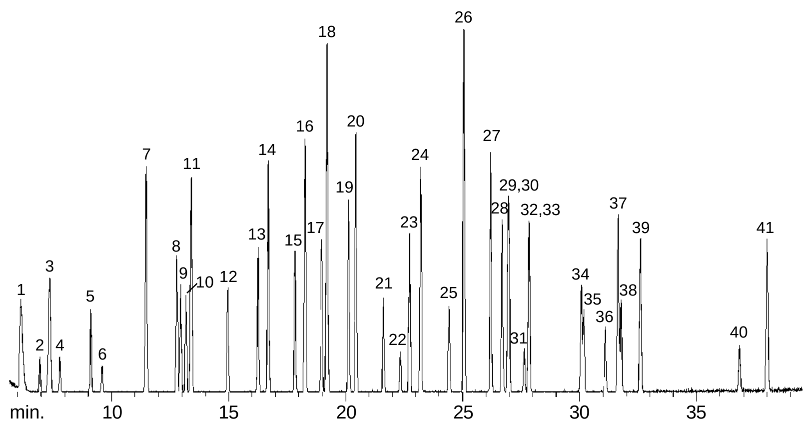
FAST FACTS

At-a-Glance Product Information from Restek

Rtx®-1/MXT®-1 Capillary Columns

100% dimethyl polysiloxane



60m, 0.32mm ID, 3.0µm Rtx®-1 (cat.# 10187). 5mL of 2ppmv TO-14 standard. **Oven temp.:** 30°C (hold 4 min.) to 250°C @ 7°C/min. (hold 15 min.); **Detector:** MS; **Det. temp.:** 250°C; **Carrier gas:** helium; **Linear velocity:** 21cm/sec. set @ 30°C; **Ionization:** EI; **Scan range:** 34-280 AMU; **Preconcentrator conditions:** Nutech 3550 A Preconcentrator; **Cryotrap temp.:** -160°C; **Cryotrap desorb temp.:** 150°C; **Cryofocusing unit temp.:** -190°C; **Cryofocusing desorb temp.:** 150°C.

1. dichlorodifluoromethane
2. chloromethane
3. 1,2-dichlorotetrafluoroethane
4. vinyl chloride
5. bromomethane
6. chloroethane
7. trichlorofluoromethane
8. 1,1-dichloroethene
9. methylene chloride
10. 3-chloropropene
11. 1,1,2-trichloro-1,2,2-trifluoroethane
12. 1,1-dichloroethane
13. *cis*-1,2-dichloroethene
14. chloroform
15. 1,2-dichloroethane
16. 1,1,1-trichloroethane
17. benzene
18. carbon tetrachloride
19. 1,2-dichloropropane
20. trichloroethene
21. *cis*-1,3-dichloropropene
22. *trans*-1,3-dichloropropene
23. 1,1,2-trichloroethane
24. toluene
25. 1,2-dibromoethane
26. tetrachloroethene
27. chlorobenzene
28. ethylbenzene
29. *m*-xylene
30. *p*-xylene
31. styrene
32. *o*-xylene
33. 1,1,2,2-tetrachloroethane
34. 4-methyltoluene

What are the Rtx®/MXT®-1 columns?

The Rtx® and MXT®-1 columns are fused silica and Silcosteel®-lined stainless steel (respectively) GC capillary columns coated with a 100% dimethyl polysiloxane stationary phase. Rtx®/ MXT®-1 columns are the least polar polysiloxane stationary phases.

Why use a 100% dimethyl polysiloxane phase?

The 100% dimethyl polysiloxane is a highly versatile phase that is extremely rugged, exhibiting long column lifetime, low bleed, and high maximum operating temperatures (360°C for fused silica and 445°C for MXT® columns).

Which applications work well using an Rtx®/MXT®-1 column?

Rtx®/MXT®-1 columns are ideal for the analysis of nonpolar petrochemical samples, such as detailed hydrocarbon analysis, hydrocarbon gases, petroleum oxygenates, petroleum aromatics, fuels, waxes, oils, sulfur compounds, mercaptans, and carbon disulfide. It also is an excellent phase for solvents, chemicals, flavors, fragrances, essential oils, air toxins, chlorofluorocarbons, arson analysis, and high-temperature applications.

RESTEK

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Rtx®-1/MXT®-1 Columns

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Rtx®-1/MXT®-1
100% dimethyl polysiloxane

100%

Similar Phases

J&W:
DB-1, DB-1ht, SE-30

Supelco:
SPB-1, SP-2100, SPB-1Sulfur, SE-30

Hewlett-Packard:
HP-1, HP-101

Alltech:
AT-1, SE-30

SGE: BP-1

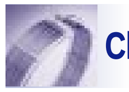
Chrompack:
CP-Sil5CB, CP-Sil5CB MS

Quadrex: 07-1

Ohio Valley: OV-1

Perkin-Elmer: PE-1

USP Nomenclature:
G1, G2, G38



Choosing the Best Phase for Your Sample

When choosing a stationary phase for capillary GC separations, remember the saying "like dissolves like." The stationary phase is a nonvolatile liquid coated on the inside walls of the column and acts as a solvent for the sample. The more soluble the solute or your analyte is in the stationary phase, the more retention it has in the column.

