

GC Application Guide

Persistent Organic Pollutants (POPs)



INTRODUCTION

Persistent organic pollutants (POPs) are organic chemical substances produced either intentionally or as byproducts of industrial activities.

Sources of pollution from POPs include the improper use and/or disposal of agrochemicals and industrial chemicals, combustion processes, and unwanted byproducts of industrial processes.

This guide offers a variety of applications for the determination of POPs listed below:

- **Dioxins** pp. 3-5
- **Furans** pp. 4-5
- **Polychlorinated Biphenyls (PCBs)** p. 6
- **Polycyclic Aromatic Hydrocarbons (PAHs)** pp. 7-11
- **Pesticides and Herbicides** pp. 12-15
- **Semivolatile Organic Compounds** pp. 16-18



Contact us if you have questions or would like more information about the methods presented in this guide.

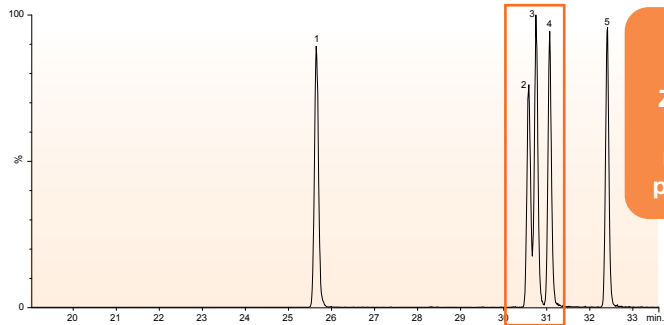
www.phenomenex.com/Chat

Enhanced Resolution of Critical Dioxins Using ZB-Dioxin GC Column

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

App ID 26010

Conditions for all separations:

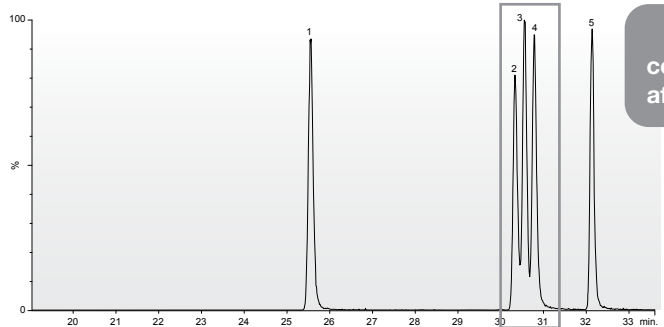
- Column 1: Zebron ZB-Dioxin
- Column 1 Dimension: 60 meter x 0.25 mm x 0.20 μm
- Column Part No.: [7KG-G045-10](#)
- Column 2: Brand A Premium 5MS
- Column 2 Dimension: 60 meter x 0.25 mm x 0.25 μm
- Recommended Z-Guard™: 5 meter Z-Guard™ Kit
- Guard Kit Part No.: [7AG-G000-00-GZK](#)
- Injection: Pulse 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 Temp.: 300 °C

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

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

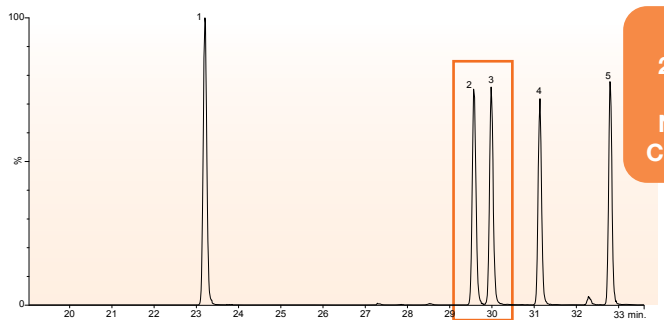
App ID 26011

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



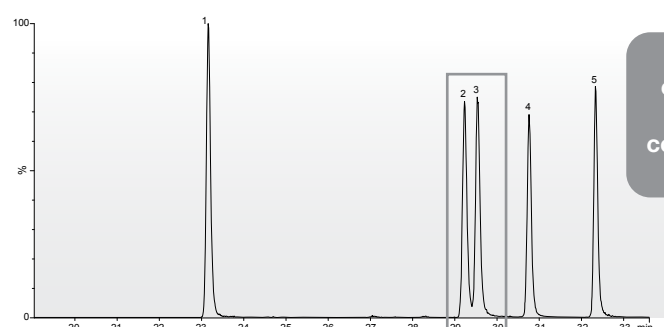
Complete resolution of 2,3,7,8-TCDF on a single column ZB-Dioxin—NO NEED FOR ADDITIONAL CONFIRMATION COLUMN

App ID 26012

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

Brand A Premium 5MS Phase

60 meter x 0.25 mm x 0.25 μm

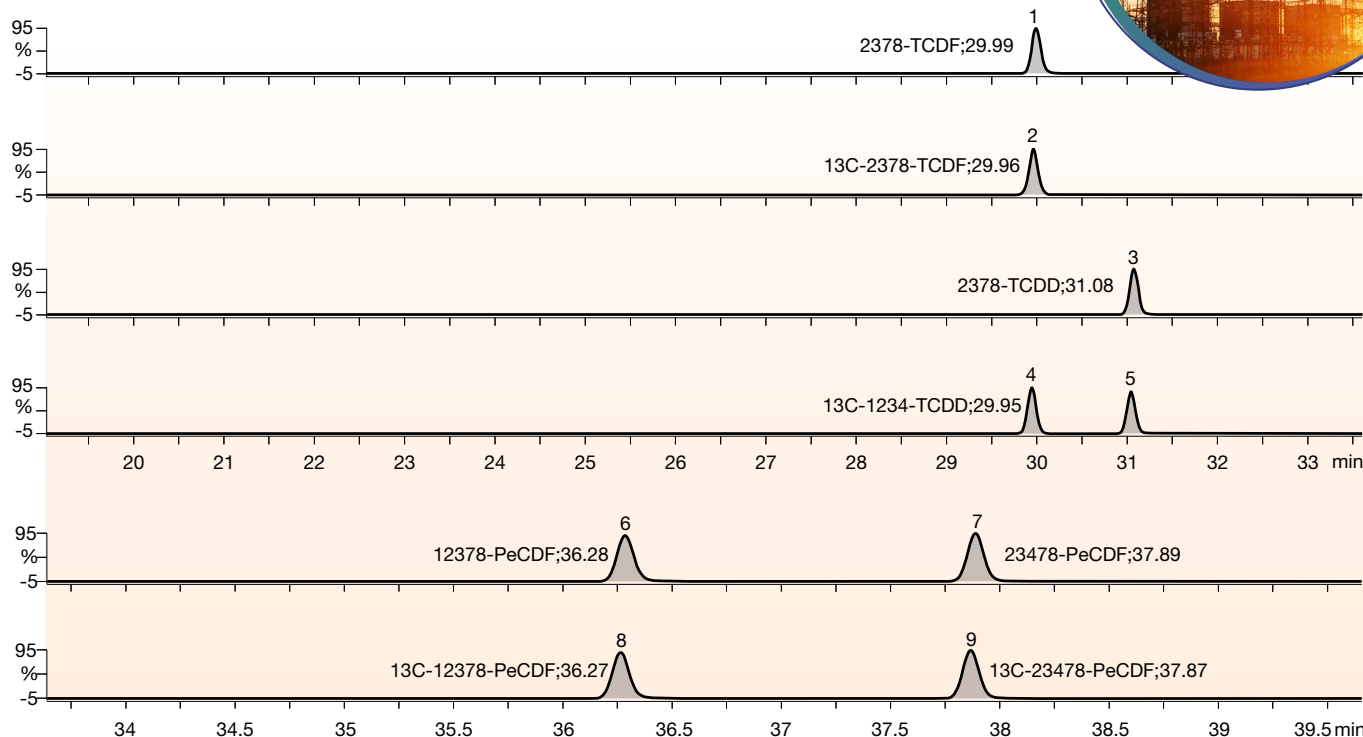
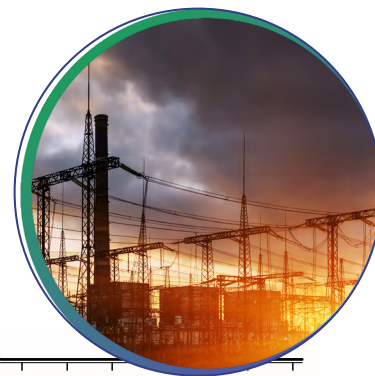


2,3,7,8-TCDF are not completely resolved and need an additional GC column to confirm isomers separation

App ID 26013

Comparative separations may not be representative of all applications.

GC-HRMS Analysis of Tetra through Octa Dioxins and Furans on Zebron™ ZB-Dioxin GC Columns



App ID 26014

GC-HRMS Conditions:

Column: Zebron ZB-Dioxin

Dimensions: 60 meter x 0.25 mm x 0.20 µm

Column Part No.: [7KG-G045-10](#)

Recommended Z-Guard™: [7AG-G000-00-GZK](#)

Injection: Pulse Splitless (2.0 min @ 60 psi) @ 280 °C, 1 µL

Recommended Liner: Zebron PLUS Single Taper

Liner Part No.: [AG2-0A10-05](#) (for Agilent® systems)

Carrier Gas: Helium @ 1.25 mL/min (constant flow)

Oven Program: 160 °C for 2.4 min, 200 °C @ 25 °C/min, 220 °C @ 5 °C/min for 19 min, 288 °C @ 4 °C/min, 300 °C @ 5 °C/min for 7.6 min

