

Zebron™ MultiResidue™ GC Columns



A New Generation of Columns for
Pesticide Analysis

Optimized for pesticide, herbicide and insecticide analysis

The use of many pesticides has been limited or discontinued due to the health and environmental risks they pose. However, the persistence of these compounds in the environment has left many sites heavily contaminated and in need of remediation. There is also international concern for the residual level of pesticides in foods, especially those imported from countries where banned pesticides are still permitted.

Though the standard method for pesticide testing varies throughout the world, many labs use Electron Capture Detectors (ECD), Nitrogen Phosphorous Detectors (NPD) or Flame Photometric Detectors (FPD) because of the sensitivity level they offer for specific compound classes. While these detectors are extremely sensitive, they do not provide spectral confirmation of the analyte. In order to provide positive confirmation, Mass Spectrometry (MS) must be used. The GC/MS can be used in Selected Ion Monitoring (SIM) mode to provide sensitivity levels similar to the previously mentioned detectors, while also providing positive confirmation of the analyte in question.

Regardless of the technique, the new MultiResidue GC columns have been optimized for pesticides, herbicide, or insecticide analysis. Each column has a unique selectivity that allows them to be used together in dual column confirmation analysis. Both phases are MS Certified, so they can also be used on MS to confirm results. We have run a number of pesticide compounds on these phases. If you don't find the application you are looking for in this brochure, be sure to contact your local Phenomenex representative.





Zebron™ MultiResidue™ (MR) Columns

- Optimized Selectivity
- Two Complementary Phase Chemistries
- MS Certified Bleed Levels
- High Temperature Limits (320/340 °C)
- Very Low Column Activity



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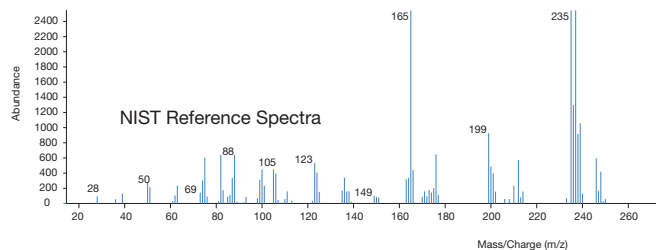
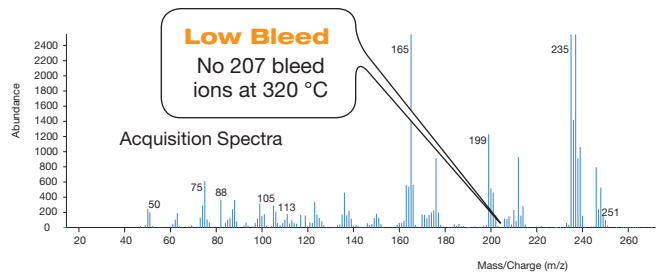
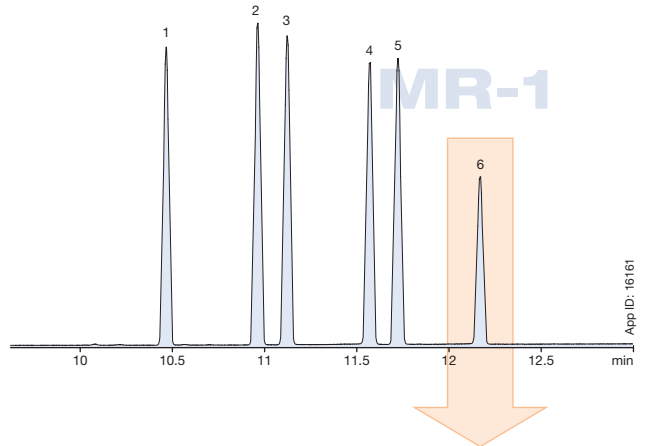
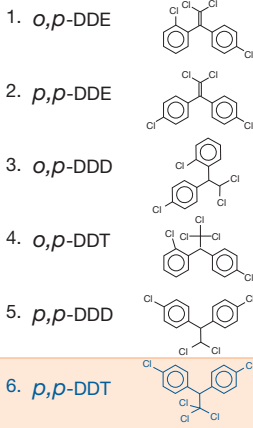
A New Generation of Columns for Pesticide Analysis

Optimized Selectivity

Many pesticide compounds have very similar structures or have isomers that are present in the product. Zebtron™ MultiResidue™ phases were developed to provide optimum selectivity for a variety of pesticide compounds. Every analysis is unique, but we can help you determine the best phase to use in order to resolve your pesticide sample.

Figure 1: Selectivity of DDT, DDD, and DDE isomers at 25 ng on column using MS

Sample:



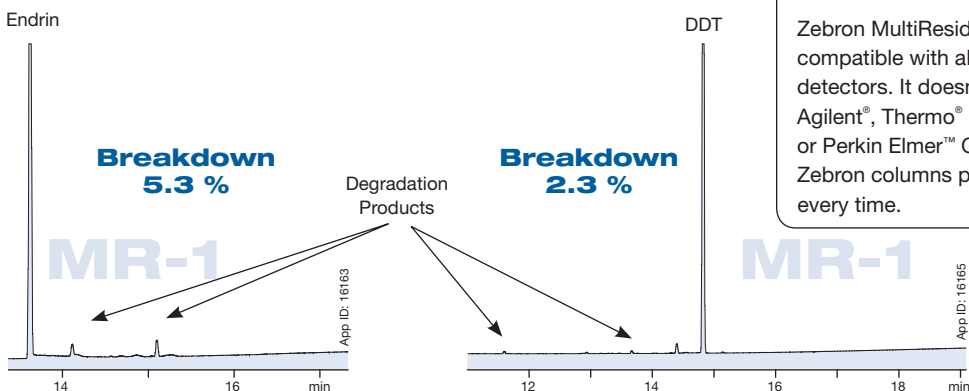
Low Bleed

Zebtron columns have developed a reputation for low column bleed and high temperature limits and Zebtron MultiResidue columns are no different. The columns are made using an extremely stable siloxane-based polymer that contains absolutely no cyano functionality. Our Engineered Self Crosslinking™ (ESC) bonding process makes both columns MS certified, allowing for unmatched spectral integrity even for low-level samples.

Low Column Activity

Many pesticides are sensitive to system activity and readily breakdown. This can be a significant problem when working with low level samples and sensitive detectors such as ECD. Zebron™ MultiResidue™ columns have been completely deactivated and provide excellent peak shape for even the most active compounds.

Figure 2: Breakdown for sensitive pesticides on Zebron MultiResidue columns



Universal Compatibility

Zebron MultiResidue GC columns are compatible with all systems and all detectors. It doesn't matter if it's an Agilent®, Thermo® Finnigan™, Shimadzu®, or Perkin Elmer™ GC or GC/MS system, Zebron columns provide reliable results every time.

Tunable Selectivity

Zebron MultiResidue GC columns were developed specifically for pesticide analysis. Their unique selectivity improves the separation of all classes of pesticides, herbicides, and insecticides. Since the columns are MS Certified, samples can be prescreened using analyte specific detectors, and then confirmed using MS.

