

Zebron Inferno[™]

Rugged GC Performance to 430 °C!

4 Versatile Selectivities

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



Introducing the Zebron™ Experience

Get More Than Just A Column

When you choose Zebron, you get more than just high quality GC products. Choosing Zebron means you get access to a wide variety of tools, resources, and personalized support to help make your GC work easier, faster, and simply better.

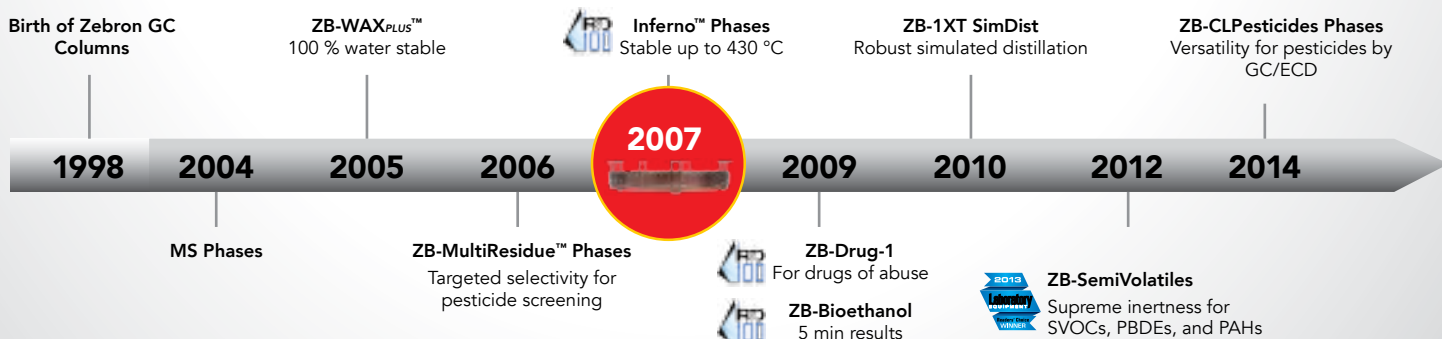
Our Customers Come First

“ Phenomenex has always given superb customer support. I changed suppliers from... Agilent to Phenomenex based on your customer support...about 10 years ago and you have not failed me since that point ! ”

Marie Coschigano
Genzyme Corp. USA

Continued Innovation

Our inventive GC scientists have 25+ years of experience, and many helped create keystone phases at J&W Scientific before joining the Phenomenex team. Zebron's track record of innovation is the only to be recognized with 3 R&D 100 Awards and 2 Readers' Choice awards!



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Zebron Inferno™

For Rugged, High Temperature GC Performance Up to 430 °C

- 04 — Overcome Traditional Obstacles
- 05 — High Temp Performance: How It Works
- 06 — Extremely Low Bleed
- 07 — Increase Column Lifetime
- 08 — Separate High Boiling Compounds With Ease
- 10 — Bake Off Contaminants, Eliminate Carryovers
- 11 — See What You've Been Missing!
- 12 — Explore Versatile Selectivities

15 — Featured Applications

Environmental	16
Petrochemical	21
Biodiesel	22
Food & Beverage	23
Industrial Chemical	24
Pharmaceutical	25



12 — Ready to Order?

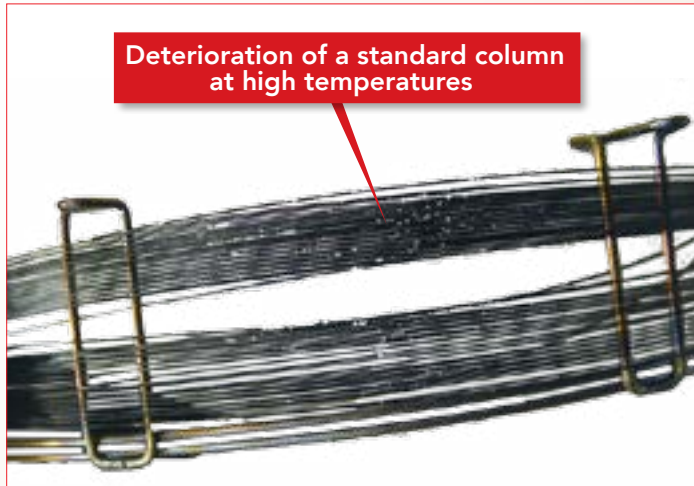
ZB-1HT	12
ZB-5HT	12
ZB-35HT	14
ZB-XLB-HT	14
Recommended GC Accessories	25

Overcome Traditional Obstacles

Challenge # 1: Short Fused Silica Column Lifetimes

Unlike Zebtron™ Inferno™ GC columns, traditional fused silica columns are not equipped to handle prolonged exposure to temperatures above 360 °C. At high temperatures, fused silica GC columns:

- Become inflexible and brittle
- Break easily and cause costly replacement
- Require more system downtime for maintenance
- Can't separate high molecular weight compounds

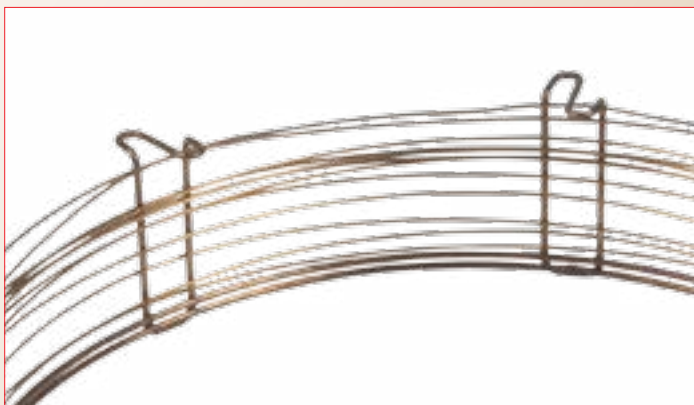


Challenge # 2: Cumbersome Metal Column Tubing

Though metal columns have higher temperature limits than capillary columns, they are more difficult to use.

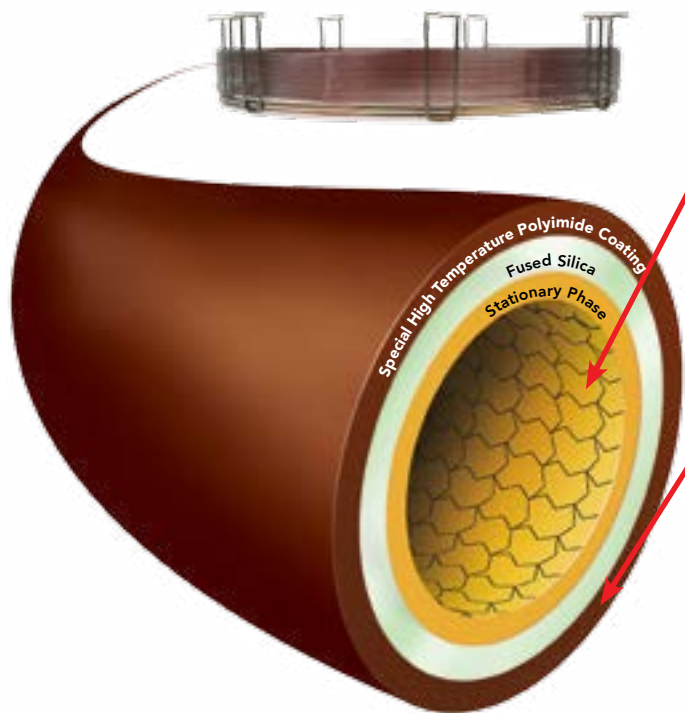
Most metal columns:

- Are inflexible and hard to use
- Require special tubing cutters for installation
- Are prone to leaks from expansion and contraction
- Have active surfaces, giving poor peak shapes for acids and bases
- Are incompatible with MS detectors



Better High Temp Performance: How It Works

Zebtron™ Inferno™ columns offer enhanced performance where other columns fail. The two critical factors that allow for this are:



1. Advanced ESC™ Bonding Technology

At high temperature ranges, the stability of standard GC columns deteriorates, resulting in increased bleed. Zebtron's Engineered Self Cross-linking™ (ESC) bonding technology reinforces the stationary phase for enhanced column durability and extremely low bleed levels at high temperatures. The result: Inferno columns with the flexibility to perform for high temp oven ramps and bakeouts.

2. High Temperature Polyimide Coating

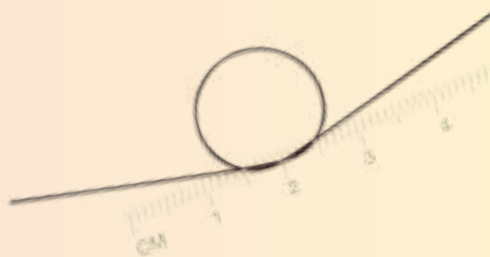
Standard polyimide resin pyrolyzes at temperatures above 360 °C, making the tubing unstable. Zebtron Inferno columns use a temperature resistant polyimide resin that shows minimal thermal degradation, even at temperatures up to 430 °C*. This means longer column lifetime at elevated temperatures.

Inferno Phase	Temperature Limit
ZB-1HT	430 °C
ZB-5HT	430 °C
ZB-35HT	400 °C
ZB-XLB-HT	400 °C



Flexible Even at 430 °C!**

Zebtron Inferno columns remain flexible and easy to work with, even after being exposed to many hours at extreme temperatures. This stability offers the flexibility of a non-metal column while providing long lifetimes, low bleed, and low activity.



* Zebtron ZB-1HT and ZB-5HT Inferno columns have an upper temperature limit of 430 °C. Zebtron ZB-35HT and ZB-XLB-HT Inferno columns have an upper temperature limit of 400 °C.

** Evaluated by performing 185 programmed temperature runs, total 23 hours at 430 °C. Polyimide tubing was still flexible as shown here.

Extremely Low Bleed for Rugged Performance

- Longer column lifetime
- Better reproducibility
- Maximum sensitivity
- More accurate quantitation



What is column bleed?

Column bleed is the loss of stationary phase (MS ions 355, 281, 207, and 73) as a result of impurities in the starting polymer or the decomposition of the phase at elevated temperatures.

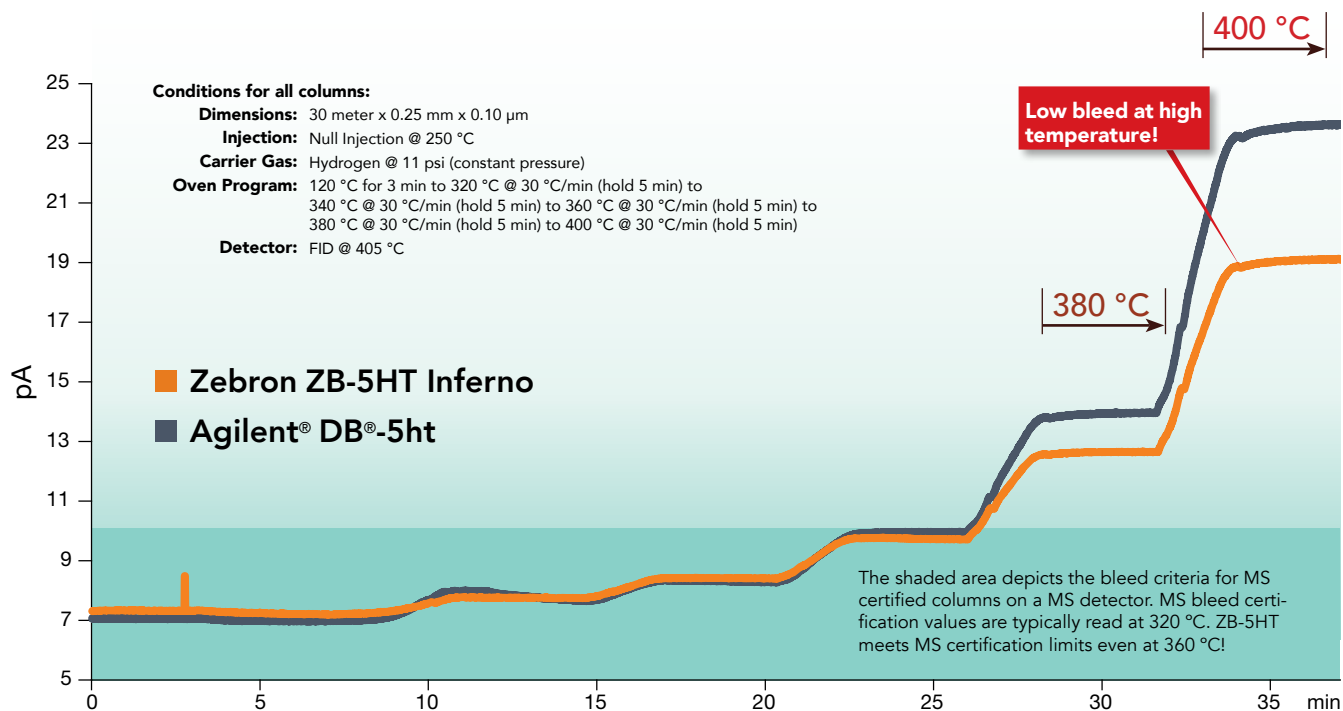
Why is column bleed undesirable?

