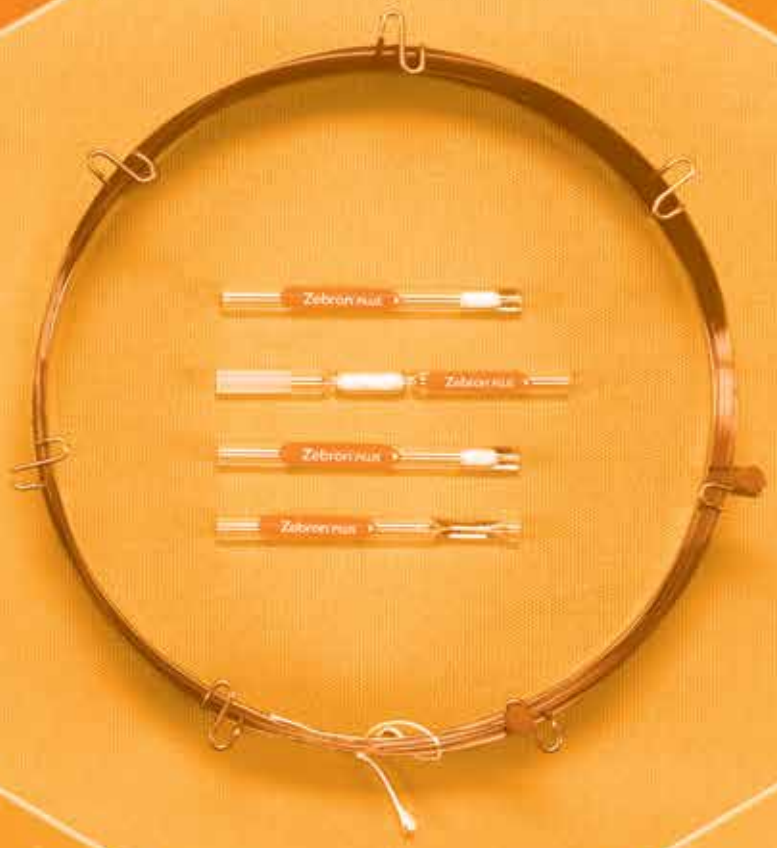


GC Column Selection Guidelines

Zebron GC Columns

GC Accessories

"The chromatography quality and performance are excellent [with Zebron]. Column bleed is minimal at 320 °C. Peak quality remains good for 5 to 6 months averaging 40 injections in a 24 hour period, 6 to 7 days per week."

Kevin Walkup
Specialized Assays, Inc.

The opinions stated herein are solely those of the speaker and not necessarily those of any company or organization.

The Master Resolution Equation

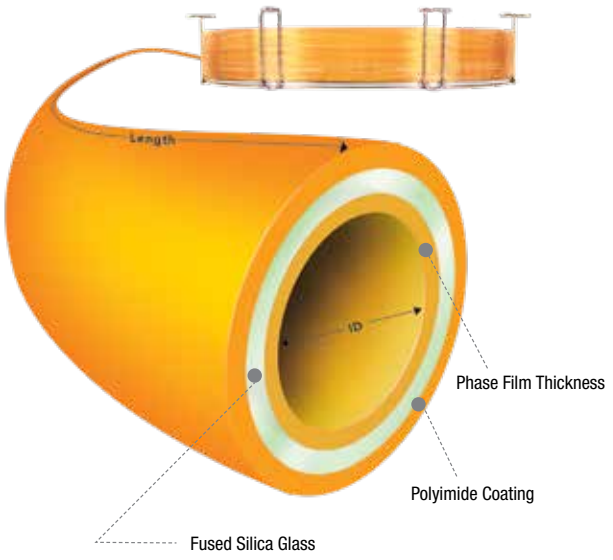
Choosing Your Selectivity

The Basic Principle of Column Selection

How do you choose a column? Do you reach into a cabinet of mystery columns, look to your favorite 5 % phenyl phase, or borrow one from a colleague? Understanding how column paramaters impact key elements of the master resolution equation will help you quickly make the right column selection for successful separations.

$$R_s = \left[\frac{\sqrt{N}}{4}\right] \times \left[\frac{\alpha - 1}{\alpha}\right] \times \left[\frac{k}{k+1}\right]$$

	Efficiency Term	Selectivity Term	Retention Term
Relates to:	Column Length Column ID	Column Phase	Column ID Film Thickness
Other Considerations:	Carrier Gas Linear Velocity	Temperature	Temperature



Selectivity Has the Biggest Impact on Resolution

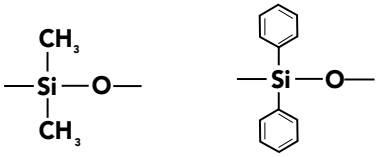
Resolution between two analytes is mainly determined by the selectivity of the stationary phase. By increasing the resolution between two compounds, the total analysis time can often be reduced significantly!

Selectivity vs. Polarity

Polarity gives a general guideline for sample capacity and separation, which can affect peak shape and resolution. However, two columns may have similar polarity but show different separation profiles due to dissimiliar phase chemistries. For example, ZB-35 and ZB-1701 are close in polarity, but the cyanopropyl group makes ZB-1701 very different from ZB-35 in terms of selectivity.

ZB-35

Polarity: 18

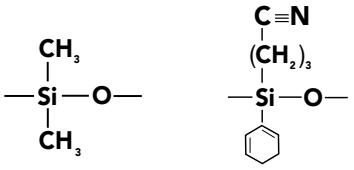


65 % Dimethylpolysiloxane

35 % Phenyl

ZB-1701

Polarity: 19



86 % Dimethylpolysiloxane

14 % Cyanopropylphenyl

The 3 Most Prevalent GC Interactions

The following selection guidelines can be a starting point for choosing Zebron™ columns in common selectivities. Please contact your Phenomenex representative for additional assistance.

Dispersive Forces (Van der Waals Interactions)

- Weakest of all intermolecular forces and occurs between non-polar compounds
- Separation is based on boiling point (classic example – hydrocarbon separation in SimDist analysis)

Dipole-Dipole Interactions

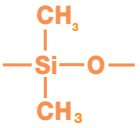
- Either permanently present or induced by analyte-stationary phase interactions
- Higher dipole-dipole interaction can help separate compounds with similar boiling points, but different chemical structures

Hydrogen Bonding (Acid-Base Interactions)

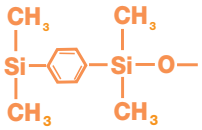
- Can cause poor peak shape or irreversible binding to the inlet liner or to the column itself
- Zebron columns are specially deactivated to minimize these interactions

Choosing A "5" Phase

Your Sample Contains	Dirty matrices or active compounds		Standard samples and wide range of analytes		Active analytes or demanding method specifications	
Your Analysis Requires	High temperature stability	Versatility for multiple analysis types	0.53 mm ID or thick film (> 0.50 µm) dimensions	Versatility for multiple analysis types or reduced bleed	Improved peak shapes, responses, or sensitivity for environmental matrices	Inertness and versatility for biological, chemical, or food matrices
Phase	**ZB-5HT Inferno™**	**ZB-5*PLUS*™**	**ZB-5**	**ZB-5ms**	**ZB-SemiVolatiles**	**ZB-5MS*PLUS*™**
	5 % Phenyl	**5 % Phenyl**	**5 % Phenyl**	**5 % Phenyl-Arylene**	**5 % Phenyl-Arylene**	**5 % Phenyl-Arylene**
	Stable to 430 °C for extended lifetime and high temp bakeouts	Highly inert, low-bleed phase recommended for drug screens and active analytes	Extremely versatile; good starting point for method developers	Extremely versatile; good starting point for method developers with better selectivity for aromatics	Enviro-Inert™ phase recommended for SVOCs, PBDEs, or other active compounds	Highly inert, versatile phase for chemical, biological, or food matrices



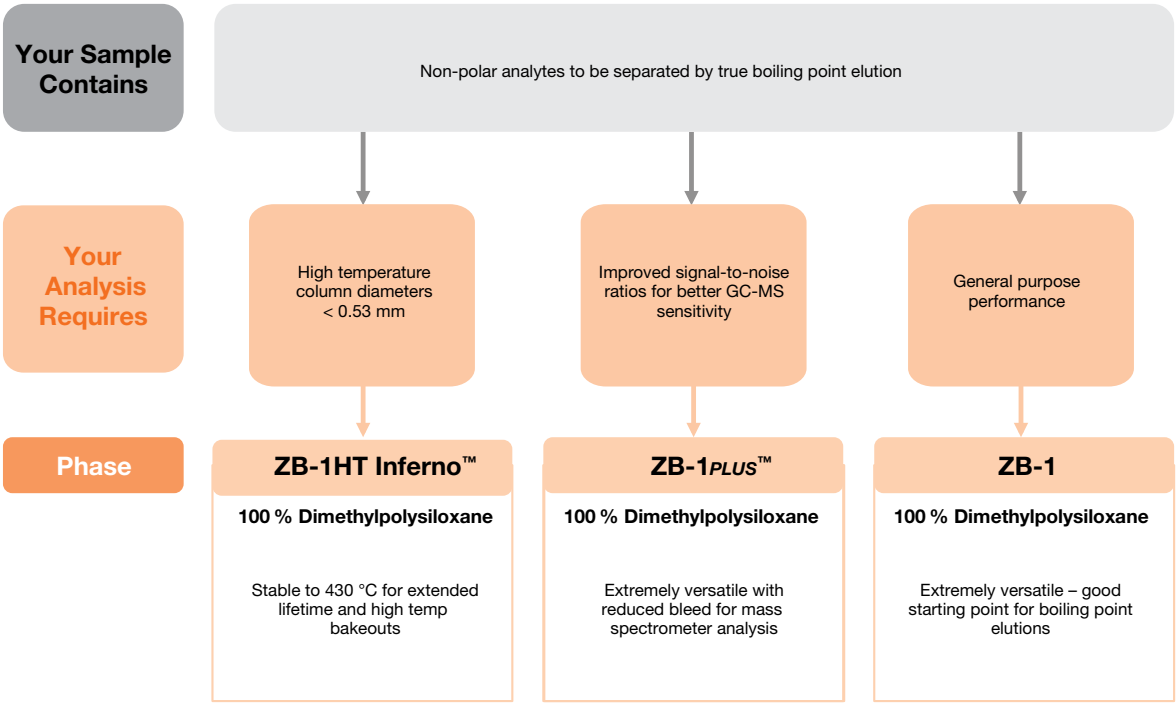
ZB-5HT Inferno, ZB-5, and ZB-5*PLUS* are 5 % phenyl based phases and are versatile for a wide analyte range.



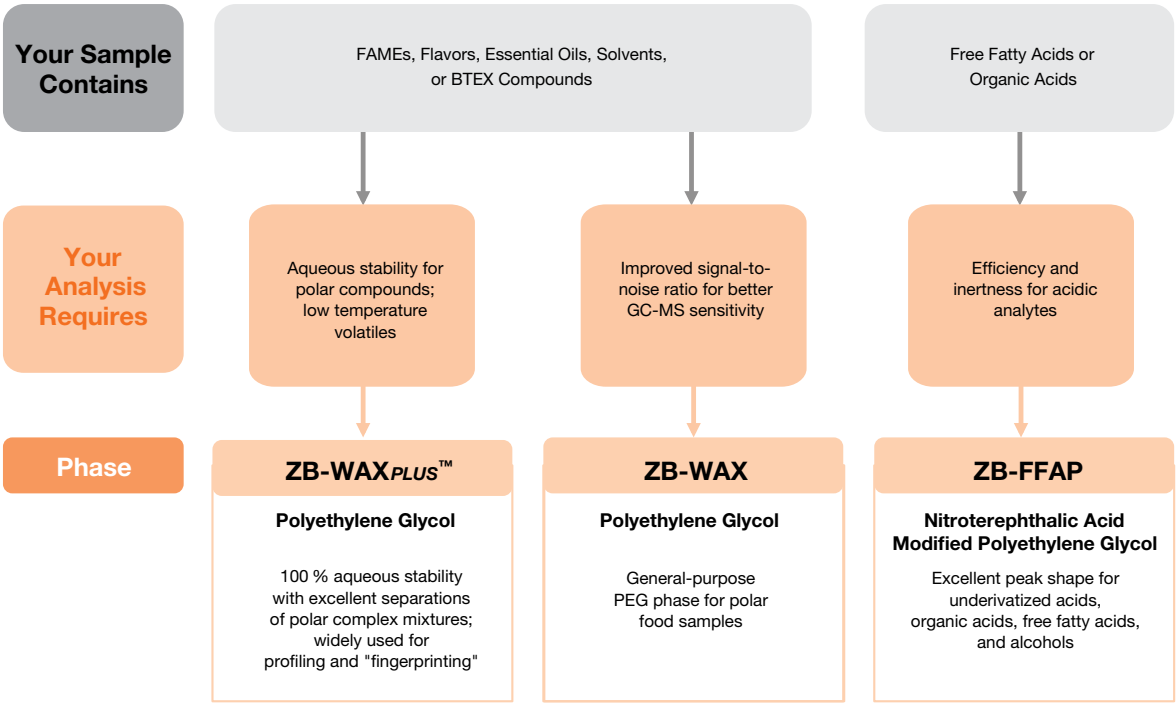
ZB-SemiVolatiles, ZB-5MS*PLUS*, and ZB-5ms are 5 % phenyl-arylene based phases and provide better separation of aromatics.

Choosing Your Selectivity *(cont'd)*

Choosing A "1" Phase



Choosing A "PEG" Phase

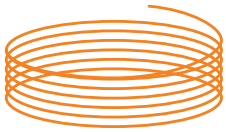


Choosing Your Dimensions

Length

Longer columns can improve resolution, but they will also increase run times. Under isothermal conditions, doubling column length only increases resolution by 41 %, but doubles the run time! Choose a column length that balances efficiency with acceptable run times.

Short → **Long**

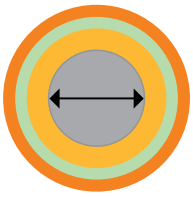
15 m or less	Good Starting Length	60 m or more
Applications • High boilers • GC-MS applications **Advantages** • Faster run times • Higher temp. limits • Lower bleed • Higher efficiency **Disadvantages** • Less inert • Limited retention	**30 m** 	**Applications** • Complex samples with closely eluting peaks • Low boilers • Less active samples • Complex temperature ramps **Advantages** • Better resolution **Disadvantages** • Slow run times

Choosing Your Dimensions *(cont'd)*

Internal Diameter

Column internal diameter (ID) has a major impact on both resolution and sample capacity. Unlike column length, using smaller ID columns can actually lead to faster run times, because the column length required with a small ID is often shorter due to increased efficiency.

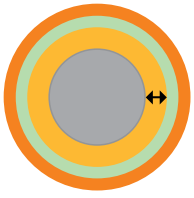
Narrow → **Wide**

0.10, 0.18, 0.20 mm	Good Starting ID	0.32, 0.53 mm
Applications • Complex samples **Advantages** • Faster run times • Better resolution **Disadvantages** • Lower sample capacity • Easily overloaded	**0.25 mm** 	**Applications** • Dirty samples • Highly concentrated samples **Advantages** • Increased sample capacity • Good for on-column injections **Disadvantages** • Decreased efficiency • May need higher flow rates unsuitable for GC-MS

Film Thickness

Film thickness determines solute retention and plays an important role in column sample capacity. Thin film columns are faster and provide higher resolution, but lower sample capacity. In most instances, choose the thinnest film possible that still provides adequate retention. When working with active samples, using a slightly thicker film can significantly improve peak shape.

Thin → **Thick**

0.10, 0.18 µm	Good Starting Film	0.50 µm or more
Applications • High boilers • GC-MS applications **Advantages** • Faster run times • Higher temp. limits • Lower bleed • Higher efficiency **Disadvantages** • Less inert • Limited retention	**0.25 µm** 	**Applications** • Low boilers • Gases, solvents, purgeables, volatiles • Purity testing **Advantages** • Better inertness • Higher capacity **Disadvantages** • Slow run times • Lower temp. limits • Higher bleed

Cross-Reference by Manufacturer

Upgrade to Zebron!

Our commitment to quality and innovation is what makes Zebron GC columns well-suited for any application. Performance is GUARANTEED.

Zebron Phase	Zebron Composition	Restek®	Agilent®	Supelco®	SGE®	OV
ZB-1	100 % Dimethylpolysiloxane	Rtx®-1, Rtx-1PONA, Rtx-1 F&F	DB®-1, DB-2887, DB-1 EVDX, HP-1, HP-101, HP-PONA,Ultra 1, CP-Sil 5 CB	SPB®-1, SPB-1 TG, SE-30, MET-1, SPB-1 Sulfur, SPB-HAP	BP1, BP1-PONA, BPX1-SimD	OV-1
ZB-DHA-PONA	100% Dimethylpolysiloxane	Rtx-DHA	HP-PONA DB-PETRO CP-Sil PONA CB	Petrocol®-DH		
ZB-1*PLUS*™	100 % Dimethylpolysiloxane	Rtx-1ms, Rxi®-1ms	DB-1ms, DB-1ms Ultra Inert, HP-1ms, HP-1ms Ultra Inert, CP-Sil 5 CB MS, VF-1ms	MDN-1, Equity®-1	SolGel-1ms™	
ZB-1HT Inferno™	100 % Dimethylpolysiloxane	Rxi-1HT	DB-1ht, CP-SimDist	Petrocol 2887		
ZB-1XT SimDist	100 % Dimethylpolysiloxane	MXT®-1HT SimDist, MXT-1, MXT-1 SimDist, MXT-2887	CP-SimDist UltiMetal, CP-Sil 8 CB UltiMetal, BPX1-SimD, DB-HT SimDis, DB-PS1, DB-PS2887			
ZB-5	5 % Phenyl 95 % Dimethylpolysiloxane	Rtx-5	DB-5, HP-5, Ultra 2, HP-PAS-5, CP-Sil 8 CB	MDN-5, SPB-5, PTE-5, SE-54, PTA-5, Equity-5, Sac-5	BP5, BPX5	OV-5
ZB-5*PLUS*™	5 % Phenyl 95 % Dimethylpolysiloxane	Rtx-5ms, Rxi-5ms, Rtx-5Amine	DB-5, HP-5ms, HP-5msi	MDN-5S		
ZB-5HT Inferno	5 % Phenyl 95 % Dimethylpolysiloxane	Rxi-5HT, Rtx-5HT Stx®-5HT, XTI®-5HT	DB-5ht, VF-5ht	HT-5		
ZB-5ms	5 % Phenyl-Arylene 95 % Dimethylpolysiloxane	Rtx-5Sil MS, Rxi-5Sil MS	DB-5ms, DB-5.625, DB-5ms EVDX, VF-5ms, CP-Sil 8 CB MS			
ZB-5MS*PLUS*™	5 % Phenyl-Arylene 95 % Dimethylpolysiloxane	Rxi-5Sil MS	DB-5ms Ultra Inert, HP-5ms Ultra Inert, DB-5ms, VF-5ms	SLB®-5ms		
ZB-SemiVolatiles	5 % Phenyl-Arylene 95 % Dimethylpolysiloxane	Rxi-5Sil MS, Rxi-5ms	DB-5ms Ultra Inert, HP-5ms Ultra Inert	SLB-5ms		
ZB-35	35 % Phenyl 65 % Dimethylpolysiloxane	Rtx-35, Rtx-35ms	DB-35, DB-35ms, HP-35, HP-35ms	MDN-35, SPB-35, SPB-608	BPX35, BPX608	OV-11
ZB-35HT Inferno	35 % Phenyl 65 % Dimethylpolysiloxane			Phenomenex Exclusive		
ZB-50	50 % Phenyl 50 % Dimethylpolysiloxane	Rtx-50	DB-17, DB-17HT, DB-17ms, DB-17 EVDX, HP-50+, CP-Sil 24 CB	SP-2250, SPB-17, SPB-50	BPX50	OV-17
ZB-624	6 % Cyanopropylphenyl 94 % Dimethylpolysiloxane	Rtx-1301, Rtx-624	DB-1301, DB-624, DB-VRX, HP-VOC, CP-1301, CP-Select 624 CB	SPB-1301, SPB-624	BP624	OV-624
ZB-624*PLUS*™	Proprietary	Rxi-624Sil MS	CP-Select 624 CB, DB-624UI Ultra Inert			
ZB-1701	14 % Cyanopropylphenyl 86 % Dimethylpolysiloxane	Rtx-1701	DB-1701, CP-Sil 19 CB	SPB-1701, Equity-1701	BP10	OV-1701
ZB-1701P	14 % Cyanopropylphenyl 86 % Dimethylpolysiloxane		DB-1701P			
ZB-FAME	High Cyanopropyl		CP-Sil 88, HP-88, DB-23	SP®-2560, SP-2380		
ZB-WAX	Polyethylene Glycol	Rtx-WAX, Famewax, Stabilwax-DB	DB-WAXetr, HP-INNOWax, CP-Wax 57 CB	MET-Wax, Omegawax	SolGel-WAX™	
ZB-WAX*PLUS*™	Polyethylene Glycol	Stabilwax®	DB-WAX, CAM, HP-20M, Carbowax 20M, CP-Wax 52 CB	SUPELCOWAX® 10	BP20	Carbowax 20M
ZB-FFAP	Nitroterephthalic Acid Modified Polyethylene Glycol	Stabilwax-DA	DB-FFAP, HP-FFAP, CP-Wax 58 FFAP CB, CP-FFAP CB	Nukol, SPB-1000	BP21	OV-351
ZB-MultiResidue™**-1**	Proprietary	Rtx-CLPesticides, Stx-CLPesticides				
ZB-MultiResidue-2	Proprietary	Rtx-CLPesticides2, Stx-CLPesticides2				
ZB-CLPesticides-1	Proprietary	Rtx-CLPesticides, Stx-CLPesticides				
ZB-CLPesticides-2	Proprietary	Rtx-CLPesticides2, Stx-CLPesticides2				
ZB-XLB	Proprietary	Rtx-XLB, Rxi-XLB	DB-XLB, VF-XMS	MDN-12		
ZB-XLB-HT Inferno	Proprietary			Phenomenex Exclusive		
ZB-Drug-1	Proprietary			Phenomenex Exclusive		
ZB-BAC-1	Proprietary	Rtx-BAC1	DB-ALC1			
ZB-BAC-2	Proprietary	Rtx-BAC2	DB-ALC2			
ZB-Bioethanol	Proprietary			Phenomenex Exclusive		

This section is, neither in terms of manufacturers nor in terms of their products, a complete list, and the accuracy of the data is not guaranteed.
Small differences in dimensions or performance might be possible and slight adjustments to your application may be necessary.

Environmental Selection Chart

Listed below are recommended Zebron columns for environmental and EPA methods. Other columns may also be used for these analyses — please contact Phenomenex for your specific GC column needs.

Drinking Water

Method #	Description	Primary Column	Confirmation Column	Page
501.3	Trihalomethanes by GC-MS with Selected Ion Monitoring (SIM)	ZB-624, ZB-624*PLUS*™		147, 130
502.2	Volatile Halogenated Organics by Purge & Trap GC/PID/ELCD	ZB-624, ZB-624*PLUS*		147, 130
503.1	Volatile Aromatics and Unsaturated Organics by Purge & Trap GC	ZB-624, ZB-624*PLUS*		147, 130
504.1	1,2-Dibromoethane (EDB), 1,2-Dibromo-3-chloropropane (DBCP), and 1,2,3-Trichloropropane (123TCP) by GC	ZB-CLPesticides-1 ZB-MultiResidue™-1	ZB-CLPesticides-2 ZB-MultiResidue-2	106 108
505	Organohalide Pesticides & Aroclors by GC-ECD	ZB-CLPesticides-1 ZB-MultiResidue-1	ZB-CLPesticides-2 ZB-MultiResidue-2	106 108
507	Nitrogen & Phosphorus Containing Pesticides by GC/NPD	ZB-MultiResidue-1 ZB-CLPesticides-2	ZB-MultiResidue-2 ZB-CLPesticides-2	108 106
508	Chlorinated Pesticides by GC-ECD	ZB-CLPesticides-1 ZB-MultiResidue-1	ZB-CLPesticides-2 ZB-MultiResidue-2	106 108
509	Ethylene Thiourea (ETU) by GC/NPD	ZB-WAX*PLUS*™	ZB-1701	128, 148
513	2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin by GC/HRMS	ZB-SemiVolatiles		104
515.3	Chlorinated Acids by Liquid-Liquid Extraction, Derivatization and GC-ECD	ZB-XLB	ZB-35	152, 145
521	Nitrosamines by Solid Phase Extraction (SPE) and GC-MS/MS with Large Volume Injection	ZB-SemiVolatiles		104
522	1,4-Dioxane by Solid Phase Extraction (SPE) and GC-MS with Selected Ion Monitoring (SIM)	ZB-SemiVolatiles		104
523	Triazine Pesticides and their Degradates by GC-MS	ZB-50		146
524.3	Purgeable Organic Compounds by GC-MS	ZB-624, ZB-624*PLUS*		147, 130
525.2	Semi-volatile Organic Chemicals by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles		104
526	Selected Semi-volatile Organic Compounds by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles		104
527	Selected Pesticides and Flame Retardants by Solid Phase Extraction (SPE) and GC-MS	ZB-5*PLUS*™		124
528	Phenols by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles	ZB-35	104, 145
529	Explosives and Related Compounds by Solid Phase Extraction (SPE) and GC-MS	ZB-5*PLUS*™		124
548	Endothall by Aqueous Derivatization, Liquid-Solid Extraction, and GC-ECD	ZB-SemiVolatiles	ZB-35	104, 145
551.1	Chlorinated Solvents & Disinfection Byproducts by Liquid-Liquid Extraction and GC-ECD	ZB-35		145
552.3	Haloacetic Acids and Dalapon by Liquid-Liquid Extraction, Derivatization, and GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35	106 152, 145
556	Carbonyl Compounds by Pentafluorobenzylhydroxylamine Derivatization and GC-ECD	ZB-SemiVolatiles	ZB-1701	104, 148

Waste Water

Method #	Description	Primary Column	Confirmation Column	Page
601	Purgeable Halocarbons by Purge & Trap GC	ZB-624, ZB-624*PLUS*		147, 130
602	Purgeable Aromatics by Purge & Trap GC	ZB-624, ZB-624*PLUS*		147, 130
603	Acrolein & Acrylonitrile Purge & Trap GC	ZB-624, ZB-624*PLUS*		147, 130
604	Phenols by GC-ECD	ZB-SemiVolatiles		104
606	Phthalate Esters by GC-ECD	ZB-5*PLUS*™		124
607	Nitrosamines by GC/NPD	ZB-SemiVolatiles		104
608	Organochlorine Pesticides and PCBs by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2	108
609	Nitroaromatics & Isophorone by GC-FID and GC-ECD	ZB-SemiVolatiles		104
610	Polynuclear Aromatic Hydrocarbons by GC-FID	ZB-SemiVolatiles		104
611	Haloethers by GC-ECD	ZB-SemiVolatiles		104
612	Chlorinated Hydrocarbons by GC-ECD	ZB-SemiVolatiles		104
613	2,3,7,8-Tetrachlorodibenzo-p-dioxin by GC-MS	ZB-SemiVolatiles		104
615	Chlorinated Herbicides by GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35	106 152, 145
619	Triazine Herbicides by GC-MS	ZB-50		146
622	Organophosphorus Pesticides by GC-MS	ZB-MultiResidue-1		108
624	Purgeable Volatiles by Purge & Trap GC-MS	ZB-624		147
625	Base/Neutral and Acids by GC-MS	ZB-SemiVolatiles		104
1613	Tetra- through Octa-Chlorinated Dioxins & Furans by Isotope Dilution HRGC/HRMS	ZB-SemiVolatiles		104
1614	Polybrominated Diphenyl Esters (PBDEs) by HRGC/HRMS	ZB-5HT Inferno™ ZB-SemiVolatiles		136 104
1618	Organohalide Pesticides, Organophosphorus Pesticides, and Phenoxy-Acid Herbicides by GC	ZB-MultiResidue-1	ZB-MultiResidue-2	108
1624	Volatile Organic Compounds by Isotope Dilution GC-MS	ZB-624, ZB-624*PLUS*		147, 130
1625	Semi-volatile Organic Compounds by Isotope Dilution GC-MS	ZB-SemiVolatiles		104
1653	Chlorinated Phenols by In-Situ Acetylation and GC-MS	ZB-SemiVolatiles		104
1657	Organophosphorous Pesticides by GC/FPD	ZB-MultiResidue-1	ZB-MultiResidue-2	108
1658	Phenoxy-Acid Herbicides by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2	108
1659	Dazomet by GC/NPD	ZB-MultiResidue-1	ZB-MultiResidue-2	108
1666	Pharmaceutical Volatile Organic Compounds by Purge & Trap GC or Isotope Dilution GC-MS	ZB-SemiVolatiles (Direct Injection) ZB-624 (Purge & Trap), ZB-624*PLUS*		104 147 130
1668	Polychlorinated Biphenyl (PCB) Congeners by HRGC/HRMS	ZB-MultiResidue-1	ZB-1	108, 142
1671	Pharmaceutical Manufacturing Volatile Organic Compounds by GC-FID	ZB-1		142
7850	White Phosphorus (P4) by Solvent Extraction and GC/NPD	ZB-1		142

Environmental Selection Chart

Listed below are recommended Zebron columns for environmental and EPA methods. Other columns may also be used for these analyses — please contact Phenomenex for your specific GC column needs.

Solid Waste

Method #	Description	Primary Column	Confirmation Column	Page
8010B	Halogenated Volatile Organics by GC/ELCD	ZB-624, ZB-624*PLUS*™		147, 130
8015C	Nonhalogenated Organics by GC	ZB-5HT		136
8020A	Aromatic Volatile Organics by GC/PID	ZB-WAX, ZB-WAX*PLUS*™		150 128
8021B	Aromatic and Halogenated Volatiles by GC/PID or GC/ELCD	ZB-624, ZB-624*PLUS*	ZB-1 (thick phase)	147, 130, 142
8030A	Acrolein and Acrylonitrile by GC-FID	ZB-624, ZB-624*PLUS*		147, 130
8032A	Acrylamide by GC-ECD	ZB-5HT Inferno™		136
8041	Phenols by GC-ECD or GC-FID	ZB-SemiVolatiles		104
8061A	Phthalate Esters by GC-ECD	ZB-SemiVolatiles	ZB-1701	104, 148
8081B	Organochlorine Pesticides by GC-ECD	ZB-MultiResidue™-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2	108 106
8082A	Polychlorinated Biphenyls (PCBs) by GC-ECD	ZB-MultiResidue-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2	108 106
8091	Nitroaromatics and Cyclic Ketones by GC-ECD or GC/NPD	ZB-SemiVolatiles	ZB-1701	104, 148
8095	Explosives by GC-ECD	ZB-50		146
8100	Polynuclear Aromatic Hydrocarbons by GC-FID	ZB-SemiVolatiles, ZB-35		104,145
8121	Chlorinated Hydrocarbons by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2	108
8131	Aniline and Selected Derivatives by GC/NPD	ZB-SemiVolatiles	ZB-1	104, 142
8141B	Organophosphorus Pesticides by GC/FPD or GC/NPD	ZB-MultiResidue-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2	108 106
8151A	Chlorinated Herbicides by GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35	106 152, 145
8260B	Volatile Organic Compounds by GC-MS	ZB-624, ZB-624*PLUS*		147, 130
8270D	Semi-volatile Organic Compounds by GC-MS	ZB-SemiVolatiles		104
8272	Polynuclear Aromatic Hydrocarbons (PAHs) by SPME and GC-MS with Selected Ion Monitoring (SIM)	ZB-SemiVolatiles, ZB-35		104 145
8280B	Polychlorinated Dibenzo-P-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) By HRGC/LRMS	ZB-SemiVolatiles		104
8290A	Polychlorinated Dibenzo-P-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) By HRGC/HRMS	ZB-SemiVolatiles		104
8410	Semi-Volatile Organic Compounds by GC/FTIR	ZB-SemiVolatiles		104
8430	Bis(2-chloroethyl) Ether and Hydrolysis Products by Direct Aqueous Injection GC/FT-IR	ZB-WAX*PLUS*		128

Air

Method #	Description	Primary Column	Page
TO-1	Volatile Organic Compounds by Thermal Adsorption and GC-MS	ZB-1*PLUS*™	122
TO-2	Volatile Organic Compounds by Carbon Molecular Sieve Adsorption and GC-MS	ZB-1*PLUS*	122
TO-3	Volatile Organic Compounds by Cryogenic Preconcentration Techniques and GC-FID /ECD	ZB-1*PLUS*	122
TO-4A	Pesticides and Polychlorinated Biphenyls (PCBs) by High Volume Polyurethane Foam (PUF) Sampling and GC	ZB-MultiResidue-1	108
TO-7	N-Nitrosodimethylamine by GC-MS	ZB-WAX*PLUS*	128
TO-9A	Polychlorinated, Polybrominated, and Brominated/Chlorinated Dibenzo-p-Dioxins and Dibenzofurans by HRGC/HRMS	ZB-SemiVolatiles	104
TO-10A	Pesticides and Polychlorinated Biphenyls (PCBs) by Low Volume Polyurethane Foam (PUF) Sampling and GC	ZB-MultiResidue-1	108
TO-13A	Polycyclic Aromatic Hydrocarbons (PAHs) by GC-MS	ZB-SemiVolatiles	104
TO-14A	Volatile Organic Compounds by Specially Prepared Canisters and GC	ZB-1*PLUS*	122
TO-15	Volatile Organic Compounds by Specially Prepared Canisters and GC-MS	ZB-1*PLUS*	122

Food & Flavors Selection Chart

Listed below are recommended Zebron columns for food safety, food quality, and flavor/fragrance methods. Other columns may also be used for these analyses — please contact Phenomenex for your specific GC column needs.

Food Safety

Compound Class	Analysis	Recommended Columns	Page
Pesticides & Antimicrobials	Multi-Residue Pesticide Screening	ZB-MultiResidue™-1 and -2	108
	Organochlorine Pesticides in Water	ZB-MultiResidue-1 and -2	108
	Organochlorine Pesticides in Foods of Plant Origin	ZB-MultiResidue-1 and -2	108
	Organophosphorus Pesticides in Foods of Plant Origin	ZB-MultiResidue-1 and -2	108
	Triazine Pesticides in Water	ZB-50	146
	Triazine Pesticides in Foods of Plant Origin	ZB-50	146
	Chloramphenicol in Foods of Animal Origin	ZB-1*PLUS*™	122
Environmental Contaminants	Polybrominated Diphenyl Ethers (PBDEs) in Food	ZB-5MS*PLUS*™, ZB-SemiVolatiles, ZB-35	124, 104, 145
	Polychlorinated Biphenyls (PCBs) in Water	ZB-MultiResidue-1, ZB-XLB-HT Inferno™	108, 140
	Polychlorinated Dibenzo-dioxins (PCDDs) in Food	ZB-5MS*PLUS*, ZB-SemiVolatiles	126, 104
	Polychlorinated Dibenzo-furans (PCDFs) in Food	ZB-5MS*PLUS*, ZB-SemiVolatiles	126, 104
	Polycyclic Aromatic Hydrocarbons (PAHs) in Water	ZB-5MS*PLUS*, ZB-SemiVolatiles, ZB-35	126, 104, 145
Food Contact Materials	Food Packaging Volatiles	ZB-624, ZB-624*PLUS*™	147, 130
	Melamine in Food	ZB-XLB-HT Inferno	140
	Cyanuric Acid in Food	ZB-XLB-HT Inferno	140
	Phthalates in Food	ZB-5MS*PLUS*	126
	Residual Solvents in Food	ZB-624, ZB-624*PLUS*, ZB-WAX*PLUS*	147, 130, 128
	Bisphenol A & F (BPA/BPF) in Food	ZB-5MS*PLUS*	126
Additives & Preservatives	Parabens in Food	ZB-5MS*PLUS*	126
	Chloropropanols (3-MCPD) in Food	ZB-5MS*PLUS*	126
	Flavor Additives (Borneol)	ZB-MultiResidue-1	108
	Phenolic Antioxidants (BHA & BHT) in Food	ZB-50	146
	Tocopherols in Food	ZB-5MS*PLUS*	126
Process Contaminants	Acrylamide in Foods	ZB-5HT Inferno	136
	Acrylamide, Acrylonitrile, and Acrolein in Water	ZB-624, ZB-624*PLUS*	147, 130
	Benzene in Food	ZB-WAX*PLUS*	128
	Glycols in Food	ZB-WAX*PLUS*	128
Hormones	Steroid Hormones in Food	ZB-5MS*PLUS*, ZB-1*PLUS*	126, 122

Food & Flavors Selection Chart

Listed below are recommended Zebron columns for food safety, food quality, and flavor/fragrance methods. Other columns may also be used for these analyses — please contact Phenomenex for your specific GC column needs.

Food Quality

Compound Class	Analysis	Recommended Columns	Page
Fatty Acids & FAMEs	Food Industry Fatty Acid Methyl Esters (FAMEs)	ZB-FAME	102
	Marine Oil Fatty Acid Methyl Esters (FAMEs)	ZB-FAME	102
	Saw Palmetto Fatty Acid Methyl Esters (FAMEs)	ZB-FAME	102
	Free Fatty Acids	ZB-FFAP	151
	Essential Fatty Acids (EFAs) Omega-3 and Omega-6	ZB-FAME	102
Triglycerides	Butter, Canola Oil, Olive Oil, and Peanut Oil Triglycerides	ZB-5HT Inferno™	136
Alcoholic Beverages	Cognac Compounds	ZB-WAX*PLUS*™	128
	Distilled Liquor Screen	ZB-FFAP	151
	Ethanol in Beer	ZB-Bioethanol	112
	Sulfur in Beer	ZB-1*PLUS*™	122
	Whiskey Compounds	ZB-WAX*PLUS*	128
	Wine Compounds	ZB-WAX, ZB-WAX*PLUS*	150, 128
Other Acids	Organic Acids	ZB-FFAP	151
	Amino Acids	ZB-50	146
Sterols	Sterols in Lard, Margarine, Peanut Butter, or Olive Oil	ZB-5HT Inferno	136
Sugars	Alditol Acetates	ZB-5MS*PLUS*™	126
	Trimethylsilyl (TMS) Sugars	ZB-MultiResidue™-1	108

Flavors & Fragrances

Compound Class	Analysis	Recommended Columns	Page
Essential Oils	Cold-Pressed Orange Oil	ZB-WAX*PLUS*	128
	Ginkgo Biloba Oil, Lavender Oil, and Ylang Ylang Oil	ZB-1*PLUS*	122
	Peppermint Oil	ZB-WAX	150
	Rose Oil	ZB-XLB	152
	Spearmint Oil	ZB-5MS*PLUS*	126
Flavors	Flavors Screening	ZB-FFAP	151
	Flavor Allergens	ZB-5MS*PLUS*	126
	Flavor Volatiles	ZB-1*PLUS*, ZB-WAX*PLUS*, ZB-624	122, 128, 147
	Alcoholic Beverage Profile	ZB-FFAP	151
	Honey Profile	ZB-WAX*PLUS*	128
Fragrances	Fragrance Screening	ZB-WAX*PLUS*, ZB-624	128, 147
	Fragrance Allergens	ZB-1*PLUS*	122

Pharmaceutical Selection Chart

Listed below are recommended Zebron columns for USP and pharmaceutical methods. Other columns may also be used for these analyses — please contact Phenomenex for your specific GC column needs.

USP

Phase	Composition	Recommended Columns	Page
G1	Dimethylpolysiloxane Oil	ZB-1, ZB-1*PLUS*™, ZB-1HT Inferno™	142, 122, 134
G2	Dimethylpolysiloxane Gum	ZB-1, ZB-1*PLUS*, ZB-1HT Inferno	142, 122, 134
G3	50 % Phenyl 50 % Methylpolysiloxane	ZB-50	146
G5	Not less than 70 % of 3-Cyanopropylpolysiloxane	ZB-FAME	102
G8	80 % Bis (3-Cyanopropyl-20 % 3-Cyanopropylphenylpolysiloxane)	ZB-FAME	102
G9	Methylvinylpolysiloxane	ZB-1*PLUS*, ZB-1HT Inferno, ZB-1	122, 134, 142
G14	Polyethylene Glycol (Average MW 950-1,050)	ZB-WAX, ZB-WAX*PLUS*™	150, 128
G15	Polyethylene Glycol (Average MW 3,000-3,700)	ZB-WAX, ZB-WAX*PLUS*	150, 128
G16	Polyethylene Glycol (Average MW 15,000)	ZB-WAX, ZB-WAX*PLUS*	150, 128
G17	75 % Phenyl 25 % Methylpolysiloxane	ZB-50	146
G20	Polyethylene Glycol (Average MW of 380-420)	ZB-WAX, ZB-WAX*PLUS*	150, 128
G25	Polyethylene Glycol TPA (Carbowax 20M Terephthalic Acid)	ZB-FFAP	151
G27	5 % Phenyl 95 % Methylpolysiloxane	ZB-5, ZB-5*PLUS*™, ZB-5HT Inferno	143, 124, 136
	5 % Phenyl-Arylene 95 % Methylpolysiloxane	ZB-5ms, ZB-5MS*PLUS*™, ZB-SemiVolatiles	144, 126, 104
G28	25 % Phenyl 75 % Methylpolysiloxane	ZB-35, ZB-35HT Inferno	145, 138
G32	20 % Phenylmethyl 80 % Dimethylpolysiloxane	ZB-35, ZB-35HT Inferno	145, 138
G35	Polyethylene Glycol & Diepoxide Esterified with Nitroterephthalic Acid	ZB-FFAP	151
G36	1 % Vinyl 5 % Phenylmethylpolysiloxane	ZB-5, ZB-5*PLUS*, ZB-5HT Inferno	143, 124, 136
G38	Phase G1 Plus A Tailing Inhibitor	ZB-1, ZB-1*PLUS*, ZB-1HT Inferno	142, 122, 134
G39	Polyethylene Glycol (Average MW 1,500)	ZB-WAX, ZB-WAX*PLUS*™	150, 128
G41	Phenylmethyldimethylsilicone (10 % Phenyl Substituted)	ZB-5, ZB-5*PLUS*, ZB-5HT Inferno	143, 124, 136
G42	35 % Phenyl 65 % Dimethylpolysiloxane	ZB-35, ZB-35HT Inferno	145, 138
G43	6 % Cyanopropylphenyl 94 % Dimethylpolysiloxane	ZB-624, ZB-624*PLUS*™	147, 130
G46	14 % Cyanopropylphenyl 86 % Methylpolysiloxane	ZB-1701, ZB-1701P	148, 149
G47	Polyethylene glycol (average MW 8,000)	ZB-WAX*PLUS* , ZB-WAX	128, 150
G48	Highly polar, partially cross-linked cyanopolysiloxane	ZB-FAME	102

Residual Solvents

USP <467> Procedure	USP Phase for Residual Solvents	Recommended Columns	Page
Procedure A	G43 (6 % Cyanopropyl 94 % Dimethylpolysiloxane)	ZB-624, ZB-624*PLUS*	147, 130
Procedure B	G16 (Polyethylene Glycol)	ZB-WAX*PLUS*	128
Procedure C	G43 or G16	ZB-624*PLUS* or ZB-WAX*PLUS*	130, 128

Doing Headspace Testing?
Find the right headspace vial for your analysis and learn more about Verex™ Certified Vial Products with our interactive web tool.
www.phenomenex.com/verex

ASTM Method Selection Chart

Listed below are recommended Zebron columns for ASTM methods. Other columns may also be used for these analyses — please contact Phenomenex for your specific GC column needs.