Separations in GC are the result of the relative solubility and selective interactions of the sample solute and column stationary phase. Table I shows the four main forces responsible for solute-stationary phase interactions. The sum of all four forces serves as a measure of the ***"polarity"*** of the stationary phase. ***Selectivity*** is the ability of a phase to preferentially retain one compound over another based on specific solute-stationary phase interactions and is determined by the type and amount of substituted functional groups in the stationary phase.

Table I: Selective Solute-Stationary Phase Interactions

Dispersion forces arise from electric intermolecular fields, which result in the induction of in-phase dipoles. They are present in all phases.

Orientation interactions occur between a stationary phase and a compound, both of which possess a permanent dipole.

Induction interactions occur between a stationary phase with a permanent dipole and a compound, which forms a dipole as a result of the interaction with the stationary phase.

Hydrogen bonding occurs between a strong polar group (FH, OH, NH) and a compound with strong electronegativity (F, O, N). Hydrogen bonding is the strongest interaction force.

Retention indices (RI) are used to measure the overall stationary phase polarity. (Retention indices on Rtx®/MXT®-1 columns are listed in Table II.) They are mathematical calculations used to indicate the elution point of a probe with respect to two hydrocarbons. The probes used to measure RI are of different functionalities, each one designated to measure a specific solute-stationary phase interaction. As the difference in RI for a probe on a given phase increases, the degree of specific interaction increases.

Table II: 100% Dimethyl Polysiloxane Stationary Phase Retention Indices

RI probe	RI	Measured interaction
benzene	651	Electron density for aromatic & olefinic hydrocarbons
n-butanol	651	Proton donor & acceptor capabilities (alcohols and nitriles)
2-pentanone	667	Proton acceptor interaction (ketones, ethers, esters, aldehydes)
nitropropane	705	Dipole interactions

Rtx®/MXT®-1 columns are the least polar polysiloxane phases. The nonpolar nature of this phase is due to the substitution of 100% dimethyl groups, which are nonpolar. Dispersion is the only source of attraction between nonpolar compounds and a nonpolar stationary phase, such as the Rtx®/MXT®-1 column. The nonpolar Rtx®/MXT®-1 phase will preferentially retain nonpolar compounds (e.g., hydrocarbons and waxes) as compared to intermediate polarity compounds (e.g., esters, ethers, ketones, or aldehydes) and polar compounds (e.g., alcohols, acids, or amines).

In summary, when selecting a stationary phase, choose a phase with similar functional groups as those present in your analyte. In the analysis of nonpolar species, select a nonpolar column, such as the Rtx®/MXT®-1 column. For the analysis of intermediate or polar compounds, choose a phase of similar polarity to those compounds. By changing columns based on polarity, you can selectively provide separation using the interaction forces discussed above. You can further examine the phase choice by comparing retention indicies of an analyte on different stationary phases.

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How do I know that an Rtx®-1/MXT®-1 column will resolve my compounds of interest?
Solute boiling point is often used as an indicator of compound volatility in GC. Unfortunately, elution order based on boiling point does not apply universally. Determining elution order based on boiling point is fairly valid when analyzing compounds in a homologous series on most stationary phases. However, when analyzing compounds with different functional groups, this generality fails, because elution order is effected by the chemical interactions between each analyte and the stationary phase. With a 100% dimethyl polysiloxane phase, dispersion is the only interaction between the solute and stationary phase. The nonpolar Rtx®/MXT®-1 column will preferentially retain nonpolar compounds as compared to intermediate polarity or polar compounds.

What is the difference between an Rtx®-1 and an MXT®-1 column?
Rtx®-1 columns are made with polyimide-coated, fused silica tubing and deactivated with a nonpolar deactivation layer, resulting in the highest degree of tubing inertness. These columns possess a maximum operating temperature of 350°C. MXT®-1 columns are made from unbreakable Silcosteel®-treated stainless steel. The Silcosteel® process bonds a thin, flexible layer to the stainless steel surface, which offers comparable efficiency and inertness to fused silica tubing, with increased durability. The maximum operating temperature of thin-film MXT®-1 columns is 400°C, making them ideal for high-temperature applications. MXT® columns are caged in 4-inch diameter coils or smaller, and are ideal for compact, portable, or process GCs.

Why are Rtx®/MXT®-1 columns so durable?
In general, column lifetime, maximum operating temperature, and efficiency are higher on nonpolar columns. All of Restek's Rtx®/MXT®-1 columns are designed using the Crossbond® process, which bonds the polymer to the fused silica surface and creates a highly cross-linked polymer lattice. Crossbond® columns exhibit extremely low bleed, longer lifetimes, and can be rejuvenated through solvent rinsing or high-temperature thermal conditioning if they get contaminated. Every Restek fused silica column is suspended in a stainless steel frame by a high-temperature string that absorbs shock and reduces the potential for spontaneous breakage.