Sensitive and Stable

Figure 3: Repeatability at 5 pg on-column concentration of various pesticides using Zebron MR-1 and MR-2 columns

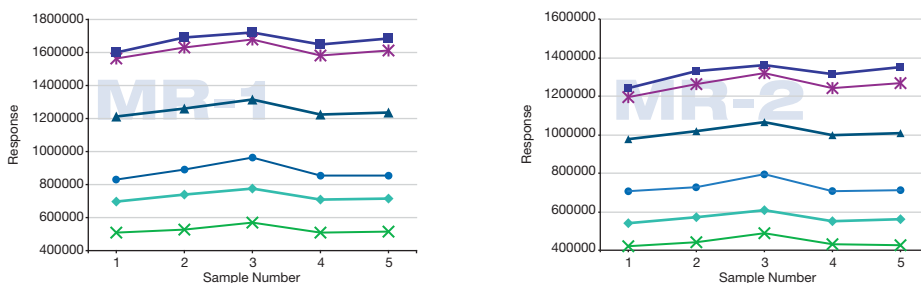


Table 1: Relative standard deviation (RSD) for five replicate injections of pesticide at 5 pg on-column concentration

Analyte	MR-1 % RSD	MR-2 % RSD
Lindane (γ-BHC)	2.78	3.53
Heptachlor	2.83	3.60
Dieldrin	3.38	3.28
Endrin	4.34	4.54
DDT	5.92	5.14
Methoxychlor	5.21	5.96

Performance That Exceeds US EPA Method 8081A Specifications

The EPA outlines strict performance guidelines that must be met for compound linearity, percent relative standard deviation (% RSD), and breakdown of DDT and endrin. Column resolution and performance are critical in meeting these requirements. The data below was calculated using EPA Method 8081A guidelines.

Table 1: Five-point calibration curve at 5, 10, 25, 100, and 250 ppb

Analyte	Zebtron™ MR-1 % RSD*	Zebtron™ MR-2 % RSD*	US EPA Specifications
α-BHC	6.75	7.91	< 20
γ-BHC (Lindane)	5.52	5.70	< 20
β-BHC	3.57	9.21	< 20
δ-BHC	5.90	7.58	< 20
Heptachlor	4.21	5.37	< 20
Aldrin	4.34	5.25	< 20
Heptachlor epoxide	3.70	4.48	< 20
γ-Chlordane	3.68	3.61	< 20
α-Chlordane	2.91	3.39	< 20
Endosulfan I	2.93	3.91	< 20
DDE	4.56	6.77	< 20
Dieldrin	3.85	4.75	< 20
Endrin	4.17	3.84	< 20
DDD	4.79	7.36	< 20
Endosulfan II	2.63	3.53	< 20
Endrin aldehyde	4.11	4.72	< 20
DDT	3.70	5.42	< 20
Endosulfan sulfate	3.31	3.20	< 20
Methoxychlor	7.39	4.21	< 20
Endrin ketone	3.48	3.95	< 20
Average	4.28	5.21	< 20

*Calculated using response factors as per EPA guidelines

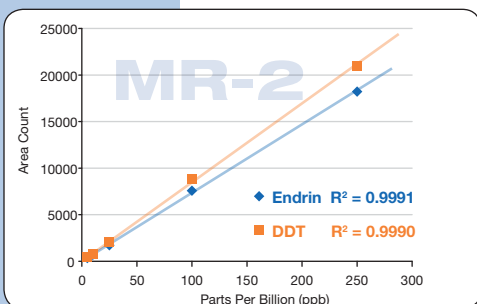
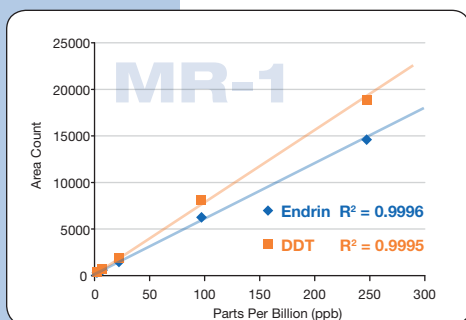


Table 2: Percent breakdown of endrin & DDT as per EPA guidelines

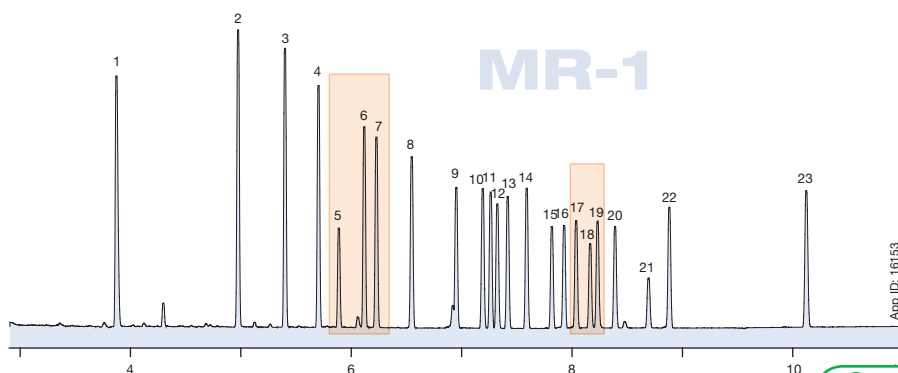
Analyte	Zebtron MR-1 % Breakdown	Zebtron MR-2 % Breakdown	US EPA Requirements
Endrin	5.3	7.0	< 15
DDT	2.3	2.9	< 15



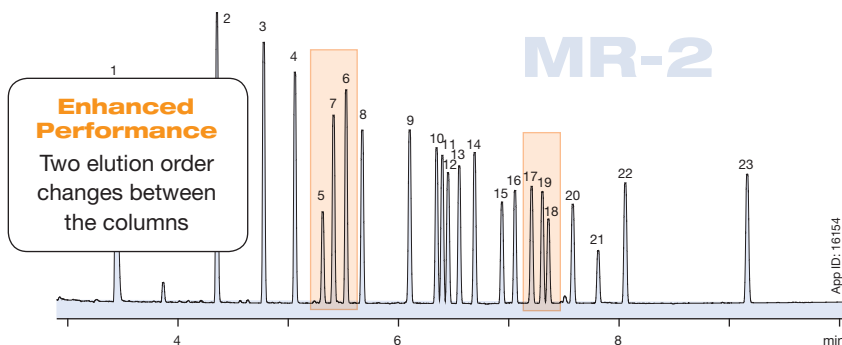
Baseline Resolution of all 20 EPA 8081A's Chlorinated Pesticides!

The US EPA regulates the testing of 20 specific chlorinated pesticides under the official Method 8081A. The method specifies an Electron Capture Detector (ECD), which is extremely sensitive for chlorinated compounds. However, it does not provide any confirmatory information about the peak.

To reduce the occurrence of misidentifications, the method requires the use of two GC columns of dissimilar selectivity in a parallel configuration. The EPA considers an analyte's presence confirmed if it has a peak at the pre-determined retention time on both columns. The unique selectivity of Zebtron™ MultiResidue™ columns allows for baseline resolution ($R_s > 1.5$) of all compounds with two elution order changes between the columns!



