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

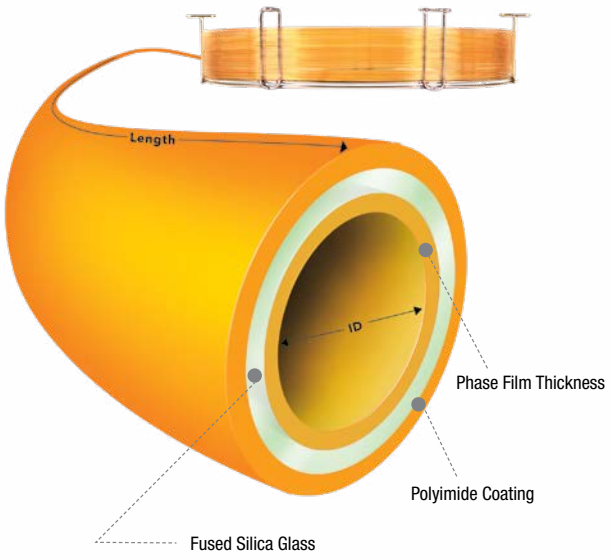
Choosing Your Selectivity

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

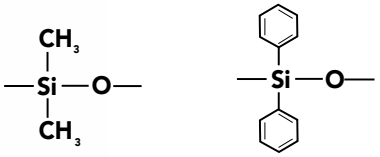
Resolution between two analytes is mainly determined by the selectivity of the stationary phase. By increasing the resolution between two compounds, the total analysis time can often be reduced significantly!

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

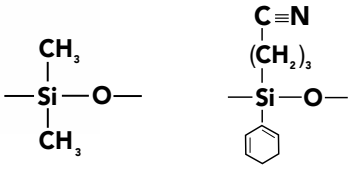


65 % Dimethylpolysiloxane

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

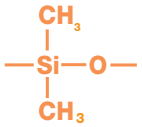
- Either permanently present or induced by analyte-stationary phase interactions
- Higher dipole-dipole interaction can help separate compounds with similar boiling points, but different chemical structures

Hydrogen Bonding (Acid-Base Interactions)

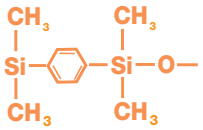
- Can cause poor peak shape or irreversible binding to the inlet liner or to the column itself
- Zebron columns are specially deactivated to minimize these interactions

Choosing A "5" Phase

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



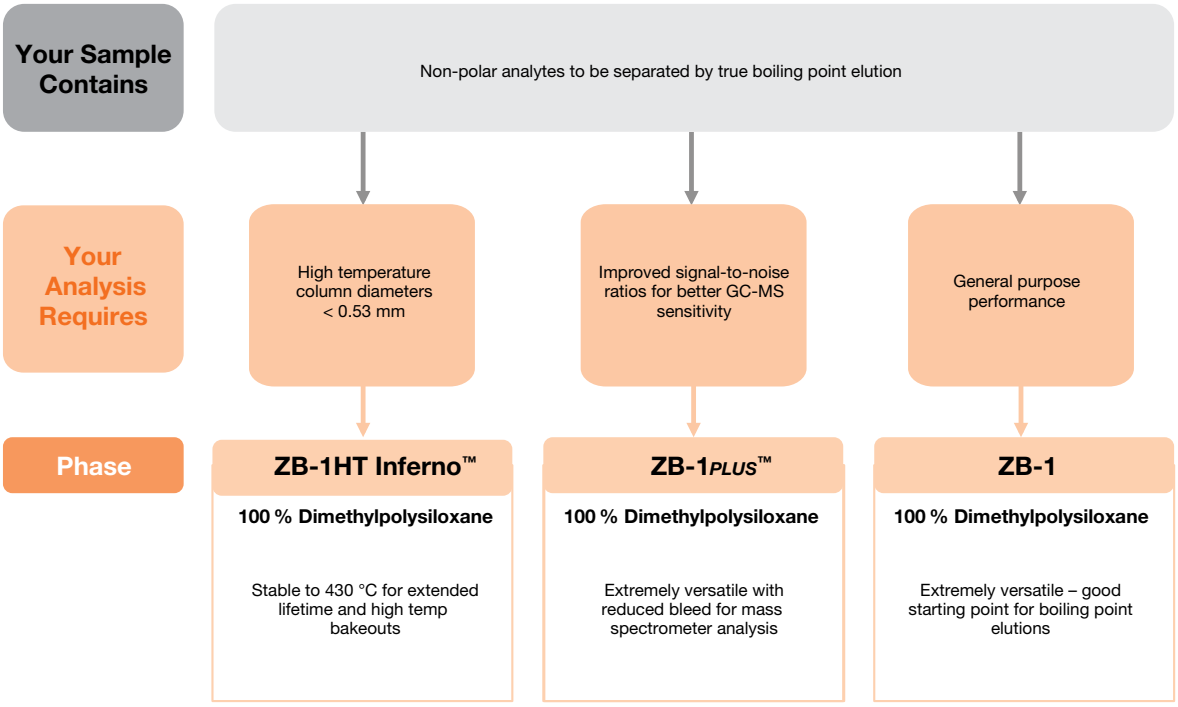
ZB-5HT Inferno, ZB-5, and ZB-5*PLUS* are 5 % phenyl based phases and are versatile for a wide analyte range.



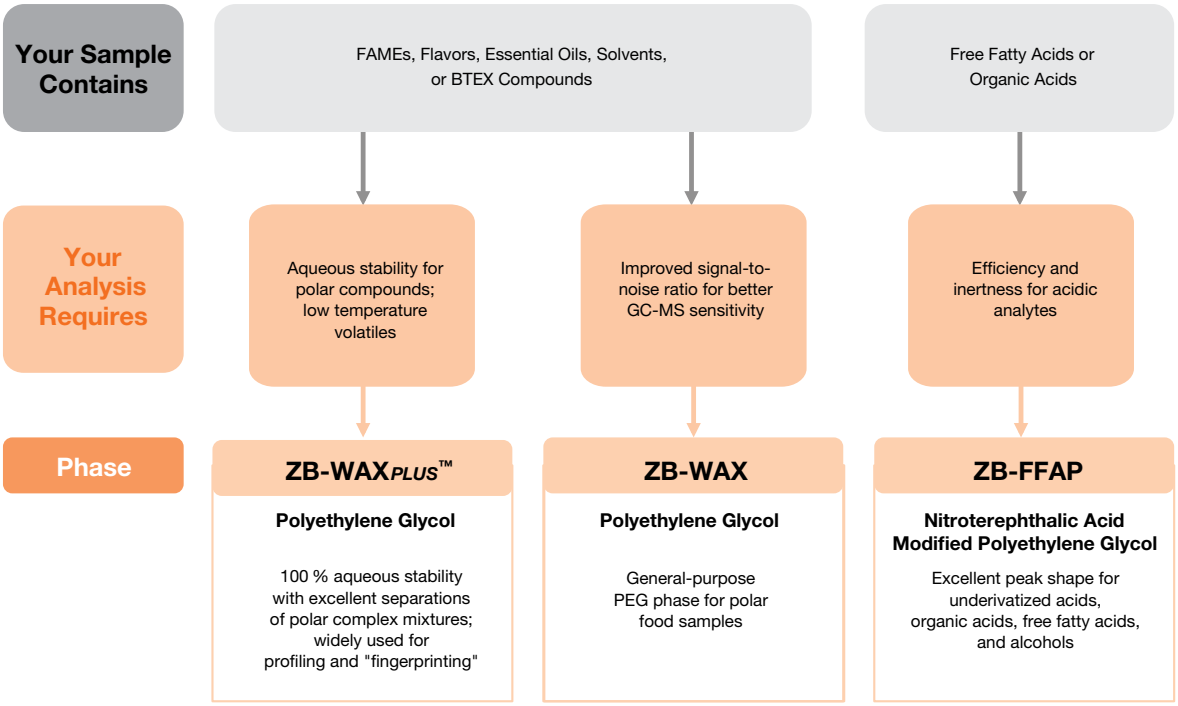
ZB-SemiVolatiles, ZB-5MS*PLUS*, and ZB-5ms are 5 % phenyl-arylene based phases and provide better separation of aromatics.

Choosing Your Selectivity *(cont'd)*

Choosing A "1" Phase



Choosing A "PEG" Phase

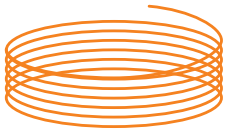


Choosing Your Dimensions

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**

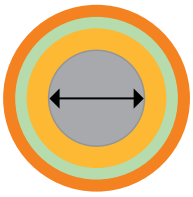
15 m or less	Good Starting Length	60 m or more
Applications • High boilers • GC-MS applications **Advantages** • Faster run times • Higher temp. limits • Lower bleed • Higher efficiency **Disadvantages** • Less inert • Limited retention	**30 m** 	**Applications** • Complex samples with closely eluting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

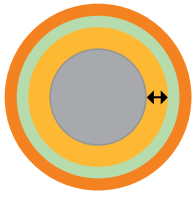
Narrow → **Wide**

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 • Not compatible with most 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-PS1, DB-HT SimDis, DB-PS287			
ZB-5	5 % Phenyl 95 % Dimethylpolysiloxane	Rtx-5	DB-5, HP-5, Ultra 2, HP-PAS-5, CP-Sil 8 CB, HP-5ms Ultra Inert	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, VF-5ms, DB-5ms EVDX, 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	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, HP-50+, DB-17 EVDX, 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-FFAP CB CP-Wax 58 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		
ZB-PAH-EU	Proprietary	Rxi-PAH	DB-PAH EU			
ZB-PAH-CT	Proprietary		PAH-Select			
ZB-Dioxin	Proprietary	Rtx-Dioxin 2	DB-Dioxin, DB-225, DB-5MSUI	SP-2330		

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*™		157, 140
502.2	Volatile Halogenated Organics by Purge & Trap GC/PID/ELCD	ZB-624, ZB-624*PLUS*		157, 140
503.1	Volatile Aromatics and Unsaturated Organics by Purge & Trap GC	ZB-624, ZB-624*PLUS*		157, 140
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	116 118
505	Organohalide Pesticides & Aroclors by GC-ECD	ZB-CLPesticides-1 ZB-MultiResidue-1	ZB-CLPesticides-2 ZB-MultiResidue-2	116 118
507	Nitrogen & Phosphorus Containing Pesticides by GC-NPD	ZB-MultiResidue-1 ZB-CLPesticides-2	ZB-MultiResidue-2 ZB-CLPesticides-2	118 116
508	Chlorinated Pesticides by GC-ECD	ZB-CLPesticides-1 ZB-MultiResidue-1	ZB-CLPesticides-2 ZB-MultiResidue-2	116 118
509	Ethylene Thiourea (ETU) by GC-NPD	ZB-WAX*PLUS*™	ZB-1701	138, 158
513	2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin by GC-HRMS	ZB-SemiVolatiles		114
515.3	Chlorinated Acids by Liquid-Liquid Extraction, Derivatization and GC-ECD	ZB-XLB	ZB-35	162, 155
521	Nitrosamines by Solid Phase Extraction (SPE) and GC-MS/MS with Large Volume Injection	ZB-SemiVolatiles		114
522	1,4-Dioxane by Solid Phase Extraction (SPE) and GC-MS with Selected Ion Monitoring (SIM)	ZB-SemiVolatiles		114
523	Triazine Pesticides and their Degradates by GC-MS	ZB-50		156
524.3	Purgeable Organic Compounds by GC-MS	ZB-624, ZB-624*PLUS*		157, 140
525.2	Semi-volatile Organic Chemicals by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles		114
526	Selected Semi-volatile Organic Compounds by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles		114
527	Selected Pesticides and Flame Retardants by Solid Phase Extraction (SPE) and GC-MS	ZB-5*PLUS*™		134
528	Phenols by Solid Phase Extraction (SPE) and GC-MS	ZB-SemiVolatiles	ZB-35	114, 155
529	Explosives and Related Compounds by Solid Phase Extraction (SPE) and GC-MS	ZB-5*PLUS*™		134
548	Endothall by Aqueous Derivatization, Liquid-Solid Extraction, and GC-ECD	ZB-SemiVolatiles	ZB-35	114, 155
551.1	Chlorinated Solvents & Disinfection Byproducts by Liquid-Liquid Extraction and GC-ECD	ZB-35		155
552.3	Haloacetic Acids and Dalapon by Liquid-Liquid Extraction, Derivatization, and GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35	116, 116 162, 155
556	Carbonyl Compounds by Pentafluorobenzylhydroxylamine Derivatization and GC-ECD	ZB-SemiVolatiles	ZB-1701	114, 158

Waste Water

Method #	Description	Primary Column	Confirmation Column	Page
601	Purgeable Halocarbons by Purge & Trap GC	ZB-624, ZB-624*PLUS*		157, 140
602	Purgeable Aromatics by Purge & Trap GC	ZB-624, ZB-624*PLUS*		157, 140
603	Acrolein & Acrylonitrile Purge & Trap GC	ZB-624, ZB-624*PLUS*		157, 140
604	Phenols by GC-ECD	ZB-SemiVolatiles		114
606	Phthalate Esters by GC-ECD	ZB-5*PLUS*™		134
607	Nitrosamines by GC-NPD	ZB-SemiVolatiles		114
608	Organochlorine Pesticides and PCBs by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2	118, 118
609	Nitroaromatics & Isophorone by GC-FID and GC-ECD	ZB-SemiVolatiles		114
610	Polynuclear Aromatic Hydrocarbons by GC-FID	ZB-PAH-EU ZB-PAH-CT		106 110
611	Haloethers by GC-ECD	ZB-SemiVolatiles	ZB-SemiVolatiles	114
612	Chlorinated Hydrocarbons by GC-ECD	ZB-SemiVolatiles		114
613	2,3,7,8-Tetrachlorodibenzo-p-dioxin by GC-MS	ZB-SemiVolatiles		114
615	Chlorinated Herbicides by GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35	116, 116 162, 155
619	Triazine Herbicides by GC-MS	ZB-50		156
622	Organophosphorus Pesticides by GC-MS	ZB-MultiResidue-1		118
624	Purgeable Volatiles by Purge & Trap GC-MS	ZB-624		157
625	Base/Neutral and Acids by GC-MS	ZB-SemiVolatiles		114
1613	Tetra- through Octa-Chlorinated Dioxins & Furans by Isotope Dilution HRGC/HRMS	ZB-Dioxin	ZB-SemiVolatiles	102, 114
1614	Polybrominated Diphenyl Esters (PBDEs) by HRGC/HRMS	ZB-5HT Inferno™ ZB-SemiVolatiles		146 114
1618	Organohalide Pesticides, Organophosphorus Pesticides, and Phenoxy-Acid Herbicides by GC	ZB-MultiResidue-1	ZB-MultiResidue-2	118, 118
1624	Volatile Organic Compounds by Isotope Dilution GC-MS	ZB-624, ZB-624*PLUS*		157, 140
1625	Semi-volatile Organic Compounds by Isotope Dilution GC-MS	ZB-SemiVolatiles		114
1653	Chlorinated Phenols by In-Situ Acetylation and GC-MS	ZB-SemiVolatiles		114
1657	Organophosphorous Pesticides by GC-FPD	ZB-MultiResidue-1	ZB-MultiResidue-2	118, 118
1658	Phenoxy-Acid Herbicides by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2	118, 118
1659	Dazomet by GC-NPD	ZB-MultiResidue-1	ZB-MultiResidue-2	118, 118
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*		114 157 140
1668	Polychlorinated Biphenyl (PCB) Congeners by HRGC/HRMS	ZB-MultiResidue-1	ZB-1	118, 152
1671	Pharmaceutical Manufacturing Volatile Organic Compounds by GC-FID	ZB-1		152
7850	White Phosphorus (P4) by Solvent Extraction and GC-NPD	ZB-1		152

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*™		157, 140
8015C	Nonhalogenated Organics by GC	ZB-5HT Inferno™		146
8020A	Aromatic Volatile Organics by GC-PID	ZB-WAX, ZB-WAX*PLUS*™		160 138
8021B	Aromatic and Halogenated Volatiles by GC-PID or GC-ELCD	ZB-624, ZB-624*PLUS*	ZB-1 (thick phase)	157, 140, 152
8030A	Acrolein and Acrylonitrile by GC-FID	ZB-624, ZB-624*PLUS*		157, 140
8032A	Acrylamide by GC-ECD	ZB-5HT Inferno		146
8041	Phenols by GC-ECD or GC-FID	ZB-SemiVolatiles		114
8061A	Phthalate Esters by GC-ECD	ZB-SemiVolatiles	ZB-1701	114, 158
8081B	Organochlorine Pesticides by GC-ECD	ZB-MultiResidue™-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2	118 116
8082A	Polychlorinated Biphenyls (PCBs) by GC-ECD	ZB-MultiResidue-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2	118 116
8091	Nitroaromatics and Cyclic Ketones by GC-ECD or GC-NPD	ZB-SemiVolatiles	ZB-1701	114, 158
8095	Explosives by GC-ECD	ZB-50		156
8100	Polynuclear Aromatic Hydrocarbons by GC-FID	ZB-SemiVolatiles ZB-35		114 155
8121	Chlorinated Hydrocarbons by GC-ECD	ZB-MultiResidue-1	ZB-MultiResidue-2	118
8131	Aniline and Selected Derivatives by GC-NPD	ZB-SemiVolatiles	ZB-1	114, 152
8141B	Organophosphorus Pesticides by GC-FPD or GC-NPD	ZB-MultiResidue-1 ZB-CLPesticides-1	ZB-MultiResidue-2 ZB-CLPesticides-2	118 116
8151A	Chlorinated Herbicides by GC-ECD	ZB-CLPesticides-1 ZB-XLB	ZB-CLPesticides-2 ZB-35	116, 116 162, 155
8260B	Volatile Organic Compounds by GC-MS	ZB-624, ZB-624*PLUS*		157, 140
8270D	Semi-volatile Organic Compounds by GC-MS	ZB-SemiVolatiles		114
8272	Polynuclear Aromatic Hydrocarbons (PAHs) by SPME and GC-MS with Selected Ion Monitoring (SIM)	ZB-SemiVolatiles, ZB-35		114 155
8280B	Polychlorinated Dibenzo-P-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) By HRGC-LRMS	ZB-SemiVolatiles		114
8290A	Polychlorinated Dibenzo-P-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) By HRGC/HRMS	ZB-SemiVolatiles		114
8410	Semi-Volatile Organic Compounds by GC-FTIR	ZB-SemiVolatiles		114
8430	Bis(2-chloroethyl) Ether and Hydrolysis Products by Direct Aqueous Injection GC-FTIR	ZB-WAX*PLUS*		138

Air

Method #	Description	Primary Column	Page
TO-1	Volatile Organic Compounds by Thermal Adsorption and GC-MS	ZB-1*PLUS*™	132
TO-2	Volatile Organic Compounds by Carbon Molecular Sieve Adsorption and GC-MS	ZB-1*PLUS*	132
TO-3	Volatile Organic Compounds by Cryogenic Preconcentration Techniques and GC-FID /ECD	ZB-1*PLUS*	132
TO-4A	Pesticides and Polychlorinated Biphenyls (PCBs) by High Volume Polyurethane Foam (PUF) Sampling and GC	ZB-MultiResidue-1	118
TO-7	N-Nitrosodimethylamine by GC-MS	ZB-WAX*PLUS*	138
TO-9A	Polychlorinated, Polybrominated, and Brominated/Chlorinated Dibenzo-p-Dioxins and Dibenzofurans by HRGC/HRMS	ZB-SemiVolatiles	114
TO-10A	Pesticides and Polychlorinated Biphenyls (PCBs) by Low Volume Polyurethane Foam (PUF) Sampling and GC	ZB-MultiResidue-1	118
TO-13A	Polycyclic Aromatic Hydrocarbons (PAHs) by GC-MS	ZB-SemiVolatiles	114
TO-14A	Volatile Organic Compounds by Specially Prepared Canisters and GC	ZB-1*PLUS*	132
TO-15	Volatile Organic Compounds by Specially Prepared Canisters and GC-MS	ZB-1*PLUS*	132

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	118
	Organochlorine Pesticides in Water	ZB-MultiResidue-1 and -2	118
	Organochlorine Pesticides in Foods of Plant Origin	ZB-MultiResidue-1 and -2	118
	Organophosphorus Pesticides in Foods of Plant Origin	ZB-MultiResidue-1 and -2	118
	Triazine Pesticides in Water	ZB-50	156
	Triazine Pesticides in Foods of Plant Origin	ZB-50	156
	Chloramphenicol in Foods of Animal Origin	ZB-1*PLUS*™	132
Environmental Contaminants	Polybrominated Diphenyl Ethers (PBDEs) in Food	ZB-5MS*PLUS*™, ZB-SemiVolatiles, ZB-35	136, 114, 155
	Polychlorinated Biphenyls (PCBs) in Water	ZB-MultiResidue-1, ZB-XLB-HT Inferno™	118, 150
	Polychlorinated Dibenzo-dioxins (PCDDs) in Food	ZB-5MS*PLUS*, ZB-SemiVolatiles	136, 114
	Polychlorinated Dibenzo-furans (PCDFs) in Food	ZB-5MS*PLUS*, ZB-SemiVolatiles	136, 114
	Polycyclic Aromatic Hydrocarbons (PAHs) in Water	ZB-PAH-EU, ZB-PAH-CT, ZB-5MS*PLUS*, ZB-SemiVolatiles, ZB-35	106,110,136, 114, 155
Food Contact Materials	Food Packaging Volatiles	ZB-624, ZB-624*PLUS*™	157, 140
	Dioxins and Furans in Food	ZB-Dioxin	102
	Melamine in Food	ZB-XLB-HT Inferno	150
	Cyanuric Acid in Food	ZB-XLB-HT Inferno	150
	Phthalates in Food	ZB-5MS*PLUS*	136
	Residual Solvents in Food	ZB-624, ZB-624*PLUS*, ZB-WAX*PLUS*	157, 140, 138
	Bisphenol A & F (BPA/BPF) in Food	ZB-5MS*PLUS*	136
Additives & Preservatives	Parabens in Food	ZB-5MS*PLUS*	136
	Chloropropanols (3-MCPD) in Food	ZB-5MS*PLUS*	136
	Flavor Additives (Borneol)	ZB-MultiResidue-1	118
	Phenolic Antioxidants (BHA & BHT) in Food	ZB-50	156
	Tocopherols in Food	ZB-5MS*PLUS*	136
Process Contaminants	Acrylamide in Foods	ZB-5HT Inferno	146
	Acrylamide, Acrylonitrile, and Acrolein in Water	ZB-624, ZB-624*PLUS*	157, 140
	Benzene in Food	ZB-WAX*PLUS*	138
	Glycols in Food	ZB-WAX*PLUS*	138
Hormones	Steroid Hormones in Food	ZB-5MS*PLUS*, ZB-1*PLUS*	136, 132

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	112
	Marine Oil Fatty Acid Methyl Esters (FAMEs)	ZB-FAME	112
	Saw Palmetto Fatty Acid Methyl Esters (FAMEs)	ZB-FAME	112
	Free Fatty Acids	ZB-FFAP	161
	Essential Fatty Acids (EFAs) Omega-3 and Omega-6	ZB-FAME	112
Triglycerides	Butter, Canola Oil, Olive Oil, and Peanut Oil Triglycerides	ZB-5HT Inferno™	146
Alcoholic Beverages	Cognac Compounds	ZB-WAX*PLUS*™	138
	Distilled Liquor Screen	ZB-FFAP	161
	Ethanol in Beer	ZB-Bioethanol	122
	Sulfur in Beer	ZB-1*PLUS*™	132
	Whiskey Compounds	ZB-WAX*PLUS*	138
	Wine Compounds	ZB-WAX, ZB-WAX*PLUS*	160, 138
Other Acids	Organic Acids	ZB-FFAP	160
	Amino Acids	ZB-50	156
Sterols	Sterols in Lard, Margarine, Peanut Butter, or Olive Oil	ZB-5HT Inferno	146
Sugars	Alditol Acetates	ZB-5MS*PLUS*™	136
	Trimethylsilyl (TMS) Sugars	ZB-MultiResidue™-1	118