ASTM

Method	Description	Recommended Columns	Page
D 1946	Reformed gas	ZB-1	142
D 2268	Analysis of n-heptane and iso-octane (high purity)	ZB-1	142
D 2306-96	Xylene isomers	ZB-WAX, ZB-WAX*PLUS*™	150, 128
D 2426	Butadiene and styrene in butadiene concentrates	ZB-1	142
D 2504	Non-condensable gases in C1-C3 hydrocarbons	ZB-1 (thick phase)	142
D 2580	Phenols in water	ZB-WAX*PLUS*	128
D 2600	Aromatic traces in light saturated hydrocarbons	ZB-WAX	150
D 2804	Purity of methyl ethyl ketone	ZB-WAX	150
D 2887	SimDist analysis of petroleum fractions	ZB-1, ZB-1XT SimDist	142, 114
D 2908	Volatile organics in water	ZB-WAX, ZB-WAX*PLUS*	150, 128
D 2998	Polyhydric alcohols in alkyd resins	ZB-1	142
D 2999	Monopentaerythritol in commercial pentaerythritol	ZB-1	142
D 3009	Composition of turpentine	ZB-WAX*PLUS*	128
D 3054	Purity and benzene content of cyclohexane	ZB-1	142
D 3086	Organochlorine pesticides in water	ZB-CLPesticides-1 or -2, ZB-MultiResidue™-1 or -2	106, 108
D 3168	Polymers in emulsion paints	ZB-1	142
D 3271	Solvent analysis in paints	ZB-WAX*PLUS*	128
D 3304	PCBs in environmental materials	ZB-MultiResidue-1 or -2	108
D 3328	Comparison of waterborne petroleum oils	ZB-1	142
D 3329	Purity of methyl isobutyl ketone	ZB-WAX*PLUS*	128
D 3432	Toluene diisocyanates in urethane prepolymers	ZB-1	142
D 3447	Purity of trichlorotrifluoroethane (CFC-113)	ZB-1, ZB-624	142, 147
D 3452	Identification of rubber	ZB-1HT Inferno™	134
D 3465	Purity of monomeric plasticizers	ZB-1	142
D 3524	Diesel fuel in lubricating oil (SAE 30)	ZB-1HT Inferno	134
D 3534	PCBs in water	ZB-5, ZB-5*PLUS*™	143, 126
D 3606	Benzene and toluene in gasoline	ZB-1	142
D 3687	Volatile organic compounds	ZB-WAX, ZB-WAX*PLUS*	150, 128
D 3710	Gasoline fractions	ZB-1XT SimDist	114
D 3725	Fatty acids in drying oils	ZB-FFAP	151
D 3760	Analysis of cumene	ZB-WAX, ZB-WAX*PLUS*	150, 128
D 3797	Analysis of o-xylene	ZB-WAX, ZB-WAX*PLUS*	150, 128
D 3798	Analysis of p-xylene impurities	ZB-WAX, ZB-WAX*PLUS*	150, 128
D 3876	Methoxyl and hydroxypropyl substitution in cellulose ether products	ZB-1	142
D 3962	Impurities in styrene	ZB-FFAP	151
D 4059	PCBs in insulating liquids	ZB-5*PLUS*, ZB-5HT Inferno	124, 136
D 4275	Butylated hydroxy toluene in ethylene and ethylenevinylacetate polymers	ZB-1	142
D 4367	Benzene in hydrocarbon solvent	ZB-1	142
D 4420	Aromatics in gasoline	ZB-1	142
D 4735	Thiophene impurities in benzene	ZB-FFAP	151
D 4768	Phenol and cresol inhibitors in insulating oils	ZB-FFAP	151
D 5060	Impurities in ethylbenzene	ZB-FFAP, ZB-WAX, ZB-WAX*PLUS*	151, 150, 128
D 5134	Petroleum naphthas through n-nonane	ZB-1, ZB-DHA-PONA	142
D 5135-95	Analysis of styrene	ZB-WAX, ZB-WAX*PLUS*	150, 128
D 5441	Analysis of Methyl Tert-Butyl Ether (MTBE)	ZB-DHA-PONA	116
D 5501	Determination of denatured bioethanol	ZB-1, ZB-Bioethanol, ZB-DHA-PONA	142, 116
D 5580	Aromatics in finished gasoline	ZB-1	142
D 6352	Extended SimDist	ZB-1HT Inferno, ZB-1XT SimDist	134, 114
D 6584	Determination of glycerine in biodiesel	ZB-5HT Inferno	136
D 6729-30, D 6733	Components in spark ignition fuels	ZB-DHA-PONA	116
D 7169	Crude Oil; Vacuum distillates	ZB-1XT SimDist	114
E 0202	Analysis of glycols	ZB-WAX*PLUS*, ZB-1	128, 142
E 1100	Analysis of denaturated ethanol	ZB-WAX*PLUS*, ZB-Bioethanol	128, 112

Essentials

A collection of tried-and-true selectivities, Essentials phases are the smart starting point for the GC method developer.

- ZB-1
- ZB-1ms
- ZB-5
- ZB-5ms
- ZB-35
- ZB-50
- ZB-624
- ZB-1701
- ZB-WAX
- ZB-FFAP
- ZB-XLB

Plus

Plus phases offer a suite of upgrades compared to their Essentials counterparts – from exceptional inertness to enhanced aqueous stability.

- ZB-1*PLUS*™
- ZB-5*PLUS*™
- ZB-5MS*PLUS*™
- ZB-WAX*PLUS*™
- ZB-624*PLUS*™

Inferno™

Resilient under even the most intense GC conditions, Inferno phases dare to defy high boilers, contaminants, and carry-overs.

- ZB-1HT
- ZB-5HT
- ZB-35HT
- ZB-XLB-HT

Unlimited

Designed for the truly bold GC scientist, Unlimited phases unleash the power of selectivity for targeted performance that breaks from the mold.

- ZB-FAME
- ZB-SemiVolatiles
- ZB-MultiResidue™ -1 & -2
- ZB-CLPesticides -1 & -2
- ZB-Drug-1
- ZB-BAC-1 & -2
- ZB-1XT SimDist
- ZB-Bioethanol
- ZB-DHA-PONA

Meet Your GC Column Family

Zebron™ GC Columns

Selected Zebron Polarities

Polarity

5	ZB-1 ZB-DHA-PONA ZB-1*PLUS*™ ZB-1HT Inferno™ ZB-1XT SimDist	**For Non-Polar Analytes** • Alkanes • Aromatics • Oils • Boiling Point Separations
8	ZB-5 ZB-5ms ZB-5*PLUS*™ ZB-5MS*PLUS*™ ZB-5HT Inferno ZB-SemiVolatiles	
9	ZB-XLB ZB-XLB-HT Inferno	
11	ZB-MultiResidue™-1	
13	ZB-624 ZB-624*PLUS*™	**For Slightly Polar Analytes** • Volatiles • Drugs • Pesticides
15	ZB-MultiResidue-2	
18	ZB-35 ZB-35HT Inferno	
19	ZB-1701 ZB-1701P	
24	ZB-50	
52	ZB-WAX*PLUS*™	**For Very Polar Analytes** • Polar Volatiles • Alcohols • Phenols • Acids
57	ZB-WAX	
58	ZB-FFAP	

Meet Your GC Column Family

ZB-FAME

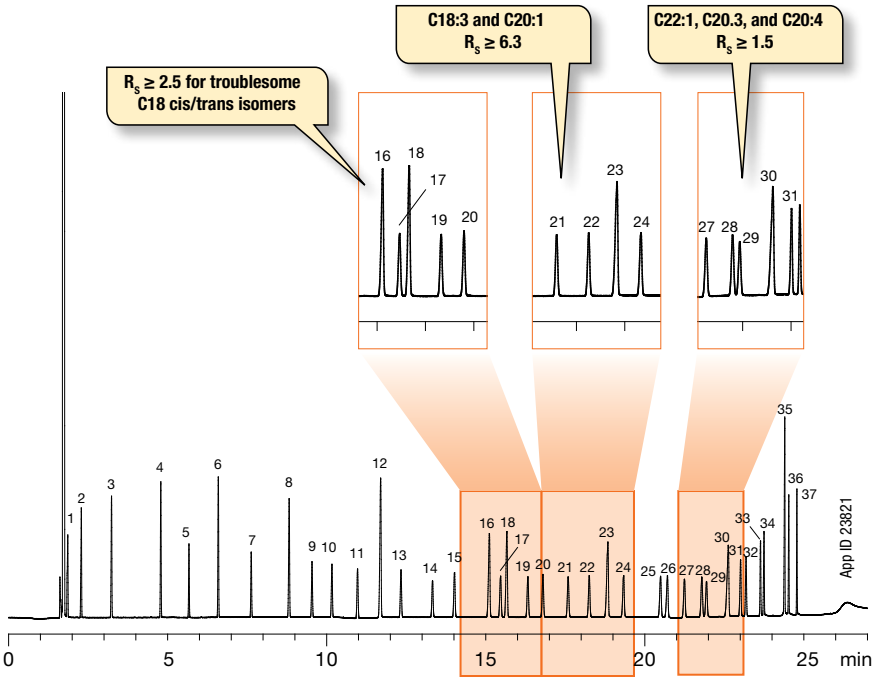
- **Reduce traditional run times up to 75 %**
- **Improve separation of cis/trans FAME isomers**
- **Suitable with AOAC, AOCS, and IOC methods**

Upgrade to Zebron from any high cyanopropyl phase:

Agilent®
- CP-Sil 88
- HP-88
- DB-23

Supelco®
- SP®-2380
- SP-2560

Baseline Separation of Common Isomers

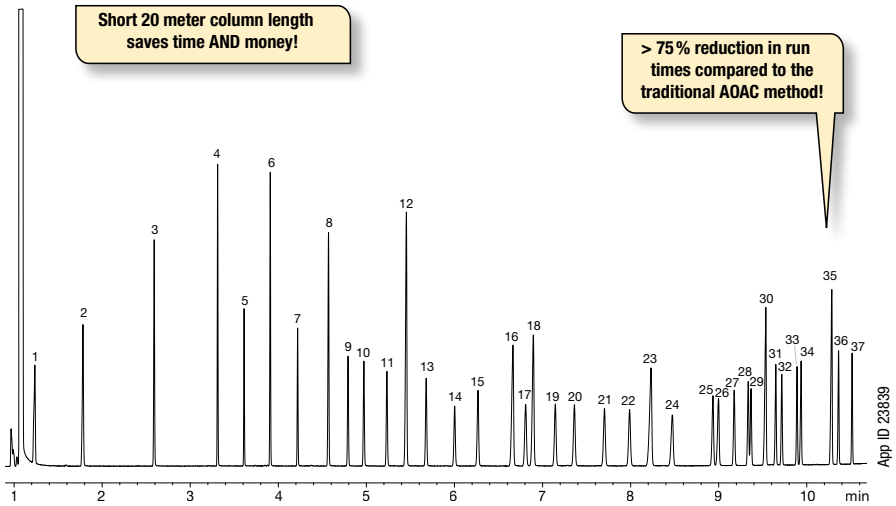


Column: Zebron ZB-FAME
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G033-10
Injection: Split 50:1 @ 240 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper with Wool, 4 mm ID
Liner Part No.: AG2-0A11-05 (for Agilent® systems)
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 100 °C for 2 min to 140 °C @ 10 °C/min to 190 °C @ 3 °C/min to 260 °C @ 30 °C/min for 2 min
Detector: FID @ 260 °C
Sample: 37 FAME standard

The Fast FAME GC Column

Traditionally, cis/trans FAME separations require the use of long (100 meters or more) columns and can run up to 60 minutes, resulting in a bottleneck to higher productivity. Zebron ZB-FAME provides targeted selectivity that allows for reduced column length – run times as short as 11 minutes without compromising your results!

37 FAMEs In A Short 11 Minute Run



Column: Zebron ZB-FAME
Dimensions: 20 meter x 0.18 mm x 0.15 µm
Part No.: 7FD-G033-05
Injection: Split 100:1 @ 250 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-0A13-05 (for Agilent® systems)
Carrier Gas: Helium @ 1.0 mL/min (constant flow)
Oven Program: 80 °C for 1.5 min to 160 °C @ 40 °C/min to 185 °C @ 5 °C/min to 260 °C @ 30 °C/min
Detector: FID @ 260 °C
Sample: 37 FAME standard

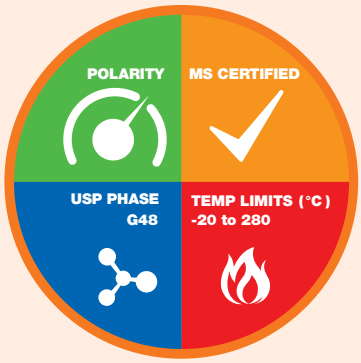
Ordering Information

Zebron ZB-FAME GC Columns

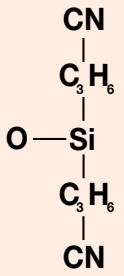
ID (mm)	df (µm)	Temp. Limits °C	Part No.
20-Meter			
0.18	0.15	-20 to 280	7FD-G033-05
30-Meter			
0.25	0.20	-20 to 280	7HG-G033-10
30-Meter with 5-Meter Guardian™ Integrated Guard			
0.25	0.20	-20 to 280	7HG-G033-10-GGA
60-Meter			
0.25	0.20	-20 to 280	7KG-G033-10
100-Meter			
0.25	0.20	-20 to 280	7MG-G033-10

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G033-10-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Phase Chemistry



High Cyanopropyl

Recommended Applications

- Fatty Acid Methyl Ester (FAMEs)
- cis/trans FAME isomers
- Omega 3, Omega 6 FAMEs

ZB-SemiVolatiles

Maximize Inertness

- **Specifically designed to overcome obstacles for sensitive semi-volatiles methods**
- **Enviro-Inert™ Technology provides a rugged 5 % phenyl-arylene phase – reduce activity without compromising selectivity**
- **Rugged QC test includes EPA 8270 tuning standard to ensure column is ready to pass suitability requirements**
- **Popular for EPA Methods 525, 610, 625, 8100, and 8270D**

Upgrade to Zebron from any 5 %-phenyl or 5 % phenyl-arylene / 95 % dimethylpolysiloxane phase:

Agilent®
- DB®-5ms
- DB-5ms Ultra Inert
- DB-5.625
- DB-UI 8270D
- HP-5ms
- HP-5ms Ultra Inert
- VP-5ms
- CP-5il 8 CB MS

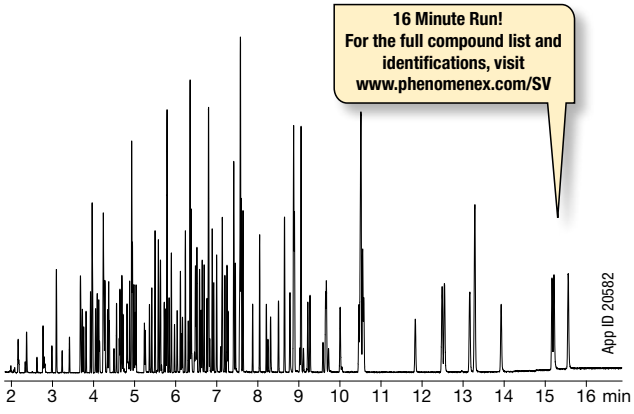
Restek®
- Rxi®-5Sil MS
- Rxi-5ms

Supelco®
- SLB®-5ms

135 Compounds in Under 16 Minutes

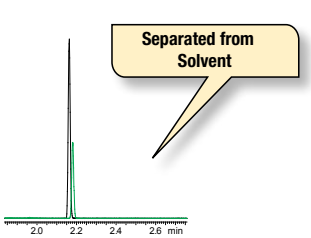
ZB-SemiVolatiles provides improved productivity with shorter run times for EPA 8270D, while maintaining resolution of key critical pairs.

Semivolatile Organic Compounds

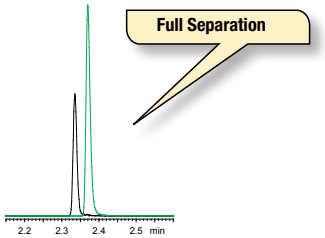


Column: Zebron ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G027-11
Injection: Split 10:1 @ 280 °C, 1 µL
Liner: AG0-8499 (Single Taper with Wool)
Septum: AG0-4697 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Easy Seals™ Inlet Base Seal)
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 260 °C @ 40 °C/min to 295 °C @ 6 °C/min to 325 °C @ 25 °C/min for 2 min
Detector: MSD @ 340 °C; 45 – 450 amu
Sample: Analytes are 25 ppm in Dichloromethane 135 compounds in EPA Method 8270D

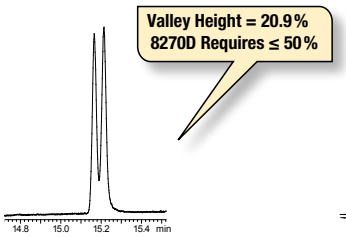
Improved Peak Shapes



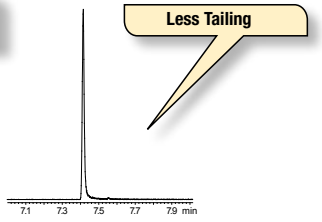
1,4-Dioxane-D8 and 1,4-Dioxane



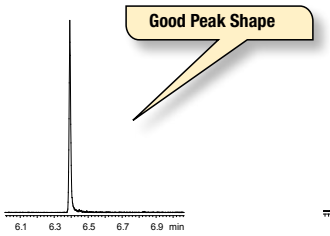
N-Nitrosodimethylamine and Pyridine



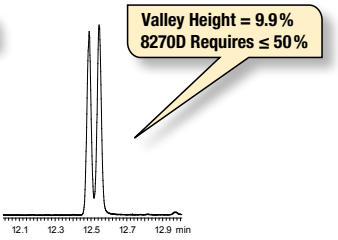
Indeno[1,2,3-cd]pyrene and Dibenz[a,h]anthracene, both share mass 276



Pentachlorophenol



2,4-Dinitrophenol



Benzo[b]fluoranthene and Benzo[k]fluoranthene

2013 Laboratory Equipment Readers' Choice WINNER

ZB-SemiVolatiles

We QC Test For the Compounds You Analyze

We take the guesswork out of meeting method requirements by aggressively testing ZB-SemiVolatiles with two different test mixes. We incorporated troublesome analytes from your samples and compounds in the EPA 8270D tuning standard into our QC test, so you can be sure your column is ready to meet suitability requirements for the method.

Meet Requirements Out-of-the-Box

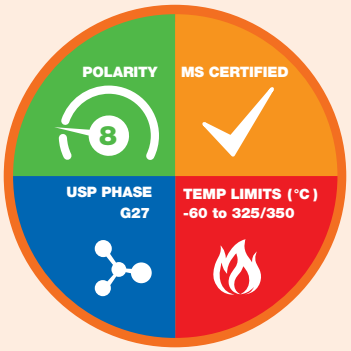
Test Probe	Criteria	EPA Requirement	Our Requirement
Pyridine Very active amine that exposes even the smallest amount of column activity. This ensures that our Enviro-Inert™ deactivated column performs at the highest possible level for difficult basic compounds.	Peak Response	Not Specified	≥ 0.6
Pentachlorophenol Disappears and tails on active columns; it is important to measure relative response and peak skew criteria.	Peak Skew Peak Response	≤ 2.0 Not Specified	≤ 2.0 ≥ 0.3
Benzidine Active amine that tails when column activity is present, complicating peak quantification.	Peak Skew	≤ 2.0	≤ 2.0
DDT Breaks down in an active system to DDE and DDD. With our QC test, you are assured that your column will meet the EPA requirements upon installation.	Breakdown	< 20 %	< 20 %
Injection To ensure trace-level sensitivity, QC is performed with a 20 ppm mix using a 100:1 split injection – effectively 250 times less than the EPA maximum allowed.	Sensitivity	50 ng or less on column	0.2 ng on column

Stands Up to Tough Samples for Increased Lifetime

> *"I have found the Phenomenex ZB-SemiVolatiles columns to be superior in quality and durability than any other columns we have previously used.*
>
> *The columns not only last longer, but the reproducibility of column is extraordinary.*
>
> *The column holds calibrations particularly well, even after multiple injections of samples with far less than desirable matrices. All of this equates to less downtime and maintenance and more productivity for TestAmerica."*
>
> **Ryan McKernan, GC-MS Semi-Volatile Analyst**
> **TestAmerica Laboratories, Inc. Buffalo**

The opinions stated herein are solely those of the speaker and not necessarily those of any company or organization.

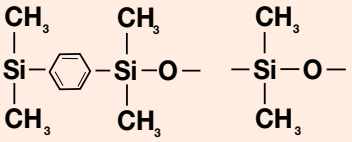
Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry

5 % Phenyl-Arylene



95 % Dimethylpolysiloxane

Recommended Applications

- Semivolatiles (SVOCs)
- EPA Methods (525, 610, 625, 8100, 8270D)
- PAHs
- PBDEs

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Ordering Information

Zebron ZB-SemiVolatiles GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.25	-60 to 325/350	7EG-G027-11
0.25	0.50	-60 to 325/350	7EG-G027-17
20-Meter			
0.18	0.18	-60 to 325/350	7FD-G027-08
0.18	0.36	-60 to 325/350	7FD-G027-53
30-Meter			
0.25	0.25	-60 to 325/350	7HG-G027-11
0.25	0.50	-60 to 325/350	7HG-G027-17
0.32	0.25	-60 to 325/350	7HM-G027-11
30-Meter with 5-Meter Guardian™ Integrated Guard			
0.25	0.25	-60 to 325/350	7HG-G027-11-GGA
0.25	0.50	-60 to 325/350	7HG-G027-17-GGA
30-Meter with 10-Meter Guardian Integrated Guard			
0.25	0.25	-60 to 325/350	7HG-G027-11-GGC
0.25	0.50	-60 to 325/350	7HG-G027-17-GGC
60-Meter			
0.25	0.25	-60 to 325/350	7KG-G027-11

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G027-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

ZB-CLPesticides-1 and -2

7 EPA Methods, One Column Set

- **Guaranteed alternative to Restek Rtx-CLPesticides**
- **Optimized, versatile selectivity for chlorinated pesticides and herbicides**
- **Well-suited for dual-column configurations using GC-ECD**
- **Run EPA Methods 8081 and 8081 extended, 8082, 8151, 504, 505, 508, and 552 without changing columns – save time**

Upgrade to Zebron from these similar* phases:

Restek®

- Rtx®-CLPesticides
- Rtx-CLPesticides2
- Stx®-CLPesticides
- Stx-CLPesticides2

*not exact equivalent, selectivity may differ

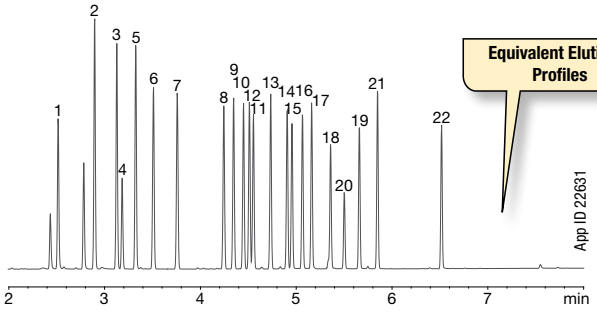
Direct Replacement for Restek Rtx-CLPesticides Phases

You asked for optimized performance for pesticides by GC-ECD detectors, without time-consuming method development. We've delivered a direct replacement**! ZB-CLPesticides-1 and -2 provide guaranteed drop-in performance compared to your current Rtx-CLPesticides column set, without the hassle.

Zebron

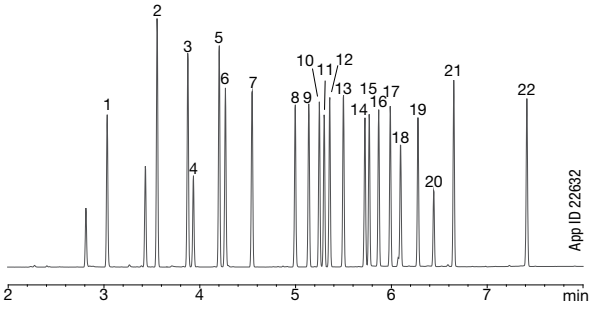
ZB-CLPesticides-1

30 m x 0.32 mm x 0.32 µm



ZB-CLPesticides-2

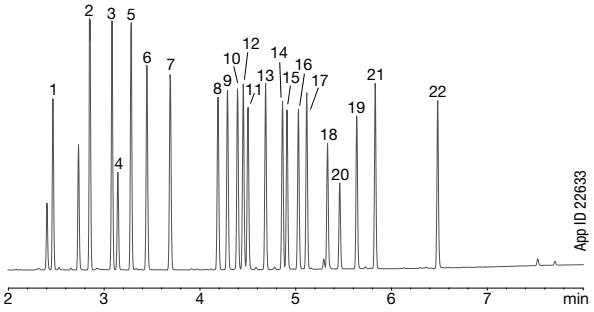
30 m x 0.32 mm x 0.25 µm



Restek®

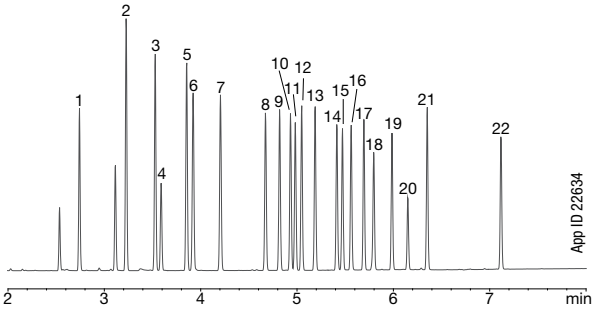
Rtx®-CLPesticides

30 m x 0.32 mm x 0.32 µm



Rtx-CLPesticides2

30 m x 0.32 mm x 0.25 µm



Conditions for all columns:

Columns: As listed
Dimensions: As listed
Part No.: 7HM-G028-51 (ZB-CLPesticides-1)
7HM-G029-11 (ZB-CLPesticides-2)
Injection: Splitless (hold 0.3 min) @ 250 °C, 1 µL
Carrier Gas: Helium @ 3.9 mL/min (constant flow)
Oven Program: 120 °C to 200 ° C @ 45 °C/min to 230 °C @ 15 °C/min to 330 °C @ 30 °C/min for 2 min

Detector: ECD @ 330 °C
Y-Connector: AG0-4717 (Fused Quartz)
Guard Column: 7AM-G000-00-GZ0 (5 m Z-Guard™)
Liner: AG0-8499 (Single Taper with Wool at Bottom)
Septum: AG0-4696 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Gold-Plated Easy Seals™)
Sample: Analytes are 250 ng/mL in hexane.

See page 107 for compound list.

**Direct replacement: this category indicates an alternative column which will likely give a similar selectivity.
Conditions for each method were the same for all columns tested.
Comparative separations may not be representative of all applications.

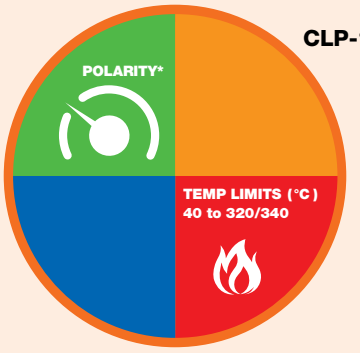
ZB-CLPesticides-1 and -2

Five-Point Calibration Curve at 5, 15, 25, 100, and 250 ng/mL

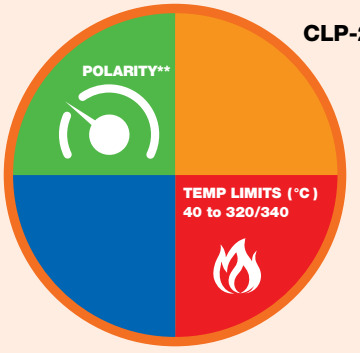
Peak No.	Analyte	ZB-CLPesticides-1 % RSD*	ZB-CLPesticides-2 % RSD*	US EPA Specifications
1	2,4,5,6-TCMX (Surr)	3.8	3.0	< 20
2	α-BHC	8.3	3.8	< 20
3	γ-BHC	5.9	5.6	< 20
4	β-BHC	6.9	6.9	< 20
5	δ-BHC	4.9	5.7	< 20
6	Heptachlor	8.0	6.5	< 20
7	Aldrin	4.2	2.3	< 20
8	Heptachlor epoxide	3.8	2.3	< 20
9	trans-Chlordane	4.1	3.8	< 20
10	cis-Chlordane	4.0	3.3	< 20
11	4,4'-DDE	4.8	2.9	< 20
12	Endosulfan I	6.0	2.5	< 20
13	Dieldrin	7.7	4.9	< 20
14	Endrin	9.4	6.6	< 20
15	4,4'-DDD	9.2	3.6	< 20
16	Endosulfan II	6.6	4.1	< 20
17	4,4'-DDT	11.6	6.9	< 20
18	Endrin aldehyde	8.3	7.3	< 20
19	Endosulfan sulfate	8.0	7.1	< 20
20	Methoxychlor	6.7	6.1	< 20
21	Endrin ketone	6.5	7.2	< 20
22	Decachlorobiphenyl (Surr)	6.7	6.6	< 20
Average		6.6 %	4.9 %	< 20

*Calculated using response factors as per EPA guidelines

Column Profile



*Similar polarity to ZB-35.



**Similar polarity to ZB-MultiResidue-2

Phase Chemistry

- Proprietary

Recommended Applications

- Dual-Column Chlorinated Pesticide Methods
- EPA Methods (8081 and 8081 extended, 8082, 8151,504, 505, 508, 552)

ZB-CLPesticides GC Column Kits

Ordering Information

0.25 mm ID Kit (includes 1 of each below) **Part No.: KG0-9285**

Description	Dimension	Part No.
ZB-CLPesticides-1	30 meter x 0.25 mm x 0.25 µm	7HG-G028-11
ZB-CLPesticides-2	30 meter x 0.25 mm x 0.20 µm	7HG-G029-10
Z-Guard™ Column	5 meter x 0.25 mm	7AG-G000-00-GZ0
Y-Connector	Fused Quartz	AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722

0.32 mm ID Kit (includes 1 of each below) **Part No.: KG0-9286**

Description	Dimension	Part No.
ZB-CLPesticides-1	30 meter x 0.32 mm x 0.32 µm	7HM-G028-51
ZB-CLPesticides-2	30 meter x 0.32 mm x 0.25 µm	7HM-G029-11
Z-Guard Column	5 meter x 0.32 mm	7AM-G000-00-GZ0
Y-Connector	Fused Quartz	AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722

0.53 mm ID Kit (includes 1 of each below) **Part No.: KG0-9290**

Description	Dimension	Part No.
ZB-CLPesticides-1	30 meter x 0.53 mm x 0.50 µm	7HK-G028-17
ZB-CLPesticides-2	30 meter x 0.53 mm x 0.42 µm	7HK-G029-16
Z-Guard Column	5 meter x 0.53 mm	7AK-G000-00-GZ0
Y-Connector	Fused Quartz	AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

ZB-CLPesticides GC Columns

Ordering Information

ZB-CLPesticides-1 GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
30-Meter			
0.25	0.25	40 to 320/340	7HG-G028-11
0.32	0.32	40 to 320/340	7HM-G028-51
0.32	0.50	40 to 320/340	7HM-G028-17
0.53	0.50	40 to 320/340	7HK-G028-17

ZB-CLPesticides-2 GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
30-Meter			
0.25	0.20	40 to 320/340	7HG-G029-10
0.32	0.25	40 to 320/340	7HM-G029-11
0.32	0.50	40 to 320/340	7HM-G029-17
0.53	0.42	40 to 320/340	7HK-G029-16

ZB-MultiResidue™-1 and -2

Optimized Selectivity for Pesticides

- **Specially designed for the separation of all types of pesticides, herbicides, and insecticides**
- **Baseline resolution and confirmation of all 20 chlorinated pesticides regulated under EPA Method 8081 in ≤ 10 min**
- **Decreased breakdown of sensitive pesticides such as DDT**
- **Robust performance for high temperature bakeouts**
- **Low bleed performance for pesticide confirmation by MS**

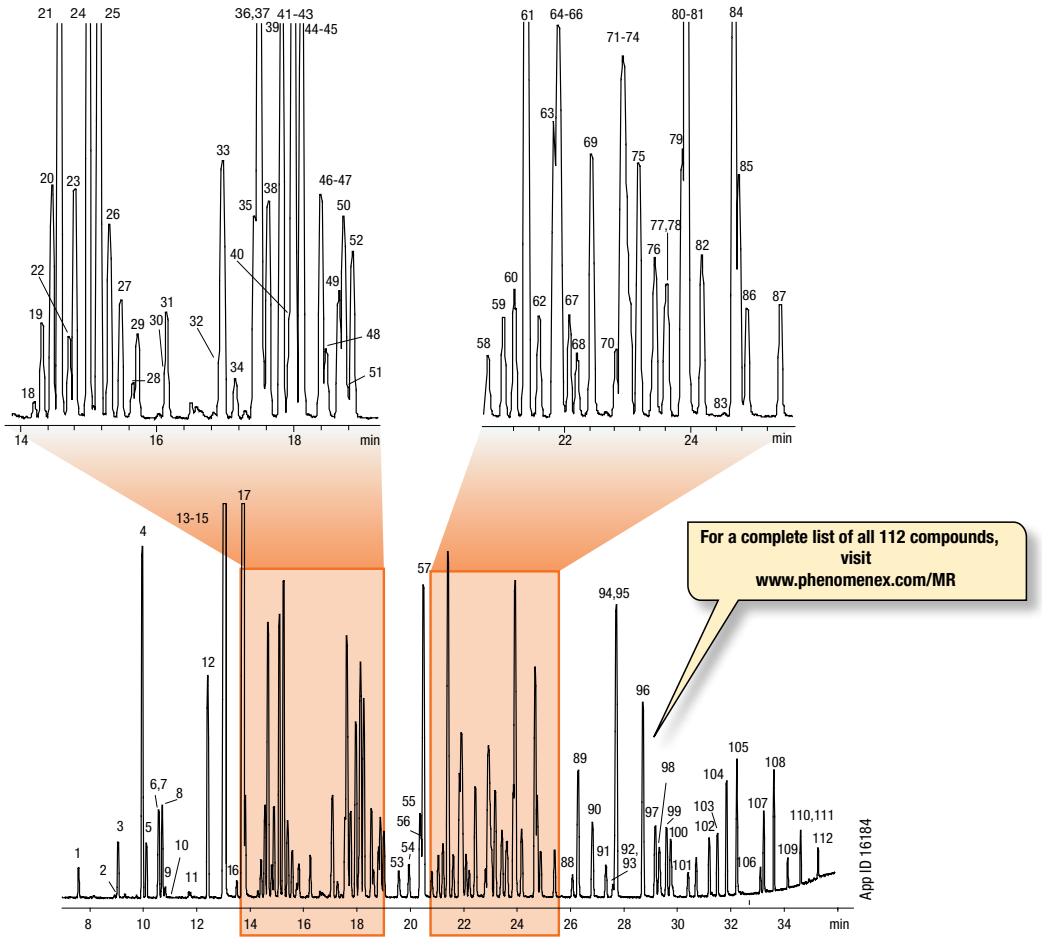
Upgrade to Zebron from these similar* phases:

Agilent®
- DB®-CLP1
- DB-CLP2

Restek®
- Rtx®-CLPesticides
- Rtx-CLPesticides2
- Stx®-CLPesticides
- Stx-CLPesticides2

*not exact equivalent, selectivity may differ

Improved Multi-Residue Pesticide Screening by GC-MS

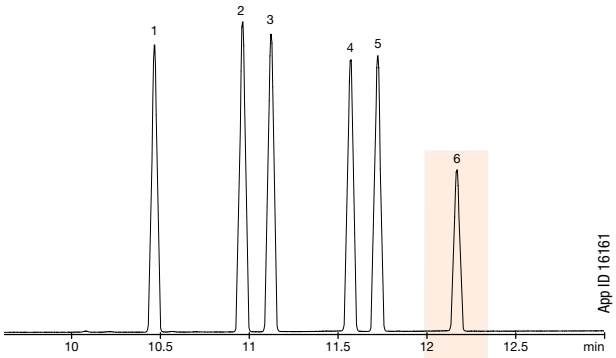


Column: Zebron MultiResidue™-1
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G016-11
Injection: Splitless @ 260 °C, 1 µL
Carrier Gas: Helium @ 0.9 mL/min (constant flow)
Oven Program: 80 °C for 0.5 min to 150 °C @ 10 °C/min to 240 °C @ 4 °C/min to 320 °C @ 15 °C/min for 3 min
Detector: MSD @ 320 °C; 45-400 amu
Sample: Analytes were 1 ppm in Dichloromethane

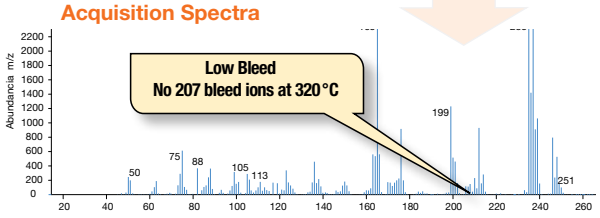
ZB-MultiResidue™-1 and -2 *(cont'd)*

Resolve Common Pesticide Isomers

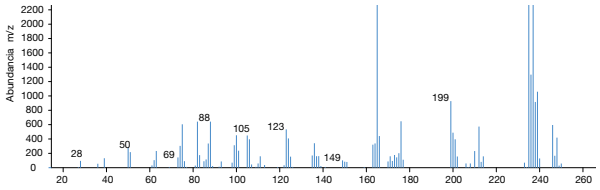
ZB-MultiResidue optimized selectivities improve resolution of complex pesticide, herbicide, and insecticide isomers. Our extremely stable siloxane-based polymer contains absolutely no nitrogen or halogenated functionality, which can be unfriendly to NPD and ECD detectors. Engineered Self-Crosslinking™ (ESC) bonding incorporates ladders into the phase backbone for low bleed and unmatched spectral integrity – even for trace-level samples.



Acquisition Spectra

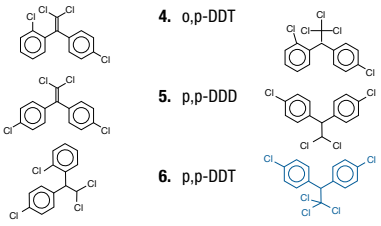


NIST Reference Spectra

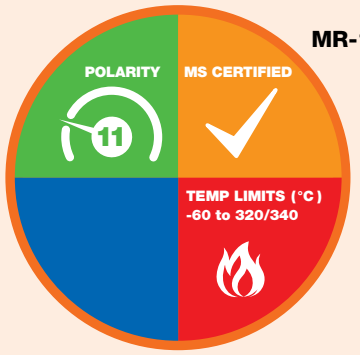


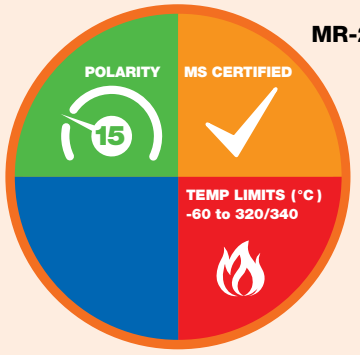
Column: Zebron ZB-MultiResidue-1
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G016-11
Injection: Splitless (hold 0.5 min) @ 260 °C, 1 µL
Carrier Gas: Helium @ 0.8 mL/min (constant flow)
Oven Program: 100 °C for 0.5 min to 200 °C at 25 °C/min to 320 °C at 15 °C/min for 2 min
Detector: MSD @ 320 °C, 45-400 amu
Sample:

1. o,p-DDE
2. p,p-DDE
3. o,p-DDD
4. o,p-DDT
5. p,p-DDD
6. p,p-DDT



Column Profile





Engineered Self Cross-linking™ (ESC)

Phase Chemistry

- Proprietary

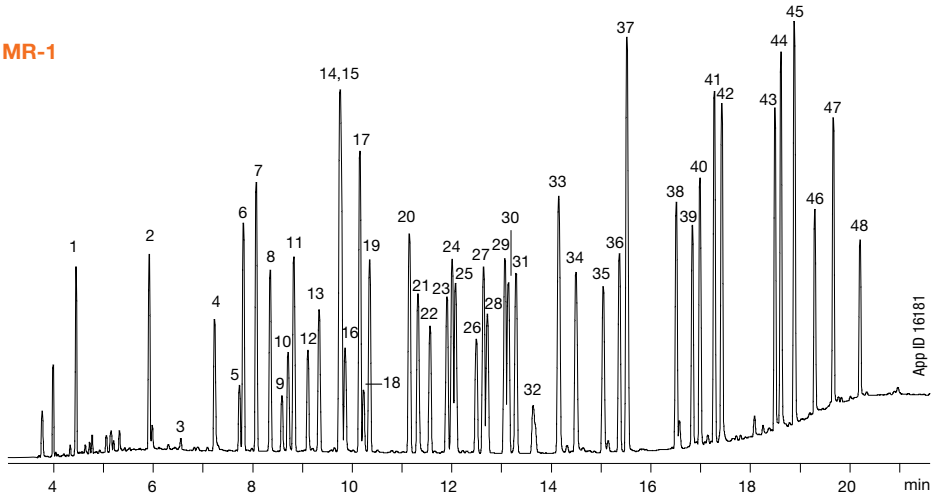
Recommended Applications

- Haloacetic Acids (HAAs)
- Herbicides / Insecticides
- Multi-Pesticide Screening
- Nitrogen Containing Pesticides
- Organochlorine Pesticides
- Organophosphorous Pesticides
- PCBs / Aroclors

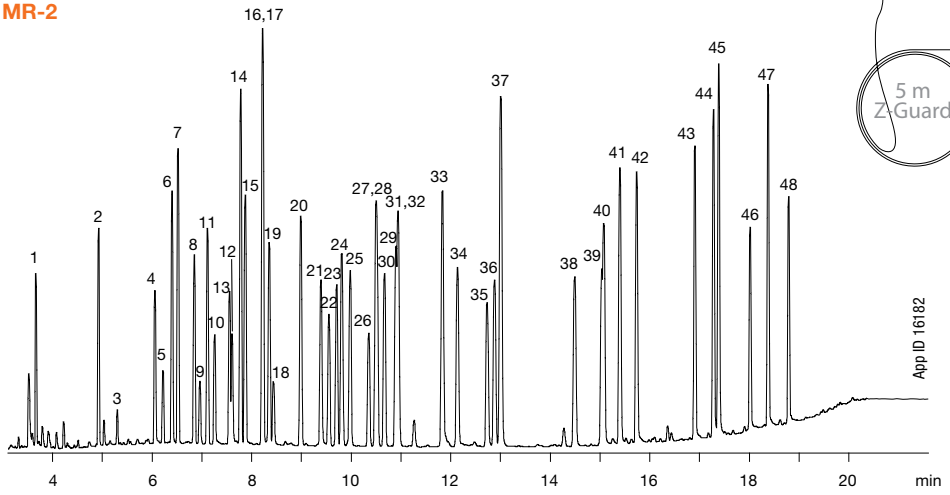
ZB-MultiResidue™-1 and -2 *(cont'd)*

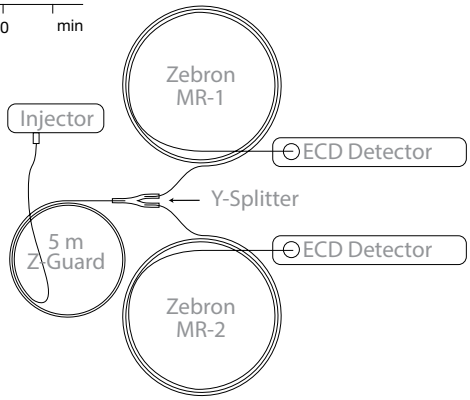
Great Results for Organophosphate Pesticides

MR-1



MR-2





Conditions for both column

Columns: Zebron MultiResidue-1
Zebron MultiResidue-2
Dimensions: 30 meter x 0.32 mm x 0.50 µm
30 meter x 0.32 mm x 0.25 µm
Part No.: 7HM-G016-17
7HM-G017-11
Injection: On-Column @ 103 °C, 1 µL
Carrier Gas: Helium @ 2.8 mL/min (constant flow)
Oven Program: 100 °C for 0.5 min to 180 °C @ 20 °C/min to 240 °C @ 6 °C/min to 320 °C @ 15 °C/min for 2 min
Detector: FID @ 340 °C
Note: Columns connected using a 5 m Z-Guard Column and a 'Y' splitter.

