

Photo courtesy of Polymicro Technologies, Phoenix, AZ

## The Fused Silica Substrate

The preparation of well-deactivated, highly efficient and thermally stable capillary columns requires consideration of the substrate surface and the interaction of this surface with an appropriately synthesized stationary phase. To this end, fused silica, formed from the reaction of silicon tetrachloride and water, and considered to be the purist form of glass, is used for the manufacture of every **QUADREX** capillary column. Accordingly, fused silica tubing contains less than one ppm of metal oxides and is inherently low in surface silanol groups.

To ensure you get the highest quality capillary column, **QUADREX** selects its fused silica from several outside manufacturers. These professionals in their field use the highest purity preforms, high temperature polyimides and the latest in draw tower technologies. Using these raw materials yields GC capillary columns which are extremely low in surface activity and generally free from defects which would lead to spontaneous failure of the tubing.

## The Stationary Phase

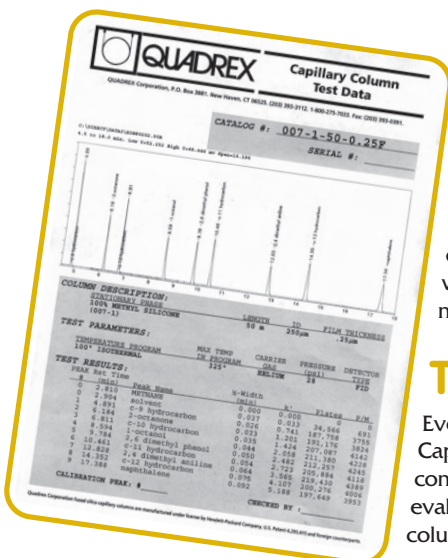
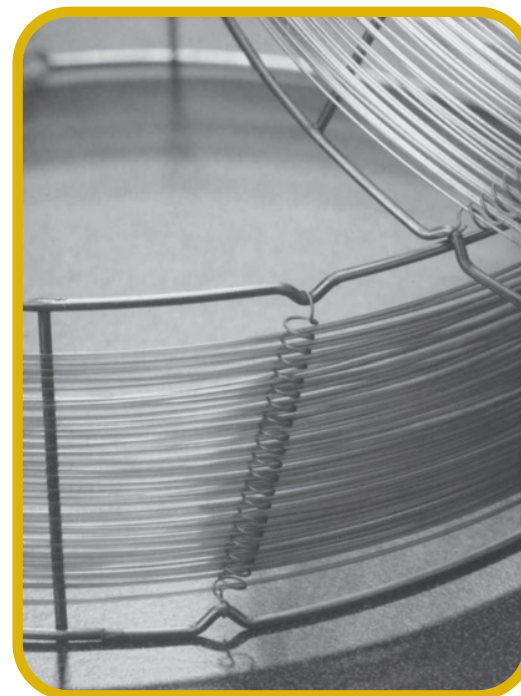
**QUADREX** synthesizes all siloxane phases in-house to insure the highest possible quality and reproducibility. All Quadrex phases, including the most polar 007-23 phase, are bonded to the silica substrate and crosslinked. A stringent QA/QC program governs the production of all in-house phases – which results in accurate selectivity, reproducibility, and outstanding thermal stability.

Our phases are available in standard films from 0.1 microns up to 1.0 microns; thick films are 2.0 microns to 8.0 microns (not available on all phases), and any film thickness in-between. Our unique PHAT Phase™ coating technology allows us to produce capillary columns with films up to 18.0 microns on two of our non-polar phases. This technology allows us to extend the film thickness range on several of the mid-polarity range phases as well, and gives us the widest range of films available from any GC column manufacturer.

Our ability to coat in such a range of film thicknesses gives you the flexibility to tailor your capillary column to meet your specific application requirements. Refer to the Phase Information of the following pages for exact film thickness availability and limitations.

## Unique cage design

When **QUADREX** introduced our polyimide-clad fused silica columns in the early 1980's, we engineered a simple, low thermal mass stainless steel support cage. We still use our original design which is easy to handle, prevents any unexpected unwinding of your capillary column, and has minimal contact points. We offer four standard cage diameters, 4", 5-1/4" (for Agilent 6850 GCs), 6-1/4" and 7" with two different heights each, 1" and 2". This gives us the flexibility to easily coil your column onto an appropriate cage in order to meet your GC oven requirements. **QUADREX** also offers custom cage diameters and heights – as well as no cage at all (we tie these with a high temperature fiberglass string). We will even place our column onto a competitor's cage, if you'd prefer. So if you can't use one of our standard cages, tell us what you need!



## The column QC test

Every **QUADREX** fused silica capillary column is pre-conditioned, Quality Control tested, and shipped with a clear and easy to read Capillary Column Test Data Sheet. This gives you all of the pertinent information regarding the column's configuration, test operating conditions, and maximum programmed and isothermal operating temperatures. Column efficiency, activity and film thickness is easily evaluated using an appropriately designed test mixture. We maintain a computer data base of all column data in order to assure you of column-to-column reproducibility.

# MANUFACTURER EQUIVALENTS

The tables at the right show **QUADREX** Phase Types and their competitive equivalents. For more information on any of Quadrex's capillary columns, check our website: [www.quadrexcorp.com](http://www.quadrexcorp.com)



## Standard Bonded Stationary Phases

QUADREX	J&W	SUPELCO	H-P	RESTEK	CHROMPACK	ALLTECH	SGE
007-1	DB-1	SPB-1	HP-1	RTx-1	CPSil 5CB	AT-1	BP-1
007-5	DB-5	SPB-5	HP-5	RTx-5	CPSil 8CB	AT-5	BP-5
007-5MS	DB-5MS	MDN-5S	HP-5MS	RTx-5MS	CP-Sil8CB/MS		BPX-5
007-20		SPB-20		RTx-20		AT-20	
007-1301	DB-1301	SPB-1301	HP-1301	RTx-1301			
007-35	DB-35,35MS	SPB-35	HP-35	RTx-35		AT-35	BPX-35
007-1701	DB-1701	SPB-1701	HP-1701	RTx-1701	CPSil 19CB	AT-1701	BP-10
007-17	DB-17	SPB-50	HP-17, HP-50+	RTx-50	CPSil 24CB	AT-50	BPX-50
007-65HT				RTx-65	TAP		
007-225	DB-225	SP-2330	HP-225	RTx-225	CPSil 43CB	AT-225	BP-225
007-CW	DB-WAX	SUPELCOWAX 10	HP-(INNO) Wax	Stabilwax	CP-WAX 52CB	AT-WAX	BP-20
007-FFAP	DB-FFAP	NUKOL	HP-FFAP	Stabilwax-DA	CP-Wax 58CB	AT-1000	BP-21
007-23	DB-23	SP-2330, 2340		RTx-2330	CPSil 88CB	AT-SILAR	BPX-70
PLT-5A	GS-Molesieve			Rt-MSieve 13			

## Special-Use Bonded Phases

### Environmental

QUADREX	J&W	SUPELCO	H-P	RESTEK	CHROMPACK	ALLTECH	SGE
007-502	DB-624	VOCOL	HP-VOC	RTx-502.2		AT-624	BP-624
007-608	DB-608	SPB-608	HP-608	RTx-35	Pesticide		
007-624	DB-624	VOCOL	HP-624	RTx-Volatiles		AT-624	
007-DXN							

### Petrochemical

QUADREX	J&W	SUPELCO	H-P	RESTEK	CHROMPACK	ALLTECH	SGE
007-1-50-0.5F		PETROCOL DH 50.2	HP-PONA		SQUALANE		BP-1
007-1-100-0.5F	DB-PETRO100	PETROCOL DH	HP-PONA	Rtx-1PONA		AT-PETRO	
007-1-10V-1.0F	DB-2887	PETROCOL 2887	D2887		SimDistl-CB	AT-2887	BPX1-SIMD
007-1-10V-5.0F		PETROCOL 3710	D3710			AT-3710	

### High Temperature

QUADREX	J&W	SUPELCO	H-P	RESTEK	CHROMPACK	ALLTECH	SGE
400-1HT	DB-1HT						
400-5HT	DB-5HT						HT5, HT8
007-50HT							
007-65HT				RTx-65HT	TAP-CB		

# CAPILLARY COLUMNS: 007-1

## 007-1 DIMETHYLPOLYSILOXANE

- Bonded and Crosslinked
- Excellent thermal stability
- Similar bonded phases: DB-1, DB-2887, DB-Petro, Rtx-1, Rtx-1PONA, Rtx-2887, HP-1, HP-PONA, Ultra-1, SPB-1, Petrocol DH, Petrocol 2887, CPSil-5CB, CP-SimDist-CB, AT-1, AT-Petro, BP-1, BP-1PONA
- Non polar
- Comparable to: SE-30, OV-1, OV-101

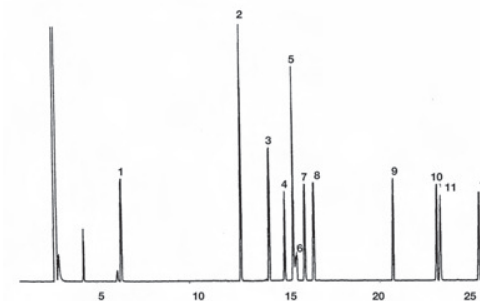
### GENERAL INFORMATION

The non-polar dimethylpolysiloxane phase (007-1), which separates compounds according to boiling point, is probably the most frequently used phase type in GC. Bonding and crosslinking this general purpose GC phase increases the resistance to degradation by rinsing, large solvent injections and the deposition of non-volatiles.

The 007-1 phase offers excellent efficiency and thermal stability. In addition, this non-polar phase is less susceptible to oxidation and hydrolysis than phases incorporating more polar functional groups.

