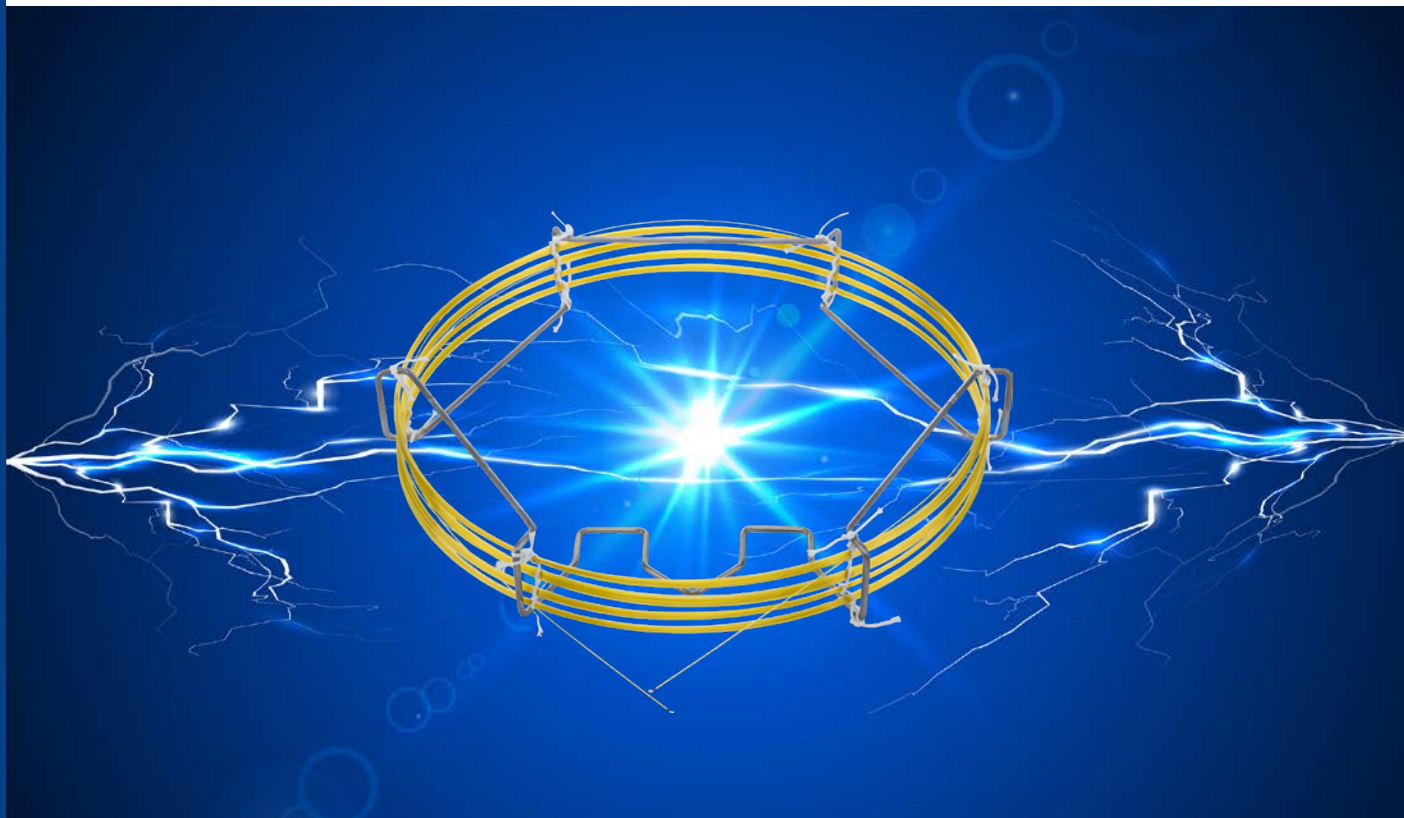


MACHEREY-NAGEL

The ultra low bleed high performance GC column

Chromatography



OPTIMA<sup>®</sup> 1-MS & 5-MS Accent and OPTIMA<sup>®</sup> XLB

- High durability due to low bleeding behavior
- Suitable for high temperature applications
- Available in various variations for individual applications