Sample: Analytes are 2 ppm in Dichloromethane.

1. Dichlorvos
2. Mevinphos
3. Trichlorfon
4. TEPP (Tetraethyl Pyrophosphate)
5. Demeton Isomer
6. Thionazin
7. Ethoprop
8. Sulfotep
9. Naled
10. Dicrotophos
11. Phorate
12. Monocrotophos
13. Demeton
14. Terbufos
15. Diazinon
16. Dimethoate
17. Fonofos
18. Phosphamidon Isomer
19. Disulfoton
20. Dichlofenthion
21. Phosphamidon
22. Chlorpyrifos Methyl
23. Ronnel
24. Aspon
25. Methyl Parathion
26. Malathion
27. Fenitrothion
28. Chlorpyrifos
29. Fenthion
30. Trichloronate
31. Parathion
32. Merphos
33. Chlorfenvinphos
34. Crotoxyphos
35. Stirofos
36. Tokuthion
37. Merphos Oxide (Tribufos)
38. Ethion
39. Fensulfothion
40. Contaminant
41. Carbophenothion
42. Famfur
43. EPN
44. Phosmet
45. Leptophos
46. Azinphos Methyl
47. Azinphos Ethyl
48. Coumaphos

ZB-MultiResidue™-1 and -2 *(cont'd)*

Ordering Information

Zebron ZB-MultiResidue -1 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
20-Meter			
0.18	0.18	-60 to 320/340	7FD-G016-08
30-Meter			
0.25	0.25	-60 to 320/340	7HG-G016-11
0.32	0.25	-60 to 320/340	7HM-G016-11
0.32	0.50	-60 to 320/340	7HM-G016-17
0.53	0.50	-60 to 320/340	7HK-G016-17

Ordering Information

Zebron ZB-MultiResidue -2 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
30-Meter			
0.25	0.20	-60 to 320/340	7HG-G017-10
0.32	0.25	-60 to 320/340	7HM-G017-11
0.53	0.50	-60 to 320/340	7HK-G017-17

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G016-11-B or 7HG-G017-10-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

ZB-MultiResidue Column Kits

Ordering Information

0.25 mm ID (kit consists of products below)	**Part No.: KG0-8237**	
Description	**Dimension**	**Part No.**
ZB-MultiResidue-1 Column	30 meter x 0.25 mm x 0.25 µm df	7HG-G016-11
ZB-MultiResidue-2 Column	30 meter x 0.25 mm x 0.20 µm df	7HG-G017-10
Z-Guard™	5 meter x 0.25 mm	7AG-G000-00-GZ0
Universal Capillary Column Y-connector, Fused Quartz		AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722
0.32 mm ID (kit consists of products below)	**Part No.: KG0-8238**	
Description	**Dimension**	**Part No.**
ZB-MultiResidue-1 Column	30 meter x 0.32 mm x 0.50 µm df	7HM-G016-17
ZB-MultiResidue-2 Column	30 meter x 0.32 mm x 0.25 µm df	7HM-G017-11
Z-Guard	5 meter x 0.32 mm	7AM-G000-00-GZ0
Universal Capillary Column Y-connector, Fused Quartz		AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722
0.53 mm ID (kit consists of products below)	**Part No.: KG0-8239**	
Description	**Dimension**	**Part No.**
ZB-MultiResidue-1 Column	30 meter x 0.53 mm x 0.50 µm df	7HK-G016-17
ZB-MultiResidue-2 Column	30 meter x 0.53 mm x 0.50 µm df	7HK-G017-17
Z-Guard	5 meter x 0.53 mm	7AK-G000-00-GZ0
Universal Capillary Column Y-connector, Fused Quartz		AG0-4717
Polyimide Resin	0.5 mL, rated to 350 °C	AG0-5722

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-Bioethanol

Quicker Bioethanol Testing

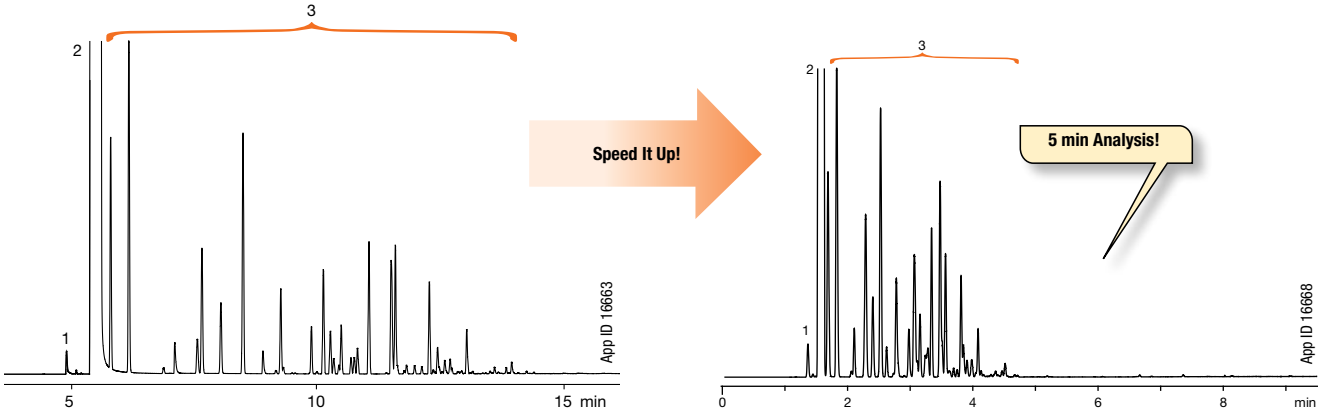
- **Specially designed for fast and accurate bioethanol testing**
- **Provides accurate and reproducible results for Certificate of Analysis (COA)**
- **Resolve methanol and ethanol from all other denaturant peaks**
- **Great resolution of fusel alcohols**
- **Allows for quick bake out in between runs to eliminate contaminates**

Upgrade to Zebron from traditional phases used for bioethanol:

Agilent®	Restek®	SGE®	Supelco®
• DB®-1	• Rtx®-1	• BP1	• SPB®-1
• HP-1	• Rxi®-1ms		• SE-30
• CP-Sil 5 CB			

Fast, Accurate Analysis

Determination of Denatured Bioethanol: ASTM Method D5501



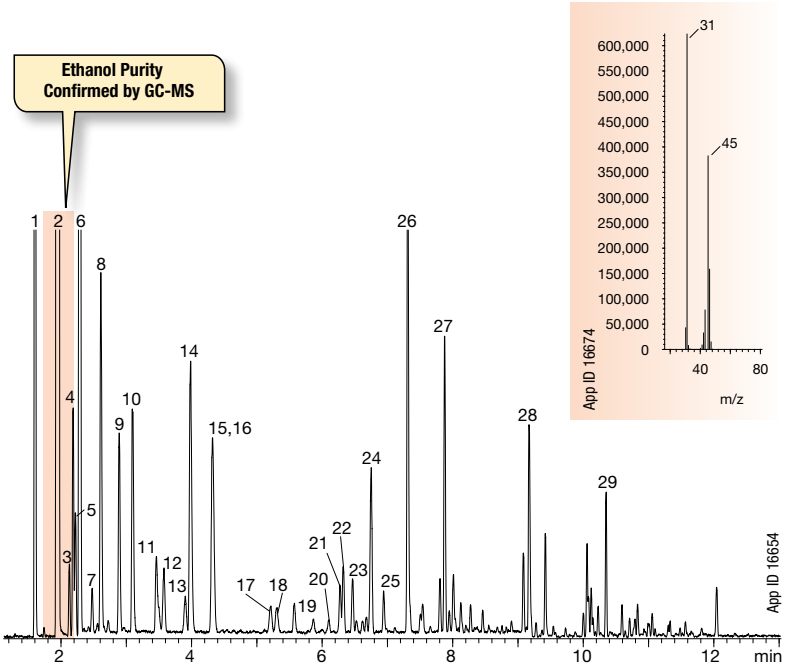
Column: Zebron ZB-1
Dimensions: 100 meter x 0.25 mm x 0.50 µm
Part No.: 7MG-G001-17
Injection: Split 50:1 @ 300 °C, 1 µL
Carrier Gas: Helium @ 35 cm/sec (constant flow)
Oven Program: 45 °C for 7 min to 255 °C @ 30 °C/min for 6 min
Detector: FID @ 300 °C
Instrument: Shimadzu® GC-2010 with Flame Ionization
Sample: 1. Methanol
2. Ethanol
3. Denaturant

Column: Zebron ZB-Bioethanol
Dimensions: 15 meter x 0.25 mm x 1.00 µm
Part No.: 7EG-G020-22
Injection: Split 50:1 @ 300 °C, 1 µL
Carrier Gas: Hydrogen @ 25 cm/sec (constant flow)
Oven Program: 55 °C for 1.7 min to 260 °C @ 40 °C/min (hold 2.67 min)
Detector: FID @ 300 °C
Instrument: Shimadzu® GC-2010 with Flame Ionization Detection and AOC-20i Automatic Liquid
Sample: 1. Methanol
2. Ethanol
3. Denaturant

2009 R&D 100 Award Recipient

ZB-Bioethanol

Resolve Fusel Alcohols



Column: Zebron ZB-Bioethanol
Dimensions: 30 meter x 0.25 mm x 1.00 µm
Part No.: 7HG-G020-22
Injection: Split 100:1 @ 240 °C, 0.1 µL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 40 °C for 5 min to 300 °C @ 25 °C/min
Detector: MSD @ 230 °C; 30-450 amu
Sample:

1. Methanol
2. Ethanol
3. Acrolein
4. Acetone
5. 2-Methylbutane
6. Isopropyl alcohol
7. Pentane
8. t-Butanol
9. Allyl alcohol
10. n-Propanol
11. 2,3-Dimethylbutane
12. 2-Methylpentane
13. 3-Methylpentane
14. 2-Butanol
15. Ethyl acetate
16. Hexane
17. Methylcyclopentane
18. 2,4-Dimethylpentane
19. Benzene
20. Cyclohexane
21. 2-Methylhexane
22. 2,3-Dimethylpentane
23. 3-Methylhexane
24. 2,2,4-Trimethylpentane
25. Heptane
26. Acetal
27. Toluene
28. Xylene
29. Trimethylbenzene

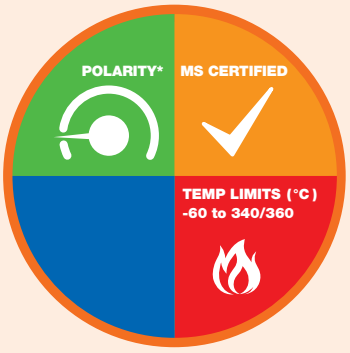
Ordering Information

Zebron ZB-Bioethanol GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	1.00	-60 to 340/360	7EG-G020-22
30-Meter			
0.25	1.00	-60 to 340/360	7HG-G020-22

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G020-22-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry

- Proprietary

Recommended Applications

- Alcohols
- Ethanol Testing
- Fusel Alcohols

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

For Bioethanol fermentation monitoring, use Rezex-ROA HPLC columns, see p. 305

ZB-1XT SimDist

High Efficiency Metal Column Performance

- **Glass Infusion™ technology for higher efficiency and greater column-to-column reproducibility**
- **Individual QC testing for every column**
- **Up to 70 % higher efficiency than other columns**
- **Increased accuracy for high temperature simulated distillation**

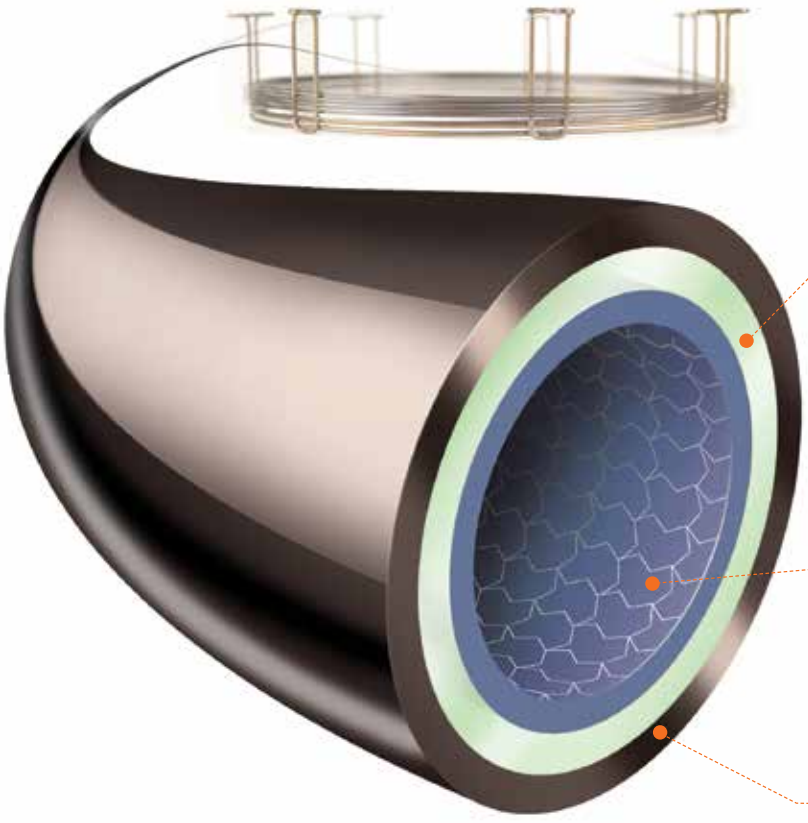
Upgrade to Zebron from any 100 % dimethylpolysiloxane phase:

Agilent®
- DB®-1
- DB-HT SimDis
- DB-PS1
- DB-PS2887
- CP-SimDist
- CP-SimDist UltiMetal

Restek®
- Rtx®-1
- Rxi®-1HT
- MXT®-1HT SimDist

SGE®
- BP1
- BPX1-SimD

Glass Infusion™ Technology for Improved Performance



Multi-layer Glass Infusion™
ensures a thick uniform surface that is consistent throughout the length of the column.

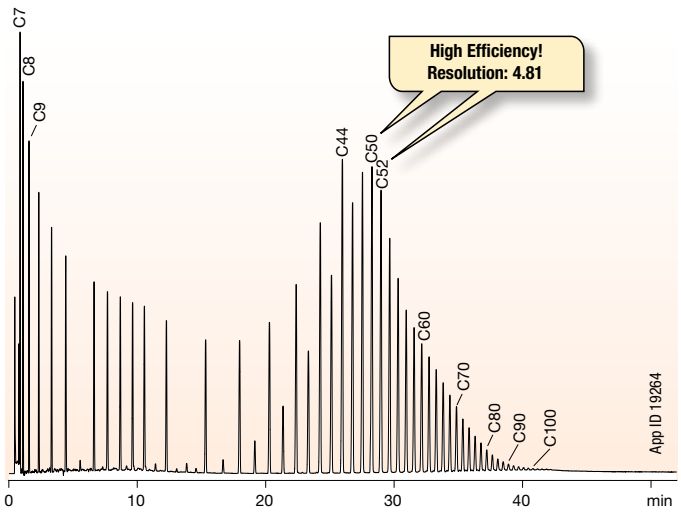
Due to the Glass Infusion, we achieve complete surface coverage with our **advanced high temperature polymer.**

Rugged Metal Tubing
allows you to run methods up to 450 °C without becoming brittle or breaking.

ZB-1XT SimDist

Improve Results for Simulated Distillation

Hydrocarbons C7–C100+: ASTM Method D7169



Column: Zebron ZB-1XT SimDist
Dimensions: 5 meter x 0.53 mm x 0.15 µm
Part No.: 7AK-G026-05
Injection: On-Column @ 33 °C, 1 µL
Carrier Gas: Helium @ 7 mL/min (constant flow)
Oven Program: 30 °C to 450 °C @ 10 °C/min for 10 min
Detector: FID @ 450 °C
Sample: C7 to C44 hydrocarbons and POLYWAX® 655 in CS_2
Note: Chromatogram is baseline subtracted.

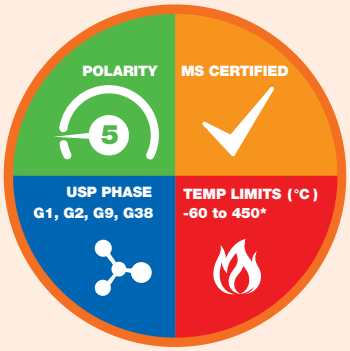
Ordering Information

Zebron ZB-1XT SimDist GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
5-Meter			
0.53	0.09	-60 to 450	7AK-G026-55
0.53	0.15	-60 to 450	7AK-G026-05
0.53	0.88	-60 to 450	7AK-G046-49
5-Meter with 2-Meter Guardian™ Integrated Guard			
0.53	0.09	-60 to 450	7AK-G026-55-GGT
0.53	0.15	-60 to 450	7AK-G026-05-GGT
10-Meter			
0.53	0.15	-60 to 450	7CK-G026-05
0.53	0.88	-60 to 450	7CK-G026-49
0.53	2.65	-60 to 400	7CK-G026-35
10-Meter with 5-Meter Guardian Integrated Guard			
0.53	2.65	-60 to 450	7CK-G026-35-GGA
15-Meter			
0.53	0.25	-60 to 450	7EK-G026-11

If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7CK-G026-05-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

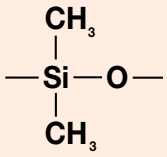
Column Profile



*Thicker film (2.65 µm) is rated to 400 °C.

Engineered Self Cross-linking™ (ESC)

Phase Chemistry



100 % Dimethylpolysiloxane

Recommended Applications

- ASTM Methods (D2887, D3710, D6352, D7169)
- Crude Oil
- Gasoline Fractions
- Petroleum Distillates
- Petroleum Fractions
- Simulated Distillation
- Vacuum Distillates

ZB-1XT SimDist Test Mix
Part No.: AG0-8645

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Guard Column Connections
SilTite™ Mini-Unions for 0.8 mm ID columns (P/N: AG0-8825) and
Replacement Ferrules (P/N: AG0-8824)

ZB-DHA-PONA

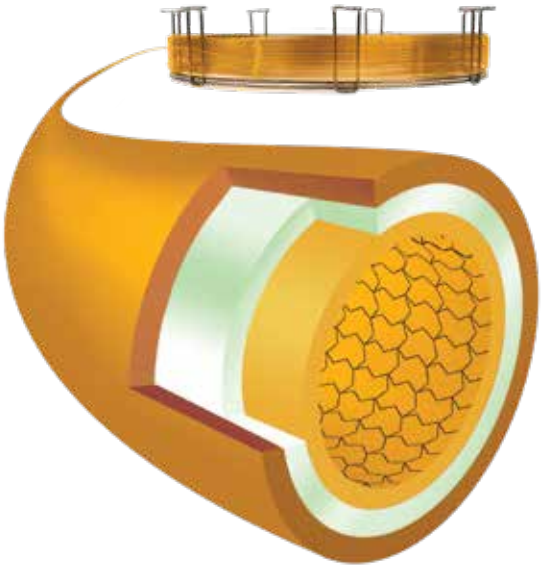
- **Excellent peak shape for polar and nonpolar compounds**
- **Temperature stability and flexibility**
- **Highly efficient dimension and consistent film thickness delivers excellent separation of paraffins, iso-paraffins, olefins, naphthenes, aromatics and polar compounds**
- **Extensive ESC™ provides intact stationary phase and MS certified low bleed**
- **Well-suited for true boiling point separation**
- **Excellent resolving power for critical pairs in complex petrochemical samples**

Upgrade to Zebron from any 100 % dimethylpolysiloxane phase:

Agilent®
- HP-PONA
- DB®-PETRO
- CP-Sil PONA CB

Restek®
- Rtx®-DHA

Supelco®
- Petrocol®-DH



The Choice for PIONA, DHA and PONA

Zebron ZB-DHA-PONA is the choice for the analysis of Detailed Hydrocarbon Analysis (DHA) within the fuel industry. The Engineered Self Cross-linking™(ESC) stationary phase provides low bleed and exceptional column life for separation of DHA critical pairs with symmetric peaks. In addition, Zebron ZB-DHA-PONA GC columns provide excellent response and peak symmetry for polar oxygenates.

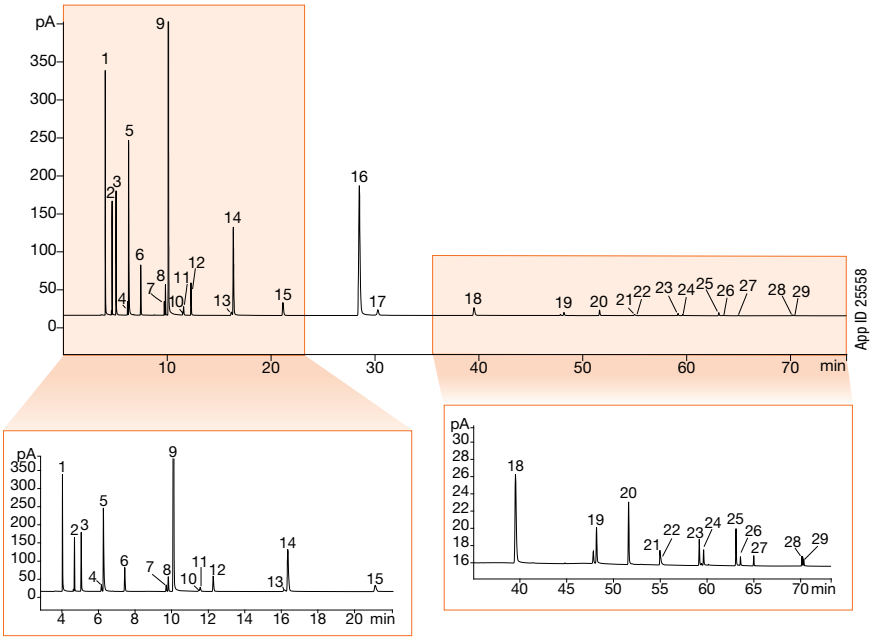
The Zebron ZB-DHA-PONA GC column provides excellent separation of DHA critical pairs with symmetric peaks suitable for ASTM Method D6730, see table below.

Easy ZB-DHA-PONA Selection for Your ASTM Method

Method	Description	Recommended Column	Recommended Dimensions	Part Number
ASTM D5134	Standard Test Method for Detailed Analysis of Petroleum Naphtha's through n-Nonane by Capillary Gas Chromatography	ZB-DHA-PONA	50 m x 0.20 mm x 0.5 µm	7JE-G042-17
		ZB-DHA-PONA	100 m x 0.25 mm x 0.5 µm	7MG-G042-17
ASTM D5441	Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBE) by GC	ZB-DHA-PONA	50 m x 0.20 mm x 0.5 µm	7JE-G042-17
		ZB-DHA-PONA	100 m x 0.25 mm x 0.5 µm	7MG-G042-17
		ZB-DHA-PONA	150 m x 0.25 mm x 1 µm	7QG-G042-22
ASTM D5501	Standard Test Method for Determination of Ethanol and Methanol Content in Fuels Containing Greater than 20 % Ethanol by Gas Chromatography	ZB-DHA-PONA	100 m x 0.25 mm x 0.5 µm	7MG-G042-17
		ZB-DHA-PONA	150 m x 0.25 mm x 1 µm	7QG-G042-22
ASTM D6729	Standard Test Method for Determination of Individual Components in Spark Ignition Engine Fuels by 100 Meter Capillary High Resolution Gas Chromatography	ZB-DHA-PONA	100 m x 0.25 mm x 0.5 µm	7MG-G042-17
ASTM D6730	Standard Test Method for Determination of Individual Components in Spark Ignition Engine Fuels by 100–Meter Capillary (with Pre-column) High-Resolution Gas Chromatography	ZB-DHA-PONA	50 m x 0.20 mm x 0.5 µm	7JE-G042-17
		ZB-DHA-PONA	100 m x 0.25 mm x 0.5 µm	7MG-G042-17
		ZB-DHA-PONA	150 m x 0.25 mm x 1 µm	7QG-G042-22
		ZB-DHA-PONA-TUNE	5 m x 0.25 mm x 1 µm	7AG-G042-22
ASTM D6733	Standard Test Method for Determination of Individual Components in Spark Ignition Engine Fuels by 50-Meter Capillary High Resolution Gas Chromatography	ZB-DHA-PONA	50 m x 0.20 mm x 0.5 µm	7JE-G042-17

ZB-DHA-PONA

Analysis of ASTM D6730 Components by GC-FID on ZB-DHA-PONA & ZB-DHA-PONA-TUNE GC Column



Column 1 (Tuning): Zebron ZB-DHA-PONA-TUNE
Phase: 5% Phenyl 95% Dimethylpolysiloxane
Dimensions: 5 meter x 0.25 mm x 1.00 µm
Part No.: 7AG-G042-22
Column 2: Zebron ZB-DHA-PONA
Phase: 100% Dimethylpolysiloxane
Dimensions: 100 meter x 0.25 mm x 0.50 µm
Part No.: 7MG-G042-17

Recommended Column Union: AG0-4716
Injection: Split 150:1 @ 200 °C, 0.2 µL
Recommended Liner: Zebron PLUS Straight Z-Liner™
Part No.: AG2-0A03-05
Carrier Gas: Hydrogen @ 2 mL/min (constant flow)
Oven Program: 30 °C for 8.5 min, to 48 °C @ 22 °C/min for 27 min, to 141 °C @ 3 °C/min for 1 min, to 275 °C @ 1 °C/min for 2 min
Detection: Flame Ionization (FID) @ 275 °C

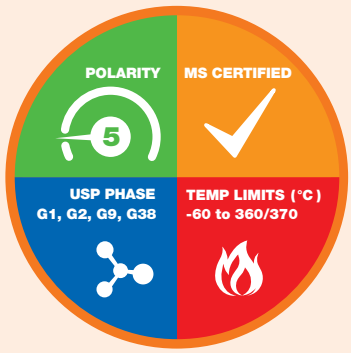
Sample:
1. Ethanol
2. C5 (n-pentane)
3. 2-Methylbutane
4. Tert-Butanol
5. 2,3-Dimethylbutane
6. Methyl tert-butyl ether (MTBE)
7. C6 (n-hexane)
8. 1-Methylcyclopentene
9. Benzene
10. Cyclohexane
11. 3-Ethylpentane
12. trans-1,2-Dimethylcyclopentane
13. C7 (n-heptane)
14. 2,3,3-Trimethylpentane
15. Toluene
16. C8 (n-octane)
17. Ethylbenzene
18. 2,3-Dimethylheptane
19. p-Xylene
20. C9 (n-nonane)
21. 5-Methylnonane
22. 1-Methyl-2-ethylbenzene
23. C10 (n-decane)
24. C11 (undecane)
25. 1,2,3,5-Tetramethylbenzene
26. Naphthalene
27. C12 (dodecane)
28. 1-Methylnapthalene
29. C13 (Tridecane)

Ordering Information

Zebron ZB-DHA-PONA GC Columns

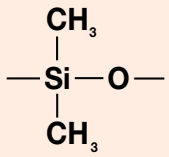
ID(mm)	df(µm)	Temp. Limits °C	Part No.
5-Meter			
0.25	1.00	-60 to 340/360	7AG-G042-22
50-Meter			
0.20	0.50	-60 to 360/370	7GE-G042-17
100-Meter			
0.25	0.50	-60 to 360/370	7MG-G042-17
150-Meter			
0.25	1.00	-60 to 340/360	7QG-G042-22

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry



100 % Dimethylpolysiloxane

Recommended Applications

- DHA
- PONA
- PIONA
- PIANO
- ASTM D5134, D5441, D5501, D6729, D6730 and D6733

Engineered Self Cross-linking™ (ESC) polymer technology.
Zebron GC Columns MS Certification, see p. 411

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-Drug-1

Faster Drugs of Abuse Testing

- **Optimized phase for the separation of drugs of abuse**
- **Provides fast analysis with great peak shape**
- **Improves resolution of target analytes from matrix interferences**
- **Specially deactivated to improve quantitation for drug compounds**

Upgrade to Zebron from traditional phases used for drugs of abuse:

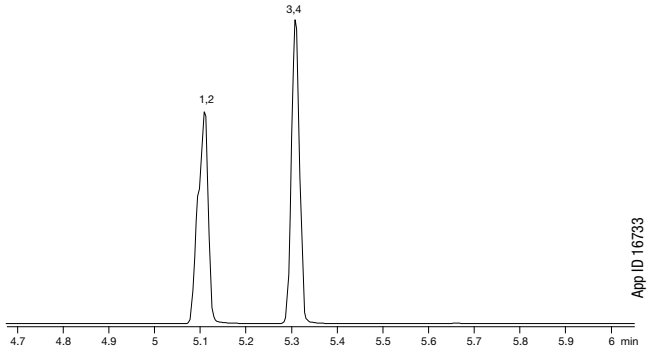
Agilent®
- DB®-1ms
- DB-5ms
- DB-35

Restek®
- Rxi®-1ms
- Rtx®-5
- Rtx-5ms
- Rtx-35ms

Supelco®
- SPB®-1

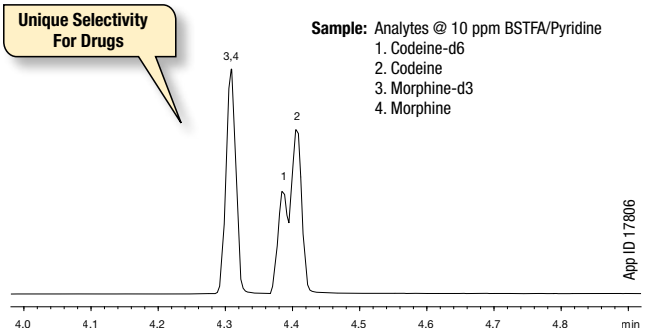
Optimized Selectivity for Multiple Drug Classes

Traditional 5 % Phenyl Phase



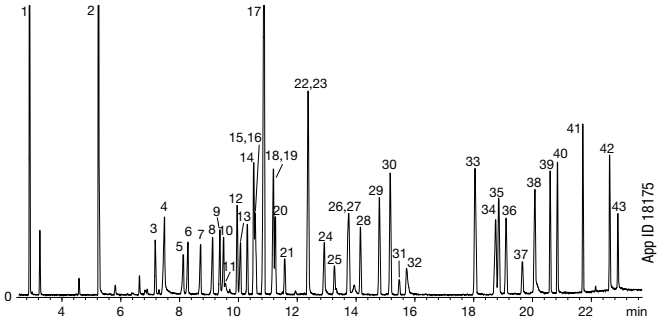
Column: As listed
Dimensions: 10 meter x 0.18 mm x 0.18 µm
Injection: Split 10:1 @ 240 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 140 °C to 320 °C @ 20 °C for 1 min
Detector: MSD @ 230 °C

Zebron ZB-Drug-1



Column: As listed
Dimensions: 10 meter x 0.18 mm x 0.18 µm
Part No.: 7CD-G023-08
Injection: Split 10:1 @ 280 °C, 1 µL
Carrier Gas: Helium @ 55 cm/sec (constant flow)
Oven Program: 180 °C to 340 °C @ 20 °C/min
Detector: MSD @ 230 °C

Common Drug Screen by GC-MS



Column: Zebron ZB-Drug-1
Dimensions: 10 meter x 0.18 mm x 0.18 µm
Part No.: 7CD-G023-08
Injection: Split 10:1 @ 260 °C,1 µL
Carrier Gas: Helium @ 1 mL/min (constant flow)
Oven Program: 50 °C to 150 °C @ 15 °C/min to 240 °C @ 7 °C/min to 320 °C @ 25 °C/min for 2 min
Detector: MSD @ 320 °C; 45-450 amu

Sample: Analytes are 25 ppm in Methanol

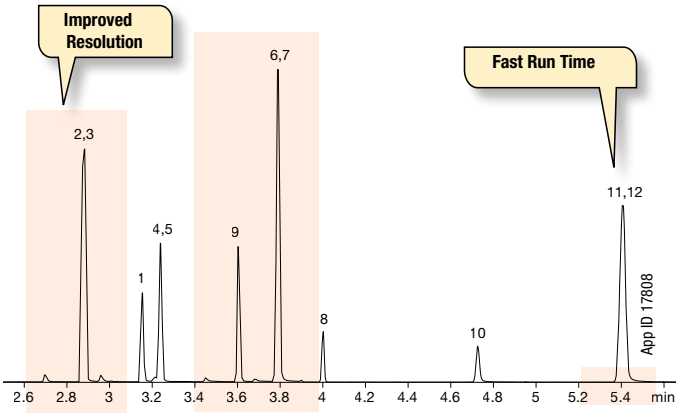
1. Acetophenone
2. Nicotine
3. Benzocaine
4. Ibuprofen
5. Allobarbital
6. Aprobarbital
7. Butalbital
8. Amobarbital
9. Phenacetin
10. Pentobarbital
11. Acetaminophen
12. Benzphetamine
13. Secobarbital
14. Phencyclidine
15. Meprobamate
16. Diphenhydramine
17. Lidocaine
18. Hexobarbital
19. Doxylamine
20. Glutethimide
21. Caffeine
22. Chlorpheniramine
23. Methapyrilene
24. Phenobarbital
25. Procaine
26. Methadone
27. Bromopheniramine
28. Propoxyphene
29. Trimipramine
30. Chlorcyclizine
31. Cocaine
32. Desipramine
33. Codeine
34. Morphine
35. Diazepam
36. Hydrocodone
37. 6-MAM
38. Oxymorphone
39. Heroin
40. Fentanyl
41. Ibogaine
42. Triazolam
43. LSD

2009 R&D 100 Award Recipient

ZB-Drug-1

Faster Run Times and Improved Resolution

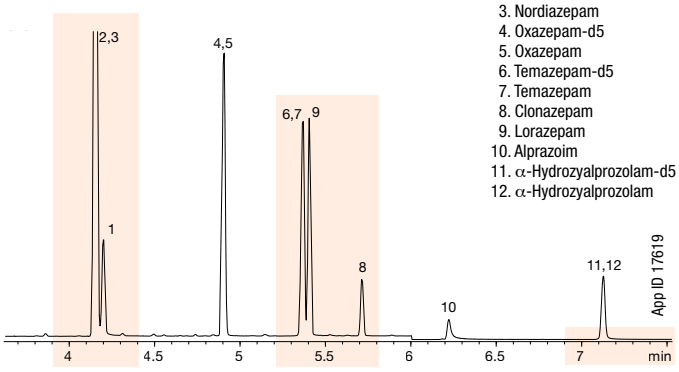
Zebron ZB-Drug-1



Column: Zebron ZB-Drug-1
Dimensions: 10 meter x 0.18 mm x 0.18 µm
Part No.: 7CD-G023-08
Injection: Split 10:1 @ 280 °C, 1 µL
Carrier Gas: Helium @ 0.7 mL/min (constant flow)
Oven Program: 200 °C to 210 °C @ 20 °C/min at 320 °C @ 30 °C/min for 1 min
Detector: MSD @ 320 °C

Traditional Mid-Polar Phase

Sample:
1. Diazepam
2. Nordiazepam-d5
3. Nordiazepam
4. Oxazepam-d5
5. Oxazepam
6. Temazepam-d5
7. Temazepam
8. Clonazepam
9. Lorazepam
10. Alprazoim
11. α-Hydrozyalprozolam-d5
12. α-Hydrozyalprozolam



Dimensions: 10 meter x 0.18 mm x 0.18 µm
Injection: Split 10:1 @ 250 °C, 1 µL
Carrier Gas: Helium @ 0.6 mL/min (constant flow)
Oven Program: 180 °C to 340 °C @ 20 °C/min for 2 min
Detector: MSD @ 320 °C

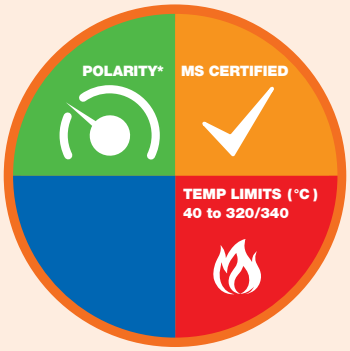
Ordering Information

Zebron ZB-Drug-1 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.18	0.18	40 to 320/340	7CD-G023-08
15-Meter			
0.25	0.25	40 to 320/340	7EG-G023-11
15-Meter with 5-Meter Guardian™ Integrated Guard			
0.25	0.25	40 to 320/340	7EG-G023-11-GGA
30-Meter			
0.25	0.25	40 to 320/340	7HG-G023-11

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G023-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



*Similar polarity to ZB-MultiResidue™-2.

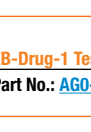
Engineered Self Cross-linking™ (ESC)

Phase Chemistry

- Proprietary

Recommended Applications

- Drug Screening
- 6-MAM
- Amphetamines
- Barbiturates
- Benzodiazepines
- PCP
- THC



ZB-Drug-1 Test Mix
Part No.: AG0-8431

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-BAC-1 and -2

Optimized Pair for Blood Alcohol Testing

- **Enhanced accuracy for post mortem samples**
- **Fast run time with baseline resolution of key components in just 2 minutes**
- **Enhanced resolution of ethanol and acetone peaks**
- **Achieve confirmation with two elution order changes when running columns in parallel**
- **Allows for the use of t-butanol or n-propanol as an internal standard**

Upgrade to Zebron from these similar* phases:

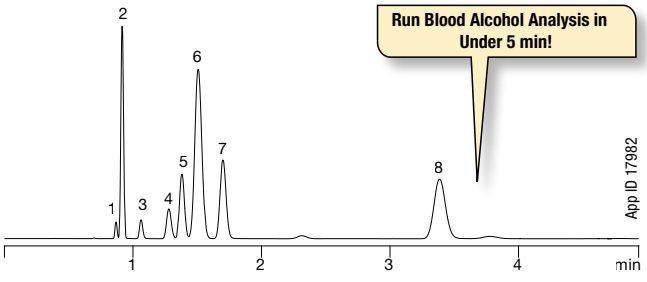
Agilent®	Restek®
• DB®-ALC1	• Rtx®-BAC1
• DB-ALC2	• Rtx-BAC2

*not exact equivalent, selectivity may differ

Faster, More Sensitive Blood Alcohol Analysis

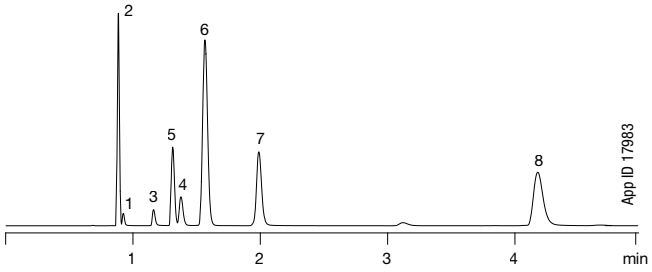
Zebron ZB-BAC-1

30 meter x 0.53 mm x 3.00 µm



Zebron ZB-BAC-2

30 meter x 0.53 mm x 2.00 µm



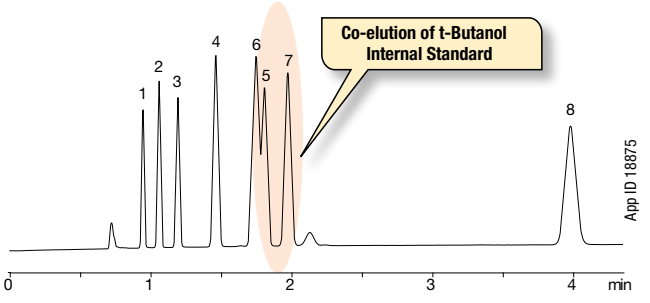
Conditions for both columns:

Column: As listed
Dimensions: As listed
Part No.: 7HK-G021-36 (ZB-BAC-1)
7HK-G022-32 (ZB-BAC-2)
Injection: Split 0.8:1 @ 150 °C, 1 mL
Carrier Gas: Helium @ 80 cm/sec (constant flow)
Oven Program: 40 °C (Isothermal)
Detector: FID @ 250 °C

Sample: Analytes 0.025 % and internal standards 0.100 % in water
1. Methanol
2. Acetaldehyde
3. Ethanol
4. Isopropanol
5. Acetone
6. t-Butanol (IS)
7. n-Propanol (IS)
8. 2-Butanol (IS)

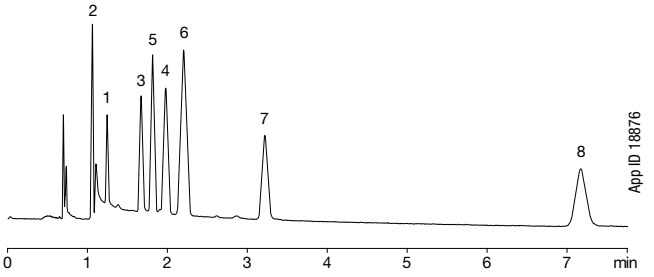
Restek Rtx-BAC1

30 meter x 0.53 mm x 3.00 µm



Restek Rtx-BAC2

30 meter x 0.53 mm x 2.00 µm



Conditions for both columns:

Column: As listed
Dimensions: As listed
Injection: Split 5:1 @ 150 °C, 1 mL
Carrier Gas: Helium @ 80 cm/sec (constant flow)
Oven Program: 40 °C (Isothermal)
Detector: FID @ 220 °C

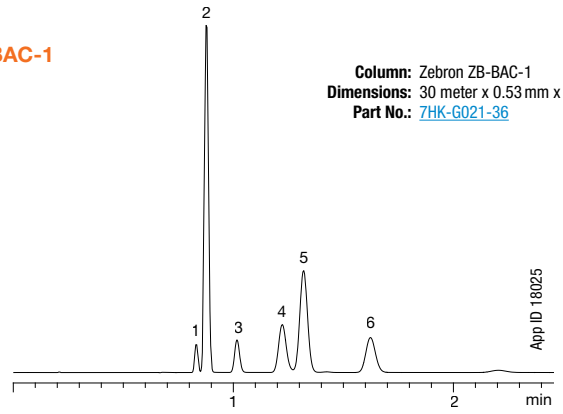
Sample: Analytes and internal standards 0.100 % in water
1. Methanol
2. Acetaldehyde
3. Ethanol
4. Isopropanol
5. Acetone
6. t-Butanol (IS)
7. n-Propanol (IS)
8. 2-Butanol (IS)

Comparative separations may not be representative of all applications.