Column bleed can be an indicator of the stability and lifetime a GC column will offer. When using sensitive detectors such as MS, bleed can impact method detection limits (MDLs) causing difficulties at the low calibration ranges.

What sets Zebron's bleed apart from others?

Our proprietary ESC™ bonding technology and special polyimide tubing enhance column durability for extremely low bleed levels at high temperature.

Zebron™ Inferno™ Columns Have Lower Bleed



Comparative separations may not be representative of all applications.

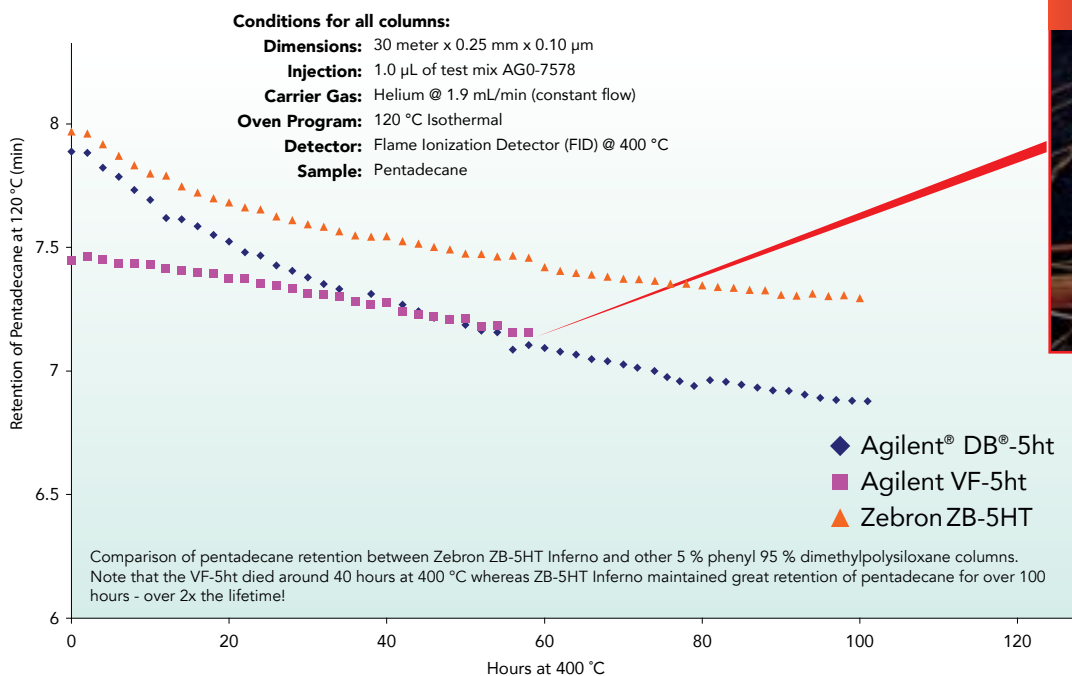
Increased Column Lifetime with Enhanced Durability

- Less instrument downtime
- More productivity
- Lower laboratory costs

Standard GC Columns Cannot Withstand High Temperature

After prolonged exposure to temperatures above 360 °C, most traditional GC columns become brittle and inflexible, often spontaneously breaking in the middle of a run. Work is stopped in order to change out the column and perform system maintenance. Unlike these fragile columns, Zebtron™ Inferno™ columns have a thermally resistant polyimide coating for longer column lifetime at temperatures up to 430 °C. As a result, you get less instrument downtime, and higher productivity.

Zebtron Inferno Columns **Win** In The Lifetime Test



Comparative separations may not be representative of all applications.



How does the lifetime test work?

Hydrocarbons are a good way to measure the stability and lifetime of a non-polar column. Because its interaction with the phase is mostly based on London Dispersion forces, any change in retention time is correlated with phase loss. This will result in increased bleed and poor reproducibility.

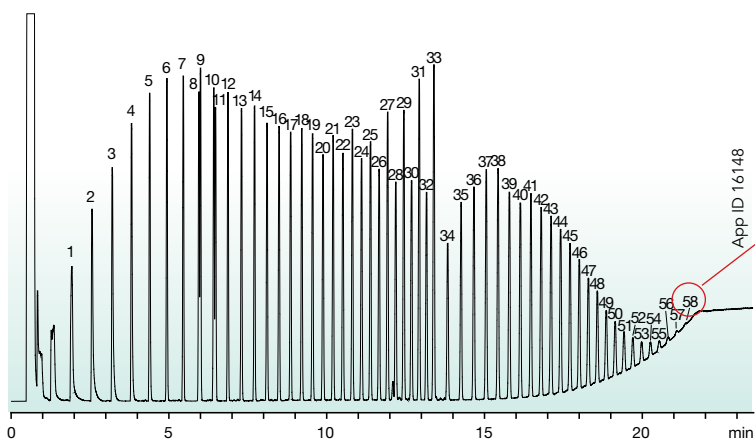
In the lifetime study above, the Zebtron ZB-5HT Inferno lasts twice as long as competing manufacturers. For the test, all columns were held at 400 °C for 2 hours and then the oven was lowered to 120 °C for pentadecane analysis. The Agilent VF-5ht column broke just after 40 hours at 400 °C. The Agilent DB-5ht column had the same retention for pentadecane at 40 hours as the ZB-5HT at 100 hours.

Greater Performance for High Boiling Compounds

- Better peak shape
- Improved separation
- More analytes detected

Zebron™ Inferno™ columns have the inertness and temperature stability needed to separate high molecular weight compounds. These high boilers require a thermally rugged column with low bleed levels. Inferno columns provide optimal separation of these analytes.

Great Separation of High Boiling Hydrocarbons (ASTM Method D6352)



Easily Elute Hydrocarbons Up To C90
 Zebron ZB-1HT Inferno can operate up to 430 °C, allowing C90 to elute on temperature ramp to meet ASTM requirements!

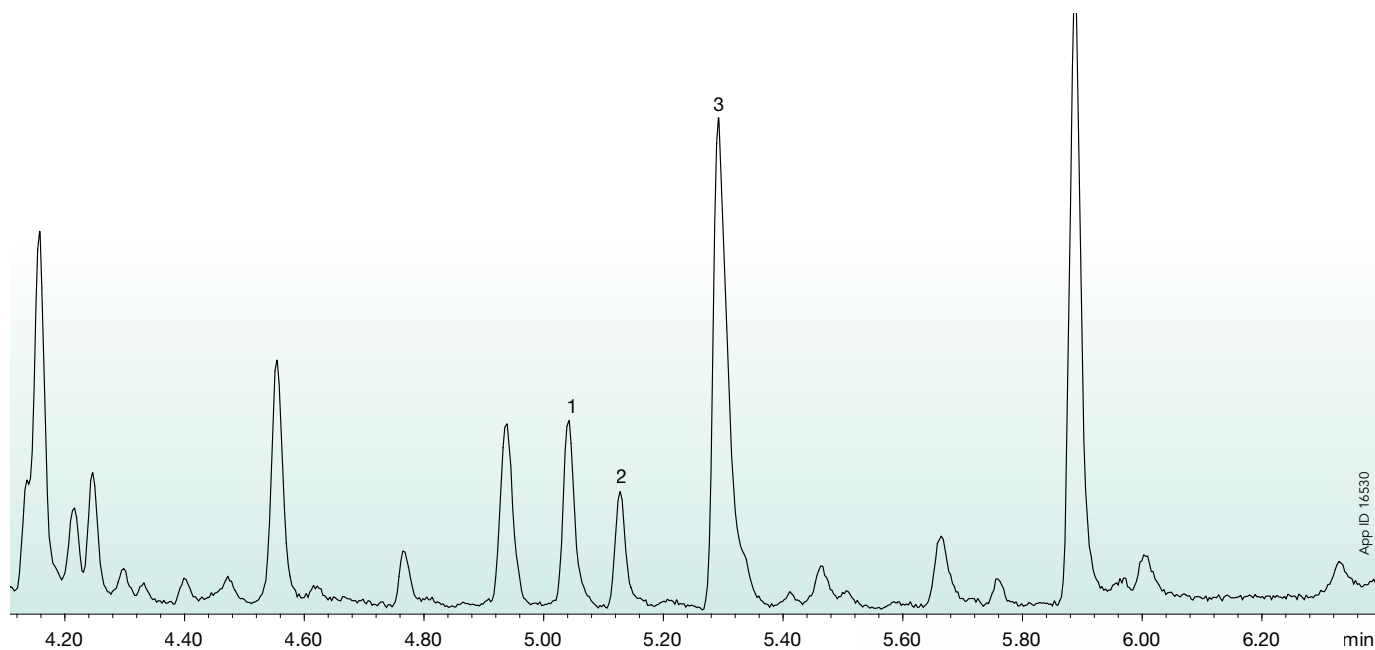
Column: Zebron ZB-1HT Inferno
Dimensions: 5 meter x 0.53 mm x 0.10 µm
Part No.: 7AK-G014-02
Injection: On-Column @ 43 °C, 0.1 µL
Carrier Gas: Helium @ 4.4 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 430 °C @ 20 °C/min for 10 min
Detector: FID @ 430 °C
Note: Sample was a combination of POLYWAX® 655 and retention time markers C8-C40 in CS₂/Chloroform

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





Sterols From Margarine by GC/MS on ZB-5HT Inferno™



Column: Zebron ZB-5HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.10 μ m
Part No.: 7HG-G015-02
Injection: Splitless @ 275 °C, 0.5 μ L
Carrier Gas: Helium @ 1.5 mL/min (constant flow)
Oven Program: 220 °C to 350 °C @ 20 °C/min
Detector: MSD @ 275 °C
Sample:
1. Campesterol
2. Stigmasterol
3. β -Sitosterol
4. Betulin (IS)



Bake Off Contaminants, Eliminate Carryovers

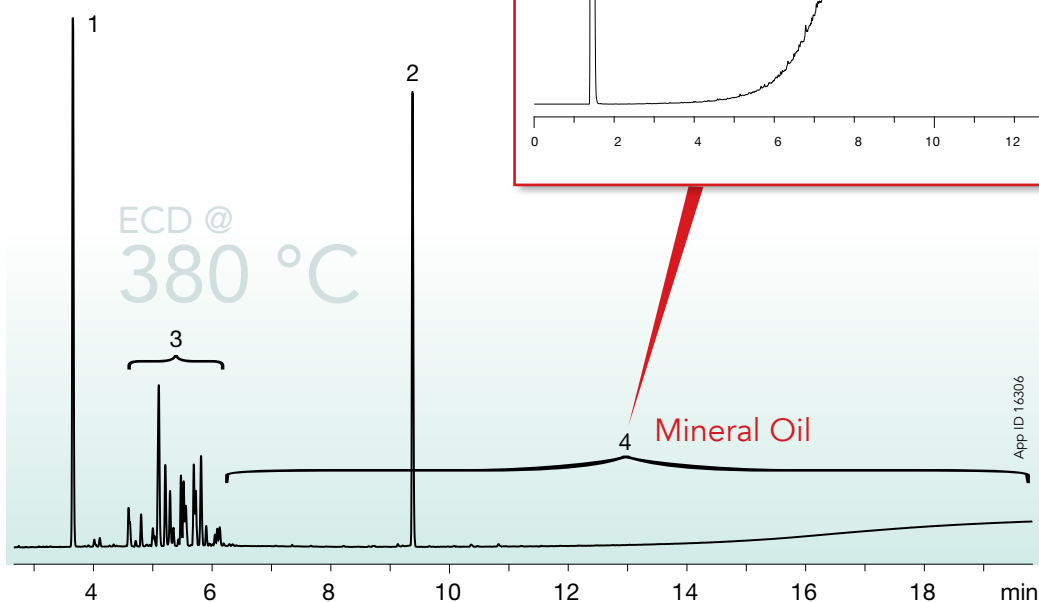
- Achieve better reproducibility
- Extend column lifetime
- Attain sharper peak shapes

Eliminate Problems Associated With Dirty Samples

Contaminants in dirty samples can linger on a GC column, eventually changing its selectivity and shortening its lifetime. Because Zebtron™ Inferno™ columns are robust enough to withstand repeated high temperature cycles, more aggressive column baking steps can be used to remove persistent contaminants, thus prolonging column lifetimes.