**MACHEREY-NAGEL**

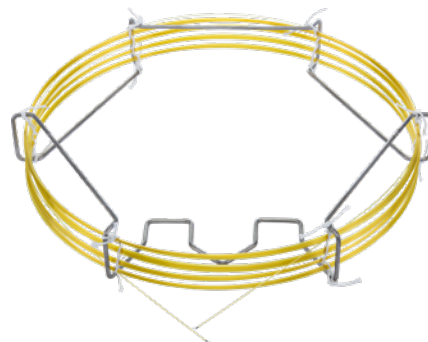
[www.mn-net.com](http://www.mn-net.com)



# The ultra low bleed high performance GC column

## Demands on state-of-the-art fused silica capillary GC columns:

- lowest column bleed for ultra trace analysis applications
- excellent signal-to-noise ratio for increased sensitivity
- suitability for ion-trap- and quadrupol-MS applications
- high temperature stability
- perfect inertness for basic compounds
- short column conditioning times (<2 h → „ready to use“)



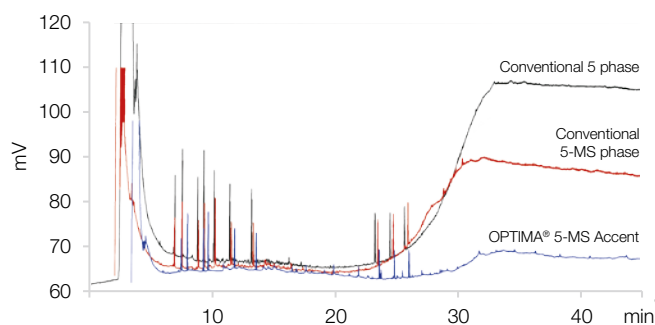
MACHEREY-NAGEL is proud to introduce now:

- OPTIMA® 1-MS Accent
- OPTIMA® 5-MS Accent
- OPTIMA® XLB

as three 100% ion-trap compatible ultra low bleed capillary GC columns based on silarylene technology.

## Lowest column bleed

- reduced contamination of the detection system
- improved detectability of solutes in trace analysis

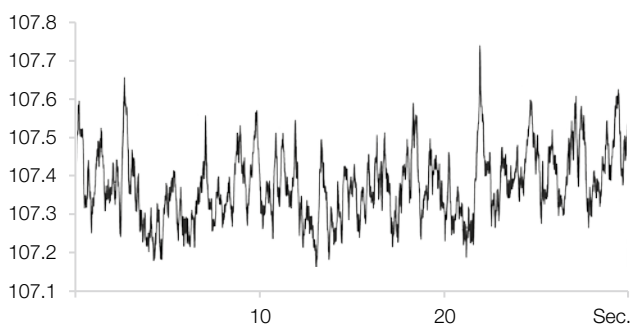


In a bleed comparison test between OPTIMA® 5-MS Accent with a conventional "5"- phase and a column designated explicitly as "5-MS", the unmatched performance of the silarylene phase can be shown.

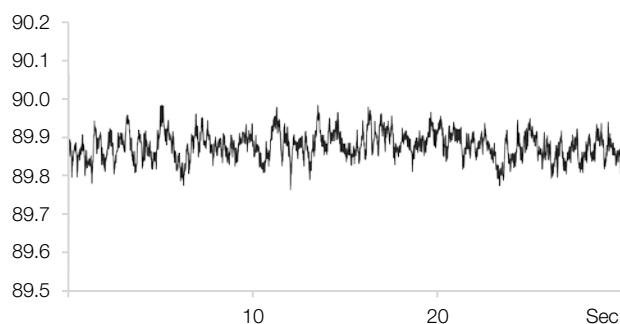
The unmatched low background level of the OPTIMA® 5-MS Accent column which is approximately three times lower compared with a "5-MS brand" provides significantly increased sensitivity and allows the use for trace analysis applications particularly of high boiling compounds.

Injection: 1 µl, split 1:50

Carrier gas: 80 kPa He, 80 °C → 360 °C at 8 °C/min



Competitor 5-MS column (FID signals in mV)