App ID: 16153



App ID: 16154

Column: Zebtron MultiResidue-1
Zebtron MultiResidue-2

Dimensions: 30 meter x 0.32 mm x 0.50 μ m
30 meter x 0.32 mm x 0.25 μ m

Part No.: 7HM-G016-17; 7HM-G017-11

Injection: Splitless @ 250 °C, 1 μ L

Carrier Gas: Helium @ 3.4 mL/min (constant flow)

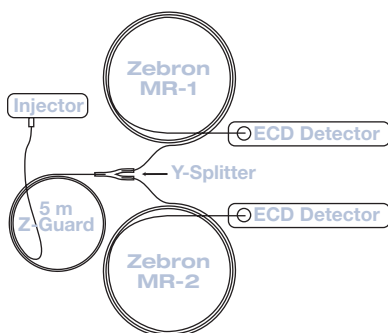
Oven Program: 100 °C for 0.5 min to 220 °C @
35 °C/min to 340 °C at 20 °C/min for
2 min

Detector: ECD @ 350 °C

Notes: Columns connected using a 5 m Z-Guard and a Y-splitter

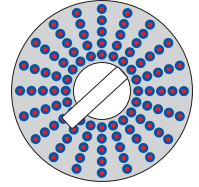
Sample:

1. Tetrachloro-m-xylene (TCMX) (surr)
2. 1-Bromo-2-nitrobenzene
3. α -BHC
4. γ -BHC (Lindane)
5. β -BHC
6. δ -BHC
7. Heptachlor
8. Aldrin
9. Heptachlor epoxide
10. γ -Chlordane (*trans*)
11. α -Chlordane (*cis*)
12. Endosulfan I
13. 4,4'-DDE
14. Dieldrin
15. Endrin
16. 4,4'-DDD
17. Endosulfan II
18. Endrin aldehyde
19. 4,4'-DDT
20. Endosulfan sulfate
21. Methoxychlor
22. Endrin ketone
23. Decachlorobiphenyl (DCB) (surr)

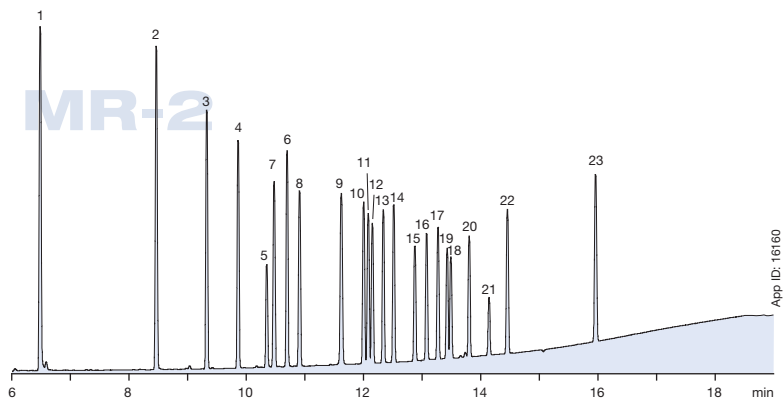
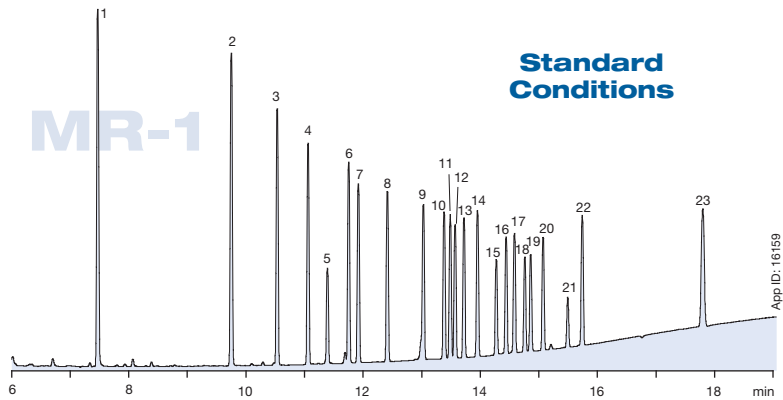
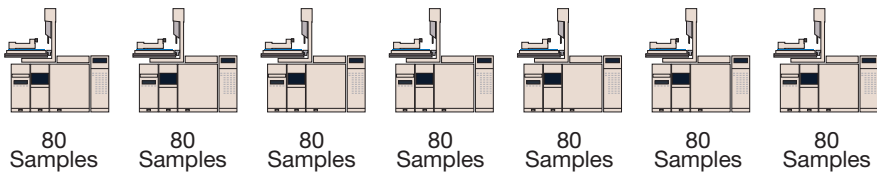


Increase Your Lab's Productivity

Zebtron™ MultiResidue™ columns were designed to provide optimized resolution of all classes of pesticides. This unique selectivity allows your lab to maintain separation of critical compounds even when analysis times are shortened by more than 40 %. The increase in lab productivity makes sure you get results to your customers on time, even for rush samples.



7 Instruments Required to Run 500 Samples Per Day



Column: Zebtron MultiResidue-1
Zebtron MultiResidue-2
Dimensions: 30 meter x 0.53 mm x 0.50 µm
30 meter x 0.53 mm x 0.50 µm
Part No.: 7HK-G016-17; 7HK-G017-17
Injection: Splitless @ 250 °C, 1 µL

Carrier Gas: Helium @ 5.2 mL/min (constant flow)
Oven Program: 90 °C for 0.5 min to 320 °C @ 15 °C/min for 5 min
Detector: ECD @ 350 °C

Same Columns + Optimized Conditions = Increased Productivity

3.5 Instruments Required to Run 500 Samples Per Day



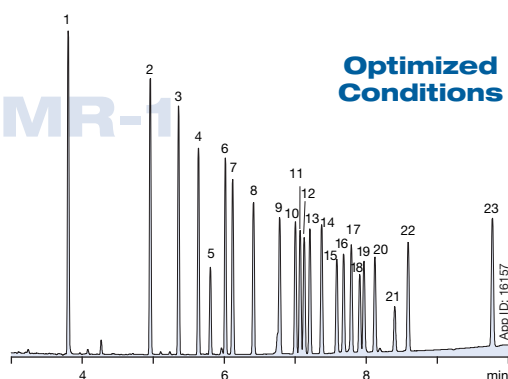
144
Samples

144
Samples

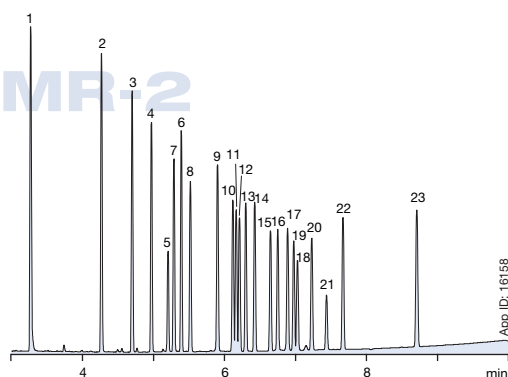
144
Samples

68 Samples
with time to
spare!

**These instruments available
for other analysis**



44 % Shorter Analysis
Almost no change in resolution!



