FAST FACTS At-a-Glance Product Information from Restek

GC Capillary Column Guard Columns

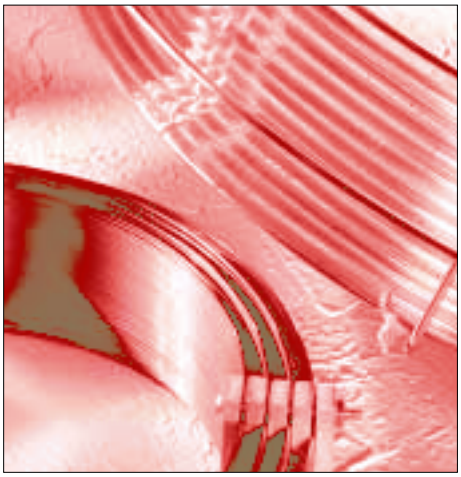
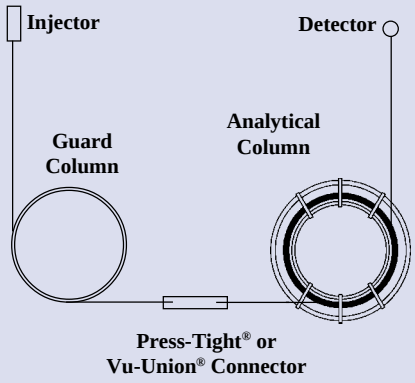


Figure 1: A guard column can protect your analytical column and ensure reproducible analyses.



What are guard columns?

Guard columns are short lengths of deactivated, uncoated fused silica or metal tubing placed between the injection port and the analytical column. They protect and prolong the lifetime of an analytical column (Figure 1).

Why use a guard column?

Capillary gas chromatography (GC) guard columns protect analytical columns in several ways. Guard columns trap nonvolatile residues, preventing them from collecting at the head of the analytical column. These nonvolatile residues may be very high molecular weight organic compounds, inorganic salts, or particulates. If these contaminants enter the analytical column, they can cause adsorption of active compounds, loss of resolution, and poor peak symmetry. When this contamination begins to affect sample analysis, a small section of the analytical column must be removed to restore proper performance. Each time a section of the analytical column is removed, retention times change, and some resolution is lost. By using a guard column and removing contaminated loops from it instead of the analytical column, the inertness and length of the analytical column remains intact.

Guard columns allow more injections to be made before contamination interferes with analytical results. Because there is no stationary phase coated on a guard column, the amount of time the sample spends in the guard column is reduced. This reduces the interaction between sample components and contamination from nonvolatile residue.

Which applications would benefit from using a guard column?

A guard column is recommended when analyzing samples that can contain nonvolatile residues or high molecular weight contaminants, such as environmental semivolatile, pesticide, PCB, herbicide, or diesel range organic (DRO) analyses; drugs of abuse in blood or urine; and fats and oil in food products. A guard column also is recommended when performing on-column injections. The guard column protects the analytical column from syringe needle damage and sample contamination that can occur in on-column injections.

Features & Benefits

Feature	Benefit
Fused silica & MXT® tubing	*Tubing material versatility—same price regardless of tubing.*
Protects the analytical column	*Increases column lifetime, reduces maintenance, and decreases column expenses.*
Different deactivations available	*Improves wettability for the sample, increases column efficiency, and enhances sample transfer.*
Integra-Guard™ columns	*Leak-free connection, protects column from non-volatile sample residue, longer column lifetime.*

See our Chromatography Products catalog or visit www.restekcorp.com for additional information.

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Commonly Asked Questions

When should a guard column be replaced?

The guard column should be replaced as it becomes contaminated with nonvolatile residue. At this point, the performance of the entire chromatographic system will begin to deteriorate. This normally is exhibited as a drastic decrease in the response of active compounds and peak tailing.

What is the life expectancy of a guard column?