ZB-BAC-1 and -2

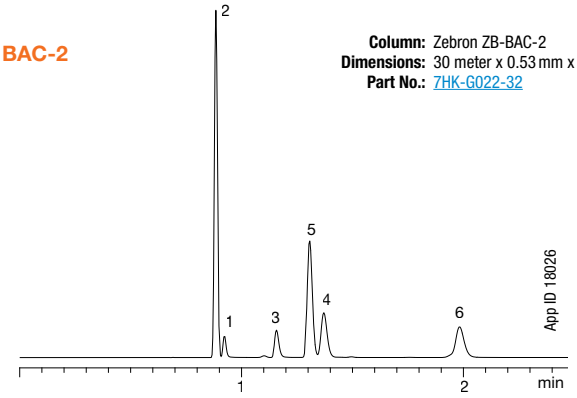
Run On Helium Or Hydrogen

BAC-1



Column: Zebron ZB-BAC-1
Dimensions: 30 meter x 0.53 mm x 3.00 µm
Part No.: 7HK-G021-36

BAC-2



Column: Zebron ZB-BAC-2
Dimensions: 30 meter x 0.53 mm x 2.00 µm
Part No.: 7HK-G022-32

Conditions for both columns:

Injection: Split 5:1 @ 150 °C, 1 mL
Carrier Gas: Hydrogen @ 80 cm/sec (constant flow)
Oven Program: 40 °C (Isothermal)
Detector: FID @ 250 °C
Sample: Analytes are 0.100 % in water

1. Methanol
2. Acetaldehyde
3. Ethanol
4. Isopropanol
5. Acetone
6. n-Propanol

Ordering Information

Zebron ZB-BAC-1 GC Columns

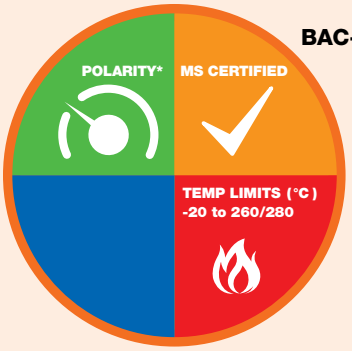
ID(mm)	df(µm)	Temp. Limits °C	Part No.
30-Meter			
0.32	1.80	-20 to 260/280	7HM-G021-31
0.53	3.00	-20 to 260/280	7HK-G021-36

Zebron ZB-BAC-2 GC Columns

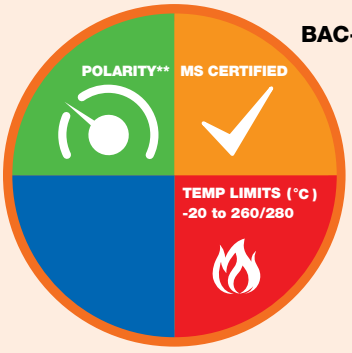
ID(mm)	df(µm)	Temp. Limits °C	Part No.
30-Meter			
0.32	1.20	-20 to 260/280	7HM-G022-25
0.53	2.00	-20 to 260/280	7HK-G022-32

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HM-G021-31-B or 7HM-G022-25-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



*Similar polarity to ZB-35.



**Similar polarity to ZB-624.

Engineered Self Cross-linking™ (ESC)

Phase Chemistry

- Proprietary

Recommended Applications

- Abused Inhalant Anesthetics
- Blood Alcohol Analysis

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-1*PLUS*™

MS Certified "1" Phase

- **Very low bleed (MS Certified) phase especially suited to high sensitivity GC-MS**
- **Extremely inert for active compounds such as drugs, pesticides, or acids and bases**
- **Improved signal-to-noise ratio for better sensitivity and mass spectral integrity**
- **Identical selectivity to 100 % dimethylpolysiloxane phases**

Upgrade to Zebron from any 100 % dimethylpolysiloxane phase:

Agilent®
- DB®-1
- DB-1ms
- DB-1ms Ultra Inert
- HP-1
- HP-1ms
- HP-1ms Ultra Inert
- VF-1ms
- CP-Sil 5 CB
- Ultra 1

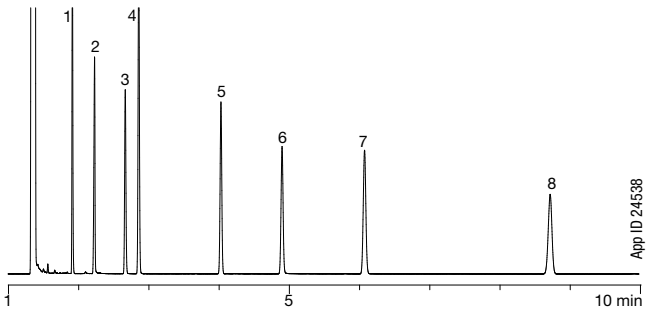
Restek®
- Rtx®-1
- Rtx-1ms
- Rxi®-1ms

SGE®
- BP1
- SolGel-1ms™

Supelco®
- SPB®-1
- SE-30
- MET-1
- MDN-1
- Equity®-1

Lower Overall Column Activity

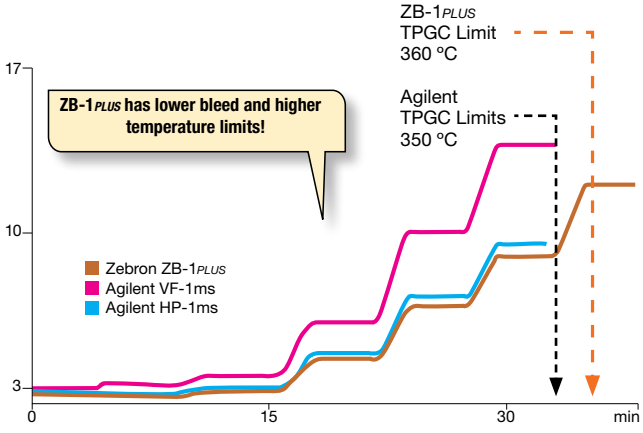
Activity is a key measure of column quality. ZB-1*PLUS* columns are aggressively tested to ensure full deactivation. Our QC test below demonstrates low tailing on ZB-1*PLUS* for even the most active compounds, like 2-ethylhexanoic acid.



Column: Zebron ZB-1*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G031-11
Injection: Split 100:1 @ 250 °C, 1.0 µL
Carrier Gas: Hydrogen @ 1.18 mL/min (constant flow)
Oven Program: 140 °C (Isothermal)
Detector: FID @ 325 °C
Sample:
1. Decane
2. 2-Ethylhexanoic Acid
3. 4-Chlorophenol
4. Naphthalene
5. Tridecane
6. 1-Undecanol
7. Dicyclohexylamine
8. Pentadecane

Lower Column Bleed

We tested the ZB-1*PLUS* column bleed profile against other "MS" columns on the market – ZB-1*PLUS* shows the lowest bleed, even at temperatures up to 360 °C.



Test conditions were stopped at 350 °C for all competitor columns so as not to cause damage to the stationary phase by exceeding their maximum temperature limit.

Conditions for all columns:

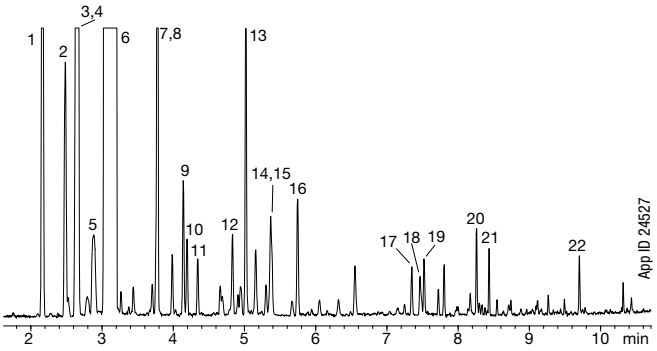
Columns: As listed
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Injection: Null Injection @ 250 °C
Carrier Gas: Hydrogen @ 100 mL/min (constant flow)
Oven Program: 240 °C for 9 min to 280 °C for 6.3 min to 320 °C for 6.4 min to 340 °C for 5.8 min to 350 °C for 5.5 min to 360 °C
Detector: FID @ 320 °C

Comparative separations may not be representative of all applications.

ZB-1*PLUS*™

Well-Suited for Food & Flavors

Cold Pressed Orange Oil by GC-MS



Column: Zebron ZB-1*PLUS*
Dimensions: 10 meter x 0.10 mm x 0.10 µm
Part No.: 7CB-G031-02
Injection: Split 120:1 @ 160 °C, 0.2 µL
Carrier Gas: Helium @ 0.3 mL/min (constant flow)
Oven Program: 60 °C to 130 °C @ 10 °C/min to 280 °C @ 30 °C/min for 3 min
Detector: MSD
Sample: Sample was 10 % in dichloromethane

1. α-Pinene
2. β-Phellandrine
3. β-Myrcene
4. Octanal
5. 3-Carene
6. Limonene
7. Nonanal
8. Linalool
9. cis-Limonene oxide
10. trans-Limonene oxide
11. Citronellal
12. α-Terpineol
13. Decanal
14. Carvone
15. Neral
16. Geranial
17. α-Cubebene
18. β-Cubebene
19. Dodecanal
20. Valencene
21. Cadinene
22. Nootkatone

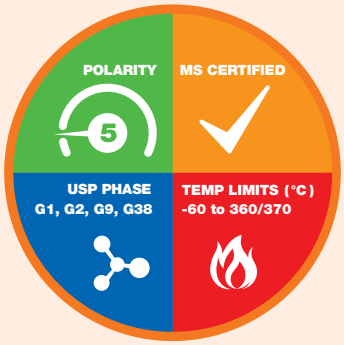
Ordering Information

Zebron ZB-1*PLUS* GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
5-Meter			
0.18	0.18	-60 to 360/370	7AD-G031-08
10-Meter			
0.10	0.10	-60 to 360/370	7CB-G031-02
12-Meter			
0.20	0.33	-60 to 360/370	7DE-G031-14
15-Meter			
0.25	0.25	-60 to 360/370	7EG-G031-11
0.32	0.25	-60 to 360/370	7EM-G031-11
15-Meter with 10-Meter Guardian™ Integrated Guard			
0.25	0.25	-60 to 360/370	7EG-G031-11-GGC
20-Meter			
0.18	0.18	-60 to 360/370	7FD-G031-08
25-Meter			
0.20	0.33	-60 to 360/370	7GE-G031-14
30-Meter			
0.25	0.10	-60 to 360/370	7HG-G031-02
0.25	0.25	-60 to 360/370	7HG-G031-11
0.32	0.25	-60 to 360/370	7HM-G031-11
30-Meter with 5-Meter Guardian Integrated Guard			
0.25	0.25	-60 to 360/370	7HG-G031-11-GGA
30-Meter with 10-Meter Guardian Integrated Guard			
0.25	0.25	-60 to 360/370	7HG-G031-11-GGC
60-Meter			
0.25	0.25	-60 to 360/370	7KG-G031-11
0.25	1.00	-60 to 360/370	7KG-G031-22
0.32	0.25	-60 to 360/370	7KM-G031-11

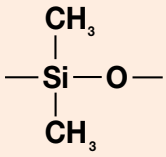
Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G031-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry



100 % Dimethylpolysiloxane

Recommended Applications

- Acids
- Amines
- Drugs
- EPA Methods (1668)
- Essential Oils
- Flavors & Fragrances
- Oxygenates and GROs
- PCBs
- Pesticides
- Solvent Impurities
- Sulfur Compounds (Light)

ZB-1*PLUS* Test Mix
Part No.: AG0-7805

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-5*PLUS*™

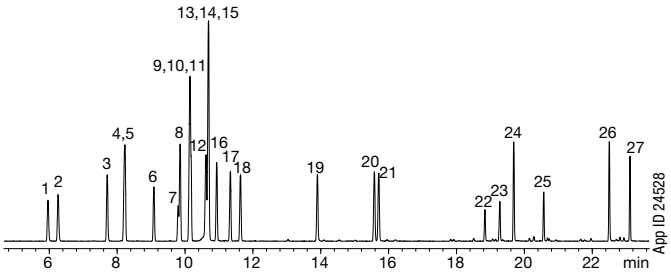
Inert 5 % Phenyl Selectivity

- **Highly inert—improved peak shape for acidic/basic compounds, drugs of abuse, and pesticides**
- **Very low bleed (MS certified) levels provide maximum sensitivity**
- **Intense QC specifications ensure column-to-column performance**
- **ESC bonding results in phase stability and high temperature limits**
- **Traditional bonding chemistry provides the same selectivity as the ZB-5 columns**

Upgrade to Zebron from any 5 % phenyl / 95 % dimethylpolysiloxane phase:

Agilent®	Restek®	SGE®	Supelco®	OV®
• DB®-5	• Rtx®-5	• BP5	• MDN-5S	• OV-5
• HP-5	• Rtx-5MS	• BPX5	• SPB®-5	
• HP-5ms	• Rtx-5Amine		• Equity®-5	
• HP-5msi	• Rxi®-5ms			

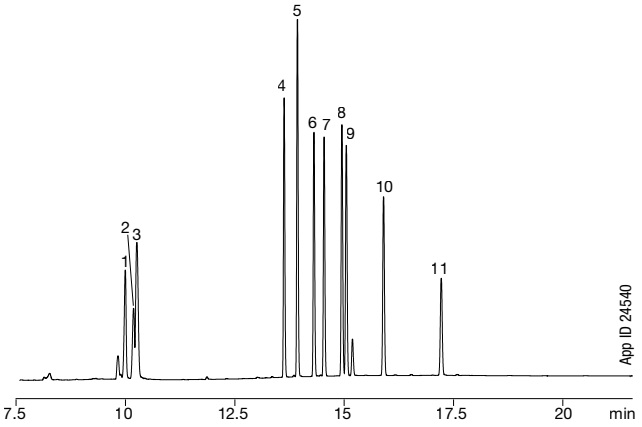
Phenols



Column: Zebron ZB-5*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G032-11
Injection: Split 5:1 @ 240 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/ min (constant flow)
Oven Program: 60 °C to 140 °C @ 5 °C/min to 280 °C @ 10 °C/min
Detector: MSD @ 230 °C, 45-450 amu
Sample:

1. Phenol
2. 2-Chlorophenol
3. 2-Methylphenol
4. 4-Methylphenol
5. 3-Methylphenol
6. 2,6-Dimethylphenol
7. 2-Nitrophenol
8. 2-Ethylphenol
9. 2,4-Dimethylphenol
10. 3,5-Dimethylphenol
11. 2,5-Dimethylphenol
12. 4-Ethylphenol
13. 3-Ethylphenol
14. 2,4-Dichlorophenol
15. Benzoic Acid
16. 2,3-Dimethylphenol
17. 3,4-Dimethylphenol
18. 2,6-Dichlorophenol
19. 4-Chloro-3-methylphenol
20. 2,4,6-Trichlorophenol
21. 2,4,5-Trichlorophenol
22. 2,4-Dinitrophenol
23. 4-Nitrophenol
24. 2,3,4,6-Tetrachlorophenol
25. 4,6-Dinitro-2-methylphenol
26. Pentachlorophenol
27. Dinoseb

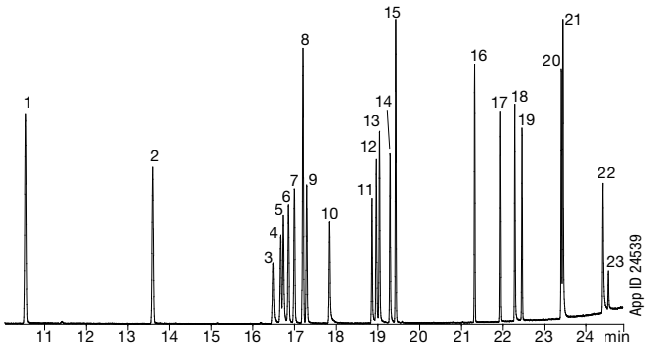
Underivatized Antihistamines by GC-FID



Column: Zebron ZB-5*PLUS*
Dimensions: 30 meter x 0.25 mm x 1.0 µm
Part No.: 7HG-G032-22
Injection: Split 50:1 @ 305 °C, 1 µL
Carrier Gas: Helium @ 1.3 mL/min (constant flow)
Oven Program: 40 °C for 1 min to 240 °C @ 25 °C/min for 2 min to 305 °C @ 25 °C/min for 8 min
Detector: FID @ 320 °C
Sample:

1. Phenylpropanolamine
2. Ephedrine
3. Pseudoephedrine
4. Pheniramine
5. Diphenhydramine
6. Doxylamine
7. Phenyltoloxamine
8. Methapyrilene
9. Chlorpheniramine
10. Brompheniramine
11. Triprolidine

Endocrine Disruptors by GC-MS



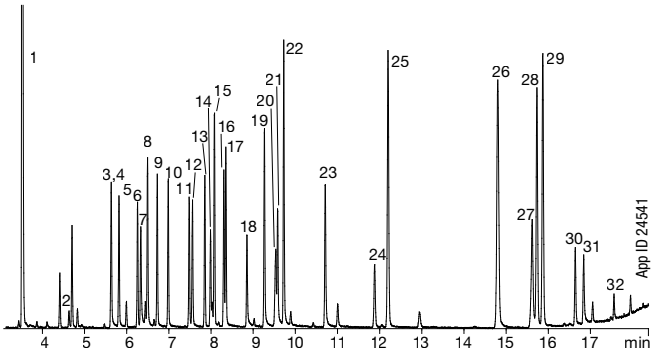
Column: Zebron ZB-5*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G032-11
Injection: Split 40:1 @ 250 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 100 °C to 180 °C @ 5 °C/min to 320 °C @ 15 °C/min
Detector: MSD @ 180 °C, 45-450 amu
Sample: Analytes are 50 ppm in acetone

1. Dimethyl phthalate
2. Diethyl phthalate
3. Atraton
4. Simazine
5. Prometon
6. Atrazine
7. Propazine
8. Dipropyl phthalate
9. Terbuthylazine
10. Secbumetone
11. Simetryn
12. Ametryn
13. Prometryn
14. Terbutryn
15. Dibutyl phthalate
16. 4,4'-DDE
17. 4,4'-DDD
18. Di-n-hexyl phthalate
19. 4,4'-DDT
20. Dicyclohexyl phthalate
21. bis(2-Ethylhexyl)phthalate
22. Di-n-octyl phthalate
23. Ethinyl estradiol

ZB-5*PLUS*™

Good Results for Drugs

Drug Screening by GC-MS



Column: Zebron ZB-5*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G032-11
Injection: Split 15:1 @ 240 °C, 1 µL
Carrier Gas: Helium @ 1.1 mL/min (constant flow)
Oven Program: 140 °C to 240 °C @ 10 °C/min for 5 min to 320 °C @ 25 °C/min for 2.25 min
Detector: MSD @ 230 °C, 45-450 amu
Sample: Analytes (underivatized) are 25 ppm in dichloromethane

1. Nicotine
2. Methylecgonine
3. Ibuprofen
4. Allobarbital
5. Aprobarbital
6. Butabarbital
7. Acetaminophenl
8. Phenacetin
9. Amobarbital
10. Pentobarbital
11. Secobarbital
12. Meprobamate
13. Methyl benzilate
14. Caffeine
15. Benzphetamine
16. Hexobarbital
17. Dimenhydrinate
18. Doxylamine
19. Phenobarbital
20. 8-Chlorotheophylline
21. Methapyrilene
22. Chlorpheniramine
23. Brompheniramine
24. Cocaine
25. Chlorcyclizine
26. Codeine
27. Morphine
28. Diazepam
29. Hydrocodone
30. 6-Monoacetylmorphine
31. Oxymorphone
32. Diacetylmorphine (Heroin)

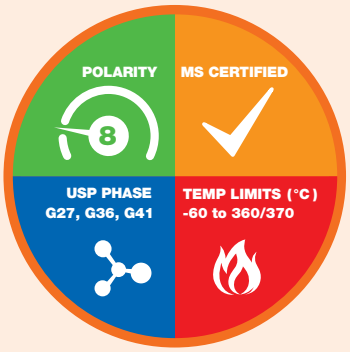
Ordering Information

Zebron ZB-5*PLUS* GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.18	0.18	-60 to 360/370	7CD-G032-08
15-Meter			
0.25	0.25	-60 to 360/370	7EG-G032-11
20-Meter			
0.18	0.18	-60 to 360/370	7FD-G032-08
0.18	0.36	-60 to 360/370	7FD-G032-53
20-Meter with 5-Meter Guardian™ Integrated Guard			
0.18	0.18	-60 to 360/370	7FD-G032-08-GGA
30-Meter			
0.25	0.25	-60 to 360/370	7HG-G032-11
0.25	0.50	-60 to 360/370	7HG-G032-17
0.25	1.00	-60 to 360/370	7HG-G032-22
0.32	0.25	-60 to 360/370	7HM-G032-11
0.32	0.50	-60 to 360/370	7HM-G032-17
0.32	1.00	-60 to 360/370	7HM-G032-22
30-Meter with 5-Meter Guardian Integrated Guard			
0.25	0.10	-60 to 360/370	7HG-G032-02-GGA
0.25	0.25	-60 to 360/370	7HG-G032-11-GGA
60-Meter			
0.25	0.25	-60 to 360/370	7KG-G032-11
60-Meter with 5-Meter Guardian Integrated Guard			
0.25	0.25	-60 to 360/370	7KG-G032-11-GGA

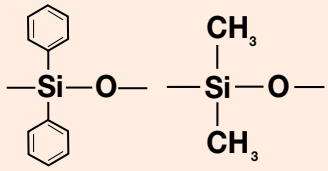
Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G032-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry



5 % Phenyl 95 % Dimethylpolysiloxane

Recommended Applications

- Drugs
- EPA Methods
- FAMEs
- Nitrosamines
- Pesticides
- Phenols

ZB-5*PLUS* Test Mix
Part No.: AG0-8362

For high temperature analysis, consider using a ZB-5HT, see p. 136

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-5MS*PLUS*™

The Next Generation of Inertness

- **The next generation of inertness for specialty chemical, forensic, toxicology, and food testing applications**
- **Specialized deactivation for versatile 5 % phenyl-arylene selectivity with improved sensitivity**
- **Low bleed (MS Certified) and well-suited to high sensitivity GC-MS and GC-MS/MS work**

Upgrade to Zebron from any 5 % phenyl or 5 % phenyl-arylene / 95 % dimethylpolysiloxane phase:

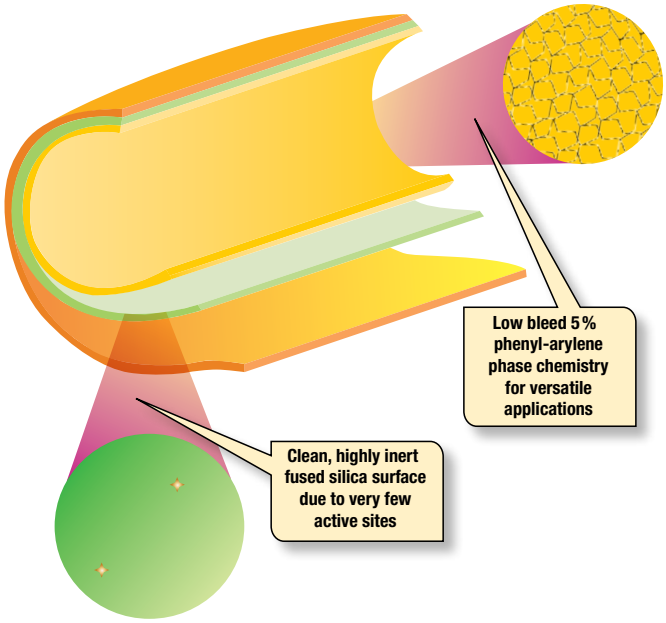
Agilent®
- DB®-5ms
- DB-5ms Ultra Inert
- HP-5ms
- HP-5ms Ultra Inert
- VF-5ms

Restek®
- Rxi®-5Sil MS

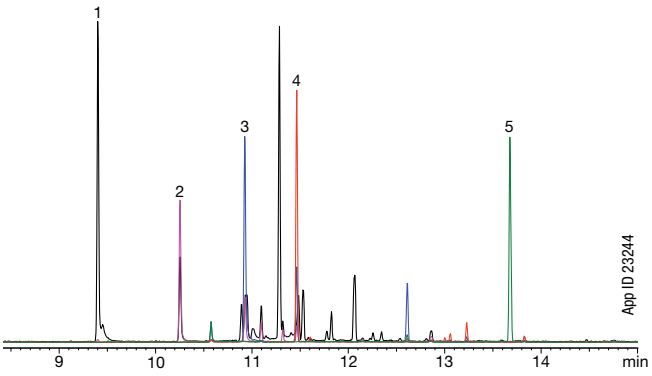
Supelco®
- SLB®-5ms

Engineered for High Performance

Active sites on a GC column's surface can result in analyte adsorption and degradation, negatively affecting peak shape and response. To reduce potential surface activity, Zebron ZB-5MS*PLUS* is designed with a rigorous fused silica deactivation process that improves inertness for troublesome compounds. Instantly achieve higher responses for active compounds compared to your current 5ms phase column, without changing your selectivity.



Melamine in Dog Food by GC-MS



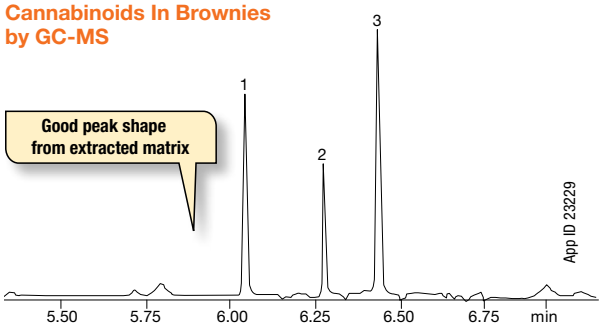
Extraction Protocol:
1. Combine 0.5 g of homogenized dog food with 10 mL of DEA/Water/Acetonitrile (1:4:5) in a 15 mL centrifuge tube
2. Sonicate for 30 min
3. Centrifuge at 5000 rpm for 10 min
4. Transfer 100 µL of supernatant to an autosampler vial and evaporate to dryness using nitrogen gas
5. Reconstitute with 100 µL of Acetonitrile/Pyridine (1:1) and then derivatize using 100 µL BSTFA with 1 % TCMS at 70 °C for 45 min

Column: Zebron ZB-5MS*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G030-11
Injection: Splitless @ 280 °C, 1 µL
Carrier Gas: Helium @ 1 mL/min (constant flow)
Oven Program: 75 °C for 1 min to 320 °C @ 15 °C/min hold for 4 min
Detector: MSD @ 320 °C
Sample: 1. Cyanuric acid
2. Ammelide
3. Ammeline
4. Melamine
5. Benzoguanamine

ZB-5MS*PLUS*™

Versatile Performance For Drugs and Chemicals

Cannabinoids In Brownies by GC-MS

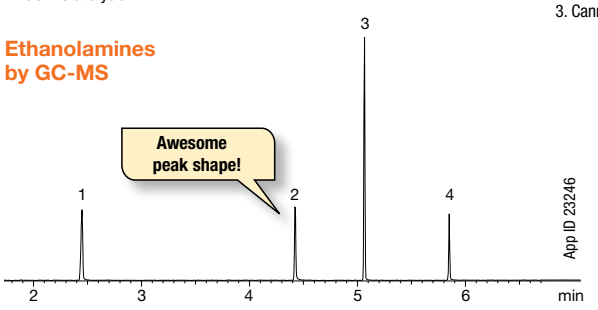


Extraction Protocol:

1. Combine 1 g of chocolate brownie with 10 mL of water in a 50 mL centrifuge tube
2. Shake using a mechanical shaker until dissolved
3. Add roQ™ QuEChERS EN15662 extraction salt packet (KS0-8909) and 10 mL of acetonitrile
4. Shake tube for 3 min using mechanical shaker
5. Centrifuge at 2700 rpm for 5 min
6. Transfer 1 mL of supernatant to an autosampler vial for GC-MS analysis

Column: Zebron ZB-5MS*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G030-11
Injection: Splitless @ 250 °C, 1 µL
Carrier Gas: Helium @ 1.5 mL/min (constant flow)
Oven Program: 100 °C for 1 min to 320 °C @ 50 °C/min, hold for 2 min
Detector: MSD @ 320 °C
Sample: 1. Cannabidiol
2. Δ-9-Tetrahydrocannabinol
3. Cannabinol

Ethanolamines by GC-MS



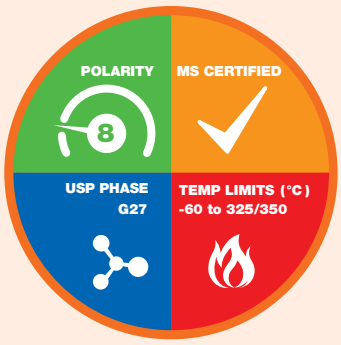
Column: Zebron ZB-5MS*PLUS*
Dimensions: 30 meter x 0.25 mm x 1.00 µm
Part No.: 7HG-G030-22
Injection: Split 200:1 @ 250 °C, 1 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 30 °C to 300 °C @ 40 °C/min
Detector: MSD @ 320 °C
Sample: 1. Monoethanolamine
2. Diethanolamine
3. Triethylene glycol monomethyl ether (IS)
4. Triethanolamine

Ordering Information

Zebron ZB-5MS*PLUS* GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
1.5-Meter			
0.25	0.25	-60 to 325/350	7XG-G030-11
15-Meter			
0.25	0.25	-60 to 325/350	7EG-G030-11
0.25	0.50	-60 to 325/350	7EG-G030-17
0.25	1.00	-60 to 325/350	7EG-G030-22
20-Meter			
0.18	0.18	-60 to 325/350	7FD-G030-08
0.18	0.36	-60 to 325/350	7FD-G030-53
30-Meter			
0.25	0.25	-60 to 325/350	7HG-G030-11
0.25	0.50	-60 to 325/350	7HG-G030-17
0.25	1.00	-60 to 325/350	7HG-G030-22
0.32	0.25	-60 to 325/350	7HM-G030-11
0.32	0.50	-60 to 325/350	7HM-G030-17
0.32	1.00	-60 to 325/350	7HM-G030-22
0.32	1.50	-60 to 325/350	7HM-G030-28
0.53	1.00	-60 to 325/350	7HK-G030-22
0.53	3.00	-60 to 325/350	7HG-G030-36

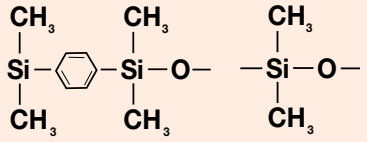
Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry

5 % Phenyl-Arylene



95 % Dimethylpolysiloxane

Recommended Applications

- Acids
- Alkaloids
- Amines
- Drugs
- Essential Oils
- Flavors
- Halo-hydrocarbons
- Pesticides
- Phenols
- Residual Solvents
- Solvent Impurities

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

Ordering Information

Zebron ZB-5MS*PLUS* GC Columns *(cont'd)*

ID(mm)	df(µm)	Temp. Limits °C	Part No.
30-Meter with 5-Meter Guardian™ Integrated Guard			
0.25	0.25	-60 to 325/350	7HG-G030-11-GGA
0.25	0.50	-60 to 325/350	7HG-G030-17-GGA
30-Meter with 10-Meter Guardian Integrated Guard			
0.25	0.25	-60 to 325/350	7HG-G030-11-GGC
0.25	0.50	-60 to 325/350	7HG-G030-17-GGC
60-Meter			
0.25	0.25	-60 to 325/350	7KG-G030-11
0.25	1.00	-60 to 325/350	7KG-G030-22
0.32	1.00	-60 to 325/350	7KM-G030-22

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G030-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

ZB-WAX*PLUS*™

Enhanced Aqueous Stability

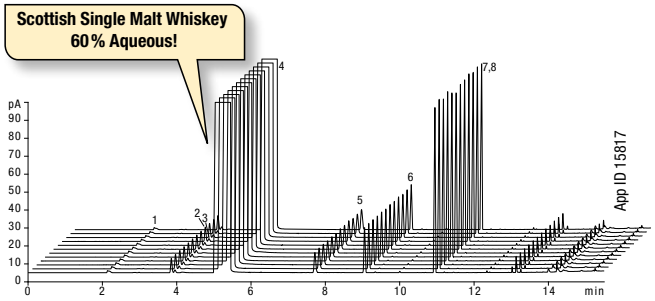
- **100 % aqueous stable, excellent for aqueous samples**
- **Extremely inert for acidic compounds**
- **Enhanced selectivity for low boiling solvents**
- **High retention of alcohols and chlorinated solvents**
- **Increased efficiency at 20 °C**

Upgrade to Zebron from any polyethylene glycol phase:

Agilent®	Restek®	SGE®	Supelco®
• DB®-WAX • CAM • HP-20M • Carbowax 20M • CP-Wax 52 CB	• Stabilwax®	• BP20	• SUPELCOWAX® 10

Water Reproducibility of ZB-WAX*PLUS*

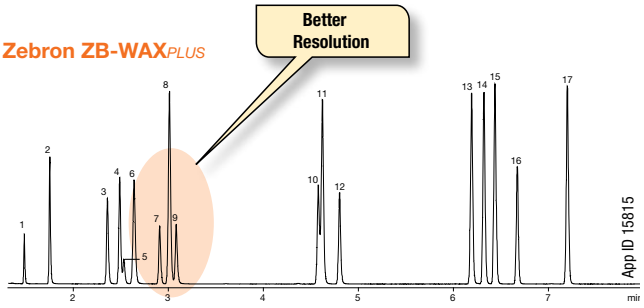
Historically, polyethylene glycol (PEG) phases have been unstable with aqueous samples such as beverages or glycols, resulting in poor reproducibility and decreased lifetime. ZB-WAX*PLUS* bonding procedure results in exceptional stability to repeated injections of aqueous matrices.



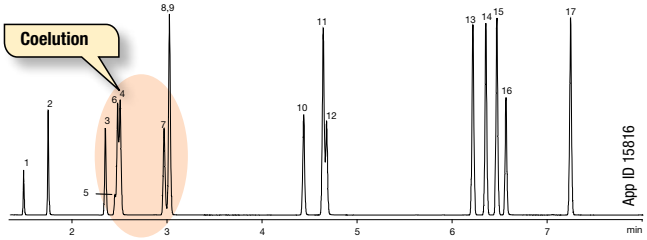
Column: Zebron ZB-WAX*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G013-11
Injection: Split 30:1 @ 140 °C, 0.2 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 35 °C for 5 min to 85 °C @ 10 °C/min to 200 °C @ 25 °C/min for 1 min
Detector: FID @ 200 °C
Sample: 1. Acetaldehyde
2. Ethyl Acetate
3. Methanol
4. Ethanol
5. Propanol
6. Isobutanol
7. 2-Methylbutanol
8. 3-Methylbutanol

Improve Resolution

Zebron ZB-WAX*PLUS*



Restek Stabilwax



Conditions same for both columns:

Dimensions: 30 meter x 0.25 mm x 0.25 µm
Injection: Split 100:1 @ 250 °C, 1 µL
Carrier Gas: Hydrogen @ 1.0 mL/min (constant flow)
Oven Program: 35 °C for 2.5 min to 85 °C @ 10 °C/min and hold until last peak elutes
Detector: FID @ 225 °C

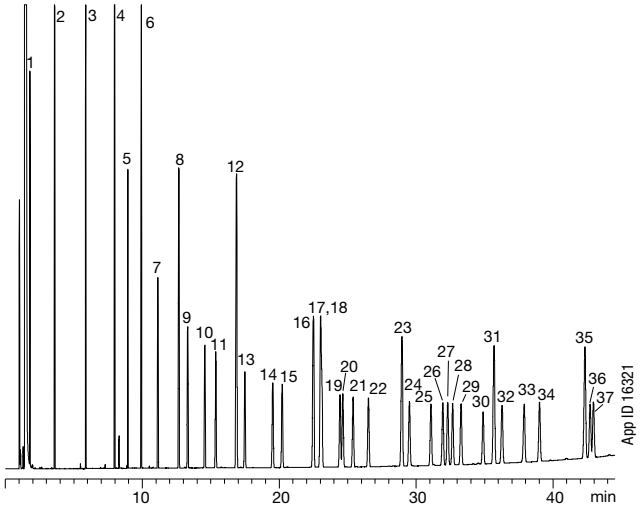
Sample:
1. Methyl Formate
2. Acetone
3. Ethyl Acetate
4. Methyl Ethyl Ketone
5. Methanol
6. 2-Methyl-2-propanol
7. Methylene Chloride
8. Benzene
9. Ethanol
10. 2-Butanol
11. Toluene
12. n-Propanol
13. Ethyl Benzene
14. p-Xylene
15. m-Xylene
16. 1-Butanol
17. o-Xylene

Comparative separations may not be representative of all applications.

ZB-WAX*PLUS*™

A Food Testing Must-Have

Food Industry FAMEs



Column: Zebron ZB-WAX*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G013-11
Injection: Split 5:1 @ 220 °C, 1 µL
Carrier Gas: Helium @ 3 mL/min (constant flow)
Oven Program: 60 °C for 2 min to 150 °C @ 13 °C/min to 240 °C @ 2 °C/min
Detector: FID @ 250 °C
Sample: See the full compound list at www.phenomenex.com/GC

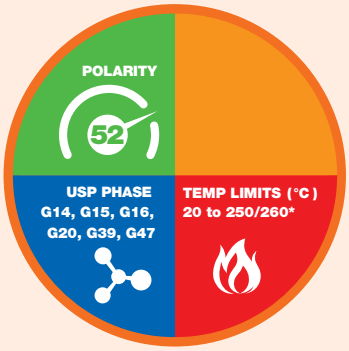
Ordering Information

Zebron ZB-WAX*PLUS* GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.10	20 to 250/260	7CB-G013-02
15-Meter			
0.25	0.25	20 to 250/260	7EG-G013-11
0.53	1.00	20 to 230/240	7EK-G013-22
20-Meter			
0.18	0.18	20 to 250/260	7FD-G013-08
30-Meter			
0.25	0.25	20 to 250/260	7HG-G013-11
0.25	0.50	20 to 250/260	7HG-G013-17
0.32	0.25	20 to 250/260	7HM-G013-11
0.32	0.50	20 to 250/260	7HM-G013-17
0.32	1.00	20 to 230/240	7HM-G013-22
0.53	0.25	20 to 250/260	7HK-G013-11
0.53	1.00	20 to 230/240	7HK-G013-22
60-Meter			
0.25	0.15	20 to 250/260	7KG-G013-05
0.25	0.25	20 to 250/260	7KG-G013-11
0.25	0.50	20 to 250/260	7KG-G013-17
0.32	0.25	20 to 250/260	7KM-G013-11
0.32	0.50	20 to 250/260	7KM-G013-17
0.53	1.00	20 to 230/240	7KK-G013-22

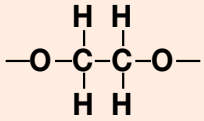
Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G013-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



*Thicker films (≥ 1.0 µm) are rated to 230/240 °C.

Phase Chemistry



100 % Polyethylene Glycol

Recommended Applications

- Alcohols
- Aldehydes
- Aromatics
- Essential Oils
- Flavors & Fragrances
- Free Fatty Acids
- Glycols
- OVIs
- Pharmaceuticals
- Solvents / Residual Solvents
- Styrene
- Xylene Isomers

ZB-WAX*PLUS* Test Mix
Part No.: AG0-7869

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-624*PLUS*™

- **Enhanced peak shape with superior deactivation**
- **Increased sensitivity for high boiling solvents**
- **Extremely low bleed for GC-MS**
- **High temperature stability (300/320 °C)**

Upgrade to Zebron from these similar* phases:

Agilent®
- CP-Select 624 CB
- DB-624UI Ultra Inert

Restek®
- Rxi-624Sil MS

*not exact equivalent, selectivity may differ

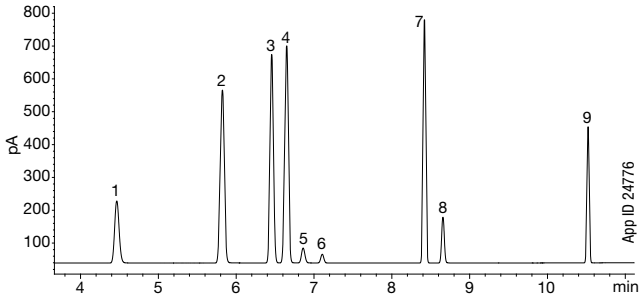
What makes the PLUS in ZB-624*PLUS*?