Sample for all columns on p. 8-9:

1. Tetrachloro-m-xylene (TCMX) (surr)
2. 1-Bromo-2-nitrobenzene (IS)
3. α -BHC
4. γ -BHC (Lindane)
5. β -BHC
6. δ -BHC
7. Heptachlor
8. Aldrin
9. Heptachlor epoxide
10. *trans*-Chlordane (gamma)
11. *cis*-Chlordane (alpha)
12. Endosulfan I
13. 4,4'-DDE
14. Dieldrin
15. Endrin
16. DDD
17. Endosulfan II
18. Endrin aldehyde
19. DDT
20. Endosulfan sulfate
21. Methoxychlor
22. Endrin ketone
23. Decachlorobiphenyl (DCB) (surr)

Tech Tip:

High flow rates reduce a compound's residence time in the inlet. This can significantly reduce injection port breakdown for sensitive compounds such as Endrin & DDT.

Column: Zebron MultiResidue-1
Zebron MultiResidue-2
Dimensions: 30 meter x 0.53 mm x 0.50 μ m
30 meter x 0.53 mm x 0.50 μ m
Part No.: 7HK-G016-17; 7HK-G017-17

Injection: Splitless @ 250 °C, 1 μ L
Carrier Gas: Helium @ 8 mL/min (constant flow)
Oven Program: 110 °C for 0.5 min to 250 °C @ 30 °C/min
to 340 °C @ 20 °C/min for 2 min
Detector: ECD @ 350 °C

Multi-Pesticide Residue Testing by GC/MS

Pesticides are widely used by farmers to control pests, weeds and molds that would otherwise decrease crop production. While this has significantly increased worldwide food productions, these same pesticides pose significant health and environmental risks.

The restrictions for specific pesticides differ from one country to the next. As world trade increases, the potential threat to other countries' populations increases. This is especially true in the European Union, where produce can be transported from one country to another quite easily.

For this reason, pesticides are the subject of increasing regulation. Since many different types of pesticides can be used on the same food product, multiple residue screening approaches are used to test for more than 300 compounds. Gas Chromatography (GC) is still the most common test method for the majority of pesticide classes. While ECD or NPD may be used for screening, MS detection must be employed to provide positive confirmation.

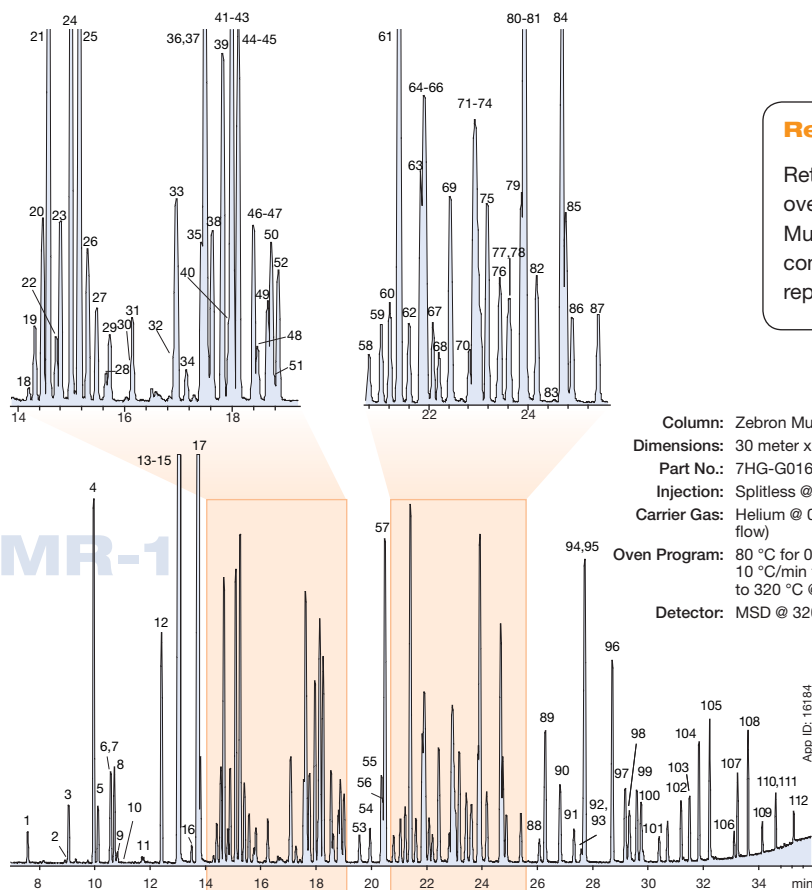


Zebron™ MultiResidue™ columns are well suited for use on all types of detectors. They provide very low bleed levels even at elevated temperatures required to remove matrix contamination during high temperature bake outs. When used in conjunction with a screening method that uses an analyte specific detector such as ECD, Zebron MR-1 and MR-2 columns can be a powerful tool in identifying positive samples.



Confirmation of Multi-Pesticide Mixture by GC/MS

The low bleed performance of both Zebron™ MultiResidue™ MR-1 and MR-2 columns allow them to be used on GC/MS.



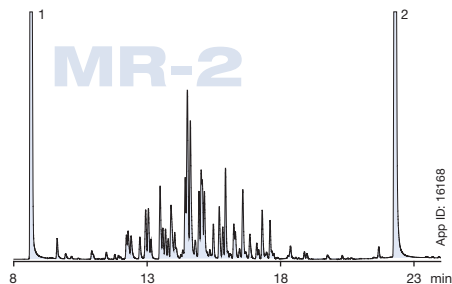
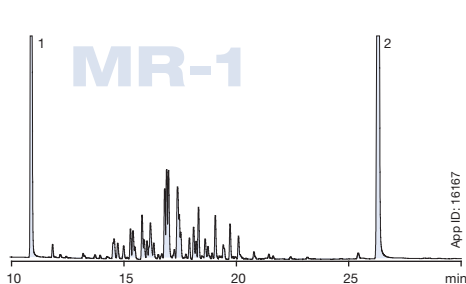
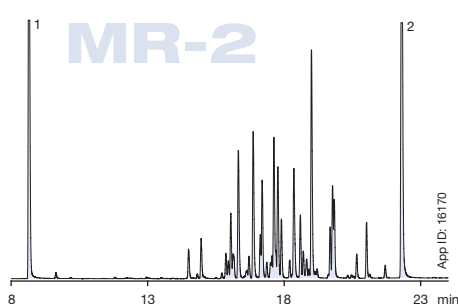
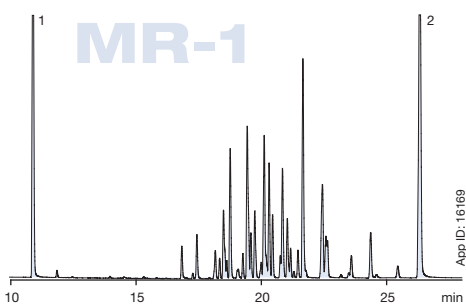
Retention Time Data

Retention time data is available for over 300 pesticides on a Zebron MultiResidue-1 column. Please contact your local Phenomenex representative for more details.