Unseen hydrocarbon contaminants revealed using FID starting at 5 minutes!

Hydrocarbon contaminants are not detected by ECD!



Conditions for ECD:

Column: Zebtron ZB-5HT Inferno
Dimensions: 30 meter x 0.32 mm x 0.10 µm
Part No.: 7HM-G015-02
Injection: Split 52:1 @ 330 °C, 1 µL
Carrier Gas: Helium @ 1.9 mL/min (constant flow)
Oven Program: 150 °C for 2 min to 420 °C @ 20 °C/min for 4.5 min
Detector: ECD @ 380 °C
Sample: Aroclor 1016 @ 100 ppb; Mineral Oil @ 1 % in isooctane
1. TCMX
2. DCOB
3. Aroclor 1016
4. Mineral Oil

Conditions for FID:

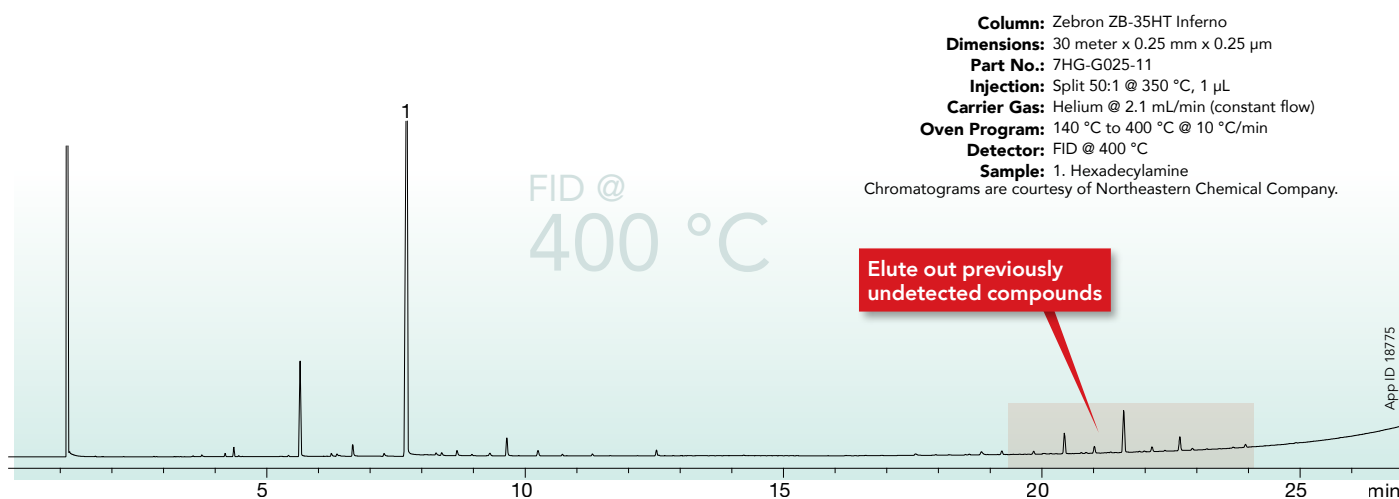
Column: Zebtron ZB-5HT Inferno
Dimensions: 30 meter x 0.32 mm x 0.10 µm
Part No.: 7HM-G015-02
Injection: Split 5:1 @ 330 °C, 1 µL
Carrier Gas: Helium @ 1.9 mL/min (constant flow)
Oven Program: 150 °C for 2 min to 420 °C @ 20 °C/min for 4.5 min
Detector: FID @ 435 °C
Sample: Analyte is 1 % in isooctane
1. Mineral Oil

See What You've Been Missing!

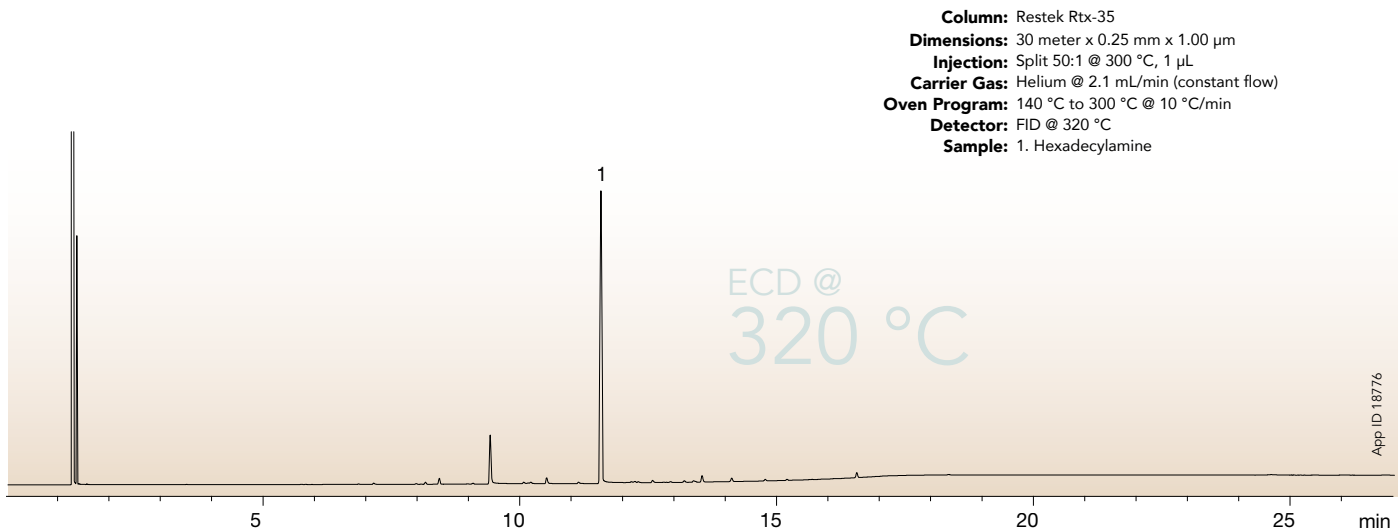
- Uncover compounds that were previously undetected
- Elute compounds at higher temperatures
- Achieve more accurate, reproducible results

Though many contaminants or unknowns are commonly unseen, this does not mean they are not being injected onto the column! Many high boiling compounds will remain on a column and go undetected run after run, as is often the case when using ECD detectors. As a consequence, results are inaccurate because of missing data. Running at higher temperatures will allow these formerly undetected compounds to elute and be detected, giving more accurate and reproducible results.

Zebron™ ZB-35HT Inferno™



Restek® Rtx®-35



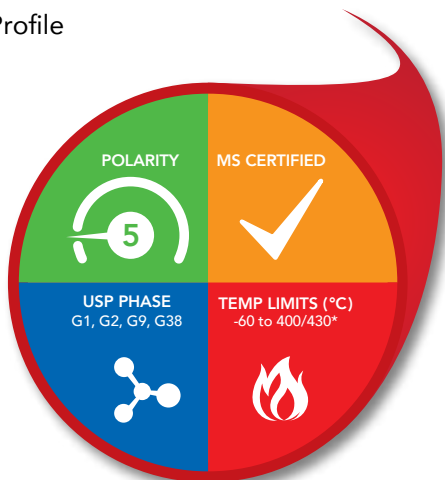
Comparative separations may not be representative of all applications.

Explore Versatile Selectivities

Zebtron™ ZB-1HT Inferno™

- Provides true boiling point separation for hydrocarbon distillation methods

Column Profile



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

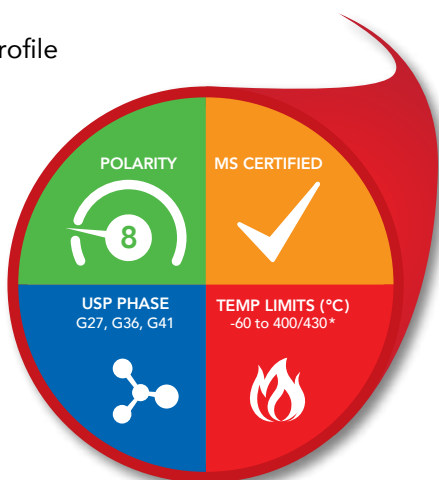
Recommended Applications

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

Zebtron ZB-5HT Inferno

- Versatile selectivity for a wide range of applications

Column Profile



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

Recommended Applications

- High Boiling Petroleum Products
- Triglycerides
- Simulated Distillation Methods
- Diesel Fuel
- Long-Chained Hydrocarbons
- Motor Oils
- Polymers/Plastics
- Surfactants
- High Molecular Weight Waxes

Alternative To: Any 100 % Dimethylpolysiloxane Phase:

- DB®-1ht
- Rxj®-1HT
- Petrocol 2887
- CP-SimDist

Ordering Information

Zebtron ZB-1HT Inferno GC Columns

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

Alternative to Any 5% Phenyl 95% Dimethylpolysiloxane Phase:

- DB-5ht
- VF-5ht
- HT-5
- Stx®-5HT
- XTI®-5HT

Ordering Information

Zebtron ZB-5HT Inferno GC Columns

Length (m)	ID (mm)	df (µm)	Temp. Limits °C	Part No.
15	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
20	0.18	0.18	-60 to 400/430	7FD-G015-08
30	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	0.25	0.25	-60 to 400/430	7KG-G015-11

guarantee

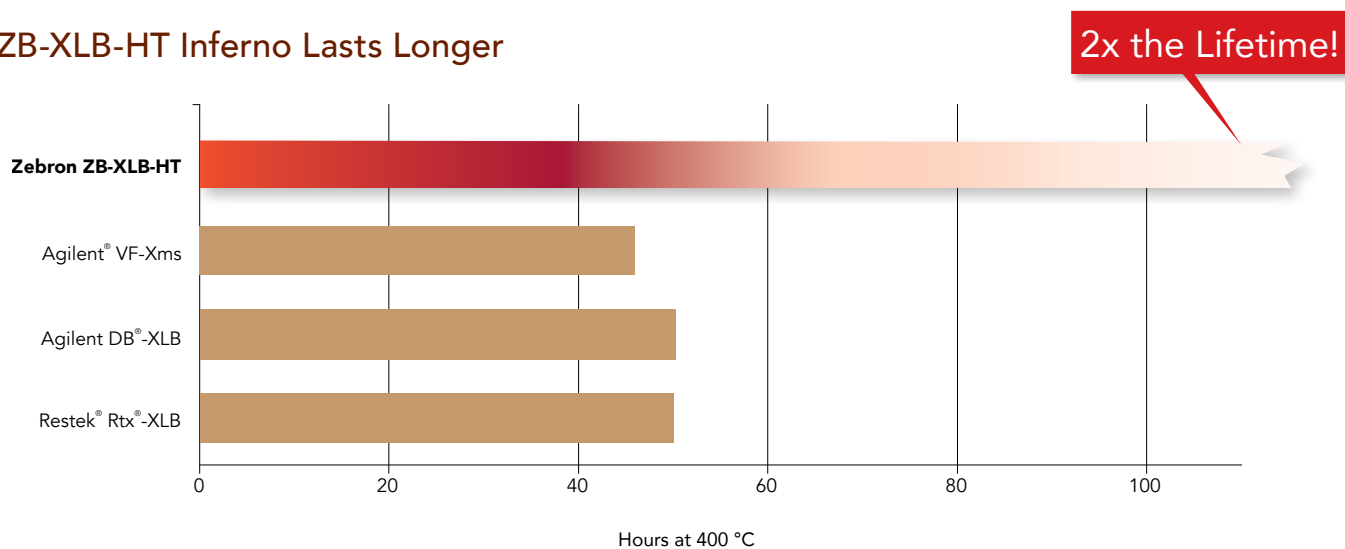
If Zebtron columns do not provide you with equivalent or better separations as compared to any other GC column of the same phase and comparable dimensions, return the column with comparative data within 45 days for a FULL REFUND.