Flavors & Fragrances

Compound Class	Analysis	Recommended Columns	Page
Essential Oils	Cold-Pressed Orange Oil	ZB-WAX*PLUS*	138
	Ginkgo Biloba Oil, Lavender Oil, and Ylang Ylang Oil	ZB-1*PLUS*	132
	Peppermint Oil	ZB-WAX	160
	Rose Oil	ZB-XLB	162
	Spearmint Oil	ZB-5MS*PLUS*	136
Flavors	Flavors Screening	ZB-FFAP	161
	Flavor Allergens	ZB-5MS*PLUS*	136
	Flavor Volatiles	ZB-1*PLUS*, ZB-WAX*PLUS*, ZB-624	132, 138, 157
	Alcoholic Beverage Profile	ZB-FFAP	161
	Honey Profile	ZB-WAX*PLUS*	138
Fragrances	Fragrance Screening	ZB-WAX*PLUS*, ZB-624	138, 157
	Fragrance Allergens	ZB-1*PLUS*	132

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™	152, 132, 144
G2	Dimethylpolysiloxane Gum	ZB-1, ZB-1*PLUS*, ZB-1HT Inferno	152, 132, 144
G3	50 % Phenyl 50 % Methylpolysiloxane	ZB-50	156
G5	Not less than 70 % of 3-Cyanopropylpolysiloxane	ZB-FAME	112
G8	80 % Bis (3-Cyanopropyl-20 % 3-Cyanopropylphenylpolysiloxane)	ZB-FAME	112
G9	Methylvinylpolysiloxane	ZB-1*PLUS*, ZB-1HT Inferno, ZB-1	132, 144, 152
G14	Polyethylene Glycol (Average MW 950-1,050)	ZB-WAX, ZB-WAX*PLUS*™	160, 138
G15	Polyethylene Glycol (Average MW 3,000-3,700)	ZB-WAX, ZB-WAX*PLUS*	160, 138
G16	Polyethylene Glycol (Average MW 15,000)	ZB-WAX, ZB-WAX*PLUS*	160, 138
G17	75 % Phenyl 25 % Methylpolysiloxane	ZB-50	156
G20	Polyethylene Glycol (Average MW of 380-420)	ZB-WAX, ZB-WAX*PLUS*	160, 138
G25	Polyethylene Glycol TPA (Carbowax 20M Terephthalic Acid)	ZB-FFAP	161
G27	5 % Phenyl 95 % Methylpolysiloxane	ZB-5, ZB-5*PLUS*™, ZB-5HT Inferno	153, 134, 146
	5 % Phenyl-Arylene 95 % Methylpolysiloxane	ZB-5ms, ZB-5MS*PLUS*™, ZB-SemiVolatiles	154, 136, 114
G28	25 % Phenyl 75 % Methylpolysiloxane	ZB-35, ZB-35HT Inferno	155, 148
G32	20 % Phenylmethyl 80 % Dimethylpolysiloxane	ZB-35, ZB-35HT Inferno	155, 148
G35	Polyethylene Glycol & Diepoxide Esterified with Nitroterephthalic Acid	ZB-FFAP	161
G36	1 % Vinyl 5 % Phenylmethylpolysiloxane	ZB-5, ZB-5*PLUS*, ZB-5HT Inferno	153, 134, 146
G38	Phase G1 Plus A Tailing Inhibitor	ZB-1, ZB-1*PLUS*, ZB-1HT Inferno	152, 132, 144
G39	Polyethylene Glycol (Average MW 1,500)	ZB-WAX, ZB-WAX*PLUS*™	160, 138
G41	Phenylmethyldimethylsilicone (10 % Phenyl Substituted)	ZB-5, ZB-5*PLUS*, ZB-5HT Inferno	153, 134, 146
G42	35 % Phenyl 65 % Dimethylpolysiloxane	ZB-35, ZB-35HT Inferno	155, 148
G43	6 % Cyanopropylphenyl 94 % Dimethylpolysiloxane	ZB-624, ZB-624*PLUS*™	157, 140
G46	14 % Cyanopropylphenyl 86 % Methylpolysiloxane	ZB-1701, ZB-1701P	158, 159
G47	Polyethylene glycol (average MW 8,000)	ZB-WAX*PLUS* , ZB-WAX	138, 160
G48	Highly polar, partially cross-linked cyanopolysiloxane	ZB-FAME	112
G51	50 % Phenyl - 50 % Dimethylpolysiloxane phase which is modified with an aromatic selector for optimized separation of polycyclic aromatic hydrocarbons (PAH)	ZB-PAH-CT, ZB-PAH-EU	110,106

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*	157, 140
Procedure B	G16 (Polyethylene Glycol)	ZB-WAX*PLUS*	138
Procedure C	G43 or G16	ZB-624*PLUS* or ZB-WAX*PLUS*	140, 138

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	152
D 2268	Analysis of n-heptane and iso-octane (high purity)	ZB-1	152
D 2306-96	Xylene isomers	ZB-WAX, ZB-WAX*PLUS*™	160, 138
D 2426	Butadiene and styrene in butadiene concentrates	ZB-1	152
D 2504	Non-condensable gases in C1-C3 hydrocarbons	ZB-1 (thick phase)	152
D 2580	Phenols in water	ZB-WAX*PLUS*	138
D 2600	Aromatic traces in light saturated hydrocarbons	ZB-WAX	160
D 2804	Purity of methyl ethyl ketone	ZB-WAX	160
D 2887	SimDist analysis of petroleum fractions	ZB-1, ZB-1XT SimDist	152, 124
D 2908	Volatile organics in water	ZB-WAX, ZB-WAX*PLUS*	160, 138
D 2998	Polyhydric alcohols in alkyd resins	ZB-1	152
D 2999	Monopentaerythritol in commercial pentaerythritol	ZB-1	152
D 3009	Composition of turpentine	ZB-WAX*PLUS*	138
D 3054	Purity and benzene content of cyclohexane	ZB-1	152
D 3086	Organochlorine pesticides in water	ZB-CLPesticides-1 or -2, ZB-MultiResidue™-1 or -2	116, 118
D 3168	Polymers in emulsion paints	ZB-1	152
D 3271	Solvent analysis in paints	ZB-WAX*PLUS*	138
D 3304	PCBs in environmental materials	ZB-MultiResidue-1 or -2	118
D 3328	Comparison of waterborne petroleum oils	ZB-1	152
D 3329	Purity of methyl isobutyl ketone	ZB-WAX*PLUS*	138
D 3432	Toluene diisocyanates in urethane prepolymers	ZB-1	152
D 3447	Purity of trichlorotrifluoroethane (CFC-113)	ZB-1, ZB-624	152, 157
D 3452	Identification of rubber	ZB-1HT Inferno™	144
D 3465	Purity of monomeric plasticizers	ZB-1	152
D 3524	Diesel fuel in lubricating oil (SAE 30)	ZB-1HT Inferno	144
D 3534	PCBs in water	ZB-5, ZB-5*PLUS*™	153, 134
D 3606	Benzene and toluene in gasoline	ZB-1	152
D 3687	Volatile organic compounds	ZB-WAX, ZB-WAX*PLUS*	160, 138
D 3710	Gasoline fractions	ZB-1XT SimDist	124
D 3725	Fatty acids in drying oils	ZB-FFAP	161
D 3760	Analysis of cumene	ZB-WAX, ZB-WAX*PLUS*	160, 138
D 3797	Analysis of o-xylene	ZB-WAX, ZB-WAX*PLUS*	160, 138
D 3798	Analysis of p-xylene impurities	ZB-WAX, ZB-WAX*PLUS*	160, 138
D 3876	Methoxyl and hydroxypropyl substitution in cellulose ether products	ZB-1	152
D 3962	Impurities in styrene	ZB-FFAP	161
D 4059	PCBs in insulating liquids	ZB-5*PLUS*, ZB-5HT Inferno	134, 146
D 4275	Butylated hydroxy toluene in ethylene and ethylenevinylacetate polymers	ZB-1	152
D 4367	Benzene in hydrocarbon solvent	ZB-1	152
D 4420	Aromatics in gasoline	ZB-1	152
D 4735	Thiophene impurities in benzene	ZB-FFAP	161
D 4768	Phenol and cresol inhibitors in insulating oils	ZB-FFAP	161
D 5060	Impurities in ethylbenzene	ZB-FFAP, ZB-WAX, ZB-WAX*PLUS*	161, 160, 138
D 5134	Petroleum naphthas through n-nonane	ZB-1, ZB-DHA-PONA	152, 126
D 5135-95	Analysis of styrene	ZB-WAX, ZB-WAX*PLUS*	160, 138
D 5441	Analysis of Methyl Tert-Butyl Ether (MTBE)	ZB-DHA-PONA	126
D 5501	Determination of denatured bioethanol	ZB-1, ZB-Bioethanol, ZB-DHA-PONA	152, 122, 126
D 5580	Aromatics in finished gasoline	ZB-1	152
D 6352	Extended SimDist	ZB-1HT Inferno, ZB-1XT SimDist	144, 124
D 6584	Determination of glycerine in biodiesel	ZB-5HT Inferno	146
D 6729-30, D 6733	Components in spark ignition fuels	ZB-DHA-PONA	126
D 7169	Crude Oil; Vacuum distillates	ZB-1XT SimDist	124
E 0202	Analysis of glycols	ZB-WAX*PLUS*, ZB-1	138, 152
E 1100	Analysis of denaturated ethanol	ZB-WAX*PLUS*, ZB-Bioethanol	138, 122

Essentials

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

- ZB-1
- ZB-5
- ZB-5ms
- ZB-35
- ZB-50
- ZB-624
- ZB-1701
- ZB-1701P
- 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-PAH-EU
- ZB-PAH-CT
- ZB-Dioxin
- 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 Products

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-Dioxin

Improve Lab Productivity by 50 %

- **Fast PCB analysis**
- **Enhanced resolution of TCDD and TCDF**
- **Improved column lifetime with integrated guard column option**
- **MS certified, low bleed GC column**

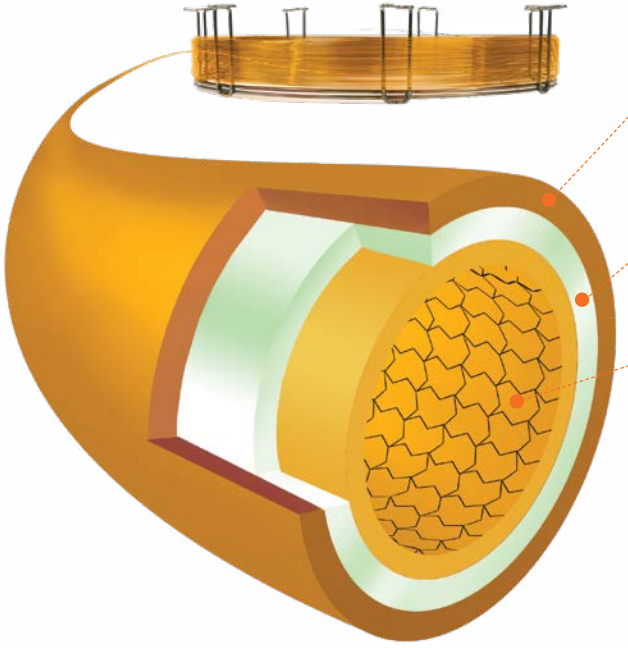
Upgrade to Zebron from traditional phases used for Dioxin analysis:

Agilent®
- DB®-5MSUI
- DB-Dioxin
- DB-225

Restek®
- Rtx®-Dioxin2

Supelco®
- SP®-2330

Why Choose ZB-Dioxin?



A Proprietary Phenyl phase which provides improved resolution of critical dioxin isomers

Intermediate polarity and thin film (60 meter x 0.20 µm x 0.25 mm) to **reduce analysis times** and **increase productivity**

Extensive cross-linking through ESC™ (Engineered Self Cross-Linking™) for low bleed and high temperature stability to minimize GC-MS maintenance and system downtime.

ZB-Dioxin for Fast Dioxin and PCB Analysis

Zebron ZB-Dioxin columns are specifically tailored for the analysis of aromatic compounds like dioxins, furans and PCBs in Food and Environmental matrices. The current analysis of tetra-octa dioxin and furan is time consuming and requires two GC columns and two GC-HRMS instruments. By switching to the unique selectivity of ZB-Dioxin, you will gain enhanced resolution of 2,3,7,8-TCDD and 2,3,7,8-TCDF from its isomers in one run, with only a single ZB-Dioxin GC column. In addition, ZB-Dioxin serves as your single column solution for Dioxin and PCB analysis. Upgrade your existing GC column to a Zebron ZB-Dioxin GC column and get all the analytical benefits and productivity gains of a single column solution.

Learn more at:

www.phenomenex.com/GCDioxin

Our Customer Says YES!

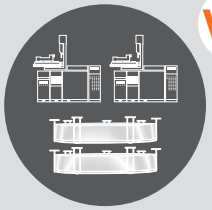
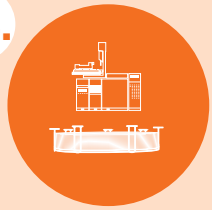
> *"The ZB-Dioxin achieves superior resolution for both 2,3,7,8-TCDD and 2,3,7,8-TCDF while not only maintaining chromatography for the hexes but actually improving it. This is all performed while reducing the overall runtime over traditional 5ms dioxin columns by as much as 25%. The ZB-Dioxin increases throughput by not only eliminating the need for a second column confirmation, but also by allowing additional samples to be analyzed in each 12-hour analytical sequence."*
>
> **Andrew Patterson,Technical Director**
> **Eurofins Specialty Services, USA**

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

ZB-Dioxin *(cont'd)*

Increase Throughput and Improve Resolution of Dioxins and PCBs by using Zebron ZB-Dioxin!

Zebron ZB-Dioxin has a unique phase that allows for improved resolution of critical dioxin and PCB congeners and its consistent film thickness allows for optimal dioxin analysis on a single column.

Traditional	ZB-Dioxin Upgrade
 VS.	
• PCB and Dioxin required 2 different GC columns	• Zebron ZB-Dioxin is a single column solution for Dioxin and PCB

Traditional	ZB-Dioxin Upgrade
 VS.	
• Higher analysis cost: 2 GC-HRMS + 2 GC columns	• Lower analysis cost: 1 GC-HRMS + 1 GC column

Traditional	ZB-Dioxin Upgrade
 VS.	
• Long run time for Dioxin analysis • First column (5 % phenyl phase) ~60 minutes • Second column (225 phase) ~30 minutes	• Faster run time using one ZB-Dioxin ~40 minutes

Traditional	ZB-Dioxin Upgrade
 VS.	
• Shorter column lifetime for difficult matrix like soil	• Longer column lifetime with ZB-Dioxin Guardian™ option (Part No: 7KG-G045-10-GGA)

Traditional	ZB-Dioxin Upgrade
 VS.	
• Lower throughput from customer perspective	• HIGH throughput from customer perspective

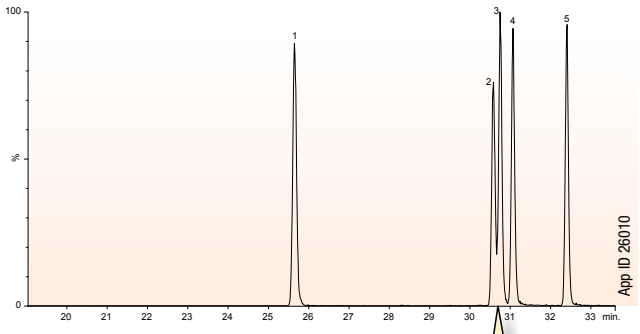
Traditional	ZB-Dioxin Upgrade
 VS.	
• Some GC Dioxin columns do not exceed 290 °C Temperature Limits	• Low Bleed GC column temp with 320/340 °C Temperature Limits, this will provide higher sensitivity for later eluters and the ability to bake out major contaminants.

ZB-Dioxin *(cont'd)*

TCDD on a Zebron ZB-Dioxin and a Popular Brand A

Zebron ZB-Dioxin GC Column

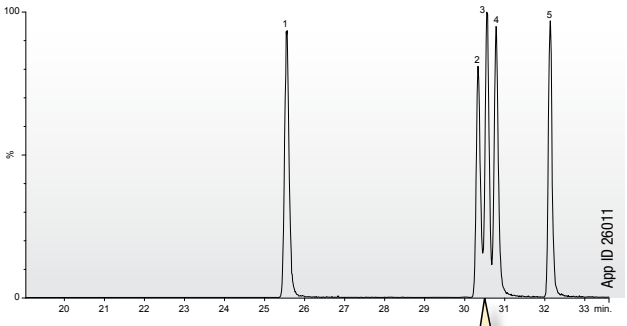
Part No. 7KG-G045-10
60 meter x 0.25 mm x 0.20 µm



High Resolution of 2,3,7,8-TCDD by using ZB-Dioxin which exceeds 25% valley EPA-1613 method requirement and provided extended lifetime

Brand A Premium 5MS Phase

60 meter x 0.25 mm x 0.25 µm



2,3,7,8-TCDD is not completely resolved which affects the column lifetime

Sample:	Run Time (min) ZB-Dioxin	Brand A
1. 1,3,6,8-TCDD	25.65	23.20
2. 1,2,3,7-TCDD	30.58	30.33
3. 1,2,3,8-TCDD	30.75	30.55
4. 2,3,7,8-TCDD	31.07	30.78
5. 1,2,8,9-TCDD	32.41	32.13

Conditions for all separations:

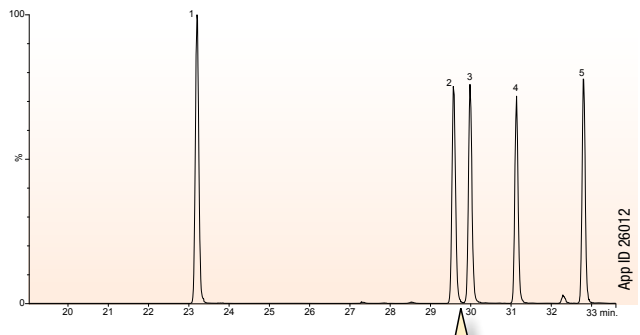
Column 1: Zebron ZB-Dioxin
Column 1 Dimension: 60 meter x 0.25 mm x 0.20 µm
Column Part No.: 7KG-G045-10
Column 2: Brand A Premium 5MS
Column 2 Dimension: 60 meter x 0.25 mm x 0.25 µm
Guard Column: 5 meter Z-Guard™ Kit
Guard Kit Part No.: 7AG-G000-00-GZK
Injection: Pulse Splitless (2.0 min, 60 psi) @ 280 °C, 1 µL
Liner: Zebron PLUS 4 mm ID Single Taper Liner
Liner Part No: AG2-0A10-05

Carrier Gas: Helium @ 1.25 mL/min (constant flow)
Oven Program: 160 °C for 2.4 min to 200 °C @ 25 °C/min to 220 °C @ 5 °C/min for 19 min to 288 °C @ 4 °C/min to 300 °C @ 5 °C/min for 7.6 min
Detector: HRMS
Transfer Line Temperature: 300 °C

TCDF on a Zebron ZB-Dioxin and a Popular Brand A

Zebron ZB-Dioxin GC Column

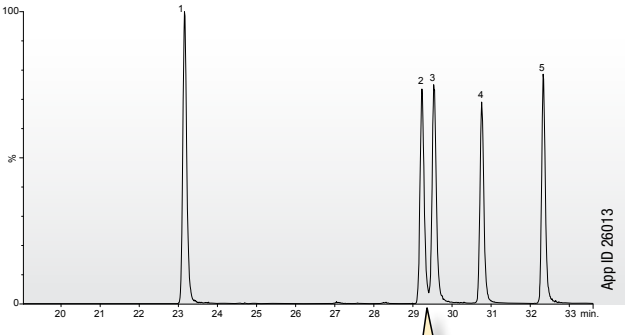
Part No. 7KG-G045-10
60 meter x 0.25 mm x 0.20 µm



Complete resolution of 2,3,7,8-TCDF on a single column ZB-Dioxin– NO NEED FOR ADDITIONAL CONFIRMATION COLUMN

Brand A Premium 5MS Phase

60 meter x 0.25 mm x 0.25 µm



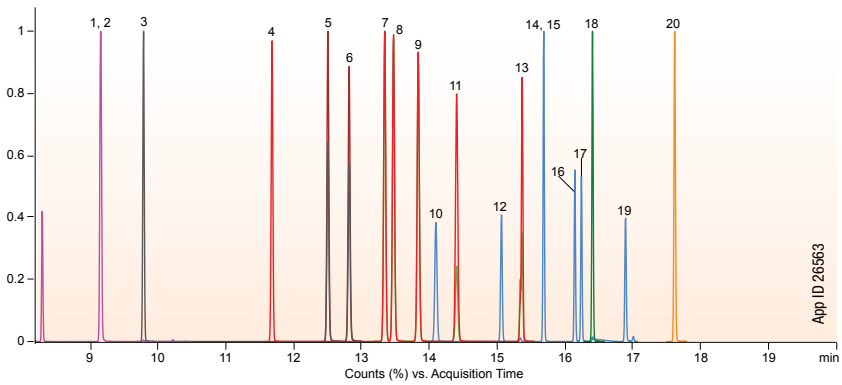
2,3,7,8-TCDF are not completely resolved and need an additional GC column to confirm isomers separation

Sample:	Run Time (min) ZB-Dioxin	Brand A
1. 1,3,6,8-TCDF	23.20	23.16
2. 1,3,4,7-TCDF	29.57	29.23
3. 2,3,7,8-TCDF	29.98	29.53
4. 1,2,3,9-TCDF	31.14	30.76
5. 1,2,8,9-TCDF	32.79	32.33

Comparative separations may not be representative of all applications.