OPTIMA® 5-MS Accent

# The ultra low bleed high performance GC column

## High temperature stability

- extended column lifetime
- applicable for high boiling compounds

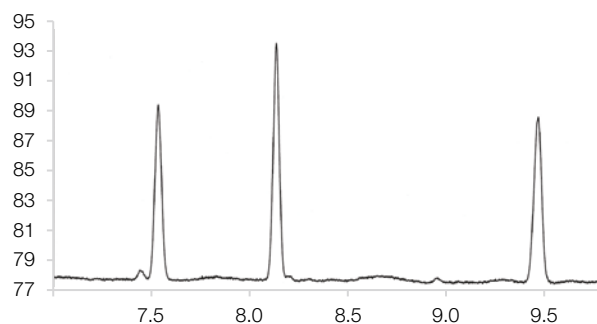
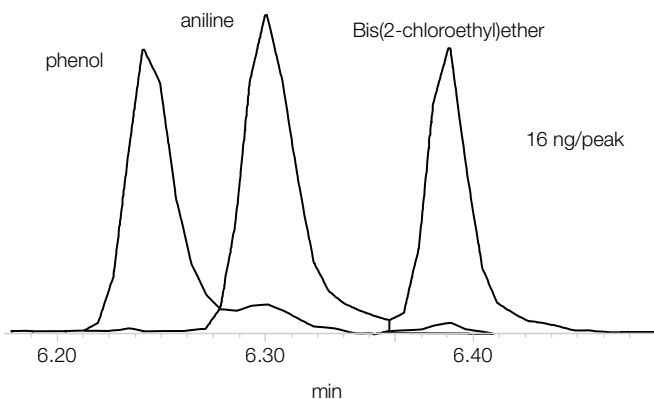
Product	Tmax (during isothermal operation)	Tmax (in temperature-programmed GC for short periods of time)
OPTIMA® 1-MS Accent	340 °C	360 °C
OPTIMA® 5-MS Accent	340 °C	360 °C
OPTIMA® XLB	340 °C	360 °C
Varian VF-5MS	325 °C*	350 °C*
Agilent DB-5MS	325 °C*	350 °C*
Agilent HP-5MS	325 °C*	350 °C*
Restek RTX-5MS	330 °C*	350 °C*

\* as indicated from manufacturers in 2005 product catalogs

## Optimized tubing surface deactivation

- Reduced tailing of polar compounds

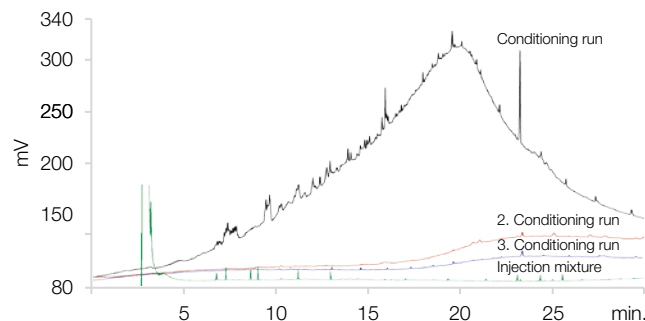
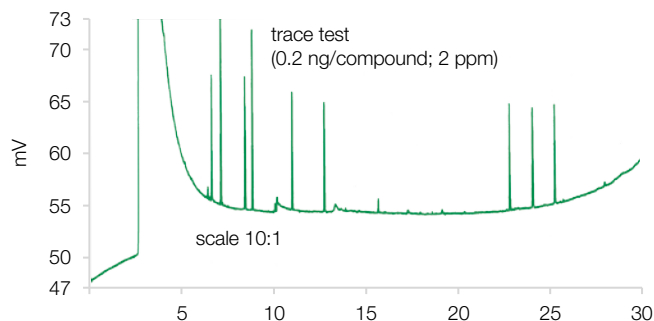
OPTIMA® 5-MS Accent exhibits excellent peak shapes and – asymmetries for i.e. phenol, aniline or dimethylaniline even without previous derivatization.



## Short column conditioning times

- Time and cost saving during column replacement

OPTIMA® 5-MS Accent is ready for use in low concentration analysis yet after three conditioning runs (80 °C -> 360 °C at 8 °C/min, a total of 1.5 h)!