Detector: GC-HRMS

Transfer Line Temp.: 300 °C

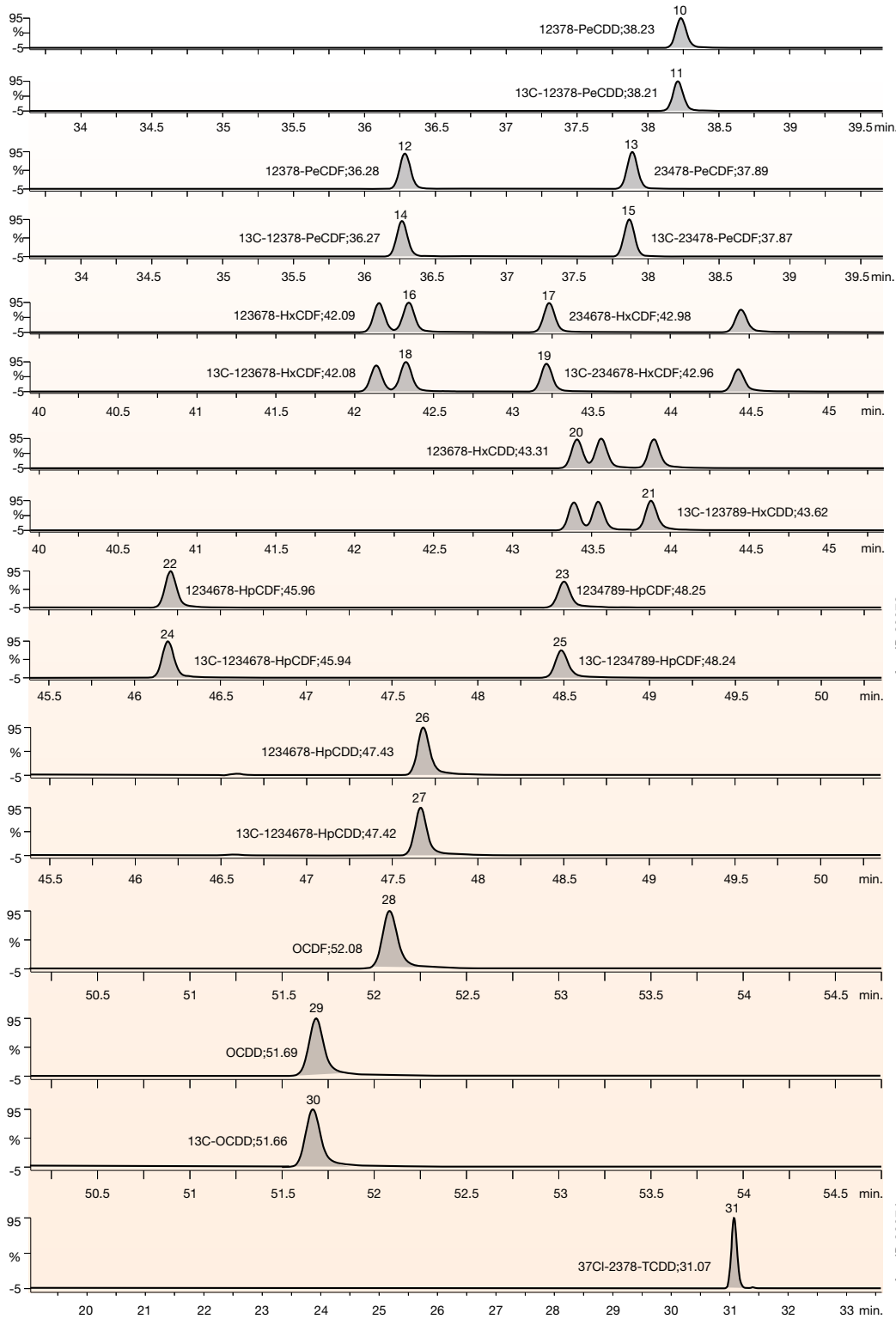
Solvent Delay: 2.0 min

- Sample:**
- | | |
|-------------------------|-----------------------------|
| 1. 2,3,7,8-TCDF | 18. 13C-1,2,3,6,7,8-HxCDF |
| 2. 13C-2,3,7,8-TCDF | 19. 13C-2,3,4,6,7,8-HxCDF |
| 3. 2,3,7,8-TCDD | 20. 1,2,3,6,7,8-HxCDD |
| 4. 13C-1,2,3,4-TCDD | 21. 13C-1,2,3,6,7,8-HxCDD |
| 5. 13C-2,3,7,8-TCDD | 22. 1,2,3,4,6,7,8-HpCDF |
| 6. 1,2,3,7,8-PeCDF | 23. 1,2,3,4,7,8,9-HpCDF |
| 7. 2,3,4,7,8-PeCDF | 24. 13C-1,2,3,4,6,7,8-HpCDF |
| 8. 13C-1,2,3,7,8-PeCDF | 25. 13C-1,2,3,4,7,8,9-HpCDF |
| 9. 13C-2,3,4,7,8-PeCDF | 26. 2,3,4,6,7,8-HpCDD |
| 10. 1,2,3,7,8-PeCDD | 27. 13C-1,2,3,4,6,7,8-HpCDD |
| 11. 13C-1,2,3,7,8-PeCDD | 28. OCDF |
| 12. 1,2,3,7,8-PeCDF | 29. OCDD |
| 13. 2,3,4,7,8-PeCDF | 30. 13C-OCDD |
| 14. 13C-1,2,3,7,8-PeCDF | 31. 37Cl-2,3,7,8-TCDD |
| 15. 13C-2,3,4,7,8-PeCDF | |
| 16. 1,2,3,6,7,8-HxCDF | |
| 17. 2,3,4,6,7,8-HxCDF | |

The high efficiency and selectivity of ZB-Dioxin provides enhanced resolution for tetra through octa dioxin isomers on a single GC column.

[Download Application](#)

GC-HRMS Analysis of Tetra through Octa Dioxins and Furans on a Zebron™ ZB-Dioxin GC Columns (con't)



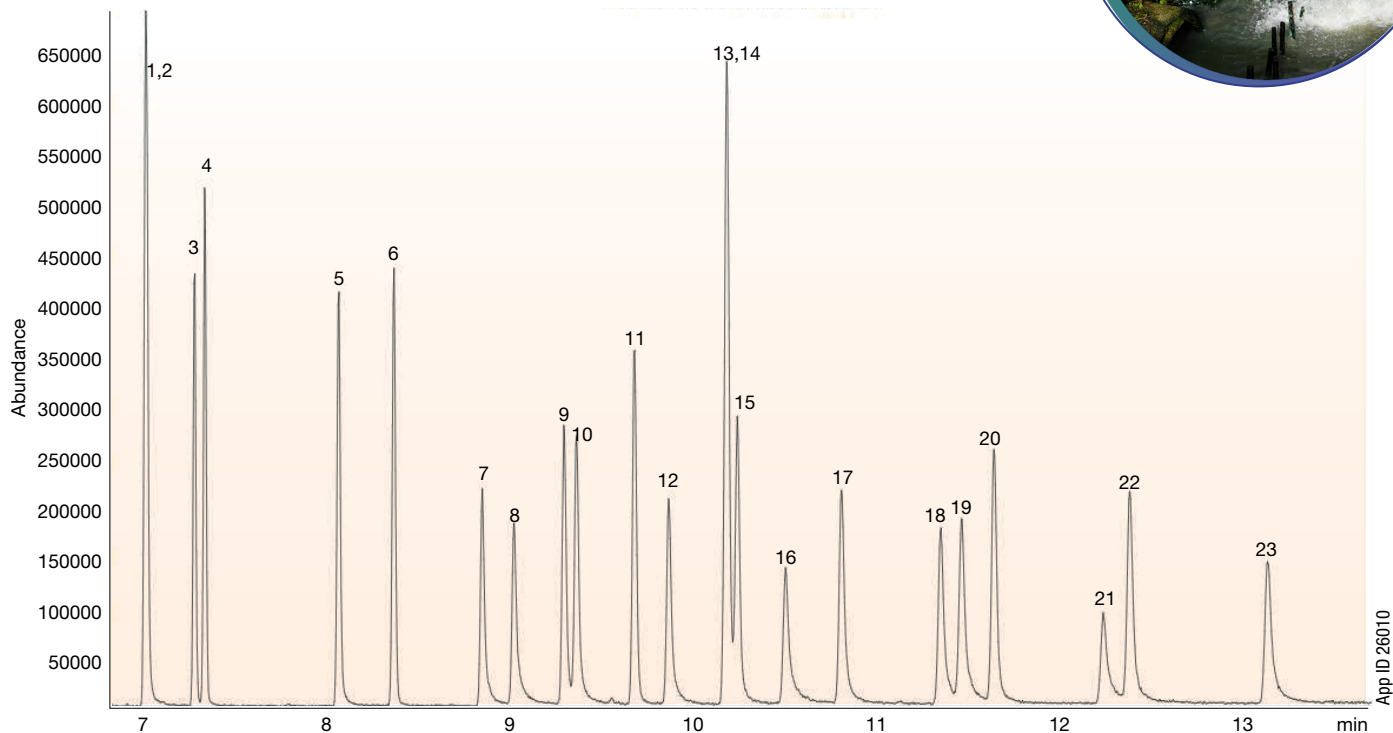
App ID 26073

App ID 26074

[Download Application](#)

POLYCHLORINATED BIPHENYLS (PCBs)

Fast Separation of PCBs using a Zebron™ ZB-Dioxin GC Column by GC-MS



GC-MS Conditions

Column: Zebron ZB-Dioxin
Dimensions: 40 meter x 0.18 mm x 0.14 µm
Column Part No.: [7PD-G045-47](#)
Injection: Splitless for 1.0 min @ 280 °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: 125 °C for 1.35 min to 250 °C @ 40.6 °C/min, to 285 °C @ 4 °C/min to 320 °C @ 15.7 °C/min for 5.1 min
Detector: GC-MS
Transfer Line Temp.: 300 °C
Mode: Scan (100-450 m/z)
Source Temp.: 230 °C
Quad Temp.: 150 °C
Solvent Delay: 2.0 min

Sample:

1. PCB 31	13. PCB 164
2. PCB 28	14. PCB 163
3. PCB 69	15. PCB 138
4. PCB 52	16. PCB 126
5. PCB 70	17. PCB 167
6. PCB 101	18. PCB 156
7. PCB 81	19. PCB 157
8. PCB 77	20. PCB 180
9. PCB 123	21. PCB 169
10. PCB 118	22. PCB 170
11. PCB 153	23. PCB 189
12. PCB 105	

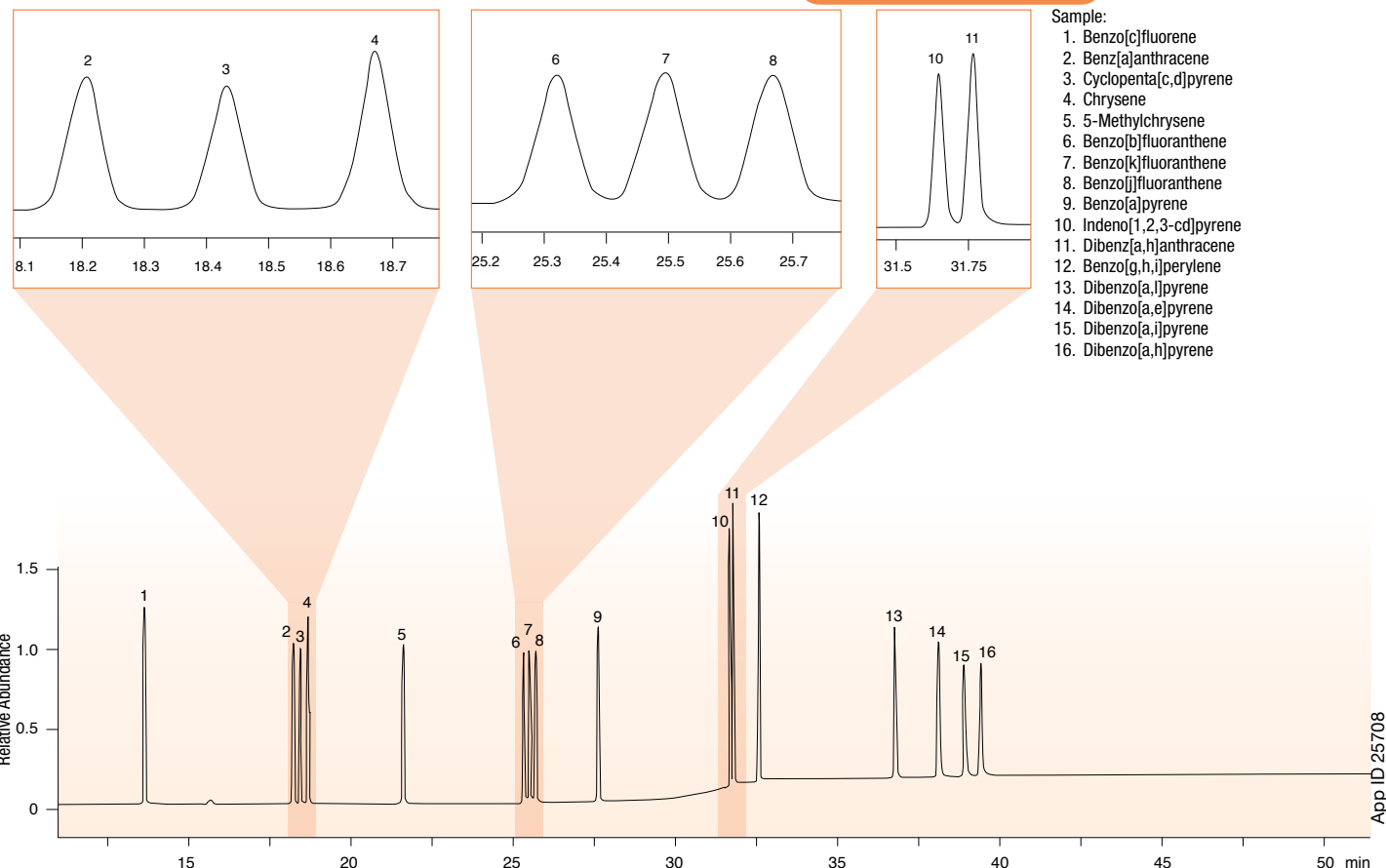
The ZB-Dioxin serves as a GC column selectivity that provides precise PCB analysis, offers optimal resolution of critical PCBs and provides fast analysis column dimensions for PCBs in addition to Dioxin analysis.