Explore Versatile Selectivities

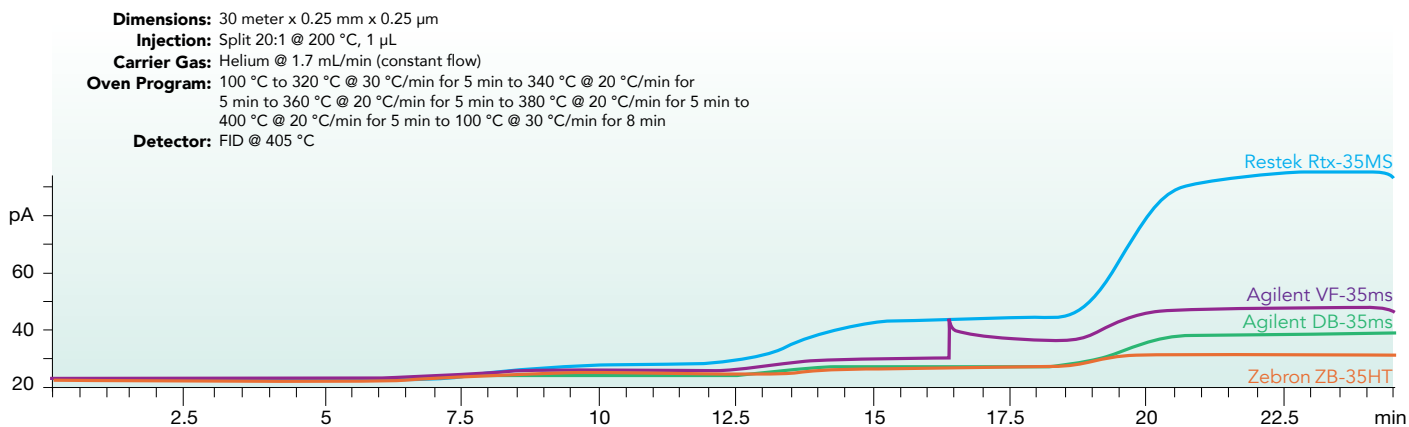
Two Innovative Mid-Polar Phases

Zebtron™ ZB-35HT and ZB-XLB-HT Inferno™ are the first and only to offer mid-polarity selectivity with the durability and ruggedness to perform well at extreme temperatures. With an astonishing upper temperature limit of 400 °C, both columns provide good separations of high boilers at extremely low bleed levels.

ZB-XLB-HT Inferno Lasts Longer



ZB-35HT Inferno Provides the Lowest Bleed



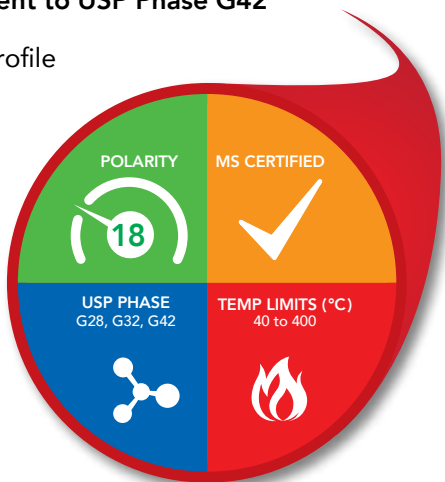
Comparative separations may not be representative of all applications.

Explore Versatile Selectivities

Zebron™ ZB-35HT Inferno™

- First non-metal 35 % Phenyl columns stable to 400 °C
- Great for high molecular weight compounds
- Equivalent to USP Phase G42

Column Profile



Alternative to Any 35 % Phenyl 65 % Dimethylpolysiloxane Phase:

- DB®-35ms
- Rtx-35
- EC-35
- Sup-Herb
- SPB-680
- SPB®-35
- BPX35
- OV-11
- MDN-35
- Rtx®-35MS
- AT-35
- HP-35
- DC-35
- 007-11
- HP-35ms
- BPX608

Ordering Information

Zebron ZB-35HT Inferno GC Columns

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

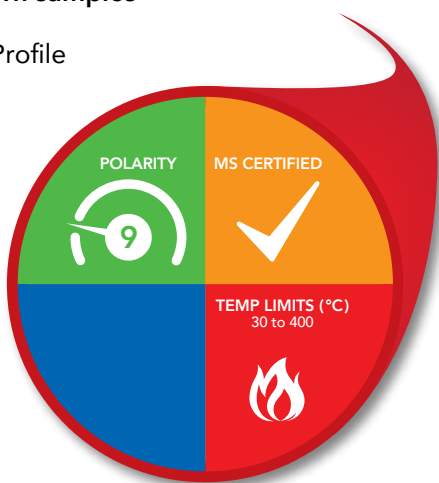
Recommended Applications

- Amines
- Aroclors
- Chemicals
- Drugs of Abuse
- EPA Methods 508, 608, 8081, 8141, 8151
- Pesticides
- Pharmaceuticals
- Semi-volatiles
- Steroids

Zebron ZB-XLB-HT Inferno

- Non-metal si-arylene GC column stable to 400 °C
- Good tool for general screening to identify unknown samples

Column Profile



Similar* To:

- MDN-12
- DB-XLB
- Rtx-XLB

*Not exact equivalent, selectivity may differ.

Ordering Information

Zebron ZB-XLB Inferno GC Columns

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

Recommended Applications

- EPA Methods
- Herbicides
- Pesticides
- Polychlorinated Biphenyls (PCBs)



If Zebron columns do not provide you with equivalent or better separations as compared to any other GC column of the same phase and comparable dimensions, return the column with comparative data within 45 days for a FULL REFUND.

Suited for a

Wide Range of Applications

For Many Industries:

Environmental.....pp. 16-20
Petrochemical.....p. 21
Biodieselp. 22
Food/Beveragep. 23
Chemicals.....p. 24
Pharmaceuticalsp. 24

Dual-Column Analysis

EPA 552.2 p. 16
EPA 8081 p. 18
EPA 8151..... p. 18

High Molecular Weight Compounds

Heavy PAHs.....p. 19
Long-Chained Hydrocarbons...p. 21
Oils.....pp. 21, 23
Triglyceridesp. 23

Dirty Samples

Oilspp. 21, 23

Trace Level Analysis

Environmental Contaminants..... pp. 16-20
Pesticides..... pp. 16-20
Biodiesel..... p. 22
Pharmaceuticals p. 24

Environmental Applications

EPA Method 552.2: Haloacetic Acids (HAAs)

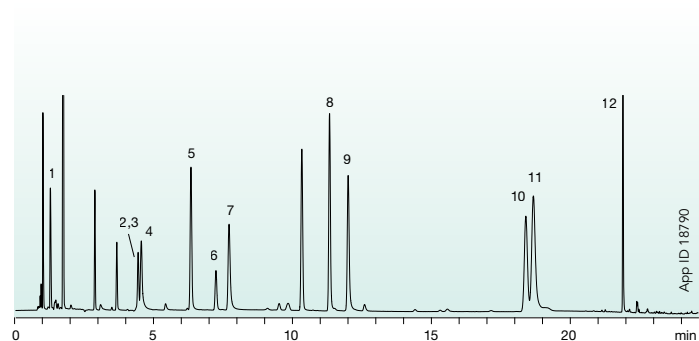
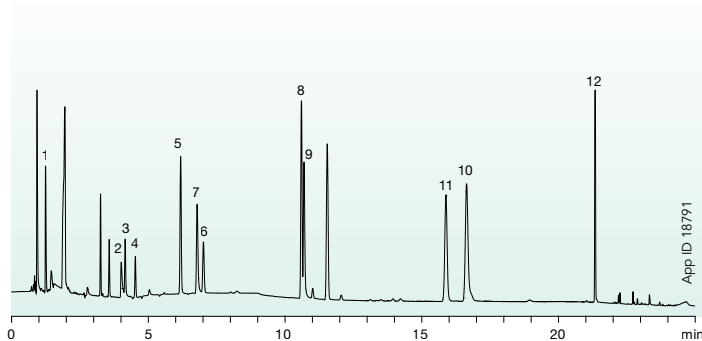
Zebron™ ZB-XLB-HT Inferno™

Part No.: 7HG-G024-11

Zebron™ ZB-35-HT Inferno

Part No.: 7HG-G025-11

Dual-Column Analysis



Conditions for both columns:

Dimensions: 30 meter x 0.25 mm x 0.25 μ m

Injection: Split 5:1 @ 250 °C, 1 μ L

Carrier Gas: Helium @ 4.0 mL/min (constant flow)

Oven Program: 40 °C for 1 min to 55 °C @ 5 °C/min for 5 min to 70 °C @ 10 °C/min for 9 min to 250 °C @ 30 °C/min for 2 min

Detector: ECD @ 300 °C

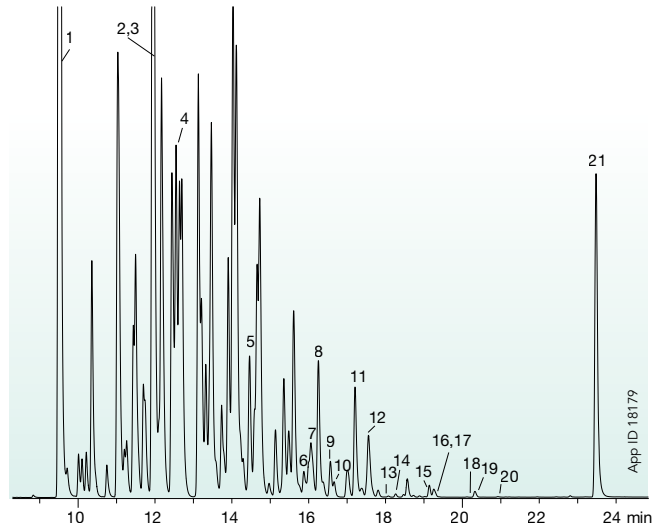
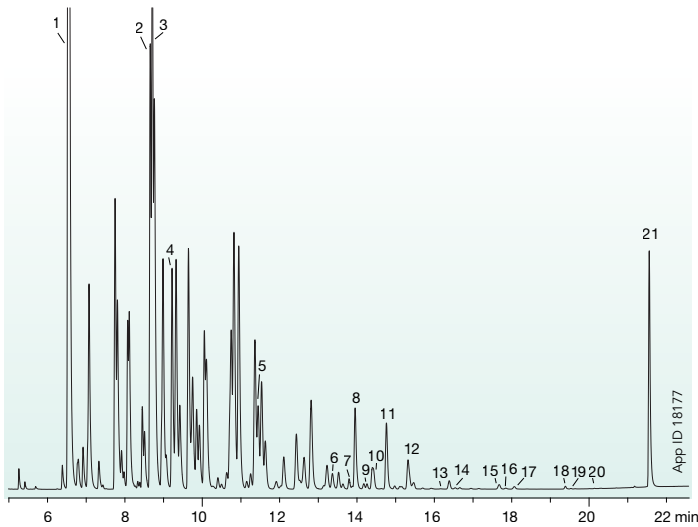
Sample: Analytes are methylated and 100 ppb in isooctane