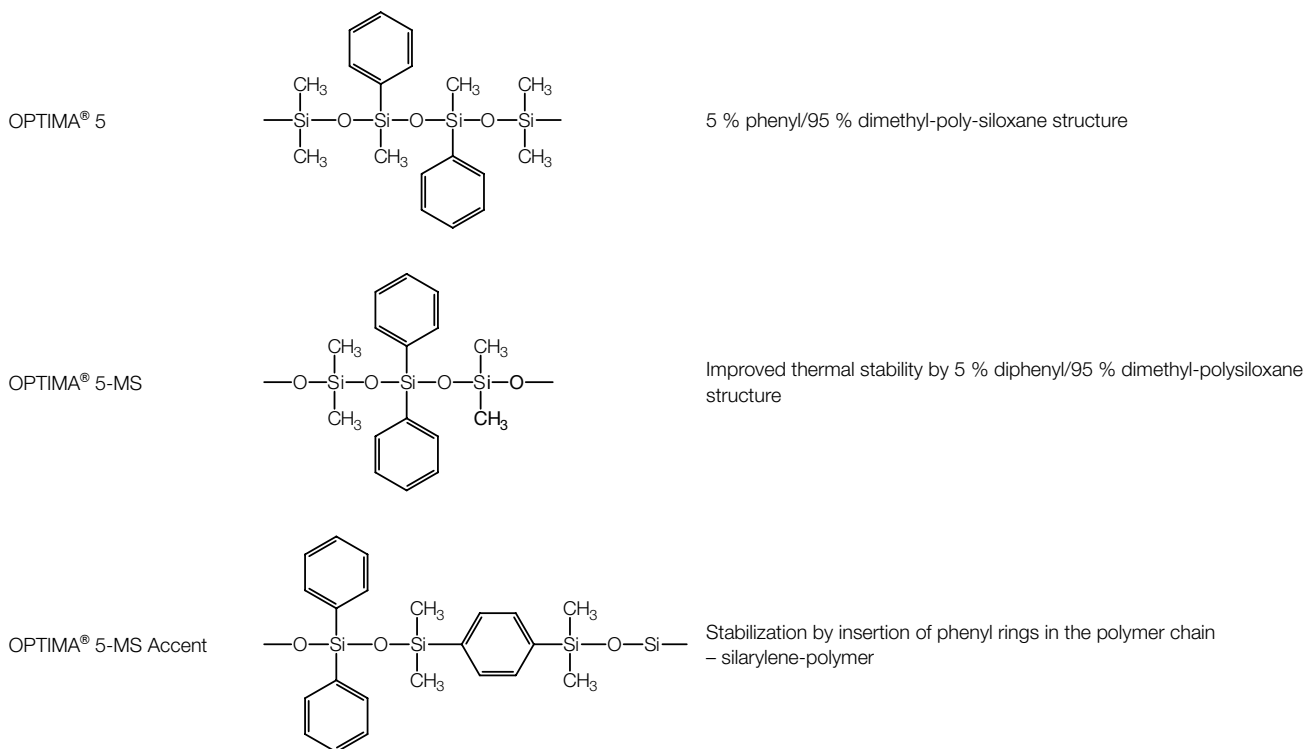


1. Conditioning run (brand new column after installation)
2. Conditioning run (after 30 min.)
3. Conditioning run (after 1 h)

# The ultra low bleed high performance GC column

## How to explain the differences between standard OPTIMA® 5, OPTIMA® 5 MS and OPTIMA® 5-MS Accent?

Basically all three stationary phases have identical polarity and from that also similar selectivity features provided that a calculated ratio of 5 % phenyl groups in the polysiloxane layer to all of the above mentioned phases. However on what are the differences based in terms of the column bleed? This can be explained by the different constitution of the phenyl rings in the polysiloxane ring structure.

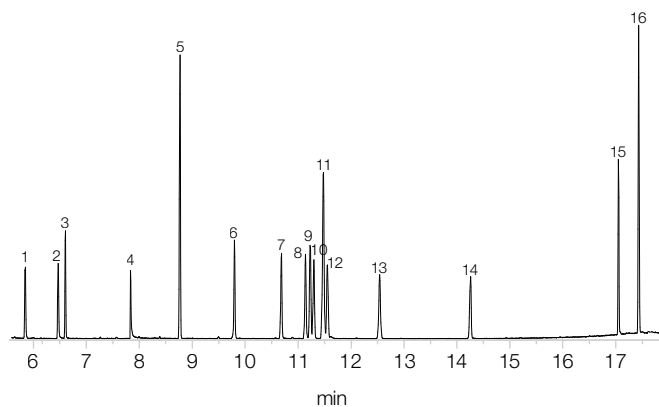


OPTIMA® XLB – larger ratio of phenyl rings – slightly increased polarity

Improved thermal stability and significantly minimized column bleed has been attained by the insertion of arylene groups in the polymeric siloxane chain!