The life expectancy of a guard column depends on its length, the amount of nonvolatile residue in the samples, and the number of samples injected on the column. When analyzing dirty samples, the guard column becomes contaminated quickly. Normally, contamination deposits in the first meter of the guard column. If a short guard column (1m) is used, it must be completely replaced when it becomes contaminated. If a longer guard column (5m) is used, the contaminated sections can be removed without having to reconnect it to the analytical column.

How long of a guard column do I need?

A guard column should be long enough to keep non-volatile residue from entering the column, but short enough so that the analysis time is not increased. Five-meter guard columns are more cost effective, reduce the frustrations of making the connection between the guard column and analytical column, and are preferred by most analysts over shorter-length guard columns. Ten-meter guard columns often are used when analyzing very dirty environmental samples. If a very long guard column (>10 meters) is used, the residence time of sample components increases, resulting in slightly longer analysis times. Guard columns over 30-meters long can cause peak distortion and a loss in efficiency; they are not recommended.

Choosing the Correct Guard Column for Your Analysis

Several types of guard columns are available. The choice of guard column should be made depending upon whether wettability is of primary concern, or if the tubing is simply being used as a transfer line to carry the sample from an inlet device to the column or from the column outlet to the detector. Wettability is the ability for the sample to spread out evenly on the guard column surface without repulsion into droplets. This is important to focus sample bands or trap non-volatile residue.

Intermediate Polarity (IP) Tubing

- Make the connection once and break off 1/2-meter sections as contamination occurs.
- Includes Grob test chromatogram for each tubing lot.
- Phenylmethyl-deactivated surface provides optimum wettability for both polar and non-polar compounds.

In most cases, the standard IP (intermediate polarity) tubing should be chosen. The IP surface contains a high percentage of phenyl groups, which allow common solvents (methylene chloride, iso-octane, and toluene) to easily wet and create a uniform film on the tubing surface. More polar solvents (methanol) also will wet the IP surface if they are co-solvated with methylene chloride or iso-octane.

Fused Silica Guard Columns/Transfer Lines (IP Deactivated)

Nom. ID	Nom. OD	1-Meter	5-Meter	10-Meter	30-Meter*	60-Meter*†
0.025mm	0.363 ± 0.012mm	10097	—	—	—	—
0.05mm	0.363 ± 0.012mm	10098	10040	—	—	—
0.075mm	0.363 ± 0.012mm	10099	—	—	—	—
0.10mm	0.363 ± 0.012mm	10100	10041	—	—	—
0.15mm	0.363 ± 0.012mm	10101	10042	—	—	—
0.18mm	0.34 ± 0.01mm	10102	10046	—	—	—
0.25mm	0.37 ± 0.04mm	—	10043	10049	10012	10013
0.32mm	0.45 ± 0.04mm	—	10044	10048	10022	10023
0.53mm	0.69 ± 0.05mm	—	10045	10047	10032	10033

Fused Silica Guard Column 6-Packs (IP Deactivated)

Nom. ID	Nom. OD	5-Meter	10-Meter
0.05mm	0.363 ± 0.012mm	10040-600	—
0.25mm	0.37 ± 0.04mm	10043-600	10049-600
0.32mm	0.45 ± 0.04mm	10044-600	10048-600
0.53mm	0.69 ± 0.05mm	10045-600	—

MXT® Guard Columns/Transfer Lines (IP Deactivated)

Nom. ID	Nom. OD	5-Meter	5-Meter (6-pk.)	10-Meter
0.28mm	0.53 ± 0.025mm	70044	70044-600	70046
0.53mm	0.74 ± 0.025mm	70045	70045-600	70047

Use Press-Tight® connectors with your guard columns.

Restek Press-Tight® connectors are lightweight, easy to use and install. We have thoroughly investigated the taper angle and tolerances to ensure a leak-tight fit on every connection with fused silica tubing having ODs ranging from 0.3 to 0.75mm (0.18 to 0.53mm IDs). They are available in straight, angled, "Y," angled "Y," and "X" configurations. Also, Restek offers Press-Tight® connectors deactivated with our high-temperature silanization or the highly-inert Siltek™ deactivation. Refer to the *Restek Chromatography Products Guide* for more information.