Column: Zebron MultiResidue-1
 Dimensions: 30 meter x 0.25 mm x 0.25 µm
 Part No.: 7HG-G016-11
 Injection: Splitless @ 260 °C, 1 µL
 Carrier Gas: Helium @ 0.90 mL/min (constant flow)
 Oven Program: 80 °C for 0.5 min to 150 °C @ 10 °C/min to 240 °C @ 4 °C/min to 320 °C @ 15 °C/min for 3 min
 Detector: MSD @ 320 °C; 45-400 amu

Sample:

- | | | | |
|---|--------------------------------------|------------------------------|----------------------|
| 1. Dichlorvos | 28. Naled | 56. Dichlofenthion | 85. Diphenamid |
| 2. DEET | 29. Chlorpropham | 57. 2,4-DB (methyl ester) | 86. MGK-264 isomer |
| 3. EPTC | 30. Dicrotophos | 58. Phosphamidon | 87. Clofenvinfos |
| 4. 3,5-Dichlorobenzoic acid (methyl ester) | 31. Phorate | 59. Chlorpyrifos methyl | 88. Crotoxyphos |
| 5. Butylate | 32. Monocrotophos | 60. Alachlor | 89. Butachlor |
| 6. 4-Nitrophenol (methyl ester) | 33. Pentachlorophenol (methyl ester) | 61. Bentazon (methyl ester) | 90. Stirofos |
| 7. Vernolate | 34. Demeton | 62. Ronnel | 91. Tokuthion |
| 8. Mevinphos | 35. Atraton | 63. Prometryn | 92. Napropamide |
| 9. Mevinphos isomer | 36. Profluralin | 64. Methyl parathion | 93. Fenamiphos |
| 10. Pebulate | 37. Prometon | 65. Ametryn | 94. Merphos Oxide |
| 11. Trichlorfon | 38. Silvex (methyl ester) | 66. Simetryn | 95. Oxadiazon |
| 12. Dicamba (methyl ester) | 39. Terbufos | 67. Aspon | 96. Oxyflurofen |
| 13. Molinate | 40. Dimethoate | 68. Metribuzin | 97. Carboxin |
| 14. Tebuthiuron | 41. Simazine | 69. Terbutryn | 98. Tricyclazole |
| 15. MCPP (methyl ester) | 42. Propazine | 70. Malathion | 99. Acifluorfen |
| 16. Tetraethyl pyrophosphate (methyl ester) | 43. Atrazine | 71. Fenitrothion | 100. Ethion |
| 17. MCPA (methyl ester) | 44. Diazinon | 72. Pichloram (methyl ester) | 101. Fensulfothion |
| 18. Demeton isomer | 45. Dioxathion | 73. Metolachlor | 102. Carbofenotion |
| 19. Thionazin | 46. Terbutylazine | 74. Chlorpyrifos | 103. Famfur |
| 20. Dichloroprop (methyl ester) | 47. Fonofos | 75. DCPA | 104. Norflurazon |
| 21. Propachlor | 48. Pronamide | 76. Bromacil | 105. Hexazinone |
| 22. Cycloate | 49. Chloramben (methyl ester) | 77. Fenthion | 106. EPN |
| 23. Ethoprop | 50. 2,4,5-T Methyl ester | 78. Trichloronate | 107. Phosmet |
| 24. Trifluralin | 51. Phosphamidon isomer | 79. Triadimeton | 108. Leptophos |
| 25. Benefin | 52. Disulfoton | 80. Isopropalin | 109. Azinphos-methyl |
| 26. 2,4-D (methyl ester) | 53. Secbumeton | 81. Parathion | 110. Fenarimol |
| 27. Sulfotep | 54. Terbacil | 82. MGK-624 | 111. Azinphos-ethyl |
| | 55. Dinoseb (methyl ester) | 83. Merphos | 112. Coumaphos |
| | | 84. Pendimethalin | |

Aroclor 1242

Aroclor 1260


Column: Zebtron MultiResidue-1
Zebtron MultiResidue-2

Dimensions: 30 meter x 0.32 mm x 0.50 μ m
30 meter x 0.32 mm x 0.25 μ m

Part No.: 7HM-G016-17; 7HM-G017-11

Injection: Split 50:1 @ 210 °C, 1 μ L

Carrier Gas: Hydrogen @ 2.3 mL/min (constant pressure)

Oven Program: 120 °C (hold 1 min) to 300 °C @ 9 °C/min (hold 10 min)

Detector: ECD @ 310 °C

Sample: 1. Tetrachloro-m-xylene (TCMX) (surr)
2. Decachlorobiphenyl (DCB) (surr)

Notes: Columns connected using a 5 meter Z-Guard and a Y-splitter

How long will columns last?

The performance of a GC system will degrade over time requiring inlet maintenance, column trimming, and ultimately the replacement of the GC column. In order to accurately determine what your column lifetime will be it's better to ask yourself the question: What makes your columns fail? Is it bleed, activity, or poor resolution?

The better the column performance for that criteria initially will usually lead to better overall performance in the long term. Zebtron MultiResidue columns provide the lowest activity, best resolution, and overall most stable performance of any pair of columns designed specifically for pesticide testing.



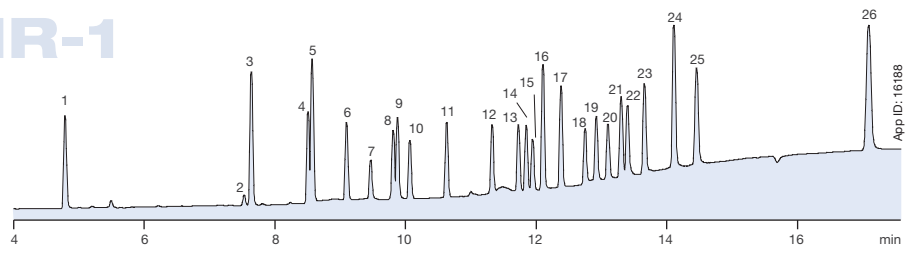


RCP/MCP States of Connecticut and Massachusetts Pesticide List

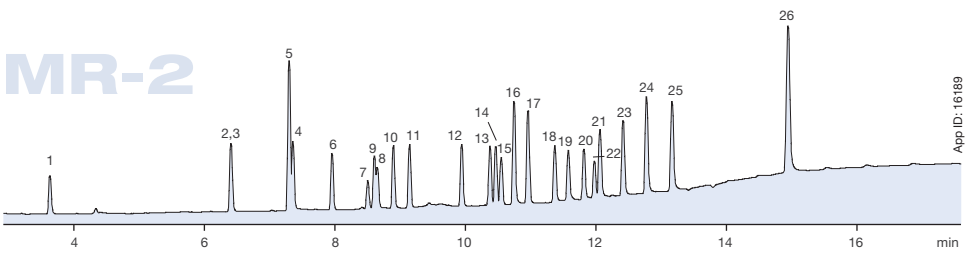


Column: Zebron MultiResidue-1
 Zebron MultiResidue-2
 Dimensions: 30 meter x 0.53 mm x 0.50 µm
 30 meter x 0.53 mm x 0.50 µm
 Part No.: 7HK-G016-17; 7HK-G017-17
 Injection: Splitless @ 250 °C, 2 µL
 Carrier Gas: Helium @ 6.7 psi (constant pressure)
 Oven Program: 130 °C for 1 min to 325 °C @ 15 °C/min
 (hold 5 min)
 Detector: ECD @ 380 °C