[Download Application](#)

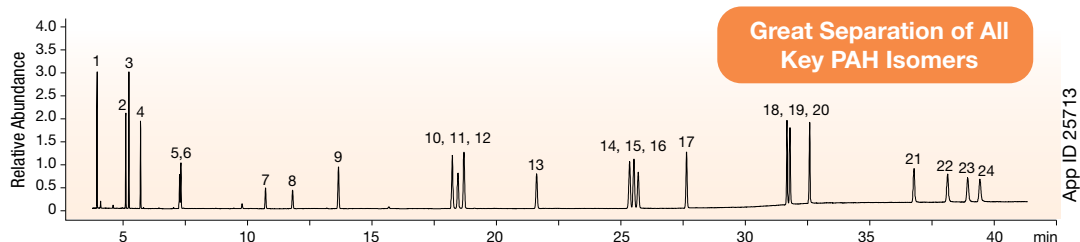
Complete Resolution of EU 15+1 and EPA 610 PAHs on a Zebron ZB-PAH-EU GC Column

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 PAHs



Analysis of EU 15+1 and EPA 610 PAHs



GC-MS conditions for both applications:

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 Temp.: 300°C
Source Temp.: 300°C

Sample:

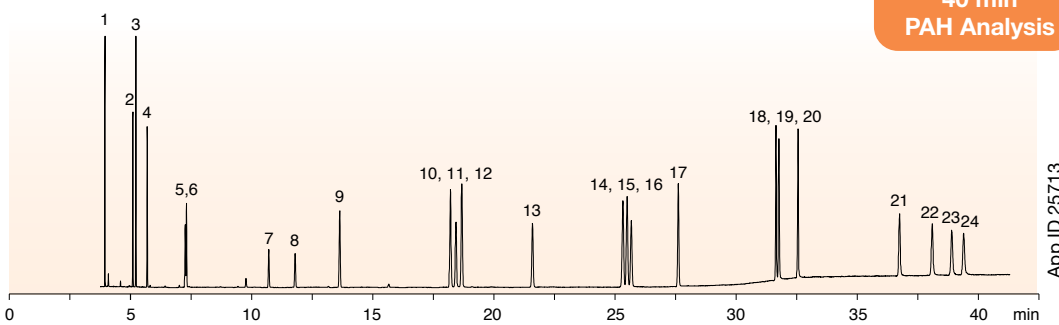
- | | | |
|-------------------|---------------------------|----------------------------|
| 1. Naphthalene | 9. Benzo[c]fluorene | 17. Benzo[a]pyrene |
| 2. Acenaphthylene | 10. Benz[a]anthracene | 18. Indeno[1,2,3-cd]pyrene |
| 3. Acenaphthene | 11. Cyclopenta[c,d]pyrene | 19. Dibenz[a,h]anthracene |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

Up to 70 % Faster PAH Analysis on a Zebron ZB-PAH-EU GC Column

Zebron™ ZB-PAH-EU will allow you to gain back your precious analysis time! You can easily optimize your column dimensions for greater speed and lab productivity.

Fast Analysis of EU 15+1 and EPA 610 PAHs using Zebron ZB-PAH-EU

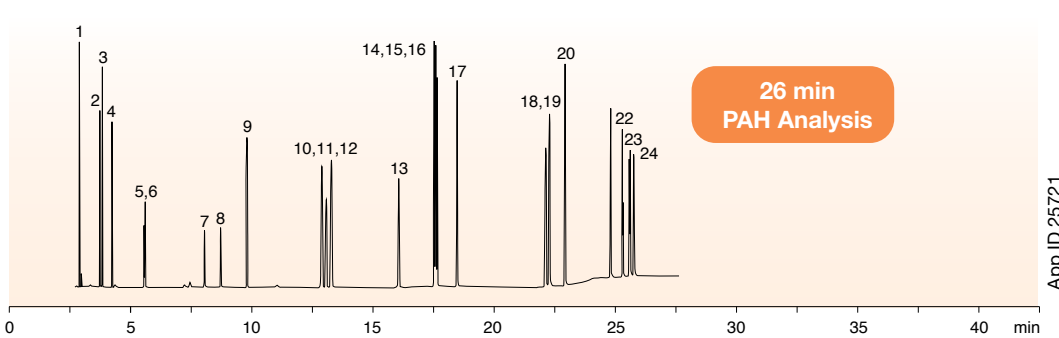
30 meter x 0.25 mm x 0.20 µm



App ID 25713

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 Temp.: 300 °C
Source Temp.: 300 °C

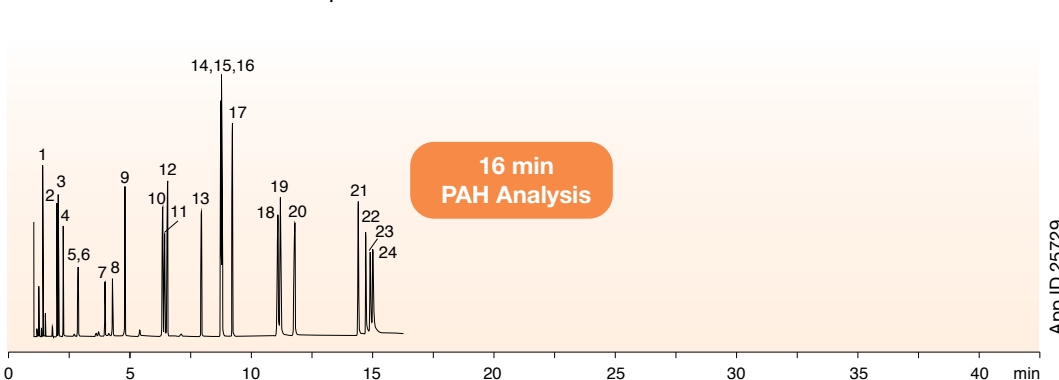
20 meter x 0.18 mm x 0.14 µm



App ID 25721

Column: Zebron ZB-PAH-EU
Dimensions: 20 meter x 0.18 mm x 0.14 µm
Part No.: 7FD-G043-47
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 @ 1.75 mL/min (constant flow)
Oven Program: 70 °C for 0.8 min to 180 °C @ 70 °C/min to 230 °C @ 7 °C/min for 6 min to 280 °C @ 40 °C/min for 5 min to 335 °C @ 25 °C/min for 5 min
Detector: MSD, 100-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

10 meter x 0.10 mm x 0.08 µm



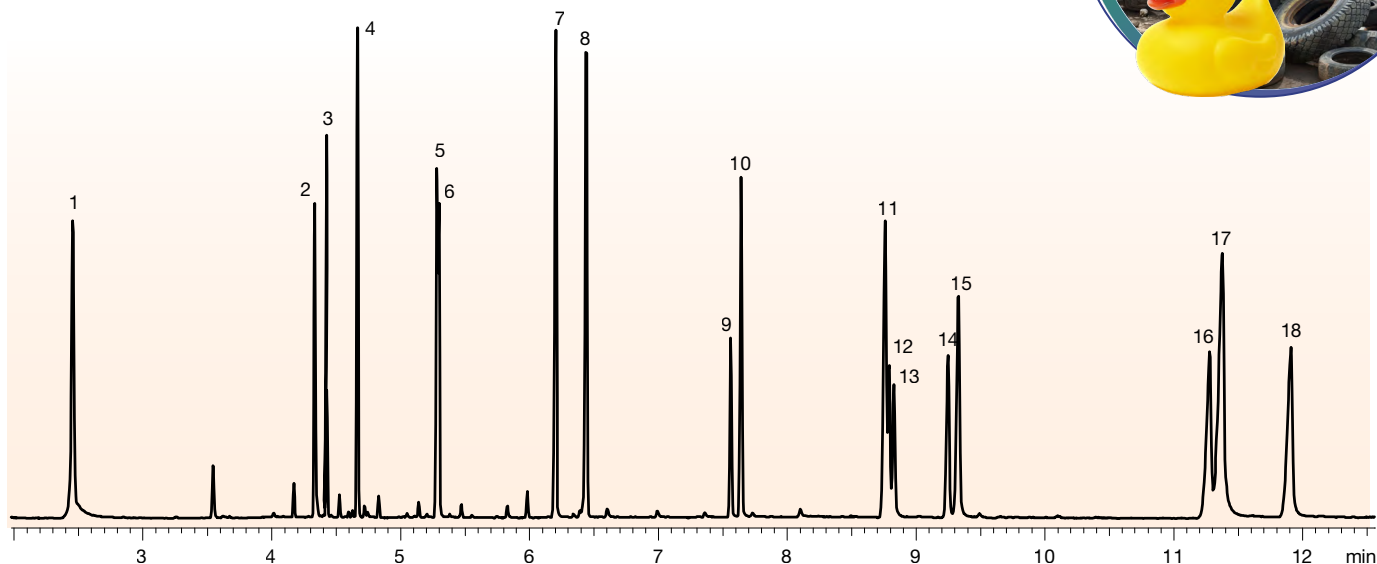
App ID 25729

Column: Zebron ZB-PAH-EU
Dimensions: 10 meter x 0.10 mm x 0.08 µm
Part No.: 7CB-G043-59
Injection: Split 15:1 @ 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 @ 0.88 mL/min (constant flow)
Oven Program: 70 °C for 0.4 min to 180 °C @ 140 °C/min to 230 °C @ 14 °C/min for 3 min to 280 °C @ 85 °C/min for 5 min to 330 °C @ 40 °C/min for 5 min
Detector: MSD, 100-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

Sample for all applications:

- | | | |
|-------------------|---------------------------|----------------------------|
| 1. Naphthalene | 9. Benzo[c]fluorene | 19. Indeno[1,2,3-cd]pyrene |
| 2. Acenaphthylene | 11. Benz[a]anthracene | 20. Dibenz[a,h]anthracene |
| 3. Acenaphthene | 12. Cyclopenta[c,d]pyrene | 21. Benzo[g,h,i]perylene |
| 4. Fluorene | 13. Chrysene | 22. Dibenzo[a,l]pyrene |
| 5. Phenanthrene | 14. 5-Methylchrysene | 23. Dibenzo[a,e]pyrene |
| 6. Anthracene | 15. Benzo[b]fluoranthene | 24. Dibenzo[a,i]pyrene |
| 7. Fluoranthene | 16. Benzo[k]fluoranthene | 25. Dibenzo[a,h]pyrene |
| 8. Pyrene | 17. Benzo[j]fluoranthene | |
| | 18. Benzo[a]pyrene | |

Fast and Accurate GC-MS Analysis of PAHs in Rubber and Plastic



App ID 25732

GC-MS Method Parameters

Column: Zebtron™ ZB-PAH-EU
Dimensions: 10 meter x 0.10 mm x 0.08 μm
Part No.: ZCB-G043-59
Injection: Split (5:1) @ 320 °C, 1.0 μL
Recommended Liner: Zebtron PLUS Single Taper Z- Liner™
Liner Part No.: AG2-3B03-05 (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: MDS, Scan (50-500 m/z)
Source Temp.: 300 °C
Transfer Line Temp.: 330 °C

Analyte details for 18 component PAHs analysis

Peak No	Analyte Name	Concentration (ppm)	Retention Time (min)
1	Naphthalene	20	2.50
2	Acenaphthylene	10	4.32
3	Acenaphthene	10	4.43
4	Fluorene	16	4.69
5	Phenanthrene	12	5.29
6	Anthracene	10	5.32
7	Fluoranthene	16	6.20
8	Pyrene	16	6.45
9	Benz[a]anthracene	4	7.57
10	Chrysene	8	7.65
11	Benzo[b]fluoranthene	10	8.80
12	Benzo[k]fluoranthene	5	8.83
13	Benzo[j]fluoranthene	4	8.87
14	Benzo[a]pyrene	8	9.27
15	Benzo[e]pyrene	5	9.35
16	Indeno[1,2,3-cd]pyrene	10	11.25
17	Dibenz[a,h]anthracene	16	11.35
18	Benzo[g,h,i]perylene	10	11.90

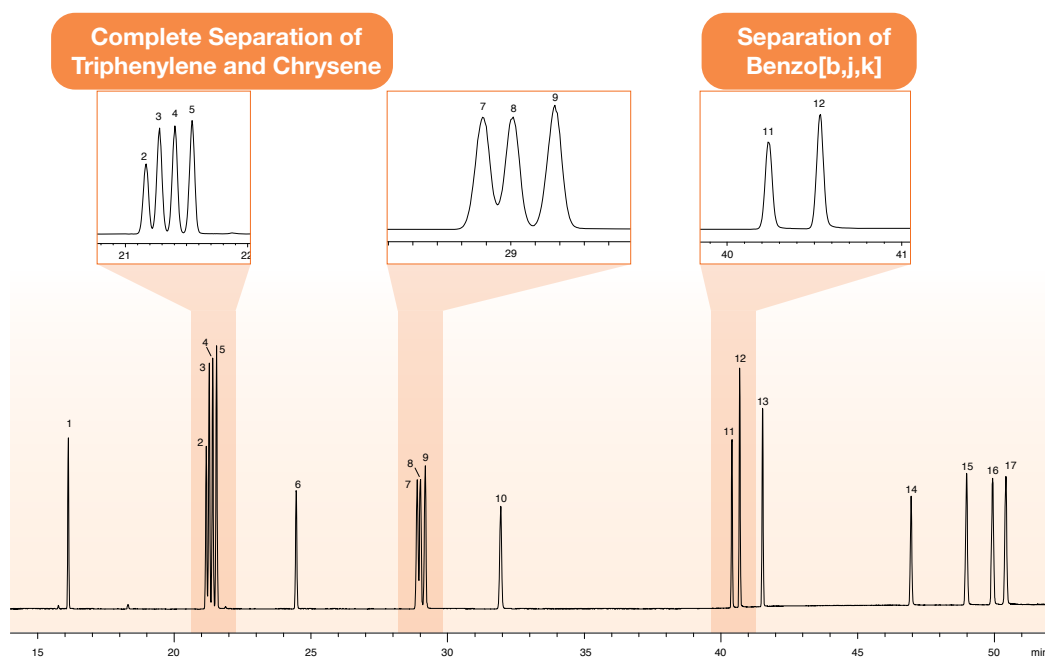
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Excellent Resolution of PAHs including Chrysene and Triphenylene Using a Zebron ZB-PAH-CT-GC Column