- | | |
|---------------------------|------------------------------|
| 1. Chloroacetic Acid | 7. Bromochloroacetic Acid |
| 2. Bromoacetic Acid | 8. Bromodichloroacetic Acid |
| 3. Dichloroacetic Acid | 9. Dibromoacetic Acid |
| 4. Dalapon | 10. Chlorodibromoacetic Acid |
| 5. Trichloroacetic Acid | 11. 2,3-Dibromopropionate |
| 6. 1,2,3-Trichloropropane | 12. Tribromoacetic Acid |

Environmental Applications

DIN Method 51527: Aroclor 1242

DIN Method 51527: Aroclor 1242



Column: Zebtron 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
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 isoctane

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

Column: Zebtron ZB-35HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G025-11
Injection: Splitless @ 250 °C, 1 µL
Carrier Gas: Helium @ 0.5 mL/min (constant flow)
Oven Program: 50 °C for 0.5 min to 220 °C @ 30 °C/min to 320 °C @ 6 °C/min for 2 min
Detector: ECD @ 350 °C

Sample:

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

Environmental Applications

EPA Method 8081: Chlorinated Pesticides

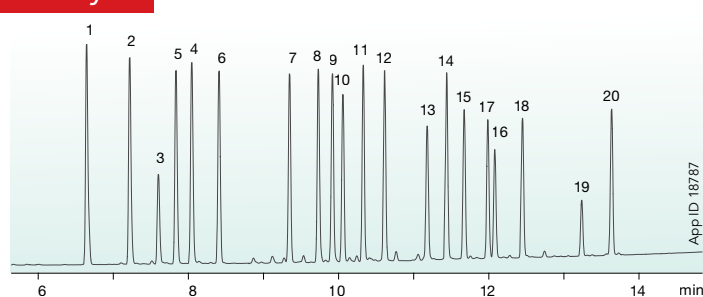
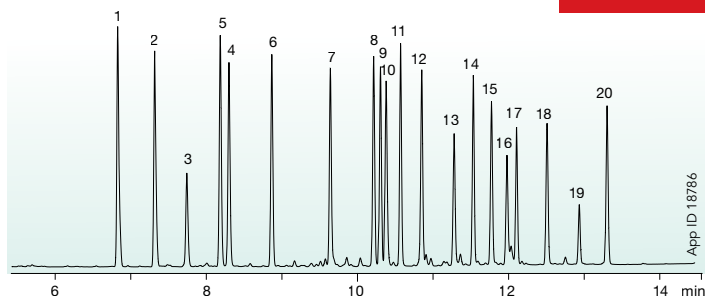
Zebtron™ ZB-XLB-HT Inferno™

Part No.: 7HG-G024-11

Zebtron ZB-35-HT Inferno

Part No.: 7HG-G025-11

Dual-Column Analysis



Conditions for both columns:

Dimensions: 30 meter x 0.25 mm x 0.25 μm
Injection: Splitless 15:1 @ 250 °C, 1 μL
Carrier Gas: Helium @ 0.8 mL/min (constant flow)
Oven Program: 160 °C for 1 min to 250 °C @ 15 °C/min for 1 min to 320 °C @ 10 °C/min
Detector: ECD @ 335 °C

Sample: Analytes are 25 ppb in isooctane

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

EPA Method 8151: Chlorinated Herbicides

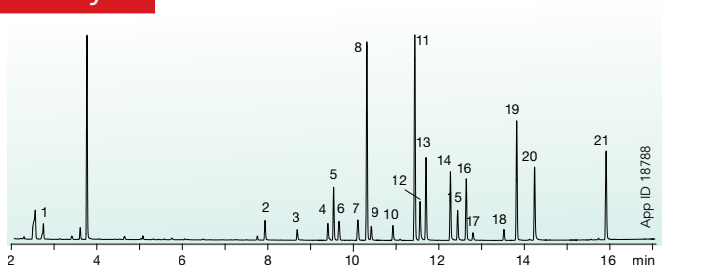
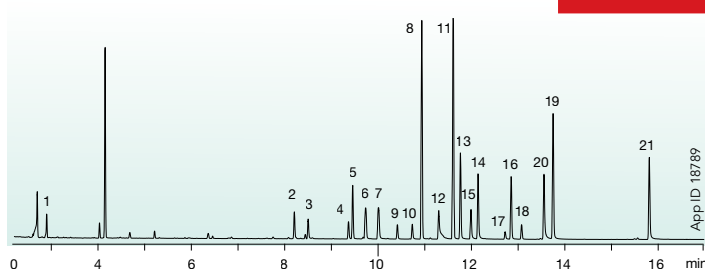
Zebtron ZB-XLB-HT Inferno

Part No.: 7HG-G024-11

Zebtron ZB-35-HT Inferno

Part No.: 7HG-G025-11

Dual-Column Analysis



Conditions for both columns:

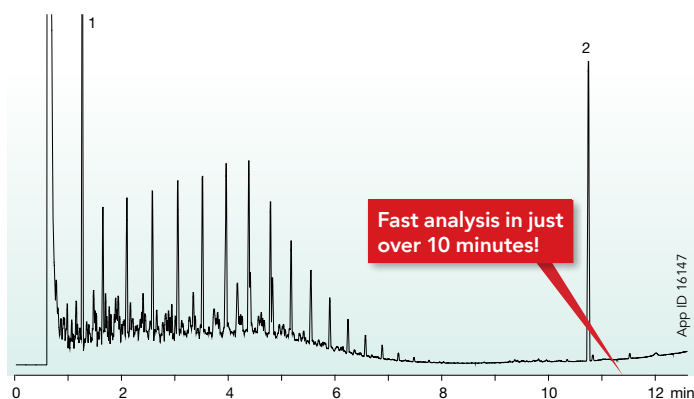
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Injection: Split 10:1 @ 200 °C, 1 μL
Carrier Gas: Helium @ 0.5 mL/min (constant flow)
Oven Program: 50 °C for 0.5 min to 100 °C @ 25 °C/min to 320 °C @ 12 °C/min for 2 min
Detector: MSD @ 350 °C

Sample: Analytes are 50 ppb in isooctane

- | | | |
|-----------------------------|-----------------------|-----------------|
| 1. Dalapon | 9. Dichlorprop | 17. Dinoseb |
| 2. 3,5-Dichlorobenzoic acid | 10. 2,4-D | 18. Bentazon |
| 3. 4-Nitrophenol | 11. Pentachlorophenol | 19. Picloram |
| 4. DCAA (Internal Standard) | 12. Contaminant | 20. DCPA |
| 5. Dicamba | 13. Silvex | 21. Acifluorfen |
| 6. MCPP | 14. Chloramben | |
| 7. MCPA | 15. 2,4,5-T | |
| 8. DBOB (Internal Standard) | 16. 2,4-DB | |

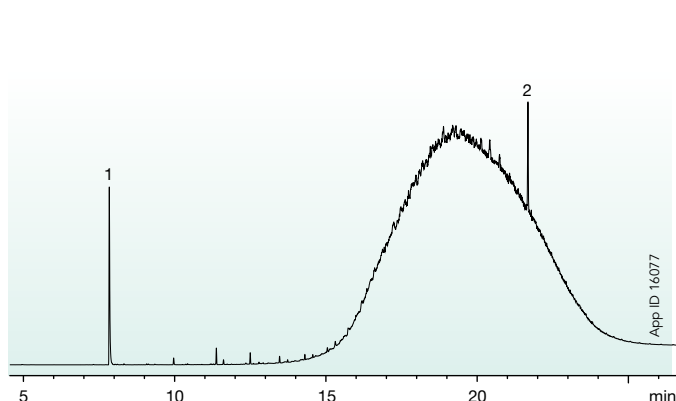
Environmental Applications

Fast H-53 Analysis of Diesel Fuel



Column: Zebtron™ ZB-5HT Inferno™
Dimensions: 15 meter x 0.32 mm x 0.10 μm
Part No.: 7EM-G015-02
Injection: On-Column @ 63 °C, 0.1 μL
Carrier Gas: Helium @ 2.7 mL/min (constant flow)
Oven Program: 60 °C to 375 °C @ 25 °C/min
Detector: FID @ 400 °C
Sample: Diesel Fuel was 200 ppm in dichloromethane with Internal Standards at 50 ppm
 1. Decane (C10)
 2. Tetracontane (C40)

Mineral Oil Using H-53 Conditions

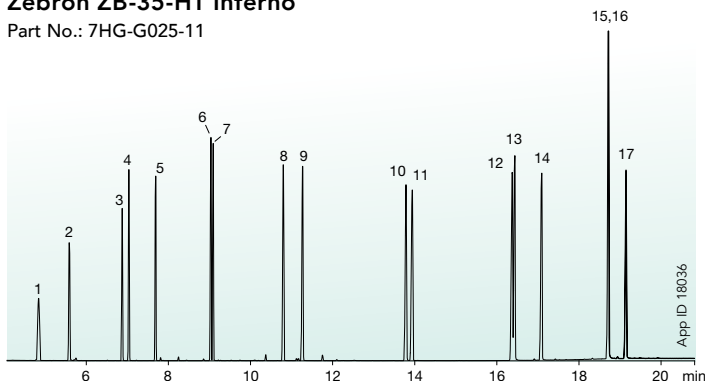


Column: Zebtron ZB-5HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.10 μm
Part No.: 7HG-G015-02
Injection: On-Column @ 53 °C, 0.1 μL
Carrier Gas: Helium @ 1.3 mL/min (constant flow)
Oven Program: 50 °C for 6 min to 400 °C @ 20 °C/min for 15 min
Detector: FID @ 415 °C
Sample: Fuel was 10 mg/mL in dichloromethane with 50 ppm markers
 1. Decane (C10)
 2. Tetracontane (C40)

Polycyclic Aromatic Hydrocarbons (PAHs)

Zebtron ZB-35-HT Inferno

Part No.: 7HG-G025-11



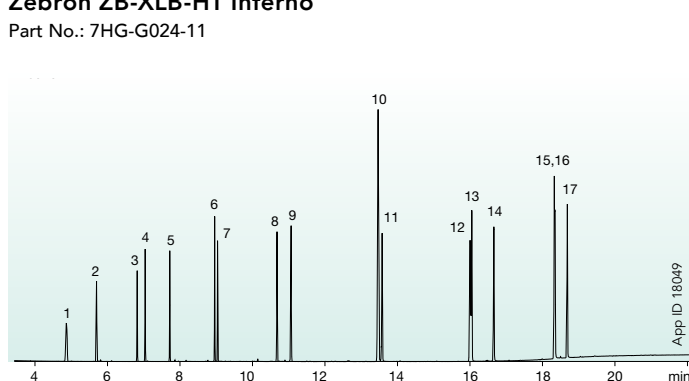
Conditions for both columns:

Dimensions: 30 meter x 0.25 mm x 0.25 μm
Injection: Pulsed Splitless @ 280 °C (20 psi for 0.66 min), 1 μL
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 80 °C for 0.66 min to 250 °C @ 20 °C/min to 300 °C @ 8 °C/min to 360 °C @ 20 °C/min for 6 min
Detector: MSD @ 360 °C; 45-400 amu

Polycyclic Aromatic Hydrocarbons (PAHs)