### BONDED PHASE RETENTION INDEX

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-1	662.5	720	668.75	730	646.88



### Grob Quality Test Mix

**COLUMN:** 007-1, Dimethylpolysiloxane  
25M. x 0.25mm I.D. x 0.5µm film

**Cat. No.:** 007-1-25-0.5F

**Temperature:** 40° (6°/min.) - 210°  
(15°/min.) - 320°C

**Injector:** 225°C

**Detector:** 325°C, FID

**Carrier Gas:** 25 cm/sec., Helium

- |                       |                        |
|-----------------------|------------------------|
| 1. 2,3-butanediol     | 7. undecane            |
| 2. decane             | 8. 2,4-dimethylaniline |
| 3. 1-octanol          | 9. methyl decanoate    |
| 4. 2,6-dimethylphenol | 10. methyl undecanoate |
| 5. nonanal            | 11. dicyclohexylamine  |
| 6. ethylhexanoic acid | 12. methyl dodecanoate |

9

0.1 – 1.0 micron films

2.0 – 5.0 micron films

6.0 – 8.0 micron films

10.0 – 18.0 micron PHAT™ films

-50

200 280 300 350

007-1 TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	10, 15, 20, 25	0.1, 0.25, (0.5 on 10, 15M. only)
0.18	10, 15, 20, 25, 30, 40, 50	0.1, 0.25, 0.5
0.25	12, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 1.0
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 0.52, 1.0 (2.0, 3.0, 4.0, 5.0 on 60M. or less)
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 0.88, 1.0, 2.0, 2.65 (3.0, 4.0, 5.0, 6.0, 7.0, 8.0 on 50M. or less)

### 007-1 APPLICATIONS ON THE WEB:

ASTM 2887 - REFERENCE GAS OIL  
ASTM 2887 - SIM DIS  
ASTM 3710 - QUALITATIVE CALIBRATION MIX  
DIESEL RANGE ORGANICS (DRO)  
EPA METHOD 551 - DISINFECTION BYPRODUCTS  
GASOLINE RANGE ORGANICS (GRO)  
ISOPARAFIN SOLVENTS  
P.I.A.N.O. MIX  
REFERENCE ALKYLATE STANDARD  
REFERENCE NAPHTHA STANDARD  
REFERENCE REFORMATE STANDARD  
SUPER UNLEADED GASOLINE

# CAPILLARY COLUMNS: 007-1 PHAT PHASE™

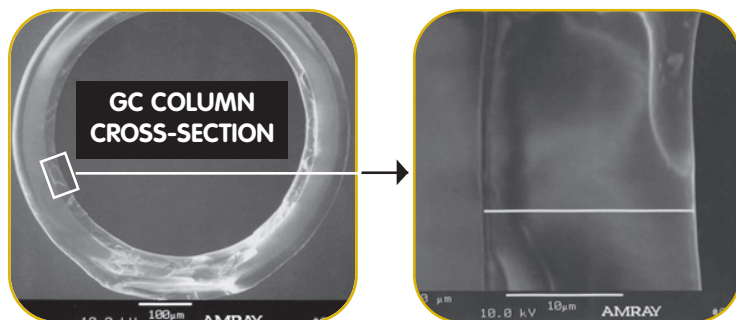
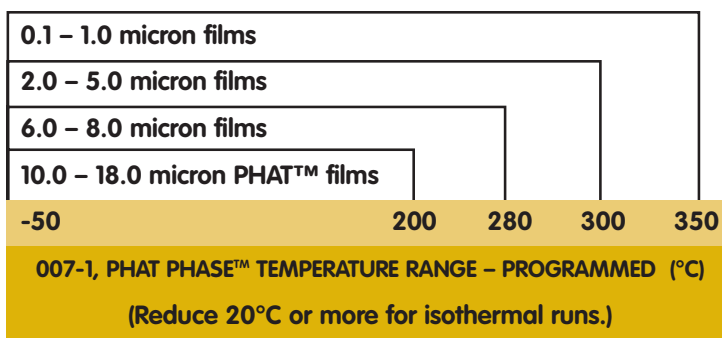


FIG. 1: 0.53mm ID

FIG. 2: 18.0µm 007-1 Phase

PHAT PHASE™ THICK FILM COLUMN CONFIGURATIONS		
I.D. (mm)	Lengths (M.)	Films (µm)
0.10	10 & 20	1.0 & 3.5
0.18	15 & 30	1.0, 3.0, 5.0
0.25	10, 15, 25, 30	3.0, 5.0, 8.0
0.32	10, 15, 25, 30	8.0, 10.0, 12.0
0.53	10, 15, 25, 30	10.0, 12.0, 15.0, 18.0

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## 007-1, PHAT PHASE™ APPLICATIONS ON THE WEB

ASTM D5441 - IMPURITIES IN MTBE  
BLOOD ALCOHOLS  
C1 TO C10 HYDROCARBONS  
C1 TO C5 HYDROCARBONS

ETHYLENE OXIDE  
ETHYLENE OXIDE  
L.M.W. AMINES  
OXYGENATES

OXYGENATES IN RF GASOLINE  
RESIDUAL SOLVENTS IN DRUGS

## 007-1 PHAT PHASE™ FUSED SILICA CAPILLARY COLUMNS

Advantages of PHAT Phase™ fused silica capillary columns include

- Greater sample size for trace analyses of very volatile compounds
- Increased retention of volatile compounds leading to higher elution temperatures

### GENERAL INFORMATION

GC analyses of gases and other types of low molecular weight compounds have been traditionally accomplished on packed columns with heavy loadings or adsorbent type columns. More recently, porous layer open tubular (PLOT) capillary columns have been utilized in the separation of low molecular weight applications despite the drawbacks in using these types of columns such as sample adsorption and bead migration within the column.

Attempts have been made to use 'thick filmed' wall coated open tubular (WCOT) capillary columns but the films have typically been confined to a maximum of 8.0 microns due to limitations in conventional column coating technology. While these 'traditional' thick film columns have been used for some for low molecular weight applications, they could not attain the separations and sample loadings that could be achieved on packed columns.

By employing our proprietary PHAT™ Phase coating technology, we are now able to reproducibly manufacture fused silica capillary columns having phase ratios comparable to heavily loaded packed columns. The PHAT Phase™ columns are available with 007-1, dimethylpolysiloxane and our 007-5, 5% phenyl methylpolysiloxane phases in lengths up to 30 meters. These PHAT Phase™ thick film capillary columns are ideal for low molecular weight analyses previously performed on packed columns.

The two SEM photomicrographs to the left are of a 0.53mm I.D. fused silica column coated with 007-1 dimethylpolysiloxane PHAT Phase™. Figure 1 (at 142x magnification) clearly shows the internal diameter of the 0.53mm I.D. column and the thick film coated on the internal surface. Note the phase coating appears to be similar in thickness to the columns' outer polyimide coating, which is typically 15-20 microns. Figure 2 is an enlargement of the area circled in the upper photograph. At a magnification of 3,120 times, the exact measurement of 18.0 microns of the dimethylpolysiloxane PHAT Phase™ layer can be viewed. Application areas for these PHAT Phase™ columns include the analysis of natural gas, auto emissions, light hydrocarbon refinery cuts, amines, alcohols, free fatty acids, refrigerants, residual solvents and air pollutants as defined in the EPA TOC Methods.

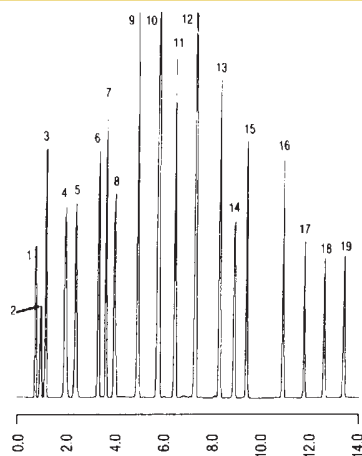
The chromatograms listed at the lower left – which can be accessed in PDF format through the **QUADREX** website – show how the resulting PHAT Phase™ columns can be used to separate low molecular weight compounds not possible with fused silica columns coated with conventional films.



# CAPILLARY COLUMNS: 007-1, SPECIAL USE: PETROCHEMICAL

## 007-1 SPECIAL-USE: PETROCHEMICAL

Columns made of the 007-1 Bonded Dimethylpolysiloxane phase type separate by boiling point and are ideal for a wide range of petrochemical applications. The wide film thickness range that we have available (0.1 to 18.0µm) also makes this non-polar phase type perfect for this chemical class. Many columns of this type are used in a number of ASTM Methods and other typical petrochemical applications. Those listed below represent columns specifically configured for these analyses.