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 GC column



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
Liner Part No.: [AG2-4B13-05](#) (for Shimadzu® 2010 GC)
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
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 Temp.: 300 °C
Source Temp.: 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,i]pyrene
15. Dibenzo[a,e]pyrene
16. Dibenzo[a,j]pyrene
17. Dibenzo[a,h]pyrene

“ The chromatography quality and performance [of Zebron GC columns] are excellent. 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. ”

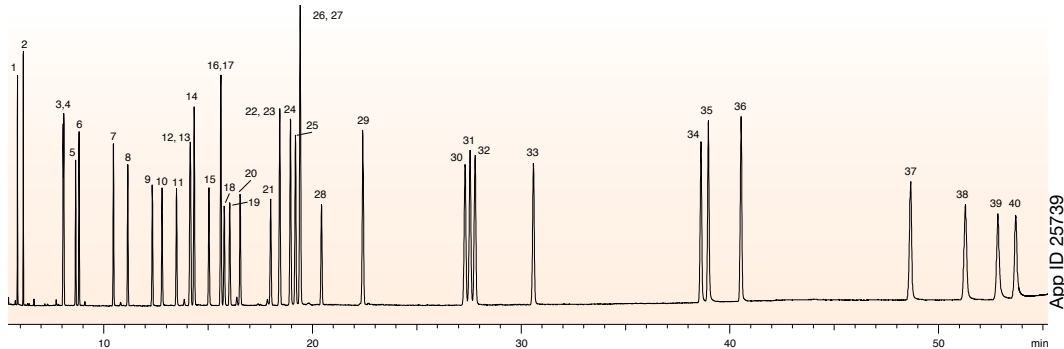
— Kevin Walkup, Specialized Assays, Inc., USA

One Column Solution for PAH, PCB, and Terphenyl Analysis!

The unique selectivity of Zebron™ ZB-PAH-EU will allow for successful separation of PAHs and polychlorinated biphenyls (PCBs) in one run, resolving false positives and inaccurate results while simplifying data processing.



PAH and PCB analysis using ZB-PAH-EU

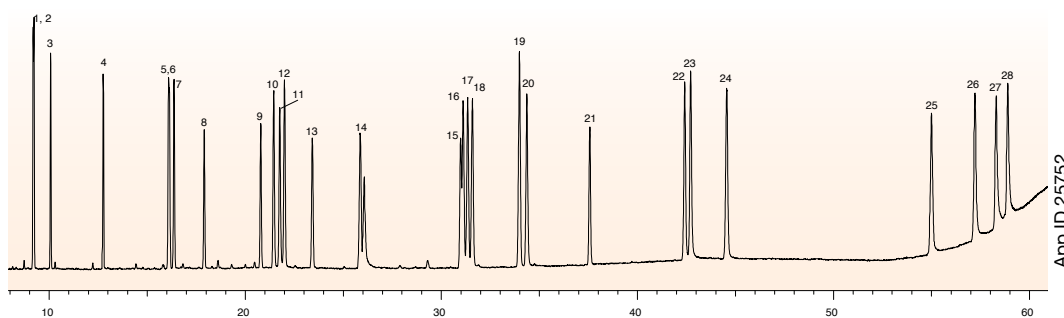


Column: Zebron ZB-PAH-EU
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G043-10
Injection: Splitless for 0.5 min @ 320 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner™
Liner Part No.: AG2-4B13-05 (for Shimadzu® 2010 GC)
Carrier Gas: Helium @ 1.3 mL/min (constant flow)
Oven Program: 45 °C for 1 min to 200 °C @ 50 °C/min to 250 °C @ 3 °C/min for 5 min to 300 °C @ 3 °C/min for 10 min to 340 °C @ 5 °C/min for 0 min
Detector: MSD, 50-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

- Sample:**
- | | | |
|----------------------|---------------------------|----------------------------|
| 1. TCMX | 15. PCB 105 | 29. 5-Methylchrysene |
| 2. DCB 22 | 16. PCB 164 | 30. Benzo[b]fluoranthene |
| 3. PCB 31 | 17. PCB 163 | 31. Benzo[k]fluoranthene |
| 4. PCB 28 | 18. PCB 138 | 32. Benzo[j]fluoranthene |
| 5. PCB 69 | 19. PCB 126 | 33. Benzo[a]pyrene |
| 6. PCB 52 | 20. PCB 167 | 34. Indeno[1,2,3-cd]pyrene |
| 7. PCB 70 | 21. PCB 156 | 35. Dibenzo[a,h]anthracene |
| 8. PCB101 | 22. PCB 180 | 36. Benzo[g,h,i]perylene |
| 9. PCB 81 | 23. PCB 157 | 37. Dibenzo[a,i]pyrene |
| 10. PCB 77 | 24. Benz[a]anthracene | 38. Dibenzo[a,e]pyrene |
| 11. PCB 123 | 25. Cyclopenta[c,d]pyrene | 39. Dibenzo[a,i]pyrene |
| 12. PCB 153 | 26. PCB 169 | 40. Dibenzo[a,h]pyrene |
| 13. PCB 118 | 27. Chrysene | |
| 14. Benzo[c]fluorene | 28. PCB 170 | |

Improve your lab's productivity by successfully combining separation of isomers and different compound classes in a single method using ZB-PAH-EU.

PAH, PCB, and Terphenyl analysis using ZB-PAH-EU



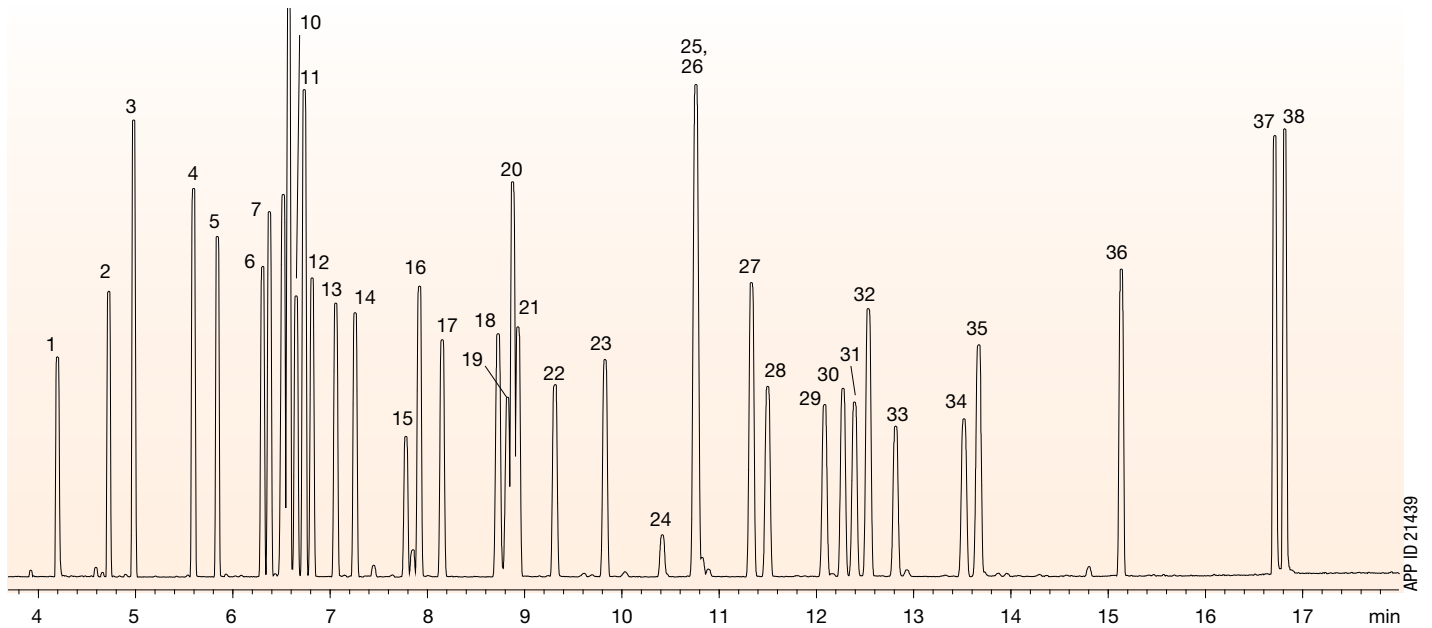
Column: Zebron ZB-PAH-EU
Dimensions: 30 meter x 0.25 mm x 0.20 µm
Part No.: 7HG-G043-10
Injection: Split 2:1 @ 320 °C, 1 µL
Recommended Liner: Zebron PLUS Single Taper Z-Liner
Liner Part No.: AG2-4B13-05 (for Shimadzu 2010 GC)
Carrier Gas: Helium @ 72.8 kPa (constant pressure)
Oven Program: 45 °C for 1 min to 200 °C @ 50 °C/min to 250 °C @ 3 °C/min for 5 min to 300 °C @ 3 °C/min for 10 min to 340 °C @ 5 °C/min for 0 min
Detector: MSD, 100-500 m/z
Transfer Line Temp.: 300 °C
Source Temp.: 300 °C

- Sample:**
- | | |
|------------------------|----------------------------|
| 1. PCB 31 | 15. Tetrachloroterphenyl |
| 2. PCB 28 | 16. Benzo[b]fluoranthene |
| 3. PCB-52 | 17. Benzo[k]fluoranthene |
| 4. PCB 101 | 18. Benzo[j]fluoranthene |
| 5. PCB 153 | 19. Benzo[e]pyrene |
| 6. PCB118 | 20. Benzo[a]pyrene |
| 7. Benzo[c]fluorene | 21. Pentachloroterphenyl |
| 8. PCB138 | 22. Indeno[1,2,3-cd]pyrene |
| 9. PCB180 | 23. Dibenzo[a,h]anthracene |
| 10. [a]anthracene | 24. Benzo[g,h,i]perylene |
| 11. [c,d]pyrene | 25. Dibenzo[a,i]pyrene |
| 12. Chrysene | 26. Dibenzo[a,e]pyrene |
| 13. Trichloroterphenyl | 27. Dibenzo[a,i]pyrene |
| 14. 5-Methylchrysene | 28. Dibenzo[a,h]pyrene |

Organochlorine Pesticides by GC-MS

Testing Pesticides or Herbicides?

