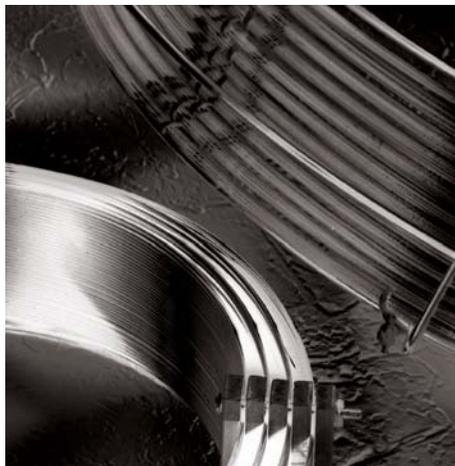


FAST FACTS

At-a-Glance
Product
Information
from Restek



What are Rtx[®]-1701/MXT[®]-1701 columns?

Rtx[®] and MXT[®]-1701 columns are fused silica and Silcosteel[®]-lined stainless steel (respectively) capillary GC columns coated with a 14% cyanopropylphenyl/86% dimethyl polysiloxane stationary phase. Rtx[®]/MXT[®]-1701 columns have an intermediate polarity.

Why use a 14% cyanopropylphenyl/86% dimethyl polysiloxane phase?

The cyano groups in Rtx[®]/MXT[®]-1701 columns impart a unique selectivity toward compounds that possess dipole moments and those that are proton donors or acceptors, such as alcohols and nitriles. Rtx[®]/MXT[®]-1701 columns are extremely versatile, exhibiting long column lifetime, low bleed, and thermal stability to 280°C.

Which applications work well using an Rtx[®]/MXT[®]-1701 column?

These columns are ideal for the analysis of nonpolar to polar compounds and acidic to basic species, all within a single analysis. They also are used for the analysis of alcohols, oxygenates, pesticides, and insecticides. The Rtx[®]/MXT[®]-1701 phase is equivalent to the G46 phase used in United States Pharmacopoeia (USP) Methods, and is frequently listed in US Environmental Protection Agency (EPA) Methods for pesticides and other pollutants.

RESTEK
www.restekcorp.com

800-356-1688
814-353-1300

Rtx[®]-1701/MXT[®]-1701 Capillary Columns

14% cyanopropylphenyl/86% dimethyl polysiloxane

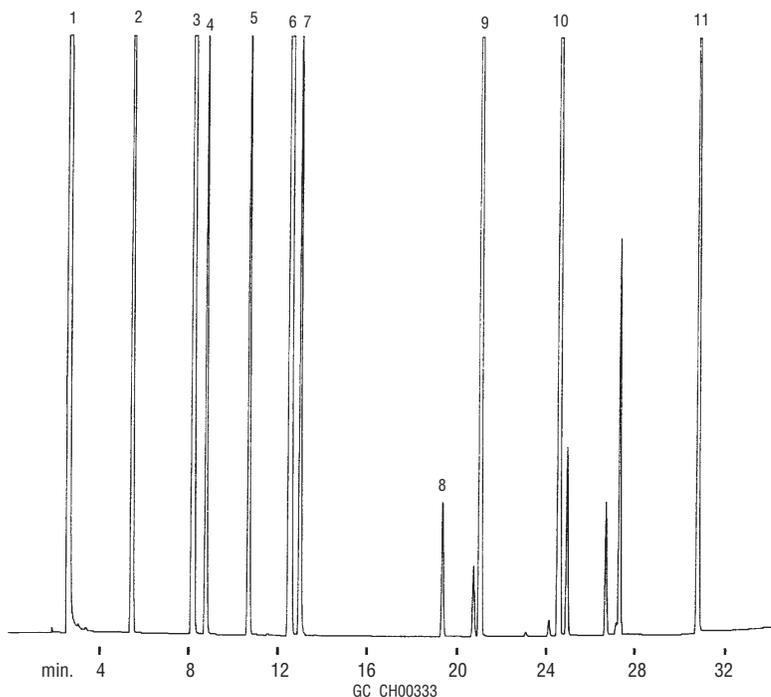
This highly versatile column can be used for a wide range of applications, such as pesticides, solvents, or drug compounds.

Substituted Pyridines on an Rtx[®]-1701 Column

1. methanol
2. benzene
3. toluene
4. pyridine
5. α -picoline
6. 2,6-lutidine
7. β -picoline
8. 4-cyanopyridine
9. 3-cyanopyridine
10. 2-cyanopyridine
11. picamide

60m, 0.53mm ID, 3.0 μ m Rtx[®]-1701 (cat.# 12088)
0.1 μ L direct injection of a substituted pyridine standard
(0.5-5% per component), Uniliner[®] inlet liner

Oven temp.: 60°C to 225°C @ 5°C/min.
Inj. & det. temp.: 230°C
Carrier gas: hydrogen
Linear velocity: 40cm/sec. (flow rate: 5.1cc/min.)
FID sensitivity: 32 x 10⁻¹¹ AFS



See our chromatography products catalog or visit www.restekcorp.com for additional application chromatograms on Rtx[®]-1701/MXT[®]-1701 columns!