ZB-Dioxin *(cont'd)*

Fast GC-MS/MS Analysis of PCBs on a Single 40 Meter Zebron ZB-Dioxin GC Column

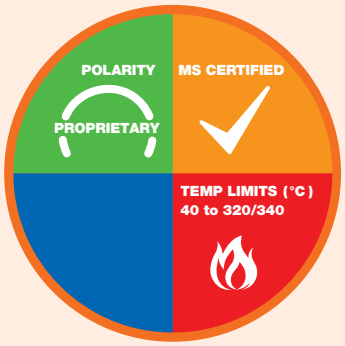


GC-MS/MS Conditions:

Column: Zebron ZB-Dioxin
Dimension: 40 meter x 0.18 mm x 0.14 µm
Part No.: 7PD-G045-47
Injection: Splitless for 1.5 min @ 290 °C, 1 µL
Recommended Liner: Zebron PLUS Z-Liner™ (Compatible with Agilent® & Thermo® GC instrument)
Part No.: AG2-0A13-05
Carrier Gas: Helium @ 0.8 mL/min (constant flow)
Oven Program: 45 °C for 0 min to 175 °C @ 50 °C/min, to 220 °C @ 15 °C/min, to 250 °C @ 5 °C/min for 3 min, to 300 °C @ 50 °C/min for 10 min
Detector: GC-MS/MS
Transfer Line Temperature: 300 °C
Mode: Scan (100-450 m/z)
Source Temperature: 300 °C
Quad Temperature: 150 °C
Solvent Delay: 8.0 min

Analyte:
1. PCB-28
2. PCB-31
3. PCB-52
4. PCB-101
5. PCB-81
6. PCB-77
7. PCB-123
8. PCB-118
9. PCB-114
10. PCB-153
11. PCB-105
12. PCB-138
13. PCB-126
14. PCB-167
15. PCB-128
16. PCB-156
17. PCB-157
18. PCB-180
19. PCB-169
20. PCB-189

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry

- Proprietary

Recommended Applications

- Dioxin and PCB in Food, Environmental Samples
- POPs in Food

Zebron GC Columns MS Certification, see p. 437

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-Dioxin GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
40-Meter			
0.18	0.14	40 to 320/340	7PD-G045-47
60-Meter			
0.25	0.20	40 to 320/340	7KG-G045-10
60-Meter with 5-Meter Guardian™ Integrated Guard			
0.25	0.20	40 to 320/340	7KG-G045-10-GGA

ZB-PAH-EU

- **Up to 70 % faster PAH analysis**
- **Elevated temperature stability (340/360 °C)**
- **Great resolution of critical isomers, e.g. Benzo[b,j,k]fluoranthene**

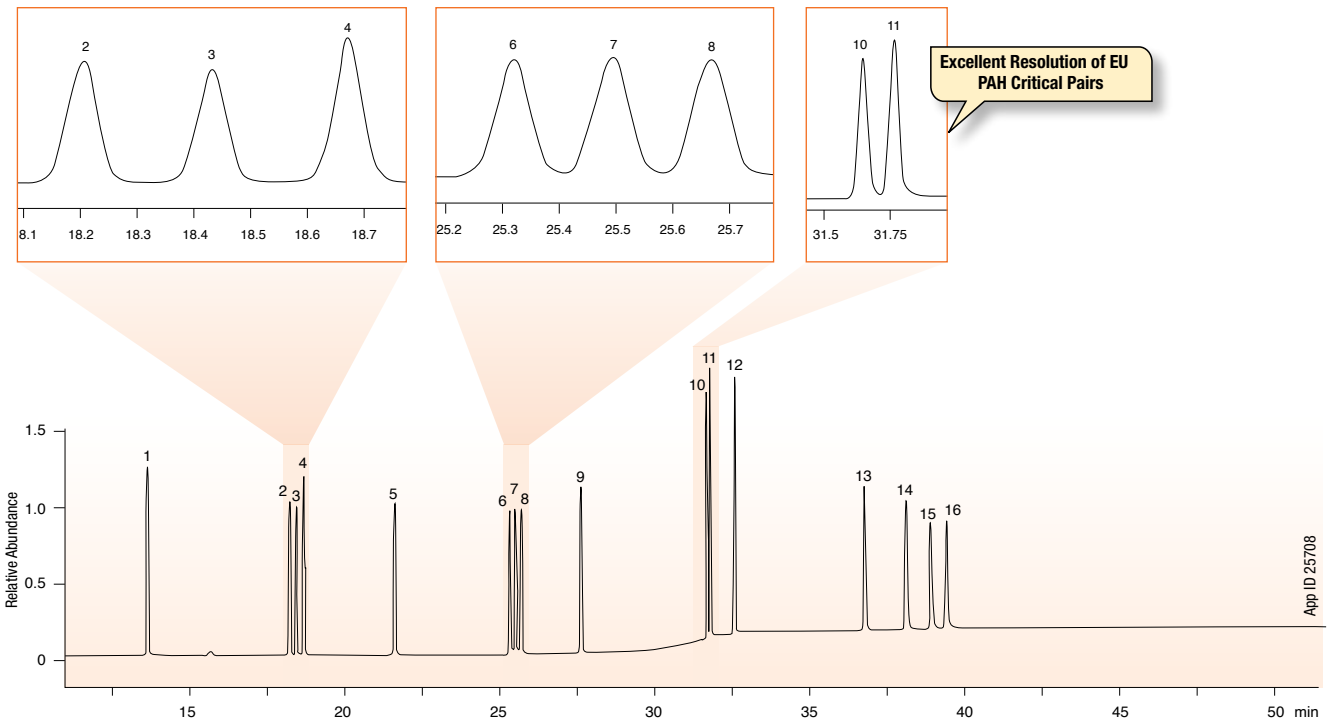
Upgrade to Zebron from traditional phases used for PAHs:

Agilent®	Restek®
• DB®-EUPAH	• Rxi®-PAH

Priority PAH Analysis by GC

Zebron ZB-PAH-EU columns are designed to move conventional PAH testing to the exceptional, Zebron GC columns come to life through a coupling of innovative spirit and technical excellence. The Zebron ZB-PAH-EU and ZB-PAH-CT offer unparalleled performance through the power of targeted selectivity when analyzing Polycyclic Aromatic Hydrocarbons (PAHs).

Analysis of EU 15+1 PAHs



GC-MS conditions:

Column: Zebron ZB-PAH-EU
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G043-10
Injection: Split 5:1 @ 330 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Carrier Gas: Helium @ 24 psi (constant pressure)
Oven Program: 45 °C for 0.8 min to 200 °C @ 45 °C/min to 226 °C @ 3 °C/min for 0 min to 320 °C @ 10 °C/min for 20 min
Detector: MSD, 50-500 m/z
Transfer Line Temperature: 300 °C
Source Temperature: 300 °C

Sample:

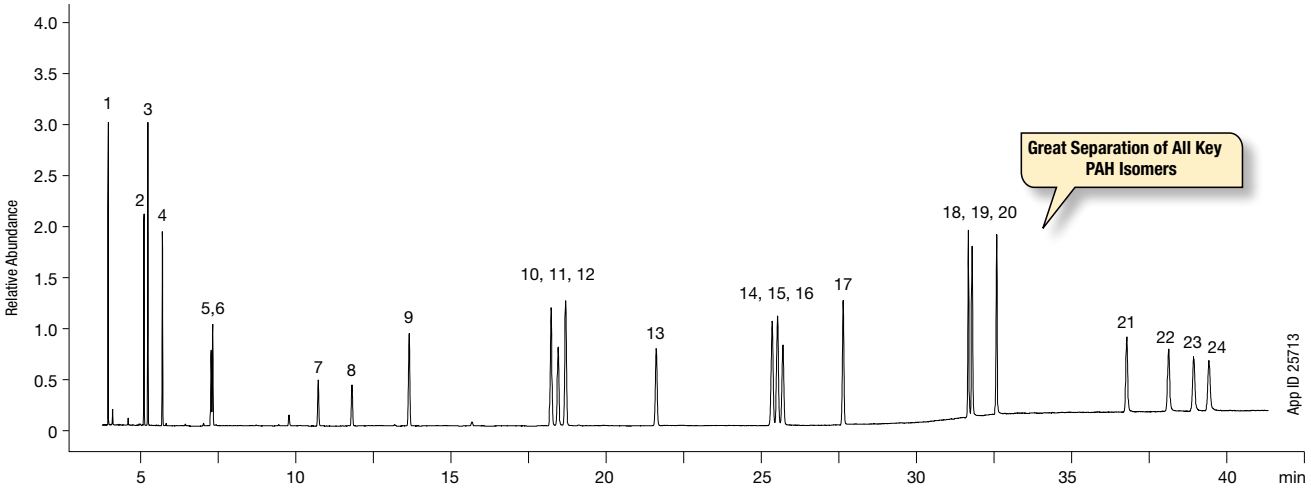
1. Benzo[c]fluorene
2. Benz[a]anthracene
3. Cyclopenta[c,d]pyrene
4. Chrysene
5. 5-Methylchrysene
6. Benzo[b]fluoranthene
7. Benzo[k]fluoranthene
8. Benzo[j]fluoranthene
9. Benzo[a]pyrene
10. Indeno[1,2,3-cd]pyrene
11. Dibenz[a,h]anthracene
12. Benzo[g,h,i]perylene
13. Dibenzo[a,l]pyrene
14. Dibenzo[a,e]pyrene
15. Dibenzo[a,i]pyrene
16. Dibenzo[a,h]pyrene

ZB-PAH-EU *(cont'd)*

Complete Resolution of EU 15+1 and EPA 610 PAHs

Zebron ZB-EU-PAH GC column demonstrates excellent resolution and accurate quantitation of European regulated EU 15+1 and EPA 610 PAHs.

Analysis of EU 15+1 and EPA 610 PAHs



GC-MS conditions:

Column: Zebron ZB-PAH-EU
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G043-10
Injection: Split 5:1 @ 330 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Carrier Gas: Helium @ 24 psi (constant pressure)
Oven Program: 45 °C for 0.8 min to 200 °C @ 45 °C/min to 226 °C @ 3 °C/min for 0 min to 320 °C @ 10 °C/min for 20 min
Detector: MSD, 50-500 m/z
Transfer Line Temperature: 300 °C
Source Temperature: 300 °C

Sample:

1. Naphthalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benzo[c]fluorene
10. Benz[a]anthracene
11. Cyclopenta[c,d]pyrene
12. Chrysene
13. 5-Methylchrysene
14. Benzo[b]fluoranthene
15. Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene
18. Indeno[1,2,3-cd]pyrene
19. Dibenz[a,h]anthracene
20. Benzo[g,h,i]perylene
21. Dibenzo[a,l]pyrene
22. Dibenzo[a,e]pyrene
23. Dibenzo[a,i]pyrene
24. Dibenzo[a,h]pyrene

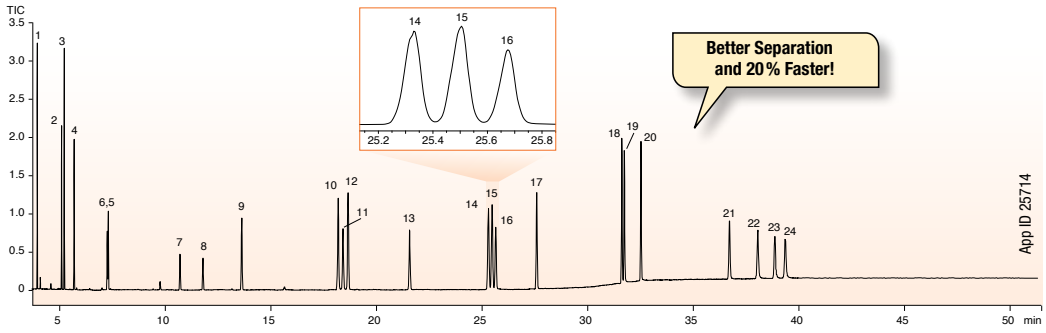
ZB-PAH-EU *(cont'd)*

Better Combination of Resolution and Speed

Zebron outperforms popular GC columns for the separation of EU 15+1 and EPA 610 PAHs.

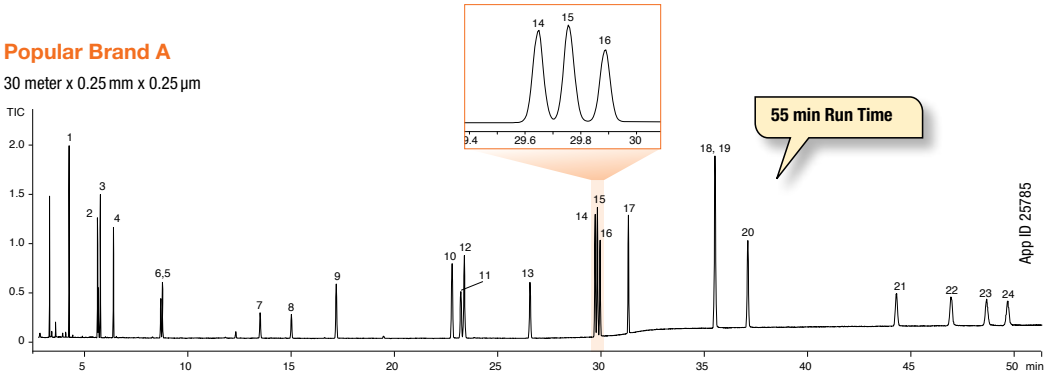
Zebron ZB-PAH-EU

30 meter x 0.25 mm x 0.20 µm



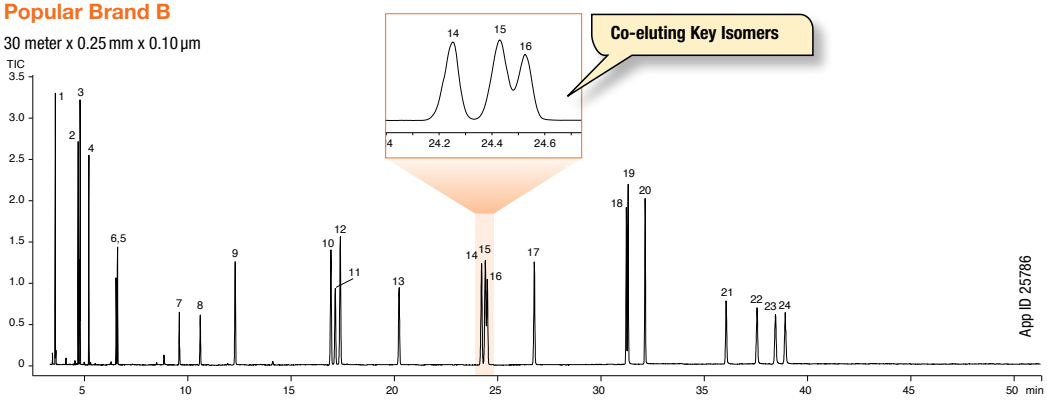
Popular Brand A

30 meter x 0.25 mm x 0.25 µm



Popular Brand B

30 meter x 0.25 mm x 0.10 µm



GC-MS conditions for both applications:

Column: As Indicated
Part No.: 7HG-G043-10 (for ZB-PAH-EU)
Dimension: As indicated
Injection: Split 5:1 @ 330 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Carrier Gas: Helium @ 24 psi (constant pressure)
Oven Program: 45 °C for 0.8 min to 200 °C @ 45 °C/min to 226 °C @ 3 °C/min for 0 min to 320 °C @ 10 °C/min for 20 min
Detector: MSD, 50-500 m/z
Transfer Line Temperature: 300 °C
Source Temperature: 300 °C

Sample:

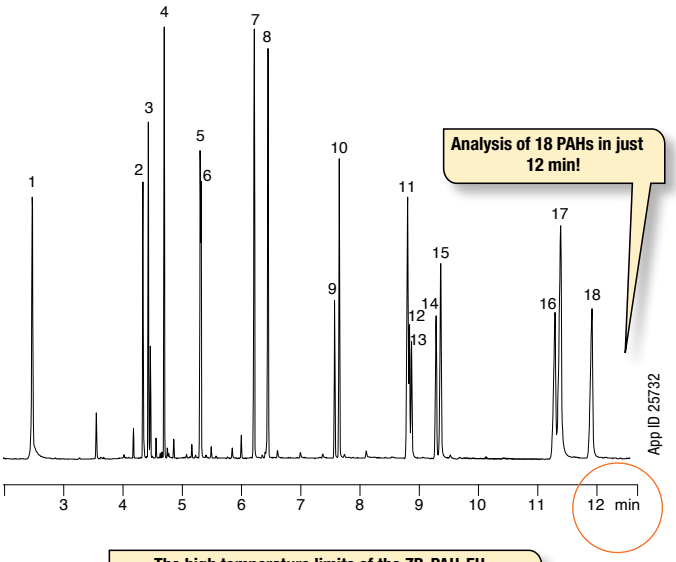
1. Naphthalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benzo[c]fluorene
10. Benz[a]anthracene
11. Cyclopenta[c,d]pyrene
12. Chrysene
13. 5-Methylchrysene
14. Benzo[b]fluoranthene
15. Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene
18. Indeno[1,2,3-cd]pyrene
19. Dibenz[a,h]anthracene
20. Benzo[g,h,i]perylene
21. Dibenzo[a,l]pyrene
22. Dibenzo[a,e]pyrene
23. Dibenzo[a,i]pyrene
24. Dibenzo[a,h]pyrene

Comparative separations may not be representative of all applications.

ZB-PAH-EU *(cont'd)*

GC-MS Analysis of PAHs in Rubber and Plastic

Zebron ZB-PAH-EU GC column separates the 18 PAH isomers within 12 minutes, resolving all critical pairs while demonstrating consistent column inertness.



Column: Zebron ZB-PAH-EU
Dimensions: 10 meter x 0.10 mm x 0.08 µm
Part No.: 7CB-G043-59
Injection: Split 5:1 @ 320 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC System)
Carrier Gas: Helium @ 0.68 mL/min (constant flow)
Oven Program: 100 °C for 3.0 min to 200 °C @ 60 °C/min to 270 °C @ 22 °C/min to 300 °C @ 4.5 °C/min to 330 °C @ 80 °C/min for 0.5 min
Detector: MSD, 50-500 m/z
Transfer Line Temperature: 300 °C
Source Temperature: 330 °C
Sample:

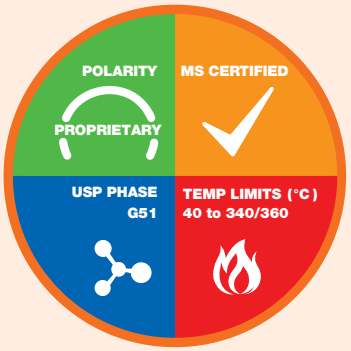
1. Naphthalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benz[a]anthracene
10. Chrysene
11. Benzo[b]fluoranthene
12. Benzo[k]fluoranthene
13. Benzo[j]fluoranthene
14. Benzo[a]pyrene
15. Benzo[e]pyrene
16. Indeno[1,2,3-cd]pyrene
17. Dibenz[a,h]anthracene
18. Benzo[g,h,i]perylene

Ordering Information

Zebron ZB-PAH-EU GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.08	40 to 340/360	7CB-G043-59
20-Meter			
0.18	0.14	40 to 340/360	7FD-G043-47
30-Meter			
0.25	0.20	40 to 340/360	7HG-G043-10
60-Meter			
0.25	0.20	40 to 340/360	7KG-G043-10

Column Profile



Phase Chemistry

- Proprietary

Recommended Applications

- Analysis of 15+1 EU-regulated and EPA regulated PAHs in food testing, rubber, plastic, coal
- Sources include cigarette smoke, vehicle exhausts, asphalt roads, coal, coal tar, wildfires, agricultural burning, residential wood burning, municipal, industrial waste incineration

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

ZB-PAH-CT

- **Enhanced resolution for chrysene and triphenylene (PAH Interferences)**
- **Increased Benzo[b,k] fluoranthene separation**
- **Optimal performance and resolution of regulated PAH isomers**
- **Great resolution of critical isomers, e.g. Benzo[b,j,k]fluoranthene**

Use the column finder to replace or upgrade an existing column:
www.phenomenex.com/FindGC

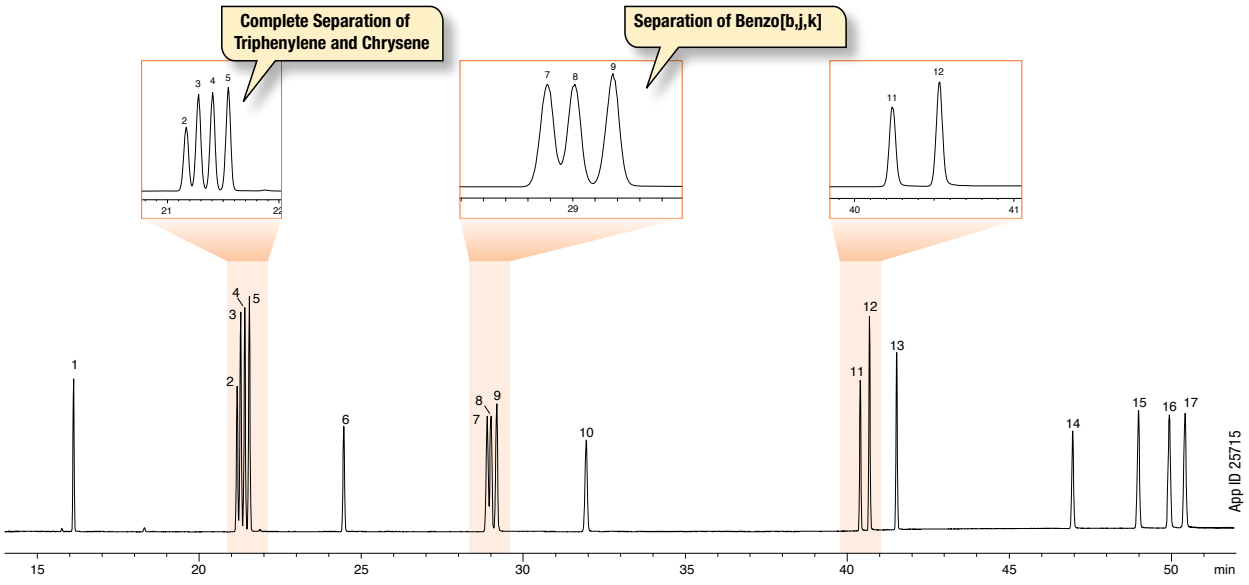
Priority PAH Analysis by GC

Zebron ZB-PAH-CT columns are manufactured to provide the most optimal performance for EU-regulated polycyclic aromatic hydrocarbons (PAHs) and EPA regulated PAHs.

Excellent Resolution of Chrysene and Triphenylene

We designed the Zebron ZB-PAH-CT GC column to achieve complete resolution of Chrysene from Triphenylene along with other EU 15+1 PAH compounds. Its unique selectivity helps eliminate false positives while resolving PAH isomers, providing easy, fast, and accurate quantification of PAHs in environmental and food samples.