See the full pesticide solution guide at www.phenomenex.com/PesticidesGC



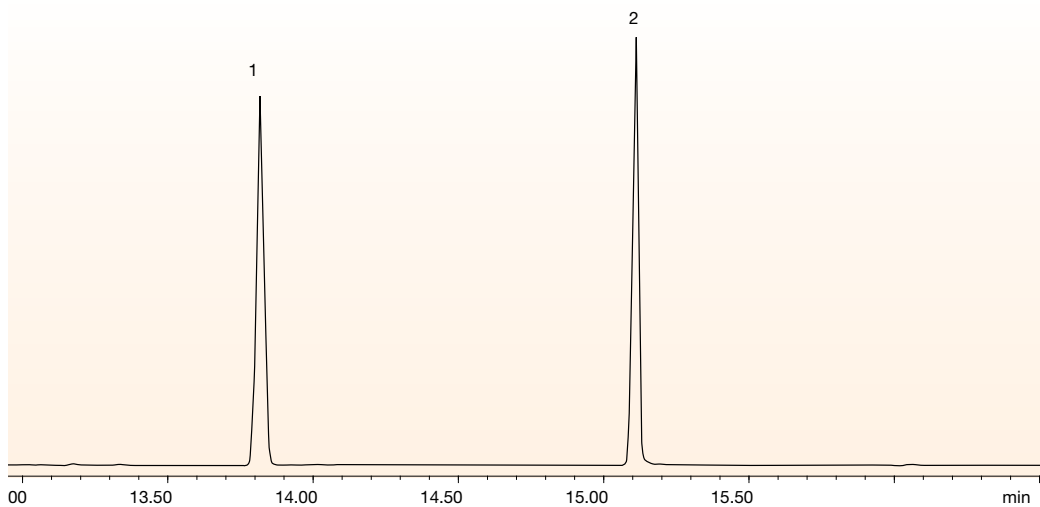
APP ID 21439

Column: Zebron™ ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part Number: [7HG-G027-11](#)
Injection: Pulsed Splitless 1 μL @ 260 °C @ 30 psi for 0.55 min
Liner: [AG0-8499](#) (Single Taper with Wool at Bottom)
Inlet Seal: [AG0-8620](#) (Gold-Plated Easy Seal)

Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 80 °C for 0.75 min to 190 °C @ 35 °C/min to 240 °C @ 5 °C/min to 300 °C @ 20 °C/min for 2 min
Detector: MSD @ 320 °C; 30-450 amu

Sample: 1. Hexachlorocyclopentadiene	9. Atrazine	17. Heptachlor	25. alpha-Chlordane	33. Endrin aldehyde
2. Etridiazole	10. gamma-BHC	18. Metolachlor	26. Endosulfan II	34. Endosulfan sulfate
3. Chloroneb	11. Pentachloronitrobenzene	19. Cyanazine	27. DDE	35. DDT (Chlorophenothane)
4. Propachlor	12. beta-BHC	20. Dacthal (DCPA)	28. Dieldrin	36. Methoxychlor
5. Trifluralin	13. Chlorothalonil	21. Aldrin	29. Endrin	37. cis-Permethrin
6. alpha-BHC	14. delta-BHC	22. 4,4-Dibromophenol	30. Chlorobenzilate	38. trans-Permethrin
7. Hexachlorobenzene	15. Metribuzin	23. Heptachlor epoxide	31. Endosulfan II	
8. Simazine	16. Alachlor	24. gamma-Chlordane	32. DDD	

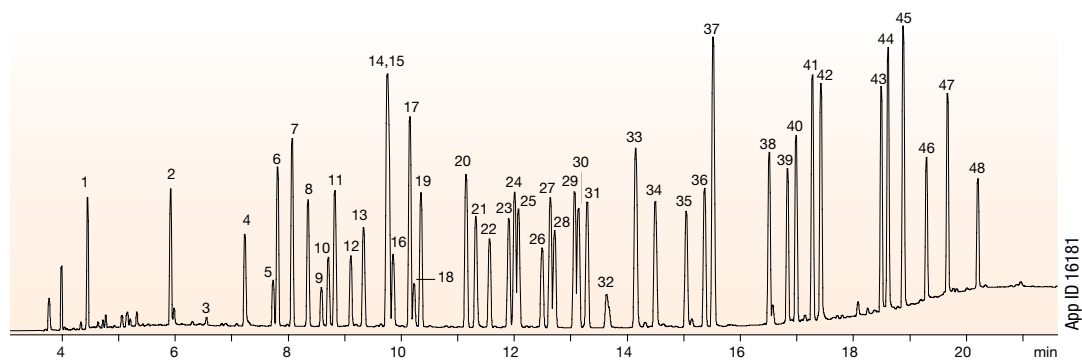
Endothall Analysis on a Zebron ZB-Semivolatiles GC Column



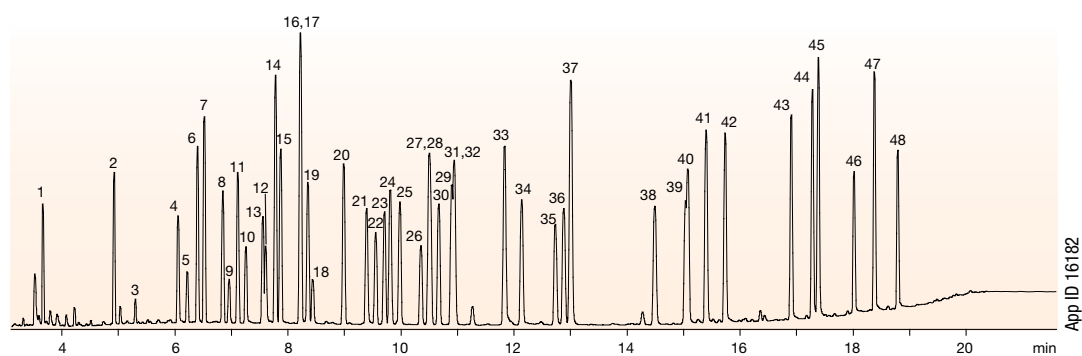
APP ID 22111

Column: Zebron ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part No.: [7HG-G027-11](#)
Injection: Pulsed 2 μL @ 200 °C
Carrier Gas: Helium @ 1 mL/min (constant flow)
Oven Program: 80 °C for 5 min to 260 °C @ 10 °C/min for 10 min
Detector: MSD @ 320 °C, 45-450 amu
Sample: 1. Acenaphthene-d10
 2. Endothall (derivatized)
 Note: Pulsed splitless injection @ 30 psi for 0.55 min

Determination of Organophosphorus Pesticides



App ID 16181



App ID 16182

Column: Zebtron™ MultiResidue-1

Zebtron 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

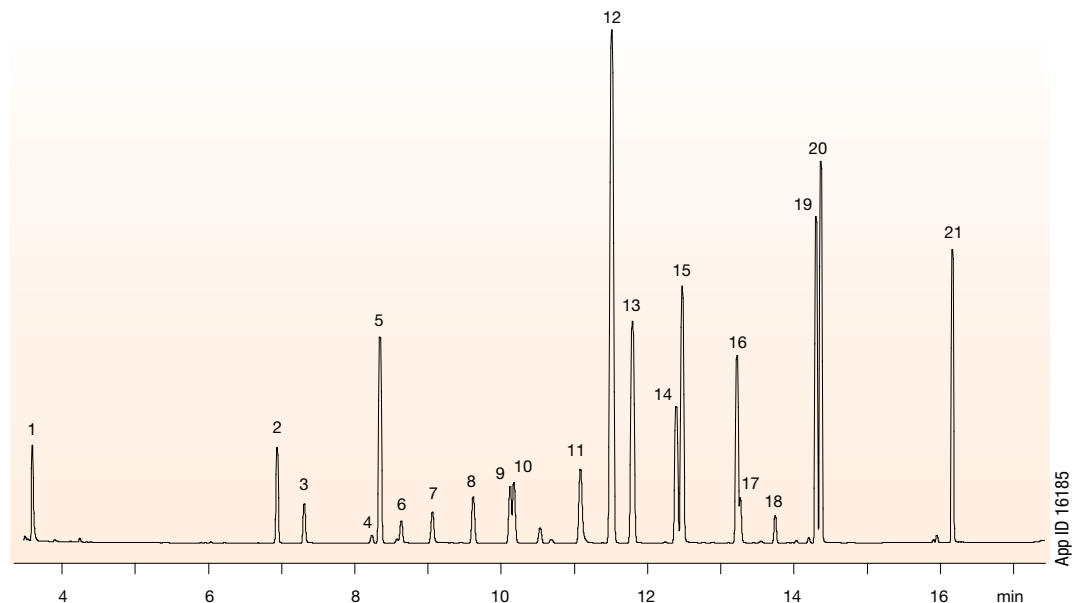
Detector: FID @ 340 °C

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

Notes: Analytes at 2 ppm in dichloromethane. Columns connected using a 5 m Z-Guard™ and a Y-splitter

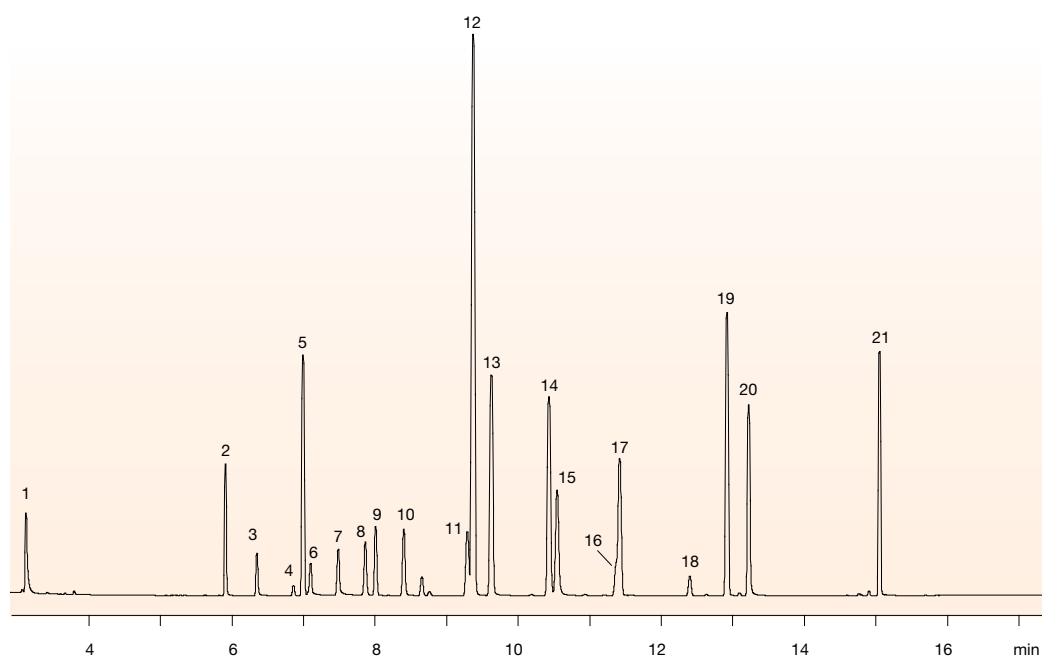
Chlorophenoxy Acid Herbicides

ZB-MultiResidue-1



App ID 16185

ZB-MultiResidue-2



App ID 16186

Column: 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: Splitless @ 250 °C, 1 µL

Carrier Gas: Helium @ 2.5 mL/min (constant flow)

Oven: 50 °C for 1 min to 180 °C @ 35 °C/min for

Program: 2 min to 205 °C @ 5 °C/min to 320 °C

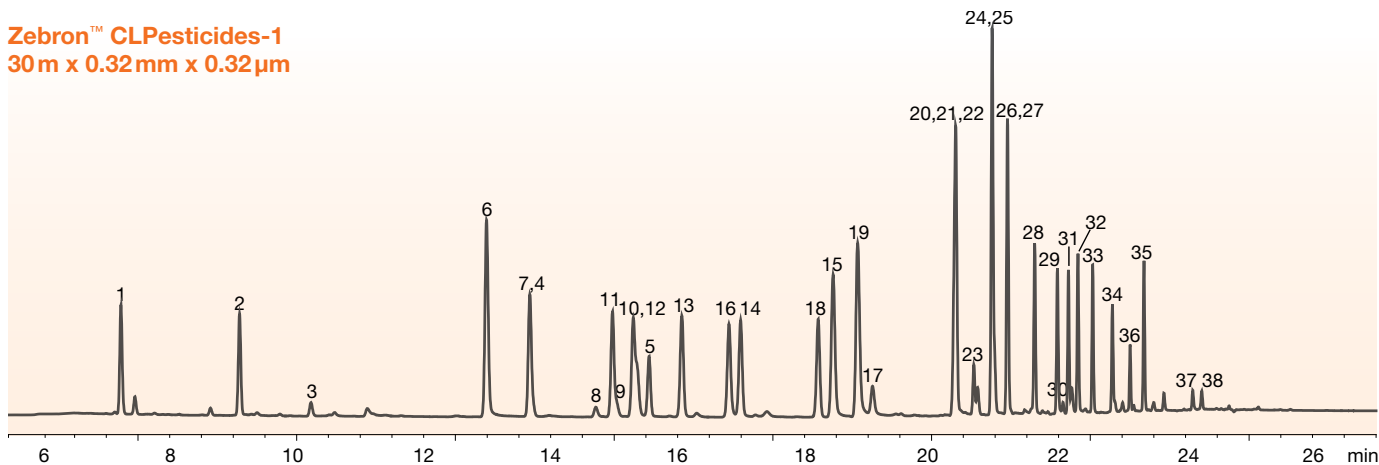
Detector: ECD @ 350 °C

Sample:

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

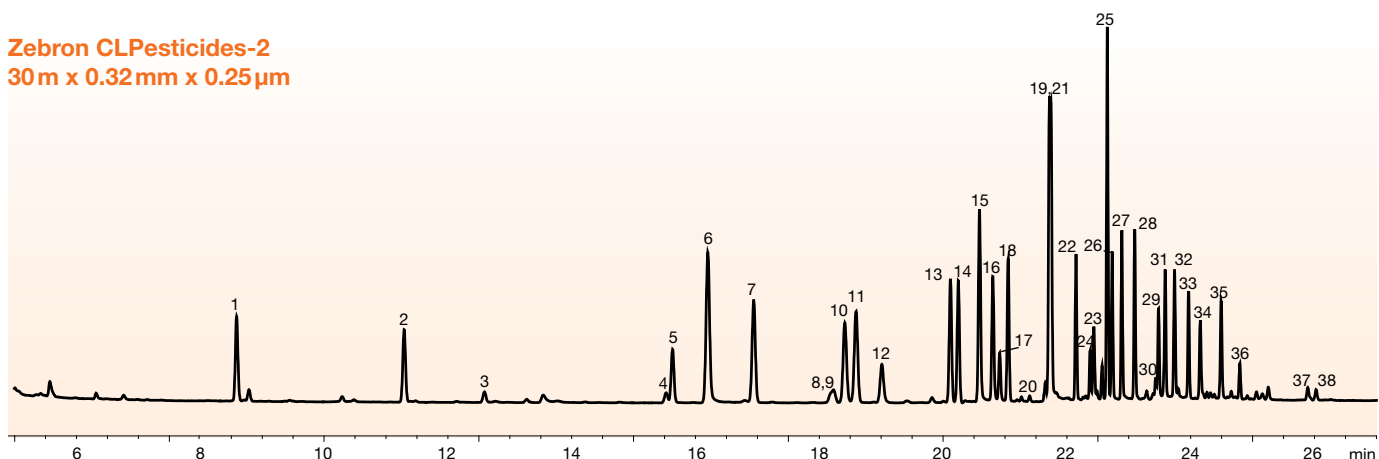
Chlorinated Pesticides, Herbicides & Organohalides

Zebtron™ CLPesticides-1
30 m x 0.32 mm x 0.32 μm



App ID 22635

Zebtron CLPesticides-2
30 m x 0.32 mm x 0.25 μm



App ID 22636

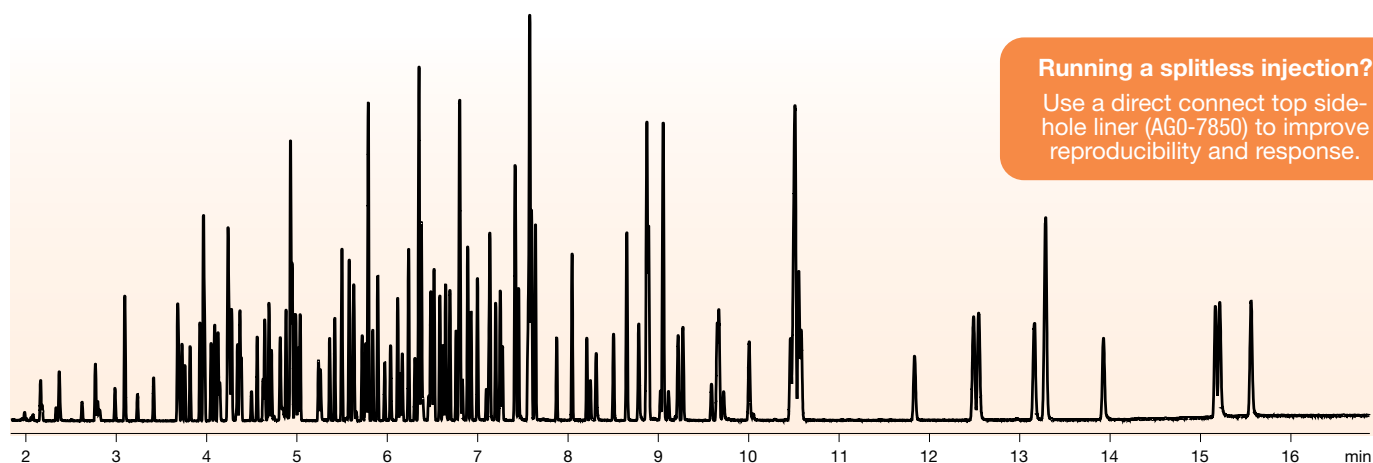
Conditions for all columns:

Columns: see above
Dimensions: see above
Part Number: [7HM-G028-51](#) (ZB-CLPesticides-1)
[7HM-G029-11](#) (ZB-CLPesticides-2)
Y-Connector: [AG0-4717](#) (Borosilicate Glass)
Recommended Z-Guard™: [7AM-G000-00-G20](#) (5 m)
Injection: Splitless (hold 0.75 min) @ 250 °C, 2 μL
Liner: [AG0-8499](#) (Single Taper with Wool at Bottom)
Septum: [AG0-4696](#) (PhenoRed™-400)
Inlet Seal: [AG0-8620](#) (Gold-Plated Easy Seal™)
Carrier Gas: Helium @ 26 cm/sec (constant flow)
Oven Program: 80 °C for 0.5 to 155 °C @ 19 °C/min for 1 min to 210 °C @ 4 °C/min to 310 °C @ 25 °C/min for 10 min
Detector: ECD @ 325 °C
Sample: Analytes are various concentrations in ethyl acetate.

Peak No.	Analyte	Concentration (ng/mL)	Peak No.	Analyte	Concentration (ng/mL)
1.	Hexachlorocyclopentadiene	100	20.	Metachlor	100
2.	Etridiazole	100	21.	DCPA(dacthal)	100
3.	Chloroneb	100	22.	Heptachlor epoxide (isomer B)	50
4.	Propachlor	100	23.	trans-Chlordane	100
5.	Trifluralin	100	24.	Cyanazine	100
6.	Hexachlorobenzene	100	25.	cis-Chlordane	100
7.	α-BHC	50	26.	Endosulfan I	50
8.	Simazine	100	27.	4,4'-DDE	50
9.	Atrazine	100	28.	Dieldrin	50
10.	γ-BHC	50	29.	Endrin	50
11.	Pentachloronitrobenzene **	50	30.	Chlorobenzilate	100
12.	β-BHC	50	31.	4,4'-DDD	50
13.	δ-BHC	50	32.	Endosulfan II	50
14.	Heptachlor	50	33.	4,4'-DDT	50
15.	Chlorothalonil	100	34.	Endrin aldehyde	50
16.	Metribuzin	100	35.	Endosulfan sulfate	50
17.	Alachlor	100	36.	Methoxychlor	50
18.	Aldrin	50	37.	cis-Permethrin	100
19.	4,4'-Dibromobiphenyl*	250	38.	trans-Permethrin	100

** Internal Standard

Determination of Semivolatile Organic Compounds



Running a splitless injection?

Use a direct connect top side-hole liner (AG0-7850) to improve reproducibility and response.

App ID 20582

Column: Zebron™ ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part Number: 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

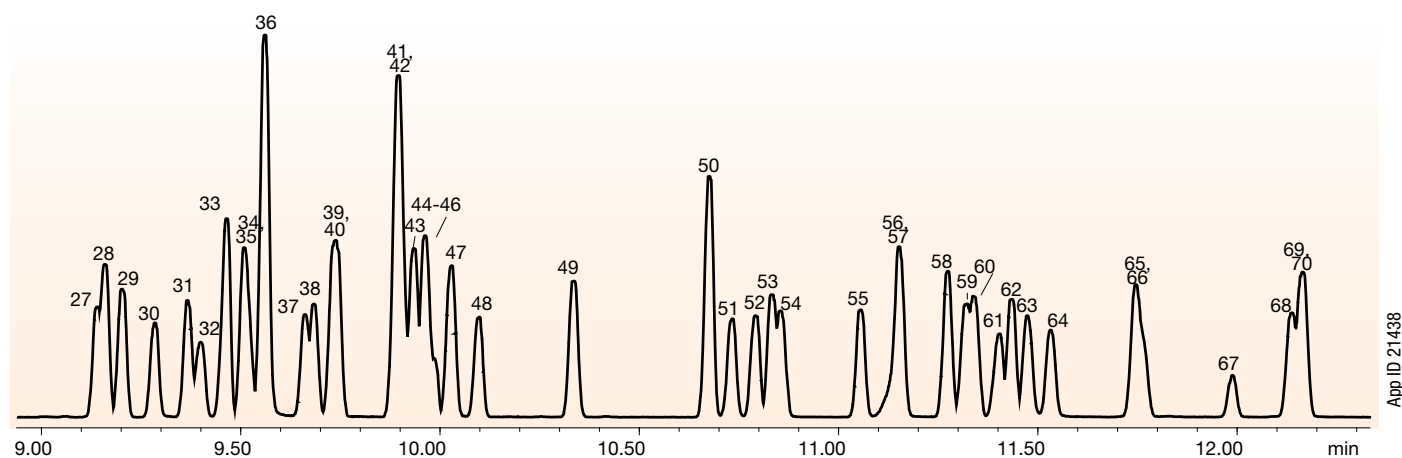
Detector: MSD @ 340 °C; 45 – 450 amu

Sample: Analytes are 25 ppm in Dichloromethane

Analytes:

- | | | | |
|--------------------------------------|--|--------------------------------|---------------------------------|
| 1. 1,4-Dioxane-d8 | 35. 2-Nitrophenol | 69. Acenaphthene-d10 | 104. Methyl parathion |
| 2. 1,4-Dioxane | 36. 2,4-Dimethylphenol | 70. 2,4-Dinitrophenol | 105. Di-n-butyl phthalate |
| 3. NNitrosodimethylamine | 37. Benzoic acid | 71. Acenaphthene | 106. Parathion |
| 4. Pyridine | 38. ,O,Triethylphosphorothioate | 72. 4-Nitrophenol | 107. 4-Nitroquinoline-1-oxide |
| 5. 2-Picoline | 39. bis(2-Chloroethoxy)methane | 73. Pentachlorobenzene | 108. Methapyrilene |
| 6. NNitrosomethylethylamine | 40. 2,4-Dichlorophenol | 74. 2,4-Dinitrotoluene | 109. Isodrin |
| 7. Methyl methanesulfonate | 41. alpha,alpha-Dimethylphenethylamine | 75. Dibenzofuran | 110. Fluoranthene |
| 8. 2-Fluorophenol | 42. 1,2,4-Trichlorobenzene | 76. 1-Naphthylamine | 111. Benzidine |
| 9. N-Nitrosodiethylamine | 43. Naphthalene-d8 | 77. 2,3,4,6-Tetrachlorophenol | 112. Pyrene-d10 |
| 10. Ethyl methanesulfonate | 44. Naphthalene | 78. 2-Naphthylamine | 113. Pyrene |
| 11. Phenol-d5 | 45. 4-Chloroaniline | 79. Diethyl phthalate | 114. Aramite |
| 12. Phenol | 46. 2,6-Dichlorophenol | 80. Thionazin | 115. p-Terphenyl-d14 |
| 13. Aniline | 47. Hexachloropropene | 81. 4-Chlorodiphenyl ether | 116. p-Dimethylaminoazobenzene |
| 14. bis(2-Chloroethyl)ether | 48. Hexachlorobutadiene | 82. Fluorene | 117. Chlorobenzilate |
| 15. 2-Chlorophenol | 49. N-Nitrosodi-nbutylamine | 83. 4-Nitroaniline | 118. o-Tolidine |
| 16. 1,3-Dichlorobenzene | 50. p-Phenylenediamine | 84. 2-Methyl-4,6-dinitrophenol | 119. Butyl benzyl phthalate |
| 17. 1,4-Dichlorobenzene-D4 | 51. 4-Chloro-3-methylphenol | 85. Diphenylamine | 120. Kepone |
| 18. 1,4-Dichlorobenzene | 52. Isosafrole | 86. Azobenzene | 121. 2-Acetylaminofluorene |
| 19. Benzyl alcohol | 53. 2-Methylnaphthalene | 87. 2,4,6-Tribromophenol | 122. 3,3'-Dichlorobenzidine |
| 20. 1,2-Dichlorobenzene | 54. 1-Methylnaphthalene | 88. 1,3,5-Trinitrobenzene | 123. Benz[a]anthracene |
| 21. 2-Methylphenol | 55. Hexachlorocyclopentadiene | 89. Di-allate 90. Phorate | 124. Chrysene-d12 |
| 22. bis(2-Chloro-1-methylethyl)ether | 56. 1,2,4,5-Tetrachlorobenzene | 91. Phenacetin | 125. Chrysene |
| 23. 3-Methylphenol | 57. 2,4,6-Trichlorophenol | 92. 4-Bromophenyl phenyl ether | 126. bis(2-Ethylhexyl)phthalate |
| 24. 4-Methylphenol | 58. 2,4,5-Trichlorophenol | 93. Hexachlorobenzene | 127. Dioctyl phthalate |
| 25. N-Nitrosopyrrolidine | 59. 2-Fluorobiphenyl | 94. Dimethoate | 128. Benzo[b]fluoranthene |
| 26. N-Nitrosodi-npropylamine | 60. Safrole | 95. 4-Aminobiphenyl | 129. Benzo[k]fluoranthene |
| 27. Acetophenone | 61. 2-Chloronaphthalene | 96. Pentachloronitrobenzene | 130. Benzo[a]pyrene |
| 28. N-Nitrosomorpholine | 62. 2-Nitroaniline | 97. Pentachlorophenol | 131. Perylene-d12 |
| 29. o-Tolidine | 63. 1,4-Naphthoquinone | 98. Pronamide | 132. 3-Methylcholanthrene |
| 30. Hexachloroethane | 64. Dimethyl phthalate | 99. Dinoseb | 133. Indeno[1,2,3-cd]pyrene |
| 31. Nitrobenzene-d5 | 65. 1,3-Dinitrobenzene | 100. Disulfoton | 134. Dibenz[a,h]anthracene |
| 32. Nitrobenzene | 66. 2,6-Dinitrotoluene | 101. Phenanthrene-d10 | 135. Benzo[g,h,i]perylene |
| 33. N-Nitrosopiperidine | 67. Acenaphthylene | 102. Phenanthrene | |
| 34. Isophorone | 68. 3-Nitroaniline | 103. Anthracene | |