### Qualitative Calibration Mix - ASTM 3710

**COLUMN:** 007-1, Bonded Dimethylpolysiloxane  
10M. x 0.53mm I.D. x 5.0µm film  
**Cat. No.:** 007-1-10V-5.0F

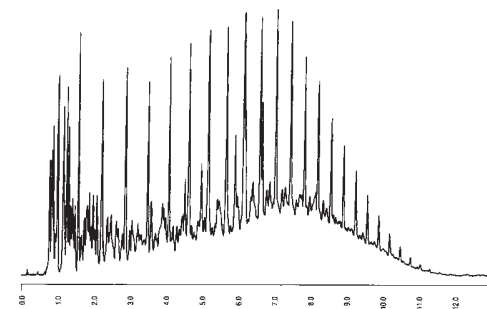
**Temperature:** 10° (1.8 min. hold) (20°/min.) - 210°C hold

**Injector:** 180°C

**Detector:** 280°C, FID

**Carrier Gas:** 10 ml/min., Helium

- |                    |                        |                  |
|--------------------|------------------------|------------------|
| 1. propane         | 8. 2,4-dimethylpentane | 15. butylbenzene |
| 2. 2-methylpropane | 9. heptane             | 16. dodecane     |
| 3. butane          | 10. toluene            | 17. tridecane    |
| 4. 2-methylbutane  | 11. octane             | 18. tetradecane  |
| 5. pentane         | 12. xylene             | 19. pentadecane  |
| 6. 2-methylpentane | 13. propylbenzene      |                  |
| 7. hexane          | 14. decane             |                  |



### Reference Gas Oil - ASTM 2887

**COLUMN:** 007-1, Dimethylpolysiloxane  
10M. x 0.53mm I.D. X 1.0µm film  
**Cat. No.:** 007-1-10V-1.0F

**Temperature:** 35° (25°/min.) - 320°C

**Injector:** 300°C

**Detector:** 350°C, FID

**Carrier Gas:** 20 ml/min., Helium

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0.1 – 1.0 micron films

2.0 – 5.0 micron films

6.0 – 8.0 micron films

10.0 – 18.0 micron PHAT™ films

-50

200 280 300 350

007-1, SPECIAL USE TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

### 007-1 SPECIAL USE: PETROCHEMICAL

COLUMN	LENGTH (M.)	I.D. (mm)	FILMS (µm)
007-2887	10M.	0.53mm	2.65µm
007-2887-1	10M.	0.53mm	1.0µm
007-SIMDIS	6M.	0.53mm	0.15µm
007-3710	10M.	0.53mm	5.0µm
007-DRO	10M.	0.53mm	1.0µm
007-GRO	10M.	0.53mm	3.0µm
007-1PETRO-50	50M.	0.25mm	0.5µm
007-1PETRO-100	100M.	0.25mm	0.5µm
007-SLFR	30M.	0.32mm	4.0µm

### 007-1 SPECIAL USE: PETROCHEMICAL APPLICATIONS ON THE WEB:

ASTM 2887 - REFERENCE GAS OIL  
ASTM 2887 - SIM DIS  
ASTM 3710 - QUALITATIVE CALIBRATION MIX  
DIESEL RANGE ORGANICS (DRO)  
EPA METHOD 551 - DISINFECTION BYPRODUCTS  
GASOLINE RANGE ORGANICS (GRO)  
ISOPARAFIN SOLVENTS  
P.I.A.N.O. MIX  
REFERENCE ALKYLATE STANDARD  
REFERENCE NAPHTHA STANDARD  
REFERENCE REFORMATE STANDARD  
SUPER UNLEADED GASOLINE

# CAPILLARY COLUMNS: 007-5

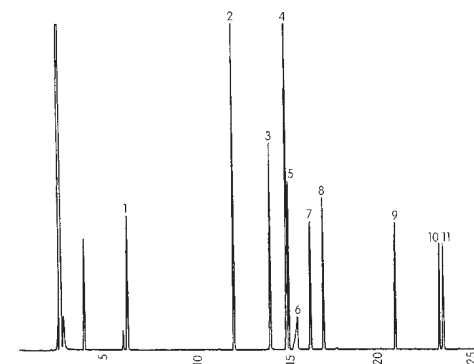
## 007-5 (5% Phenyl) Methylpolysiloxane

- Bonded and Crosslinked
- Excellent thermal stability
- Similar bonded phases: DB-5, DB-5.625, Rtx -5, HP-5, Ultra-2, SPB-5, CPSil-8CB, AT-5, BP-5
- Non polar
- Comparable to: SE-52, SE-54, OV-73

### General Information

The 007-5 is a 5% phenyl methylpolysiloxane polymer. Like the dimethylpolysiloxane phase 007-1, the 007-5 phase is a widely used general purpose GC phase ideal for a broad range of applications. The presence of the phenyl groups provides induced dipole interactions leading to degrees of increased retention for aromatic solutes. The 5% phenyl substitution causes a nominal increase in polarity; yet the 007-5 phase displays the attributes of a non-polar phase.

Our efforts to develop the new 007-5MS low bleed silphenylene polysiloxane phase discussed on page 14 has had the added beneficial side-effect of producing a superior 007-5 phase. Our refined 007-5 phase exhibits greatly improved column bleed to temperatures up to 310°C. As shown in Figure 1, a 30M. x 0.25mm I.D. x 0.25µm 007-5 column was programmed from 40°- 310°C at 10°/min. The GC/MS spectra indicates a bleed of less than 20,000 counts. Figure 2 exhibits the sensitivity of the improved 007-5 phase in the analysis of 1.3ppm of benzo (a) pyrene. Here the same column was programmed from 200° - 310°C at 10°/minute.



### Grob Quality Test Mix

**COLUMN:** 007-5, (5% Phenyl) methylpolysiloxane  
25M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-5-25-0.5F

**Temperature:** 40° (6°/min.) - 210° (15°/min.) - 320°C  
**Injector:** 225°C  
**Detector:** 325°C, FID  
**Carrier Gas:** 25 cm/sec., Helium

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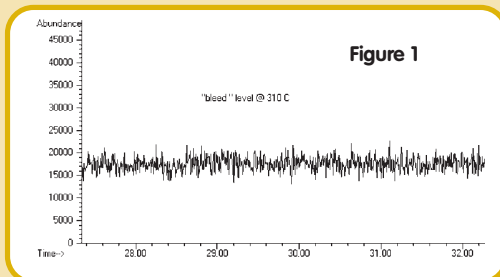


Figure 1

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-5	665.62	751.12	689.59	756.23	662.46

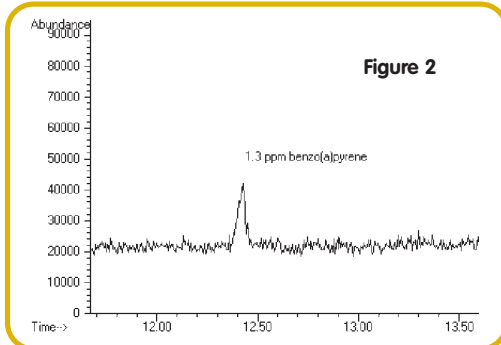


Figure 2

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	10, 15, 20, 25	0.1, 0.25, (0.5 on 10, 15M. only)
0.18	10, 15, 20, 25, 30, 40, 50	0.1, 0.25, 0.5
0.25	12, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 1.0
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 0.52, 1.0, 2.0, 3.0, 4.0, (5.0 on 60M. or less)
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 0.88, 1.0, 2.0, 2.65 (3.0, 4.0, 5.0, 6.0, 7.0, 8.0 on 50M. or less)

# CAPILLARY COLUMNS: 007-5, "PHAT PHASE"<sup>TM</sup>

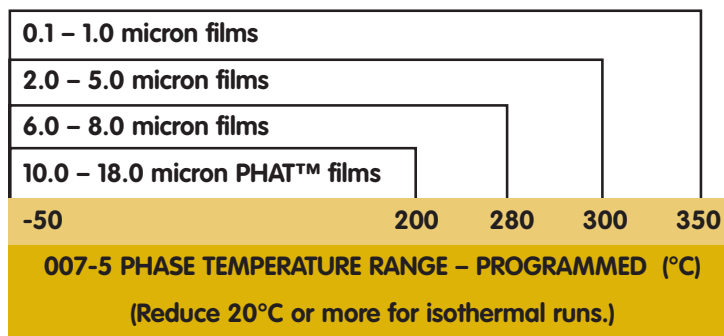
## 007-5, PHAT Phase<sup>TM</sup>

Advantages of PHAT PHASE<sup>TM</sup> fused silica capillary columns include

- Greater sample size for trace analyses of very volatile compounds
- Increased retention of volatile compounds leading to higher elution temperatures

Similar to the 007-1 PHAT<sup>TM</sup> Phase dimethyl-polysiloxane columns as noted on page 10, the 007-5, 5% phenyl methylpolysiloxane phase is available in very thick films as noted below.

Application areas for these PHAT Phase<sup>TM</sup> columns include the analysis of natural gas, auto emissions, light hydrocarbon refinery cuts, amines, alcohols, free fatty acids, refrigerants, residual solvents and air pollutants as defined in the EPA TOC Methods.



PHAT PHASE<sup>TM</sup> THICK FILM COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	10 & 20	1.0 & 3.5
0.18	15 & 30	1.0, 3.0, 5.0
0.25	10, 15, 25, 30	3.0, 5.0, 8.0
0.32	10, 15, 25, 30	8.0, 10.0, 12.0
0.53	10, 15, 25, 30	10.0, 12.0, 15.0, 18.0

### 007-5 PHASE APPLICATIONS ON THE WEB:

#2 FUEL OIL  
 #4 FUEL OIL  
 #5 FUEL OIL  
 #6 FUEL OIL  
 ACRYLATES  
 ANABOLIC STEROIDS  
 ANESTHETICS  
 ANTICONVULSANT DRUGS  
 ANTIDEPRESSANTS  
 CORTICOSTEROIDS  
 EPA METHOD 505 - ORGANOHALIDE PESTICIDES  
 EPA METHOD 605 - PHENOLS  
 EPA METHOD 625 - HAZARDOUS SUBSTANCES  
 EPA METHOD 8140 - ORGANOPHOSPHOROUS PESTICIDES  
 EPA METHOD 8270 - SEMI-VOLATILE ORGANICS  
 EPA METHOD 8270 - SEMI-VOLATILE ORGANICS  
 EPA METHOD 8270 - SEMI-VOLATILE ORGANICS  
 EPA OIL ANALYSIS STANDARD  
 GASOLINE - QUICK SCREEN  
 MISA ACID EXTRACTABLES  
 NATURAL GAS  
 PEPPER SPRAY  
 PHENOXYACID ESTERS  
 TESTOSTERONE DERIVATIVE STEROIDS

# CAPILLARY COLUMNS: 007-5MS

## 007-5MS Silphenylene Polysiloxane

- Bonded and Crosslinked
- Excellent thermal stability
- Ideal for GC/MS
- Similar bonded phases: DB-5MS, Rtx-5MS, Ultra-2, BPX-5, MDN-5S, CPSil-8CB/MS
- Non polar
- Low Bleed Characteristics
- Comparable to: SE-52, SE-54, OV-73

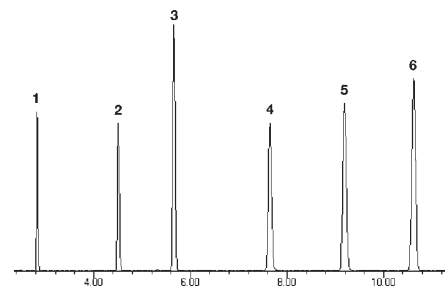
### General Information

The 007-5MS is a silphenylene/siloxane stationary phase designed for the GC-MS analysis of semi-volatile compounds such as those comprising EPA Methods 524.1, 524.2, 610, 625, 8100, and 8270. The silphenylene/siloxane chemistry ensures that the 007-5MS exhibits extremely low column 'bleed' as evidenced in Figure 2.