EU 15+1 PAH Analysis Using Zebron ZB-PAH-CT



Column: Zebron ZB-PAH-CT
Dimensions: 40 meter x 0.18 mm x 0.14 µm
Part No.: 7PD-G044-47
Injection: Split 30:1 @ 320 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Carrier Gas: Helium @ 78 psi (constant pressure)
Oven Program: 45 °C for 0.8 min to 200 °C @ 45 °C/min to 265 °C @ 3 °C/ min for 5 min to 270 °C @ 1 °C/min to 320 °C @ 10 °C/min for 15 min
Detector: MSD (Shimadzu GC-MS-QP2010 Ultra)
Mode: SIM
SIM Ions: 216, 226, 228, 242, 252, 276, 278, 302 m/z
Transfer Line Temperature: 300 °C
Source Temperature: 300 °C

Sample:
1. Benzo[c]fluorene
2. Cyclopenta[c,d]pyrene
3. Benz[a]anthracene
4. Triphenylene
5. Chrysene
6. 5-Methylchrysene
7. Benzo[b]fluoranthene
8. Benzo[j]fluoranthene
9. Benzo[k]fluoranthene
10. Benzo[a]pyrene
11. Indeno[1,2,3-c,d]pyrene
12. Dibenz[a,h]anthracene
13. Benzo[g,h,i]perylene
14. Dibenzo[a,l]pyrene
15. Dibenzo[a,e]pyrene
16. Dibenzo[a,i]pyrene
17. Dibenzo[a,h]pyrene

ZB-PAH-CT *(cont'd)*

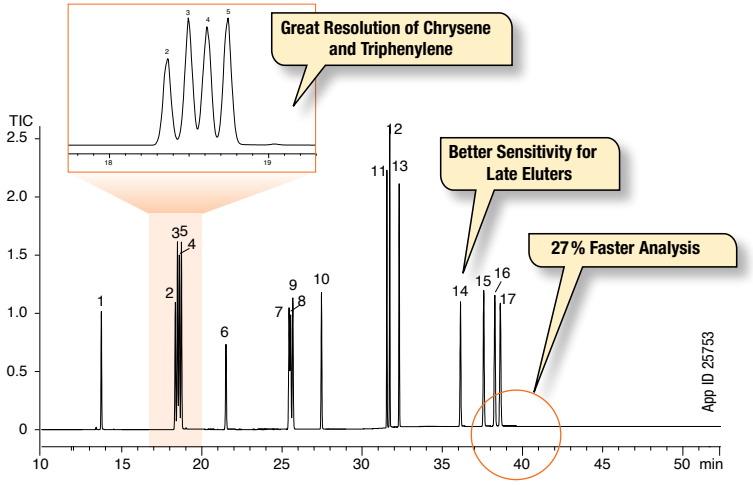
Comparison of ZB-PAH-CT vs. Popular GC PAH column

Shorter Run Time and Better Sensitivity

Analysis of EU 15+1 and Triphenylene PAHs

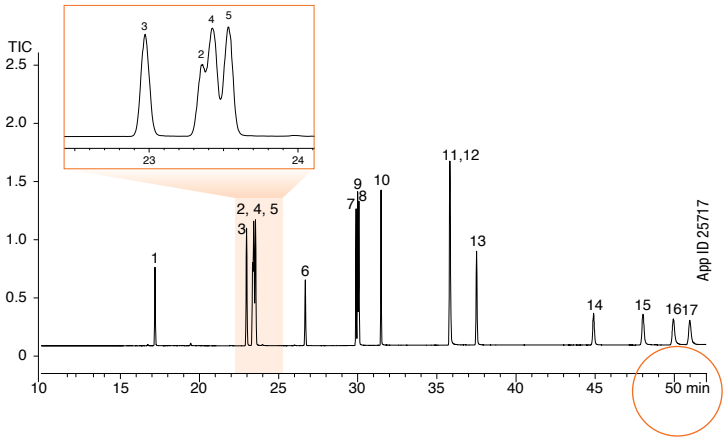
Zebron ZB-PAH-CT

30 meter x 0.25 mm x 0.20 µm



Popular Brand A

30 meter x 0.25 mm x 0.15 µm



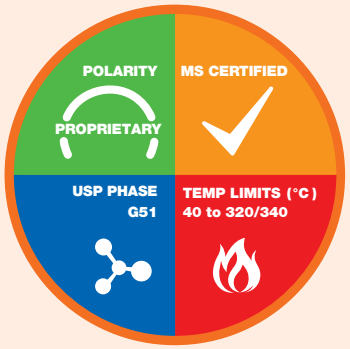
GC-MS conditions for both applications:

Column: As Indicated
Dimensions: As Indicated
Part No.: 7HG-G044-10 (Zebron ZB-PAH-CT)
Injection: Split 15:1 @ 320 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05
Carrier Gas: Helium @ 23.7 psi (constant pressure)
Oven Program: 45 °C for 0.8 min to 200 °C @ 45 °C/min to 266 °C @ 3 °C/ min for 0 min to 320 °C @ 10 °C/min to 320 °C for 20 min
Detector: MSD (Shimadzu® GC-MS-QP2010 Ultra)
Mode: SIM
SIM Ions: 216, 226, 228, 242, 252, 276, 278, 302 m/z
Transfer Line Temperature: 300 °C
Source Temperature: 300 °C

Sample:
1. Benzo[c]fluorene
2. Cyclopenta[c,d]pyrene
3. Benz[a]anthracene
4. Triphenylene
5. Chrysene
6. 5-Methylchrysene
7. Benzo[b]fluoranthene
8. Benzo[j]fluoranthene
9. Benzo[k]fluoranthene
10. Benzo[a]pyrene
11. Indeno[1,2,3-c,d]pyrene
12. Dibenz[a,h]anthracene
13. Benzo[g,h,i]perylene
14. Dibenzo[a,l]pyrene
15. Dibenzo[a,e]pyrene
16. Dibenzo[a,i]pyrene
17. Dibenzo[a,h]pyrene

Comparative separations may not be representative of all applications.

Column Profile



Phase Chemistry

- Proprietary

Recommended Applications

- Analysis of 15+1 EU-regulated and EPA regulated PAHs in food testing, rubber, plastic, coal
- Sources include cigarette smoke, vehicle exhausts, asphalt roads, coal, coal tar, wildfires, agricultural burning, residential wood burning, municipal, industrial waste incineration.

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-PAH-CT GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.10	40 to 320/340	7CB-G044-02
20-Meter			
0.18	0.14	40 to 320/340	7FD-G044-47
30-Meter			
0.25	0.20	40 to 320/340	7HG-G044-10
40-Meter			
0.18	0.14	40 to 320/340	7PD-G044-47

ZB-FAME

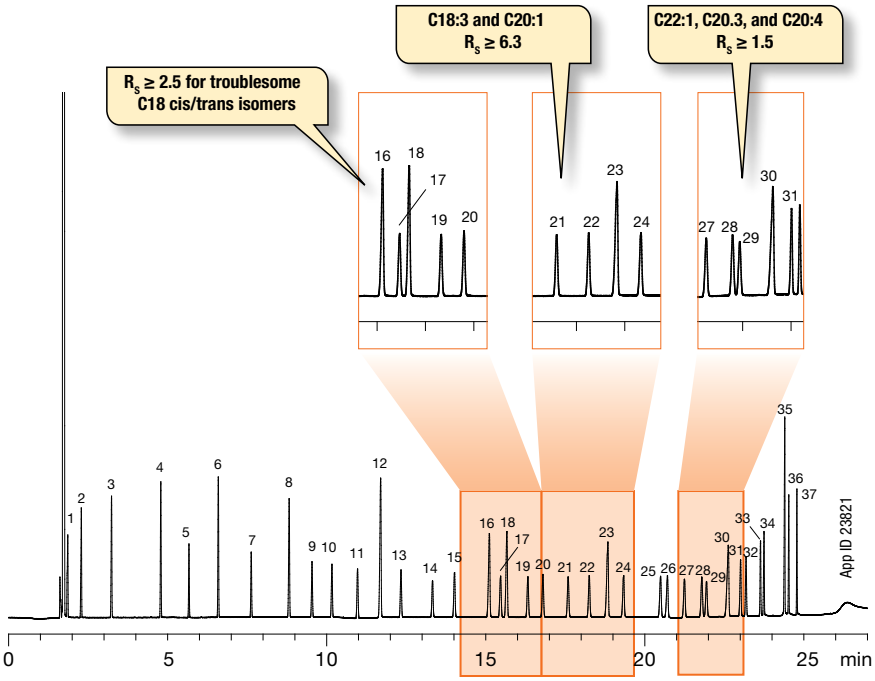
- **Reduce traditional run times up to 75 %**
- **Improve separation of cis/trans FAME isomers**
- **Suitable with AOAC, AOCS, and IOC methods**

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

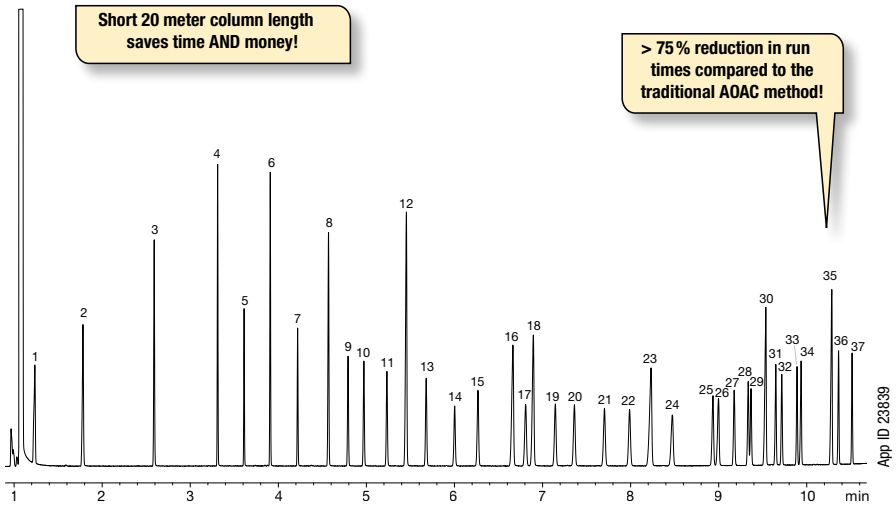


Column: Zebron ZB-FAME
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G033-10
Injection: Split 50:1 @ 240 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper with Wool, 4 mm ID
Liner Part No.: AG2-0A11-05 (for Agilent® systems)
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 100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

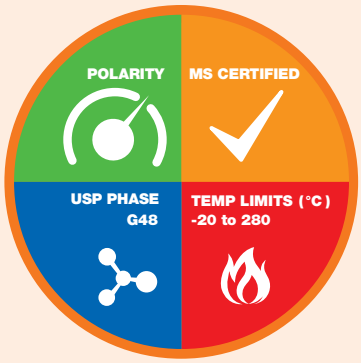
Ordering Information

Zebron ZB-FAME GC Columns

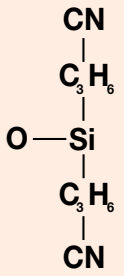
ID (mm)	df (µm)	Temp. Limits °C	Part No.
20-Meter			
0.18	0.15	-20 to 280	7FD-G033-05
30-Meter			
0.25	0.20	-20 to 280	7HG-G033-10
30-Meter with 5-Meter Guardian™ Integrated Guard			
0.25	0.20	-20 to 280	7HG-G033-10-GGA
60-Meter			
0.25	0.20	-20 to 280	7KG-G033-10
100-Meter			
0.25	0.20	-20 to 280	7MG-G033-10

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, 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

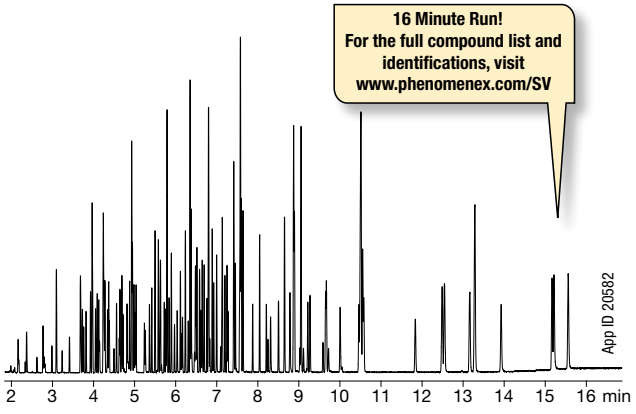
Restek®
- Rxi®-5Sil MS
- Rxi-5ms

Supelco®
- SLB®-5ms

135 Compounds in Under 16 Minutes

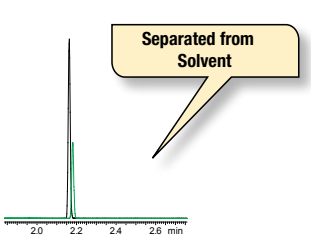
ZB-SemiVolatiles provides improved productivity with shorter run times for EPA 8270D, while maintaining resolution of key critical pairs.

Semivolatile Organic Compounds

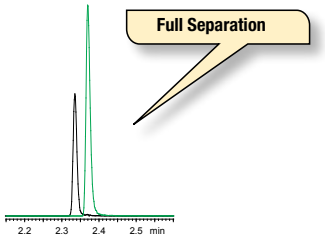


Column: Zebron ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G027-11
Injection: Split 10:1 @ 280 °C, 1 µL
Liner: AG0-8499 (Single Taper with Wool)
Septum: AG0-4697 (PhenoRed™-400)
Inlet Seal: AG0-8620 (Easy Seals™ Inlet Base Seal)
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
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

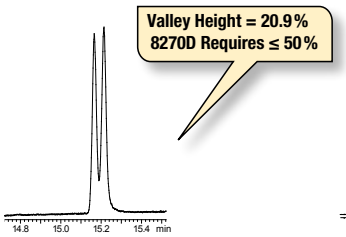
Improved Peak Shapes



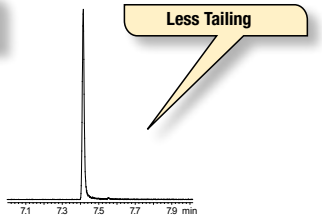
1,4-Dioxane-D8 and 1,4-Dioxane



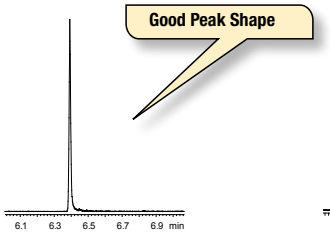
N-Nitrosodimethylamine and Pyridine



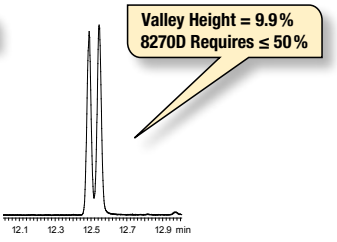
Indeno[1,2,3-cd]pyrene and Dibenz[a,h]anthracene, both share mass 276



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

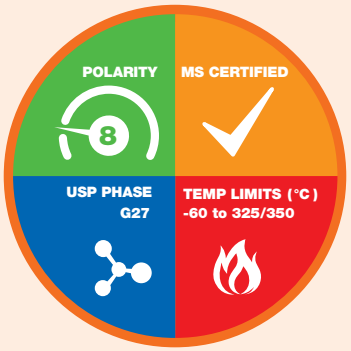
Test Probe	Criteria	EPA Requirement	Our Requirement
Pyridine Very active amine that exposes even the smallest amount of column activity. This ensures that our Enviro-Inert™ deactivated column performs at the highest possible level for difficult basic compounds.	Peak Response	Not Specified	≥ 0.6
Pentachlorophenol 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.

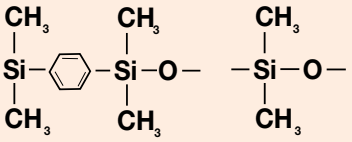
Column Profile



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
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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, 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

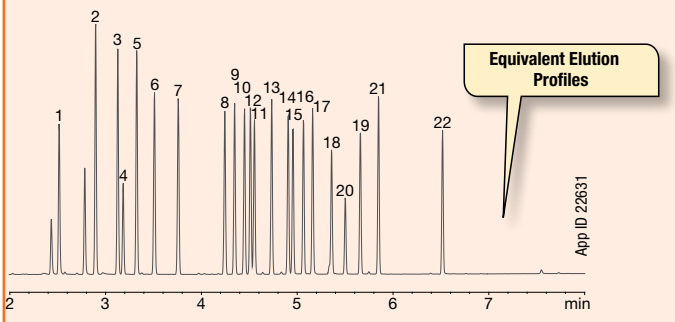
Direct Replacement for Restek Rtx-CLPesticides Phases

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.

EPA 8081

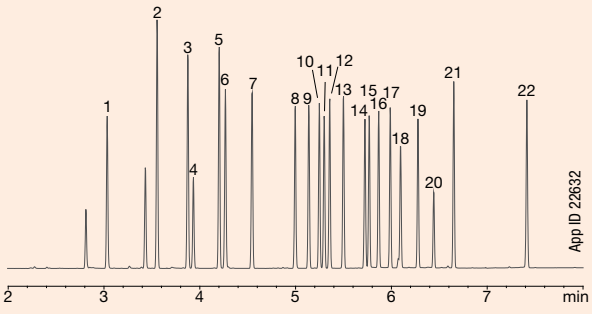
Zebron ZB-CLPesticides-1

30 m x 0.32 mm x 0.32 µm



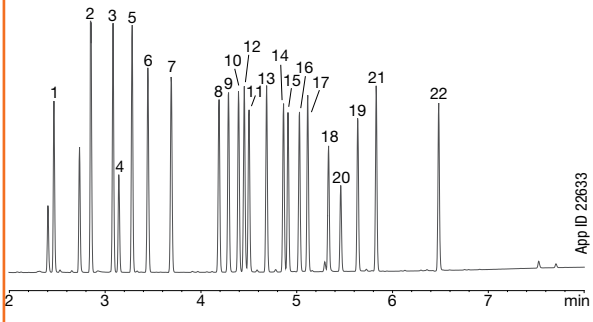
Zebron ZB-CLPesticides-2

30 m x 0.32 mm x 0.25 µm



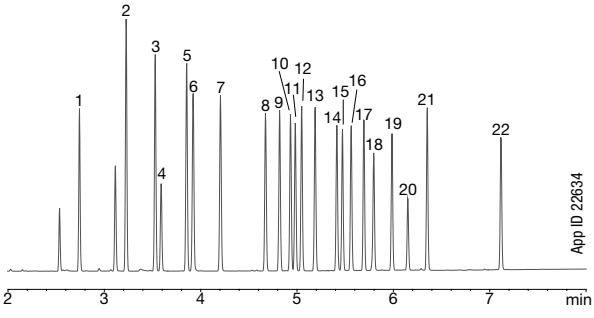
Restek Rtx-CLPesticides

30 m x 0.32 mm x 0.32 µm



Restek 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 117 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.

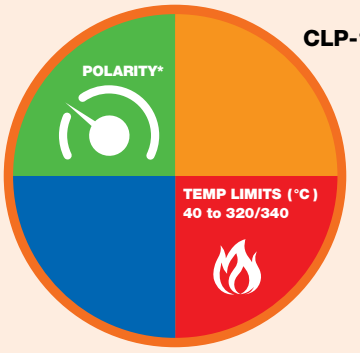
ZB-CLPesticides-1 and -2

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

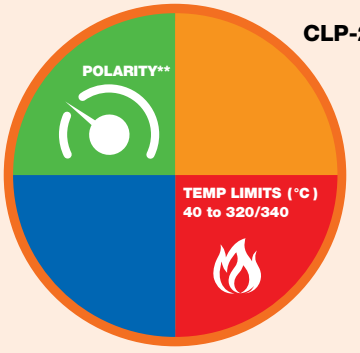
Peak No.	Analyte	ZB-CLPesticides-1 % RSD*	ZB-CLPesticides-2 % RSD*	US EPA Specifications
1	2,4,5,6-TCMX (Surr)	3.8	3.0	< 20
2	α-BHC	8.3	3.8	< 20
3	γ-BHC	5.9	5.6	< 20
4	β-BHC	6.9	6.9	< 20
5	δ-BHC	4.9	5.7	< 20
6	Heptachlor	8.0	6.5	< 20
7	Aldrin	4.2	2.3	< 20
8	Heptachlor epoxide	3.8	2.3	< 20
9	trans-Chlordane	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

0.32 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

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

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

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**

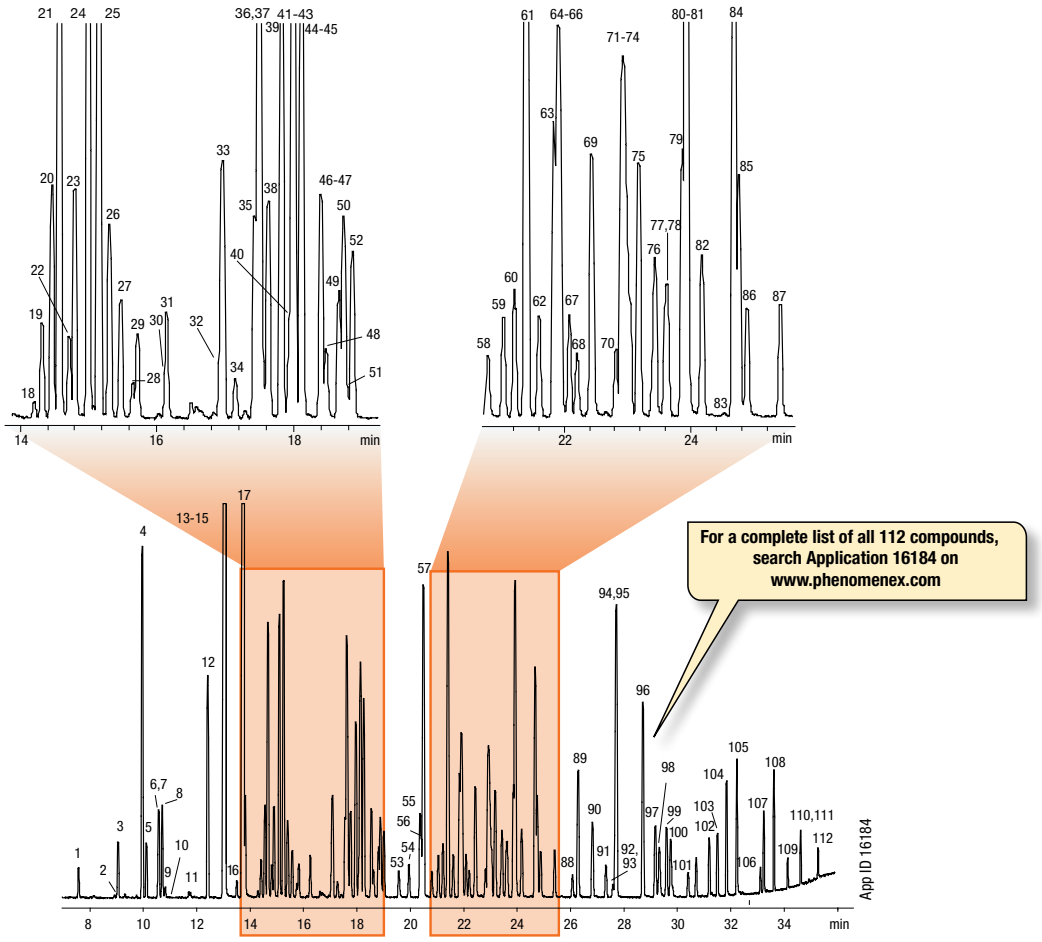
Upgrade to Zebron from these similar* phases:

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

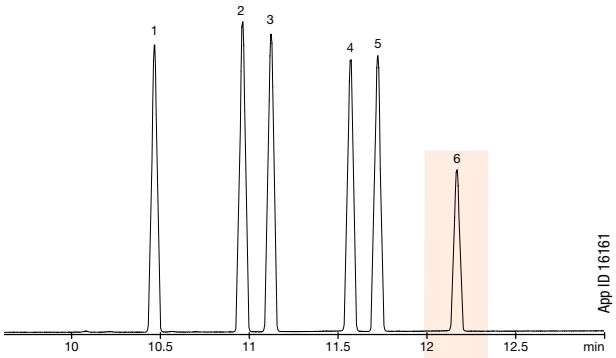


Column: Zebron MultiResidue-1
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G016-11
Injection: Splitless @ 260 °C, 1 µL
Carrier Gas: Helium @ 0.9 mL/min (constant flow)
Oven Program: 80 °C for 0.5 min to 150 °C @ 10 °C/min to 240 °C @ 4 °C/min to 320 °C @ 15 °C/min for 3 min
Detector: MSD @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

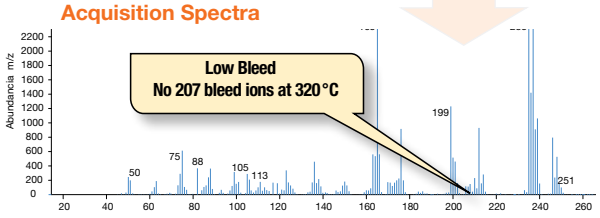
ZB-MultiResidue™-1 and -2 *(cont'd)*

Resolve Common Pesticide Isomers

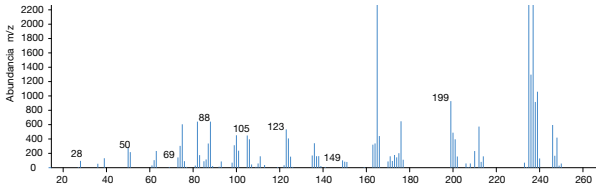
ZB-MultiResidue optimized selectivities improve resolution of complex pesticide, herbicide, and insecticide isomers. Our extremely stable siloxane-based polymer contains absolutely no nitrogen or halogenated functionality, which can be unfriendly to NPD and ECD detectors. Engineered Self-Crosslinking™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