Polar-Deactivated Tubing

- Provides optimum wettability for polar compounds.
- Minimizes peak splitting when using polar solvents such as methanol and water.
- Polyethylene glycol deactivation layer.
- Compatible with Stabilwax®, Rtx®-225, and Rtx®-2330 capillary columns.

If methanol or water is the primary solvent, then polar surfaces should be used such as our polar-deactivated tubing. The polar deactivated surface is not resistant to harsh water vaporization, which occurs when water in the liquid state is injected onto the tubing surface and rapidly vaporized (such as in steam cleaning).

Fused Silica Guard Columns (Polar-Deactivated)					
Nom. ID	**Nom. OD**	**5-Meter**	**10-Meter**	**30-Meter***	**60-Meter*†**
0.25mm	0.37 ± 0.04mm	10065	10068	10014	10015
0.32mm	0.45 ± 0.04mm	10066	10069	10024	10025
0.53mm	0.69 ± 0.05mm	10067	10070	10034	10035

Hydroguard™ Tubing

- Withstands harsh "steam-cleaning" chromatography processes.
- Reduces effects of dirty samples on column performance.
- Reduces downtime and maintenance.

Hydroguard™ tubing is preferred for situations where there is harsh water varporization. When transfer lines carry condensed water vapor, the deactivated tubing of a column quickly becomes active because of the creation of free silanol groups. These silanol groups subsequently cause adsorption of active oxygenated compounds such as alcohols and diols. Restek has addressed this problem by designing Hydroguard™ deactivation. By using a unique deactivation chemistry, the resulting high-density surface is not readily attacked after an aggressive hydrolysis treatment. The high-density surface coverage effectively prevents water vapor from reaching the fused silica surface beneath the Hydroguard™ deactivation layer. However, the Hydroguard™ surface is not easily wetted by polar solvents and will cause bead formation or repulsion if samples pass through the tubing at temperatures 20°C less than the boiling point.

Hydroguard™ Fused Silica Guard Columns/Transfer Lines					
Nom. ID	**Nom. OD**	**5-Meter**	**10-Meter**	**30-Meter***	**60-Meter*†**
0.05mm	0.363 ± 0.012mm	10075	—	—	—
0.10mm	0.363 ± 0.012mm	10076	—	—	—
0.15mm	0.363 ± 0.012mm	10077	—	—	—
0.18mm	0.34 ± 0.01mm	10078	—	—	—
0.25mm	0.37 ± 0.04mm	10079	10082	10085	10088
0.32mm	0.45 ± 0.04mm	10080	10083	10086	10089
0.53mm	0.69 ± 0.05mm	10081	10084	10087	10090

Hydroguard™ Fused Silica Guard Column 6-Packs		
Nom. ID	**Nom. OD**	**5-Meter (6-pk.)**
0.25mm	0.37 ± 0.04mm	10079-600
0.32mm	0.45 ± 0.04mm	10080-600
0.53mm	0.69 ± 0.05mm	10081-600

Hydroguard™ MXT® Guard Columns/Transfer Lines					
Nom. ID	**Nom. OD**	**5-Meter**	**10-Meter**	**30-Meter***	**60-Meter*†**
0.28mm	0.53 ± 0.025mm	70080	70083	70086	70089
0.53mm	0.74 ± 0.025mm	70081	70084	70087	70090

**30- and 60-meter lengths are banded in 5-meter sections.*
†We recommend cutting 60-meter guard column into shroter lengths to avoid peak distortion.

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Commonly Asked Questions, cont.

Which type of guard column deactivations should I use for my analysis?

Intermediate-polarity deactivation (IP): Use IP deactivation tubing for both non-polar and moderately polar organic solvents such as methylene chloride, pentane, hexane, ethyl acetate, iso-octane, toluene.

Polar deactivation (P): Use polar deactivation for polar sample solvents, such as methanol and water.