The following application examples exhibit the outstanding performance of the new OPTIMA® Accent columns and Optima® XLB

## Organo-phosphor-pesticides



OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)

Sample: EPA method 526 Mix 10 ppm (20 ppm IS) · Injection: 1.0 µL splitless (hold 0.3 min.) · Inj. temp.: 300 °C

Carrier gas: helium, 0.8 ml/min. · Temperature: 50 °C (hold 1 min.) – 200 °C at 20 °C/min. (hold 5 min.) – 310 °C

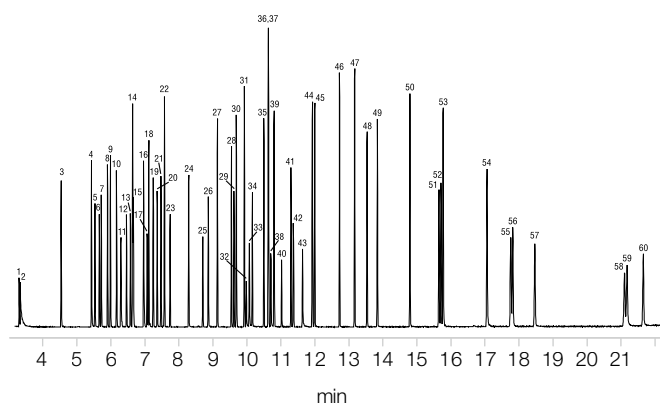
at 30 °C/min. (hold 3 min.) · Detection: GC/MS, 280 °C, scan range: 35-550 amu

1. nitrobenzene, 2. 2,4-dichlorophenol, 3. 1,3-dimethyl-2-nitrobenzene, 4. 2,4,6-trichlorophenol, 5. acenaphthene-d10 (IS1), 6. azobenzene\*, 7. prometon, 8. terbufos, 9. diazinon, 10. fonofos, 11. phenanthrene-d10 (IS2), 12. disulfoton, 13. acetochlor, 14. cyanazine, 15. triphenylphosphate, 16. chrysene-d12

\* Decomposition product of 1,2-diphenylhydrazine

# The ultra low bleed high performance GC column

## EPA method 625 (phenols, pesticides)



OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)

Sample: US EPA method 625 Mix, 10 ppm (20 ppm IS)

Injection: 1.0 µl, 20 psi 0.3 min, pulsed splitless (hold 0.3 min.)

Inj. temp.: 300 °C

Carrier gas: helium, 1.0 ml/min.

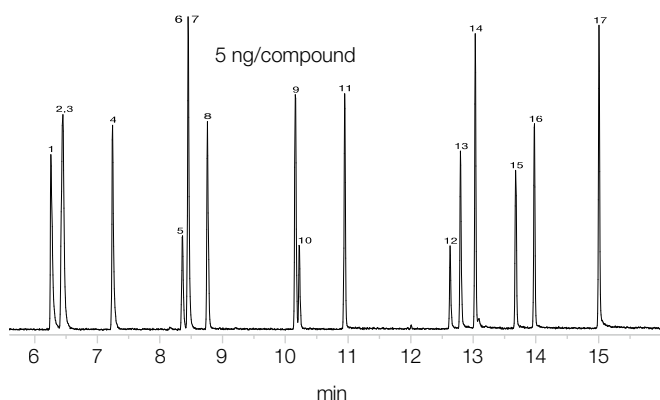
Temperature: 35 °C (hold 1 min.) -> 270 °C at 18 °C/min. -> 305 °C at 5 °C/min.

(hold 0 min.) -> 330 °C at 30 °C/min. (hold 1 min.)