- **Enhanced Inertness**
  Proprietary superior deactivation gives great peak shape for troublesome compounds.
- **High Selectivity**
  A G43 phase that's highly selective for polar, non-polar, low and high boiling solvents.
- **Column-to-Column Reproducibility**
  Excellent column-to-column reproducibility well suited for validated methods.
- **Temperature Limits**
  Push the temperature limits of traditional 624 and elute/bake high boiling analytes at 300/320 °C.
- **MS Certified**
  Low bleed characteristics makes it the right choice for GC-MS.

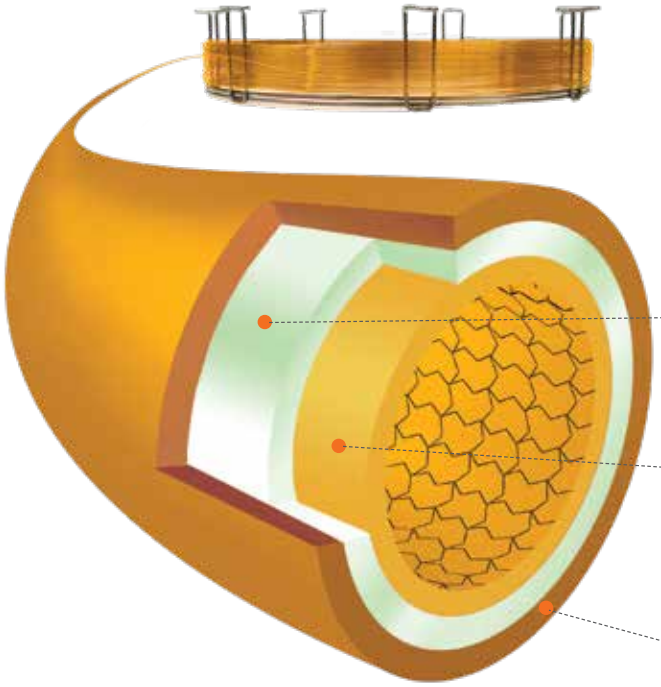
Shorter Residual Solvent Analysis by GC-FID

Why wait for an hour long method. Upgrade to ZB-624*PLUS* and get short runtime, low bleed, high temperature resistance, and the 624 selectivity, all in one column.

Separation of Residual Solvent Critical Pairs in Less than 15 min



Column: Zebron ZB-624*PLUS*
Dimensions: 30 meter x 0.32 mm x 1.80 µm
Part No.: 7HM-G040-31
Injection: Split 20:1 @ 200 °C, 1 µL
Recommended Liner: Zebron PLUS Straight Z-Liner™
Liner Part No.: AG2-0A03-05 (for Agilent® & Thermo Scientific® systems)
Carrier Gas: Helium @ 1 mL/min (constant flow)
Oven Program: 40 °C for 5 min to 260 °C @ 25 °C/min for 3 min
Detector: FID @ 250 °C
Sample:
1. Methanol
2. Ethanol
3. Acetone
4. IPA
5. Acetonitrile
6. DCM
7. Ethyl Acetate
8. THF
9. Toluene



Superior Deactivated Fused Silica
Dramatically reduces analyte adsorption, maximizing your peak symmetry.

Highly Selective Stationary Phase
Provides excellent separation of polar, nonpolar, low and high boiling solvents, while Engineered Self Cross-linking (ESC™) results in high-thermal stability and low bleed.

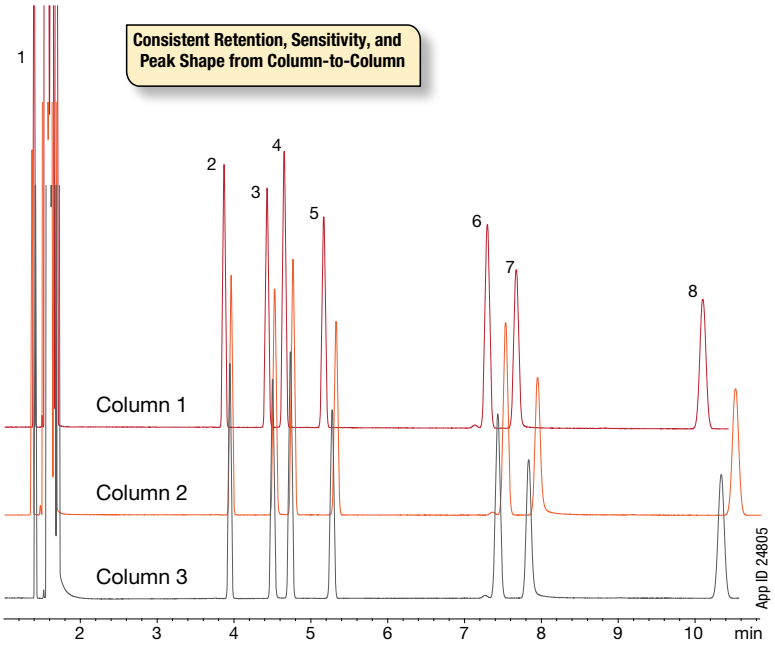
Polyimide Coating
Flexibility and temperature resistance (300/320°C).

0.53 mm ID ZB-624*PLUS*™ columns are not MS Certified.

ZB-624*PLUS*™

We QC Test for the Compounds You Analyze

We added challenging and troublesome analytes to our QC test to make sure each ZB-624*PLUS* column has superior deactivation.

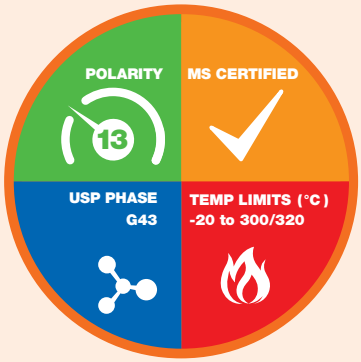


Test Probe	The Plus Advantage	Property
2,4-Dimethylphenol 2,4-Dimethylaniline	We screen challenging analytes, like acids and bases, to mimic your most challenging compounds.	Inertness

Conditions for all separations:

Column: Zebron ZB-624*PLUS*
Dimensions: 30 meter x 0.32 mm x 1.80 µm
Part No.: 7HM-G040-31
Injection: Split 50:1 @ 250 °C, 1 µL
Recommended Liner: Zebron PLUS Straight Z-Liner™
Liner Part No.: AG2-0A03-05 (for Agilent® & Thermo Scientific® systems)
Carrier Gas: Hydrogen @ 6 psi (constant pressure)
Oven Program: 85 °C for 10.5 min
Detector: FID @ 305 °C
Sample: 1. Methane
2. Dodecane
3. 2,4-Dimethylphenol
4. 2,4-Dimethylaniline
5. Tridecane
6. 1-Methylnaphthalene
7. 1-Undecanol
8. Pentadecane

Column Profile



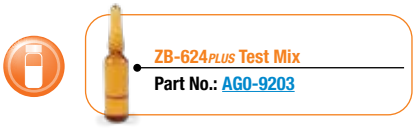
Engineered Self Cross-linking™ (ESC)

Phase Chemistry

- Proprietary

Recommended Applications

- Cannabis
- Terpenes
- Residual Solvents
- Volatile Amines
- EPA Method 8260
- EPA Method 524
- EPA Method 624
- Food
- Flavors and Fragrances
- Solvent Purity
- Alcohols



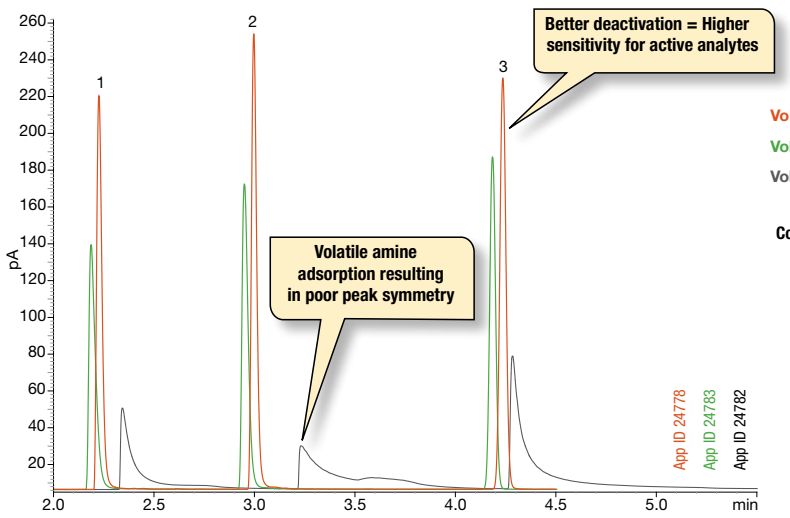
Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

ZB-624*PLUS*™ *(cont'd)*

Improved Peak Shape of Volatile Amines

Volatile amines are challenging analytes for GC analysis. They can adsorb to even the smallest imperfections in fused silica. ZB-624*PLUS* undergoes a superior deactivation process which minimizes active compound adsorption leading to gains in peak response and shape.

Comparison of Volatile Amines on Various 624 Columns



Volatile Amines on a Zebron ZB-624*PLUS* - 500 ppm

Volatile Amines on a Restek® Rxi®-624Sil MS - 500 ppm

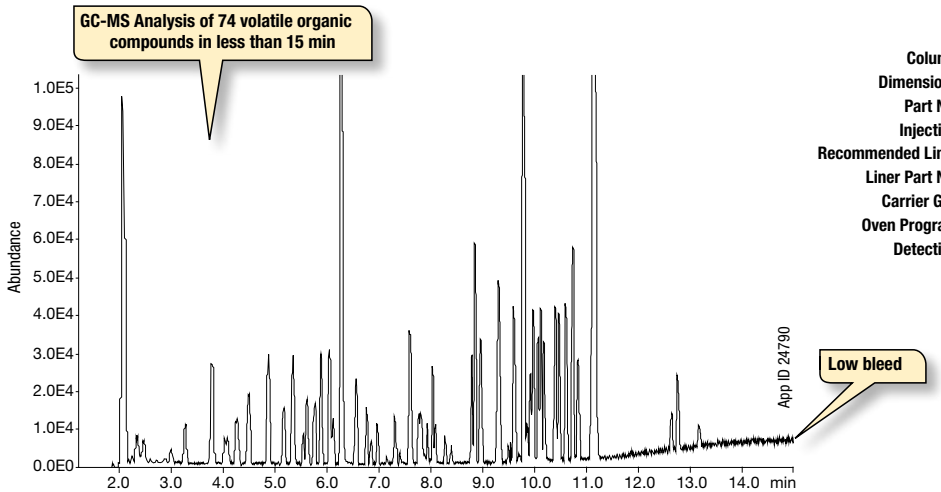
Volatile Amines on a Agilent® DB®-624UI Ultra Inert - 500 ppm

Conditions for all separations:

Column: Zebron ZB-624*PLUS*
Restek Rxi-624Sil MS
Agilent DB-624UI Ultra Inert
Dimensions: 30 meter x 0.32 mm x 1.80 µm
Injection: Split 20:1 @ 200 °C, 1 µL
Recommended Liner: Zebron PLUS Straight Z-Liner™
Liner Part No.: AG2-0A03-05 (for Agilent® & Thermo Scientific® systems)
Carrier Gas: Helium @ 1.8 mL/min (constant flow)
Oven Program: 50 °C for 1 min, to 200 °C @ 20 °C/min for 5 min
Detector: FID @ 250 °C
Sample: 1. Isopropylamine
2. Diethylamine
3. Triethylamine

Volatile Organic Compounds in EPA Methods 8260, 524, and 624

Our high efficiency dimension and superior deactivation can stand real world samples. In addition, MS certification provides extreme low bleed to your GC-MS analysis.



Column: Zebron™ ZB-624*PLUS*
Dimensions: 30 meter x 0.25 mm x 1.40 µm
Part No.: 7HG-G040-27
Injection: Split 50:1 @ 230°C, 1 µL
Recommended Liner: Zebron PLUS Straight Z-Liner™
Liner Part No.: AG2-0A03-05 (for Agilent® & Thermo Scientific® systems)
Carrier Gas: Helium @ 0.7 mL/min (constant flow)
Oven Program: 40 °C for 2 min, to 210 °C @ 17 °C/min for 3 min
Detection: Mass Spec transfer line @ 250 °C

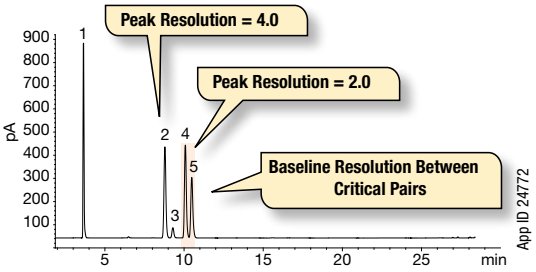
Comparative separations may not be representative of all applications.

ZB-624*PLUS*™ *(cont'd)*

Exceeding USP <467> System Suitability

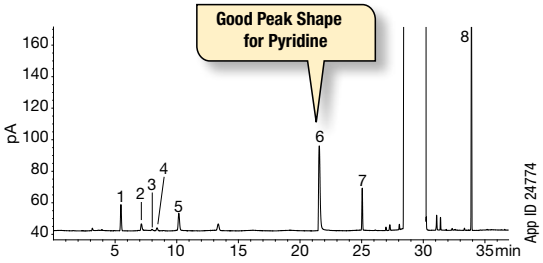
USP <467> method requires resolution of 1.5 for critical pairs. Zebron ZB-624*PLUS* took the challenge and succeeded with even greater resolution!

Class 1 Residual Solvents



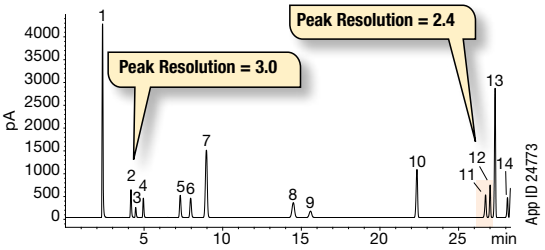
Sample: 1. 1,1-Dichloroethene
2. 1,1,1-Tetrachloride
3. Carbon tetrachloride
4. Benzene
5. 1,2-Dichloroethane

Class 2B Residual Solvents



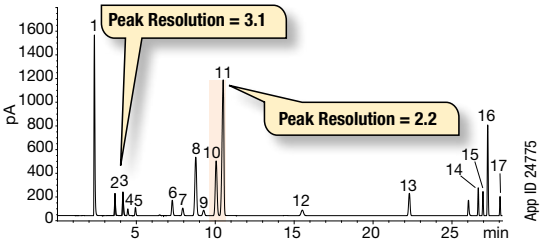
Sample: 1. Hexane
2. Nitromethane
3. Chloroform
4. 1,2-Dimethoxyethane
5. Trichlorethylene
6. Pyridine
7. 2-Hexanone
8. Tetralin

Class 2A Residual Solvents



Sample: 1. Methanol
2. Acetonitrile
3. Dichloromethane
4. trans-1,2-Dichloroethane
5. cis-1,2-Dichloroethane
6. Tetrahydrofuran
7. Cyclohexane
8. Methyl cyclohexane
9. 1,4-Dioxane
10. Toluene
11. Chlorobenzene
12. Ethyl benzene
13. m-Xylene / p-Xylene
14. o-Xylene

Class 1 and 2A Residual Solvents



Sample: 1. Methanol
2. 1,1-Dichloroethene
3. Acetonitrile
4. Dichloromethane
5. trans-1,2-Dichloroethene
6. cis-1,2-Dichloroethene
7. Tetrahydrofuran
8. 1,1,1-Tetrachloride
9. Carbon tetrachloride
10. Benzene
11. 1,2-Dichloroethane
12. 1,4-Dioxane
13. Toluene
14. Chlorobenzene
15. Ethyl benzene
16. m-Xylene/ p-Xylene
17. o-Xylene

Same conditions for all separations:

Column: Zebron ZB-624*PLUS*
Dimensions: 30 meter x 0.32 mm x 1.80 µm
Part No.: 7HM-G040-31
Injection: Split 5:1 @ 140 °C, 1 µL
Recommended Liner: Zebron PLUS Straight Z-Liner™
Liner Part No.: AG2-0A03-05 (for Agilent® & Thermo Scientific® systems)
Carrier Gas: Helium @ 2.2 mL/min (constant flow)
Oven Program: 40 °C for 20 min to 240 °C @ 10 °C/min
Detector: FID @ 250 °C

Ordering Information

Zebron ZB-624*PLUS* GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
20-Meter			
0.18	1.00	-20 to 300/320	7FD-G040-22
0.25	1.40	-20 to 300/320	7FG-G040-27
30-Meter			
0.25	1.40	-20 to 300/320	7HG-G040-27
0.32	1.80	-20 to 300/320	7HM-G040-31
0.53	3.00	-20 to 300/320	7HK-G040-36
60-Meter			
0.25	1.40	-20 to 300/320	7KG-G040-27
0.32	1.80	-20 to 300/320	7KM-G040-31
0.53	3.00	-20 to 300/320	7KK-G040-36
75-Meter			
0.53	3.00	-20 to 300/320	7LK-G040-36

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G040-27-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages. 0.18 mm, 0.25 mm, and 0.32 mm are MS certified.

ZB-1HT Inferno™

Robust Results Up to 430 ºC

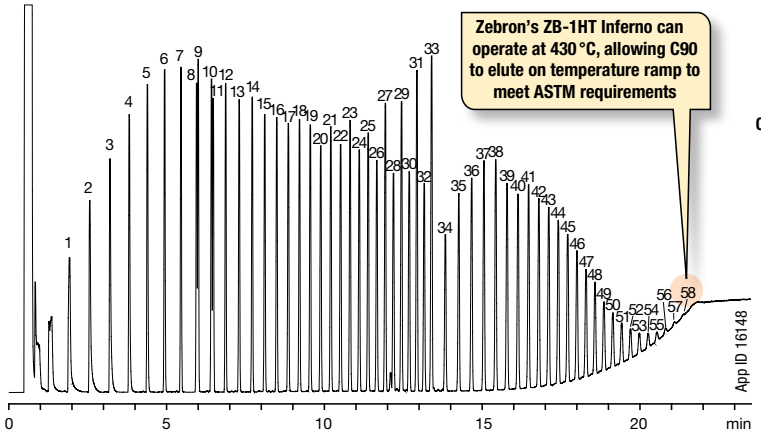
- **First non-metal columns stable to 430 °C**
- **Provides true boiling point separation for hydrocarbon distillation methods**
- **Longer lifetime with rugged high temperature, polyimide coated, fused silica tubing**
- **Low activity, provides good peak shape for acidic and basic samples**
- **Provides robust column performance for high temperature bake outs**

Upgrade to Zebron from any 100 % dimethylpolysiloxane phase:

Agilent®	Restek®	SGE®	Supelco®
• DB®-1	• Rtx®-1	• BP1	• SPB®-1
• DB-1ht	• Rxi®-1HT		• Petrocol® 2887
• HP-1			
• CP-Sil 5 CB			
• CP-SimDist			

Rugged, High-Temperature Performance

Great Separation of High Boiling Hydrocarbons (ASTM D6352)

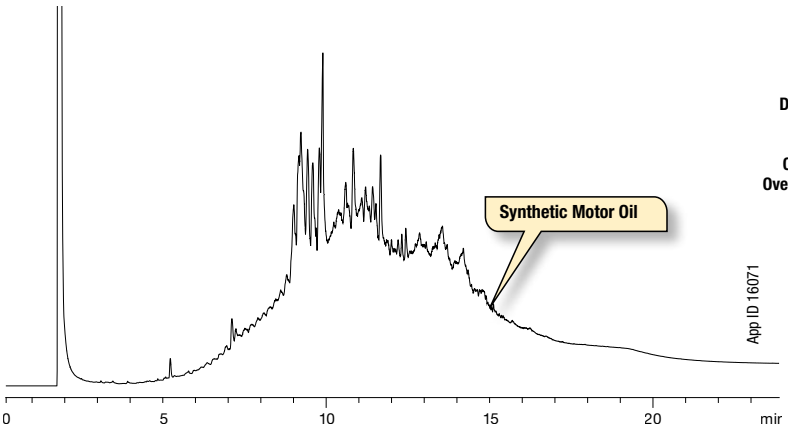


Column: Zebron ZB-1HT Inferno
Dimensions: 5 meter x 0.53 mm x 0.10 µm
Part No.: 7AK-G014-02
Injection: On-Column @ 43 °C, 0.1 µL
Carrier Gas: Helium @ 4.4 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 430 °C @ 20 °C/min for 10 min
Detector: FID @ 430 °C
Sample:

1. C10	16. C23	31. C38	46. C66
2. C11	17. C24	32. C39	47. C68
3. C12	18. C25	33. C40	48. C70
4. C13	19. C26	34. C42	49. C72
5. C14	20. C27	35. C44	50. C74
6. C15	21. C28	36. C46	51. C76
7. C16	22. C29	37. C48	52. C78
8. C17	23. C30	38. C50	53. C80
9. Pristane	24. C31	39. C52	54. C82
10. C18	25. C32	40. C54	55. C84
11. Phytane	26. C33	41. C56	56. C86
12. C19	27. C34	42. C58	57. C88
13. C20	28. C35	43. C60	58. C90
14. C21	29. C36	44. C62	
15. C22	30. C37	45. C64	

Note: Sample was a combination of PolyWax® 655 and retention time markers C8-C40 in CS_2/Chloroform

Bake Off Contaminants from Dirty Matrices



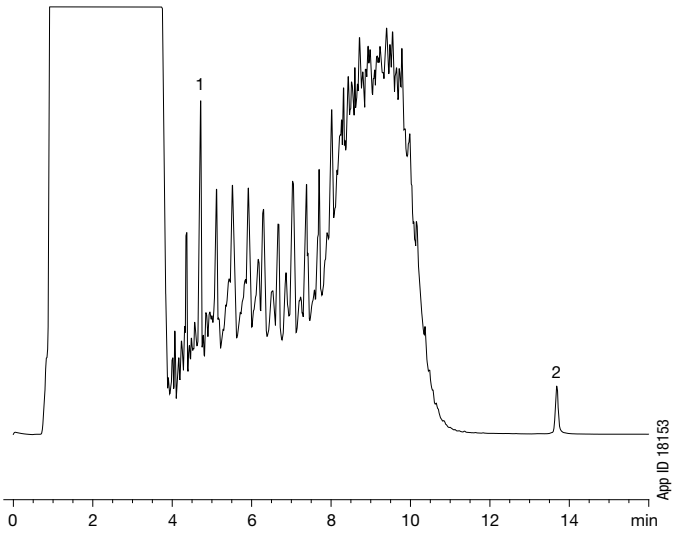
Column: Zebron ZB-1HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.10 µm
Part No.: 7HG-G014-02
Injection: On-Column @ 153 °C, 1 µL
Carrier Gas: Helium @ 1 mL/min (constant flow)
Oven Program: 150 °C to 400 °C @ 14 °C/min for 6 min
Detector: FID @ 400 °C
Sample: Sample was 1 % in dichloromethane Mobil® 1 10W-30 Fully Synthetic Motor Oil

2007 R&D 100 Award Recipient

ZB-1HT Inferno™

Run Versatile Samples

Hydrocarbons from Water by GC-FID
DIN EN ISO 9377-2 (DEV H53)



Column: Zebron ZB-1HT Inferno
Dimensions: 15 meter x 0.32 mm x 0.25 µm
Part No.: 7EM-G014-11
Injection: Splitless @ 300 °C, 20 µL
Carrier Gas: Helium @ 2.0 mL/min (constant flow)
Oven Program: 50 °C for 2 min to 320 °C @ 30 °C/min for 5 min
Detector: FID @ 330 °C
Sample: 1. Decane (C10)
2. Tetracontane (C40)

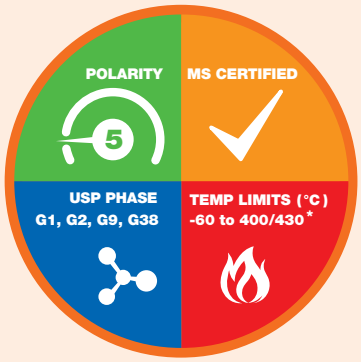
Ordering Information

Zebron ZB-1HT Inferno GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
5-Meter			
0.53	0.10	-60 to 400/430	7AK-G014-02
10-Meter			
0.32	0.25	-60 to 400/430	7CM-G014-11
15-Meter			
0.25	0.10	-60 to 400/430	7EG-G014-02
0.25	0.25	-60 to 400/430	7EG-G014-11
0.32	0.10	-60 to 400/430	7EM-G014-02
0.32	0.25	-60 to 400/430	7EM-G014-11
0.53	0.15	-60 to 400	7EK-G014-05
20-Meter			
0.18	0.18	-60 to 400/430	7FD-G014-08
30-Meter			
0.25	0.10	-60 to 400/430	7HG-G014-02
0.25	0.25	-60 to 400/430	7HG-G014-11
0.32	0.10	-60 to 400/430	7HM-G014-02
0.32	0.25	-60 to 400/430	7HM-G014-11
0.53	0.15	-60 to 400	7HK-G014-05

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G014-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

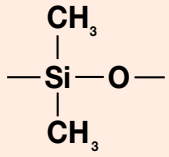
Column Profile



*0.53 mm ID columns are rated to 400 °C.

Engineered Self Cross-linking™ (ESC)

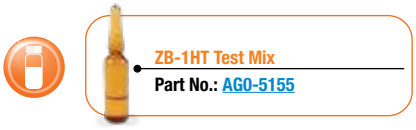
Phase Chemistry



100 % Dimethylpolysiloxane

Recommended Applications

- Diesel Fuel
- High Boiling Petroleum Products
- High Molecular Weight Waxes
- Hydrocarbons
- Motor Oils
- Polymers/Plastics
- Simulated Distillation



ZB-1HT Test Mix
Part No.: AG0-5155

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-5HT Inferno™

Robust Results Up to 430 °C

- **First non-metal columns stable to 430 °C**
- **Robust column for high temperature bake outs and analysis, such as biodiesel, long-chain hydrocarbons, polymers, and high molecular weight compounds**
- **Provides true boiling point separation for hydrocarbon distillation methods**
- **Longer lifetime with rugged high temperature, polyimide coated, fused silica tubing**
- **Low activity, provides good peak shape for acidic and basic samples**

Upgrade to Zebron from any 5 % phenyl / 95 % dimethylpolysiloxane phase:

Agilent®
- DB®-5ht
- VF-5ht

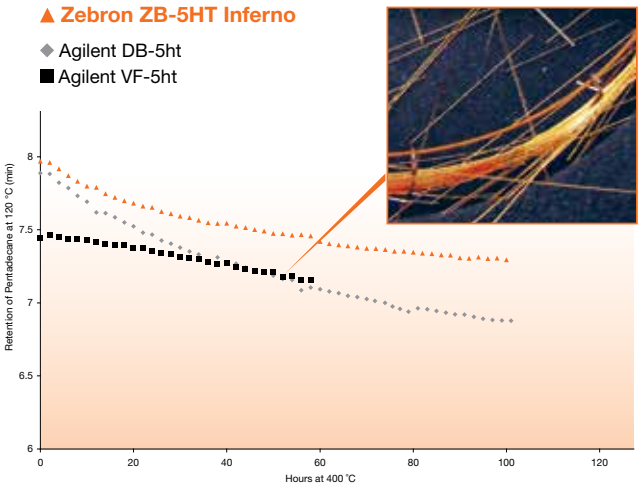
Restek®
- Rxi®-5HT
- Stx®-5HT
- XTI®-5HT
- Rtx®-5HT

SGE®
- HT-5

Zebron Inferno Columns Win In The Lifetime Test

How does the lifetime test work?

All columns were held at 400 °C for 2 hours and then the oven was lowered to 120 °C for pentadecane analysis. The VF-5ht column broke just after 40 hours at 400 °C. The ZB-5HT had the same retention for pentadecane at 100 hours as the DB-5ht column at 40 hours — over 2X the lifetime!



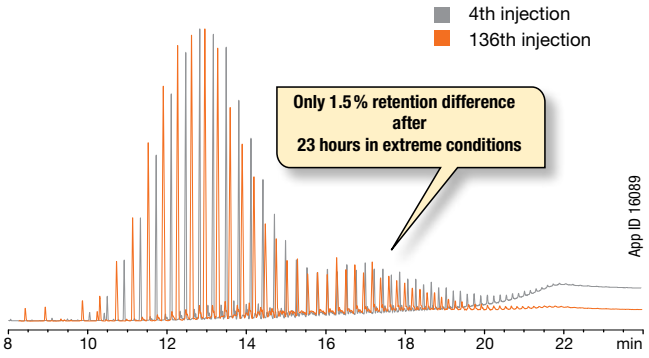
Note that the VF-5ht column died around 40 hours at 400 °C whereas the Zebron ZB-5HT Inferno column maintained great retention of Pentadecane over 100 hours.

Conditions for all columns:

Dimensions: 30 meter x 0.25 mm x 0.10 µm
Injection: 1.0 µL of test mix AG0-7578
Carrier Gas: Helium @ 1.9 mL/min (constant flow)
Oven Program: 120 °C (Isothermal)
Detector: FID @ 400 °C
Sample: Pentadecane

Comparative separations may not be representative of all applications.

Paraffin Wax



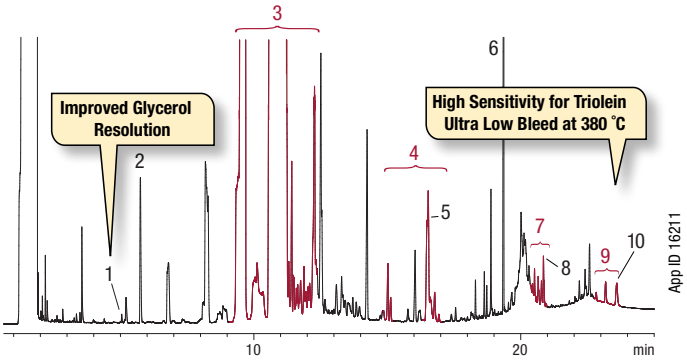
Column: Zebron ZB-5HT Inferno
Dimensions: 15 meter x 0.32 mm x 0.10 µm
Part No.: 7EM-G015-02
Injection: On Column @ 43 °C, 0.1 µL
Carrier Gas: Helium @ 1.9 mL/min (constant flow)
Oven Program: 40 °C for 2 min to 430 °C @ 20 °C for 10 min
Detector: FID @ 430 °C
Sample: Paraffin Wax

2007 R&D 100 Award Recipient

ZB-5HT Inferno™

Well-Suited for Fuels Analysis

Free Total Glycerin in B100 Biodiesel by GC-FID



Column: Zebron ZB-5HT Inferno
Dimensions: 15 meter x 0.32 mm x 0.10 µm + 2 meter x 0.53 mm Z-Guard™
Part No.: 7EM-G015-02
Injection: On-Column @ 53 °C, 1 µL
Carrier Gas: Helium @ 3.0 mL/min (constant flow)
Oven Program: 50 °C for 1 min to 180 °C @ 15 °C/min to 230 °C @ 7 °C/min to 380 °C @ 30 °C/min for 10 min
Detector: FID @ 380 °C
Note: A 2 m x 0.53 mm Guard Column was connected to the analytical column per ASTM method requirement
Sample:

1. Glycerol
2. Butanetriol (ISTD1)
3. Esters
4. Monoglycerides
5. 1-Monooleoyl-rac-glycerol
6. Tricarpin (ISTD2)
7. Diglycerides
8. 1,3-Diolein
9. Triglycerides
10. Triolein

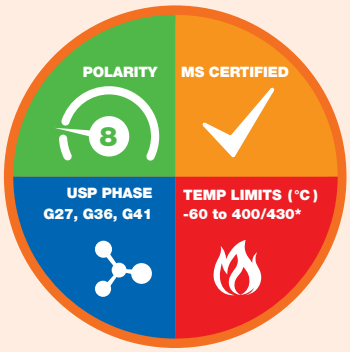
Ordering Information

Zebron ZB-5HT Inferno GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter with 2-Meter Spliced Guard (0.53 mm ID)			
0.32	0.10	-60 to 400/430	7CM-G015-02-GST
15-Meter			
0.25	0.10	-60 to 400/430	7EG-G015-02
0.25	0.25	-60 to 400/430	7EG-G015-11
0.32	0.10	-60 to 400/430	7EM-G015-02
0.32	0.25	-60 to 400/430	7EM-G015-11
0.53	0.15	-60 to 400	7EK-G015-05
15-Meter with 2-Meter Spliced Guard (0.53 mm ID)			
0.32	0.10	-60 to 400/430	7EM-G015-02-GST
20-Meter			
0.18	0.18	-60 to 400/430	7FD-G015-08
30-Meter			
0.25	0.10	-60 to 400/430	7HG-G015-02
0.25	0.25	-60 to 400/430	7HG-G015-11
0.32	0.10	-60 to 400/430	7HM-G015-02
0.32	0.25	-60 to 400/430	7HM-G015-11
0.53	0.15	-60 to 400	7HK-G015-05
60-Meter			
0.25	0.25	-60 to 400/430	7KG-G015-11

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G015-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

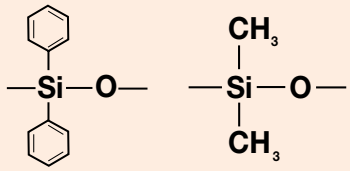
Column Profile



*0.53 mm ID columns are rated to 400 °C.

Engineered Self Cross-linking™ (ESC)

Phase Chemistry



5 % Phenyl 95 % Dimethylpolysiloxane

Recommended Applications

- Diesel Fuels
- High Boiling Petroleum Products
- High Molecular Weight Waxes
- Hydrocarbons
- Motor Oils
- Polymers/Plastics
- Simulated Distillation
- Surfactants
- Triglycerides

ZB-5HT Test Mix
Part No.: AG0-5155

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

ZB-35HT Inferno™

High Temperature Stability for Mid-Polarity

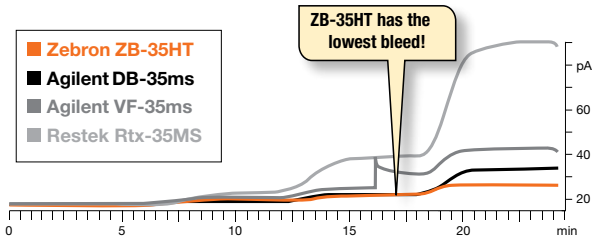
- **First non-metal, 35 % phenyl columns stable to 400 ˚C**
- **Longer lifetime with rugged high temperature, polyimide coated, fused silica tubing**
- **Robust column for high temperature analysis**
- **Great for high molecular weight compounds**
- **Eliminate carry-over with high temperature bake outs**
- **Low activity, provides good peak shape for acidic and basic samples**

Upgrade to Zebron from any 35 % phenyl / 65 % dimethylpolysiloxane phase:

Agilent®	Restek®	SGE®	Supelco®	OV®
• DB®-35 • HP-35ms • HP-35	• Rtx®-35 • Rtx-35ms	• BPX35 • BPX608	• MDN-35 • SPB®-35 • SPB-608	• OV-11

Lower Bleed Than Other Columns!

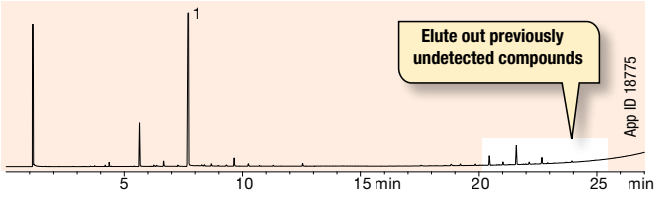
Conditions for all columns:
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Injection: Split 20:1 @ 200 °C, 1 µL
Carrier Gas Helium @ 1.7 mL/min (constant flow)
Oven Program: 100 °C to 320 °C @ 30 °C/min for 5 min to 340 °C @ 20 °C/min for 5 min to 360 °C @ 20 °C/min for 5 min to 380 °C @ 20 °C/min for 5 min to 400 °C @ 20 °C/min for 5 min to 100 °C @ 30 °C/min for 8 min
Detector: FID @ 405 °C



See What You've Been Missing

A) ZB-35HT Inferno

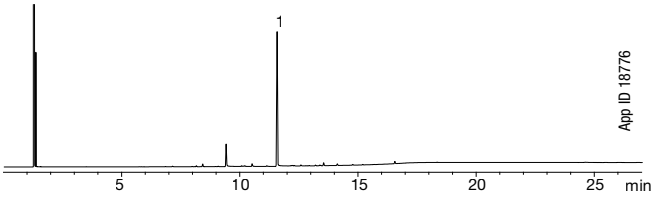
30 meter x 0.25 mm x 0.25 µm



VS.

B) Restek Rtx-35

30 meter x 0.25 mm x 1.00 µm



Column: As listed
Dimensions: As listed
Part No.: 7HG-G025-11 (ZB-35HT Inferno)
Injection: A) Split 50:1 @ 350 °C, 1 µL
B) Split 50:1 @ 300 °C, 1 µL
Carrier Gas: Helium @ 2.1 mL/min (constant flow)
Oven Program: A) 140 °C to 400 °C @ 10 °C/min
B) 140 °C to 300 °C @ 10 °C/min
Detector: A) FID @ 400 °C
B) FID @ 320 °C
Sample: 1. Hexadecylamine

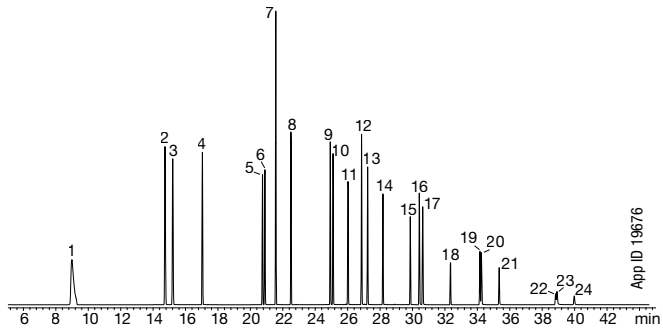
Note: Chromatogram is courtesy of Northeastern Chemical Company.

Comparative separations may not be representative of all applications.