Base-deactivation: Use base deactivation when analyzing basic samples, such as mono, di-, and tri-amines, ethanolamines, alkanolamines, and nitrogen-containing heterocycles.

Siltek™ deactivation: Use Siltek™ deactivation for active compound analysis, such as pesticides, herbicides, and explosives. Siltek™ deactivation also is suitable for samples with a wide pH range. Siltek™ is recommended for purge and trap transfer lines.

Hydroguard™ tubing: Use Hydroguard™ tubing in situations where there is harsh water varporization.

Capillary Column Guard Columns

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Other Tubing Materials

In addition to different inner surfaces, different tubing materials are available. While fused silica is the most common, MXT® (Silcosteel®-treated) tubing is available for more harsh applications. Use MXT® tubing if your column will be subjected to mechanical stress or thermal shock.

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Lit. Cat. #59319

Specialized Deactivations

Specialized deactivations are available for unique applications. Chemists using guard columns during the analysis of basic compounds frequently experience peak tailing and low recovery. This problem occurs because the deactivated surface of the guard column can be adsorptive to basic compounds. Restek offers base-deactivated guard columns for completely inert pathways for basic compounds. Restek also offers the new Siltek™ deactivation process, which produces a highly-inert surface and features high temperature stability, extreme durability to wide pH ranges, and low bleed. Siltek™ deactivation currently provides the best inertness towards chlorinated pesticides and explosive analyses.

Base-Deactivated Fused Silica Guard Columns

- Provides excellent inertness for the analysis of basic compounds.
- Tested with basic amine test mix (chromatogram included).
- Recommended for use with Rtx®-5 Amine and Stabilwax®-DB capillary columns.

Fused Silica Guard Columns (Base-Deactivated)

Nom. ID	Nom. OD	5-Meter	5-Meter (6-pk.)
0.25mm	0.37 ± 0.04mm	10000	10000-600
0.32mm	0.45 ± 0.04mm	10001	10001-600
0.53mm	0.69 ± 0.05mm	10002	10002-600

Siltek™-Deactivated Fused Silica Guard Columns Product Listing

- Revolutionary deactivation process lowers analyte breakdown to less than 1%.
- Minimizes bleed.
- Ideal for chlorinated pesticide analysis.
- Analyzes tough samples quickly and accurately.
- Recommended for use with Rtx®-CLPesticides and Rtx®-TNT columns.

Siltek™-Deactivated Fused Silica Guard Columns

Nom. ID	Nom. OD	5-Meter	10-Meter
0.25mm	0.37 ± 0.04mm	10026	10036
0.32mm	0.45 ± 0.04mm	10027	10037
0.53mm	0.69 ± 0.05mm	10028	10038

Integra-Guard™ Columns

- Continuous length of tubing containing both the guard column and the analytical column.
- Guaranteed leak-free.

Restek also offers a wide variety of Integra-Guard™ capillary columns featuring a leak-free connection. Integra-Guard™ columns are available in many phases (Table 1). 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 permanent and leak-free than an Integra-Guard™ column! The guard column is tied separately from the analytical column using high-temperature string. Just imagine—guard columns *without* press-tight connections—protecting your analytical column has never been easier!

Ordering is simple. Just add the appropriate suffix number and price to the analytical column's catalog number and price. For example, a 30m, 0.25mm ID, 0.25µm Rtx®-5 with a 5-meter Integra-Guard™ column is cat.# 10223-124.

Integra-Guard™ Columns

ID	5-Meter (suffix #)	10-Meter (suffix #)
0.18mm	-135	-136
0.25mm	-124	-127
0.28mm	-243	-244
0.32mm	-125	-128
0.53mm	-126	-129

Table I: Phases currently available as Integra-Guard™ columns.

Rtx®-1	Rtx®-5MS	Rtx®-624	Rtx®-20
Stabilwax®	Rtx®-1MS	XTI®-5	Rtx®-1701
Rtx®-35	Rtx®-5	Rtx®-1301	Rtx®-Volatiles
Rtx®-BAC 1 & 2		Rtx®-5Sil MS	