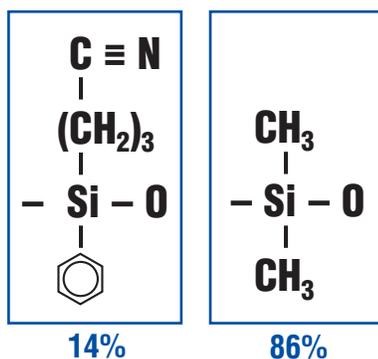
Features & Benefits

Feature	Benefit
Fused silica & MXT [®] tubing	Tubing material versatility—same price regardless of tubing.
Available in a variety of lengths, IDs and film thicknesses	Useful for a wide range of applications.
Low bleed	Increased detector sensitivity. Reduced system maintenance.
Integra-Guard [™] columns	Protects column from non-volatile sample residue; longer column lifetime. Connectionless.

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**FAST
FACTS**At-a-Glance
Product
Information
from Restek**Rtx[®]-1701/MXT[®]-1701**
14% cyanopropylphenyl/
86% dimethyl polysiloxane**Similar Phases****J&W:**
DB[®]-1701**Supelco:**
SPB[™]-1701**Hewlett-Packard:**
HP-1701, HP-624**Alltech:**
AT[®]-1701**SGE:**
BP-10**Chrompack:**
CP-Sil[®] 19CB**Quadrex:**
007-1701**Ohio Valley:**
OV[®]-1701**PerkinElmer:**
Elite[®]-1701**USP Nomenclature:**
G46**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 of the column and acting as a solvent for the sample. The more soluble the solute (your analyte) is in the stationary phase, the more it is retained 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 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 stationary 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 that forms a dipole as a result of the interaction with the stationary phase.

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

Retention indices (RI) are used to measure the overall stationary phase polarity. Retention indices on Rtx[®]/MXT[®]-1701 columns are listed in Table II. They are mathematical calculations used to indicate the elution point of a probe with respect to two straight-chain hydrocarbons. The probes used to measure RI are of different functionalities, each one designated to measure a specific solute-stationary phase interaction. As the RI for a probe on a given phase increases, the degree of specific interaction increases, relative to hydrocarbons.

Table II: 14% Cyanopropylphenyl/86% Dimethyl Polysiloxane Stationary Phase Retention Indices

RI probe	RI	Measured interaction
benzene	721	Electron density for aromatic & olefinic hydrocarbons
<i>n</i> -butanol	778	Proton donor & acceptor capabilities (alcohols and nitriles)
2-pentanone	784	Proton acceptor interaction (ketones, ethers, esters, aldehydes)
nitropropane	881	Dipole interactions

Rtx[®]/MXT[®]-1701 columns are intermediate in polarity and are coated with a 14% cyanopropylphenyl/86% dimethyl polysiloxane stationary phase. The 14% cyano substitution imparts a dipole moment to this stationary phase. Solute-stationary phase interactions occurring in the Rtx[®]/MXT[®]-1701 column include a strong dispersion interaction, plus a selectivity toward aromatic compounds, proton donors or acceptors, and compounds possessing a dipole moment. Rtx[®]/MXT[®]-1701 columns can provide separations of alcohols, nitriles, and halogenated materials that a nonpolar phase cannot.

In summary, when selecting a stationary phase, choose a phase with functional groups similar to those present in your analyte. For a versatile, intermediate-polarity stationary phase, select an Rtx[®]/MXT[®]-1701 column. These columns are the best choice for pesticides, solvents or drug compounds.

? Commonly Asked Questions

What is the difference between an Rtx®-1701 and an MXT®-1701 column?

Rtx®-1701 columns are made with polyimide-coated, fused silica tubing and are deactivated with a nonpolar deactivation layer, resulting in the highest degree of tubing inertness. MXT®-1701 columns are made from unbreakable Silcosteel®-treated stainless steel. The Silcosteel® process bonds a thin, flexible layer to the stainless steel surface, which offers efficiency and inertness comparable to fused silica tubing, with increased durability. MXT® columns are caged in 4-inch diameter coils or smaller, and are ideal for compact, portable, or process GCs. Both columns possess a maximum operating temperature of 280°C.

How do I choose the right -1701 column for my application?

After you've decided whether you want an Rtx®-1701 column or an MXT®-1701 column, based on the answer to the question above, there are three main factors that should be considered when selecting a column: length, inside diameter (ID), and film thickness.

Column length affects the total plate count, which in turn, affects separation. Typical column lengths are 15, 30, 60, and 105 meters. Most separations can be achieved with 30-meter columns. However, if the sample contains very few compounds, a 15-meter column might offer sufficient separation. Alternatively, a 60- or 105-meter column might be required for samples containing large numbers of compounds.

Column ID affects both resolution and sample capacity. Typical column diameters range from 0.10mm ID to 0.53mm ID. Smaller ID columns offer better separation, but less sample capacity. 0.25mm and 0.32mm ID columns offer the best compromise between separation and capacity.