MR-1




MR-2



Sample:

- | | |
|--|-------------------------------------|
| 1. Hexachlorocyclopentadiene | 14. α-Chlordane |
| 2. Propaclor | 15. Endosulfan I |
| 3. Tetrachloro- <i>m</i> -xylene (TCMX) (surr) | 16. 4,4'-DDE |
| 4. α-BHC | 17. Dieldrin |
| 5. Hexachlorobenzene | 18. Endrin |
| 6. γ-BHC (Lindane) | 19. 4,4'-DDD |
| 7. β-BHC | 20. Endosulfan II |
| 8. Alachlor | 21. Endrin aldehyde |
| 9. δ-BHC | 22. 4,4'-DDT |
| 10. Heptachlor | 23. Endosulfan sulfate |
| 11. Aldrin | 24. Methoxychlor |
| 12. Heptachlor epoxide | 25. Endrin ketone |
| 13. γ-Chlordane | 26. Decachlorobiphenyl (DCB) (surr) |

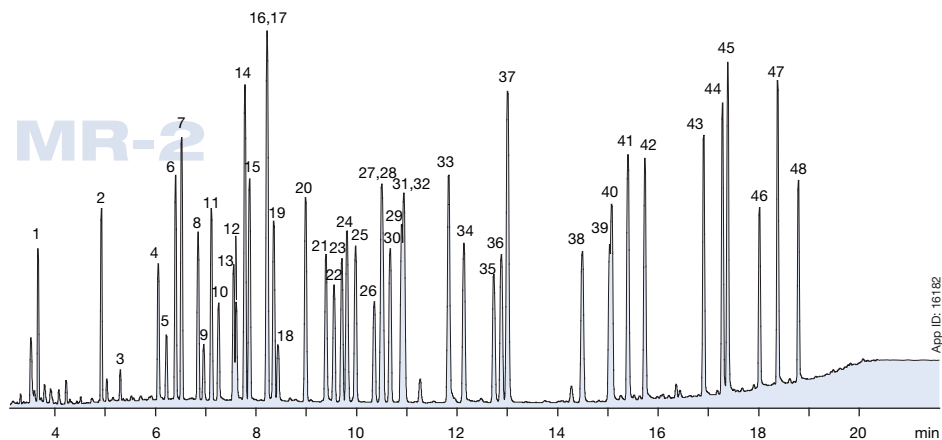
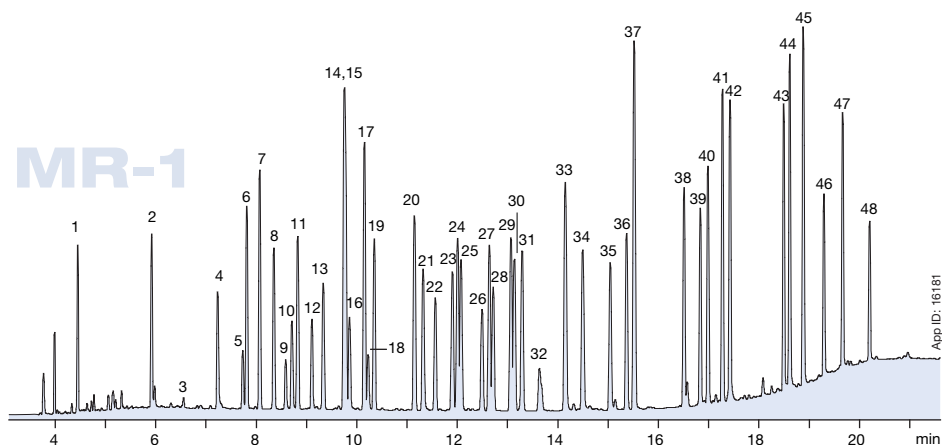


This application was supplied courtesy of Keith Aloisa at Phoenix Labs. Phoenix Labs (www.phoenixlabs.com) is a full service environmental lab that is NELAC accredited and certified in all of New England, New York, and New Jersey.

**“Better resolution. Higher efficiency.
 Best results I’ve ever gotten with
 any column pair.”**

Do you have a noteworthy application using Zebron GC columns that you would like published?

For consideration, please send your chromatogram and a short abstract to skyc@Phenomenex.com or fax it to (310) 328-7768 attn: Sky Countryman. Any type of application is welcome.



Column: Zebron MultiResidue-1

Zebron MultiResidue-2

Dimensions: 30 meter x 0.32 mm x 0.50 μ m

30 meter x 0.32 mm x 0.25 μ m

Part No.: 7HM-G016-17; 7HM-G017-11

Injection: On-column @ 103 °C, 1 μ L

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

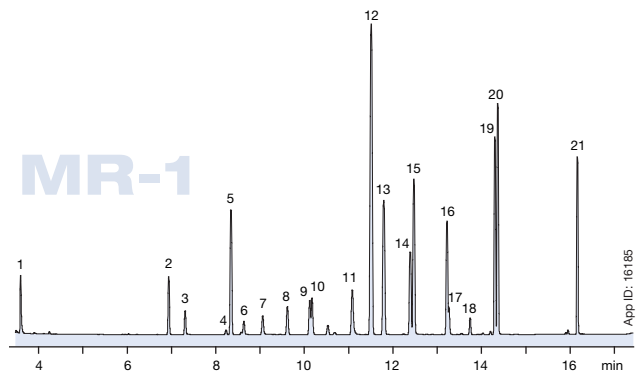
Detector: FID @ 340 °C

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

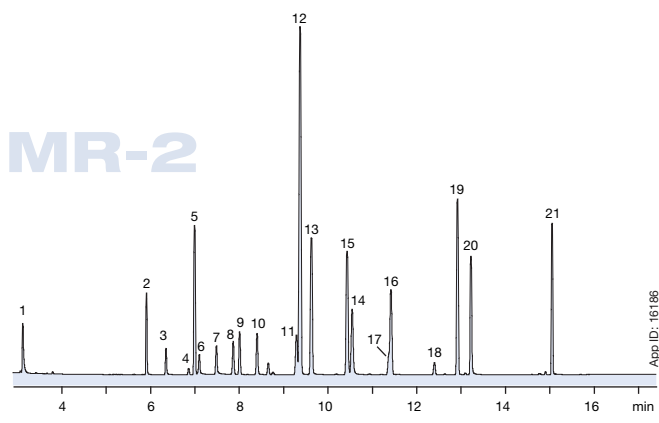
Sample:


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

MR-1



MR-2



 **Request Additional EPA Methods**

- 8082** Aroclors
- 507** Nitrogen- and Phosphorus-Containing Pesticides
- 8081A** Chlorinated Pesticides