Detection: GC/MS, 280 °C, scan range: 35-450 amu

1. *N*-nitrosodimethylamine, 2. pyridine-d5, 3. 2-fluorophenol (SS), 4. pentafluorophenol (IS), 5. phenol, 6. bis-(2-chloroethyl)ether, 7. 2-chlorophenol, 8. 1,3-dichlorobenzene, 9. 1,4-dichlorobenzene, 10. 1,2-dichlorobenzene, 11. bis(2-chloroisopropyl)ether, 12. *N*-nitroso-di-n-propylamine, 13. hexachloroethane, 14. nitrobenzene-d5 (IS), 15. nitrobenzene, 16. isophorone, 17. 2-nitro-phenol, 18. 2,4-dimethylphenol, 19. bis(2-chloroethoxy)methane, 20. 2,4-dichlorophenol, 21. 1,2,4-trichlorobenzene, 22. naphthalene, 23. hexachlorobutadiene, 24. 4-chloro-3-methylphenol, 25. hexachlorocyclopentadiene, 26. 2,4,6-trichlorophenol, 27. 2-chloronaphthalene, 28. dimethylphthalate, 29. 2,6-dinitrotoluene, 30. acenaphthylene, 31. acenaphthene, 32. 2,4-dinitrophenol, 33. 4-nitrophenol, 34. 2,4-dinitrotoluene, 35. diethylphthalate, 36. fluorene, 37. 4-chlorophenyl phenyl ether, 38. 4,6-dinitro-2-methylphenol, 39. diphenylamine, 40. 4,4'-dibromooctafluorobiphenyl, 41. 4-bromophenyl phenyl ether, 42. hexachlorobenzene, 43. pentachlorophenol, 44. phenanthrene, 45. anthracene, 46. di-*n*-butylphthalate, 47. 4,4'-dibromobiphenyl (IS), 48. fluoranthene, 49. pyrene, 50. butyl benzyl phthalate, 51. benzo(a)anthracene, 52. chrysene, 53. bis(2-ethylhexyl) phthalate, 54. di-*n*-octyl phthalate, 55. benzo(b)fluoranthene, 56. benzo(k)fluoranthene, 57. benzo(a)pyrene, 58. Indeno(1,2,3-*cd*)pyrene, 59. dibenzo(a,h)anthracene, 60. benzo(ghi)perylene

## Phenols



OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)

Sample: US EPA method 528 Mix 1µL 5 ppm, 5 ng/compound

Injection: 1.0 µl pulsed splitless (hold 0.5 min.), pulsed pressure 50 psi (hold 0.5 min.)

Inj. temp.: 220 °C

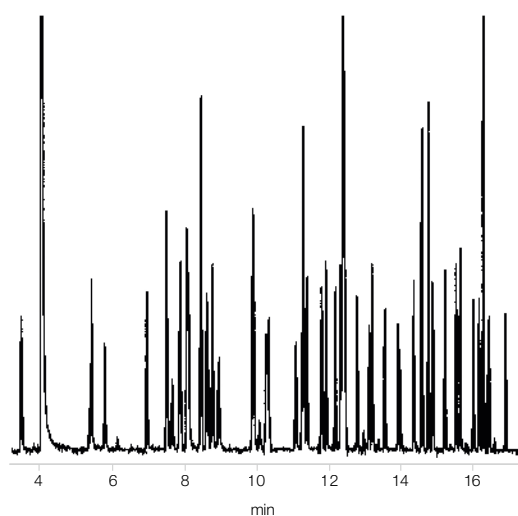
Carrier gas: helium, 1.3 ml/min.

Temperature: 40 °C (hold 1 min.) – 200 °C at 12 °C/min. (hold 0 min.) – 300 °C at 30 °C/min. (hold 1 min.)

Detection: GC/MS, 280 °C, scan range: 35-550 amu

1. phenol, 2. 2-chlorophenol-3,4,5,6-d4, 3. 2-chlorophenol, 4. 2-methylphenol, 5. 2-nitrophenol, 6. 2,4-dimethylphenol-3,5,6-d3, 7. 2,4-dimethylphenol, 8. 2,4-dichlorophenol, 9. 4-chloro-3-methylphenol, 10. 1,2-dimethyl-3-nitrobenzene (IS1), 11. 2,4,6-trichlorophenol, 12. 2,4-dinitrophenol, 13. 4-nitrophenol, 14. 2,3,4,5-tetrachlorophenol (IS2), 15. 2-methyl-4,6-dinitrophenol 16. 2,4,6-tribromophenol (SS), 17. pentachlorophenol

## EPA 8140 / 8141 / 8141 A Organo-phosphor-pesticides



OPTIMA® 1-MS Accent, 30 m, 0.32 mm ID, 0.50 µm (Cat. No. 725807.30)

Sample: 0.2 µg/ml in hexane

8140/8141 OP pesticides calibration mix A

8141 OP pesticides calibration mix B

IS: Triphenyl phosphate and Tributyl phosphate

Injection: splitless, (hold 1 min.)