Zebtron ZB-XLB-HT Inferno

Part No.: 7HG-G024-11



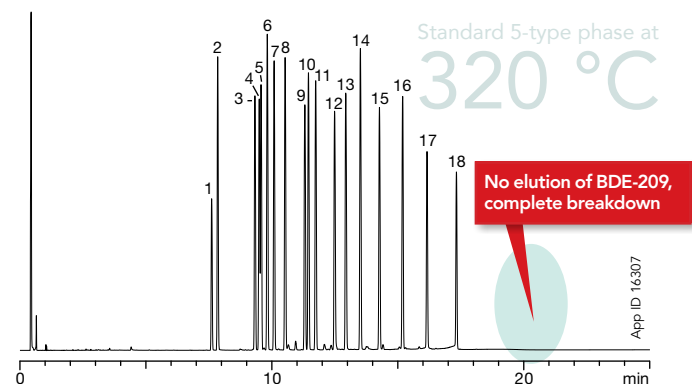
Sample: Analytes are @ 10 ppm in dichloromethane

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

Environmental Applications

Polybrominated Diphenyl Ethers (PBDE)

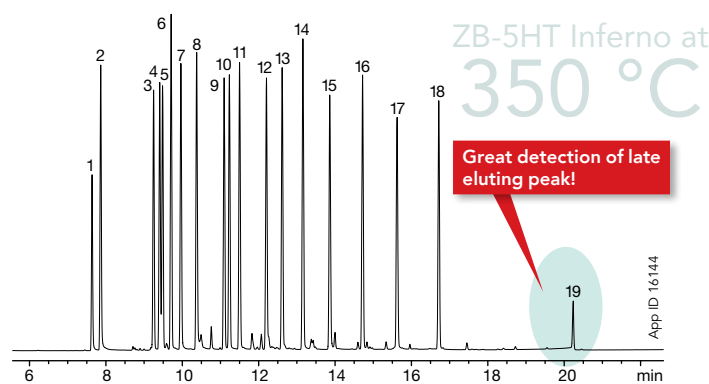
In a GC column, late eluting PBDEs often break down and become difficult to detect. ZB-5HT Inferno™ columns have increased sensitivity for late eluting compounds and thus can easily detect these analytes.



Column: Standard 5-type phase
Dimensions: 15 meter x 0.25 mm x 0.10 µm
Injection: On-Column @ 73 °C, 0.5 µL
Carrier Gas: Helium @ 3.4 mL/min (constant pressure)
Oven Program: 70 °C to 160 °C @ 25 °C/min to 320 °C @ 10 °C/min hold 10 min
Detector: ECD @ 340 °C

Sample: Sample was 2.5 ppm in isooctane

1. BDE-25	11. BDE-99
2. BDE-28	12. BDE-85
3. BDE-75	13. BDE-154
4. BDE-49	14. BDE-153
5. BDE-71	15. BDE-138
6. BDE-47	16. BDE-183
7. BDE-66	17. BDE-190
8. BDE-77	18. BDE-203
9. BDE-100	
10. BDE-119	

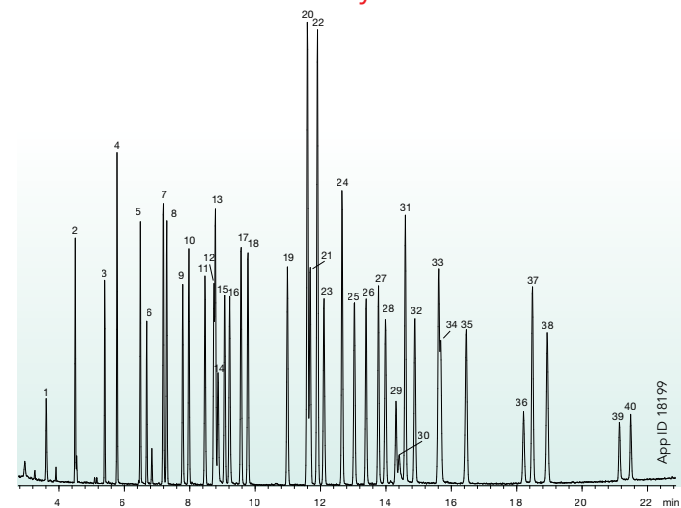


Column: Zebron™ ZB-5HT Inferno
Dimensions: 15 meter x 0.25 mm x 0.10 µm
Part No.: 7EG-G015-02
Injection: On-Column @ 73 °C, 0.5 µL
Carrier Gas: Helium @ 1.5 mL/min (constant flow)
Oven Program: 70 °C to 160 °C @ 25 °C/min to 350 °C @ 10 °C/min for 5 min
Detector: ECD @ 400 °C

Sample: Sample was 2.5 ppm in isooctane

1. BDE-25	11. BDE-99
2. BDE-28	12. BDE-85
3. BDE-75	13. BDE-154
4. BDE-49	14. BDE-153
5. BDE-71	15. BDE-138
6. BDE-47	16. BDE-183
7. BDE-66	17. BDE-190
8. BDE-77	18. BDE-203
9. BDE-100	19. BDE-209
10. BDE-119	

Chlorinated Pesticides by GC/MS

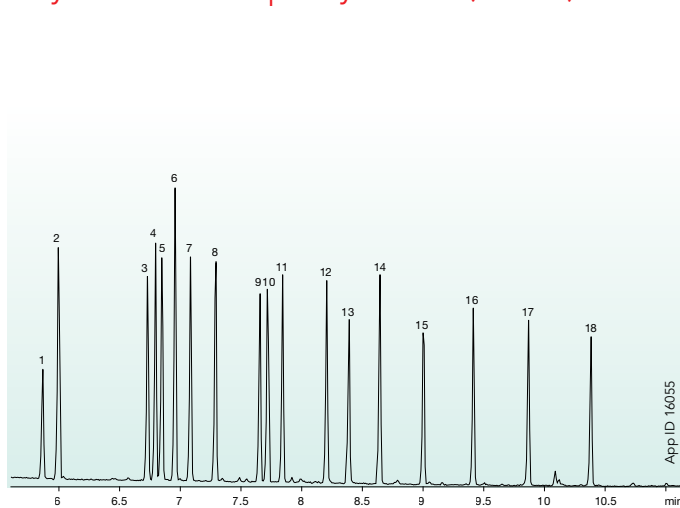


Column: Zebron ZB-35HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part No.: 7HG-G025-11
Injection: Split 10:1 @ 200 °C, 1 µL
Carrier Gas: Helium @ 0.5 mL/min (constant flow)
Oven Program: 100 °C for 0.5 min to 210 °C @ 30 °C/min for 0.5 min to 230 °C @ 10 °C/min for 2 min to 260 °C @ 5 °C/min for 2 min to 300 °C @ 6 °C/min for 2 min
Detector: MSD @ 350 °C; 50-550 amu

Sample: Analytes were 10 ppm in isooctane

1. DBCP	14. Diclhone	27. Chlorobenzilate
2. Hexachlorocyclopentadiene	15. δ-BHC	28. Endrin
3. Etridiazole	16. Chlorothalonil	29. Nitrofen
4. Chloroneb	17. Aldrin	30. Kepone
5. Propachlor	18. DCPA (Dacthal)	31. 4,4'-DDD
6. Diallate	19. Heptachlor epoxide	32. Endosulfan II
7. Hexachlorobenzene	20. trans-Chlordane (gamma)	33. 4,4'-DDT
8. α-BHC	21. trans-Nonachlor	34. Endrin Aldehyde
9. PCNB	22. cis-Chlordane (alpha)	35. Endosulfan sulfate
10. γ-BHC	23. Endosulfan I	36. Captafol
11. β-BHC	24. 4,4'-DDE	37. Methoxychlor
12. Alachlor	25. Dieldrin	38. Endrin Ketone
13. Heptachlor	26. Chloropropylate	39. Permethrin
		40. Permethrin isomer

Polybrominated Diphenyl Ethers (PBDEs)



Column: Zebron ZB-5HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.10 µm
Part No.: 7HG-G015-02
Injection: Pulsed Splitless (50 psi) @ 350 °C, 2 µL
Carrier Gas: Helium @ 1.3 mL/min (constant flow)
Oven Program: 125 °C to 380 °C @ 22 °C/min for 15 min
Detector: MSD; 45 - 800 amu

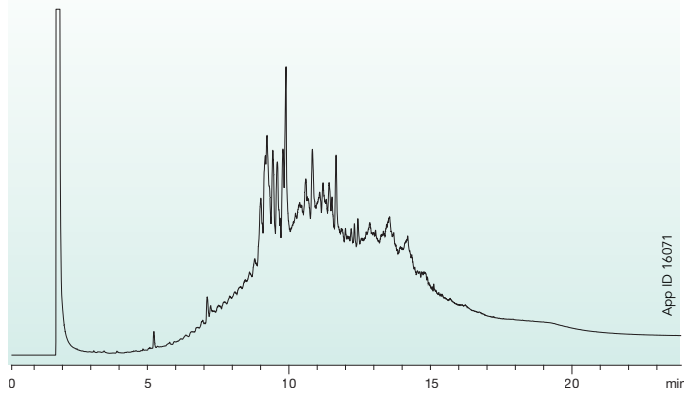
Sample: Analytes were 2.5 ppm in isooctane

1. BDE-25	7. BDE-66	13. BDE-154
2. BDE-28	8. BDE-77	14. BDE-153
3. BDE-75	9. BDE-100	15. BDE-138
4. BDE-49	10. BDE-119	16. BDE-183
5. BDE-71	11. BDE-99	17. BDE-190
6. BDE-47	12. BDE-85	18. BDE-203

Petrochemical Applications

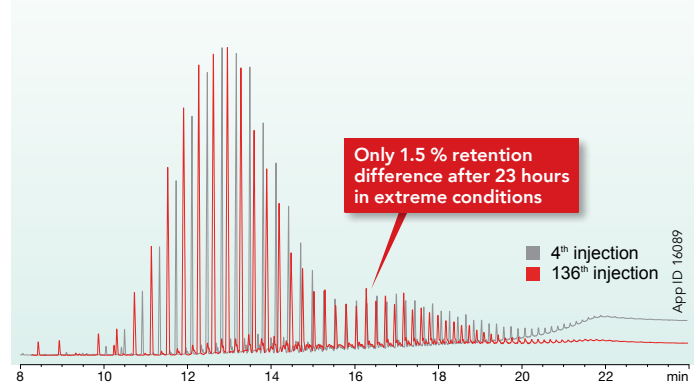
Motor Oil by GC/FID

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 at 14 °C/min for 6 min
Detector: FID @ 400 °C
Sample: Sample was 1 % in dichloromethane
 Mobil® 1 10W-30 Fully Synthetic Motor Oil



Paraffin Wax by GC/FID

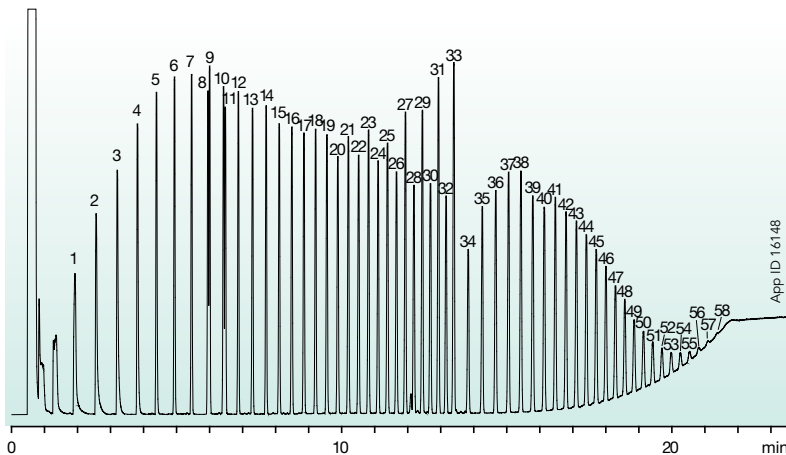
Column: Zebron ZB-5HT Inferno
Dimensions: 15 meter x 0.32 mm x 0.10 µm
Part No.: 7EM-G015-02
Injection: Direct on-column @ 43 °C, 0.01 µL
Carrier Gas: Helium @ 1.9 mL/min (constant flow)
Oven Program: 40 °C for 2 min to 430 °C @ 20 °C for 10 min
Detector: FID @ 430 °C
Sample: Paraffin Wax



ASTM Methods D2887 and D6352 On One Column

ASTM D2887 and D6352 both set standard test methods for boiling range determination of petroleum fractions by GC. While ASTM D2887 is used for products having a final boiling point of 538 °C or lower, ASTM D6352 is used for determining petroleum distillate fractions with a boiling point (BP) up to 700 °C. Zebron Inferno columns make simulated distillation analysis easier and less expensive. Typically both a traditional fused silica column for ASTM D2887 and a metal column for ASTM D6352 are used. Zebron Inferno columns provide a robust, single-column solution for both analyses.