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: Splitless @ 250 °C, 1 µL

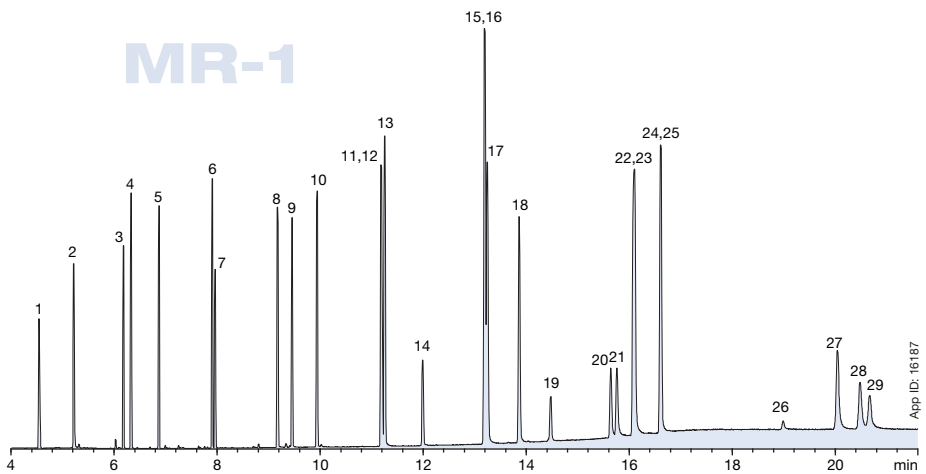
Carrier Gas: Helium @ 2.5 mL/min (constant flow)

Oven Program: 50 °C for 1 min to 180 °C @ 35 °C/min for 2 min to 205 °C @ 5 °C/min to 320 °C @ 20 °C/min

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 | |





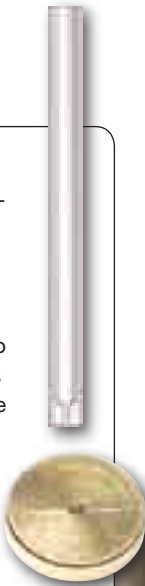
Column: Zebron MultiResidue-1
 Dimensions: 30 meter x 0.25 mm x 0.25 μ m
 Part No.: 7HG-G016-11
 Injection: Splitless @ 300 °C, 1 μ L
 Carrier Gas: Helium @ 1.4 mL/min (constant flow)
 Oven Program: 70 °C for 0.5 min to 275 °C @
 25 °C/min to 340 °C @ 8 °C/min for
 7 min
 Detector: MSD @ 320 °C; 45-400

Sample:

- | | |
|------------------------------------|---------------------------------------|
| 1. Naphthalene | 16. Benzo[<i>j</i>]fluoranthene |
| 2. 2-Methylnaphthalene | 17. Benzo[<i>k</i>]fluoranthene |
| 3. Acenaphthylene | 18. Benzo[<i>a</i>]pyrene |
| 4. Acenaphthene | 19. 3-Methylcholanthrene |
| 5. Fluorene | 20. Dibenz[<i>a,h</i>]acridine |
| 6. Phenanthrene | 21. Dibenz[<i>a,j</i>]acridine |
| 7. Anthracene | 22. Indeno[1,2,3- <i>cd</i>]pyrene |
| 8. Fluoranthene | 23. Dibenz[<i>a,h</i>]anthracene |
| 9. Pyrene | 24. Benzo[<i>g,h,i</i>]perylene |
| 10. Benzo[<i>c</i>]fluorene | 25. 7H-Dibenzo[<i>c,g</i>]carbazole |
| 11. Benz[<i>a</i>]anthracene | 26. Dibenzo[<i>a,l</i>]pyrene |
| 12. Cyclopenta[<i>c,d</i>]pyrene | 27. Dibenzo[<i>a,e</i>]pyrene |
| 13. Chrysene | 28. Dibenzo[<i>a,i</i>]pyrene |
| 14. Methylchrysene | 29. Dibenzo[<i>a,h</i>]pyrene |
| 15. Benzo[<i>b</i>]fluoranthene | |

Tech Tip:

Inlet deactivation is critical for obtaining stable calibration curves. Use a liner style that has a taper at the bottom to help focus analytes onto the column. Avoid liners with glass wool because it adds activity. Also remember to change your gold seal regularly when working with Agilent® 5890 or 6890 instruments.



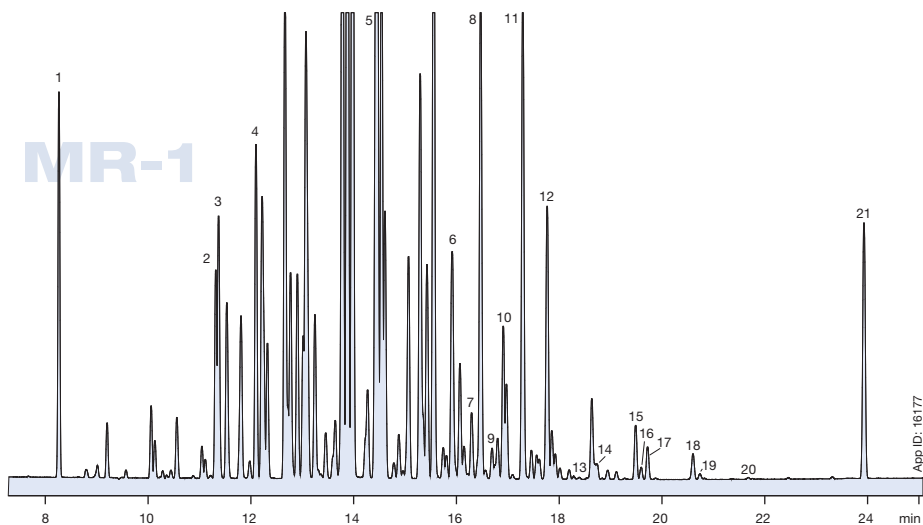
DIN Method 51527: Polychlorinated Biphenyls Separation



Resolving Critical Isomers

Polychlorinated Biphenyls (PCBs) are a class of priority environmental pollutants that have been identified for international regulation. The similarity in structure and polarity makes the resolution of certain isomers challenging on standard phases. German law requires separation of specific PCB congeners under DIN Method 51527.

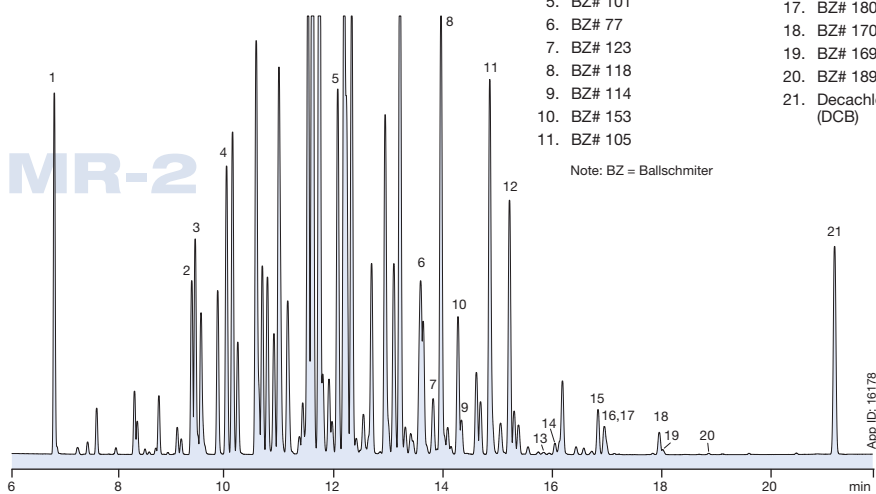
The unique selectivity offered by Zebron™ MultiResidue™ columns makes them a versatile solution for many applications outside of pesticide analysis. Both the MR-1 and the MR-2 columns provide resolution of all the required PCB congeners in less than 30 minutes, allowing for simultaneous confirmation of each sample.