Inj. Temp.: 250 °C

Carrier gas: helium, 1 ml/min., constant pressure

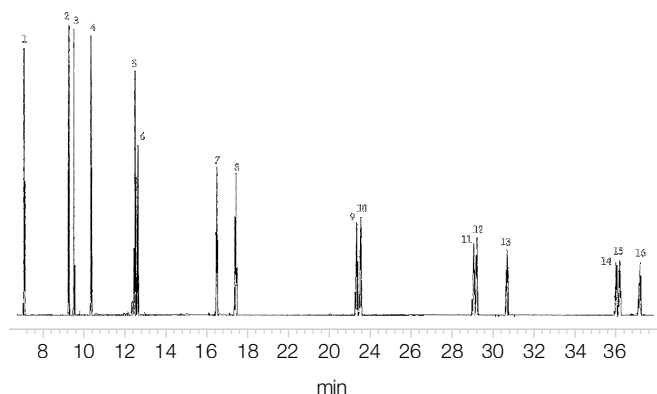
Temperature: 100 °C – 180 °C (10 °C/min.) (hold 2 min.) – 300 °C (18 °C/min.) (hold 3 min.)

Detector: FPD (Flame Photometric Detector), 280 °C

1. Dichlorvos, 2. Hexamethylphosphoramide, 3. Mevinphos, 4. Trichlorfon, 5. TEPP, 6. Thionazin, 7. Demeton-0, 8. Ethoprop, 9. Tributyl phosphate (IS), 10. Dicrotophos, 11. Monocrotophos, 12. Naled, 13. Sulfotepp, 14. Phorate, 15. Dimethoate, 16. Demeton-S, 17. Dioxathion, 18. Terbufos, 19. Fonophos, 20. Phosphamidon isomer, 21. Diazinon, 22. Disulfoton, 23. Phosphamidon, 24. Dichlorofenthion, 25. Parathion-methyl, 26. Chlorpyrifos methyl, 27. Ronnel, 28. Fenitrothion, 29. Malathion, 30. Fenthion, 31. Aspon, 32. Parathion-ethyl, 33. Chlorpyrifos, 34. Trichloronate, 35. Chlorfenvinphos, 36. Merphos, 37. Crotoxyphos, 38. Stirofos, 39. Tokuthion, 40. Merphos oxidation product, 41. Fensulfotioh, 42. Famphur, 43. Ethion, 44. Bolstar, 45. Carbophenothion, 46. Triphenyl phosphate (IS), 47. Phosmet, 48. EPN, 49. Azinphos-methyl, 50. Leptophos, 51. Tri-*o*-Cresyl phosphate 52. Azinphos-ethyl, 53. Coumaphos

# The ultra low bleed high performance GC column

## Separation of PAHs



1. naphthalene, 2. acenaphthylene, 3. acenaphthene, 4. fluorene, 5. phenanthrene, 6. anthracene, 7. fluoranthene, 8. pyrene, 9. benzo(a)anthracene, 10. chrysene, 11. benzo(b)fluoranthene, 12. benzo(k)fluoranthene, 13. benzo(a)pyrene, 14. indeno(1,2,3-cd)pyrene, 15. dibenzo(a,h)anthracene, 16. benzo(ghi)perylene

OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)

Sample: 1 µl of 20 ng/µl, PAH Mix

Injection: splitless (hold 1 min.)

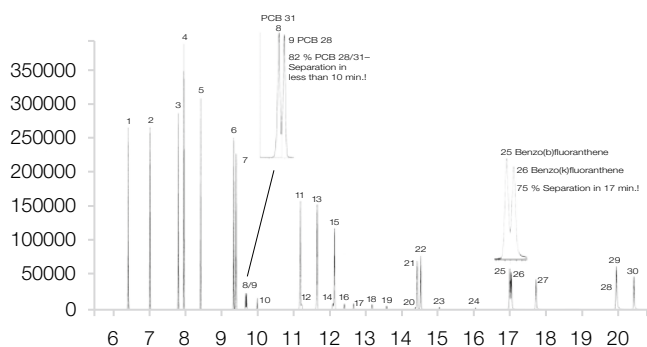
Inj. temp.: 300 °C

Carrier gas: hydrogen, 40 cm/sec.

Temperature: 40 °C (hold 1 min.) – 200 °C at 20 °C/min. – 310 °C at 4 °C/min. (hold 5 min.)