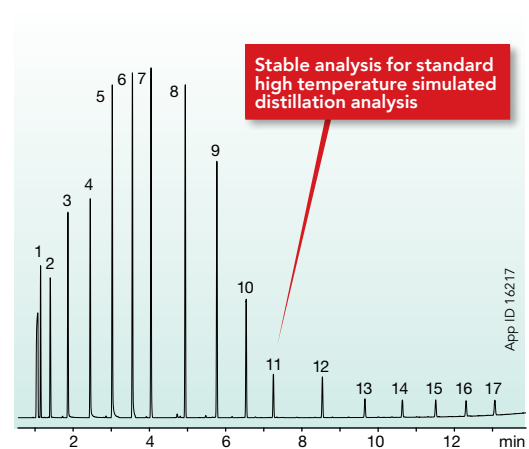
ASTM Method D6352



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: Sample was a combination of POLYWAX® 655 and retention time markers C8-C40 in CS₂/Chloroform

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

ASTM Method D2887-97



Column: Zebron ZB-1HT Inferno
Dimensions: 15 meter x 0.53 mm x 0.15 µm
Part No.: 7EK-G014-05
Injection: On-Column @ 38 °C, 0.1 µL
Carrier Gas: Helium @ 10 mL/min (constant flow)
Oven Program: 35 °C for 1 min to 360 °C @ 25 °C/min
Detector: FID @ 375 °C
Sample:

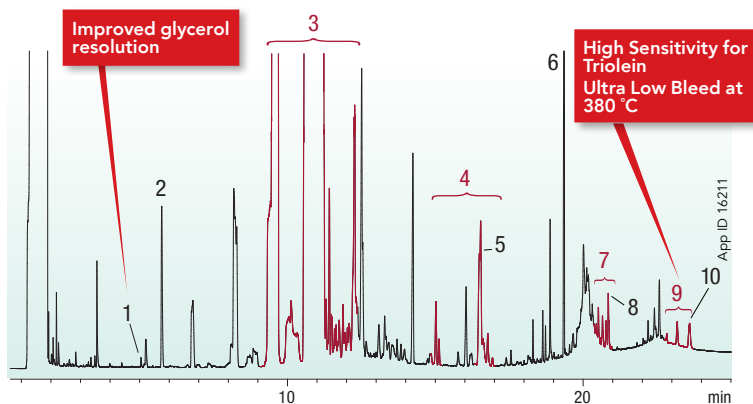
1. Hexane	10. Octadecane
2. Heptane	11. Eicosane
3. Octane	12. Tetracosane
4. Nonane	13. Octacosane
5. Decane	14. n-Dotriacontane
6. Undecane	15. n-Hexatriacontane
7. Dodecane	16. Tetracontane
8. Tetradecane	17. Tetratetracontane
9. Hexadecane	

Biodiesel Applications

Free and Total Glycerin in Biodiesel

Zebtron™ ZB-1HT Inferno™ is ideal for biodiesel analysis because it is stable at the elevated temperatures needed to resolve and remove high boiling triglycerides. While standard polyimide resin degrades at temperatures above 380 °C, ZB-1HT Inferno shows minimal thermal breakdown, even at programmed temperatures up to 430 °C– the highest thermal stability of any non-metal GC column!

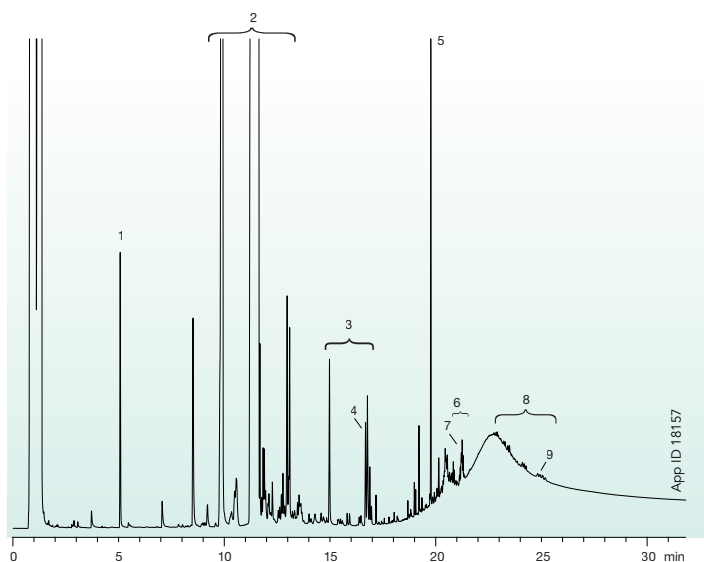
ASTM Method D6584: Free and Total Glycerin in B-100 Biodiesel Methyl Esters



Column: Zebtron 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

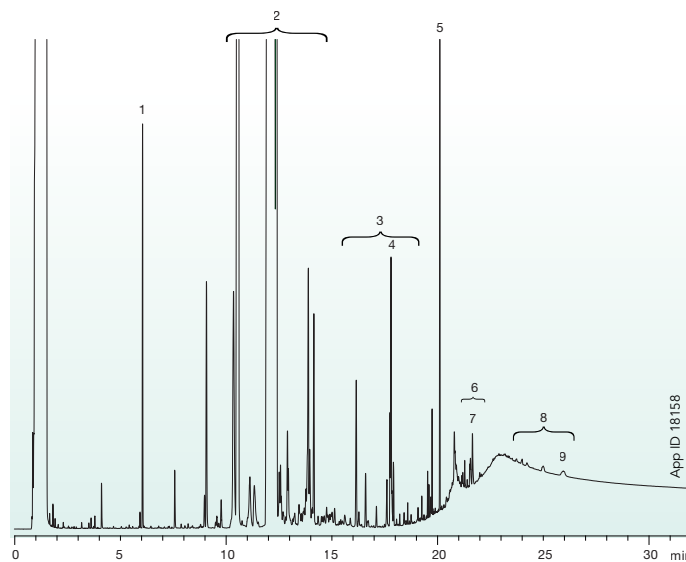
Sample: A 2.0 m x 0.53 mm ID guard column was connected to the analytical column per ASTM method requirements.

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



Column: Zebtron ZB-35HT Inferno
Dimensions: 15 meter x 0.25 mm x 0.10 μm
Part No.: 7EG-G025-02
Injection: On-Column @ 53 °C, 0.1 μL
Carrier Gas: Helium @ 1.3 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
Sample: A 30 cm x 0.5 mm ID guard column was connected to the analytical column per ASTM method requirements

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



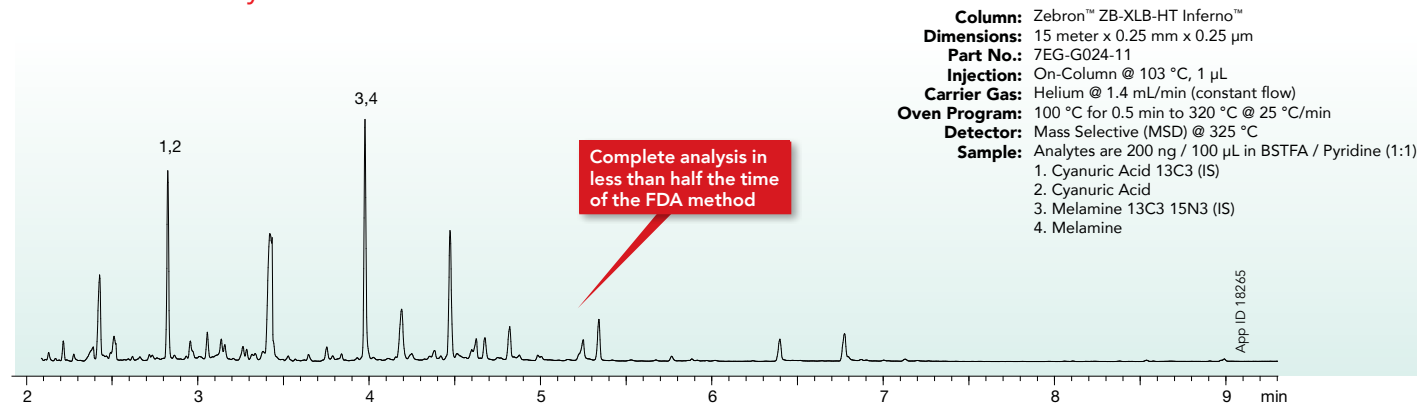
Column: Zebtron ZB-XLB-HT Inferno
Dimensions: 15 meter x 0.25 mm x 0.10 μm
Part No.: 7HG-G024-11
Injection: On-Column @ 53 °C, 0.1 μL
Carrier Gas: Helium @ 1.3 mL/min (constant flow)
Oven Program: 50 °C for 1 min to 180 °C @ 15 °C/min to 230 °C @ 7 °C/min to 380 °C @ 30 °C/min for 10 min
Detector: FID @ 380 °C
Sample: A 30 cm x 0.5 mm ID guard column was connected to the analytical column per ASTM method requirements