Determination of Semivolatiles in Drinking Water

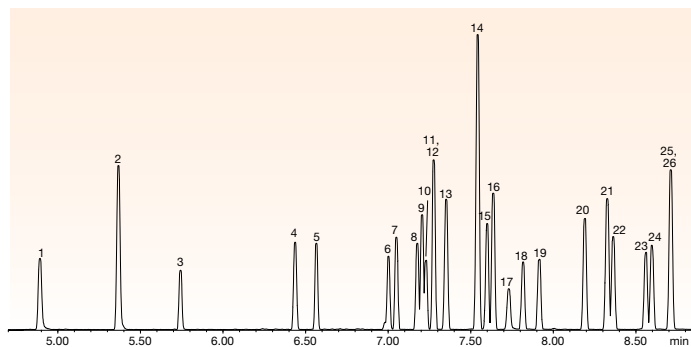


App ID 21438

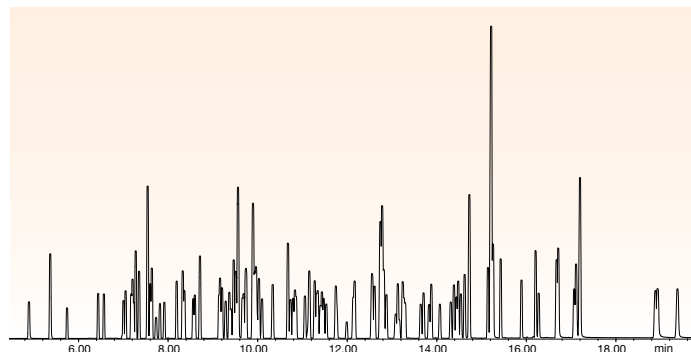
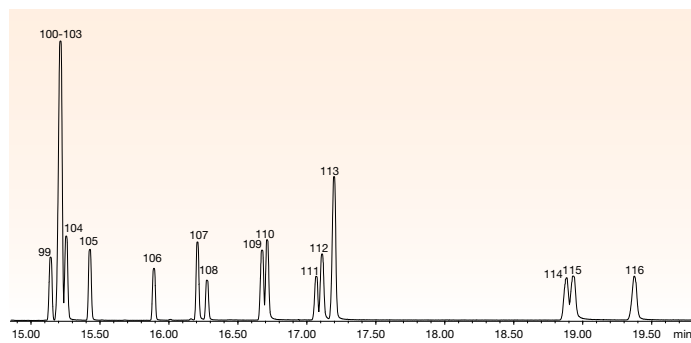
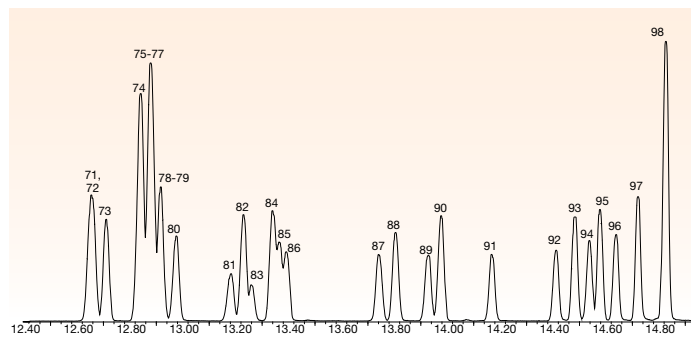
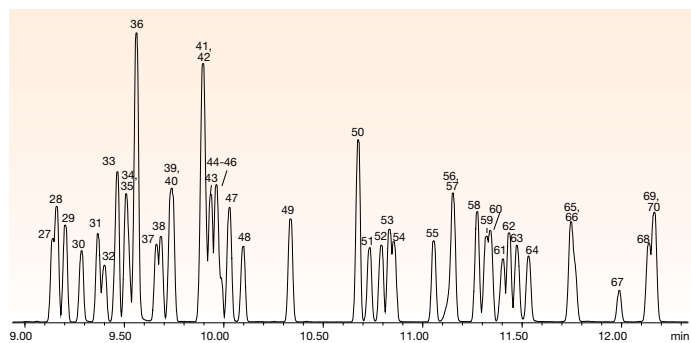
Column: Zebron™ ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 µm
Part Number: 7HG-G027-11
Injection: Pulsed Splitless 1 µL @ 260 °C
Liner: AGO-8499 (Single Taper with Wool)
Septum: AGO-4697 (PhenoRed™- 400)
Inlet Seal: AGO-8620 (Easy Seals™ Inlet Base Seal)
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 60 °C for 0.75 min to 180 °C @ 20 °C/min to 250 °C @ 10 °C/min to 310 °C @ 25 °C/min for 5 min
Detector: MSD @ 320 °C; 30-440 amu

Sample:		
1. Isophorone	30. Atraton	60. Chlorpyrifos
2. 1,3-Dimethyl-2-nitrobenzene(surrogate)	31. Prometon	61. Cyanazine
3. Dichlorvos(DDVP)	32. Simazine	62. Dacthal(DCPA)
4. Hexachlorocyclopentadiene	33. Atrazine	63. Aldrin
5. EPTC(Eptam)	34. beta-BHC	64. Triadimefon
6. Mevinphos(Phosdrin)	35. Propazine	65. Diphenamide
7. Butylate	36. Pentachlorophenol	66. MGK-264
8. Vernolate	37. gamma-BHC	67. MGK-264(isomer)
9. Dimethylphthalate	38. Terbufos(Terbuphos)	68. Heptachlorepoixide
10. Etridiazole	39. Pronamide(Propyzamide)	69. Merphos
11. 2,6-Dinitrotoluene	40. Diazinon	70. BZ#98
12. Pebulate(Tillam)	41. Phenanthrene-d10 (internal standard)	71. trans-Chlordane
13. Acenaphthylene	42. Chlorthalonil	72. Tetrachlorvinphos
14. Acenaphthene-d10 (internal standard)	43. Phenanthrene	73. Butachlor
15. Chloroneb	44. Disulfoton	74. Pyreth10
16. BZ#1	45. Methylparaoxon	75. Pyrene
17. Tebuthiuron	46. Terbacil	76. cis-Chlordane
18. 2,4-Dinitrotoluene	47. Anthracene	77. EndosulfanI
19. Molinate	48. delta-BHC	78. Fenamiphos
20. Diethylphthalate	49. BZ#29	79. trans-Nonachlor
21. Fluorene	50. Alachlor	80. Napropamide
22. Propachlor	51. Simetryn	81. Tricyclazole
23. Ethoprop(Ethoprophos)	52. Ametryn	82. DDE
24. Cycloate	53. Prometryn	83. DEF
25. Trifluralin	54. Heptachlor	84. BZ#154
26. Chlorpropham	55. Terbutryn	85. Dieldrin
27. alpha-BHC	56. Bromacil	86. Carboxin
28. BZ#5	57. Dibutylphthalate	87. Endrin
29. Hexachlorobenzene	58. BZ#47	88. Chlorobenzilate
	59. Metolachlor	89. EndosulfanII
		90. DDD
		91. Endrinldehyde
		92. Norflurazon
		93. Benzylbutylphthalate
		94. Endosulfansulfate
		95. DDT(Chlorophenothane)
		96. Hexazinone
		97. bis(2-Ethylhexyl)adipate
		98. Triphenylphosphate (DisflamolITP, surrogate)
		99. BZ#171
		100. Benz[a]anthracene
		101. BZ#200
		102. Methoxychlor
		103. Chrysene-d12 (internal standard)
		104. Chrysene
		105. Bis(2-ethylhexyl)phthalate
		106. Fenarimol
		107. cis-Permethrin
		108. trans-Permethrin
		109. Benzo[b]fluoranthene
		110. Benzo[k]fluoranthene
		111. Fluridone
		112. Benzo[a]pyrene
		113. Perylene-d12 (internal standard)
		114. Indeno[1,2,3-cd]pyrene
		115. Dibenzo[a,h]anthracene
		116. Benzo[g,h,i]perylene

SEMIVOLATILE ORGANIC COMPOUNDS



App ID 21438



Column: Zebtron™ ZB-SemiVolatiles
Dimensions: 30 meter x 0.25 mm x 0.25 μm
Part Number: 7HG-G027-11
Injection: Pulsed Splitless 1 μL @ 260 °C
Liner: AGO-8499 (Single Taper with Wool)
Septum: AGO-4697 (PhenoRed™- 400)
Inlet Seal: AGO-8620 (Easy Seals™ Inlet Base Seal)
Carrier Gas: Helium @ 1.2 mL/min (constant flow)
Oven Program: 60 °C for 0.75 min to 180 °C @ 20 °C/min to 250 °C @ 10 °C/min to 310 °C @ 25 °C/min for 5 min
Detector: MSD @ 320 °C; 30-440 amu