What is an Integra-Guard™ column?
Guard columns are commonly used to protect and prolong the lifetime of the analytical column by trapping nonvolatile residues. However, for many analysts, the art of attaching a guard column to the analytical column is a mystery. Restek's chemists have discovered the solution to this mystery—the most reliable connection is no connection at all! An Integra-Guard™ column is a continuous length of fused silica tubing, containing both the guard column and the analytical column. No guard tubing is more leak-free than an Integra-Guard™ column! The guard column is tied separately from the analytical column using high-temperature string. The transition area between the columns is the point where the guard column ends and the analytical column begins. Just imagine, guard columns WITHOUT press tight connections. Protecting your capillary column has never been easier!

When would I use an Rtx®-1MS column?
The Rtx®-1MS column is a 100% dimethyl polysiloxane phase designed specifically for GC/mass spectroscopy (MS) applications. When a capillary column is connected to sensitive detector, such as an MS, column bleed can cause a number of problems, such as misidentification of analytes, loss of detector sensitivity, and inaccurate quantitation. Restek has recently developed a new chemistry that allows us to manufacture low-bleed MS phases. The combination of our MS column chemistry and rigorous QA testing ensures that each MS column exceeds the requirements of the most sensitive mass spectrometers. When you require a low-bleed column or high detector sensitivity, use the Rtx®-1MS column. These are also available with built-in Integra-Guard™ columns.

Column Selection Made Easy

3 ***ezGC*™ software**: Restek has Retention Index Libraries that contain more than 3000 compounds analyzed on the most commonly used stationary phases, in 10 different application areas including: petroleum hydrocarbons, solvents & chemicals, flavors & fragrances, FAMEs, pesticides, PCBs, dioxins/ furans, semivolatile, volatile, and drugs of abuse.

Product Listing

Rtx®-1 (fused silica) Crossbond® 100% dimethyl polysiloxane						
ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-60 to 330/350°C	10105	10108	10111	10114
	0.25	-60 to 330/350°C	10120	10123	10126	10129
	0.50	-60 to 330/350°C	10135	10138	10141	10144
	1.0	-60 to 320/340°C	10150	10153	10156	10159
0.32mm	0.10	-60 to 330/350°C	10106	10109	10112	10115
	0.25	-60 to 330/350°C	10121	10124	10127	10130
	0.50	-60 to 330/350°C	10136	10139	10142	10145
	1.00	-60 to 320/340°C	10151	10154	10157	10160
	1.50	-60 to 310/330°C	10166	10169	10172	10175
	3.00	-60 to 280/30°C	10181	10184	10187	10190
	4.00	-60 to 280/30°C		10198		
	5.00	-60 to 260/280°C	10176	10178	10180	
0.53mm	0.10	-60 to 320/340°C	10107	10110	10113	
	0.25	-60 to 320/340°C	10122	10125	10128	
	0.50	-60 to 310/330°C	10137	10140	10143	
	1.0	-60 to 310/330°C	10152	10155	10158	
	1.50	-60 to 310/330°C	10167	10170	10173	
	3.00	-60 to 270/290°C	10182	10185	10188	10189
	5.00	-60 to 270/290°C	10177	10179	10183	10194
	7.00	-60 to 240/260°C	10191	10192	10193	
ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter	
0.10mm	0.10	-60 to 330/350°C	41101	41102		
	0.40	-60 to 320/340°C	41103	41104		
0.18mm	0.20	-60 to 330/350°C	40101	40102	40103	
	0.40	-60 to 320/340°C	40110	40111	40112	

ID	df (µm)	temp. limits	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-60 to 400°C	70105	70116	70117	70114
	0.25	-60 to 360°C	70120	70123	70126	70129
	0.50	-60 to 350°C	70135	70138	70141	70144
	1.00	-60 to 340°C	70150	70153	70156	70159
0.28mm	0.10	-60 to 360°C	70106	70109		
	0.25	-60 to 360°C	70121	70124	70127	
	0.50	-60 to 330°C	70136	70139	70142	
	1.00	-60 to 320°C	70151	70154	70157	
	3.00	-60 to 285°C	70181	70184	70187	
0.53mm	0.25	-60 to 360°C	70122	70125	70128	
	0.50	-60 to 330°C	70137	70140	70143	
	1.0	-60 to 320°C	70152	70155	70158	
	1.50	-60 to 310°C	70167	70170	70173	
	3.00	-60 to 285°C	70182	70185	70188	70189
	5.00	-60 to 270°C	70177	70179	70183	
	7.00	-60 to 250°C	70191	70192	70193	

Fused Silica Guard Columns & Transfer Lines (IP deactivated)			
Nominal ID	Nominal OD	5-Meter (ea.)	5-Meter (6-pk.)
0.10mm	0.363 ± 0.012mm	10041	——
0.18mm	0.34 ± 0.01mm	10046	——
0.25mm	0.37 ± 0.04mm	10043	10043-600
0.32mm	0.45 ± 0.04mm	10044	10044-600
0.53mm	0.69 ± 0.05mm	1045	10045-600

MXT®

Rtx®-1 Columns are available with ***Integra-Guard™*** built-in guard columns.

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