ZB-35HT Inferno™

Well-Suited for Environmental Contaminants

PAHs and PCBs In A Single Run



Column: Zebron ZB-35HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G025-11
Injection: Splitless @ 265 °C, 2 µL
Carrier Gas: Helium @ 1 mL/min (constant flow)
Oven Program: 85 °C for 3 min to 320 °C @ 7 °C /min for 8 min
Detector: MSD @ 280 °C
Sample: Compounds are 5 ppm

1. Naphthalene	9. PCB 101	17. Chrysene
2. Acenaphthylene	10. Fluoranthene	18. PCB 194
3. Acenaphthene	11. Pyrene	19. Benzo[b]fluoranthene
4. Fluorene	12. PCB 118	20. Benzo[k]fluoranthene
5. Phenanthrene	13. PCB 153	21. Benzo[a]pyrene
6. Anthracene	14. PCB 138	22. Indeno[1,2,3-cd]pyrene
7. PCB 28	15. PCB 180	23. Dibenz[a,h]anthracene
8. PCB 52	16. Benz[a]anthracene	24. Benzo[g,h,i]perylene

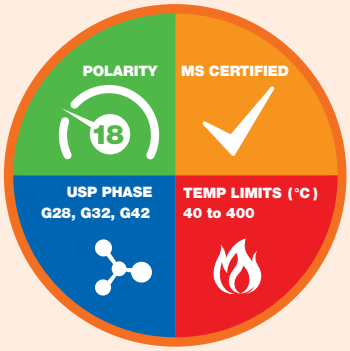
Ordering Information

Zebron ZB-35HT Inferno GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.10	40 to 400	7EG-G025-02
0.25	0.25	40 to 400	7EG-G025-11
0.32	0.25	40 to 400	7EM-G025-11
20-Meter			
0.18	0.18	40 to 400	7FD-G025-08
30-Meter			
0.25	0.10	40 to 400	7HG-G025-02
0.25	0.25	40 to 400	7HG-G025-11
0.32	0.25	40 to 400	7HM-G025-11

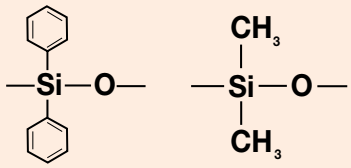
Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G025-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

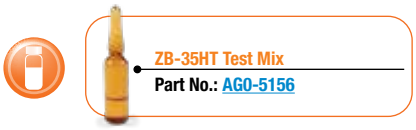
Phase Chemistry



35 % Phenyl 65 % Dimethylpolysiloxane

Recommended Applications

- Amines
- Chemicals
- Drugs
- EPA Methods (508, 608, 8081, 8141, 8151)
- PCBs / Aroclors
- Pesticides
- Pharmaceuticals
- Steroids



ZB-35HT Test Mix
Part No.: AG0-5156

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-XLB-HT Inferno™

High Temp Stability, Low Bleed

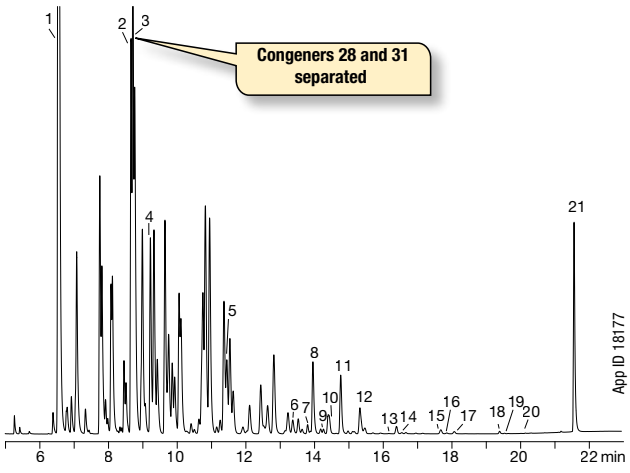
- **Rugged, non-metal si-arylene GC column stable to 400 °C**
- **Robust column for high temperature bake outs and analysis, such as high molecular weight compounds**
- **Provides unique selectivity for conformational analyses**
- **Longer lifetime with high temperature, polyimide coated, fused silica tubing**
- **Low activity, provides good peak shape for acidic and basic samples**
- **Good tool for general screening to identify unknown samples**

Upgrade to Zebron from these similar* phases:

Agilent®	Restek®	Supelco®
• DB®-XLB • VF-XMS	• DB®-XLB	• MDN-12

*not exact equivalent, selectivity may differ

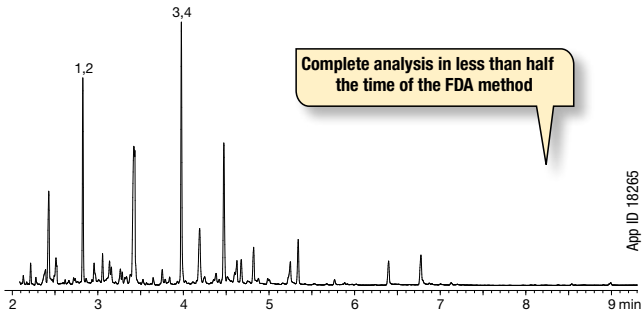
Aroclor 1242: DIN Method 51527



Column: Zebron ZB-XLB-HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G024-11
Injection: Split 2:1 @ 250 °C, 1 µL, pressure pulse @ 40 psi for first 0.25 min
Carrier Gas: Helium @ 1.5 mL/min (constant flow)
Oven Program: 50 °C for 0.5 min to 210 °C @ 40 °C/min for 3 min to 230 °C @ 30 °C/min for 5 min to 250 °C @ 30 °C/min for 5 min to 320 °C @ 40 °C/min for 2 min
Detector: ECD @ 350 °C
Sample: Total concentration of aroclors was 90 ppm in isooctane

1. TCMX
2. BZ# 31
3. BZ# 28
4. BZ# 52
5. BZ# 101
6. BZ# 77
7. BZ# 123
8. BZ# 118
9. BZ# 153
10. BZ# 114
11. BZ# 105
12. BZ# 138
13. BZ# 126
14. BZ# 167
15. BZ# 156
16. BZ# 180
17. BZ# 157
18. BZ# 170
19. BZ# 169
20. BZ# 189
21. DCB

Melamine and Cyanuric Acid by GC-MS



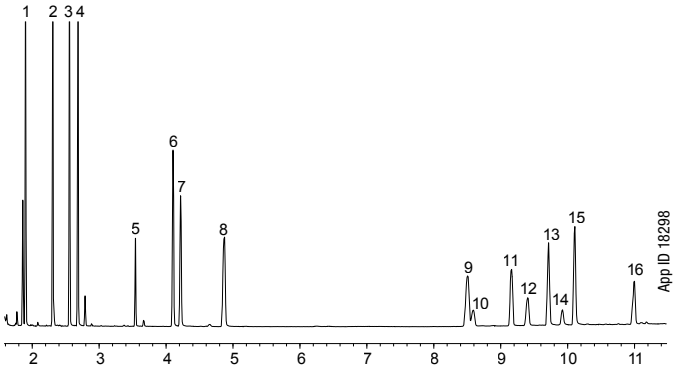
Column: Zebron ZB-XLB-HT Inferno
Dimensions: 15 meter x 0.25 mm x 0.25 µm
Part No.: 7EG-G024-11
Injection: On-Column @ 103 °C, 1 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 100 °C for 0.5 min to 320 °C @ 25 °C/min
Detector: MSD @ 325 °C
Sample: Analytes are 200 ng / 100 µL in BSTFA / Pyridine (1:1)

1. Cyanuric Acid 13C3 (IS)
2. Cyanuric Acid
3. Melamine 13C3 15N3 (IS)
4. Melamine

ZB-XLB-HT Inferno™

Good Results for Difficult Samples

Explosives by GC-MS



Column: Zebron ZB-XLB-HT Inferno
Dimensions: 15 meter x 0.25 mm x 0.25 µm
Part No.: 7EG-G024-11
Injection: On-Column @ 73 °C, 0.5 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 70 °C for 1 min to 140 °C @ 25 °C/min for 4 min to 280 °C @ 25 °C/min
Detector: MSD @ 300 °C, 40-400 amu
Sample: Analytes are 10 ppm in dichloromethane

1. Nitrobenzene
2. 2-Nitrotoluene
3. 3-Nitrotoluene
4. 4-Nitrotoluene
5. Nitroglycerin
6. 2,6-Dinitrotoluene (2,6-DNT)
7. 1,3-Dinitrobenzene (1,3-DNB)
8. 2,4-Dinitrotoluene
9. 2,4,6-Trinitrotoluene (2,4,6-TNT)
10. PETN
11. 1,3,5-Trinitrobenzene (1,3,5-TNB
12. RDX
13. 4-Amino-2,6-dinitrotoluene
14. 3,5-Nitroaniline
15. 2-Amino-4,6-dinitrotoluene
16. Tetryl

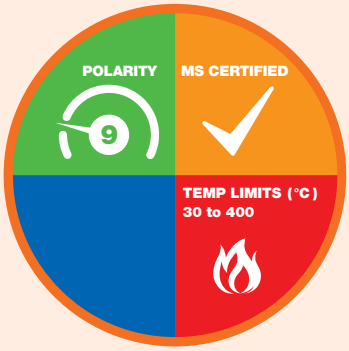
Ordering Information

Zebron ZB-XLB-HT Inferno GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.10	30 to 400	7EG-G024-02
0.25	0.25	30 to 400	7EG-G024-11
0.32	0.10	30 to 400	7EM-G024-02
20-Meter			
0.18	0.18	30 to 400	7FD-G024-08
30-Meter			
0.25	0.10	30 to 400	7HG-G024-02
0.25	0.25	30 to 400	7HG-G024-11
0.32	0.25	30 to 400	7HM-G024-11
60-Meter			
0.25	0.25	30 to 400	7KG-G024-11

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G024-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



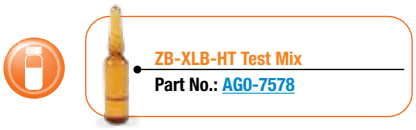
Engineered Self Cross-linking™ (ESC)

Phase Chemistry

- Proprietary

Recommended Applications

- Herbicides / Insecticides
- PCBs
- Pesticides
- Unknown Samples



ZB-XLB-HT Test Mix
Part No.: AG0-7578

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-1

Low Polarity for Versatile Applications

- **Low polarity phase suited for true boiling point compounds**
- **Low bleed (MS Certified), low activity, and high efficiency**
- **Excellent resolving power of critical pairs in complex petrochemical samples**
- **Used for "fingerprinting" and routine quality control analyses**

Upgrade to Zebron from any 100 % dimethylpolysiloxane phase:

Agilent®
- DB®-1
- DB-2887
- DB-1 EVDX
- HP-1
- HP-101
- HP-PONA
- Ultra 1
- CP-Sil 5 CB

Restek®
- Rtx®-1
- Rtx-1PONA
- Rtx-1 F&F

SGE®
- BP1
- BP1-PONA
- BPX1-SimD

Supelco®
- SPB®-1
- SPB-1 TG
- SE-30
- MET-1
- SPB-1 Sulfur
- SPB-HAP

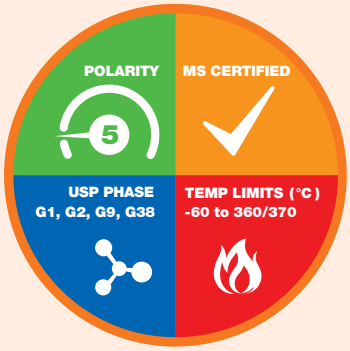
Ordering Information

Zebron ZB-1 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.53	2.65	-60 to 340/360	7CK-G001-35
15-Meter			
0.25	0.10	-60 to 360/370	7EG-G001-02
0.25	0.25	-60 to 360/370	7EG-G001-11
0.25	1.00	-60 to 340/360	7EG-G001-22
0.32	0.25	-60 to 360/370	7EM-G001-11
0.32	1.00	-60 to 340/360	7EM-G001-22
0.53	0.15	-60 to 360/370	7EK-G001-05
0.53	0.50	-60 to 360/370	7EK-G001-17
0.53	1.50	-60 to 340/360	7EK-G001-28
30-Meter			
0.25	0.10	-60 to 360/370	7HG-G001-02
0.25	0.25	-60 to 360/370	7HG-G001-11
0.25	0.50	-60 to 360/370	7HG-G001-17
0.25	1.00	-60 to 340/360	7HG-G001-22
0.32	0.25	-60 to 360/370	7HM-G001-11
0.32	0.50	-60 to 360/370	7HM-G001-17
0.32	1.00	-60 to 340/360	7HM-G001-22
0.32	3.00	-60 to 340/360	7HM-G001-36
0.32	5.00	-60 to 340/360	7HM-G001-39
0.53	0.50	-60 to 360/370	7HK-G001-17
0.53	1.50	-60 to 340/360	7HK-G001-28
0.53	3.00	-60 to 340/360	7HK-G001-36
0.53	5.00	-60 to 340/360	7HK-G001-39
50-Meter			
0.25	0.50	-60 to 360/370	7JG-G001-17
60-Meter			
0.25	0.25	-60 to 360/370	7KG-G001-11
0.25	1.00	-60 to 340/360	7KG-G001-22
0.32	0.25	-60 to 360/370	7KM-G001-11
0.32	1.00	-60 to 340/360	7KM-G001-22
0.32	3.00	-60 to 340/360	7KM-G001-36
0.53	1.50	-60 to 340/360	7KK-G001-28
100-Meter			
0.25	0.50	-60 to 360/370	7MG-G001-17

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G001-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

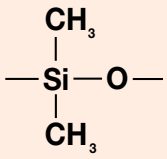
Column Profile



*Thicker films (≥ 1.0 µm) are rated to 340/360 °C.

Engineered Self Cross-linking™ (ESC)

Phase Chemistry



100 % Dimethylpolysiloxane

Recommended Applications

- Ethanol
- Hydrocarbons
- Mercaptans
- MTBE
- Natural Gas Odorants
- Oxygenates and GROs
- Solvent Impurities
- Sulfur Compounds (Light)

ZB-1 Test Mix
Part No.: AG0-5155

Engineered Self Cross-linking™ (ESC) . Zebron GC Columns MS Certification, see p. 411

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-5

Low Polarity For A Wide Application Range

- **Rugged, versatile low polarity column for general lab purpose**
- **Resilient to dirty samples—long column life**
- **Low bleed (MS Certified) especially suited to high sensitivity work using GC-MS**
- **Extremely inert for active compounds such as drugs or pesticides**
- **Great column for unknown samples**

Upgrade to Zebron from any 5 % phenyl / 95 % dimethylpolysiloxane phase:

Agilent®
- DB®-5
- HP-5
- HP-PAS-5
- CP-Sil 8 CB
- Ultra 2

Restek®
- Rtx®-5

SGE®
- BP5
- BPX5

Supelco®
- MDN-5
- SPB®-5
- PTE-5
- SE-54
- PTA-5
- Equity®-5
- Sac-5

OV®
- OV-5

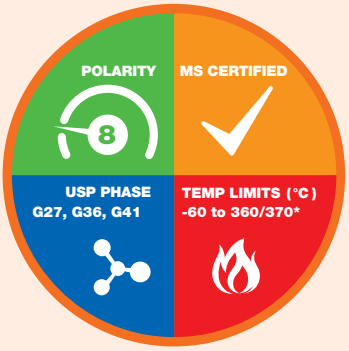
Ordering Information

Zebron ZB-5 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.10	-60 to 360/370	7EG-G002-02
0.25	0.25	-60 to 360/370	7EG-G002-11
0.25	0.50	-60 to 360/370	7EG-G002-17
0.25	1.00	-60 to 340/360	7EG-G002-22
0.32	0.10	-60 to 360/370	7EM-G002-02
0.32	0.25	-60 to 360/370	7EM-G002-11
0.32	1.00	-60 to 340/360	7EM-G002-22
0.53	0.50	-60 to 360/370	7EK-G002-17
0.53	1.50	-60 to 340/360	7EK-G002-28
0.53	3.00	-60 to 340/360	7EK-G002-36
20-Meter			
0.18	0.18	-60 to 360/370	7FD-G002-08
30-Meter			
0.25	0.10	-60 to 360/370	7HG-G002-02
0.25	0.25	-60 to 360/370	7HG-G002-11
0.25	0.50	-60 to 360/370	7HG-G002-17
0.25	1.00	-60 to 340/360	7HG-G002-22
0.32	0.25	-60 to 360/370	7HM-G002-11
0.32	0.50	-60 to 360/370	7HM-G002-17
0.32	1.00	-60 to 340/360	7HM-G002-22
0.53	0.50	-60 to 360/370	7HK-G002-17
0.53	1.50	-60 to 340/360	7HK-G002-28
0.53	3.00	-60 to 340/360	7HK-G002-36
0.53	5.00	-60 to 340/360	7HK-G002-39
60-Meter			
0.25	0.10	-60 to 360/370	7KG-G002-02
0.25	0.25	-60 to 360/370	7KG-G002-11
0.25	0.50	-60 to 360/370	7KG-G002-17
0.25	1.00	-60 to 340/360	7KG-G002-22
0.32	0.25	-60 to 360/370	7KM-G002-11
0.32	1.00	-60 to 340/360	7KM-G002-22
0.53	1.50	-60 to 340/360	7KK-G002-28

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G002-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

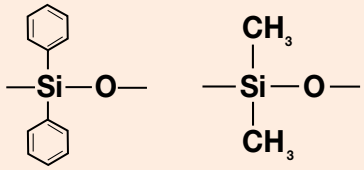
Column Profile



*Thicker films (≥ 1.0 µm) are rated to 340/360 °C.

Engineered Self Cross-linking™ (ESC)

Phase Chemistry



5 % Phenyl 95 % Dimethylpolysiloxane

Recommended Applications

- Alkaloids
- Dioxins
- Drugs
- Essential Oils
- Flavors
- FAMEs
- Halo-Hydrocarbons
- Herbicides
- PCBs / Aroclors
- Pesticides
- Phenols
- Residual Solvents

ZB-5 Test Mix
Part No.: AG0-5155

For ultra low bleed, consider using a ZB-5ms, see p. 144
For high temperature analysis, consider using a ZB-5HT, see p. 136

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-5ms

Robust Results, Versatile Performance

- **Popular rugged column for general purpose use**
- **Fully conditioned within 35 minutes**
- **High response for acids and bases**
- **Enhanced resolution of polyaromatic hydrocarbons (PAHs) and other multi-ring aromatic compounds**

Upgrade to Zebron from any 5 % phenyl-arylene / 95 % dimethylpolysiloxane phase:

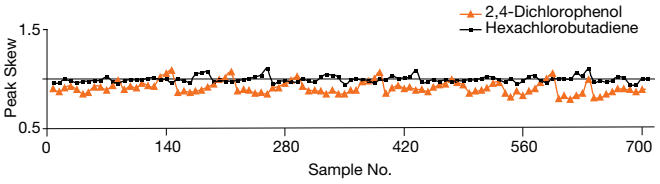
Agilent®
- DB®-5ms
- DB-5.625
- DB-5ms EVDX
- CP-Sil 8 CB MS
- VF-5ms

Restek®
- Rtx®-5Sil MS
- Rxi®-5Sil MS

Supelco®
- SLB®-5ms

Long Lifetime

Consistent response after more than 700 samples at pH 2!



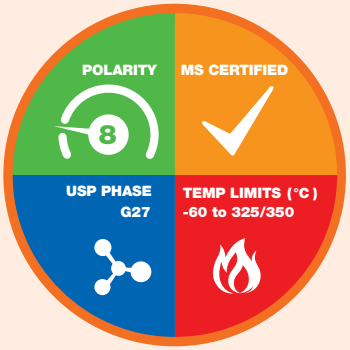
Ordering Information

Zebron ZB-5ms GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.10	-60 to 325/350	7CB-G010-02
0.18	0.18	-60 to 325/350	7CD-G010-08
12-Meter			
0.20	0.33	-60 to 325/350	7DE-G010-14
15-Meter			
0.25	0.25	-60 to 325/350	7EG-G010-11
20-Meter			
0.18	0.18	-60 to 325/350	7FD-G010-08
0.18	0.32	-60 to 325/350	7FD-G010-51
0.18	0.36	-60 to 325/350	7FD-G010-53
25-Meter			
0.20	0.33	-60 to 325/350	7GE-G010-14
30-Meter			
0.25	0.25	-60 to 325/350	7HG-G010-11
0.25	0.50	-60 to 325/350	7HG-G010-17
0.25	1.00	-60 to 325/350	7HG-G010-22
0.32	0.25	-60 to 325/350	7HM-G010-11
0.32	0.50	-60 to 325/350	7HM-G010-17
0.32	1.00	-60 to 325/350	7HM-G010-22
60-Meter			
0.25	0.10	-60 to 325/350	7KG-G010-02
0.25	0.25	-60 to 325/350	7KG-G010-11
0.32	0.25	-60 to 325/350	7KM-G010-11

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G010-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

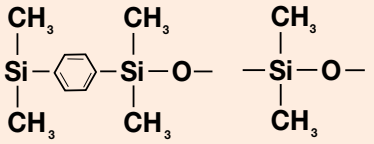
Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry

5 % Phenyl-Arylene



95 % Dimethylpolysiloxane

Recommended Applications

- Acids
- Alkaloids
- Amines
- Dioxins
- Drugs
- Essential Oils
- Flavors
- FAMEs
- Halo-hydrocarbons
- Herbicides
- PCBs/Aroclors
- Pesticides
- Phenols
- Residual Solvents
- Solvent Impurities

ZB-5ms Test Mix
Part No.: AG0-7578

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-35

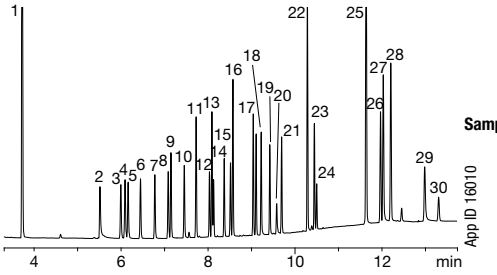
Intermediate Polarity for GC-MS

- **Intermediate polarity column with temperature limits up to 360 ˚C allows high molecular weight analysis**
- **Excellent inertness to minimize analyte adsorption, improve efficiency, and reproducibility**
- **More rugged (longer column life) than other polar phases**
- **Excellent for trace analysis with bleed-sensitive detectors (MS, FID, ECD, NPD)**

Upgrade to Zebron from any 35 % phenyl / 65 % dimethylpolysiloxane phase:

Agilent®	Restek®	SGE®	Supelco®	OV®
• DB®-35	• Rtx®-35	• BPX35	• MDN-35	• OV-11
• DB-35ms	• Rtx-35ms	• BPX608	• SPB®-35	
• HP-35			• SPB-608	
• HP-35ms				

Common Drug Screen by GC-FID



Column: Zebron ZB-35
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G003-11
Injection: Split 10:1 @ 225 °C, 1.5 µL
Carrier Gas: Helium @ 1.4 mL/ min (constant flow)
Oven Program: 120 ˚C to 180 ˚C @ 25 ˚C/min to 200 ˚C @ 6 ˚C/min to 300 ˚C @ 20 ˚C/min for 3 min
Detector: FID @ 300 °C

Sample: All analytes are 25 ppm except nicotine at 100 ppm

1. Nicotine
2. Ibuprofen
3. Allobarbital
4. Acetaminophen
5. Aprobarbital
6. Butalbital
7. Amobarbital
8. Pentobarbital
9. Phenacetin
10. Secobarbital
11. Benzphetamine
12. Meprobamate
13. Dimenhydrinate
14. Hexobarbital
15. Doxylamine
16. Caffeine
17. Chlorpheniramine
18. Methapyrilene
19. Phenobarbital
20. Procaine
21. Bromopheniramine
22. Chlorcyclizine
23. Cocaine
24. Benactyzine
25. Codeine
26. Diazepam
27. Morphine
28. Hydrocodone
29. Oxymorphone
30. Heroin

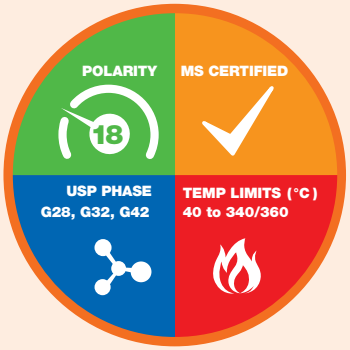
Ordering Information

Zebron ZB-35 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.10	40 to 340/360	7CB-G003-02
15-Meter			
0.25	0.25	40 to 340/360	7EG-G003-11
0.25	0.50	40 to 340/360	7EG-G003-17
0.53	1.00	40 to 340/360	7EK-G003-22
30-Meter			
0.25	0.25	40 to 340/360	7HG-G003-11
0.25	0.50	40 to 340/360	7HG-G003-17
0.32	0.25	40 to 340/360	7HM-G003-11
0.32	0.50	40 to 340/360	7HM-G003-17
0.53	0.50	40 to 340/360	7HK-G003-17
0.53	1.00	40 to 340/360	7HK-G003-22
60-Meter			
0.25	0.25	40 to 340/360	7KG-G003-11
0.32	0.25	40 to 340/360	7KM-G003-11

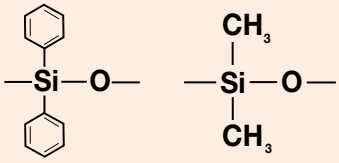
Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G003-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

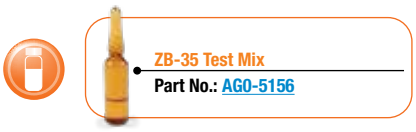
Phase Chemistry



35 % Phenyl 65 % Dimethylpolysiloxane

Recommended Applications

- Amines
- Drugs
- EPA Methods (508, 608, 8081, 8141, 8151)
- PCBs / Aroclors
- Pesticides
- Pharmaceuticals



ZB-35 Test Mix
Part No.: AG0-5156

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-50

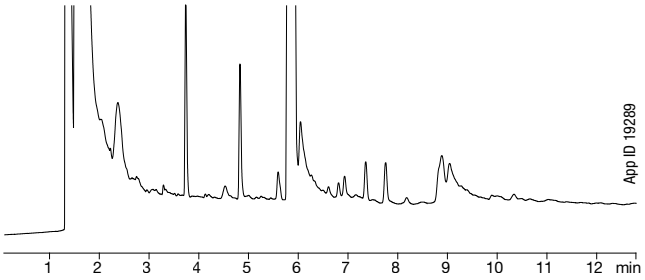
Robust Results, Rugged Performance

- **High polarity column with temperature limits up to 340 ˚C allows high temperature bake out to remove contaminants**
- **Excellent inertness to minimize analyte adsorption, improve efficiency, and reproducibility**
- **More rugged (longer column life) than other polar phases**
- **Excellent for trace analysis with bleed-sensitive detectors**
- **Great for drug screening and environmental compounds**

Upgrade to Zebron from any 50 % phenyl / 50 % dimethylpolysiloxane phase:

Agilent®	Restek®	SGE®	Supelco®
• DB®-17 • DB-17ht • DB-17ms • DB-17 EVDX	• Rtx®-50	• BPX50	• SP®-2250 • SPB®-17 • SPB-50

Antihistamine by GC-FID



Column: Zebron ZB-50
Dimensions: 30 meter x 0.32 mm x 0.50 µm
Part No.: 7HM-G004-17
Injection: Split 20:1 @ 250 °C, 1 µL
Carrier Gas: Helium @ 40 cm/sec (constant flow)
Oven Program: 190 °C to 260 °C @ 25 °C/min for 10 min
Detector: FID @ 270 °C
Sample: Brompheniramine

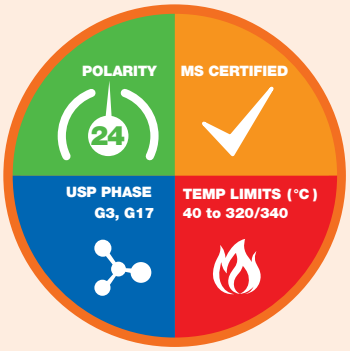
Ordering Information

Zebron ZB-50 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.10	40 to 320/340	7CB-G004-02
0.53	2.00	40 to 320/340	7CK-G004-32
15-Meter			
0.25	0.15	40 to 320/340	7EG-G004-05
0.25	0.25	40 to 320/340	7EG-G004-11
0.32	0.25	40 to 320/340	7EM-G004-11
0.32	0.50	40 to 320/340	7EM-G004-17
0.53	1.00	40 to 320/340	7EK-G004-22
30-Meter			
0.25	0.25	40 to 320/340	7HG-G004-11
0.25	0.50	40 to 320/340	7HG-G004-17
0.32	0.25	40 to 320/340	7HM-G004-11
0.32	0.50	40 to 320/340	7HM-G004-17
0.53	1.00	40 to 320/340	7HK-G004-22
60-Meter			
0.25	0.25	40 to 320/340	7KG-G004-11
0.25	0.50	40 to 320/340	7KG-G004-17

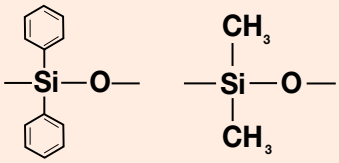
Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G004-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry



50 % Phenyl — 50 % Dimethylpolysiloxane

Recommended Applications

- Antidepressants
- Cholesterols
- Drugs of Abuse
- EPA Methods (508, 608, 8081, 8141, 8151)
- Glycols
- Herbicides
- Pesticides
- Steroids
- Triglycerides

ZB-50 Test Mix
Part No.: AG0-5157

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-624

Robust Results for VOCs and Residual Solvents

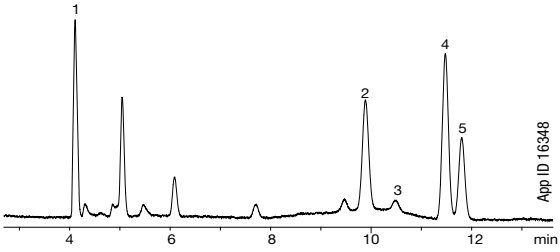
- **Widely used phase to separate volatile organic flavor and fragrance additives and residual solvents in industrial or pharmaceutical products (OVIs)**
- **Popular choice for residual solvent testing**
- **Excellent for US EPA Methods 501.3, 502.2, 503.1, 524.2, 601, 602, 624, 8010, 8015, 8020, 8021, 8240, 8260**
- **Specifically designed for the separation of volatile organic compounds (VOCs)**
- **Increased temperature limit speeds run times and re-equilibration**

Upgrade to Zebron from any 6 % cyanopropylphenyl / 94 % dimethylpolysiloxane phase:

Agilent®	Restek®	SGE®	Supelco®	OV®
• DB®-624 • DB-1301 • DB-VRX • HP-VOC • CP-1301 • CP-Select 624 CB	• Rtx®-624 • Rtx-1301 • Rtx-VMS	• BPX624	• SPB®-624 • SPB-1301	• OV-624

Good Performance for Pharmaceuticals

USP <467> Residual Solvents Procedure A — Class 1



Column: Zebron ZB-624
Dimensions: 30 meter x 0.32 mm x 1.80 µm
Part No.: 7HM-G005-31
Injection: Split 5:1 @ 140 °C, 1 mL
Carrier Gas: Helium @ 35 cm/sec (constant flow)
Oven Program: 40 °C for 20 min to 240 °C @ 10 °C/min for 20 min
Detector: FID @ 250 °C

Sample:
1. 1,1-Dichloroethene
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Benzene
5. 1,2-Dichloroethane

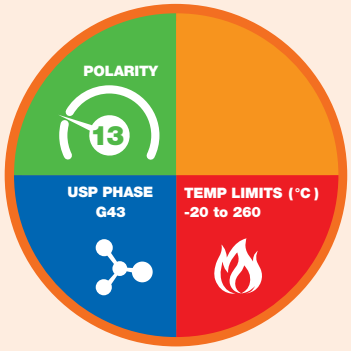
Ordering Information

Zebron ZB-624 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
20-Meter			
0.18	1.00	-20 to 260	7FD-G005-22
30-Meter			
0.25	1.40	-20 to 260	7HG-G005-27
0.32	1.80	-20 to 260	7HM-G005-31
0.53	3.00	-20 to 260	7HK-G005-36
60-Meter			
0.25	1.40	-20 to 260	7KG-G005-27
0.32	1.80	-20 to 260	7KM-G005-31
0.53	3.00	-20 to 260	7KK-G005-36
75-Meter			
0.53	3.00	-20 to 260	7LK-G005-36
105-Meter			
0.53	3.00	-20 to 260	7NK-G005-36

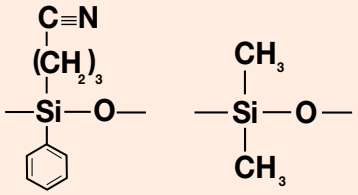
Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G005-27-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Phase Chemistry

6 % Cyanopropylphenyl



94 % Dimethylpolysiloxane

Recommended Applications

- Pharmaceuticals
- Residual Solvents
- Volatile Organic Compounds (VOCs)
- EPA Methods (501.3, 502.2, 503.1, 524.2, 601, 602, 624, 8010, 8015, 8020, 8021, 8240, 8260)

ZB-624 Test Mix
Part No.: AG0-5159

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-1701

Alternate Selectivity for Mid-Polarity Analyses

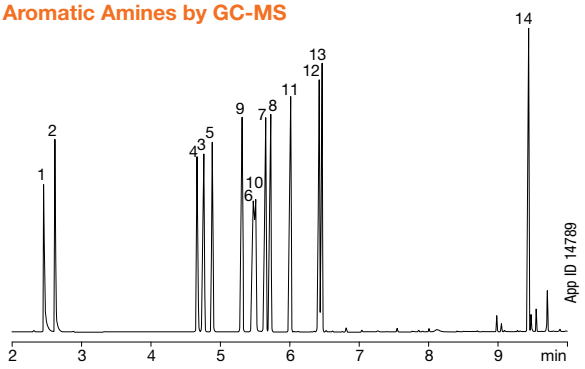
- **Fast run and re-equilibration times for enhanced sample throughput and productivity**
- **Provides alternate selectivity to phenyl phases with similar polarity**

Upgrade to Zebron from any 14 % cyanopropylphenyl / 86 % dimethylpolysiloxane phase:

Agilent®	Restek®	SGE®	Supelco®	OV®
• DB®-1701	• Rtx®-1701	• BP10	• SPB®-1701	• OV-1701
• CP-Sil 19 CB	• Rtx-VMS		• Equity®-1701	

Good Peak Shape for Active Analytes

Aromatic Amines by GC-MS



Column: Zebron ZB-1701
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G006-11
Injection: Split 15:1 @ 220 °C, 1 µL
Carrier Gas: Helium @ 1.0 mL/min (constant flow)
Oven Program: 60 °C for 1 min to 110 °C @ 30 °C/min to 135 °C @ 9 °C/min to 260 °C @ 30 °C/min for 2 min
Detector: MSD @ 180 °C
Sample: Analytes are at 1.58 mg/mL each

1. Piperidine
2. 2-Methylpiperidine
3. Aniline
4. Benzylamine
5. α-Phenylethylamine
6. N-Methylaniline
7. m-Toluidine
8. o-Toluidine
9. N,N-Dimethylaniline
10. β-Phenylethylamine
11. N-Ethylaniline
12. 2,4-Dimethylaniline
13. N,N-Diethylaniline
14. Dibenzylamine

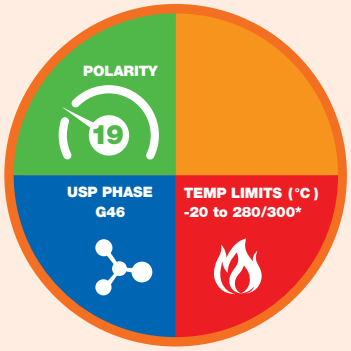
Ordering Information

Zebron ZB-1701 GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.25	-20 to 280/300	7EG-G006-11
0.32	0.25	-20 to 280/300	7EM-G006-11
30-Meter			
0.25	0.25	-20 to 280/300	7HG-G006-11
0.25	1.00	-20 to 260/280	7HG-G006-22
0.32	0.25	-20 to 280/300	7HM-G006-11
0.32	1.00	-20 to 260/280	7HM-G006-22
0.53	1.00	-20 to 260/280	7HK-G006-22
60-Meter			
0.25	0.25	-20 to 280/300	7KG-G006-11
0.32	0.25	-20 to 280/300	7KM-G006-11

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G006-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

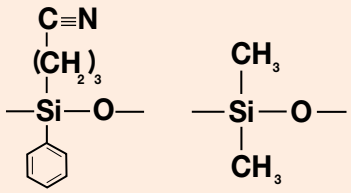
Column Profile



*Thicker films (≥ 1.0 µm) are rated to 260/280 °C.

Phase Chemistry

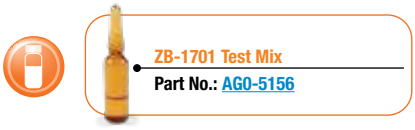
14 % Cyanopropylphenyl



86 % Dimethylpolysiloxane

Recommended Applications

- Alcohols
- Amines
- Aromatic Hydrocarbons
- Drugs
- Esters
- PAHs
- PCBs
- Pharmaceutical Intermediates
- Phenols
- Solvents
- Steroids
- TMS Sugars
- Tranquilizers



ZB-1701 Test Mix
Part No.: AG0-5156

For enhanced response to Endrin and DDT, consider using ZB-1701P, See p. 149

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-1701P

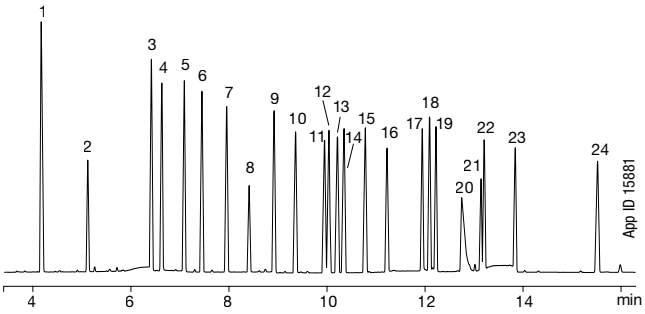
Enhanced Response for DDT and Endrin

- **Specially tested to ensure response of DDT, Endrin, Endrin Aldehyde, and Endrin Ketone**
- **Fast run and re-equilibration times for enhanced sample throughput and productivity**
- **Guaranteed column for pesticide analysis**

Upgrade to Zebron from any 14 % cyanopropylphenyl / 86 % dimethylpolysiloxane phase:

Agilent®	Restek®	SGE®	Supelco®	OV®
• DB®-1701	• Rtx®-1701	• BP10	• SPB®-1701	• OV-1701
• DB-1701P	• Rtx-VMS		• Equity®-1701	
• CP-Sil 19 CB				

Chlorinated Pesticides by GC-ECD: EPA Method 8081



Column: Zebron ZB-1701P
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G012-11
Injection: Splitless @ 240 °C, 1 µL
Carrier Gas: Helium @ 1.6 mL/min (constant flow)
Oven Program: 100 °C to 200 °C @ 25 °C/min to 240 °C @ 6 °C/min to 265 °C @ 20 °C/min for 5 min
Detector: ECD @ 300 °C
Sample: All compounds are 20 ppm

1. 1-Bromo-2-Nitrobenzene (IS)
2. Tetrachloro-m-xylene (Surr)
3. α-BHC
4. Pentachloronitrobenzene (IS)
5. γ-BHC (Lindane)
6. Heptachlor
7. Aldrin
8. β-BHC
9. δ-BHC
10. Heptachlor Epoxide
11. Endosulfan I
12. γ-Chlordane
13. α-Chlordane
14. DDE
15. Dieldrin
16. Endrin
17. DDD
18. Endosulfan II
19. DDT
20. Endrin Aldehyde
21. Methoxychlor
22. Endosulfan Sulfate
23. Endrin Ketone
24. Decachlorobiphenyl (Surr)

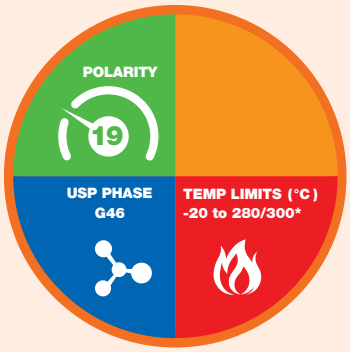
Ordering Information

Zebron ZB-1701P GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
30-Meter			
0.25	0.25	-20 to 280/300	7HG-G012-11
0.32	0.25	-20 to 280/300	7HM-G012-11
0.53	1.00	-20 to 260/280	7HK-G012-22

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G012-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

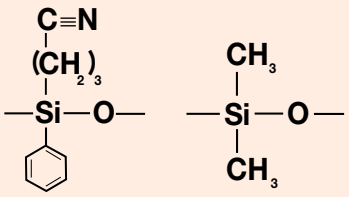
Column Profile



*Thicker films (≥ 1.0 µm) are rated to 260/280 °C.

Phase Chemistry

14 % Cyanopropylphenyl



86 % Dimethylpolysiloxane

Recommended Applications

- Nitrogen Containing Pesticides
- Organochlorine Pesticides
- Organophosphorous Pesticides
- PCBs / Aroclors

ZB-1701 Test Mix
Part No.: AG0-5156

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-WAX

PEG Versatility for Solvents, Acids, and Amines

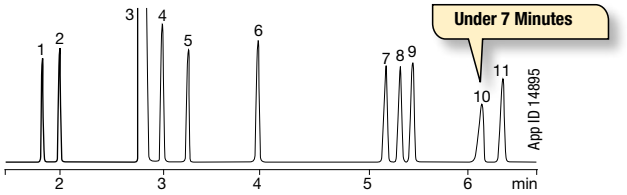
- **High polarity column with low bleed (MS certified) for improved results**
- **Highly stable, long lifetime**
- **Low activity for amines**
- **Bonded, solvent rinsible**
- **Excellent chromatography of polar complex mixtures**
- **Widely used for profiling and "fingerprinting"**

Upgrade to Zebron from any polyethylene glycol phase:

Agilent®	Restek®	SGE®	Supelco®
• DB®-WAXetr	• Rtx®-WAX	• SolGel-WAX™	• Met-Wax
• HP-INNOWax	• Famewax		• Omegawax
• CP-Wax 57 CB	• Stabilwax®-DB		

Performs for Industrial Chemicals

BTEX by GC-FID



Column: Zebron ZB-WAX
Dimensions: 30 meter x 0.32 mm x 0.50 µm
Part No.: 7HM-G007-17
Injection: Split 20:1 @ 250 °C, 0.2 µL
Carrier Gas: Helium @ 2 mL/min (constant flow)
Oven Program: 60 °C to 75 °C @ 15 °C/min to 90 °C @ 3 °C/min (hold 3 min)
Detector: FID @ 300 °C

Sample:
1. Pentane
2. Heptane
3. Solvent (methylene chloride)
4. Benzene
5. Decane
6. Toluene
7. Ethylbenzene
8. p-Xylene
9. m-Xylene
10. Dodecane
11. o-Xylene

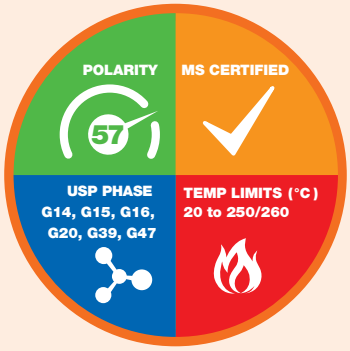
Ordering Information

Zebron ZB-WAX GC Columns

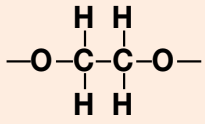
ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.10	20 to 250/260	7CB-G007-02
15-Meter			
0.25	0.25	20 to 250/260	7EG-G007-11
0.32	0.25	20 to 250/260	7EM-G007-11
0.32	0.50	20 to 250/260	7EM-G007-17
0.53	1.00	20 to 250/260	7EK-G007-22
20-Meter			
0.18	0.18	20 to 250/260	7FD-G007-08
30-Meter			
0.25	0.15	20 to 250/260	7HG-G007-05
0.25	0.25	20 to 250/260	7HG-G007-11
0.25	0.50	20 to 250/260	7HG-G007-17
0.25	1.00	20 to 250/260	7HG-G007-22
0.32	0.15	20 to 250/260	7HM-G007-05
0.32	0.25	20 to 250/260	7HM-G007-11
0.32	0.50	20 to 250/260	7HM-G007-17
0.53	0.50	20 to 250/260	7HK-G007-17
0.53	1.00	20 to 250/260	7HK-G007-22
60-Meter			
0.25	0.15	20 to 250/260	7KG-G007-05
0.25	0.25	20 to 250/260	7KG-G007-11
0.25	0.50	20 to 250/260	7KG-G007-17
0.32	0.25	20 to 250/260	7KM-G007-11
0.32	0.50	20 to 250/260	7KM-G007-17
0.53	1.00	20 to 250/260	7KK-G007-22

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G007-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Phase Chemistry



100 % Polyethylene Glycol

Recommended Applications

- Alcohols
- Aldehydes
- Aromatics
- Basic Compounds
- Essential Oils
- Flavors & Fragrances
- Glycols
- Pharmaceuticals
- Solvents
- Styrene
- Xylene Isomers

ZB-WAX Test Mix
Part No.: AG0-5158

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime.
Add a Z-guard to your next Zebron GC order.