Acquisition Spectra

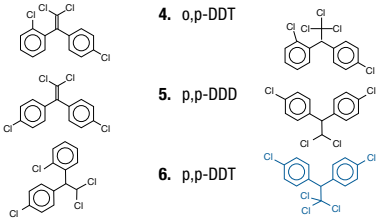


NIST Reference Spectra

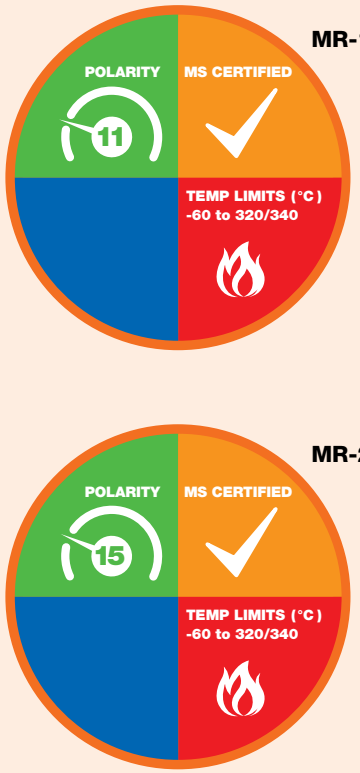


Column: Zebron ZB-MultiResidue-1
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G016-11
Injection: Splitless (hold 0.5 min) @ 260 °C, 1 µL
Carrier Gas: Helium @ 0.8 mL/min (constant flow)
Oven Program: 100 °C for 0.5 min to 200 °C @ 25 °C/min to 320 °C @ 15 °C/min for 2 min
Detector: MSD @ 320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

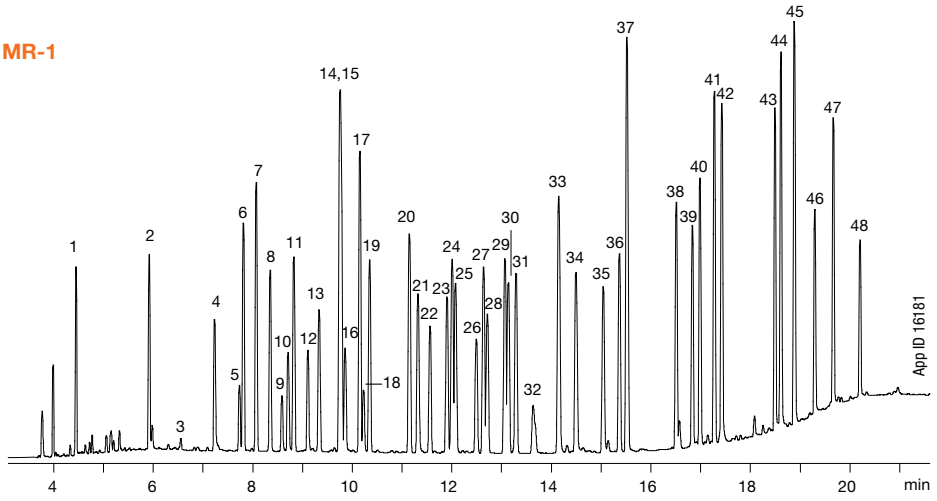
Recommended Applications

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

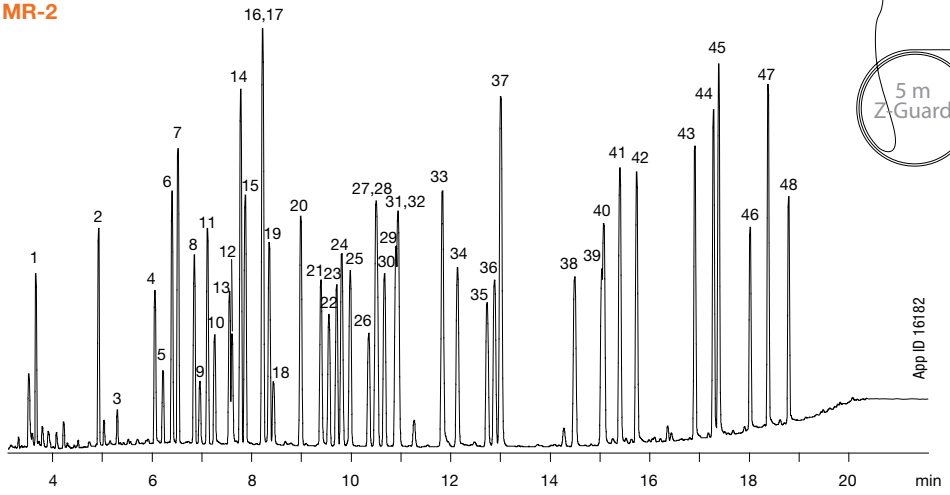
ZB-MultiResidue™-1 and -2 *(cont'd)*

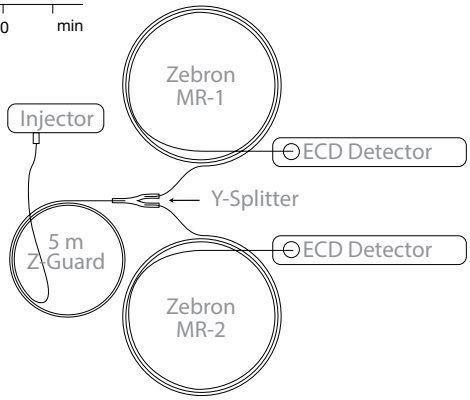
Great Results for Organophosphate Pesticides

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

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, 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	*
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

* Only available with kit order

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

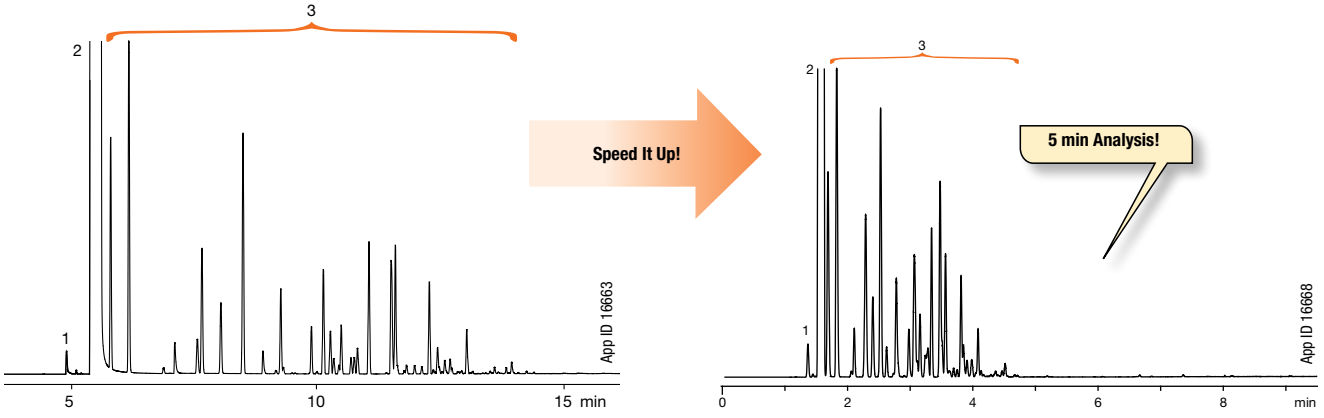
- **Specially designed for fast and accurate bioethanol testing**
- **Provides accurate and reproducible results for Certificate of Analysis (COA)**
- **Resolve methanol and ethanol from all other denaturant peaks**
- **Great resolution of fusel alcohols**
- **Allows for quick bake out in between runs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



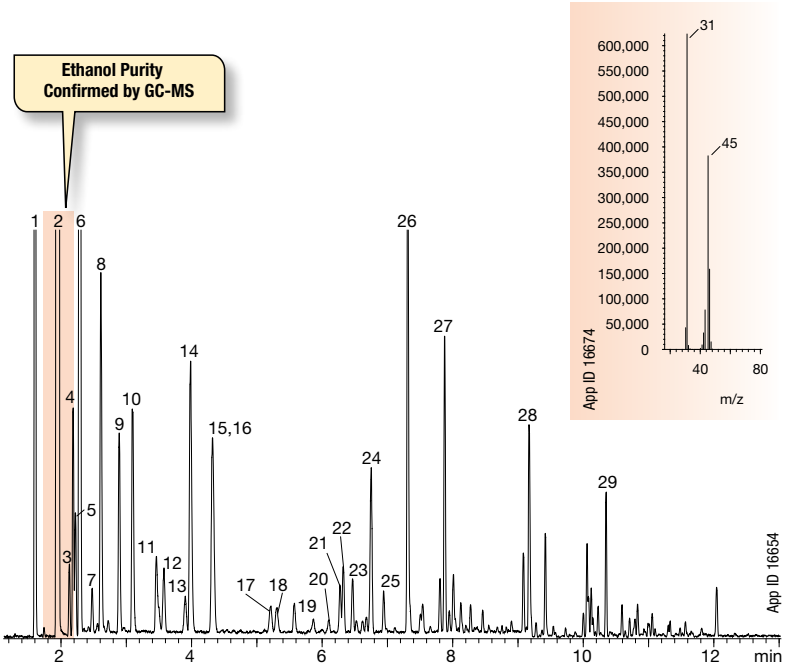
Column: Zebron ZB-1
Dimensions: 100 meter x 0.25 mm x 0.50 µm
Part No.: 7MG-G001-17
Injection: Split 50:1 @ 300 °C, 1 µL
Carrier Gas: Helium @ 35 cm/sec (constant flow)
Oven Program: 45 °C for 7 min to 255 °C @ 30 °C/min for 6 min
Detector: FID @ 300 °C
Instrument: Shimadzu® GC-2010 with Flame Ionization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

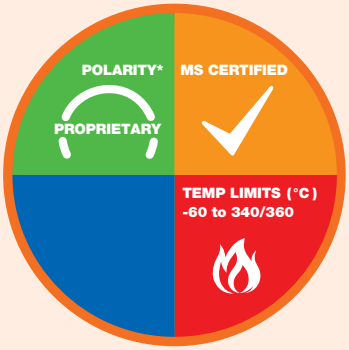
Ordering Information

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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, 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. 325

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**

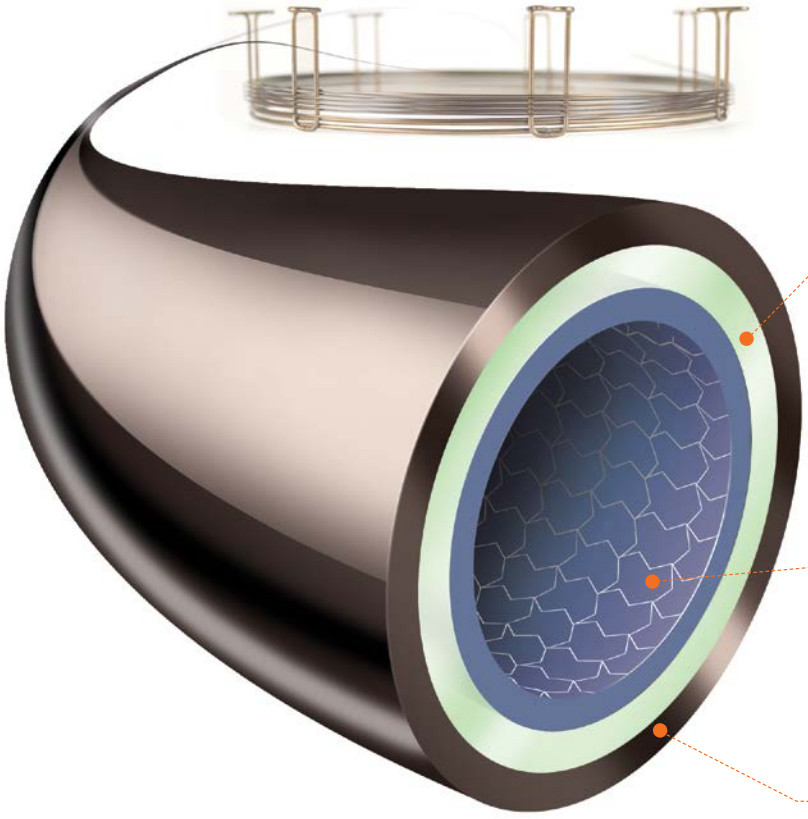
Upgrade to Zebron from any 100 % dimethylpolysiloxane phase:

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.

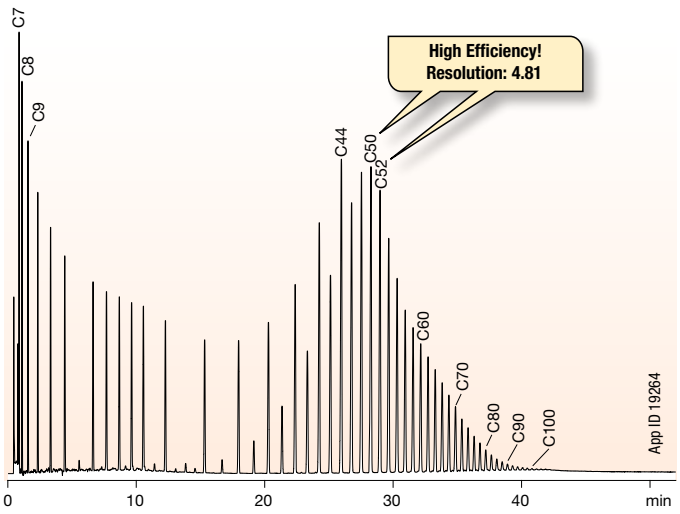
Due to the Glass Infusion, we achieve complete surface coverage with our **advanced high temperature polymer.**

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.

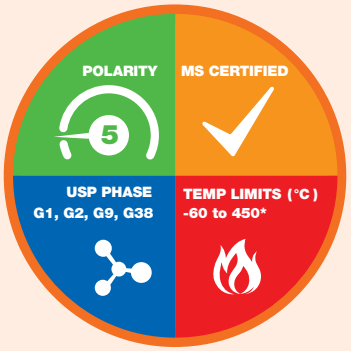
Ordering Information

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-G026-49
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
15-Meter			
0.53	0.25	-60 to 450	7EK-G026-11

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

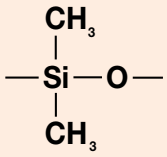
Column Profile



*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

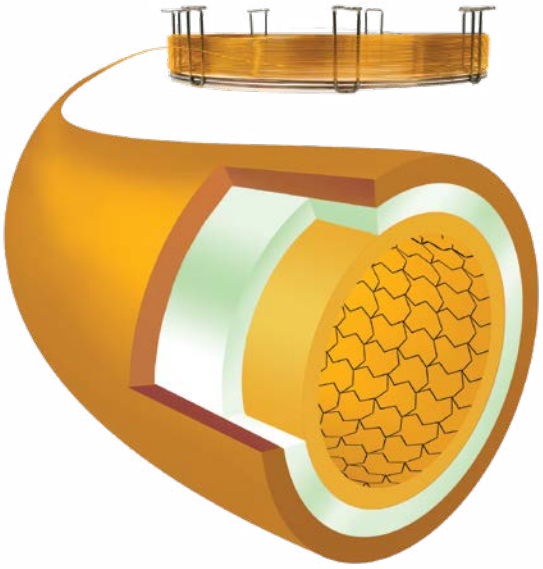
- **Excellent peak shape for polar and nonpolar compounds**
- **Temperature stability and flexibility**
- **Highly efficient dimension and consistent film thickness delivers excellent separation of paraffins, iso-paraffins, olefins, naphthenes, aromatics and polar compounds**
- **Extensive ESC™ provides 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.

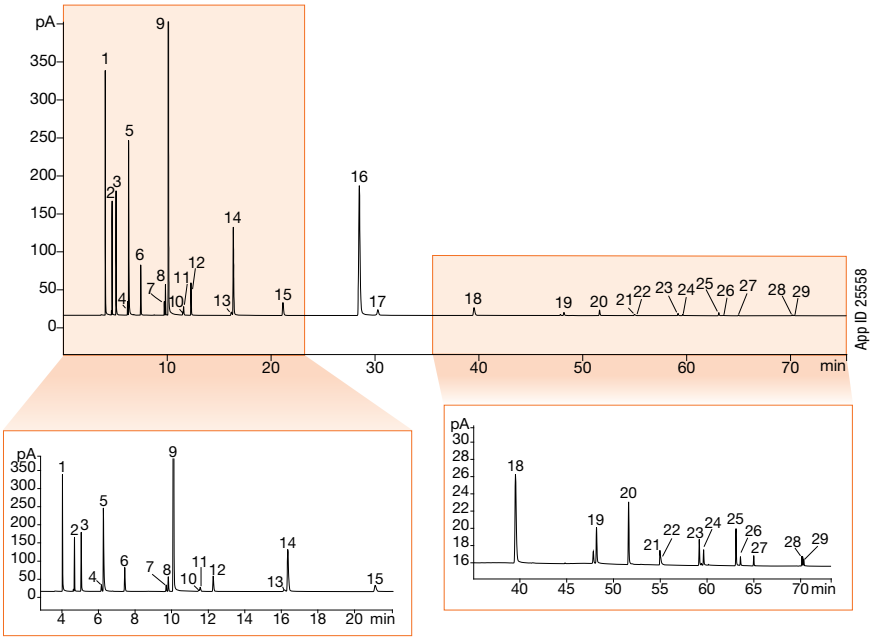
The Zebron ZB-DHA-PONA GC column provides excellent separation of DHA critical pairs with symmetric peaks suitable for ASTM Method D6730, see table below.

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-Methylnaphthalene
29. C13 (Tridecane)

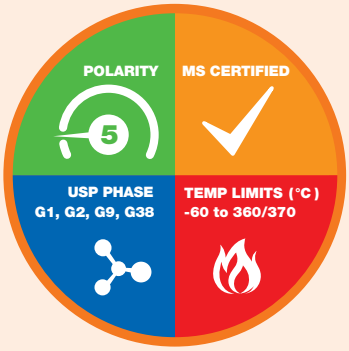
Ordering Information

Zebron ZB-DHA-PONA GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
5-Meter (PONA-TUNE)			
0.25	1.00	-60 to 340/360	7AG-G042-22
50-Meter			
0.20	0.50	-60 to 340/360	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

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

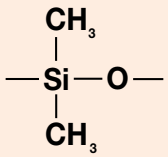
Column Profile



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

Engineered Self Cross-linking™ (ESC)

Phase Chemistry



100 % Dimethylpolysiloxane

Recommended Applications

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

Zebron GC Columns MS Certification, see p. 437

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:

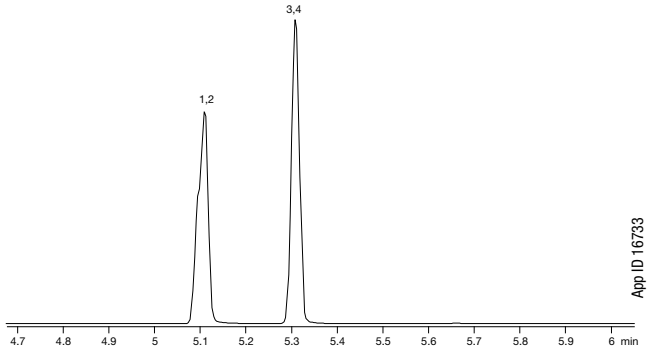
Agilent®
- DB®-1ms
- DB-5ms
- DB-35

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

Supelco®
- SPB®-1

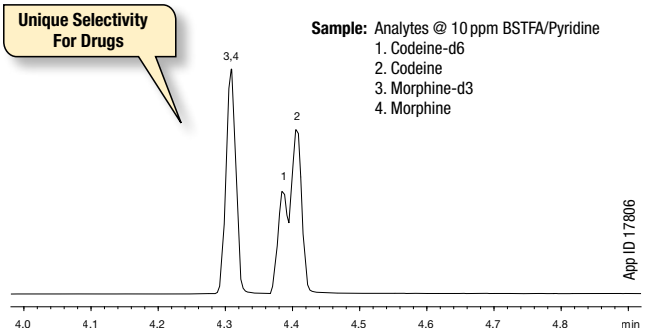
Optimized Selectivity for Multiple Drug Classes

Traditional 5 % Phenyl Phase



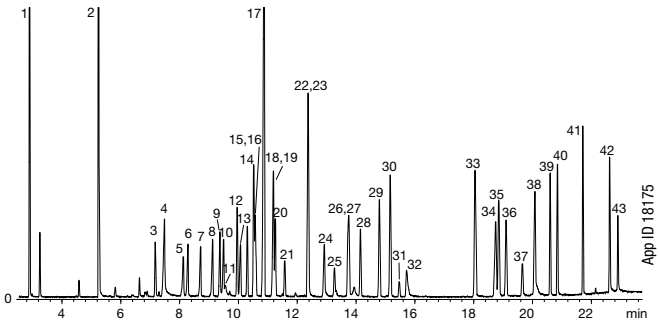
Column: As listed
Dimensions: 10 meter x 0.18 mm x 0.18 µm
Injection: Split 10:1 @ 240 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 140 °C to 320 °C @ 20 °C for 1 min
Detector: MSD @ 230 °C

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

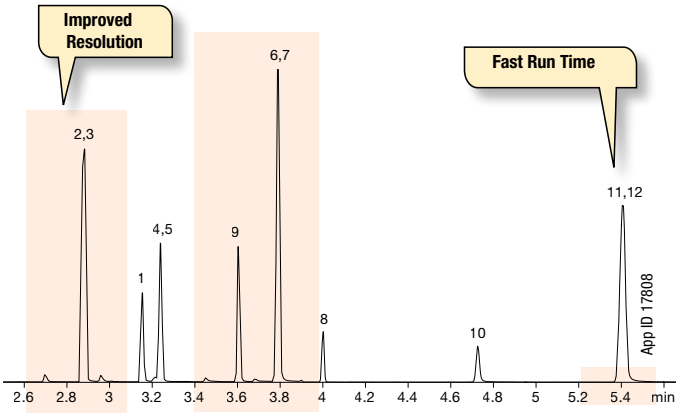
1. Acetophenone
2. Nicotine
3. Benzocaine
4. Ibuprofen
5. Allobarbital
6. Aprobarbital
7. Butalbital
8. Amobarbital
9. Phenacetin
10. Pentobarbital
11. Acetaminophen
12. Benzphetamine
13. Secobarbital
14. Phencyclidine
15. Meprobamate
16. Diphenhydramine
17. Lidocaine
18. Hexobarbital
19. Doxylamine
20. Glutethimide
21. Caffeine
22. Chlorpheniramine
23. Methapyrilene
24. Phenobarbital
25. Procaine
26. Methadone
27. Brompheniramine
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

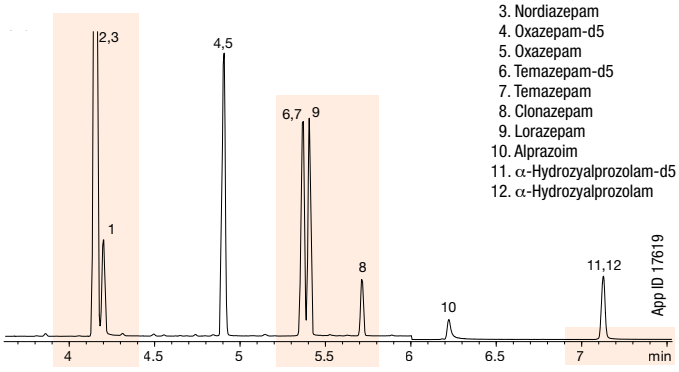
Zebron ZB-Drug-1



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

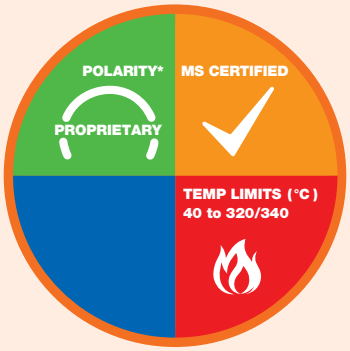
Ordering Information

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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, 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:

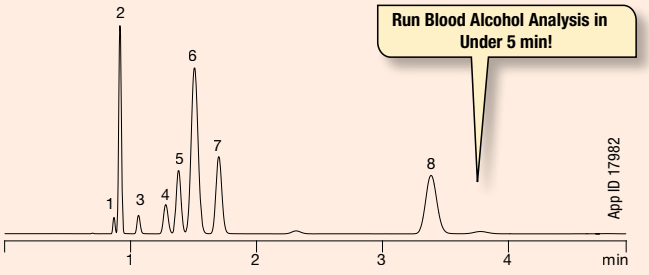
Agilent®	Restek®
• DB®-ALC1	• Rtx®-BAC1
• DB-ALC2	• Rtx-BAC2

*not exact equivalent, selectivity may differ

Faster, More Sensitive Blood Alcohol Analysis

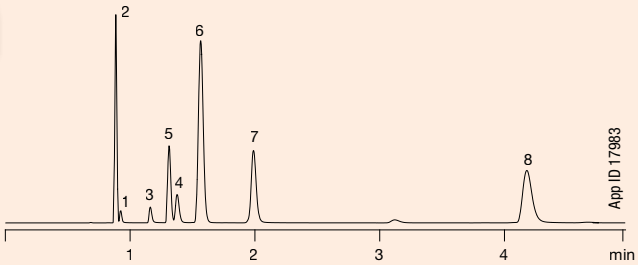
Zebron ZB-BAC-1

30 meter x 0.53 mm x 3.00 µm



Zebron ZB-BAC-2

30 meter x 0.53 mm x 2.00 µm



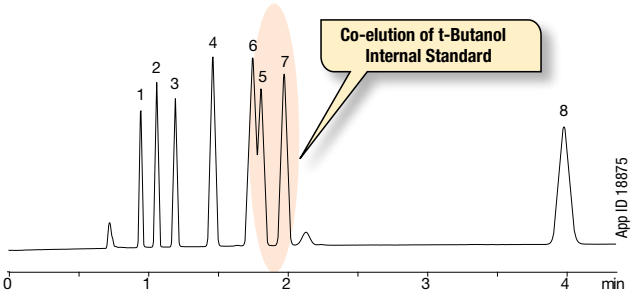
Conditions for both columns:

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)

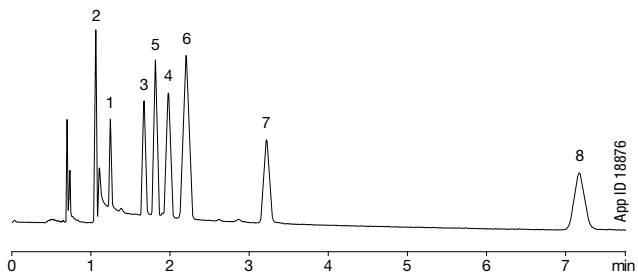
Restek Rtx-BAC1

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

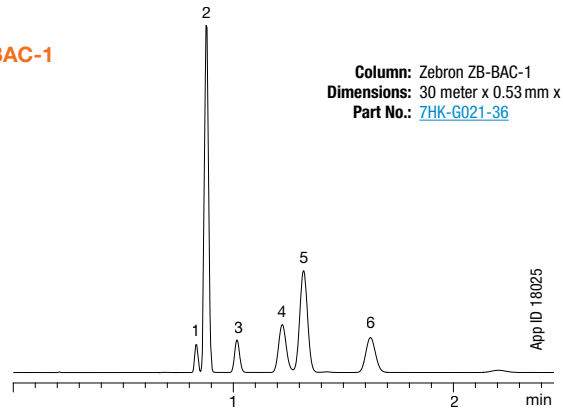
Sample: Analytes and internal standards 0.100 % in water
1. Methanol
2. Acetaldehyde
3. Ethanol
4. Isopropanol
5. Acetone
6. t-Butanol (IS)
7. n-Propanol (IS)
8. 2-Butanol (IS)

Comparative separations may not be representative of all applications.