Sample:

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

Note: BZ = Ballschmüser



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 @ 1.5 mL/min (constant flow)

Oven Program: 100 °C for 0.5 min to 200 °C @ 25 °C/min
to 320 °C @ 6 °C/min for 2 min

Detector: ECD @ 350 °C

Ordering Information

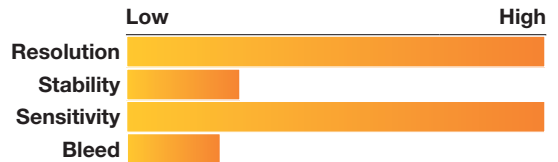
Choose the Best Column Set for Your Needs

We know every lab is different and we want to help make choosing the right GC column easy. Zebtron™ MultiResidue™ columns are available in a variety of formats to meet your lab's needs.

0.25 mm ID



Provides the overall best resolution, lowest bleed, and greatest sensitivity. Recommended when using GC/MS or when needing the lowest detection levels possible. Does not handle highly contaminated samples well, column lifetime might be reduced.



0.32 mm ID

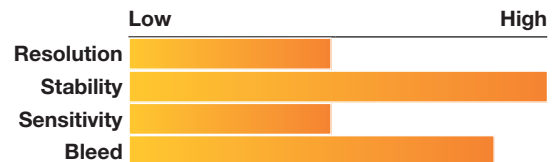


Good compromise between resolution and column stability. Recommended when working with dual column set-ups where high level samples will be encountered. Works well on newer MS systems. High flow rates decrease residence time in the inlet.





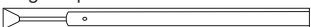


0.53 mm ID

Recommended when working with highly contaminated samples. Good for screening instruments. Resolution and sensitivity will be slightly reduced when compared to 0.32 or 0.25 mm ID columns. However, Zebtron MultiResidue phases have very high selectivity for pesticides. Thus, resolution will be greater than other phases recommended for this work.



Phenomenex Recommended Liners

Description	GC Instruments & Model No.		Dimensions	Part No.	Unit	Price
	ID x L x OD (mm)					
Split / Splitless Liner with wool 	Agilent 5880/5890/6890		4 x 78.5 x 6.3	AG0-8174	5/pk	
Splitless Liner 	Shimadzu 17A, 17B, 2010		2.6 x 95.5 x 5.0	AG0-4667	5/pk	
Splitless Liner 	Varian 1075/1077		2 x 74 x 6.3	AG0-4671	5/pk	
Single Taper Direct Connect with Side Hole (top) 	Agilent 5880/5890/6890		4 x 78.5 x 6.3	AG0-7850	5/pk	
Single Taper Direct Connect with Side Hole (bottom) 	Agilent 5880/5980/6890		4 x 78.5 x 6.3	AG0-7851	5/pk	

Column Installs This End

**Zebtron™
MultiResidue™ 1** | **Zebtron™
MultiResidue™ 2**

ID (mm)	Temp. Limits °C	df (µm)	Part No.	df (µm)	Part No.	Price
30-Meter						
0.25	-60 to 320/340	0.25	7HG-G016-11	0.20	7HG-G017-10	
0.32	-60 to 320/340	0.50	7HM-G016-17	0.25	7HM-G017-11	
0.53	-60 to 320/340	0.50	7HK-G016-17	0.50	7HK-G017-17	

Zebtron MultiResidue Column Kits

0.25 mm ID Kit		KG0-8237
Description	Dimension	Part No.
MultiResidue-1	30 meter x 0.25 mm x 0.25 µm df	7HG-G016-11
MultiResidue-2	30 meter x 0.25 mm x 0.20 µm df	7HG-G017-10
Z-Guard	5 meters x 0.25 mm	7AG-G000-00-GZ0
Universal Capillary Column Y-connector, Borosilicate		AG0-4717

0.32 mm ID Kit		KG0-8238
Description	Dimension	Part No.
MultiResidue-1	30 meter x 0.32 mm x 0.50 µm df	7HM-G016-17
MultiResidue-2	30 meter x 0.32 mm x 0.25 µm df	7HM-G017-11
Z-Guard	5 meters x 0.32 mm	7AM-G000-00-GZ0
Universal Capillary Column Y-connector, Borosilicate		AG0-4717

0.53 mm ID Kit		KG0-8239
Description	Dimension	Part No.
MultiResidue-1	30 meter x 0.53 mm x 0.50 µm df	7HK-G016-17
MultiResidue-2	30 meter x 0.53 mm x 0.50 µm df	7HK-G017-17
Z-Guard	5 meter x 0.53 mm	7AK-G000-00-GZ0
Universal Capillary Column Y-connector, Borosilicate		AG0-4717



Gold Inlet Base Seals

Standard, Single Groove for Splitless Applications, 0.8 mm dia. Inlet Hole

Part No.	Description	Similar to Mfr. No.*	Unit	Price
AG0-7518	Gold Inlet Base Seal, splitless (single groove)	18740-20885	2/pk	
AG0-7519	Gold Inlet Base Seal, splitless (single groove)	18740-20885	10/pk	

Replacement Inlet Seal Washers

Part No.	Description	Similar to Mfr. No.*	Unit	Price
AG0-7522	Inlet Seal Washers, for Agilent® GC injection port	5061-5869	12/pk	

Inlet seal washers are sold separately from inlet base seals.

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

Phenomenex: 25 Years of Progress



Since its founding in 1982, Phenomenex has been dedicated to the development, manufacturing and supply of products and accessories for the separation, analysis and purification of chemicals and biochemicals. Offering the widest selection of chromatography columns and consumables from a single supplier worldwide, Phenomenex's objective is to provide the very best product for every application.

The company has subsidiaries and leading market positions in the USA, Canada, United Kingdom, Germany, New Zealand, Australia, France, Ireland, Denmark, Italy, and many other countries. Our vast network of well-trained partners and distributors enables Phenomenex to successfully supply and support the work of scientists in more than 60 countries around the world.

Zebtron GC Columns

In 1996, Phenomenex diversified its business into the field of Gas Chromatography. It brought together chemists with more than 25 years of GC column manufacturing knowledge from other major names in the GC column industry. The goal was simple: make a better GC column. Phenomenex has rapidly grown to be one of the leaders in GC column technology and already produces a significant portion of the high performance capillary columns used worldwide.



The Best Guarantee in the Industry

If Zebtron does not provide you with better separation as compared to any other GC column of the same phase and comparable dimensions, send in your comparative data within 45 days and keep your Zebtron column for FREE!



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