The 007-5MS columns are available in a variety of standard column configurations. Traditional polysiloxane-type GC stationary phases degrade at elevated temperatures. The degradation process is well documented and consists of the thermal rearrangement of the siloxane backbone to produce cyclic groups. These groups are volatile and elute from the column as column "bleed". The silphenylene units (Fig. 1) within the 007-5MS backbone act as heat sinks and limit the formation of the cyclic groups normally associated with polysiloxane degradation.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-5MS	675.24	745.5	688	770.78	660



### Low Bleed Test Mix

**COLUMN:** 007-5MS, Silphenylene siloxane  
0.25mm I.D. x 0.5µm film  
Cat. No.: 007-5MS-30-0.5F

**Temperature:** 115°C Isothermal  
**Injector:** 225°C  
**Detector:** MSD, 300° Transfer Line  
**Carrier Gas:** 26 cm/sec., Helium

- |            |                        |
|------------|------------------------|
| 1. C10     | 4. 2,6-dimethylphenol  |
| 2. octanol | 5. 2,4-dimethylaniline |
| 3. C8 FAME | 6. naphthalene         |

14

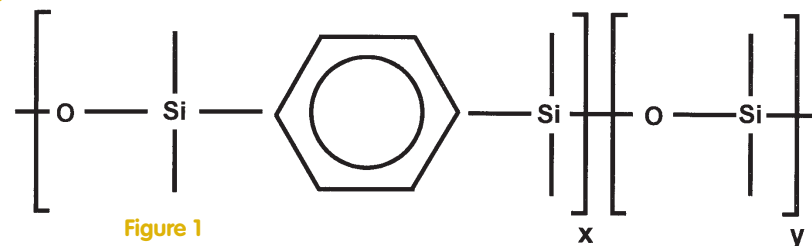


Figure 1

0.1 – 1.0 micron films

-50 350

007-5MS TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

### AVAILABLE COLUMN CONFIGURATIONS

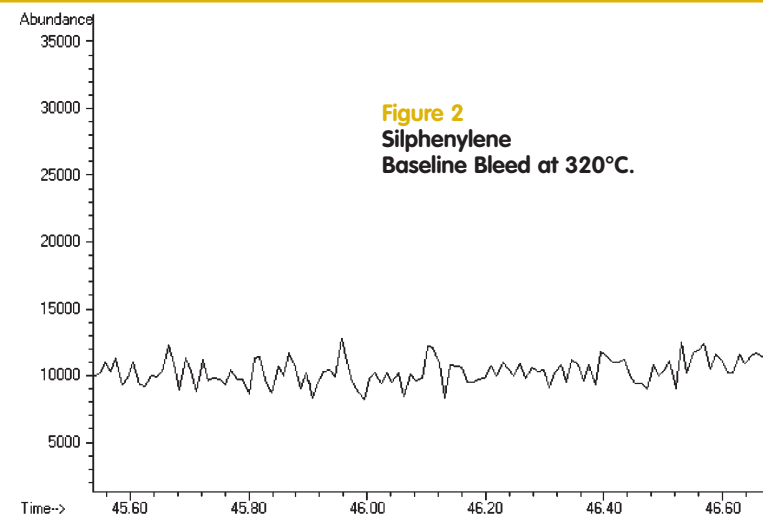
I.D. (mm)	Lengths (M.)	Films (µm)
0.10	10, 20	0.1, 0.25
0.18	10, 20, 40	0.1, 0.25
0.25	15, 25, 30, 50, 60	0.1, 0.25, 0.5, 1.0
0.32	15, 25, 30, 50, 60	0.1, 0.25, 0.5, 1.0
0.53	10, 15, 25, 30, 50	0.1, 0.25, 0.5, 1.0



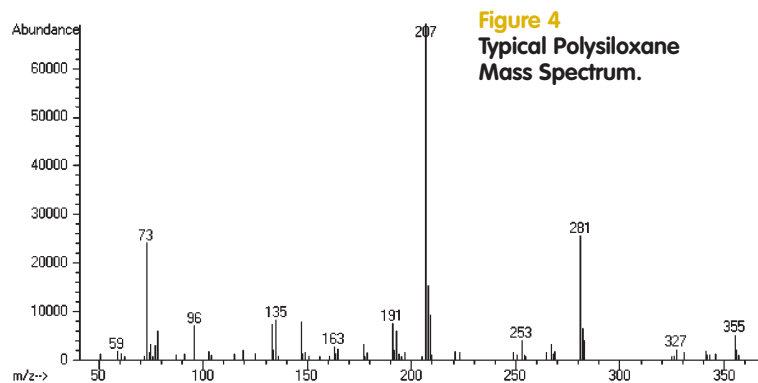
The 007-5MS silphenylene columns offer the chromatographer a number of advantages:

- Greater thermal stability
- Greater resistance to oxygen degradation
- Fast ramping to elevated temperatures to purge the column of residual components
- Improved analysis of trace level compounds
- Less baseline bleed equals less baseline noise, which results in lower detection limits
- Increased column lifetimes
- Reduced contamination of MS sources and other GC detector surfaces
- “Cleaner” mass spectra...mass spectra with fewer extraneous ions enables the analyst to achieve more accurate compound identification and a more efficient library search

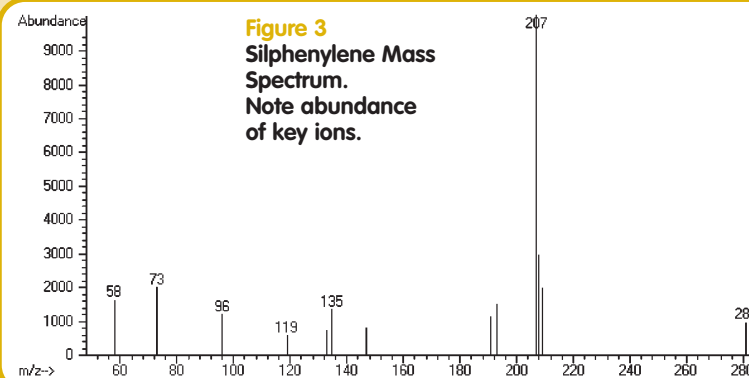
A typical 007-5MS baseline bleed is shown in Figure 2. The mass spectrum of the baseline bleed is shown in Figure 3. While typical methylpolysiloxane bleed spectrum yields high abundances of ions with  $m/z$  207, 281, and 355 (Figure 4), the mass spectrum of the 007-5MS silphenylene column yields significantly lower abundance of these ions. Additionally, it is apparent from Figure 3 that there is a reduction in the total number of ions resulting in “cleaner” spectrum and less background interference.



**Figure 2**  
Silphenylene  
Baseline Bleed at 320°C.



**Figure 4**  
Typical Polysiloxane  
Mass Spectrum.

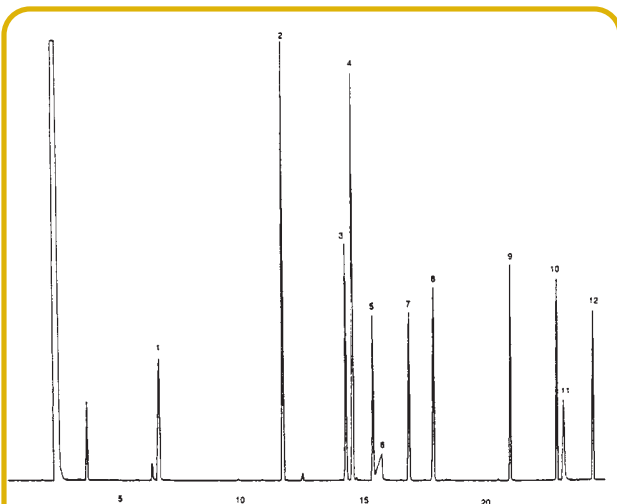


**Figure 3**  
Silphenylene Mass  
Spectrum.  
Note abundance  
of key ions.

#### 007-5MS APPLICATIONS ON THE WEB

AVIATION FUEL - JET A  
CHIMNEY CREOSOTE  
DIOXINS - 5PPM  
PESTICIDES  
SYNTHETIC FRAGRANCE MIX

# CAPILLARY COLUMNS: 007-10, 007-20



## Grob Quality Test Mix

**COLUMN:** 007-10, (10% Phenyl) methylpolysiloxane  
25M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-10-25-0.5F

**Temperature:** 40° (6°/min.) - 160° (15°/min.) - 280°C  
**Injector:** 225°C  
**Detector:** 300°C, FID  
**Carrier Gas:** 25 cm/sec., Helium

16

## 007-10, 007-20, (10% & 20% Phenyl) Methylpolysiloxane

- Bonded and Crosslinked
- Comparable to: OV-3, OV-7
- Similar bonded phases: Rtx-20, SPB-20, AT-20