ZB-BAC-1 and -2

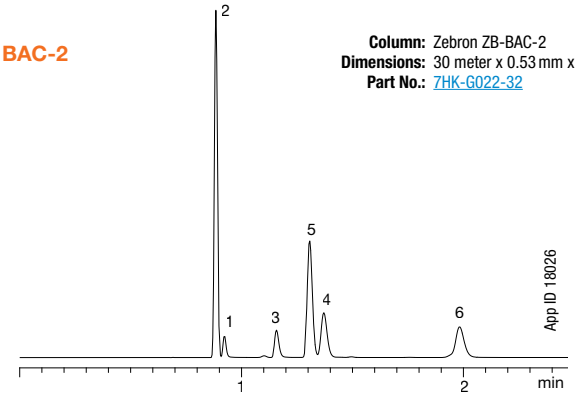
Run on Helium or Hydrogen

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

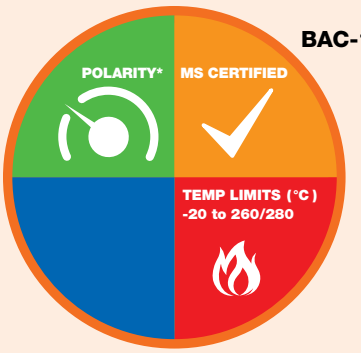
ID(mm)	df(µm)	Temp. Limits °C	Part No.
30-Meter			
0.32	1.80	-20 to 260/280	7HM-G021-31
0.53	3.00	-20 to 260/280	7HK-G021-36

Zebron ZB-BAC-2 GC Columns

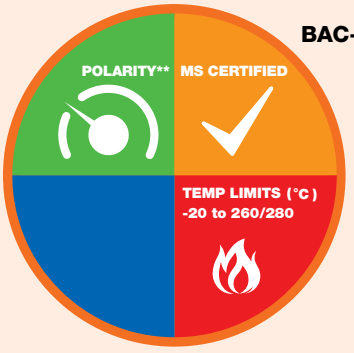
ID(mm)	df(µm)	Temp. Limits °C	Part No.
30-Meter			
0.32	1.20	-20 to 260/280	7HM-G022-25
0.53	2.00	-20 to 260/280	7HK-G022-32

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, 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

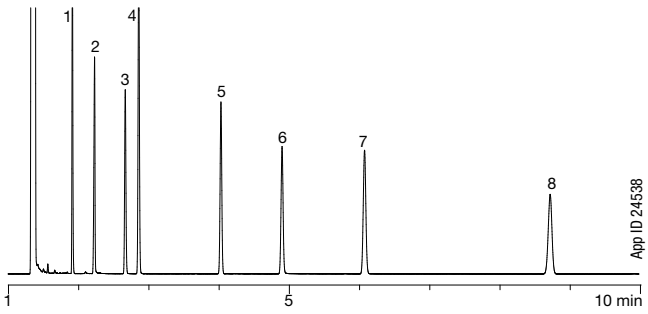
Restek®
- Rtx®-1
- Rtx-1ms
- Rxi®-1ms

SGE®
- BP1
- SolGel-1ms™

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

Lower Overall Column Activity

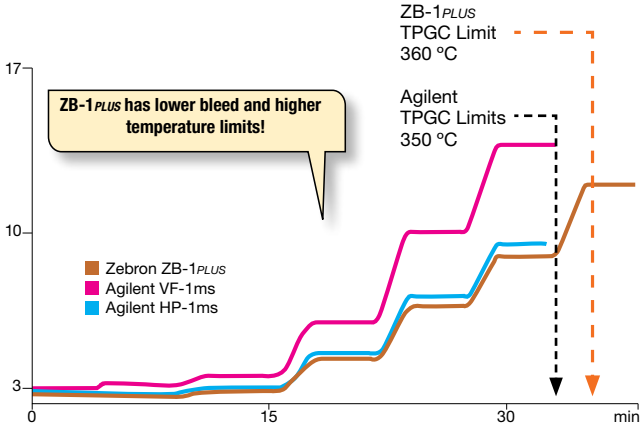
Activity is a key measure of column quality. ZB-1*PLUS* columns are aggressively tested to ensure full deactivation. Our QC test below demonstrates low tailing on ZB-1*PLUS* for even the most active compounds, like 2-ethylhexanoic acid.



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:

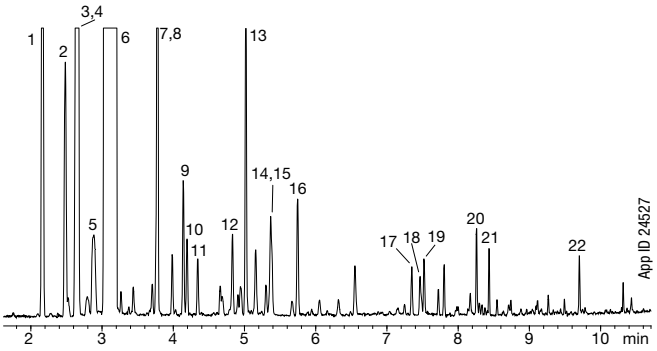
Columns: As listed
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Injection: Null Injection @ 250 °C
Carrier Gas: Hydrogen @ 100 mL/min (constant flow)
Oven Program: 240 °C for 9 min to 280 °C for 6.3 min to 320 °C for 6.4 min to 340 °C for 5.8 min to 350 °C for 5.5 min to 360 °C
Detector: FID @ 320 °C

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

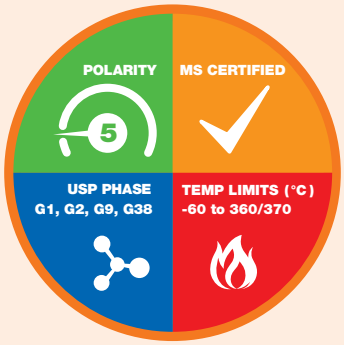
Ordering Information

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
0.18	0.18	-60 to 360/370	7CD-G031-08
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
20-Meter			
0.18	0.18	-60 to 360/370	7FD-G031-08
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

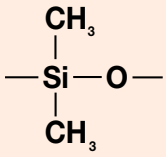
Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry



100 % Dimethylpolysiloxane

Recommended Applications

- Acids
- Amines
- Diesel Fuel
- 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*™

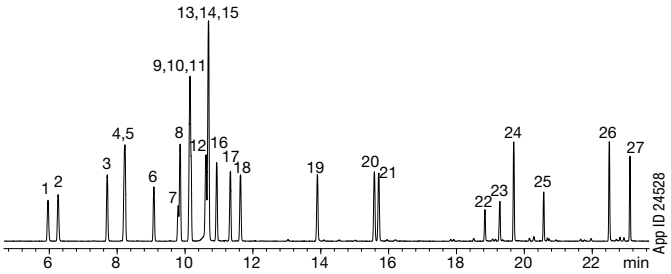
Inert 5 % Phenyl Selectivity

- **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:

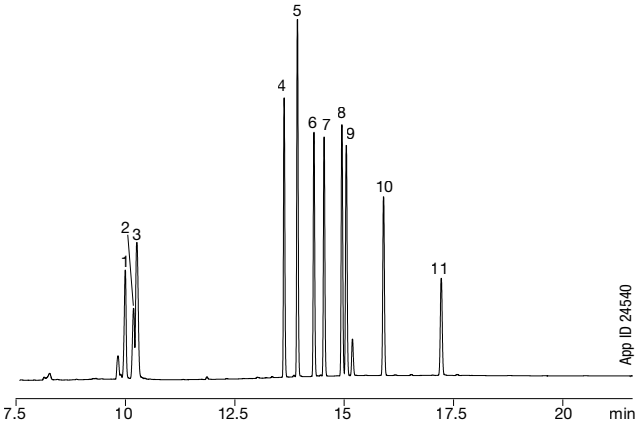
Agilent®	Restek®	SGE®	Supelco®	OV®
• DB®-5	• Rtx®-5	• BP5	• MDN-5S	• OV-5
• HP-5	• Rtx-5MS	• BPX5	• SPB®-5	
• HP-5ms	• Rtx-5Amine		• Equity®-5	
• HP-5msi	• Rxi®-5ms			

Phenols



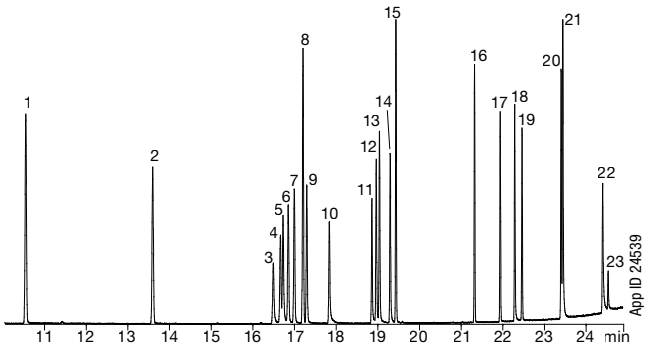
Column: Zebron ZB-5*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G032-11
Injection: Split 5:1 @ 240 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/ min (constant flow)
Oven Program: 60 °C to 140 °C @ 5 °C/min to 280 °C @ 10 °C/min
Detector: MSD @ 230 °C, 45-450 amu
Sample:
1. Phenol
2. 2-Chlorophenol
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

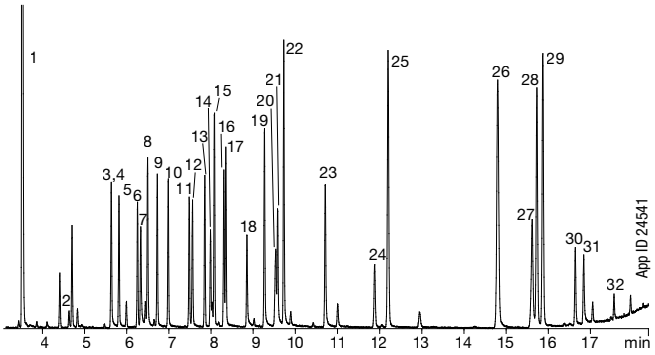


Column: Zebron ZB-5*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G032-11
Injection: Split 40:1 @ 250 °C, 1 µL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 100 °C to 180 °C @ 5 °C/min to 320 °C @ 15 °C/min
Detector: MSD @ 180 °C, 45-450 amu
Sample: Analytes are 50 ppm in acetone
1. Dimethyl phthalate
2. Diethyl phthalate
3. Atraton
4. Simazine
5. Prometon
6. Atrazine
7. Propazine
8. Dipropyl phthalate
9. Terbuthylazine
10. Secbumeton
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)

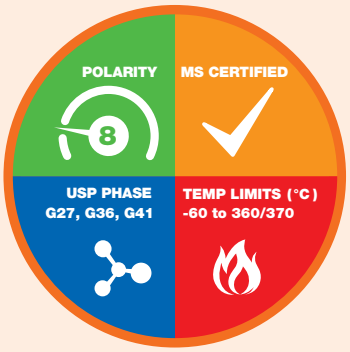
Ordering Information

Zebron ZB-5*PLUS* GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
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
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
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

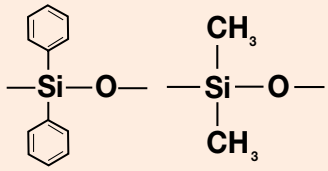
Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

Phase Chemistry



5 % Phenyl 95 % Dimethylpolysiloxane

Recommended Applications

- Barbiturates
- Benzodiazepines
- Drugs of Abuse
- EPA Methods
- FAMEs
- Nitrosamines
- Pesticides
- Phenols
- THC Metabolites

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

For high temperature analysis, consider using a ZB-5HT, see p. 146

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:

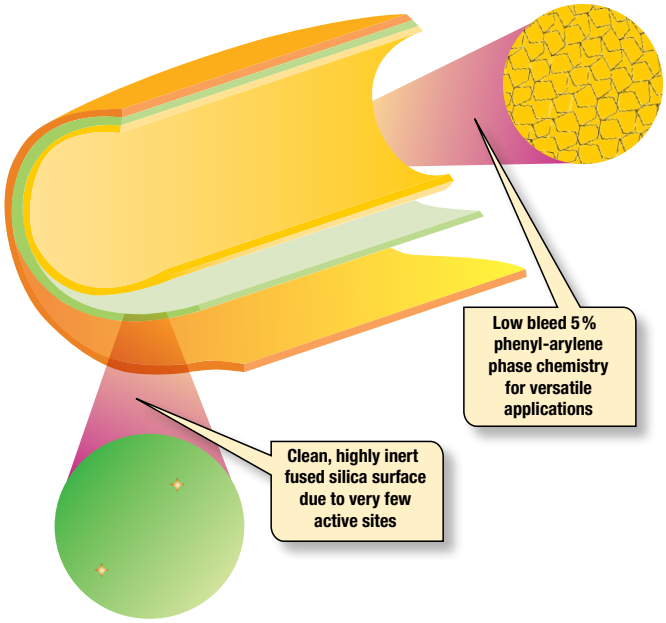
Agilent®
- DB®-5ms
- DB-5ms Ultra Inert
- HP-5ms
- HP-5ms Ultra Inert
- VF-5ms

Restek®
- Rxi®-5Sil MS

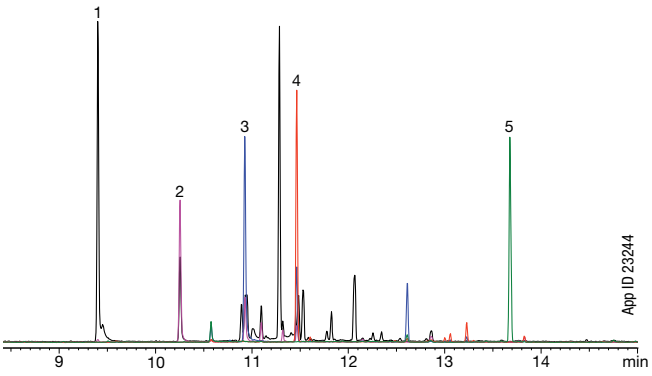
Supelco®
- SLB®-5ms

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



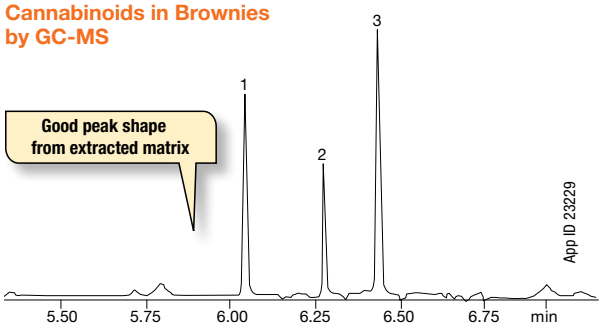
Extraction Protocol:
1. Combine 0.5 g of homogenized dog food with 10 mL of DEA/Water/Acetonitrile (1:4:5) in a 15 mL centrifuge tube
2. Sonicate for 30 min
3. Centrifuge at 5000 rpm for 10 min
4. Transfer 100 µL of supernatant to an autosampler vial and evaporate to dryness using nitrogen gas
5. Reconstitute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

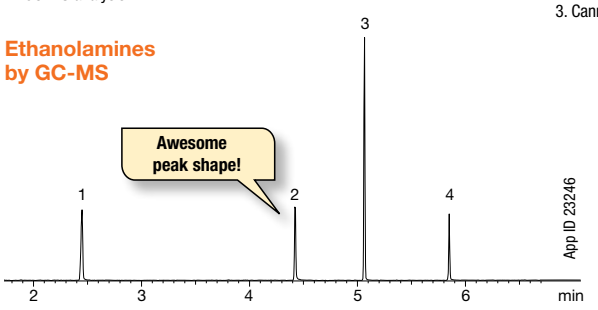


Extraction Protocol:

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



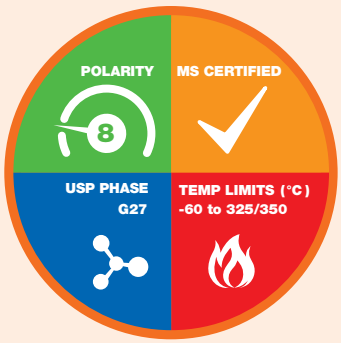
Column: Zebron ZB-5MS*PLUS*
Dimensions: 30 meter x 0.25 mm x 1.00 µm
Part No.: 7HG-G030-22
Injection: Split 200:1 @ 250 °C, 1 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 30 °C to 300 °C @ 40 °C/min
Detector: MSD @ 320 °C
Sample: 1. Monoethanolamine
2. Diethanolamine
3. Triethylene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

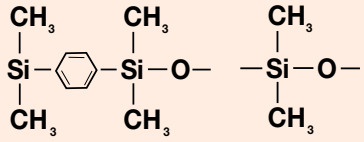
Column Profile



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
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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

ZB-WAX*PLUS*™

Enhanced Aqueous Stability

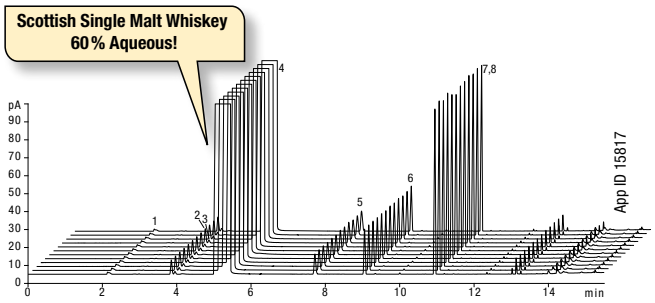
- **100 % aqueous stable, excellent for aqueous samples**
- **Extremely inert for acidic compounds**
- **Enhanced selectivity for low boiling solvents**
- **High retention of alcohols and chlorinated solvents**
- **Increased efficiency at 20 °C**

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*

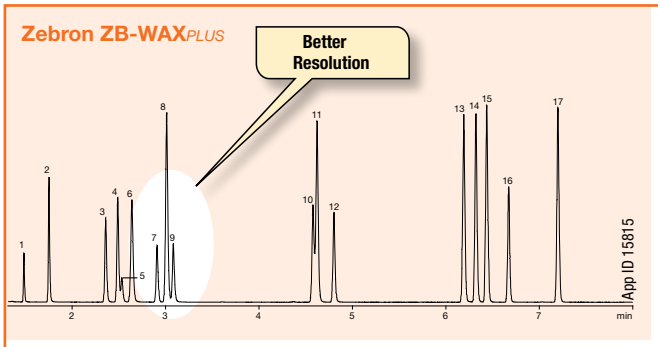
Historically, polyethylene glycol (PEG) phases have been unstable with aqueous samples such as beverages or glycols, resulting in poor reproducibility and decreased lifetime. ZB-WAX*PLUS* bonding procedure results in exceptional stability to repeated injections of aqueous matrices.



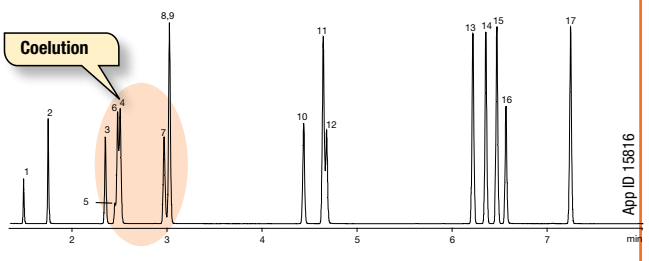
Column: Zebron ZB-WAX*PLUS*
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G013-11
Injection: Split 30:1 @ 140 °C, 0.2 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 35 °C for 5 min to 85 °C @ 10 °C/min to 200 °C @ 25 °C/min for 1 min
Detector: FID @ 200 °C
Sample:
1. Acetaldehyde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

Improve Resolution for ASTM D5135-95: Stryene Impurities

Zebron ZB-WAX*PLUS*



Restek Stabilwax



Conditions same for both columns:

Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G013-11
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

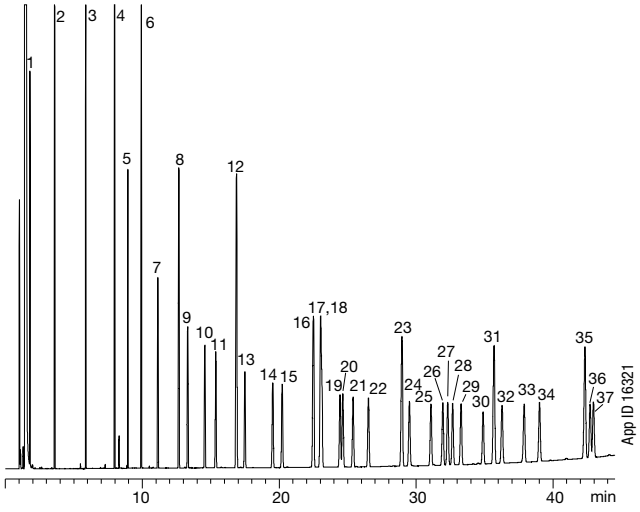
Sample:
1. Methyl Formate
2. Acetone
3. Ethyl Acetate
4. Methyl Ethyl Ketone
5. Methanol
6. 2-Methyl-2-propanol
7. Methylene Chloride
8. Benzene
9. Ethanol
10. 2-Butanol
11. Toluene
12. n-Propanol
13. Ethyl Benzene
14. p-Xylene
15. m-Xylene
16. 1-Butanol
17. o-Xylene

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

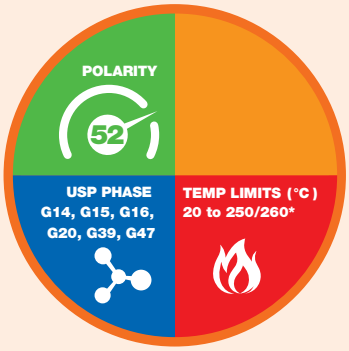
Ordering Information

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

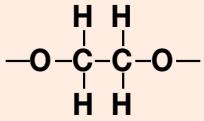
Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

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

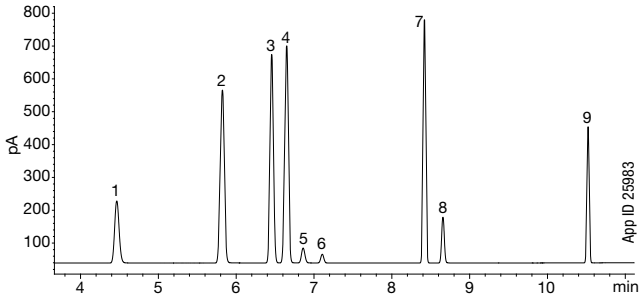
What Makes the PLUS in ZB-624*PLUS*?