- Sample:**
- | | |
|---|---|
| 1. Isophorone | 59. Metolachlor |
| 2. 1,3-Dimethyl-2-nitrobenzene(surrogate) | 60. Chloropyrifos |
| 3. Dichlorvos(DDVP) | 61. Cyanazine |
| 4. Hexachlorocyclopentadiene | 62. Dacthal(DCPA) |
| 5. EPTC(Eptam) | 63. Aldrin |
| 6. Mevinphos(Phosdrin) | 64. Triadimefon |
| 7. Butylate | 65. Diphenamide |
| 8. Vernolate | 66. MGK-264 |
| 9. Dimethylphthalate | 67. MGK-264(isomer) |
| 10. Etridiazole | 68. Heptachlorepoxide |
| 11. 2,6-Dinitrotoluene | 69. Merphos |
| 12. Pebulate(Tillam) | 70. BZ#98 |
| 13. Acenaphthylene | 71. trans-Chlordane |
| 14. Acenaphthene-d10 (internal standard) | 72. Tetrachlorvinphos |
| 15. Chloroneb | 73. Butachlor |
| 16. BZ#1 | 74. Pyrened10 |
| 17. Tebuthiuron | 75. Pyrene |
| 18. 2,4-Dinitrotoluene | 76. cis-Chlordane |
| 19. Molinate | 77. Endosulfanl |
| 20. Diethylphthalate | 78. Fenamiphos |
| 21. Fluorene | 79. trans-Nonachlor |
| 22. Propachlor | 80. Napropamide |
| 23. Ethoprop(Ethoprofos) | 81. Tricyclazole |
| 24. Cycloate | 82. DDE |
| 25. Trifluralin | 83. DEF |
| 26. Chlorpropham | 84. BZ#154 |
| 27. alpha-BHC | 85. Dieldrin |
| 28. BZ#5 | 86. Carboxin |
| 29. Hexachlorobenzene | 87. Endrin |
| 30. Atraton | 88. Chlorobenzilate |
| 31. Prometon | 89. Endosulfanll |
| 32. Simazine | 90. DDD |
| 33. Atrazine | 91. Endrinaldehyde |
| 34. beta-BHC | 92. Norflurazon |
| 35. Propazine | 93. Benzylbutylphthalate |
| 36. Pentachlorophenol | 94. Endosulfansulfate |
| 37. gamma-BHC | 95. DDT(Chlorophenothane) |
| 38. Terbufos(Terbuphos) | 96. Hexazinone |
| 39. Pronamide(Propyzamide) | 97. bis(2-Ethylhexyl)adipate |
| 40. Diazinon | 98. Triphenylphosphate (DisflamolTP, surrogate) |
| 41. Phenanthrene-d10 (internal standard) | 99. BZ#171 |
| 42. Chlorthalonil | 100. Benz[a]anthracene |
| 43. Phenanthrene | 101. BZ#200 |
| 44. Disulfoton | 102. Methoxychlor |
| 45. Methylparaoxon | 103. Chrysene-d12 (internal standard) |
| 46. Terbacil | 104. Chrysene |
| 47. Anthracene | 105. Bis(2-ethylhexyl)phthalate |
| 48. delta-BHC | 106. Fenarimol |
| 49. BZ#29 | 107. cis-Permethrin |
| 50. Alachlor | 108. trans-Permethrin |
| 51. Simetryn | 109. Benzo[b]fluoranthene |
| 52. Ametryn | 110. Benzo[k]fluoranthene |
| 53. Prometryn | 111. Fluridone |
| 54. Heptachor | 112. Benzo[a]pyrene |
| 55. Terbutryn | 113. Perylene-d12 (internal standard) |
| 56. Bromacil | 114. Indeno[1,2,3-cd]pyrene |
| 57. Dibutylphthalate | 115. Dibenzo[a,h]anthracene |
| 58. BZ#47 | 116. Benzo[g,h,i]perylene |

EPA offices and laboratories, and outside organizations, have developed approved methods for measuring the concentration of a substance or pollutant.

In supporting regulatory analyses, Phenomenex offers a wide array analytical columns. Here is a selection of GC columns by EPA method.

Drinking Water

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



Wastewater

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



Solid Waste

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



Air

Method #	Description	Primary Column
T0-1	Volatile Organic Compounds by Thermal Adsorption and GC-MS	ZB-1 ^{PLUS} [™] , ZB-624, ZB-624 ^{PLUS}
T0-2	Volatile Organic Compounds by Carbon Molecular Sieve Adsorption and GC-MS	ZB-1 ^{PLUS} , ZB-624, ZB-624 ^{PLUS}
T0-3	Volatile Organic Compounds by Cryogenic Preconcentration Techniques and GC-FID /ECD	ZB-1 ^{PLUS} , ZB-624, ZB-624 ^{PLUS}
T0-4A	Pesticides and Polychlorinated Biphenyls (PCBs) by High Volume Polyurethane Foam (PUF) Sampling and GC	ZB-MultiResidue-1
T0-7	N-Nitrosodimethylamine by GC-MS	ZB-WAX ^{PLUS}
T0-9A	Polychlorinated, Polybrominated, and Brominated/Chlorinated Dibenzo-p-Dioxins and Dibenzofurans by HRGC/HRMS	ZB-SemiVolatiles, ZB-5MS
T0-10A	Pesticides and Polychlorinated Biphenyls (PCBs) by Low Volume Polyurethane Foam (PUF) Sampling and GC	ZB-MultiResidue-1
T0-13A	Polycyclic Aromatic Hydrocarbons (PAHs) by GC-MS	ZB-SemiVolatiles, ZB-PAH-EU, ZB-PAH-CT
T0-14A	Volatile Organic Compounds by Specially Prepared Canisters and GC	ZB-1 ^{PLUS}
T0-15	Volatile Organic Compounds by Specially Prepared Canisters and GC-MS	ZB-1 ^{PLUS} , ZB-624 ^{PLUS}



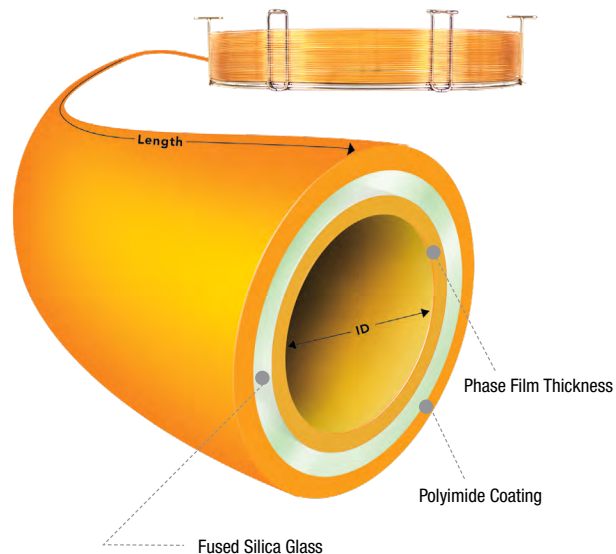
GC Solutions for Quality Analysis

Quality GC analysis requires selectivities that are able to resolve complex compounds with high resolution and proper retention time for quantification and qualification of critical compounds.

Zebtron GC columns provide:

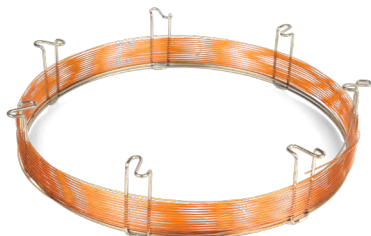
- Excellent sensitivity
- High reproducibility and stability
- Low bleed
- Long lifetime
- Optimized resolution of critical pairs

Zebtron GC columns are well suited to work with all types of GC detectors.



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Enhanced the analysis of dirty samples, samples with wide boiling points, or samples with wide molecular weights with Zebtron PLUS liner/quartz wool.

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Have questions or need support with your GC analysis? Chat live at any time with our analytical experts.

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ORDERING INFORMATION

Zebtron™ 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

Zebtron 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

Zebtron ZB-PAH-CT GC Columns

ID (mm)	df (µm)	Temp. Limits °C	Part No.
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-CLPesticides GC Columns

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

Zebtron ZB-SemiVolatiles GC Columns

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

Zebtron ZB-MultiResidue GC Columns

Zebtron ZB-MultiResidue -2 GC Columns

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

Zebtron 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

Zebtron™ Gas Management Filters

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



Zebtron Gas Management Traps





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



Zebtron Connecting Units


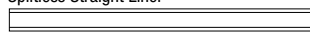
Part No.	Description	Unit
AG6-2101	1-position Connecting Unit ¼ in. Brass	ea
AG6-2102	2-position Connecting Unit ¼ in. Brass	ea
AG6-2103	4-position Connecting Unit ¼ in. Brass	ea
AG6-2201	1-position Connecting Unit ⅜ in. Brass	ea
AG6-2202	2-position Connecting Unit ⅜ in. Brass	ea
AG6-2203	4-position Connecting Unit ⅜ in. Brass	ea
AG6-2204	High flow 2-position connecting unit for LC-MS	ea
AG6-2205	Particle Filter for LC-MS	ea
AG6-2206	O-ring replacement for gas filter baseplate	20/pk
AG6-2301	1-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2302	2-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2303	4-position Connecting Unit ¼ in. Stainless Steel	ea
AG6-2304	1-position Connecting Unit ⅜ in. Stainless Steel	ea
AG6-2305	2-position Connecting Unit ⅜ in. Stainless Steel	ea
AG6-2306	4-position Connecting Unit ⅜ in. Stainless Steel	ea

Liners for Agilent® Technologies (HP) GC Systems (GC Model No. 5880/5890/6890/7890)

Description	Benefits / Uses	Dimensions ID x L x OD (mm)	Units	Similar to Mfr. No.**	Part No.	Unit
Split / Splitless, FocusLiner™ Single Taper with wool 	General use or dirty samples	4 x 78.5 x 6.3	ea	5183-4711 20994	–	–
			5/pk	5183-4712 20995	AGO-4680	5/pk
			25/pk	5183-4713 20996	AGO-7514	25/pk
Splitless, Single Taper Liner with wool 	Large injection, trace analysis	4 x 78.5 x 6.3	5/pk	5183-4693	AGO-8499	5/pk
			25/pk	5183-4694	AGO-9170	25/pk
Split / Splitless Liner with wool 	Large injection, trace analysis	4 x 78.5 x 6.3	5/pk	5183-4691	AGO-8653	5/pk
			25/pk	5183-4692	AGO-8654	25/pk
Single Taper Direct Connect with Side Hole (top) 	Great recovery and linearity for trace analysis of active compounds	4 x 78.5 x 6.3	ea	G1544 21054	–	–
			5/pk	21055	AGO-7850	5/pk
			25/pk	20998	–	–

Column Installs This End

Liners for Shimadzu® GC Systems (GC Model No. 17A, 17B, 2010, 2014)

Description	Benefits / Uses	Dimensions ID x L x OD (mm)	Units	Similar to Mfr. No.**	Part No.	Unit
Split/Splitless Single Taper / Gooseneck Tapered FocusLiner with wool 	Great recovery and linearity for trace analysis of active compounds	3.4 x 95 x 5	–	092068	AGO-4683	5/pk
Splitless Straight Liner 	Small injection, trace analysis	2.6 x 95 x 5	–	–	AGO-4667	5/pk

Note: Large injection ≥ 2µL. Small injection ≤ 2µL. ** Similar to but not always an exact equivalent to the original manufacturer's product.

GC Application Guide

Persistent Organic Pollutants (POPs)



Phenomenex products are available worldwide. For the distributor in your country/region, contact Phenomenex USA, International Department at international@phenomenex.com

Australia

t: +61 (0)2-9428-6444
auinfo@phenomenex.com

Austria

t: +43 (0)1-319-1301
anfrage@phenomenex.com

Belgium

t: +32 (0)2 503 4015 (French)
t: +32 (0)2 511 8666 (Dutch)
beinfo@phenomenex.com

Canada

t: +1 (800) 543-3681
www.phenomenex.com/chat

China

t: +86 400-606-8099
cninfo@phenomenex.com

Czech Republic

t: +420 272 017 077
cz-info@phenomenex.com

Denmark

t: +45 4824 8048
nordicinfo@phenomenex.com

Finland

t: +358 (0)9 4789 0063
nordicinfo@phenomenex.com

France

t: +33 (0)1 30 09 21 10
franceinfo@phenomenex.com

Germany

t: +49 (0)6021-58830-0
anfrage@phenomenex.com

Hong Kong

t: +852 6012 8162
hkinfo@phenomenex.com

India

t: +91 (0)40-3012 2400
indiainfo@phenomenex.com

Indonesia

t: +62 21 5019 9707
indoinfo@phenomenex.com

Ireland

t: +353 (0)1 247 5405
eireinfo@phenomenex.com

Italy

t: +39 051 6327511
italiainfo@phenomenex.com

Japan

t: +81 (0) 120-149-262
jpinfo@phenomenex.com

Luxembourg

t: +31 (0)30-2418700
nlinfo@phenomenex.com

Mexico

t: 01-800-844-5226
tecnicomx@phenomenex.com

The Netherlands

t: +31 (0)30-2418700
nlinfo@phenomenex.com

New Zealand

t: +64 (0)9-4780951
nzinfo@phenomenex.com

Norway

t: +47 810 02 005
nordicinfo@phenomenex.com

Poland

t: +48 22 104 21 72
pl-info@phenomenex.com

Portugal

t: +351 221 450 488
ptinfo@phenomenex.com

Singapore

t: +65 6559 4364
sginfo@phenomenex.com

Slovakia

t: +420 272 017 077
sk-info@phenomenex.com

Spain

t: +34 91-413-8613
espinfo@phenomenex.com

Sweden

t: +46 (0)8 611 6950
nordicinfo@phenomenex.com

Switzerland

t: +41 (0)61 692 20 20
swissinfo@phenomenex.com

Taiwan

t: +886 (0) 0801-49-1246
twinfo@phenomenex.com

Thailand

t: +66 (0) 2 566 0287
thaiinfo@phenomenex.com

United Kingdom

t: +44 (0)1625-501367
ukinfo@phenomenex.com

USA

t: +1 (310) 212-0555
www.phenomenex.com/chat

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Corporate Office USA
t: +1 (310) 212-0555
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