### General Information

The 007-10 and 007-20 are (10% phenyl) and (20% phenyl) substitutions, respectively, for two low polarity phenyl methylpolysiloxane phases. The phenyl substitutions contribute to the “induced dipole” selectivity of these phases. A column coated with either phase displays excellent efficiency and thermal stability. These phases provide an excellent alternative for drug and environmental pollutant analyses where greater retention of aromatic compounds is necessary.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-10	702.35	794.14	697.10	757.18	669.35
007-20	697.66	784.037	10.65	784.03	675.23

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	15, 25	0.1, 0.25, (0.5 on 15M. only)
0.18	15, 25, 30, 50	0.1, 0.25, (0.5 on 30M. or less)
0.25	12, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 1.0
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 0.52, 1.0, (2.0, 3.0, 4.0 5.0 on 60M. or less)
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 0.88, 1.0, 2.0, 2.65 (3.0, 4.0, 5.0, 6.0, 7.0, 8.0 on 50M. or less)

0.1 – 1.0 micron films

2.0 – 5.0 micron films

6.0 – 8.0 micron films

-50 260 280 300

007-10, -20 TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

# CAPILLARY COLUMNS: 007-502, 007-608, 007-624

## 007-502, 007-608, 007-624 Cyanopropylphenyl Methylpolysiloxane

- Bonded and Crosslinked
- Ideal for volatile organic compound analyses
- Similar bonded phases: DB-624, Rtx-502, DB-608, SPB-608, Rtx-35, VOCOL, Rtx-Volatiles, Rtx-624, AT-624, BP-624, CPSil-13CB

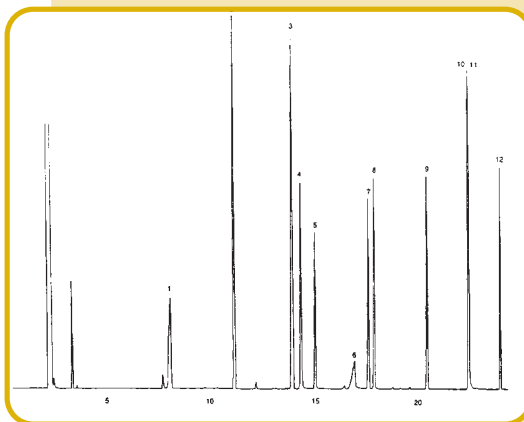
### General Information

007-502, 007-608, and 007-624 are three slightly different versions of cyanopropylphenyl substitutions on a methylpolysiloxane phase backbone. These phases have been specifically designed for difficult environmental analyses, such as volatile organic compounds and pesticides as specified in many EPA Methods including 502.1, 502.2, 503.1, 524.1, 524.2, 601, 602, 608, 624, 8010, 8011, 8015, 8020, 8240, and 8260. By using 007-502 and 007-624 phase types on 0.53mm I.D. columns, the entire range of volatile compounds, including gases, can be analyzed beginning at ambient temperatures. Some of the most often requested "environmental" columns are of the 007-624 phase-type, in the following configurations:

- 30M. x 0.32mm I.D. x 3.0 micron film (007-624-30W-3.0F)
- 30M. x 0.53mm I.D. x 3.0 micron film (007-624-30V-3.0F)
- 30M. x 0.25mm I.D. x 1.5 micron film (007-624-30-1.5F)
- 30M. x 0.25mm I.D. x 2.0 micron film (007-624-30-2.0F)

#### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.25	30, 50	1.0, 2.0
0.32	30, 50	3.0, 5.0
0.53	15, 30, 50, 60, 75, 105	0.8, 1.0, 2.0, 2.5, 3.0, 5.0



### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-624	684.05	881.36	724.27	793.53	707.78

### Grob Quality Test Mix

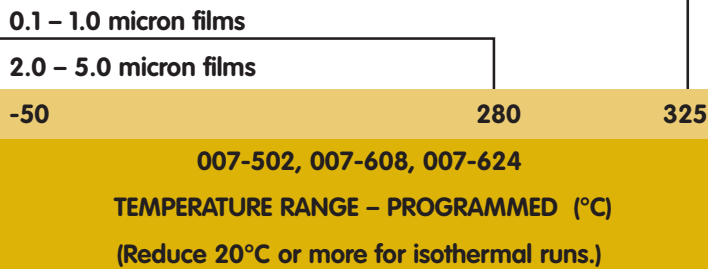
**COLUMN:** 007-624, Cyanopropylphenyl methylpolysiloxane  
25M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-624-25-0.5F

**Temperature:** 40° (6°/min.)  
- 160° (15°/min.) - 260°C

**Injector:** 225°C  
**Detector:** 300°C, FID

**Carrier Gas:** 25 cm/sec., Helium

- |                       |                        |
|-----------------------|------------------------|
| 1. 2,3-butanediol     | 7. 2,6-dimethylphenol  |
| 2. decane             | 8. 2,4-dimethylaniline |
| 3. nonanal            | 9. methyl decanoate    |
| 4. undecane           | 10. methyl undecanoate |
| 5. 1-octanol          | 11. dicyclohexylamine  |
| 6. ethylhexanoic acid | 12. methyl dodecanoate |



### 007-502/608/624 APPLICATIONS ON THE WEB

EPA METHOD 502 - DRINKING WATER  
DDT ISOMERS  
EPA METHOD 608 - PESTICIDES  
HERBICIDES  
EPA METHOD 524.2 - DRINKING WATER  
EPA METHOD 601  
EPA METHOD 601 - GASES  
EPA METHOD 601 STANDARDS  
EPA METHOD 624 - PURGE AND TRAP  
RESIDUAL SOLVENTS IN DRUGS

# CAPILLARY COLUMNS: 007-1301

## 007-1301 (6% Cyanopropylphenyl) Methylpolysiloxane

- Bonded and Crosslinked
- Excellent thermal stability
- Similar bonded phases: DB-1301, Rtx -1301, HP-1301, SPB-1301
- Moderately polar
- Comparable to: OV-1301

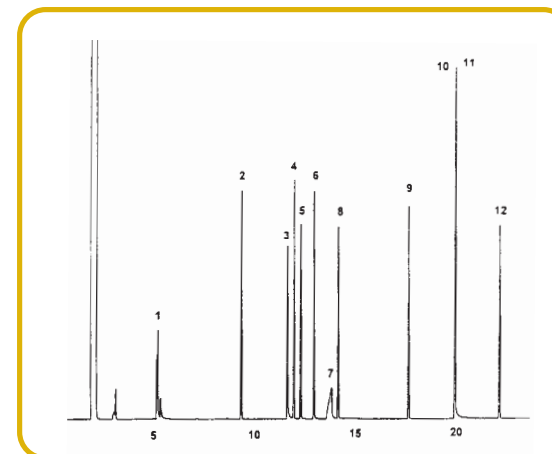
### General Information

007-1301 is a (6% cyanopropylphenyl) methylpolysiloxane phase. Overall, 007-1301 is a low polarity phase which exhibits excellent thermal stability. The cyanopropyl (permanent dipole) and the phenyl (polarizable) substituents provide a specific selectivity for polar and polarizable compounds. More of a boiling point phase than 007-1701 (14% cyanopropyl phenyl methylpolysiloxane), the 007-1301 exhibits less retention of polyaromatic compounds than 007-17 (50% phenyl methylpolysiloxane). Nitrogen-containing herbicides, various types of pesticides, drugs and other heteroatom-containing compounds are good candidates for separation using this phase. As part of the 007 Series of bonded phases, the 007-1301 can withstand large solvent injections and rinsing to remove insoluble impurities.

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### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-1301	660	780	720	790	708



### Grob Quality Test Mix

**COLUMN:** 007-1301, (6% Cyanopropylphenyl) methylpolysiloxane  
30M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-1301-30-0.5F

**Temperature:** 60° (6°/min.) - 250°C  
**Injector:** 220°C  
**Detector:** 300°C, FID  
**Carrier Gas:** 30 cm/sec., Helium

- |                   |                         |
|-------------------|-------------------------|
| 1. 2,3-butanediol | 7. 2-ethylhexanoic acid |
| 2. decane         | 8. dimethylaniline      |
| 3. octanol        | 9. methyl decanoate     |
| 4. undecane       | 10. methyl undecanoate  |
| 5. nonanal        | 11. dicyclohexylamine   |
| 6. dimethylphenol | 12. methyl dodecanoate  |

### 007-1301 APPLICATIONS ON THE WEB

EPA METHOD 606 - PHTHALATE ESTERS  
TOXIC SUBSTANCES MIX II

#### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	10, 15, 25	0.1, 0.25
0.18	15, 25, 30, 50	0.1, 0.25, 0.5
0.25	15, 25, 30, 50, 60	0.1, 0.25, 0.5
0.32	10, 15, 25, 30, 50, 60	0.1, 0.25, 0.5
0.53	10, 15, 25, 30, 50, 60	0.1, 0.25, 0.5, 1.0

#### 0.1 – 1.0 micron films

-30

320

007-1301 TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

# CAPILLARY COLUMNS: 007-35

## 007-35, (35% Phenyl) Methylpolysiloxane

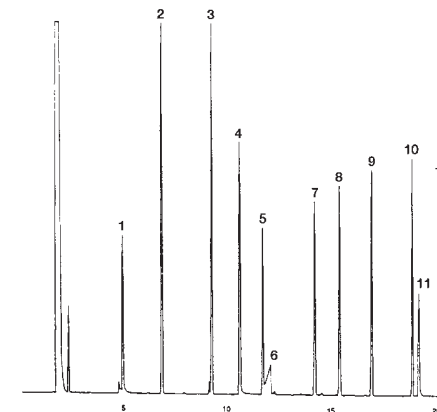
- Bonded and Crosslinked
- Comparable to: OV-11
- Similar bonded phases: DB-35, Rtx-35, SPB-35, AT-35, HP-35, BPX-35