- **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.

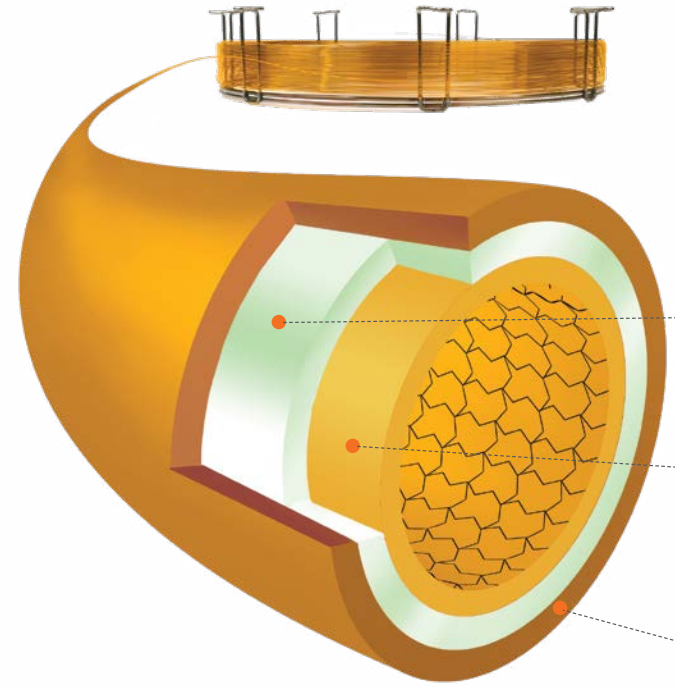
Shorter Residual Solvent Analysis by GC-FID

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.

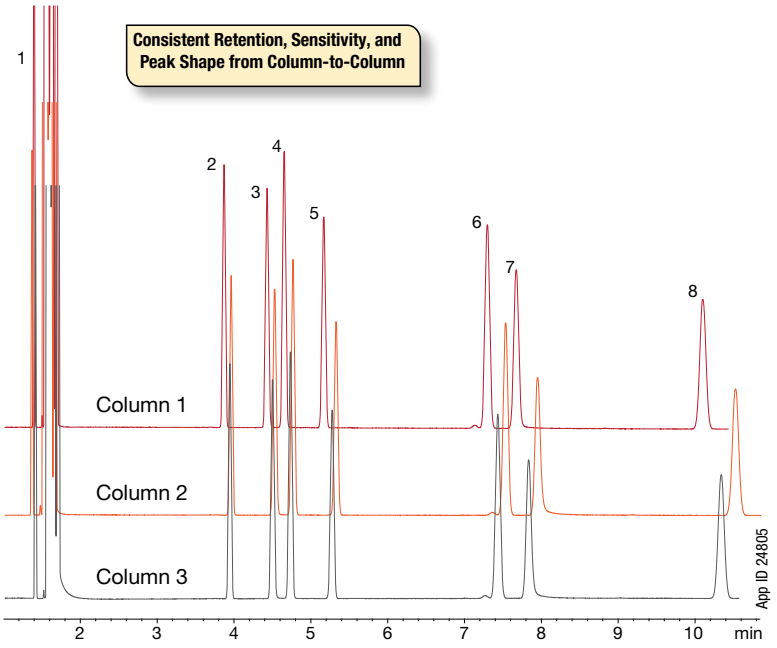
2019 Pittcon Excellence Award

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.

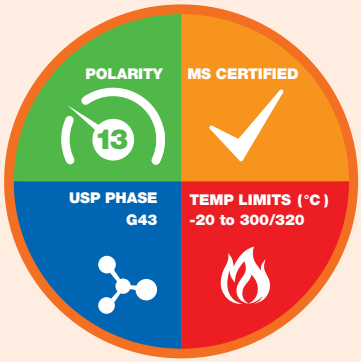
Test Probe	The PLUS Advantage	Property
2,4-Dimethylphenol 2,4-Dimethylaniline	We screen challenging analytes, like acids and bases, to mimic your most challenging compounds.	Inertness



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



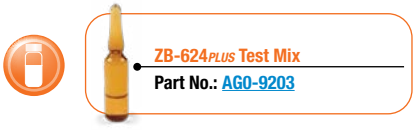
Engineered Self Cross-linking™ (ESC)

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



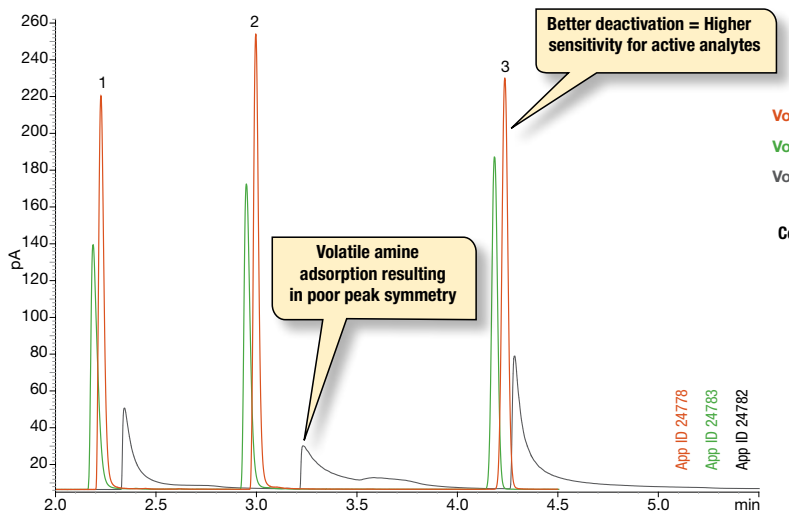
Contact Phenomenex or your local Phenomenex distributor for additional GC products and applications.

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

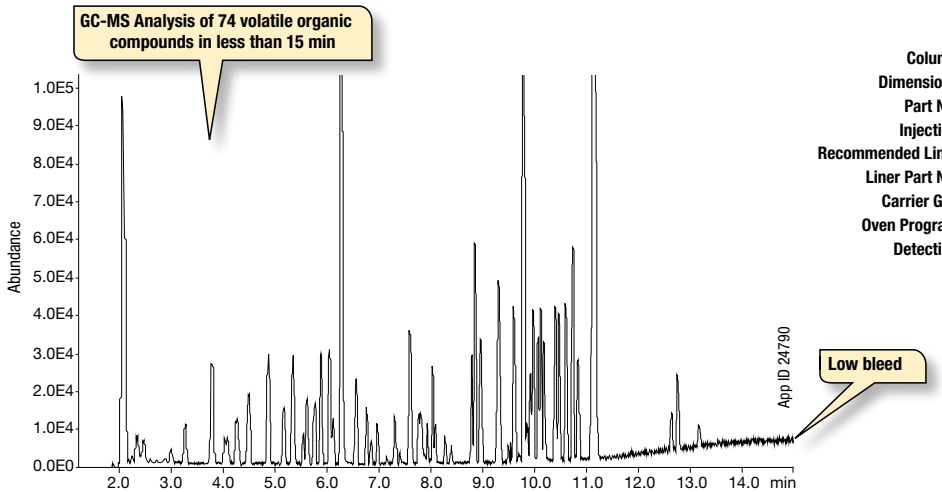
Volatile Amines on a Agilent® DB®-624UI Ultra Inert - 500 ppm

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

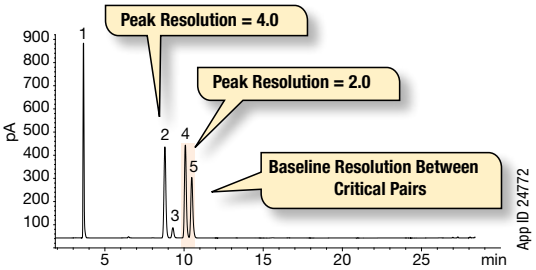
Comparative separations may not be representative of all applications.

ZB-624*PLUS*™ *(cont'd)*

Exceeding USP <467> System Suitability

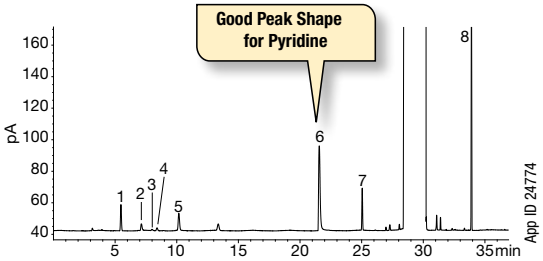
USP <467> method requires resolution of 1.5 for critical pairs. Zebron ZB-624*PLUS* took the challenge and succeeded with even greater resolution!

Class 1 Residual Solvents



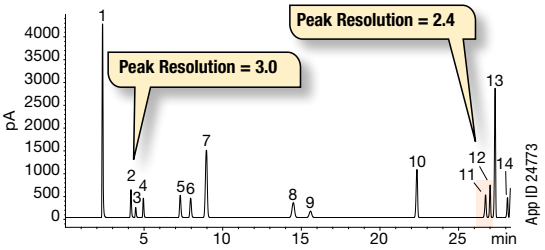
Sample: 1. 1,1-Dichloroethene
2. 1,1,1-Tetrachloride
3. Carbon tetrachloride
4. Benzene
5. 1,2-Dichloroethane

Class 2B Residual Solvents



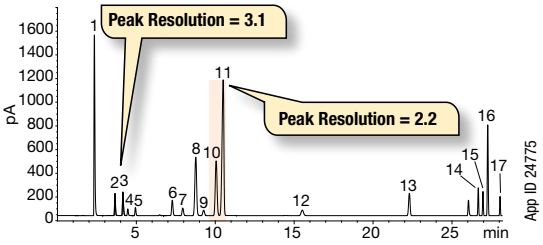
Sample: 1. Hexane
2. Nitromethane
3. Chloroform
4. 1,2-Dimethoxyethane
5. Trichlorethylene
6. Pyridine
7. 2-Hexanone
8. Tetralin

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
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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages. 0.18 mm, 0.25 mm, and 0.32 mm IDs are MS certified.

ZB-1HT Inferno™

Robust Results up to 430 ºC

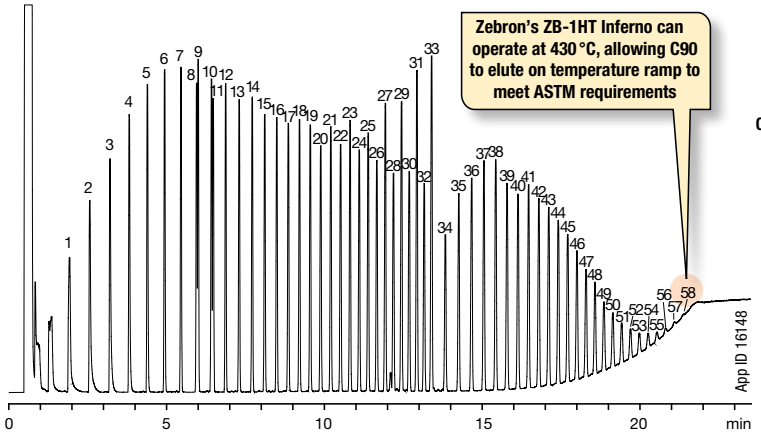
- **First non-metal columns stable to 430 °C**
- **Provides true boiling point separation for hydrocarbon distillation methods**
- **Longer lifetime with rugged high temperature, polyimide coated, fused silica tubing**
- **Low activity, provides good peak shape for acidic and basic samples**
- **Provides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

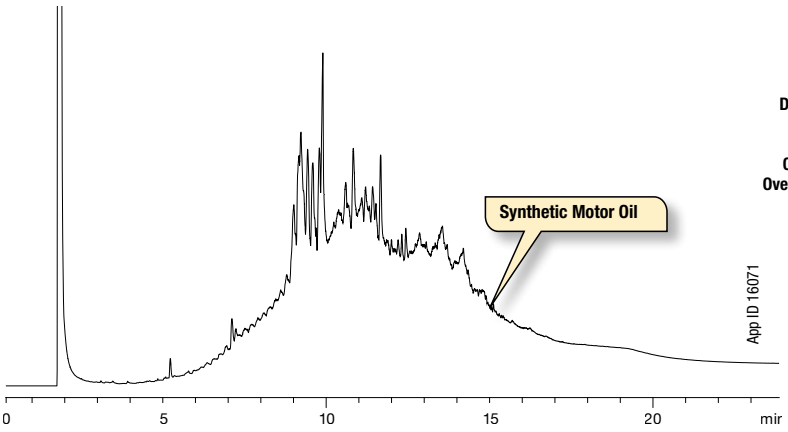


Column: Zebron ZB-1HT Inferno
Dimensions: 5 meter x 0.53 mm x 0.10 µm
Part No.: 7AK-G014-02
Injection: On-Column @ 43 °C, 0.1 µL
Carrier Gas: Helium @ 4.4 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 430 °C @ 20 °C/min for 10 min
Detector: FID @ 430 °C
Sample:

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



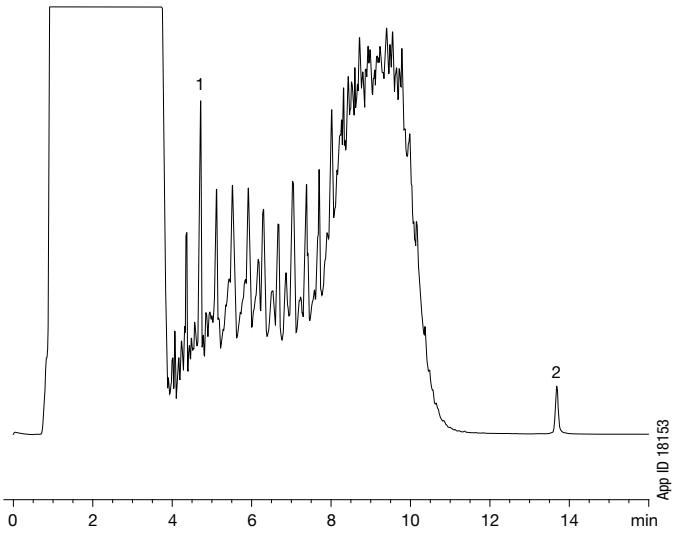
Column: Zebron ZB-1HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.10 µm
Part No.: 7HG-G014-02
Injection: On-Column @ 153 °C, 1 µL
Carrier Gas: Helium @ 1 mL/min (constant flow)
Oven Program: 150 °C to 400 °C @ 14 °C/min for 6 min
Detector: FID @ 400 °C
Sample: Sample was 1 % in dichloromethane Mobil®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

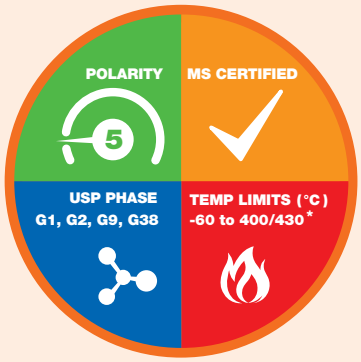
Ordering Information

Zebron ZB-1HT Inferno GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
5-Meter			
0.53	0.10	-60 to 400	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

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

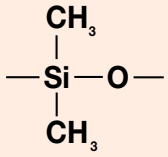
Column Profile



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

Engineered Self Cross-linking™ (ESC)

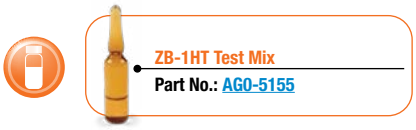
Phase Chemistry



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

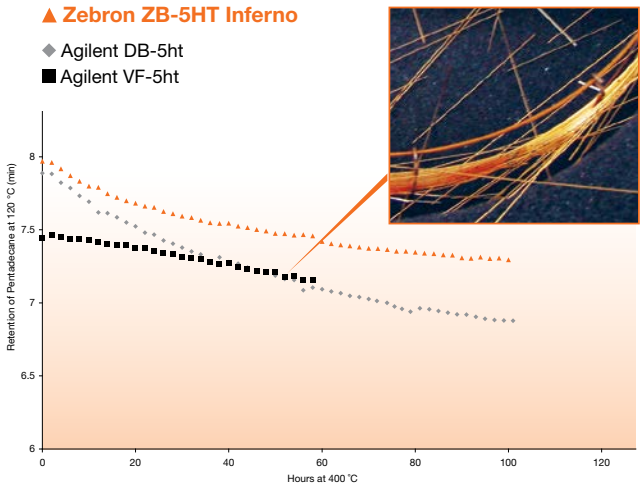
Restek®
- Rxi®-5HT
- Stx®-5HT
- XTI®-5HT
- Rtx®-5HT

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!



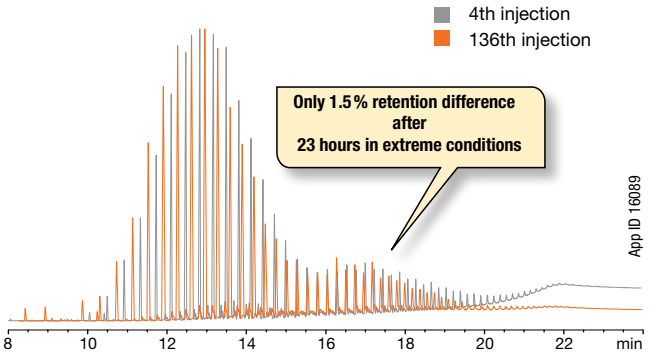
Note that the VF-5ht column died around 40 hours at 400 °C whereas the Zebron ZB-5HT Inferno column maintained great retention of Pentadecane over 100 hours.

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



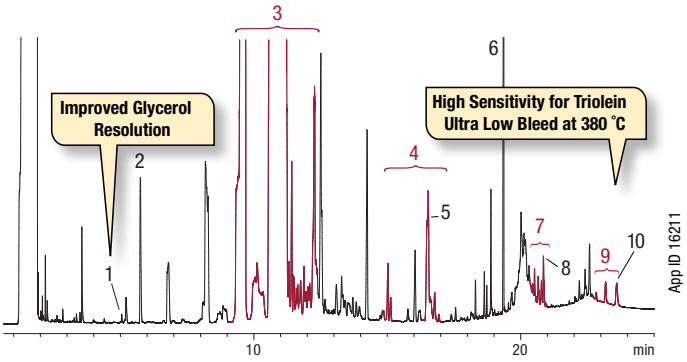
Column: Zebron ZB-5HT Inferno
Dimensions: 15 meter x 0.32 mm x 0.10 µm
Part No.: 7EM-G015-02
Injection: On Column @ 43 °C, 0.1 µL
Carrier Gas: Helium @ 1.9 mL/min (constant flow)
Oven Program: 40 °C for 2 min to 430 °C @ 20 °C for 10 min
Detector: FID @ 430 °C
Sample: Paraffin Wax

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

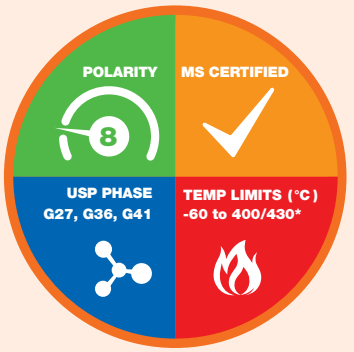
Ordering Information

Zebron ZB-5HT Inferno GC Columns

ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.32	0.10	-60 to 400/430	7CM-G015-02
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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

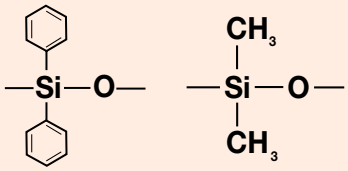
Column Profile



*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**

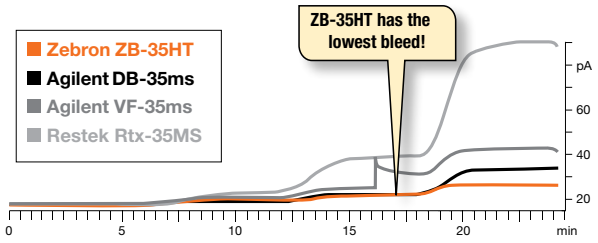
Upgrade to Zebron from any 35 % phenyl / 65 % dimethylpolysiloxane phase:

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

Lower Bleed Than Other Columns!

Conditions for all columns:

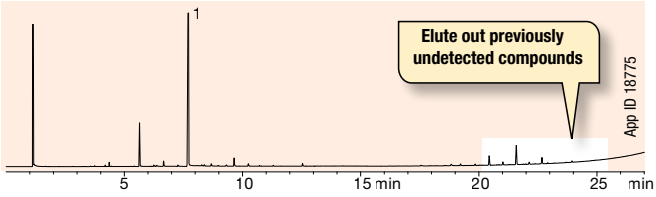
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Injection: Split 20:1 @ 200 °C, 1 µL
Carrier Gas Helium @ 1.7 mL/min (constant flow)
Oven Program: 100 °C to 320 °C @ 30 °C/min for 5 min to 340 °C @ 20 °C/min for 5 min to 360 °C @ 20 °C/min for 5 min to 380 °C @ 20 °C/min for 5 min to 400 °C @ 20 °C/min for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

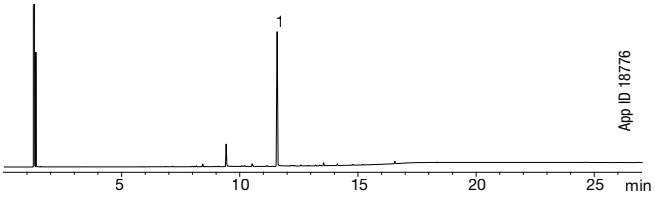
30 meter x 0.25 mm x 0.25 µm



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

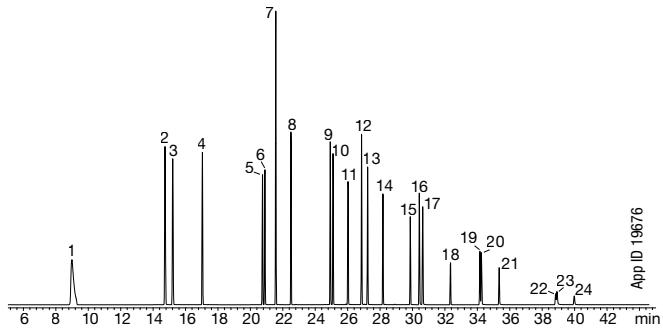
Note: Chromatogram is courtesy of Northeastern Chemical Company.