Detection: FID, 310 °C

## Rapid separation of PCBs and PAHs



1. Naphthalene, 2. 2-methylnaphthalene, 3. Acenaphthylene, 4. Acenaphthene, 5. Fluorene, 6. Phenanthrene, 7. Anthracene, 8. PCB 31, 9. PCB 28, 10. PCB 52, 11. Fluoranthene, 12. PCB 101, 13. Pyrene, 14. PCB 77, 15. 2-methylfluoranthene, 16. PCB 118, 17. PCB 153, 18. PCB 138, 19. PCB 126, 20. PCB 180, 21. Benzo(a)anthracene, 22. Chrysene, 23. PCB 169, 24. PCB 194, 25. Benzo(b)fluoranthene, 26. Benzo(k)fluoranthene, 27. Benzo(a)pyrene, 28. Dibenzo(ah)anthracene, 29. Indeno(123cd)pyrene, 30. Benzo(ghi)perylene

OPTIMA® 5-MS Accent, 30 m, 0.25 mm ID, 0.25 µm (Cat. No. 725820.30)

Sample: 1 µl of 20 ng/µl, PAH Mix

Injection: splitless (hold 1 min.)

Inj. temp.: 300 °C

Carrier gas: hydrogen, 40 cm/sec.

Temperature: 40 °C (hold 1 min.) -> 200 °C at 20 °C/min. -> 310 °C at 4 °C/min. (hold 5 min.)

Detection: FID, 310 °C

# The ultra low bleed high performance GC column

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## OPTIMA® 1-MS Accent / OPTIMA® 5-MS Accent / OPTIMA® XLB

- high temperature stability (340 °C for isothermally operated runs / 360 °C for short isothermal runs in temperature programmed GC), columns with film-thicknesses > 0.5 µm have temperature limits of 320 °C / 340 °C
- Very low bleed characteristics, non-polar phases, suitable for ion-trap detection systems
- Application areas: "allround" phases for environmental analysis, trace analysis, EPA methods, pesticides, PCBs, food and drug analysis

### OPTIMA® 1-MS Accent

Chemically bonded, cross-linked phase, polarity index according to 100 % Dimethyl-Polysiloxane

- Similar phases: OV-1, DB-1 MS, SE-30, HP-1 MS, Ultra-1, SPB-1, CP-SIL 5 CB MS, Rtx®-1 MS, 007-1, BPX-1, MDN-1, AT™-1 MS, ZB-1,
- OV-101, VF-1 MS
- USP G 2

### OPTIMA® 5-MS Accent

Chemically bonded, cross-linked silylarylene phase, polarity index according to 5 % Diphenyl / 95 % Dimethyl-Polysiloxane

- Similar phases: SE-54, SE-52, DB-5 MS, HP-5 MS, Ultra-2, Equity™-5, CP-SIL 8 CB low bleed/MS, Rtx®-5 SIL-MS,
- Rtx®-5 MS, 007-5 MS, BPX-5, MDN-5S, AT™-5 MS, ZB-5, VF-5 MS
- USP G 27, 36

### OPTIMA® XLB

Chemically bonded, cross-linked silylarylene phase with higher ratio of silarylene

- Similar phases: DB-XLB, Rtx®-ALB, MDN-12, VF-XMS

# The ultra low bleed high performance GC column

## Ordering information

OPTIMA® 1-MS Accent	12 m	15 m	25 m	30 m	50 m	60 m
0.2 mm ID						
0.20 µm film			725801.25		725801.50	
0.25 mm ID						
0.25 µm film		72508.15		725805.30		725805.60
0.50 µm film				725806.30		725806.60
0.32 mm ID						
0.25 µm film				725802.30		725802.60
0.50 µm film				725807.30		725807.60
OPTIMA® 5-MS Accent	12 m	15 m	25 m	30 m	50 m	60 m
0.2 mm ID						
0.20 µm film			725810.25		725810.50	
0.35 µm film	725815.12				725815.50	
0.25 mm ID						
0.25 µm film		725820.15		725820.30		725820.60
0.50 µm film				725825.30		725825.60
1.00 µm film				725826.30		725826.60
0.32 mm ID						
0.25 µm film				725811.30		725811.60
0.50 µm film				725813.30		
1.00 µm film			725812.25			725812.60
OPTIMA® XLB	12 m	15 m	25 m	30 m	50 m	60 m
0.25 mm ID						
0.25 µm film				725850.30		725850.60

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[www.mn-net.com](http://www.mn-net.com)

**MACHEREY-NAGEL**



Management System  
EN ISO 13485:2016  
ISO 9001:2015



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