ZB-FFAP

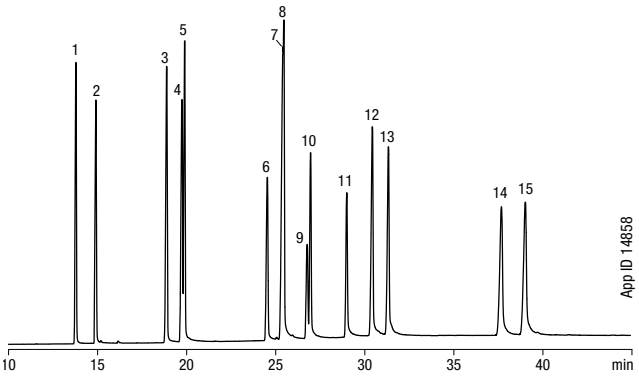
Improve Resolution for Free Fatty Acids

- **High polarity column; excellent thermal and chemical stability**
- **Provides better peak shape for underivatized acids**
- **Especially suited for organic acids, free fatty acids, and alcohols**
- **Bonded, solvent rinsable FFAP phase**

Upgrade to Zebron from any nitroterephthalic acid modified polyethylene glycol phase:

Agilent®	Restek®	SGE®	Supelco®	OV®
• DB®-FFAP • HP-FFAP • CP-Wax 58 FFAP CB • CP-FFAP CB	• Stabilwax®-DA	• BP21	• Nukol • SPB®-1000	• OV-351

Unsaturated Free Fatty Acids by GC-FID



Column: Zebron ZB-FFAP
Dimensions: 60 meter x 0.25 mm x 0.25 µm
Part No.: 7KG-G009-11
Injection: Split 40:1 @ 220 °C, 0.2 µL
Carrier Gas: Helium @ 2.4 mL/min (constant flow)
Oven Program: 200 °C to 260 °C @ 2 °C/min for 30 min
Detector: FID @ 250 °C

Sample:
1. Myristic Acid (C14:0)
2. Myristoleic Acid (C14:1c)
3. Palmitic Acid (C16:0)
4. Palmitelaidic Acid (C16:1t)
5. Palmitoleic Acid (C16:1c)
6. Stearic Acid (C18:0)
7. Elaidic Acid (C18:1t)
8. Oleic Acid (C18:1c)
9. Linolelaidic Acid (C18:2t)
10. Linoleic Acid (C18:2c)
11. Linolenic Acid (C18:3c)
12. Arachidic Acid (C20:0)
13. Gondonic Acid (C20:1c)
14. Behenic Acid (C22:0)
15. Erucic Acid (C22:1c)

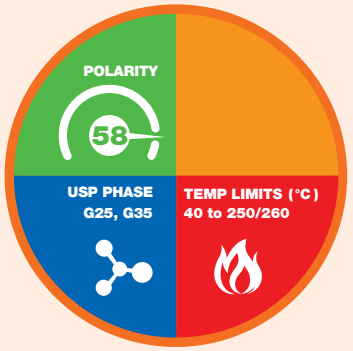
Ordering Information

Zebron ZB-FFAP GC Columns

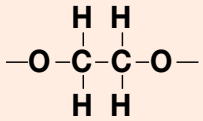
ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.25	40 to 250/260	7EG-G009-11
0.32	0.25	40 to 250/260	7EM-G009-11
0.32	0.50	40 to 250/260	7EM-G009-17
0.53	1.00	40 to 250/260	7EK-G009-22
30-Meter			
0.25	0.25	40 to 250/260	7HG-G009-11
0.32	0.25	40 to 250/260	7HM-G009-11
0.32	0.50	40 to 250/260	7HM-G009-17
0.32	1.00	40 to 250/260	7HM-G009-22
0.53	1.00	40 to 250/260	7HK-G009-22
50-Meter			
0.32	0.50	40 to 250/260	7JM-G009-17
60-Meter			
0.25	0.25	40 to 250/260	7KG-G009-11

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G009-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Column Profile



Phase Chemistry



Nitroterephthalic Acid Modified Polyethylene Glycol

Recommended Applications

- Acrylates
- Alcohols
- Aldehydes
- Free Fatty Acids
- Ketones
- Organic Acids
- Phenols
- Volatile Free Acids

ZB-FFAP Test Mix
Part No.: AG0-5158

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

ZB-XLB

Extra Low Bleed

- **Unique, low polarity si-arylene column**
- **Engineered specifically for use with bleed sensitive detectors such as MS**
- **Provides alternate selectivity to standard 5-type phases**
- **Often used for confirmation of pesticides, PCBs, or other environmental samples**
- **Good tool for sample screening to identify unknown contaminants**

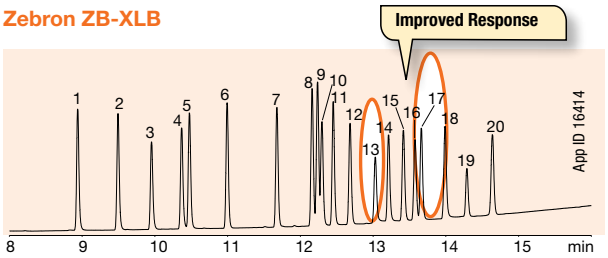
Upgrade to Zebron from these similar* phases:

Agilent®	Restek®	Supelco®
• DB®-XLB	• Rtx®-XLB	• MDN-12
• VF-XMS	• Rxi®-XLB	

*not exact equivalent, selectivity may differ

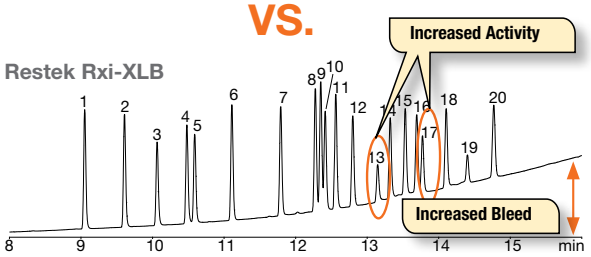
Better Performance for Chlorinated Pesticides EPA Method 8081A

Zebron ZB-XLB



VS.

Restek Rxi-XLB



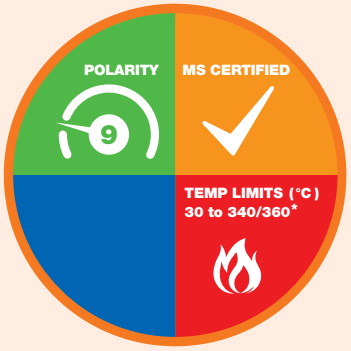
Conditions for both coloumns:

Columns: As listed
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Injection: Split 111:1 @ 250 °C, 1.5 µL
Carrier Gas: Helium @ 0.9 mL/min (constant flow)
Oven Programv: 110 °C to 320 °C @ 15 °C/min and hold until last peak elutes
Detector: ECD @ 350 °C

Sample:
1. α-BHC
2. γ-BHC
3. β-BHC
4. δ-BHC
5. Heptachlor
6. Aldrin
7. Heptachlor epoxide
8. γ-Chlordane
9. α-Chlordane
10. Endosulfan I
11. 4,4'-DDE
12. Dieldrin
13. Endrin
14. 4,4'-DDD
15. Endosulfan II
16. Endrin aldehyde
17. 4,4'-DDT
18. Endosulfan sulfate
19. Methoxychlor
20. Endrin ketone

Comparative separations may not be representative of all applications.

Column Profile



*Thicker films (≥ 1.0 µm) are rated to 320/340 °C.

Engineered Self Cross-linking™ (ESC)

Phase Chemistry

- Proprietary

Recommended Applications

- Herbicides / Insecticides
- PCBs
- Pesticides
- Unknown Samples

ZB-XLB Test Mix
Part No.: AG0-7578

Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Extend column lifetime. Add a Z-guard to your next Zebron GC order.

Ordering Information

Zebron ZB-XLB GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.18	0.18	30 to 340/360	7CD-G019-08
15-Meter			
0.25	0.25	30 to 340/360	7EG-G019-11
20-Meter			
0.18	0.18	30 to 340/360	7FD-G019-08

Note: If you need a 5 in. cage, simply add a (-B) after the part number, e.g., 7HG-G019-11-B. Some exceptions may apply. Agilent 6850 and some SRI and process GC systems use only 5 in. cages.

Ordering Information

Zebron ZB-XLB GC Columns *(cont'd)*

ID(mm)	df(µm)	Temp. Limits °C	Part No.
30-Meter			
0.25	0.25	30 to 340/360	7HG-G019-11
0.25	0.50	30 to 340/360	7HG-G019-17
0.32	0.25	30 to 340/360	7HM-G019-11
0.32	0.50	30 to 340/360	7HM-G019-17
0.53	1.50	30 to 320/340	7HK-G019-28
60-Meter			
0.25	0.25	30 to 340/360	7KG-G019-11

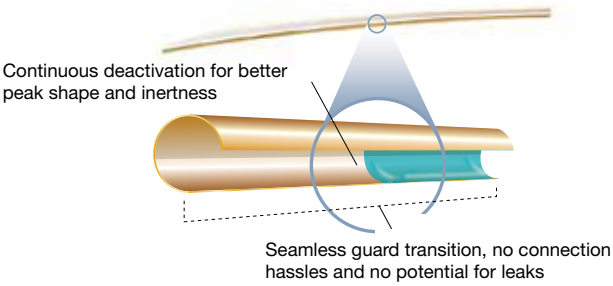
Guardian Integrated Guard Columns

Built-In Column Protection: No Leaks, No Worries!

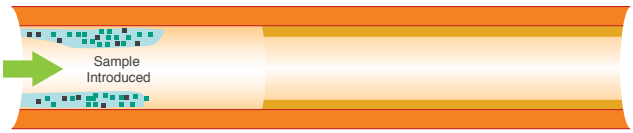
Why Choose Zebron With Guardian?

Guardian columns have the 2 m, 5 m or 10 m guard built directly into the analytical column in one continuous length of tubing. Unlike traditional guard columns, which are known to be difficult to seal and prone to leaking after normal column maintenance, the Guardian system provides the same inert column protection, but eliminates the possibility of leaks.

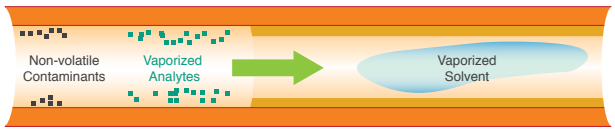
- **Eliminate the potential for leaks**
- **Extend column life**
- **Improve analyte focusing for low boiling compounds**
- **Aggressively tested to ensure deactivation**



How It Works



The sample is introduced onto the Guardian section of the column.



As temperature increases (oven ramp program), the sample is vaporized and moves unretained through the Guardian section of the column. Non-volatile contaminants are deposited on the Guardian section, better preserving the stationary phase and making it easier to trim contaminants off the front of the column.

When the analytes reach the stationary phase (analytical portion of the column), they are refocused, resulting in a narrower initial peak width. This can help improve resolution.

Ordering Information

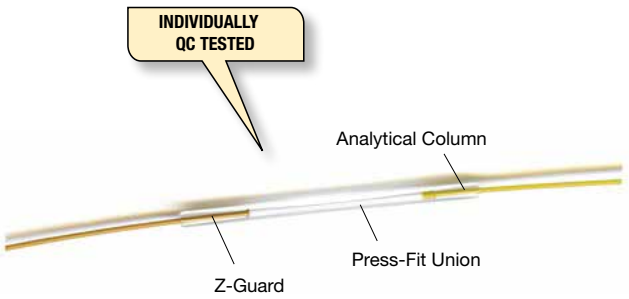
Guardian: Integrated Guard Columns

Zebron GC Column Phase	Dimensions	2 m Guardian Part No.	5 m Guardian Part No.	10 m Guardian Part No.
ZB-1*PLUS*™	15 meter x 0.25 mm x 0.25 µm	—	—	7EG-G031-11-GGC
ZB-1*PLUS*	30 meter x 0.25 mm x 0.25 µm	—	7HG-G031-11-GGA	7HG-G031-11-GGC
ZB-1HT Inferno™	30 meter x 0.25 mm x 0.10 µm	—	7HG-G014-02-GGA	—
ZB-5ms	15 meter x 0.25 mm x 0.25 µm	—	—	7EG-G010-11-GGC
ZB-5ms	30 meter x 0.25 mm x 0.25 µm	—	7HG-G010-11-GGA	7HG-G010-11-GGC
ZB-5ms	30 meter x 0.25 mm x 0.50 µm	—	7HG-G010-17-GGA	7HG-G010-17-GGC
ZB-5ms	30 meter x 0.32 mm x 0.25 µm	—	7HM-G010-11-GGA	—
ZB-5ms	30 meter x 0.32 mm x 1.00 µm	—	7HM-G010-22-GGA	—
ZB-5MS*PLUS*™	30 meter x 0.25 mm x 0.25 µm	—	7HG-G030-11-GGA	7HG-G030-11-GGC
ZB-5MS*PLUS*	30 meter x 0.25 mm x 0.50 µm	—	—	7HG-G030-17-GGC
ZB-5	30 meter x 0.25 mm x 0.25 µm	—	7HG-G002-11-GGA	7HG-G002-11-GGC
ZB-5	30 meter x 0.25 mm x 0.50 µm	—	7HG-G002-17-GGA	7HG-G002-17-GGC
ZB-5	60 meter x 0.25 mm x 0.25 µm	—	7KG-G002-11-GGA	—
ZB-5HT Inferno	30 meter x 0.25 mm x 0.10 µm	—	7HG-G015-02-GGA	—
ZB-5HT Inferno	30 meter x 0.25 mm x 0.25 µm	—	7HG-G015-11-GGA	—
ZB-5*PLUS*™	20 meter x 0.18 mm x 0.18 µm	—	7FD-G032-08-GGA	—
ZB-5*PLUS*	30 meter x 0.25 mm x 0.10 µm	—	7HG-G032-02-GGA	—
ZB-5*PLUS*	30 meter x 0.25 mm x 0.25 µm	—	7HG-G032-11-GGA	—
ZB-50	10 meter x 0.18 mm x 0.18 µm	7CD-G004-08-GGT	—	—
ZB-MultiResidue™-1	30 meter x 0.25 mm x 0.25 µm	—	—	7HG-G016-11-GGC
ZB-SemiVolatiles	30 meter x 0.25 mm x 0.25 µm	—	7HG-G027-11-GGA	7HG-G027-11-GGC

Z-Guard™ Columns

Protect and Extend Column Lifetime

- **Individually QC tested to ensure the highest level of quality**
- **Extend column lifetime by preventing stationary phase damage**
- **Improve separation and peak shapes (especially early elutors)**
- **Improve sensitivity and accuracy of quantitative results**
- **Available as individual guard columns or as complete kits with connectors**



To ensure that all Z-Guards are the highest possible quality, we individually test each one! The columns are attached to a reference Zebron ZB-5 column and are tested using our specially designed QC mix. We carefully monitor activity, bleed, and stability. This way, we are able to say with confidence that Z-Guards will provide the low activity and high quality your methods require.

Ordering Information

Metal Z-Guard Column

ID (mm)	Description	Part No.
		5-Meter
0.53	Guard Column	7AK-G000-00-GM0

High Temperature Z-Guard Columns and Kits

ID (mm)	Description	Part No.	Part No.
		5-Meter	10-Meter
0.25	Guard Column	7AG-G000-00-GH0	7CG-G000-00-GH0
	Guard Column Kit	7AG-G000-00-GHK	7CG-G000-00-GHK
0.32	Guard Column	7AM-G000-00-GH0	7CM-G000-00-GH0
	Guard Column Kit	7AM-G000-00-GHK	7CM-G000-00-GHK
0.53	Guard Column	7AK-G000-00-GH0	7CK-G000-00-GH0
	Guard Column Kit	7AK-G000-00-GHK	7CK-G000-00-GHK

Standard Z-Guard Columns and Kits

ID (mm)	Description	Part No.	Part No.
		5-Meter	10-Meter
0.10	Guard Column	7AB-G000-00-GZ0	7CB-G000-00-GZ0
	Guard Column Kit	7AB-G000-00-GZK	—
0.18	Guard Column	7AD-G000-00-GZ0	7CD-G000-00-GZ0
	Guard Column Kit	7AD-G000-00-GZK	7CD-G000-00-GZK
0.20	Guard Column	7AE-G000-00-GZ0	—
0.25	Guard Column	7AG-G000-00-GZ0	7CG-G000-00-GZ0
	Guard Column Kit	7AG-G000-00-GZK	7CG-G000-00-GZK
0.32	Guard Column	7AM-G000-00-GZ0	7CM-G000-00-GZ0
	Guard Column Kit	7AM-G000-00-GZK	7CM-G000-00-GZK
0.53	Guard Column	7AK-G000-00-GZ0	7CK-G000-00-GZ0
	Guard Column Kit	7AK-G000-00-GZK	7CK-G000-00-GZK

Bulk Z-Guard Columns

ID (mm)	Description	Part No.	Unit
50-Meter			
0.25	Guard Column	7JG-G000-00-GZ0	ea
0.32	Guard Column	7JM-G000-00-GZ0	ea
0.53	Guard Column	7JK-G000-00-GZ0	ea
5-Meter			
0.53	Guard Column	7AK-G000-00-GZ1	10/pk

ZB-5 Z-Guard Column Multi-Pak

ID (mm)	Description	Part No.	Unit
2-Meter			
0.25	Zebron ZB-5 Z-Guard Column	KG0-7868	25/pk

Universal GC Guard Column. Designed for use with virtually any GC Capillary column from virtually any manufacturer. Alternative to: Restek, Supelco, Agilent Technologies, and many more.

Z-Guard Column Kits include 5 or 10 meters of deactivated fused silica tubing, 5 universal connectors and 0.5 mL of high-temperature polyimide resin.

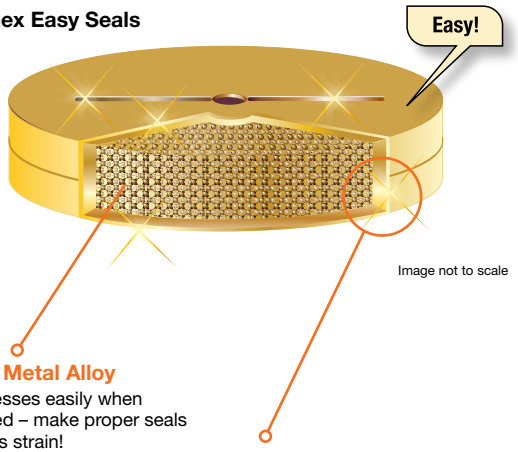
Replacement Parts for Z-Guard Kits

Description	Part No.	Unit
Universal Capillary Column Union, Borosilicate	AG0-4716	5/pk
High Temperature Polyimide Resin, 0.5 mL	AG0-8514	ea

Inlet Base Seals

Easy Seals™ for Agilent® GCs

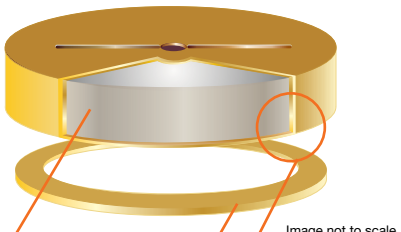
Phenomenex Easy Seals



Softer Metal Alloy
Compresses easily when tightened – make proper seals with less strain!

2x the Gold Plating
16 µm of gold plating is used to deactivate each Easy Seal, improving inertness and eliminating the need for a spacing washer without compromising performance!

Traditional Gold Plated Seals



Hard Stainless Steel
Requires greater force to compress tightly – difficult to seal properly

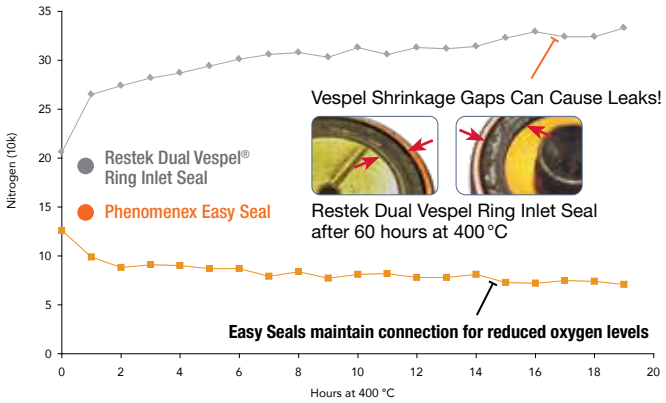
Thinner Gold Plating
Half the gold plating (8 µm) and less inert

Washer Required
Extra hassle and cost from additional small parts needed to install

The Oxygen Test: 20 Hours at 400 ˚C

Easy Seals are designed to create leak-tight connections that reduce the amount of oxygen entering the GC system, even up to 400 ˚C! Our testing showed that the Easy Seal maintained a good connection while the Restek® Dual Vespel® Ring Inlet Seal showed increasing levels of oxygen in the system — increased potential for contamination!

Test Conditions: Both inlet base seals were new and unused prior to testing. Seals were installed in an Agilent 6890 Series instrument with a 5973 MS with a Zebron ZB-5ms GC column (15 meter x 0.25 mm x 0.25 µm). An initial air and water check was performed upon installation to ensure there was no error in installation. The inlet temperature was set to 400 °C and counts of oxygen were measured over time.



Ordering Information

Easy Seals Inlet Base Seals				2/pk	10/pk
Description	Injection Type	Groove Style	Inlet Hole Diameter (mm)	Part No.	Part No.
Easy Seals Gold Inlet Seal	Splitless	Single	0.8	AG0-8619	AG0-8620

Inlet Base Seals *(cont'd)*

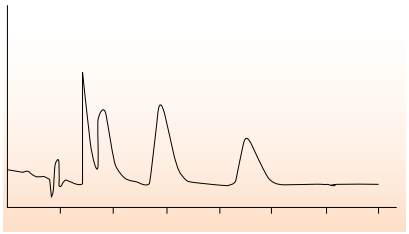
Standard Inlet Base Seals & Washers

- **Prevent leaks and reduce oxygen damage**
- **Trap non-volatile residues, septum fragments, and other contaminants**
- **Gold plated Easy Seals™ provide the best performance, inertness, and ease of use**

An inert flow path through the entire GC system is critical to achieving the best results for your analysis – and that includes the seal at the base of the inlet! Leaks can allow air into the system and cause oxygen contamination, leading to:

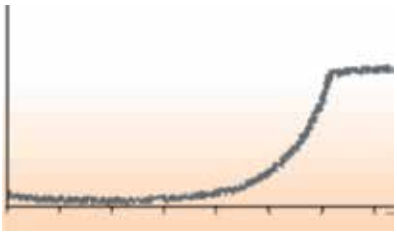
Difficult Quantitation

Stationary phase damage can distort peak shape



Low Sensitivity

Excessive bleed can lower signal-to-noise



Expensive Column Replacement

Oxygen damage is irreversible and can only be fixed by replacing your column

Ordering Information

Standard Inlet Base Seals						2/pk		10/pk
Description		**Injection Type**	**Groove Style**	**Inlet Hole Diameter (mm)**	**Similar to Mfr No.***	**Part No.**	**Similar to Mfr No.***	**Part No.**
Standard Gold Inlet Seal		Splitless	Single	0.8	18740-20885	AG0-7518	18740-20885	AG0-7519
		Splitless	Single	1.2	21305	AG0-8581	21306	AG0-8582
		Split	Cross	0.8	5182-9652	AG0-7520	5182-9652	AG0-7521
		Split	Cross	1.2	21009	AG0-8583	21010	AG0-8584
Standard Stainless Steel Inlet Seal		Splitless	Single	0.8	18740-20880	AG0-8393	18740-20880	AG0-8394
		Split	Cross	0.8	—	AG0-8395	—	AG0-8396

Ordering Information

Standard Inlet Base Seal Replacement Washers			12/pk
Description		**Similar to Mfr No.***	**Part No.**
Standard Gold Inlet Seal Washer		—	AG0-8397
Stainless Steel Inlet Seal Washer		5061-5869	AG0-7522

Due to different replacement frequencies, inlet seal washers are sold separately from inlet base seals.

*Similar to but not always an exact equivalent to the original manufacturer's product.

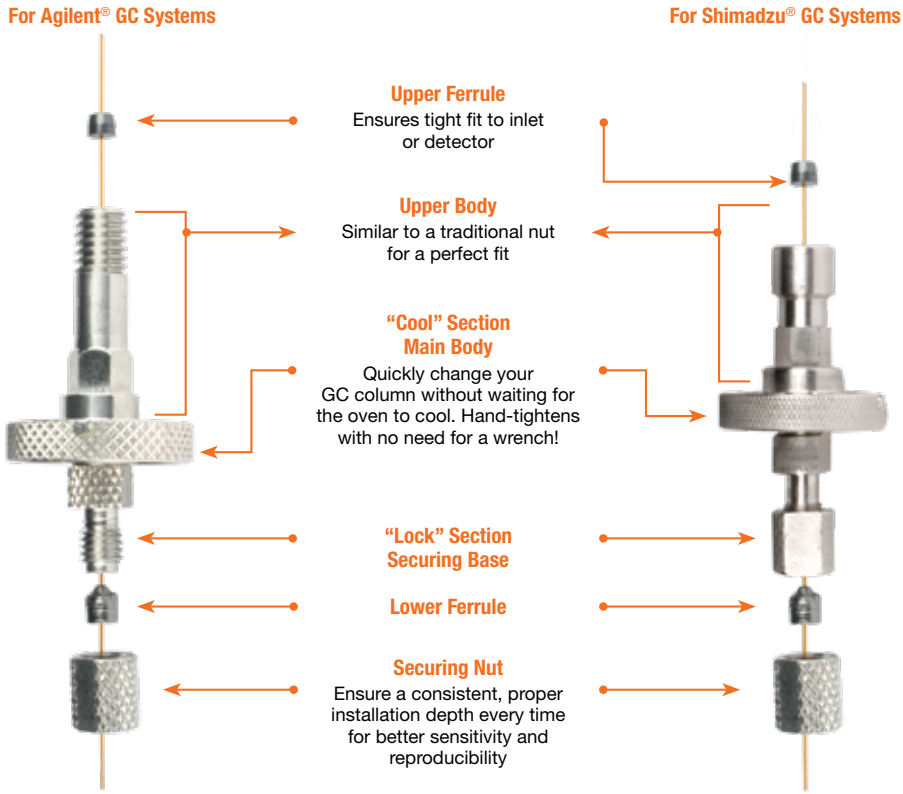
For Sealing O-Rings, see p. 161

Installation Nuts

Cool-Lock™ Nut

U.S. Patent No. 8, 062, 516

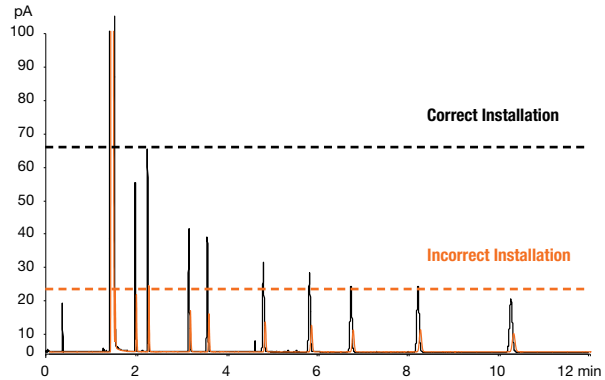
Fast GC Column Installation Without The Burn



Consistent, Accurate Installation Every Time

The red trace below is installed at 2 mm, rather than the manufacturer's recommended 6 mm past the column on the injector side of the system. Correct installation noticeably increases sensitivity for all peaks; Cool-Lock Nut allows for locking of the proper insertion depth every time to improve run-to-run response reproducibility.

Correct Installation = 165 % Better Signal



Conditions for both chromatograms:

Column: Zebron ZB-WAX
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G007-11
Injection: Split 1:100 @ 250 °C, 1.4 µL
Carrier Gas: Helium @ 40 cm/sec (constant flow)
Oven Program: 140 °C for 10 minutes
Detector: FID @ 250 °C
Sample:
1. 2-Octanone
2. Tetradecane
3. 1-Octanol
4. Methyl decanoate
5. Methyl undecanoate
6. 1-Decanol
7. Methyl dodecanoate
8. 2,6-Dimethylaniline
9. 2,6-Dimethylphenol

Installation Nuts *(cont'd)*

Cool-Lock™ Nut Selection Guide

Shimadzu® Systems	Agilent® Systems			
1 Use Part No.	**1** Decide On The Style of Cool-Lock Nut Needed		**2** Determine How Many Cool-Lock Nuts Needed Per System	
	Short Style (AG0-8319) Recommended for use with standard short style ferrules.	**Long Style** (AG0-8320) Recommend for use with standard long style ferrules.	**Detector** MS	**Number of Nuts** 1
AG0-8419	Also, use for both the inlet and detector configurations on Agilent 6890, 5890, and 7890 GC systems		FID, ECD, Other	2

Ordering Information

Cool-Lock Installation Nuts and Gauges

Description	Fits Model No.	For Use With Ferrule Style	Part No.	Unit
For Agilent Systems				
Cool-Lock Installation Nut 	5850, 5890, 6850, 6890, 7890	Short (1.65 mm)	AG0-8319	ea
		Long (2.4 mm)	AG0-8320	ea
Cool-Lock Installation Gauge 	5850, 5890, 6850, 6890, 7890	—	AG0-8349	ea
For Shimadzu Systems				
Cool-Lock Installation Nut 	2010, 2014, 2025	—	AG0-8419	ea
Cool-Lock Installation Gauge 	2010, 2014, 2025	—	AG0-8420	ea

For Ferrule Selection Guide for Cool-Lock Nuts, see p. 159 

Ordering Information

Standard Installation Nut

Description	Similar to Mfr No.*	For Use With Ferrule Style	Part No.	Unit
For GC-MS Systems				
Brass Installation Nut, Nickel Plated	—	—	AG0-9076	5/pk
For Other Systems				
Agilent Installation Nut, Standard (1/16 in. Hex Stainless Steel) 	5181-8830	Short (1.65 mm)	AG0-5152	2/pk
Agilent Installation Nut, Deep Well (1/16 in. Hex Stainless Steel)	5020-8292	Long (2.4 mm)	AG0-5153	2/pk

* Similar to but not always an exact equivalent to the original manufacturer's product.

Caution: For safety, please use common sense when handling metal surfaces within the GC oven, including the Cool-Lock Nut. The Cool-Lock Nut is designed to track the GC oven temperature as close as possible, therefore, when you cool down your GC oven, the Cool-Lock Nut will follow suit because it is related to oven temperature with the fan on. So if the oven is hot enough to cause severe burns, the Cool-Lock Nut will also be hot enough to cause severe burns. If the GC oven fan has turned off and the injection port temperature is still hot, the Cool-Lock Nut will begin to heat up causing it to be too hot to touch with the bare hand. For any questions regarding use of the Cool-Lock Nut, please contact your local Phenomenex representative.

Ferrules

Ferrule Selection Guide by Material

Material	Advantage	Disadvantage	Recommended for
100 % Graphite	• Easy to use • Tight, stable seal • Rated to 450 °C	• Porous to oxygen • Not for MS or other oxygen sensitive detectors • Easily deformed • Potential to contaminate system	• General use • FID and NPD • High temperature analysis • Cool on-column
85/15 % Vespel®/Graphite	• Durable for long lifetime • Not porous to oxygen • Rated to 350 °C	• Non-reusable • Need to re-tighten frequently • Flows at high temperatures	• Good for MS or other oxygen sensitive detectors • Most leak free
60/40 % Vespel/Graphite	• Easier to use than 85/15 • Not porous to oxygen • Rated to 400 °C	• Non-reusable • Easier to deform than 85/15	• Good for MS or other oxygen sensitive detectors • Best balance between tight seal and ease of use
SilTite™	• No need to re-tighten • Reliable seal • No contamination • Rated > 450 °C	• Easily deforms	• High temperature MS analysis

Ferrule Selection Guide by Length

Length	Advantage	Disadvantage	Recommended for
Short	• Robust seal	• Not recommended for MS detector connection	• Standard detectors and inlet
Long	• Good nut and interface design	• Not recommended for inlet connection	• MS detector connection

Ferrule Selection Guide for Cool-Lock™ Nuts

		Agilent Systems				Shimadzu Systems	
		Long Style Nut		Short Style Nut			
Column ID (mm)	Ferrule ID (mm)	Top Ferrule	Bottom Ferrule	Top Ferrule	Bottom Ferrule	Top Ferrule	Bottom Ferrule
0.10-0.25	0.4	AG0-4698	AG0-4698	AG0-8929	AG0-4698	AG0-8881	AG0-4698
0.28-0.35	0.5	AG0-4701	AG0-4701	AG0-7513	AG0-4701	AG0-8881	AG0-4701
0.45-0.53	0.8	AG0-4704	AG0-4704	AG0-8676	AG0-4704	AG0-8882	AG0-4704

Ferrule ordering information on next page.

All ferrules are 1/16 in. (except SilTite™)
Preconditioned for lower bleed.

All Vespel containing ferrules should be pre-shrunk in an oven at 250 °C for at least 4 hours prior to use.

Ferrules *(cont'd)*

Ordering Information

	Composition	GC Column ID (mm)	Ferrule ID (mm)	Similar to Mfr. No.*	Preconditioned	Part No.	Unit
Short		0.10-0.25	0.4	500-2114	N	AG0-8929	10/pk
	**100% Graphite**	0.28-0.35	0.5	072635 5080-8853	Y	AG0-7513	10/pk
		0.45-0.53	0.8	072636 500-2118	Y	AG0-8676	10/pk
	85% Vespel® / 15% Graphite	0.10-0.25	0.4	5181-3323	N	AG0-7318	10/pk
				5181-3322	Y	AG0-7321	10/pk
		0.28-0.35	0.5	5062-3514	N	AG0-7319	10/pk
				5062-3513	Y	AG0-7322	10/pk
		0.40-0.53	0.8	5062-3512	N	AG0-7320	10/pk
				5062-3511	Y	AG0-7323	10/pk
Long		0.10-0.25	0.4	20200	N	AG0-4698	10/pk
				20227		AG0-4699	50/pk
	**100% Graphite**	0.28-0.35	0.5	72635	N	AG0-4701	10/pk
						AG0-4702	50/pk
		0.45-0.53	0.8	82636	N	AG0-4704	10/pk
						AG0-4705	50/pk
	85% Vespel / 15% Graphite	0.10-0.25	0.4	072663 5062-3508	Y	AG0-8677	10/pk
		0.28-0.35	0.5	072654 5062-3506	Y	AG0-8678	10/pk
		0.45-0.53	0.8	072655 5062-3538	Y	AG0-8679	10/pk
	60% Vespel / 40% Graphite	0.10-0.25	0.4	20211	Y	AG0-4707	10/pk
				20229		AG0-4708	50/pk
		0.28-0.35	0.5	20212	Y	AG0-4710	10/pk
				20231		AG0-4711	50/pk
		0.45-0.53	0.8	20213	Y	AG0-4713	10/pk
				20230		AG0-4714	50/pk
Two Hole		0.10-0.25	0.4	072662 5062-3580	Y	AG0-8680	10/pk
	**85% Vespel / 15% Graphite**	0.28-0.35	0.5	212222 5062-3581	N	AG0-8681**	10/pk
		0.45-0.53	0.8	072674	Y	AG0-8682**	10/pk
SilTite		0.10-0.25	0.4	073220	Y	AG0-8762	10/pk
	**SilTite™**	0.28-0.35	0.5	073221	Y	AG0-8757	10/pk
		0.45-0.53	0.8	073222	Y	AG0-8758	10/pk
Metal Encapsulated		0.10-0.25	0.4	221-32126-05	Y	AG0-8881	10/pk
	**100% Graphite** for Shimadzu GCs	0.25-0.35	0.5	221-32126-05	Y	AG0-8881	10/pk
		0.45-0.53	0.8	221-32126-08	Y	AG0-8882	10/pk

* Similar to but not always an exact equivalent to the original manufacturer's product.
Note: SilTite ferrules are to be used with SilTite nuts. Please contact your Phenomenex technical consultant or distributor for the appropriate nut and ferrule part numbers for your GC system.

For Replacement Ferrules for Mini-unions, see p. 171

All ferrules are 1/16 in. (except SilTite™) and ** ferrules are 1/8 in. Preconditioned ferrules provide lower bleed.

All Vespel containing ferrules should be pre-shrunk in an oven at 250 °C for at least 4 hours prior to use.

O-Rings

Ordering Information

O-Rings

Fits Liners for Manufacturer		Description	Similar to Mfr. No.*	Part No.	Unit
Agilent®		Viton® Fluorocarbon, rated to < 300 °C Graphite, rated to 450 °C	5180-4182 5180-4168	AG0-7326 AG0-7327	10/pk 10/pk
PerkinElmer®		Viton for 6.2 mm OD inlet liners	N9302783	AG0-8674	10/pk
Shimadzu® (Model 2010)		Viton	036-11203-84	AG0-8675	10/pk

* Similar to but not always an exact equivalent to the original manufacturer's product.

Septa

Advanced silicone formulations reduce coring, enhance durability and re-sealing capabilities, and increase septum lifetime. Septa with GuideRight™ holes guide the needle during injection, for longer lifetime and less bent needles.

Septa Sizes by GC Instrument

Manufacturer	Instrument Model	Septa Diameter 9.5 mm (3/8 in.)	Septa Diameter 11 mm (7/16 in.)	Septa Plug
Agilent® (HP)	5850, 5880A, 5890, 6850, 6890, 7890		•	
	5700 series, 5880	•		
Antek®	All	•		
Thermo Scientific®	Finnigan 9600	•		
GOW-MAC®	All	•		
HNU	Portable GC	•		
PerkinElmer®	Sigma series, 900, 990, 8000, AutoSystem, Clarus 500		•	
Shimadzu®	All			•
SRI	All			•
Tracor	550, 560	•		
Varian®	1040, 1041, 1060, 1061	•		
	1075,1077,1078,1079		•	
	3700 / Vista, Capillary Injectors		•	
	Packed Column Injectors	•		
	SPI		•	

Ordering Information

Septa

Type	Description		Diameter (mm)	Diameter (in.)	Includes GuideRight Hole	Part No.	Unit
Silicone Rubber Septa	PhenoRed™ -400 	• Our most popular choice for low-bleed septa, rated to 400 °C • Designed and conditioned for high sensitivity • Durometer rating of 50 with typical injection life of 150 punctures	9.5	3/8	✓	AG0-7916	50/pk
			9.5	3/8		AG0-4690	50/pk
			9.5	3/8		AG0-4691	100/pk
			11	7/16	✓	AG0-7917	50/pk
			11	7/16		AG0-4696	50/pk
			11	7/16		AG0-4697	100/pk
	PhenoGreen™ -400	• Long-life, high temperature septa for use up to 400 °C	9.5	3/8		AG0-8572	50/pk
			11	7/16	✓	AG0-7875	50/pk
			11	7/16		AG0-8573	50/pk
	PhenoBlue™ -300	• Low-bleed septum heat stable to 350 °C • Durometer rating of 50 - 60 for easy puncture up to 100 injections at 300 °C	9.5	3/8		AG0-4688	50/pk
			9.5	3/8		AG0-4689	100/pk
			11	7/16		AG0-4694	50/pk
			11	7/16		AG0-4695	100/pk
	PhenoGrey™ -250	• General purpose silicone rubber septum rated to 250 °C • Durometer rating of 40 - 45 for easy puncture up to 100 injections	9.5	3/8		AG0-4686	50/pk
			11	7/16		AG0-4692	50/pk
			11	7/16		AG0-4693	100/pk
Injector Septa Plugs	BTO® Silicone Septa Plug 	• Fits Shimadzu (9A, 14, 15A, 17A, 2010) and SRI injectors • Rated to 400 °C				AG0-7517	50/pk

For additional parts and accessories contact Phenomenex or visit:
www.phenomenex.com/GC

Merlin Microseal™ Septum

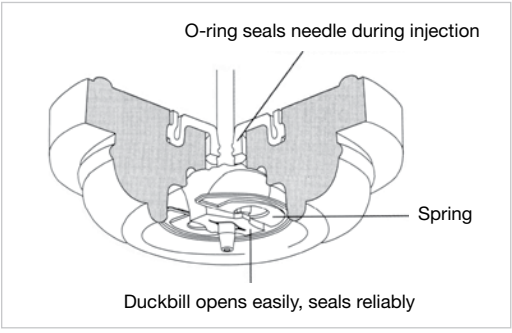
- **Improves chromatographic performance and quantitative results by reducing bleed and ghost peaks**
- **Improves reliability and performance during extended automated runs**
- **Thousands of injections before seal replacement**
- **Save time changing septa, instrument downtime and troubleshooting**

The Merlin Microseal Septum is a long-life replacement for the standard septum on the capillary inlet or the purged-packed inlet of Agilent GC systems.

The Microseal is a patented inlet assembly that provides two distinct sealing mechanisms. The first is a double O-ring seal around the syringe that ensures gas leak integrity during time of injection. There is no traditional septum to core or flake, which can cause bleeding and ghost peaks, and less force is required for the user to make a manual injection. The second seal is a spring-assisted duckbill that reliably maintains a high-pressure seal within the injection port at all times.

Since the syringe does not pierce any septum material, seal lifetime is significantly extended – Microseals are typically used for up to one year or more under normal conditions before septum replacement. Many laboratories experience lifetimes of 5,000 to 10,000 injections or more. This means you save tremendously in time changing septa, instrument downtime and troubleshooting. Chromatographic performance will also improve due to less bleed and fewer ghost peaks, improving quantitation and data reliability.

Instrument Compatibility: The Merlin Microseal systems can be used manually with all Agilent 5800, 6800, and 7890 series GCs. However, for autosampler use it is compatible with only the 7673A and 7673B units. Other inlets or autosampler systems from Agilent or other manufacturers are not compatible.



(1) Complete High Pressure Kits include the nut and one or two Microseal septa. All High Pressure Kits are rated for inlet pressures up to 100 psi. For long-term operation (>6 months) with the Microseal septum use the following injection port limits: (a) Agilent 6890, 5890 Series II - 325 °C; (b) Agilent 5890A - 300 °C. Higher temperatures will result in shorter lifetimes.

(2) The Merlin Microseal Septum should only be used with a blunt-tipped, 0.63 mm diameter (0.025 in., 23 gauge) syringe needle (typically used with the Agilent 7673 autosampler). Sharp-pointed or sharp-edged needles should not be used as they may slice or pierce the seals.

Ordering Information

Part No.	Description	Unit
Merlin Microseal Septum		
AG0-5985	Merlin Microseal High Pressure Septum Standard Kit, includes nut and 2 septa	ea
AG0-5986	Merlin Microseal High Pressure Septum Starter Kit, includes nut and 1 septum	ea
Replacement Parts		
AG0-5987	Merlin Microseal High Pressure Septum	ea

Syringes for Use With the Merlin Microseal

Ordering Information

Part No.	Mfr. No.	Agilent P/N	Description*	Capacity (µL)	Unit
For Agilent 7673 Autosamplers					
AS0-4386	87987	9301-0892	75ASN (23s/1.71in./HP)	5	ea
AS0-4387	80387	9301-0713	701ASN (23s/1.71in./HP)	10	ea
AS0-4388	80390	9301-0725	701ASN (23s/1.71in./HP)	10	6/pk

NOTE: Replacement needles are available in packs of three.

* Values in parentheses denote the following: (gauge/length/point style). "s" after gauge denotes smaller/reduced internal needle diameter.

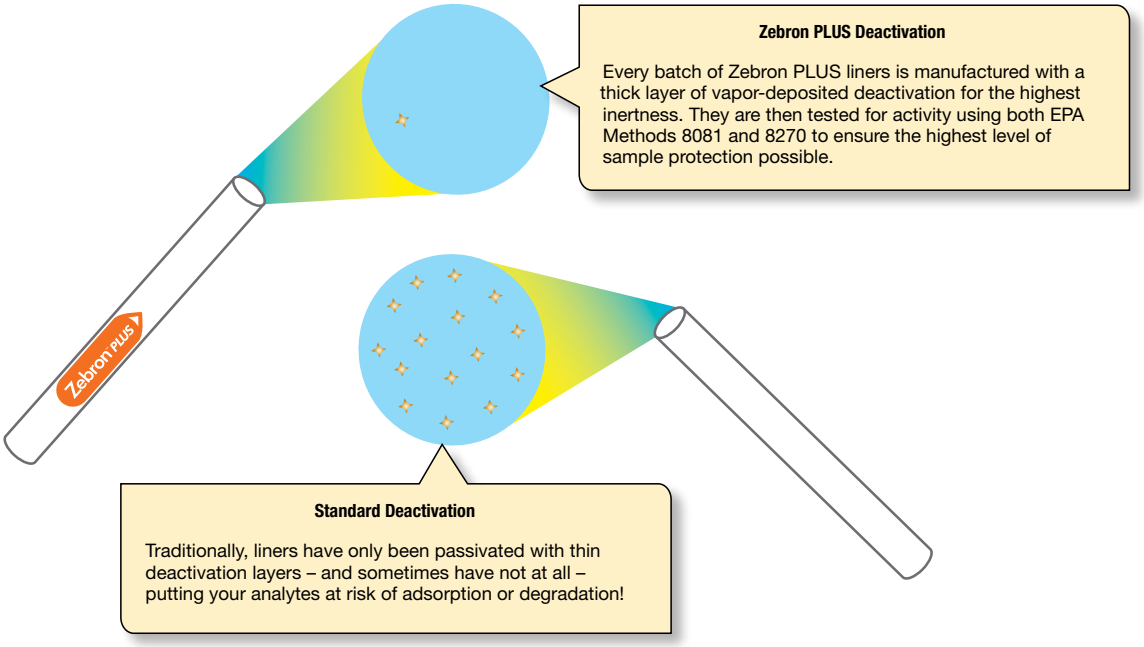
Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

Inlet Liners

Protect Your Samples with Zebron PLUS GC Inlet Liners

Zebron PLUS GC inlet liners undergo a unique deactivation process, resulting in a remarkably inert pathway that prevents sample adsorption and degradation for active compounds.