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

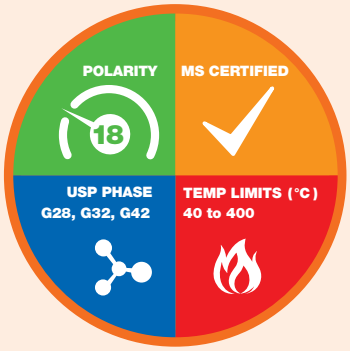
Ordering Information

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

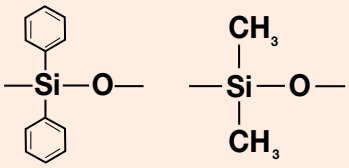
Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

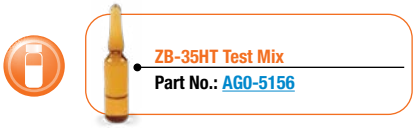
Phase Chemistry



35 % Phenyl 65 % Dimethylpolysiloxane

Recommended Applications

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



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

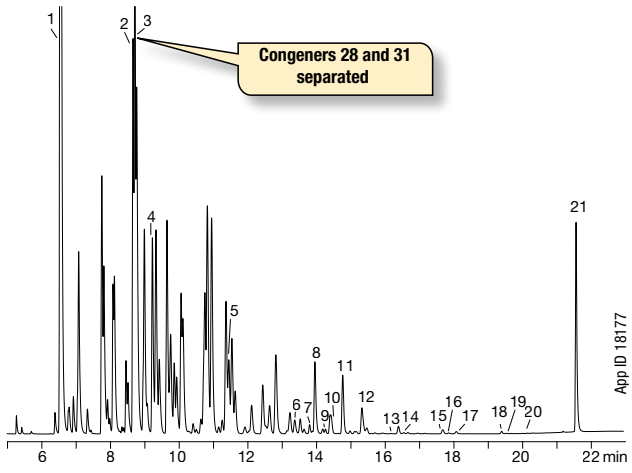
- **Rugged, non-metal si-arylene GC column stable to 400 °C**
- **Robust column for high temperature bake outs and analysis, such as high molecular weight compounds**
- **Provides unique selectivity for conformational analyses**
- **Longer lifetime with high temperature, polyimide coated, fused silica 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

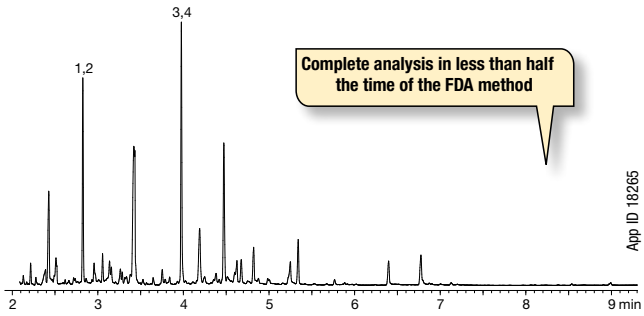
Aroclor 1242: DIN Method 51527



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



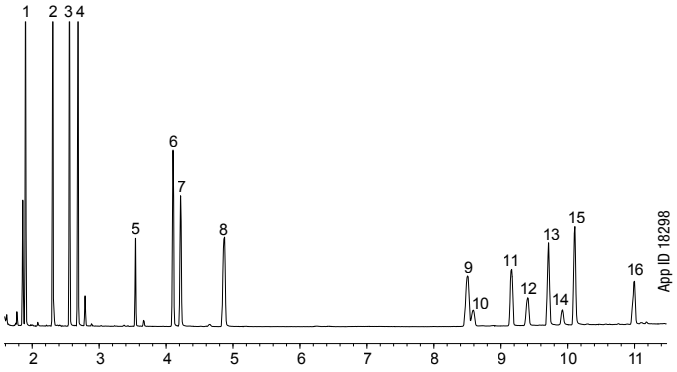
Column: Zebron ZB-XLB-HT Inferno
Dimensions: 15 meter x 0.25 mm x 0.25 µm
Part No.: 7EG-G024-11
Injection: On-Column @ 103 °C, 1 µL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 100 °C for 0.5 min to 320 °C @ 25 °C/min
Detector: MSD @ 325 °C
Sample: Analytes are 200 ng / 100 µL in BSTFA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

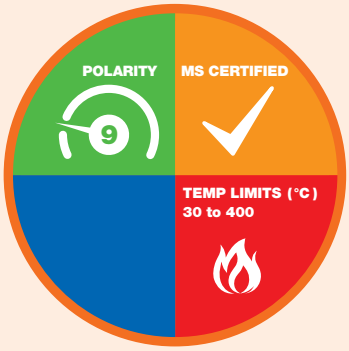
Ordering Information

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
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
0.32	0.10	30 to 400	7HM-G024-02
60-Meter			
0.25	0.25	30 to 400	7KG-G024-11

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

Column Profile



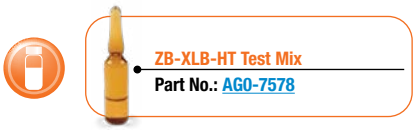
Engineered Self Cross-linking™ (ESC)

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

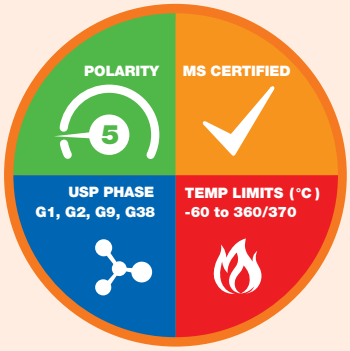
Ordering Information

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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

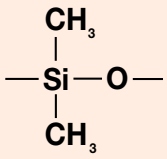
Column Profile



*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

Zebron GC Columns MS Certification, see p. 437

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

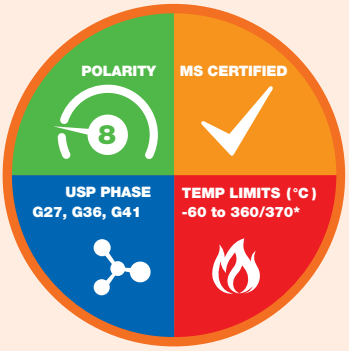
Ordering Information

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	0.25	-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	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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

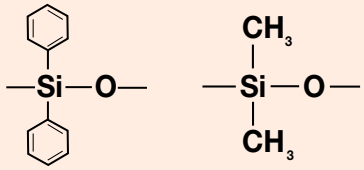
Column Profile



*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. 154
For high temperature analysis, consider using a ZB-5HT, see p. 146

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:

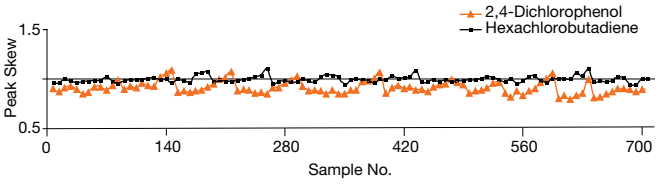
Agilent®
- DB®-5ms
- DB-5.625
- DB-5ms EVDX
- CP-Sil 8 CB MS
- VF-5ms

Restek®
- Rtx®-5Sil MS
- Rxi®-5Sil MS

Supelco®
- SLB®-5ms

Long Lifetime

Consistent response after more than 700 samples at pH 2!



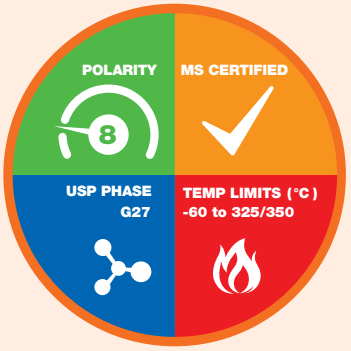
Ordering Information

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
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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

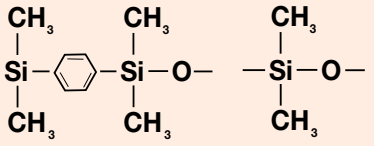
Column Profile



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

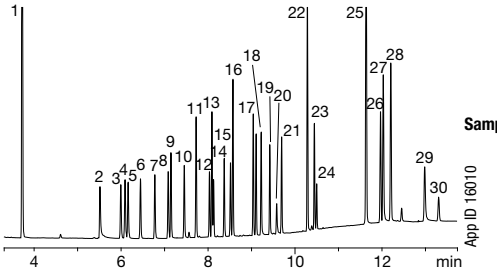
Intermediate Polarity for GC-MS

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

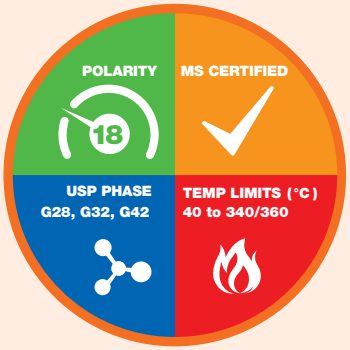
Ordering Information

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

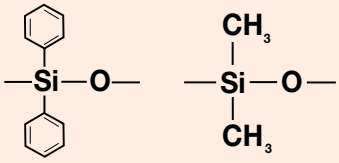
Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

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

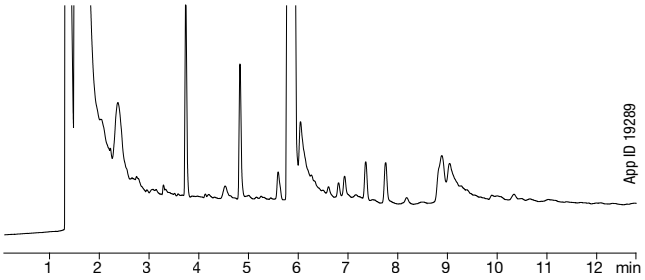
Robust Results, Rugged Performance

- **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

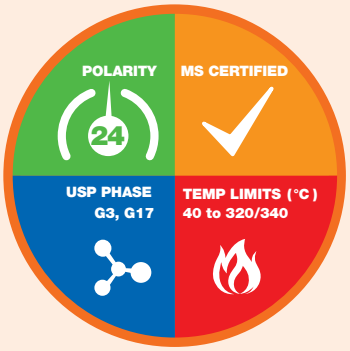
Ordering Information

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
0.53	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

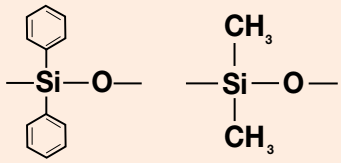
Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

Column Profile



Engineered Self Cross-linking™ (ESC)

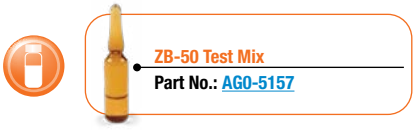
Phase Chemistry



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

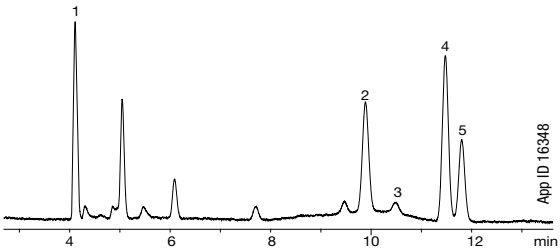
- **Widely used phase to separate volatile organic flavor and fragrance additives and residual solvents in industrial or pharmaceutical products (OVIs)**
- **Popular choice for residual solvent testing**
- **Excellent for US EPA Methods 501.3, 502.2, 503.1, 524.2, 601, 602, 624, 8010, 8015, 8020, 8021, 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

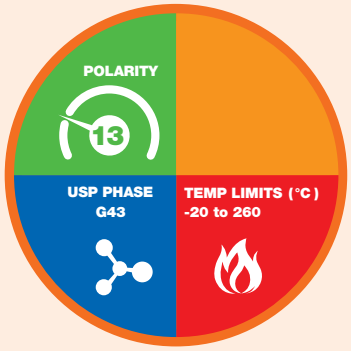
Ordering Information

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
0.53	1.00	-20 to 260	7HK-G005-22
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

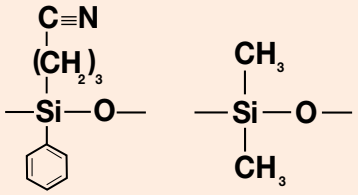
Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

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

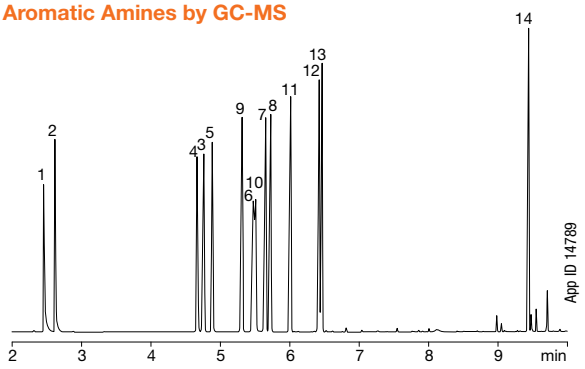
- **Fast run and re-equilibration times for enhanced sample throughput and productivity**
- **Provides alternate selectivity to phenyl phases with similar polarity**

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

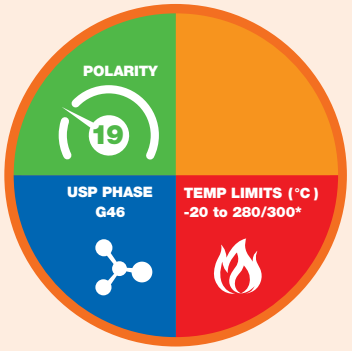
Ordering Information

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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

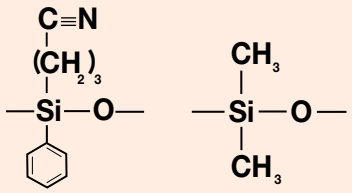
Column Profile



*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. 159
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

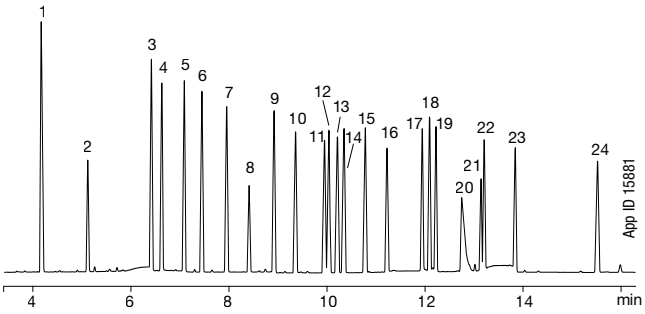
Enhanced Response for DDT and Endrin

- **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)

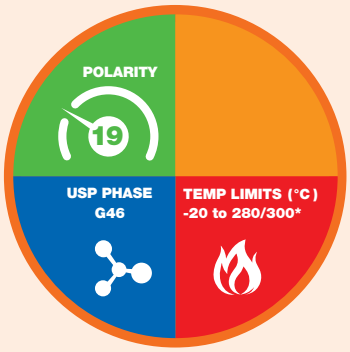
Ordering Information

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

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

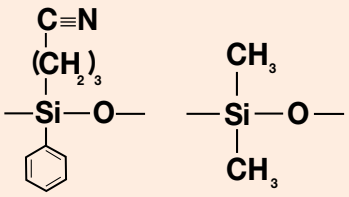
Column Profile



*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

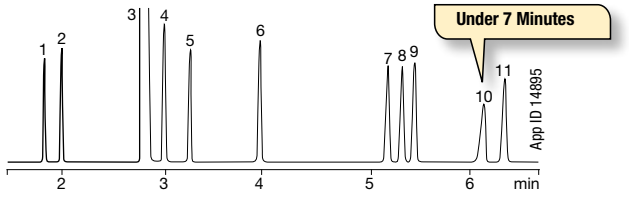
- **High polarity column with low bleed (MS certified) for improved results**
- **Highly stable, long lifetime**
- **Low activity for amines**
- **Bonded, solvent rinsible**
- **Excellent chromatography of polar complex mixtures**
- **Widely used for profiling and "fingerprinting"**

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

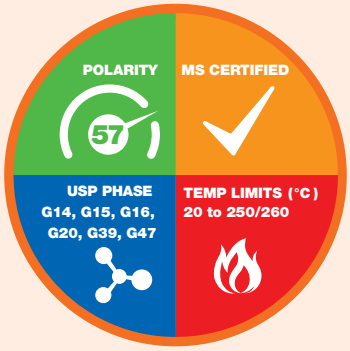
Ordering Information

Zebron ZB-WAX GC Columns

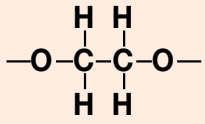
ID(mm)	df(µm)	Temp. Limits °C	Part No.
10-Meter			
0.10	0.10	20 to 250/260	7CB-G007-02
15-Meter			
0.25	0.25	20 to 250/260	7EG-G007-11
0.32	0.25	20 to 250/260	7EM-G007-11
0.53	1.00	20 to 250/260	7EK-G007-22
20-Meter			
0.18	0.18	20 to 250/260	7FD-G007-08
30-Meter			
0.25	0.15	20 to 250/260	7HG-G007-05
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	0.25	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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, 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

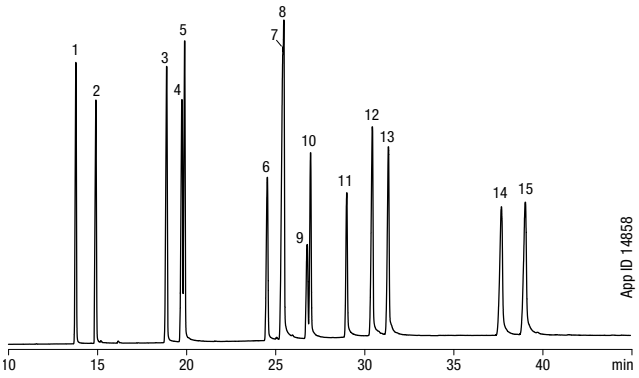
Improve Resolution for Free Fatty Acids

- **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)

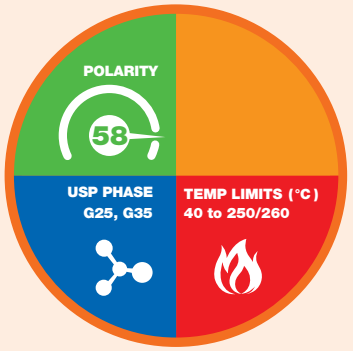
Ordering Information

Zebron ZB-FFAP GC Columns

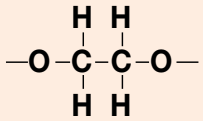
ID(mm)	df(µm)	Temp. Limits °C	Part No.
15-Meter			
0.25	0.25	40 to 250/260	7EG-G009-11
0.32	0.25	40 to 250/260	7EM-G009-11
0.53	1.00	40 to 250/260	7EK-G009-22
30-Meter			
0.25	0.25	40 to 250/260	7HG-G009-11
0.32	0.25	40 to 250/260	7HM-G009-11
0.32	0.50	40 to 250/260	7HM-G009-17
0.32	1.00	40 to 250/260	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, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, 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

Get Extremely 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**

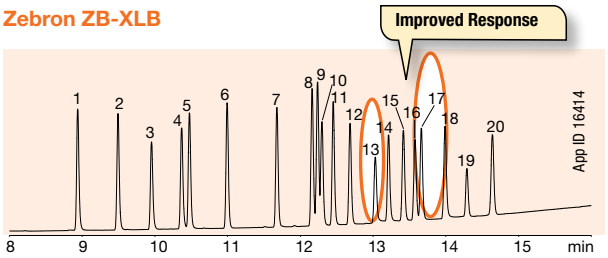
Upgrade to Zebron from these similar* phases:

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

*not exact equivalent, selectivity may differ

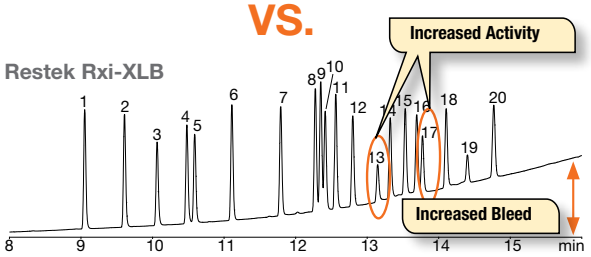
Better Performance for Chlorinated Pesticides EPA Method 8081A

Zebron ZB-XLB



VS.

Restek Rxi-XLB



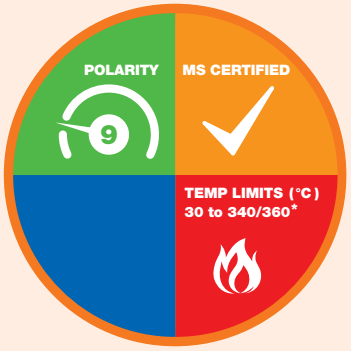
Conditions for both coloumns:

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

Comparative separations may not be representative of all applications.

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

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.
20-Meter			
0.18	0.18	30 to 340/360	7FD-G019-08

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	0.50	30 to 340/360	7HM-G019-17
60-Meter			
0.25	0.25	30 to 340/360	7KG-G019-11

Note: If you need a 5 in. cage, contact technical support at www.phenomenex.com/chat or simply reach out to your Technical consultant. Conditions may apply. Agilent 6850, some SRI and process GC systems use only 5 in. cages.

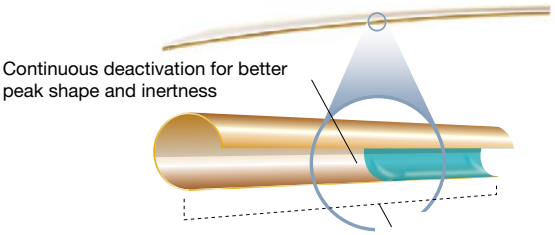
Guardian Integrated Guard Columns

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

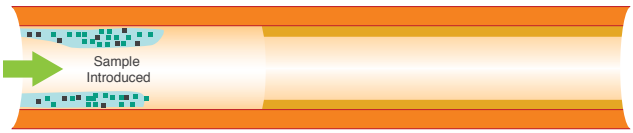
Why Choose Zebron With Guardian?

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.

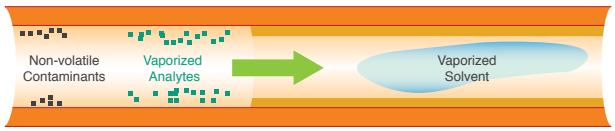
- **Eliminate the potential for leaks**
- **Extend column life**
- **Improve analyte focusing for low boiling compounds**
- **Aggressively tested to ensure deactivation**



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

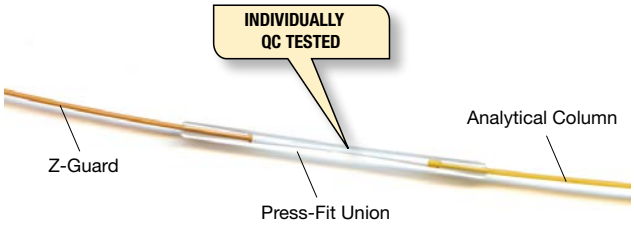
Guardian: Integrated Guard Columns

Zebron GC Column Phase	Dimensions	2 m Guardian Part No.	5 m Guardian Part No.	10 m Guardian Part No.
ZB-1*PLUS*	30 meter x 0.25 mm x 0.25 µm	—	7HG-G031-11-GGA	7HG-G031-11-GGC
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 0.32 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-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-GGC
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
ZB-Dioxin	60 meter x 0.25 mm x 0.20 µm	—	7KG-G045-10-GGA	—

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	—
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
0.18	Guard Column	7AD-G000-00-GZ0	7CD-G000-00-GZ0
	Guard Column Kit	7AD-G000-00-GZK	—
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