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

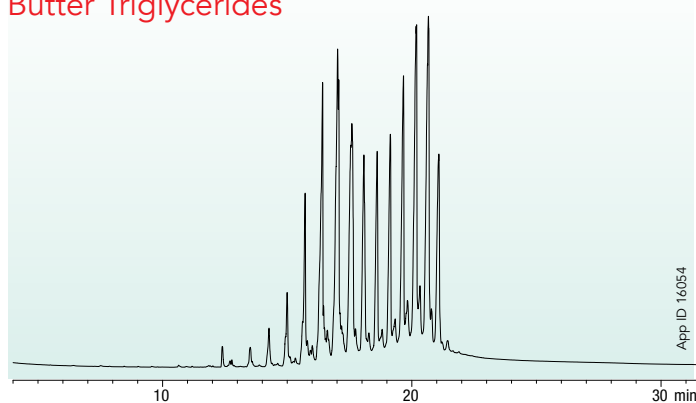


Food and Beverage Applications

Melamine in Baby Formula

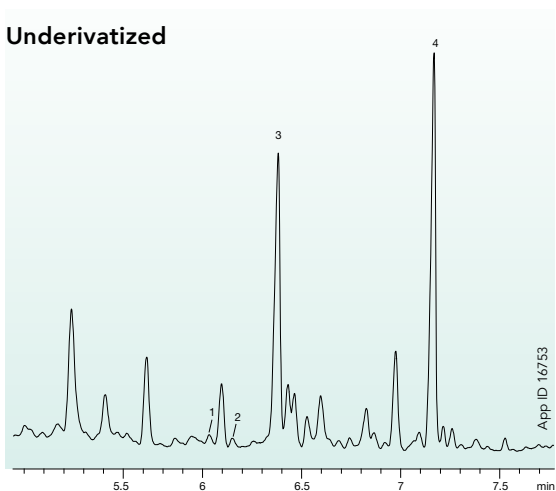


Butter Triglycerides

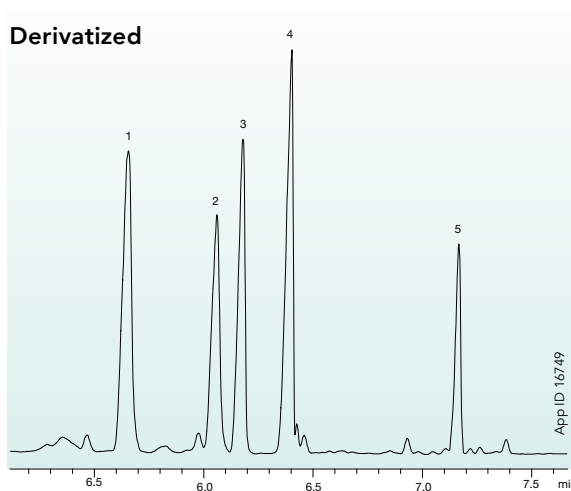


Sterols from Olive Oil

Underivatized

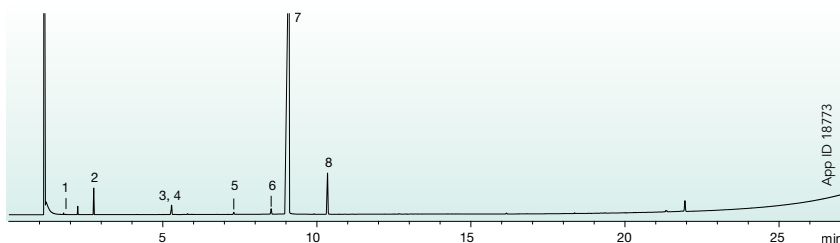


Derivatized



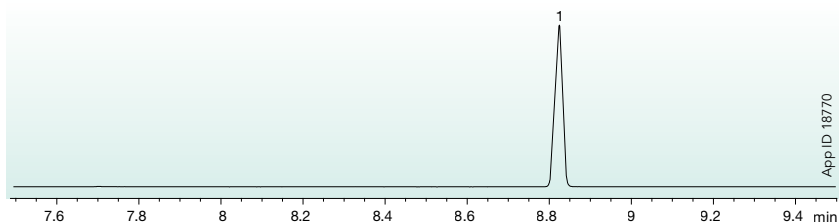
Industrial Chemical Applications

Amine and Nitrosamine



Column: Zebron™ ZB-35HT Inferno™
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part No.: 7HG-G025-11
Injection: Split 50:1 @ 350 °C, 1 μL
Carrier Gas: Helium @ 2.1 mL/min (constant flow)
Oven Program: 140 °C to 400 °C @ 10 °C/min
Detector: FID @ 410 °C
Sample: Application courtesy of Northeastern Chemical Company
 1. Amine MW 135
 2. Amine MW 163
 3. Amine MW 178
 4. Amine MW 208
 5. Nitrosamine MW 164
 6. Nitrosamine MW 178
 7. Nitrosamine MW 192
 8. Nitrosamine MW 208

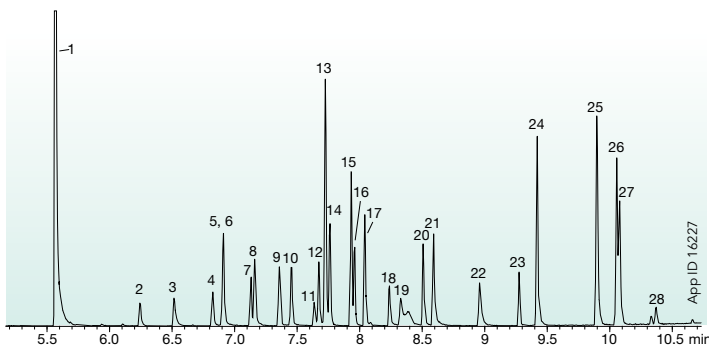
Diethylene Glycol Divinyl Ether



Column: Zebron ZB-35HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part No.: 7HG-G025-11
Injection: Split 40:1 @ 250 °C, 1 μL
Carrier Gas: Helium @ 1.4 mL/min (constant flow)
Oven Program: 40 °C for 0.5 min to 150 °C @ 10 °C/min to 310 °C @ 25 °C/min for 2 min
Detector: FID @ 320 °C
Sample: Application courtesy of Northeastern Chemical Company
 1. Diethylene glycol divinyl ether

Pharmaceutical/Drug Applications

Drug Screen by GC/MS



Column: Zebron ZB-1HT Inferno
Dimensions: 30 meter x 0.25 mm x 0.10 μm
Part No.: 7HG-G014-02
Injection: Split 15:1 @ 250 °C, 1 μL
Carrier Gas: Helium 1.1 mL/min (constant flow)
Oven Program: 50 °C for 1 min to 320 °C @ 25 °C/min for 3 min
Detector: MSD @ 310 °C; 45-450 amu
Sample: Analytes were 25 ppm

1. Nicotine	8. Phenacetin	15. Benzphetamine	22. Brompheniramine
2. Contaminant	9. Amobarbital	16. Hexobarbital	23. Cocaine
3. Acetaminophen	10. Pentobarbital	17. Dimenhydrinate	24. Chlorcyclizine
4. Allobarbitol	11. Meprobamate	18. Doxylamine	25. Codeine
5. Aprobarbital	12. Secobarbital	19. Phenobarbital	26. Diazepam
6. Ibuprofen	13. Caffeine	20. Methapyrilene	27. Hydrocodone
7. Butabarbitol	14. Methyl Benzilate	21. Chlorpheniramine	28. Oxymorphone



Recommended High Temperature GC Accessories

Guardian™ Integrated Guard Columns

- Eliminates the potential for leaks
- Extends column life
- Improves analyte focusing for low boiling compounds
- Aggressively tested to ensure deactivation

Traditional Union Connected Guard Column VS. Guardian Integrated Guard Column

Ordering Information
Zebtron™ Inferno™ Columns with Guardian

Phase	Dimensions	5 m Guardian Part No.
Zebtron ZB-1HT	30 meter x 0.25 mm x 0.10 µm	7HG-G014-02-GGA
Zebtron ZB-5HT	30 meter x 0.25 mm x 0.10 µm	7HG-G015-02-GGA
Zebtron ZB-5HT	30 meter x 0.25 mm x 0.25 µm	7HG-G015-11-GGA

Inlet Base Seals

Ordering Information

Description	Injection Type	Groove Style	Inlet Hole Diameter (mm)	2/pk		10/pk	
				Part No.	Similar* to Mfr. No.	Part No.	Similar* to Mfr. No.
Easy Seals™ Gold Inlet Seal	Splitless	Single	0.8	AG0-8619	–	AG0-8620	–
Standard Gold Inlet Seal	Splitless	Single	0.8	AG0-7518	18740-20885	AG0-7519	18740-20885
			1.2	AG0-8581	21305	AG0-8582	21306
	Split	Cross	0.8	AG0-7520	5182-9652	AG0-7521	5182-9652
			1.2	AG0-8583	21009	AG0-8584	21010
Standard Stainless Steel Inlet Seal	Splitless	Single	0.8	AG0-8393	18740-20880	AG0-8394	18740-20880
			Split	Cross	0.8	AG0-8395	–



Standard Inlet Base Seal Washers

Description	12/pk	
	Part No.	Similar* to Mfr. No.
Gold Inlet Seal Washer	AG0-8397	–
Stainless Steel Inlet Seal Washer	AG0-7522	5061-5869



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

Recommended High Temperature GC Accessories

Inlet Liners

- Fit standard instrument manufacturers' inlets
- Popular designs at excellent prices
- Reduce analyte discrimination
- Improve reproducibility and results
- Clean, non-adsorptive/non-reactive surface



Ordering Information

Description	GC Model No.	Dimensions ID x L x OD (mm)	Material* (deactivated)	Quartz Wool (Y/N)	Similar to Manufacturer Number**	Part No.	Unit
Agilent Technologies® (HP)							
Single Taper Direct Connect with Side Hole (bottom)	5880/5980/6890/7890	4 x 78.5 x 6.3	B (y)	N	G1544-80730 20771	AGO-7851	5/pk
Split / Splitless Focus Liner with wool	5880/5890/6890/7890	4 x 78.5 x 6.3	B (y)	Y	210-4004	AGO-7515	5/pk
Shimadzu®							
Splitless Liner	9A/15A/16A	3.4 x 139 x 5.0	B (y)	N	20749	AGO-4669	5/pk
Thermo Scientific® (Finnigan)							
Splitless / Single Taper Liner /Trace	TRACE™/ FOCUS™	5 x 105 x 8.0	B (y)	N	45350033	AGO-7852	5/pk

* B= Borosilicate; Deactivated = Yes (y) or No (n). ** Similar to but not always an exact equivalent to the original manufacturer's product.



Additional GC Accessories Are Available!

For more information, contact your GC Specialist.

Long Ferrules

Graphite Ferrules

- High-purity graphite significantly reduces ferrule bleed
- Special construction minimizes "flaking"
- Stable to 450 °C - excellent for high temperature use
- Not for use with GC/MS transfer lines



Ordering Information

Ferrule ID	Part No.	Description	Unit
0.4 mm	AGO-4698	Graphite Ferrule 1/16 in. to 0.4 mm	10/pk
	AGO-4699	Graphite Ferrule 1/16 in. to 0.4 mm	50/pk
0.5 mm	AGO-4701	Graphite Ferrule 1/16 in. to 0.5 mm	10/pk
	AGO-4702	Graphite Ferrule 1/16 in. to 0.5 mm	50/pk
0.8 mm	AGO-4704	Graphite Ferrule 1/16 in. to 0.8 mm	10/pk
	AGO-4705	Graphite Ferrule 1/16 in. to 0.8 mm	50/pk

Recommended High Temperature GC Accessories

Cool-Lock™ Installation Nut


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

Ordering Information

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

Septa

Ordering Information

Description	Diameter		Includes GuideRight™ Hole	Part No.	Unit
	(mm)	(in.)			
PhenoRed™ -400  <ul style="list-style-type: none"> Our most popular choice for low-bleed septa, rated to 400°C Designed and conditioned for high sensitivity Durometer rating of 50 with typical injection life of 150 punctures 	9.5	3/8	✓	AG0-7916	50/pk
	9.5	3/8		AG0-4690	50/pk
	9.5	3/8		AG0-4691	100/pk
	11	7/16	✓	AG0-7917	50/pk
	11	7/16		AG0-4696	50/pk
	11	7/16		AG0-4697	100/pk
PhenoGreen™ -400 <ul style="list-style-type: none"> Long-life, high temperature septa for use up to 400°C 	9.5	3/8	✓	AG0-7874	50/pk
	9.5	3/8		AG0-8572	50/pk
	11	7/16	✓	AG0-7875	50/pk
PhenoBlue™ -300 <ul style="list-style-type: none"> Low-bleed septum heat stable to 350°C Durometer rating of 50 - 60 for easy puncture up to 100 injections at 300°C 	11	7/16		AG0-8573	50/pk
	9.5	3/8		AG0-4688	50/pk
	9.5	3/8		AG0-4689	100/pk
PhenoGrey™ -250 <ul style="list-style-type: none"> General purpose silicone rubber septum rated to 250°C Durometer rating of 40 - 45 for easy puncture up to 100 injections 	11	7/16		AG0-4694	50/pk
	11	7/16		AG0-4695	100/pk
PhenoGrey™ -250 <ul style="list-style-type: none"> General purpose silicone rubber septum rated to 250°C Durometer rating of 40 - 45 for easy puncture up to 100 injections 	9.5	3/8		AG0-4686	50/pk
	9.5	3/8		AG0-4687	100/pk
	11	7/16		AG0-4692	50/pk
	11	7/16		AG0-4693	100/pk



Zebtron Inferno™

Rugged, High Temperature GC Columns

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Cool-Lock Nut is patented by Phenomenex. U.S. Patent No. 8,062,512.

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