### General Information

007-35 is the Quadrex designation for a (35% phenyl) methylpolysiloxane phase. This phase is a compromise between 007-20 and 007-17 in phenyl content. It is a popular phase for drug and pesticide/herbicide analyses; and like the entire series of phenyl-substituted phases, columns coated with the 007-35 can be rinsed to remove non-volatile and high boiling contaminants.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-35	751.49	879.77	772.34	876.34	739.57



### Grob Quality Test Mix

**COLUMN:** 007-35, (35% Phenyl) methylpolysiloxane  
25M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-35-25-0.5F

**Temperature:** 60° (6°/min.) - 160° (15°/min.) - 280°C

**Injector:** 225°C

**Detector:** 300°C, FID

**Carrier Gas:** 25 cm/sec, Helium

- |                       |                        |
|-----------------------|------------------------|
| 1. 2,3-butanediol     | 7. 2,4-dimethylaniline |
| 2. decane             | 8. 2,6-dimethylphenol  |
| 3. undecane           | 9. methyl decanoate    |
| 4. 1-octanol          | 10. methyl undecanoate |
| 5. nonanal            | 11. dicyclohexylamine  |
| 6. ethylhexanoic acid | 12. methyl dodecanoate |

19

0.1 – 1.0 micron films

2.0 – 5.0 micron films

6.0 – 8.0 micron films

-50

260 280 300

007-35 TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	15, 25	0.1, 0.25, (0.5 on 15M. only)
0.18	15, 25, 30, 50	0.1, 0.25, (0.5 on 30M. or less)
0.25	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 1.0
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 0.52, 1.0 (2.0, 3.0, 4.0, 5.0 on 60M. or less)
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 0.88, 1.0, 2.0, 2.65 (3.0, 4.0, 5.0, 6.0, 7.0, 8.0 on 50M. or less)

### 007-35 APPLICATIONS ON THE WEB

EPA METHOD 515 - HERBICIDES  
EPA METHOD 606 - PHTHALATE ESTERS  
TOXIC SUBSTANCES MIX II



# CAPILLARY COLUMNS: 007-1701

## 007-1701 (14% Cyanopropylphenyl) Methylpolysiloxane

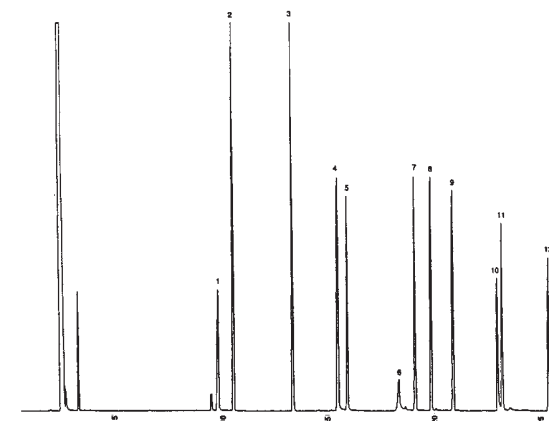
- Bonded and Crosslinked
- Moderately Polar
- Comparable to: OV-1701
- Similar bonded phases: DB-1701, Rtx-1701, SPB-1701, AT-1701, BP-10, CPSil-19CB

### General Information

007-1701 is a (14% cyanopropylphenyl) methylpolysiloxane phase. The cyanopropyl functional groups provide a permanent dipole selectivity different from the induced dipole interactions of the phenyl groups. The overall "polarity" of this phase remains nominal when compared to the more highly cyanopropyl substituted phases such as 007-225 and 007-23. The 007-1701 phase is often used for solvents, pharmaceuticals, derivatized sugars and many environmental applications.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-1701	725.81	882.76	774.19	848.28	764.52



### Grob Quality Test Mix

**COLUMN:** 007-1701, (14% Cyanopropylphenyl) methylpolysiloxane  
25M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-1701-25-0.5F

**Temperature:** 40° (6°/min.) - 210° (15°/min.) - 270°C

**Injector:** 225°C

**Detector:** 325°C, FID

**Carrier Gas:** 25 cm/sec., Helium

- |                       |                        |
|-----------------------|------------------------|
| 1. 2,3-butanediol     | 7. 2,6-dimethylphenol  |
| 2. decane             | 8. 2,4-dimethylaniline |
| 3. undecane           | 9. methyl decanoate    |
| 4. 1-octanol          | 10. dicyclohexylamine  |
| 5. nonanal            | 11. methyl undecanoate |
| 6. ethylhexanoic acid | 12. methyl dodecanoate |

20

### 007-1701 APPLICATIONS ON THE WEB

DRUG MIX  
NITROAROMATICS

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	15, 25	0.1, 0.25, (0.5 on 15M. only)
0.18	15, 25, 30, 50	0.1, 0.25, 0.5
0.25	15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0, 2.0, 3.0
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0, 2.0, 3.0

0.1 – 1.0 micron films

2.0 – 3.0 micron films

-20

260

280

007-1701 TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

# CAPILLARY COLUMNS: 007-17

## 007-17 (50% Phenyl) Methylpolysiloxane

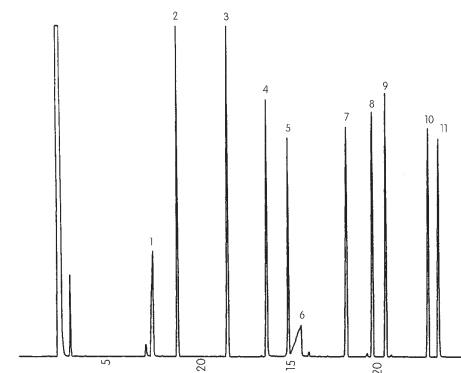
- Bonded and Crosslinked
- Medium Polarity
- Comparable to: OV-17
- Similar bonded phases: DB-17, HP-17, HP-50+, Rtx-50, SP-2250, SPB-50, AT-50, CPSil-20CB

### General Information

007-17 is a (50% phenyl) methylpolysiloxane phase. The presence of the 50% phenyl groups increases the overall “polarity” of the phase and enhances the selectivity of induced dipole interactions resulting in greater retention of aromatic solutes. The 007-17 phase is widely used as an EPA Method confirmation column and provides for efficient separations of PAH’s, and biomedical samples such as drugs, sugars and steroids.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-17	780.95	920	800	925	721



### Grob Quality Test Mix

**COLUMN:** 007-17, (50% Phenyl) methylpolysiloxane  
25M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-17-25-0.5F

**Temperature:** 40° (6°/min.) - 210° (15°/min.) - 280°C

**Injector:** 225°C

**Detector:** 325°C, FID

**Carrier Gas:** 25 cm/sec., Helium

- |                       |                        |
|-----------------------|------------------------|
| 1. 2,3-butanediol     | 7. 2,4-dimethylaniline |
| 2. decane             | 8. methyl decanoate    |
| 3. undecane           | 9. 2,6-dimethylphenol  |
| 4. 1-octanol          | 10. methyl undecanoate |
| 5. nonanal            | 11. dicyclohexylamine  |
| 6. ethylhexanoic acid | 12. methyl dodecanoate |

21

0.1 – 1.0 micron films

2.0 – 3.0 micron films

40

300

325

007-17 TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	15, 25	0.1, 0.25, (0.5 on 15M. only)
0.18	15, 25, 30, 50	0.1, 0.25, 0.5
0.25	15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.33, 0.5, 1.0
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 0.52, 1.0, 2.0, 3.0
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0 (2.0, 3.0 on 50M. or less)

### 007-17 APPLICATIONS ON THE WEB

EPA METHOD 507 - PESTICIDES/HERBICIDES  
TRICYCLIC ANTIDEPRESSANTS

# CAPILLARY COLUMNS: 007-65HT, SPECIAL USE: TRIGLYCERIDES

## 007-65HT, SPECIAL USE TRIGLYCERIDES (65% Phenyl) Methylpolysiloxane

- Bonded and Crosslinked
- Excellent thermal stability
- Similar bonded phases: Rtx-65HT, TAP-CB
- Moderately “polar”
- Comparable to: No equivalent

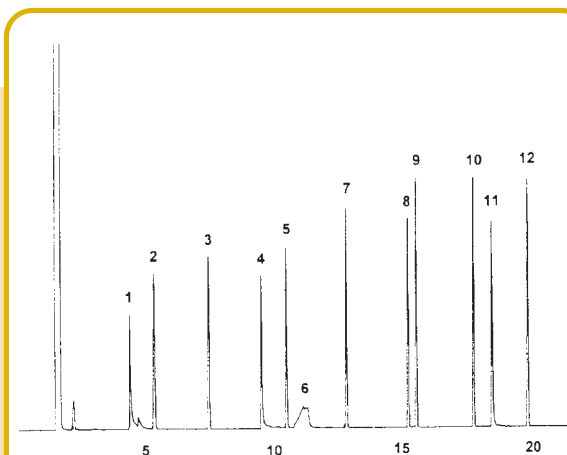
### General Information

The 007-65HT phase represents a 65% phenyl methylpolysiloxane phase composition. It is a companion phase to the 007-17 (50% phenyl methylpolysiloxane), but the additional 15% phenyl substitution provides greater selectivity toward compounds exhibiting induced dipole effects. This enhanced selectivity is most evident in the analysis of triglycerides where the resolution is “fine tuned” over that of the 50% phenyl substitution. Examples of the improved resolution of the 007-65HT columns can be seen by following the CHROMATOGRAMS link on our website, under the TRIGLYCERIDE section.