Select film thickness based on the volatility range of the compounds in the sample. As a general rule, use a film thickness of 1.0µm or greater for compounds with boiling points below 200°C. For compounds with boiling points higher than 200°C, use a film thickness of less than 1.0µm.

For answers to specific applications questions regarding Rtx®-1701 columns, contact Restek's Technical Service group, or your Restek representative.

What is an Integra-Guard™ column?

Guard columns are commonly used to trap nonvolatile residues, to protect and prolong the lifetime of the analytical column. 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. The guard column is tied separately from the analytical column, using high-temperature string. Just imagine, guard columns WITHOUT connections - or leaks. Protecting your capillary column has never been easier!

Rtx®-1701/MXT®-1701 Columns

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At-a-Glance
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Information
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Column Selection Made Easy

1 Contact Restek's Technical Service at 800-356-1688 or 814-353-1300, ext. 4. We have more than 25 trained chemists with direct laboratory and applications experience, ready to assist you in choosing the best column.

2 Consult the applications section (hundreds of chromatograms) in Restek's chromatography products catalog, or on-line at www.restekcorp.com

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, semivolatiles, volatiles, and drugs of abuse. ezGC™ software is available from our chromatography products catalog.

Rtx®-1701/MXT®-1701 Columns

FAST FACTS

At-a-Glance
Product
Information
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Rtx®-1701 columns are
available with

Integra-Guard™
built-in guard columns.

Integra-Guard™ Columns

ID	Length	Suffix #
0.25mm	5m	-124
	10m	-127
0.28mm	5m	-243
	10m	-244
0.32mm	5m	-125
	10m	-128
0.53mm	5m	-126
	10m	-129

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Silcosteel

Other trademarks: AT (Alltech Associates),
CP-Sil (Chrompack), DB (J&W Scientific), OV (Ohio
Valley Specialty Chemical Co.), Elite (PerkinElmer),
SPB (Sigma-Aldrich Co.).

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Lit. Cat. #59016

Product Listing

Ordering Information | Rtx®-1701 (fused silica)

(Crossbond® 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25mm	0.10	-20 to 280°C	12005	12008	12011	12014
	0.25	-20 to 280°C	12020	12023	12026	12029
	0.50	-20 to 270/280°C	12035	12038	12041	12044
	1.00	-20 to 260/280°C	12050	12053	12056	12059
0.32mm	0.10	-20 to 280°C	12006	12009	12012	12015
	0.25	-20 to 280°C	12021	12024	12027	12030
	0.50	-20 to 270/280°C	12036	12039	12042	12045
	1.00	-20 to 260/280°C	12051	12054	12057	12060
0.53mm	1.50	-20 to 240/260°C	12066	12069	12072	12075
	0.10	-20 to 270/280°C	12007	12010	12013	
	0.25	-20 to 270/280°C	12022	12025	12028	
	0.50	-20 to 260/270°C	12037	12040	12043	
	1.00	-20 to 250/270°C	12052	12055	12058	
	1.50	-20 to 240/260°C	12067	12070	12073	
	3.00	-20 to 230/250°C	12082	12085	12088	
	ID	df (µm)	temp. limits	10-Meter	20-Meter	40-Meter
0.10mm	0.10	-20 to 280°C	42201	42202		
0.18mm	0.20	-20 to 280°C	42001	42002	42003	
	0.40	-20 to 270/280°C	42010	42011	42012	

*Maximum temperatures listed are for 15- and 30-meter lengths.

Longer lengths may have a slightly reduced maximum temperature.

Ordering Information | MXT®-1701 (Silcosteel®-treated stainless steel)

(Crossbond® 14% cyanopropylphenyl/86% dimethyl polysiloxane)

ID	df (µm)	temp. limits*	15-Meter	30-Meter	60-Meter
0.25mm	0.25	-20 to 280°C	72020	72023	72026
	0.50	-20 to 280°C	72035	72038	72041
	1.00	-20 to 280°C	72050	72053	72056
0.28mm	0.25	-20 to 280°C	72021	72024	72027
	0.50	-20 to 270°C	72036	72039	72042
	1.00	-20 to 260°C	72051	72054	72057
0.53mm	1.50	-20 to 250°C	72066	72069	72072
	0.25	-20 to 280°C	72022	72025	72028
	0.50	-20 to 270°C	72037	72040	72043
	1.00	-20 to 260°C	72052	72055	72058
	1.50	-20 to 250°C	72067	72070	72073
	3.00	-20 to 240°C	72082	72085	72088
	ID	df (µm)	temp. limits	10-Meter	20-Meter
0.18mm	0.20	-20 to 270/280°C	71871	71872	71873
	0.40	-20 to 270/280°C	71874	71875	71876

*Maximum temperatures listed are for 15- and 30-meter lengths.

Longer lengths may have a slightly reduced maximum temperature.

See our chromatography products catalog for
additional product information, or visit www.restekcorp.com

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