See The Difference: Zebron PLUS vs. Traditional Deactivation



Enhance Your Analysis

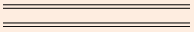
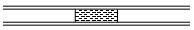
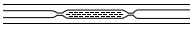
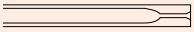
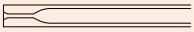
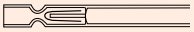
Analysis of dirty samples, samples with wide boiling points, or samples with wide molecular weights can be enhanced by choosing a Zebron PLUS liner with quartz wool. Liners packed with wool can prevent non-volatile compounds from entering the column and also improve sample vaporization for a more robust, reproducible analysis.

Why Use Pre-Packed Liners?

Though the upfront cost of self-packing your liner may seem attractive, the time and headaches caused by resulting tailing or irreproducible peaks can be sizeable! Self-packed wool fibers commonly break during installation and any existing deactivation on the liner can also be scratched or damaged. Pre-packed Zebron PLUS liners undergo the deactivation process with the quartz wool already in place, which ensures that any active sites that form during packing are not exposed.

Inlet Liners

Liner Geometry Selection Guide

Liner Style*	Function	Advantages	Disadvantages	Recommended For
Straight				
	Low surface area for less activity	• Simple to use • Least expensive • Low activity	• Possible inlet discrimination • More frequent gold seal maintenance from exposure to sample contamination • Possible inconsistency if sample injection bypasses split ratio	Volatiles
Glass Wool				
In the middle 	Traps non-volatiles; mixes sample; vaporizes sample above the column	• Reduces gold seal/column contamination and maintenance • More reproducible results • Can help focus analytes • Extends column life	• Higher surface area that can become active • Glass wool can become dislodged	Dirty samples, volatiles, high initial oven temperatures
At the bottom 	Traps non-volatiles; mixes sample; vaporizes sample above the column	• Reduces gold seal/column contamination and maintenance • More reproducible results • Can provide higher responses than wool in middle	• Higher surface area that can become active • Glass wool can become dislodged	Dirty samples
At the top / Z-Liner™ 	Keeps glass wool in place; wipes syringe needle clean	• Reduces gold seal/column contamination and maintenance • More reproducible results • Can help focus analytes • Extends column life	• Higher surface area that can become active	Pressure pulsed injections, dirty samples, volatiles, high initial oven temperatures
Taper / Gooseneck				
At the top 	Limits the expansion of the solvent to the inlet	• Allows for larger injection volumes • Decrease backflash	• Higher risk of needle breakage • Increased cost • Cannot self-pack with glass wool	Water injections
At the bottom 	Directs flow onto column; low surface area	• Reduces gold seal/column contamination and maintenance • Improved sensitivity • Lower activity	• Increased cost	Pesticides (without wool), semi-volatiles (with wool)
Direct Connect 	Connects directly to column to aid transfer of analytes	• Better sensitivity for splitless injections • Decreases inlet discrimination	• Only used for splitless injections • Increased cost • One-time use	Trace analysis, splitless injections, separation from solvent peak (with top hole), aqueous samples (with bottom hole)
Internal Diameter (ID)				
Small 	Small internal volume and surface area; restricts sample diffusion	• Better peak shape of gaseous samples • Less activity for small injections of active compounds	• Very small internal volume is easy to overload with normal injection volumes	Headspace, purge and trap, or gas injections; active samples with low expansion solvents
Outer Diameter (OD) / Splitless				
Large OD / Splitless 	Fits tightly inside the inlet and limits sample contact with inlet components	• Better sensitivity for long splitless hold times	• Not very amenable for changing to large split ratios	Splitless injections of active compounds
Cup Liner 	Cup traps non-volatiles but has lower surface area than wool; vaporizes sample above the column	• Good sample mixing • Reduces gold seal/column contamination and maintenance • More reproducible results • Improves results for active compounds • Provides receptacle for multiple injections	• Increased cost • Higher surface area than straight liner can result in increased activity for very active compounds	Multiple or large volume injections, active samples, dirty samples

*Examples given are only one possible option. Other available options may be better suited for your analysis.

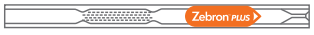
What's a Z-Liner?

Zebron PLUS Liners with a Z-Liner geometry contain optimally-placed deactivated quartz wool, which is held in place by two tapered sections of glass inside the liner. This ensures that the wool remains in the correct position for injection, wipes the needle tip completely clean, and properly volatilizes the sample.

Liners for Agilent® GC Systems

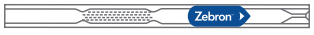
Ordering Information

Zebron™ PLUS Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 5890, 6890 and 7890 Models						
Direct Connect 	Trace analysis, Splitless injections	S/SL	4 x 78.5	PLUS Inert	AG2-0A50-01 AG2-0A50-05 AG2-0A50-25	ea 5/pk 25/pk
Single Taper 	Pesticides	S/SL	4 x 78.5	PLUS Inert	AG2-0A10-01 AG2-0A10-05 AG2-0A10-25	ea 5/pk 25/pk
Single Taper Z-Liner™ 	Semi-volatiles, Dirty samples	S/SL	4 x 78.5	PLUS Inert	AG2-0A13-01 AG2-0A13-05 AG2-0A13-25	ea 5/pk 25/pk
Single Taper with Wool 	Semi-volatiles	S/SL	4 x 78.5	PLUS Inert	AG2-0A11-01 AG2-0A11-05 AG2-0A11-25	ea 5/pk 25/pk
Straight 	Volatiles	S/SL	4 x 78.5	PLUS Inert	AG2-0A00-01 AG2-0A00-05 AG2-0A00-25	ea 5/pk 25/pk
Straight Z-Liner 	Dirty samples, Volatiles, High initial oven temperatures	S/SL	4 x 78.5	PLUS Inert	AG2-0A03-01 AG2-0A03-05 AG2-0A03-25	ea 5/pk 25/pk
Straight Single Baffle 	Semi-volatiles, Pesticides	S/SL	1.8 x 71	PLUS Inert	AG2-1F06-01 AG2-1F06-05 AG2-1F06-25	ea 5/pk 25/pk

Ordering Information

Zebron Essentials Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 5890, 6890 and 7890 Models						
Direct Connect 	Trace analysis, Splitless injections	S/SL	4 x 78.5	Standard	AG1-0A50-01 AG1-0A50-05 AG1-0A50-25	ea 5/pk 25/pk
Single Taper 	Pesticides	S/SL	4 x 78.5	Standard	AG1-0A10-01 AG1-0A10-05 AG1-0A10-25	ea 5/pk 25/pk
Single Taper Z-Liner 	Semi-volatiles, Dirty samples	S/SL	4 x 78.5	Standard	AG1-0A13-01 AG1-0A13-05 AG1-0A13-25	ea 5/pk 25/pk
Single Taper with Wool 	Semi-volatiles	S/SL	4 x 78.5	Standard	AG1-0A11-01 AG1-0A11-05 AG1-0A11-25	ea 5/pk 25/pk
Straight 	Volatiles	S/SL	4 x 78.5	Standard	AG1-0A00-01 AG1-0A00-05 AG1-0A00-25	ea 5/pk 25/pk
Straight Z-Liner 	Dirty samples, Volatiles, High initial oven temperatures	S/SL	4 x 78.5	Standard	AG1-0A03-01 AG1-0A03-05 AG1-0A03-25	ea 5/pk 25/pk
Straight Single Baffle 	Semi-volatiles, Pesticides	PTV	1.8 x 71	Standard	AG1-1F06-01 AG1-1F06-05 AG1-1F06-25	ea 5/pk 25/pk

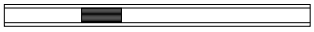
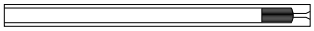
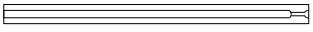
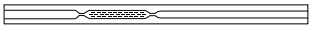
Inlet Styles Key

- **S/SL:** Split/Splitless
- **PTV:** Programmed-Temperature Vaporization
- **PSS:** Programmed-Temperature Split/Splitless
- **SPI:** Single Point Injection

Liners for Agilent® GC Systems *(cont'd)*

Ordering Information

GC Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 5890, 6890, and 7890 Models						
Straight with Wool 	Large injection, Trace analysis	S/SL	4 x 78.5	Standard	AG0-4655 AG0-4656	5/pk 25/pk
Single Taper with Wool 	Large injection, Trace analysis	S/SL	4 x 78.5	Standard	AG0-4657 AG0-4658	5/pk 25/pk
Cup 	High and low MW compounds, Large volume injections	S/SL	4 x 78.5	Not Deactivated	AG0-4647 AG0-4648	5/pk 25/pk
Cup with Wool 	Large volume injection of dirty samples	S/SL	4 x 78.5	Not Deactivated	AG0-7853	5/pk
Straight 	Large injection, Trace analysis	S/SL	2 x 78.5	Not Deactivated	AG0-4649 AG0-4650	5/pk 25/pk
Straight 	Large injection, Trace analysis	S/SL	4 x 78.5	Standard	AG0-4651 AG0-4652	5/pk 25/pk
Single Taper 	Small injection, Trace analysis	S/SL	2 x 78.5	Standard	AG0-4653	5/pk
Direct 	Injection < 1 µL, Purge and Trap/Headspace	S/SL	1.5 x 78.5	Standard	AG0-4659 AG0-4660	5/pk 25/pk
Recessed Gooseneck with Wool 	Large injection of dirty samples	S/SL	4 x 78.5	Standard	AG0-4661 AG0-4662	5/pk 25/pk
Direct Single Taper with Top Hole 	Trace analysis of active compounds	S/SL	4 x 78.5	Standard	AG0-7850	5/pk
Direct Single Taper with Bottom Hole 	Trace analysis of active compounds	S/SL	4 x 78.5	Standard	AG0-7851	5/pk
Single Taper with Wool 	General use, Dirty samples	S/SL	4 x 78.5	Standard	AG0-8172	5/pk
Double Taper 	Large injection, Trace analysis of active compounds	S/SL	4 x 78.5	Standard	AG0-8173	5/pk
Double Gooseneck with Bottom Hole 	Trace analysis of active compounds	S/SL	4 x 78.5	Standard	AG0-8430	5/pk
Straight with Wool 	Large injection Trace analysis,	S/SL	4 x 78.5	Standard	AG0-8653 AG0-8654	5/pk 25/pk
Straight with Stabilized Wool 	Small injection, Trace analysis of dirty samples	S/SL	2.3 x 78.5	Standard	AG0-8379	5/pk

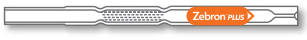
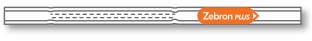
Inlet Styles Key

- **S/SL:** Split/Splitless
- **PTV:** Programmed-Temperature Vaporization
- **PSS:** Programmed-Temperature Split/Splitless
- **SPI:** Single Point Injection

Liners for PerkinElmer® GC Systems

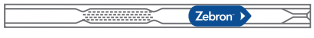
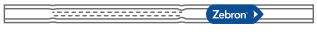
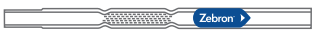
Ordering Information

Zebron™ PLUS Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For AutoSystem™, AutoSystem XL, Clarus 500, and Clarus 600 Models						
Single Taper 	Pesticides	S/SL	4 x 92	PLUS Inert	AG2-2A10-01 AG2-2A10-05 AG2-2A10-25	ea 5/pk 25/pk
Single Taper Z-Liner™ 	Semi-volatiles, Dirty samples	S/SL	4 x 92	PLUS Inert	AG2-2A13-01 AG2-2A13-05 AG2-2A13-25	ea 5/pk 25/pk
Straight 	Volatiles	S/SL	4 x 92	PLUS Inert	AG2-2A00-01 AG2-2A00-05 AG2-2A00-25	ea 5/pk 25/pk
Straight Z-Liner 	Volatiles, Dirty samples	PSS	2 x 86.2	PLUS Inert	AG2-2E03-01 AG2-2E03-05 AG2-2E03-25	ea 5/pk 25/pk
Straight Z-Liner 	High initial oven temperatures	S/SL	4 x 92	PLUS Inert	AG2-2A03-01 AG2-2A03-05 AG2-2A03-25	ea 5/pk 25/pk

Ordering Information

Zebron Essentials Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For AutoSystem, AutoSystem XL, Clarus 500, and Clarus 600 Models						
Single Taper 	Pesticides	S/SL	4 x 92	Standard	AG1-2A10-01 AG1-2A10-05 AG1-2A10-25	ea 5/pk 25/pk
Single Taper Z-Liner 	Semi-volatiles, Dirty samples	S/SL	4 x 92	Standard	AG1-2A13-01 AG1-2A13-05 AG1-2A13-25	ea 5/pk 25/pk
Straight 	Volatiles	S/SL	4 x 92	Standard	AG1-2A00-01 AG1-2A00-05 AG1-2A00-25	ea 5/pk 25/pk
Straight Z-Liner 	Volatiles, Dirty samples	PSS	2 x 86.2	Standard	AG1-2E03-01 AG1-2E03-05 AG1-2E03-25	ea 5/pk 25/pk
Straight Z-Liner 	High initial oven temperatures	S/SL	4 x 92	Standard	AG1-2A03-01 AG1-2A03-05 AG1-2A03-25	ea 5/pk 25/pk

Ordering Information

GC Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For AutoSystem, AutoSystem XL, Clarus 500, and Clarus 600 Models						
Straight 	General use, Trace samples	S/SL	4 x 92	Not Deactivated	AG0-4665	5/pk
Sintered Glass 	Large injection, Trace analysis	PSS	2 x 86.2	Standard	AG0-8658	5/pk

Inlet Styles Key

- **S/SL:** Split/Splitless
- **PTV:** Programmed-Temperature Vaporization
- **PSS:** Programmed-Temperature Split/Splitless
- **SPI:** Single Point Injection

Liners for Shimadzu® GC Systems

Ordering Information

Zebron™ PLUS Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 17A, 2014 and 2025 Models						
Single Taper Z-Liner™ 	Pesticides	S/SL	3.4 x 95	PLUS Inert	AG2-3B13-01 AG2-3B13-05 AG2-3B13-25	ea 5/pk 25/pk
Straight Z-Liner 	Volatiles, Dirty samples, High initial oven temperatures	S/SL	3.4 x 95	PLUS Inert	AG2-3B03-01 AG2-3B03-05 AG2-3B03-25	ea 5/pk 25/pk
For 2010 Models						
Single Taper 	Volatiles, Dirty samples, High initial oven temperatures	S/SL	3.4 x 95	PLUS Inert	AG2-4B10-01 AG2-4B10-05 AG2-4B10-25	ea 5/pk 25/pk
Single Taper Z-Liner 	Pesticides	S/SL	3.4 x 95	PLUS Inert	AG2-4B13-01 AG2-4B13-05 AG2-4B13-25	ea 5/pk 25/pk
Straight 	Volatiles	S/SL	3.4 x 95	PLUS Inert	AG2-4B00-01 AG2-4B00-05 AG2-4B00-25	ea 5/pk 25/pk
Straight Z-Liner 	Volatiles, Dirty samples , High initial oven temperatures	S/SL	3.4 x 95	PLUS Inert	AG2-4B03-01 AG2-4B03-05 AG2-4B03-25	ea 5/pk 25/pk

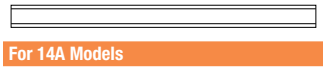
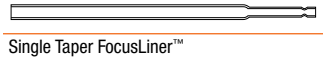
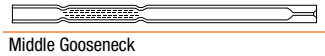
Ordering Information

Zebron Essentials Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 17A, 2014, and 2025 Models						
Single Taper Z-Liner 	Pesticides	S/SL	3.4 x 95	Standard	AG1-3B13-01 AG1-3B13-05 AG1-3B13-25	ea 5/pk 25/pk
Straight Z-Liner 		S/SL	3.4 x 95	Standard	AG1-3B03-01 AG1-3B03-05 AG1-3B03-25	ea 5/pk 25/pk
For 2010 Models						
Single Taper 	Volatiles, Dirty samples, High initial oven temperatures	S/SL	3.4 x 95	Standard	AG1-4B10-01 AG1-4B10-05 AG1-4B10-25	ea 5/pk 25/pk
Single Taper Z-Liner 	Pesticides	S/SL	3.4 x 95	Standard	AG1-4B13-01 AG1-4B13-05 AG1-4B13-25	ea 5/pk 25/pk
Straight 	Volatiles	S/SL	3.4 x 95	Standard	AG1-4B00-01 AG1-4B00-05 AG1-4B00-25	ea 5/pk 25/pk
Straight Z-Liner 	Volatiles, Dirty samples , High initial oven temperatures	S/SL	3.4 x 95	Standard	AG1-4B03-01 AG1-4B03-05 AG1-4B03-25	ea 5/pk 25/pk

Ordering Information

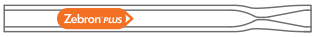
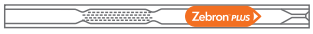
GC Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 17A, 2014, and 2025 Models						
Straight 	Small injection, Trace analysis	S/SL	2.6 x 95	Standard	AG0-4667	5/pk
For 14A Models						
Straight 	Trace analysis	WBC	3.4 x 139	Standard	AG0-4669	5/pk
Single Taper FocusLiner™ 	General use, Dirty samples	S/SL	3.4 x 99	Standard	AG0-4682	5/pk
Middle Gooseneck 	General use, Dirty samples	S/SL	3.4 x 95	Standard	AG0-8661	5/pk
Recessed Gooseneck with Wool	General use, Dirty samples	S/SL	3.4 x 95	Standard	AG0-8663	5/pk

Liners for Thermo Scientific® GC Systems

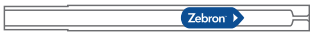
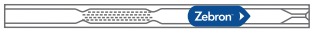
Ordering Information

Zebron™ PLUS Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 5890, 6890 and 7890 Models						
Direct Connect 	Trace analysis, Splitless injections	S/SL	4 x 78.5	PLUS Inert	AG2-0A50-01 AG2-0A50-05 AG2-0A50-25	ea 5/pk 25/pk
Single Taper 	Pesticides	S/SL	4 x 78.5	PLUS Inert	AG2-0A10-01 AG2-0A10-05 AG2-0A10-25	ea 5/pk 25/pk
Single Taper Z-Liner™ 	Semi-volatiles, Dirty samples	S/SL	4 x 78.5	PLUS Inert	AG2-0A13-01 AG2-0A13-05 AG2-0A13-25	ea 5/pk 25/pk
Single Taper with Wool 	Semi-volatiles	S/SL	4 x 78.5	PLUS Inert	AG2-0A11-01 AG2-0A11-05 AG2-0A11-25	ea 5/pk 25/pk
Straight 	Volatiles	S/SL	4 x 78.5	PLUS Inert	AG2-0A00-01 AG2-0A00-05 AG2-0A00-25	ea 5/pk 25/pk
Straight Z-Liner 	Dirty samples, Volatiles, High initial oven temperatures	S/SL	4 x 78.5	PLUS Inert	AG2-0A03-01 AG2-0A03-05 AG2-0A03-25	ea 5/pk 25/pk
Straight Single Baffle 	Semi-volatiles, Pesticides	PTV	1.8 x 71	PLUS Inert	AG2-1F06-01 AG2-1F06-05 AG2-1F06-25	ea 5/pk 25/pk

Ordering Information

Zebron Essentials Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 5890, 6890 and 7890 Models						
Direct Connect 	Trace analysis, Splitless injections	S/SL	4 x 78.5	Standard	AG1-0A50-01 AG1-0A50-05 AG1-0A50-25	ea 5/pk 25/pk
Single Taper 	Pesticides	S/SL	4 x 78.5	Standard	AG1-0A10-01 AG1-0A10-05 AG1-0A10-25	ea 5/pk 25/pk
Single Taper Z-Liner 	Semi-volatiles, Dirty samples	S/SL	4 x 78.5	Standard	AG1-0A13-01 AG1-0A13-05 AG1-0A13-25	ea 5/pk 25/pk
Single Taper with Wool 	Semi-volatiles	S/SL	4 x 78.5	Standard	AG1-0A11-01 AG1-0A11-05 AG1-0A11-25	ea 5/pk 25/pk
Straight 	Volatiles	S/SL	4 x 78.5	Standard	AG1-0A00-01 AG1-0A00-05 AG1-0A00-25	ea 5/pk 25/pk
Straight Z-Liner 	Dirty samples, Volatiles, High initial oven temperatures	S/SL	4 x 78.5	Standard	AG1-0A03-01 AG1-0A03-05 AG1-0A03-25	ea 5/pk 25/pk
Straight Single Baffle 	Semi-volatiles, Pesticides	PTV	1.8 x 71	Standard	AG1-1F06-01 AG1-1F06-05 AG1-1F06-25	ea 5/pk 25/pk

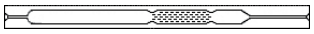
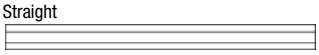
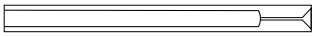
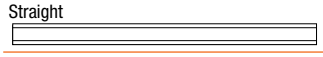
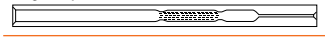
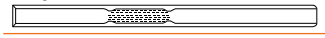
Inlet Styles Key

S/SL: Split/Splitless
PTV: Programmed-Temperature Vaporization
PSS: Programmed-Temperature Split/Splitless
SPI: Single Point Injection

Liners for Thermo Scientific® GC Systems *(cont'd)*

Ordering Information

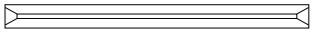
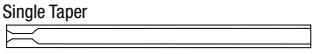
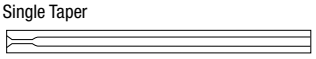
GC Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For TRACE 8000 and FOCUS Models						
Double Taper FocusLiner™ 	Trace analysis of dirty samples	S/SL	5 x 105	Standard	AG0-4679 AG0-7863	5/pk 25/pk
Straight 	General use	S/SL	3 x 105	Standard	AG0-4645	5/pk
Single Taper 	Trace analysis	S/SL	5 x 105	Standard	AG0-7852	5/pk
Straight 	General use	S/SL	5 x 105	Standard	AG0-8669	5/pk
Single Taper FocusLiner 	General use, Dirty samples	S/SL	5 x 105	Standard	AG0-8671	5/pk
Single Taper 	Small injection, Trace analysis	S/SL	3 x 105	Standard	AG0-8672	5/pk
Straight FocusLiner 	General use, Dirty samples	S/SL	5 x 105	Standard	AG0-8673	5/pk

Liners for Bruker/Varian® GC Systems

Ordering Information

GC Liners

Description	Application	Inlet Style	Dimensions ID x L (mm)	Deactivation	Part No.	Unit
For 1093 / 1094 Models						
Straight 	Large injection, Trace analysis	S/SL	4 x 75	Standard	AG0-4673	5/pk
For 1078 / 1079 Models						
Straight 	Trace analysis	S/SL	0.5 x 54	Standard	AG0-8665	5/pk
Single Taper FocusLiner™ 	General use or Dirty samples	S/SL	3.4 x 54	Standard	AG0-8666	5/pk
Single Taper 	Large injection, Trace analysis	S/SL	3.4 x 54	Standard	AG0-8667	5/pk
Single Taper 	Small injection, Trace analysis	S/SL	2 x 54	Standard	AG0-8668	5/pk
For 1075 / 1077 Models						
Straight 	For 0.25 and 0.32 mm ID Column	SPI	0.5 x 54	Standard	AG0-4675	5/pk
Straight 	For 0.53 mm ID Column	SPI	0.8 x 54	Standard	AG0-4677	5/pk

Inlet Styles Key

- **S/SL:** Split/Splitless
- **PTV:** Programmed-Temperature Vaporization
- **PSS:** Programmed-Temperature Split/Splitless
- **SPI:** Single Point Injection

Column Unions, Mini-Unions, and Splitters

Selection Guide

Use the Union or Mini-Union for:	Use the Y-Connector (splitter) for:
• Connecting a guard column to an analytical column • Connecting columns of different selectivities • Connecting transfer lines to, e.g., mass spec • Repairing a broken column	• Splitting a sample onto two columns (perform confirmational analysis in a single injection) • Splitting the column eluent to two detectors

Mini-Unions

- **High-precision unions for connecting capillary GC columns of same or dissimilar sizes**
- **Inert and precise glass-lined bore**
- **Low dead volume**

Graphite/Vespel® Ferrule Mini-Unions

- **15 % Graphite / 85 % Vespel ferrules, Rated to 350 °C**
- **Includes 1 mini-union, 2 nuts, and 5 ferrules**

Ordering Information

Graphite/Vespel Ferrule Mini-Unions

Column 1 ID (mm)	Column 2 ID (mm)	Ferrule ID (mm)	Similar to Mfr. No.*	Part No.	Unit
0.10-0.25	0.10-0.53	0.4	103431	AG0-5160	ea
0.28-0.35	0.32-0.53	0.5	103432	AG0-5161	ea
0.45-0.53	0.45-0.53	0.8	103433	AG0-5162	ea

Replacement Ferrules

Column ID (mm)	Ferrule ID (mm)	Similar to Mfr. No.*	Part No.	Unit
0.10-0.25	0.4	072696	AG0-7033	10/pk
0.28-0.35	0.5	072697	AG0-7034	10/pk
0.45-0.53	0.8	072698	AG0-7035	10/pk

SilTite™ Mini-Unions

- **Supplied with SilTite ferrules – no more leaks and no need to re-tighten after installation**
- **Recommended for high temperature analysis. Stable above 450 °C.**

Ordering Information

SilTite Mini-Unions

Column 1 ID (mm)	Column 2 ID (mm)	Ferrule ID (mm)	Similar to Mfr. No.*	Part No.	Unit
0.10-0.25	0.10-0.53	0.4	073550	AG0-8763	ea
0.28-0.35	0.32-0.53	0.5	073551	AG0-8764	ea
0.45-0.53	0.45-0.53	0.8	073554	AG0-8825	ea

Replacement Ferrules

Column ID (mm)	Ferrule ID (mm)	Similar to Mfr. No.*	Part No.	Unit
0.10-0.25	0.4	073470	AG0-8759	10/pk
0.28-0.35	0.5	073471	AG0-8760	10/pk
0.45-0.53	0.8	073473	AG0-8824	10/pk

* Similar to but not always an exact equivalent to the original manufacturer's product.

Press-Fit Unions and Splitters

- **Connect fused silica capillary tubing of the same or different diameter, from 0.10 to 0.53 mm ID**
- **Patented laser-formed linear taper**
- **Provides leak-free seal without tools, glue, or fittings**
- **Stays sealed even at high temperatures and pressures**
- **Laser-cut smooth ends prevent column damage during insertion**

Ordering Information

Capillary Unions and Splitters

Part No.	Description	Unit
AG0-4716	Universal Capillary Column Union, Fused Quartz	5/pk
AG0-4717	Universal Capillary Column Y-connector, Fused Quartz	ea

Polyimide Resins

- **Permanently connects unions and splitters to capillary tubing**
- **Prevents connections from dislodging due to vibration or shock**

Ordering Information

Polyimide Resins

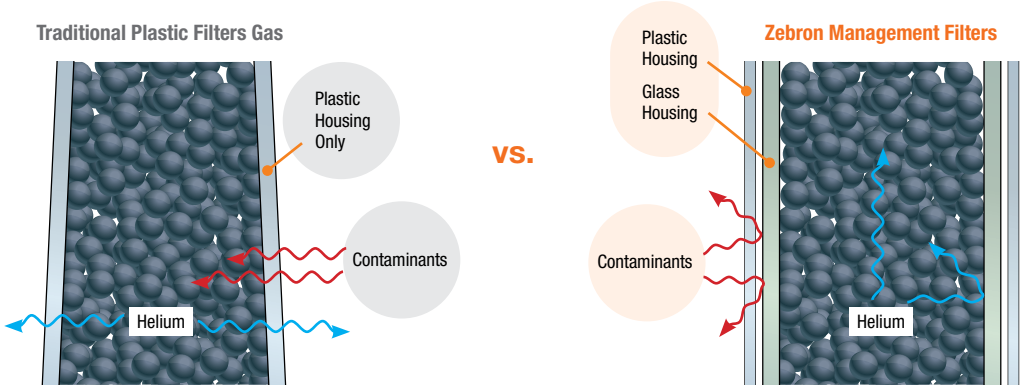
Part No.	Description	Unit
AG0-5722	Polyimide Resin, 350 °C, 0.5 mL	ea
AG0-8514	High Temperature, 400 °C, Polymide Resin, 0.5 mL	ea

For GC Retention Gaps and Guard Column Kits, see p. 154

Zebron™ Gas Management

UPGRADE Your Gas Filter System!

Improved design with a dual wall housing (plastic outside and glass inside).
Glass prevents diffusion, ensuring a leak and contaminant free system.



Plug-In GC and LC-MS Gas Filters

- Easy to use
- Dual filter housing prevents diffusion and increases safety
- Incredible high capacity
- Ensures high gas purity (99.9999% pure)
- 4 filter types

Universal · Oxygen · Moisture · Hydrocarbon

Click-On GC Gas Traps

- Easy to use, Click-on GC Gas Traps
- Serves multiple GC instruments at once
- Incredible high capacity
- Ensures high gas purity (99.9999% pure)
- 5 trap types

Universal · Oxygen · Moisture · Hydrocarbon · Carbon Dioxide

Protect Your LC-MS using NEW Zebron LC-MS Gas Filters

- Removes water, organic compounds, and other foreign material from LC-MS nebulizer gas
- Dual filter: Moisture and Hydrocarbon
- To be used in combination with a high flow 2-position connecting unit (Part No.: AG6-2204) and Particle Filter (Part No.: AG6-2205)

Moisture · Hydrocarbon

Save Time and Money!

Zebron Electronic Indicator

Easily know when to replace the Gas Filter and Trap by using the NEW Zebron Electronic Indicator

Zebron Gas Management

Ordering Information

Zebron Gas Management Filters

Part No.	Description	Unit
AG6-1010	Gas Filter Oxygen	ea
AG6-1020	Gas Filter Moisture	ea
AG6-1030	Gas Filter Hydrocarbon	ea
AG6-1040	Gas Filter Universal	ea
AG6-1070	Gas Filter Universal (Helium specific)	ea
AG6-1050	Gas Filter Hydrocarbon/moisture for LC-MS	2/pk
AG6-1060	Ring nut for Gas Filter	ea

Ordering Information

Zebron Gas Management Traps

Part No.	Description	Unit
AG6-3110	Click-on Oxygen Trap	ea
AG6-3120	Click-on Moisture Trap	ea
AG6-3130	Click-on Hydrocarbon Trap	ea
AG6-3140	Click-on Universal Trap	ea
AG6-3150	Click-on Carbon Dioxide Trap	ea

Ordering Information

Zebron Connecting Units

Part No.	Description	Unit
AG6-2101	1-position Connecting Unit ¼ in.	ea
AG6-2102	2-position Connecting Unit ¼ in.	ea
AG6-2103	4-position Connecting Unit ¼ in.	ea
AG6-2201	1-position Connecting Unit ⅛ in.	ea
AG6-2202	2-position Connecting Unit ⅛ in.	ea
AG6-2203	4-position Connecting Unit ⅛ in.	ea
AG6-2204	High flow 2-position connecting unit for LC-MS	ea
AG6-2205	Particle Filter for LC-MS	ea
AG6-2206	O-ring replacement for gas filter baseplate	10/pk

Ordering Information

Zebron Connecting Units *(cont'd)*

Part No.	Description	Unit
AG6-2301	1-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2302	2-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2303	4-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2304	1-position Connecting Unit ⅛ in. Stainless Steel	ea
AG6-2305	2-position Connecting Unit ⅛ in. Stainless Steel	ea
AG6-2306	4-position Connecting Unit ⅛ in. Stainless Steel	ea

Ordering Information

Zebron Base Electronic Indicator and Other Accessories

Part No.	Description	Unit
AG6-3160	⅛ in. Brass CLICK-ON Connector Set	2/pk
AG6-3170	¼ in. Brass CLICK-ON Connector Set	2/pk
AG6-4150	⅛ in. Stainless Steel CLICK-ON Connector Set	2/pk
AG6-4160	¼ in. Stainless Steel CLICK-ON Connector Set	2/pk
AG6-3180	Wall-mounting Clamp Set for Gas Traps	2/pk
AG6-3190	O-ring replacement set for Gas Trap	10/pk
AG6-4110	Electronic Indicator for Gas Trap	ea
AG6-4120	Electronic Indicator for Gas Filter	ea

Electronic Indicator

Wall-mounting Clamp Set

O-ring

Brass Click-on Connector

First time ordering Zebron Click-On Gas Traps?

Be sure to order the brass or stainless steel connector with your first trap.

AG6-3160 (⅛ in. Brass)

AG6-4150 (⅛ in. Stainless Steel)

AG6-3170 (¼ in. Brass)

AG6-4160 (¼ in. Stainless Steel)

Moisture, Oxygen, and Hydrocarbon Gas Traps/Purifiers

- **Extends column lifetimes**
- **Protects columns from irreversible damage**
- **Improve analytical reliability (identification and quantitation results)**
- **Reliable and affordable high-capacity, high-performance purifiers**

Recommended Gas Traps

Use	Gas	Recommended Trap(s)
Carrier Gas	Helium, Hydrogen, or Nitrogen	Moisture, Hydrocarbon, Oxygen
	Air	Hydrocarbon
FID, NPD	Make-up	Hydrocarbon
	Hydrogen	Hydrocarbon
ECD	Make-up	Water, Oxygen
TCD	Same as carrier	Moisture, Hydrocarbon, Oxygen

Ordering Information

Moisture, Oxygen, and Hydrocarbon Gas Traps / Purifiers

Type	Media	Max Pressure	Purity		Capacity	Indicating	Fittings	Part No.	Unit
Moisture	Molecular Sieve 13x	100 psi	≤10 ppb water		100 cc	Yes	1/8 in.	AG0-4766	ea
					250 cc	Yes	1/8 in.	AG0-4768	ea
					250 cc	Yes	1/4 in.	AG0-4769	ea
Hydrocarbon	Impregnated carbon filter media	250 psi	Call for specific compounds		100 cc	No	1/8 in.	AG0-4770	ea
					100 cc	No	1/4 in.	AG0-4771	ea
					200 cc	No	1/8 in.	AG0-4772	ea
					200 cc	No	1/4 in.	AG0-4773	ea
Oxygen	Proprietary	50 psi	≤1 ppb oxygen		50 cc	Yes	1/8 in.	AG0-4774	ea
					150 cc	Yes	1/8 in.	AG0-4776	ea
					150 cc	Yes	1/4 in.	AG0-4777	ea
		250 psi	≤5 ppb oxygen		5.5 x 2 in.	No	1/8 in.	AG0-4792	ea
					5.5 x 2 in.	No	1/4 in.	AG0-4791	ea
Oxygen / Moisture	Proprietary	250 psi	≤15 ppb oxygen and water		150 cc	No	1/8 in.	AG0-4778	ea
					150 cc	No	1/4 in.	AG0-4779	ea

To get the greatest lifetime out of gas traps, try placing a large capacity non-indicating trap in-line before an indicating trap. Replace the large capacity trap only when the indicating trap starts to change color. Mark the color transition on the indicating trap with a marker. The color transition moves only when the large capacity trap is saturated. This gives long term savings by eliminating unnecessary maintenance and maintains quality gas.

For maximum efficiency, flow rates for any trap should not exceed 3 L/min. Trapping efficiency will drop-off rapidly as flow rates increase.

Tools & Maintenance Kits

Ordering Information

Tools & Maintenance Kits

Description			Part No.	Unit
Ferrule Remover Tool Kit	• Simple, effective tools effectively remove stuck ferrules • Spiral-cut ratchet grabs ferrules tightly • Includes two tools for removing ferrules from 0.4 to 0.8 mm ID		AD0-4725	ea
Ceramic Scoring Wafers	• High-quality ceramic cutting tool for fused silica columns		AG0-4718	2/pk
Flame Detector Jet Cleaning Kit	• For routine maintenance of FIDs • Use either while flame jet has been taken apart or still installed • Includes: 3 jet reamers (0.008, 0.08, 0.02 in.); 1 stainless steel and 1 brass brush; 1 dual-ended pin vise		AD0-4723	ea

Test the Performance of GC Columns

- **Convenient way to check column performance**
- **Essential tool for GC troubleshooting**
- **Affordable and easy to use**
- **Suitable for Phenomenex Zebron™ and equivalent brands**
- **Sealed in 2 mL glass ampules–prevent evaporation and increase shelf life**
- **All test mixes supplied with Certificate of Analysis**

App ID 15840

Zebron ZB-1 *PLUS*™

Part No.: AG0-7805

500 µg/mL each in acetone:

1. Decane
2. 2-Ethylhexanoic Acid
3. 4-Chlorophenol
4. Naphthalene
5. Tridecane
6. 1-Undecanol
7. Dicyclohexylamine
8. Pentadecane

App ID 5160, App ID 10714

Zebron ZB-1, ZB-5, ZB-1HT, and ZB-5HT

Part No.: AG0-5155

250 µg/mL each in hexane:

1. Undecane
2. 4-Chlorophenol
3. Tridecane
4. 1-Undecanol
5. Dicyclohexylamine
6. Pentadecane

App ID 14836

Guardian™ Integrated Guard / ZB-5

Part No.: AG0-7549

250 µg/mL each in acetone:

1. Decane
2. 2-Ethylhexanoic Acid
3. 1,6-Hexanediol
4. 4-Chlorophenol
5. Tridecane
6. 1-Methylnaphthalene
7. 1-Undecanol
8. Tetradecane
9. Dicyclohexylamine

App ID 16439

Zebron ZB-5 *PLUS*™

Part No.: AG0-8362

250 µg/mL each in acetone:

1. Decane
2. Methyl Caprylate
3. 1,6-Hexanediol
4. 4-Chlorophenol
5. Tridecane
6. 1,8-Octanediol
7. Dihexylamine
8. 1-Undecanol
9. Dicyclohexylamine
10. Pentadecane

App ID 14973

Zebron ZB-5ms, ZB-SemiVolatiles, ZB-XLB, and ZB-XLB-HT

Part No.: AG0-7578

250 µg/mL each in acetone:

1. Decane
2. 2-Ethylhexanoic Acid
3. 1,6-Hexanediol
4. 4-Chlorophenol
5. Tridecane
6. 1-Methylnaphthalene
7. 1-Undecanol
8. Tetradecane
9. Dicyclohexylamine
10. Pentadecane

App ID 5162, App ID 5161

Zebron ZB-35, ZB-35HT, ZB-1701, and ZB-1701P

Part No.: AG0-5156

250 µg/mL each in hexane:

1. Undecane
2. 2,4-Dimethylphenol
3. 2,6-Dimethylaniline
4. Tetradecane
5. 1-Undecanol
6. 1-Methylnaphthalene
7. Hexadecane

Test mix components are shown in order of elution

App ID 5163

Zebron ZB-50

Part No.: AG0-5157

250 µg/mL each in hexane:

1. Undecane
2. Tridecane
3. 2,4-Dimethylphenol
4. 2,6-Dimethylaniline
5. 1-Undecanol
6. 1-Methylnaphthalene
7. Hexadecane

App ID 24917

Zebron ZB-624 *PLUS*™

Part No.: AG0-9203

250 µg/mL each in hexane:

1. Dodecane
2. 2,4-Dimethylphenol
3. 2,6-Dimethylaniline
4. Tridecane
5. 1-Methylnaphthalene
6. 1-Undecanol
7. Pentadecane

App ID 5165

Zebron ZB-624

Part No.: AG0-5159

1000 µg/mL each in methanol:

1. 1,2-Dichloropropane
2. Octane
3. Tetrachloroethylene
4. Chlorobenzene
5. Nonane

App ID 16214

Zebron ZB-WAX *PLUS*™

Part No.: AG0-7869

250 µg/mL each in hexane:

1. 2-Octanone
2. Tetradecane
3. Pentadecane
4. 1-Octanol
5. Hexadecane
6. Methyl decanoate
7. Heptadecane
8. Methyl undecanoate
9. 1-Decanol
10. Octadecane
11. Methyl dodecanoate
12. 2,6-Dimethylaniline
13. Nonadecane
14. 2,6-Dimethylphenol

App ID 14326, App ID 5164

Zebron ZB-WAX and ZB-FFAP

Part No.: AG0-5158

250 µg/mL each in hexane:

1. 2-Octanone
2. Tetradecane
3. 1-Octanol
4. Methyl decanoate
5. Methyl undecanoate
6. 1-Decanol
7. Methyl dodecanoate
8. 2,6-Dimethylaniline
9. 2,6-Dimethylphenol

App ID 18461

Zebron ZB-Drug-1

Part No.: AG0-8431

250 µg/mL each in acetone:

1. Dodecane
2. Tridecane
3. 4-Chlorophenol
4. Tetradecane
5. 1-Undecanol
6. 1-Methylnaphthalene
7. Dicyclohexylamine
8. Hexadecane

App ID 19305

Zebron ZB-1XT SimDist

Part No.: AG0-8645

1000 µg/mL each in hexane:

1. Undecane
2. Dodecane
3. Tridecane
4. 1-Undecanol
5. Dicyclohexylamine
6. Pentadecane

App ID 5158

Grob Test Mixture

Part No.: AG0-5154

400 µg/mL each in methylene chloride:

1. 2,3-Butanediol
2. Decane
3. Undecane
4. 1-Octanol
5. 1-Nonanal
6. 2-Ethylhexanoic acid
7. 2,6-Dimethylphenol
8. 2,6-Dimethylaniline
9. Methyl decanoate
10. Methyl undecanoate
11. Dicyclohexylamine
12. Methyl dodecanoate