Columns produced with the 007-65HT phase possess excellent thermal stability and can be used routinely for high temperature analyses.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-65HT	750	950	820	850	760



### Grob Quality Test Mix

**COLUMN:** 007-65HT, (65% Phenyl) methylpolysiloxane  
30M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-65HT-30-0.5F

**Temperature:** 50° (1 min. hold) (6°/min.) - 220°C

**Injector:** 220°C

**Detector:** 300°C, FID

**Carrier Gas:** 30 cm/sec., Helium

- |                         |                        |
|-------------------------|------------------------|
| 1. 2,3-butanediol       | 7. dimethylphenol      |
| 2. decane               | 8. dimethylaniline     |
| 3. undecane             | 9. methyl decanoate    |
| 4. octanol              | 10. methyl undecanoate |
| 5. nonanal              | 11. dicyclohexylamine  |
| 6. 2-ethylhexanoic acid | 12. methyl dodecanoate |

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### 007-65HT APPLICATIONS ON THE WEB

BUTTER TRIGLYCERIDES  
CANOLA OIL  
COCOA BUTTER  
COCONUT OIL  
CORN OIL  
ITALIAN OLIVE OIL  
PALM OIL  
SAFFLOWER OIL

#### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.25	15, 25, 30, 50, 60,	0.1, 0.25

0.1 – 0.25 micron films

40

390

007-65HT TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

# CAPILLARY COLUMNS: 007-225

## 007-225 (50% Cyanopropylphenyl) Methylpolysiloxane

- Bonded and Crosslinked
- Moderately polar
- Comparable to: OV-225
- Similar bonded phases: DB-225, Rtx -225, AT-225, SP-2300, BP-225, CPSil-43CB

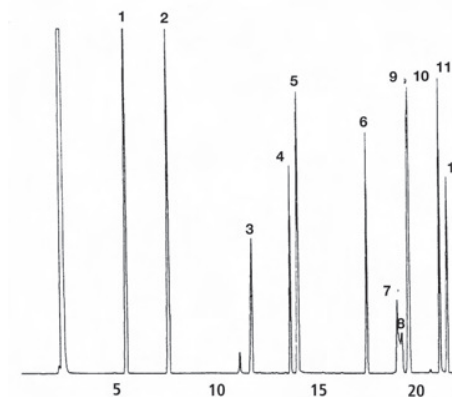
### General Information

007-225 is a (50% cyanopropylphenyl) methylpolysiloxane. This phase possesses both permanent dipole interactions (nitrile) as well as induced dipole (phenyl) and dispersion interactions. It has unique selectivity for derivatized compounds such as fatty acids and carbohydrates. Non-volatile residues can be rinsed from the column to restore column performance.

Quadrex 007-225 columns have been cited in a number of estrogen assay methods. The most commonly used 007-225 column configuration is the 15M x 0.25mm x 0.25µm film, #007-225-15-0.25F.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-225	866.42	1126.44	916.18	1064.98	927.94



### Grob Quality Test Mix

**COLUMN:** 007-225, (50% Cyanopropylphenyl) methylpolysiloxane  
30M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-225-30-0.5F

**Temperature:** 40° (6°/min.)  
- 150° (15°/min.) - 250°C

**Injector:** 225°C

**Detector:** 300°C, FID

**Carrier Gas:** 25 cm/sec., Helium

- |                     |                         |
|---------------------|-------------------------|
| 1. decane           | 7. dicyclohexylamine    |
| 2. undecane         | 8. 2-ethylhexanoic acid |
| 3. 2,3-butanediol   | 9. methyl undecanoate   |
| 4. octanol          | 10. 2,6-dimethylphenol  |
| 5. nonanal          | 11. 2,4-dimethylaniline |
| 6. methyl decanoate | 12. methyl dodecanoate  |

0.1 – 1.0 micron films

2.0 - 3.0 micron films

40

220 240

007-225 TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	15, 25	0.1, 0.25
0.18	15, 25, 30, 50	0.1, 0.25, 0.5
0.25	15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0, 1.2, 2.0, 3.0

# CAPILLARY COLUMNS: 007-CW

## 007-CW Polyethylene Glycol (PEG) Polymer

- Bonded and Crosslinked
- Moderately polar
- Comparable to: Carbowax 20M\*
- Similar bonded phases: DB-Wax, Stabilwax, AT-Wax, HP-20M, HP-Innowax, Supelcowax-10, BP-20, CPWax-52CB

### General Information

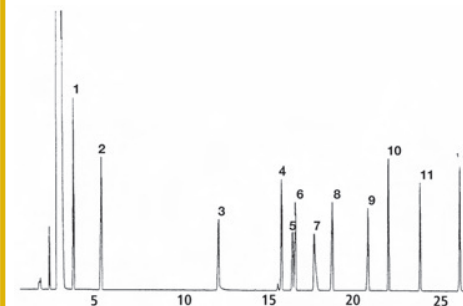
007-CW is a polyethylene glycol (PEG) phase. This polymer can be used to separate compounds at temperatures not normally associated with polyethylene glycol (Carbowax™) phases. Both the lower and upper temperature limits of traditional Carbowax type columns are extended with the 007-CW phase.

The hydrogen bonding interactions of the 007-CW phase makes it well suited for the analysis of polar compounds such as solvents, perfumes, flavors, and essential oils. This phase is not recommended for the analysis of mixtures containing silylating reagents.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-CW	923.30	1214.35	923.30	1205.08	1137.80

\* Carbowax is a trademark of Union Carbide Corporation.



### Grob Quality Test Mix

**COLUMN:** 007-CW, Polyethylene glycol (PEG) polymer  
30M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-CW-30-0.5F

**Temperature:** 40° (6°/min.) - 250°C  
**Injector:** 225°C  
**Detector:** 280°C, FID  
**Carrier Gas:** 25 cm/sec., Helium

- |                     |                          |
|---------------------|--------------------------|
| 1. decane           | 7. dicyclohexylamine     |
| 2. undecane         | 8. methyl undecanoate    |
| 3. nonanal          | 9. methyl dodecanoate    |
| 4. octanol          | 10. 2,6-dimethylaniline  |
| 5. 2,3-butanediol   | 11. 2-ethylhexanoic acid |
| 6. methyl decanoate | 12. 2,4-dimethylphenol   |

24

### 007-CW APPLICATIONS ON THE WEB

AROMATICS IN RF GASOLINE  
BTX  
FAME MIX  
METHYL ESTERS OF SUNFLOWER OIL  
PEPPERMINT OIL  
REFORMULATED (RF) GASOLINE  
SOLVENT MIXTURE  
YLANG YLANG ESSENTIAL OIL

### STAINLESS STEEL

BTX  
L.M.W. FREE FATTY ACIDS  
RESIDUE SOLVENTS IN PAINT

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	15, 25	0.1, 0.25
0.18	15, 25, 30, 50	0.1, 0.25, 0.5
0.25	15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, (1.0 on 60M. or less)
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0, (2.0, 3.0 on 50M. or less)
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0, 2.0, 3.0, (4.0, 5.0 on 30M. or less)

### 0.1 – 1.0 micron films

### 2.0 – 5.0 micron films

20

240

280

### 007-CW TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)



# CAPILLARY COLUMNS: BTR-CW

## BTR-CW Oxygen Resistant Polyethylene Glycol (PEG)

- Bonded and Crosslinked
- Excellent oxygen resistance
- Similar bonded phases: DB-Wax, Stabilwax, AT-Wax, HP-20M, HP-Innowax, Supelcowax-10, BP-20, CPWax-52CB
- Moderately polar
- Comparable to: Carbowax 20M\*

### General Information

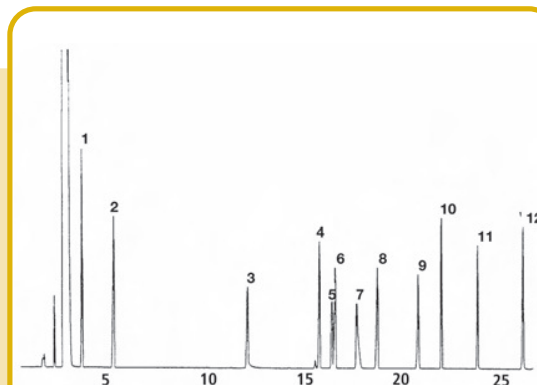
Traditional Carbowax 20M and bondable PEG columns deteriorate in the presence of oxygen. It has been necessary, therefore, to maintain an oxygen-free chromatographic system. To avoid the costs of maintaining such a system and to improve the chromatographic properties of the PEG column, we offer the BTR-CW phase. The BTR-CW is a polyethylene glycol (PEG) phase, similar to our 007-CW phase, which incorporates an anti-oxidant moiety to better withstand oxygen degradation. The BTR-CW phase also offers increased thermal stability and longer column lifetimes.

BTR-CW can be used to separate compounds at temperatures not normally associated with polyethylene glycol (Carbowax™) phases. Both the lower and upper temperature limits of traditional Carbowax type columns are extended with this phase. As with the 007-CW phase, the BTR-CW phase is well suited for the analysis of polar compounds such as solvents, flavors, perfumes, and essential oils. BTR-CW is not recommended for the analysis of mixtures containing silylating reagents.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
BTR-CW	967.80	1218.58	1005.78	1205.75	1150.69

\* Carbowax is a trademark of Union Carbide Corporation.



### Grob Quality Test Mix

**COLUMN:** BTR-CW,  
Polyethylene glycol (PEG) polymer  
30M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: BTR-CW-30-0.5F

**Temperature:** 40° (6°/min.) - 250°C  
**Injector:** 225°C  
**Detector:** 280°C, FID  
**Carrier Gas:** 25 cm/sec., Helium

- |                     |                          |
|---------------------|--------------------------|
| 1. decane           | 7. dicyclohexylamine     |
| 2. undecane         | 8. methyl undecanoate    |
| 3. nonanal          | 9. methyl dodecanoate    |
| 4. octanol          | 10. 2,6-dimethylaniline  |
| 5. 2,3-butanediol   | 11. 2-ethylhexanoic acid |
| 6. methyl decanoate | 12. 2,4-dimethylphenol   |

25

0.1 – 1.0 micron films

2.0 – 5.0 micron films

20

240

280

BTR-CW TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	15, 25	0.1, 0.25
0.18	15, 25, 30, 50	0.1, 0.25, 0.5
0.25	15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, (1.0 on 60M. or less)
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0 (2.0, 3.0 on 50M. or less)
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0, 2.0, 3.0 (4.0, 5.0 on 30M. or less)

### BTR-CW APPLICATIONS ON THE WEB

BTR-CW	
ALCOHOLS	64
ALDEHYDES	64
CELERY SEED OIL	65
NITROSAMINES	58
PUFA 2 - ANIMAL SOURCE	62

# CAPILLARY COLUMNS: 007-FFAP

## 007-FFAP, Nitroterephthalic acid modified Polyethylene Glycol (PEG)

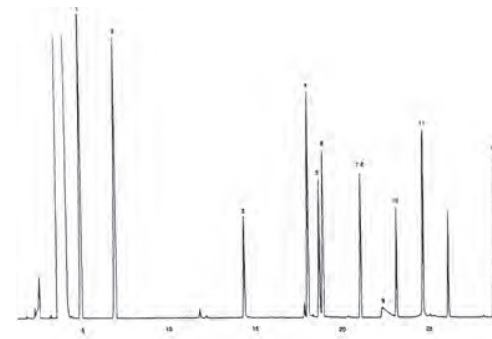
- Bonded
- Moderately polar
- Comparable to: FFAP, OV-351, SP-1000
- Similar bonded phases: DB-FFAP, AT-1000, HP-FFAP, Stabilwax DA, BP-21, Nukol, CPWax-58CB

### General Information

007-FFAP is a nitroterephthalic acid modified polyethylene glycol polymer. This bonded acidic phase is ideal for the analysis of aqueous solutions of free fatty acids as well as fatty acid methyl esters (FAMES). As with the 007-CW and BTR-CW bonded polyethylene glycol phases, 007-FFAP is not recommended for the analysis of silylating reagents.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-FFAP	973.71	1218.70	995.36	1207.56	1151.34



### Grob Quality Test Mix

**COLUMN:** 007-FFAP,  
Nitroterephthalic acid modified PEG  
30M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-FFAP-30-0.5F

Temperature: 40° (6°/min.) - 220°C  
Injector: 225°C  
Detector: 280°C, FID  
Carrier Gas: 25 cm/sec., Helium

- |                      |                         |
|----------------------|-------------------------|
| 1. decane            | 8. methyl undecanoate   |
| 2. undecane          | 9. 2-ethylhexanoic acid |
| 3. nonanal           | 10. methyl dodecanoate  |
| 4. octanal           | 11. 2,6-dimethylaniline |
| 5. 2,3-butanediol    | 12. 2,4-dimethylphenol  |
| 6. methyl decanoate  |                         |
| 7. dicyclohexylamine |                         |

26

### 007-FFAP APPLICATIONS ON THE WEB

FREE FATTY ACIDS  
VOLATILE FREE FATTY ACIDS  
WHISKEY CONGENERS

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.10	10, 15, 25	0.1, 0.25
0.18	15, 25, 30, 50	0.1, 0.25, 0.5
0.25	15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, (1.0 on 60M. or less)
0.32	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0, (2.0, 3.0 on 60M. or less)
0.53	10, 15, 25, 30, 50, 60, 75, 100	0.1, 0.25, 0.5, 1.0, 2.0, 3.0, (4.0, 5.0 on 30M. or less)

0.1 – 1.0 micron films

2.0 – 5.0 micron films

20

240

260

007-FFAP TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

# CAPILLARY COLUMNS: 007-23

## 007-23 (78% Cyanopropyl) Methylpolysiloxane

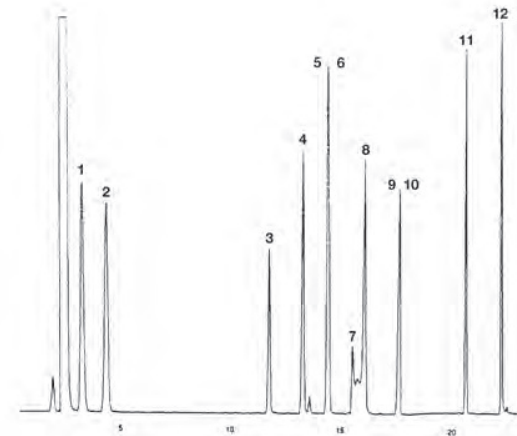
- Bonded and Crosslinked
- Very polar
- FAME Column
- Comparable to: Silar 7CP, SP-2310
- Similar bonded phases: DB-23, Rtx-2330, BPx-70, SP-2330, AT-SILAR, CPSil 88

### General Information

007-23 is a (78% cyanopropyl) methylpolysiloxane and is our most polar phase type. The strong permanent dipole interactions of this phase with unsaturated compounds yields separations according to geometric configurations of the double bonds. The 007-23 phase is ideal for the separation of cis/trans isomers of fatty acid methyl esters (FAMES) as well as the isomers of dioxins and furans. The 007-23 phase is bonded and crosslinked and the column performance can be restored by rinsing.

### Bonded Phase Retention Index

Phase	benzene	1-nitropropane	2-pentanone	pyridine	butanol
007-23	1049.03	1416.88	1156.73	1267.56	1206.43



### Grob Quality Test Mix

**COLUMN:** 007-23, (78% Cyanopropyl) methylpolysiloxane  
30M. x 0.25mm I.D. x 0.5µm film  
Cat. No.: 007-23-30-0.5F

**Temperature:** 40° (6°/min.) - 160° (15°/min.) - 250°C

**Injector:** 225°C

**Detector:** 300°C, FID

**Carrier Gas:** 26 cm/sec., Helium

- |             |                       |                          |
|-------------|-----------------------|--------------------------|
| 1. decane   | 5. 2,3-butanediol     | 9. methyl dodecanoate    |
| 2. undecane | 6. methyl decanoate   | 10. 2-ethylhexanoic acid |
| 3. nonanal  | 7. dicyclohexylamine  | 11. 2,6-dimethylaniline  |
| 4. octanol  | 8. methyl undecanoate | 12. 2,4-dimethylphenol   |

27

0.25 micron films

40

280

007-23 TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Film (µm)
0.25	30, 60	0.1, 0.25, 0.5

### 007-23

#### APPLICATIONS ON THE WEB

ALDITOL ACETATES	65
AROMATICS IN LIGHT NAPHTHA AND AVIATION GASOLINES	69
CHOLESTERYL ESTERS	89
DIOXINS/FURANS	42
FAME MIX	60
MONOGLYCERIDES-TMS DERIVATIVES	61
PUFA 1 - MARINE SOURCE	62
PUFA 2 - ANIMAL SOURCE	63

# CAPILLARY COLUMNS: PLT-5A

## PLT-5A Molecular Sieve 5Å PLOT Column

- Reliable permanent gas analysis
- Rugged layer of molecular sieve
- Excellent thermal stability for regenerating the adsorbent layer
- Similar phases: GS-Molesieve, RT-Msieve 5A, AT-Mole Sieve

### General Information

The analysis of permanent gases, traditionally performed on packed columns, is an important petrochemical application. The PLT-5A Molecular Sieve PLOT (porous layer open tubular) capillary column offers the advantage of higher resolution and faster analysis times; for example, O<sub>2</sub>, N<sub>2</sub>, CO and CH<sub>4</sub> typically separate in under six minutes. In addition, the important O<sub>2</sub>/Ar separation can be achieved at subambient temperatures with this column.

**QUADREX** uses a proprietary coating process that insures column-to-column reproducibility. A unique binding agent eliminates adsorbent layer degradation and particle migration that can cause the contamination of valves and detectors. The PLT-5A column can be regenerated at temperatures up to 300°C to regain resolution lost to water contamination.

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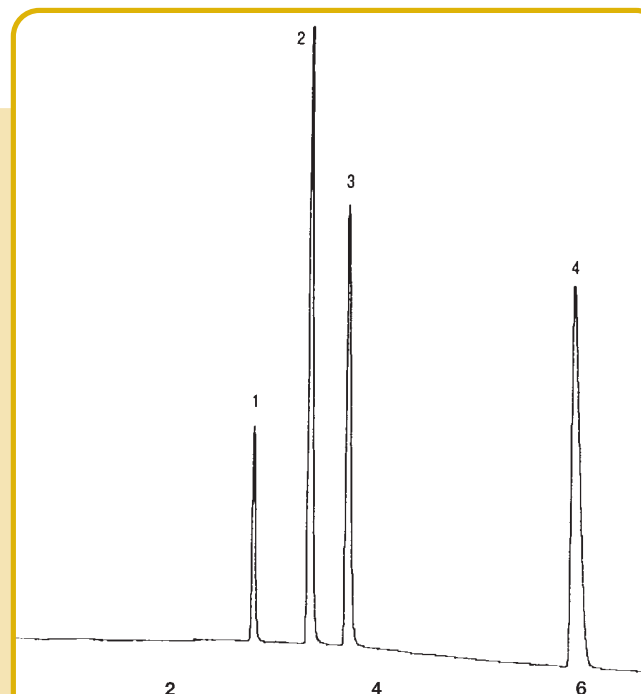
25 micron films

-50

300

PLT-5A TEMPERATURE RANGE – PROGRAMMED (°C)

(Reduce 20°C or more for isothermal runs.)



### Quality Test Mix

**COLUMN:** Molecular Sieve 5Å PLOT  
30M. x 0.53mm I.D. x 25.0µm film  
Cat. No.: PLT-5A-30V

**Temperature:** 35° (5 min. hold) (30°/min.) - 100°C

**Injector:** 50°C

**Detector:** 150°C, TCD

**Carrier Gas:** 5psi, Helium

1. oxygen  
2. nitrogen

3. methane  
4. carbon monoxide

### AVAILABLE COLUMN CONFIGURATIONS

I.D. (mm)	Lengths (M.)	Films (µm)
0.53	30	25.0