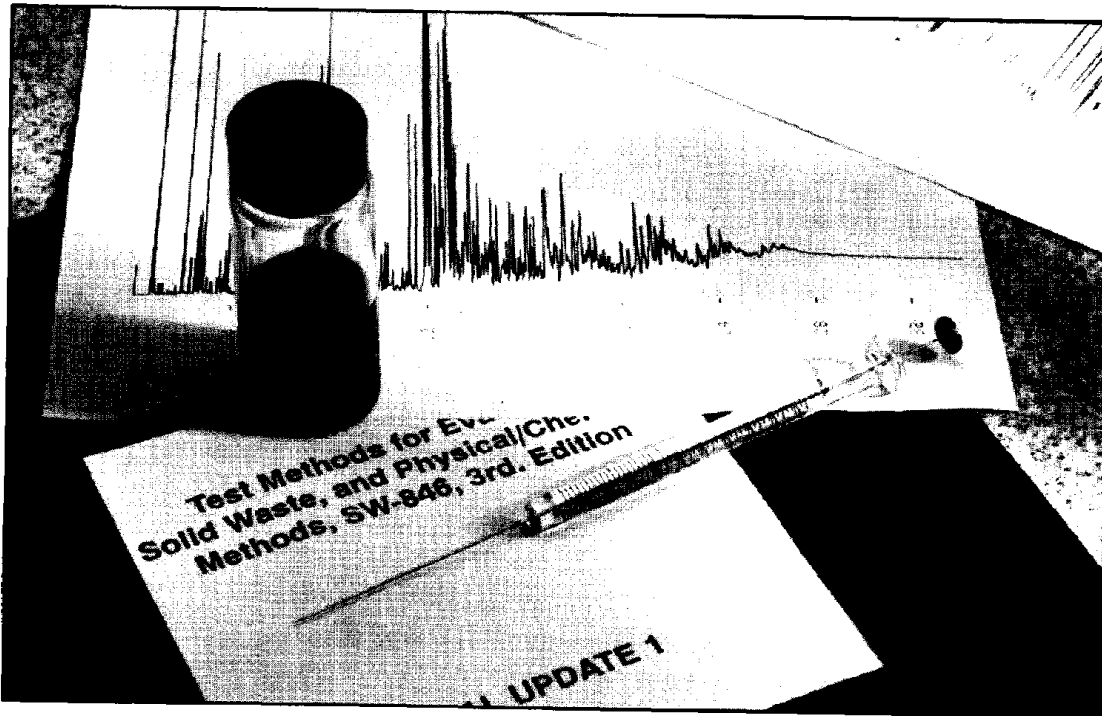


A Guide When Injecting Dirty Samples



This guide presents:

- The effects of dirty samples on capillary column performance.
- The use of packed inlet sleeves for filtering non-volatile residue.
- The benefits of using a guard column to protect the analytical column.
- Techniques for connecting the guard column to the analytical column.

From
Chromalytic
Australian Distributor
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Fax : (03) 761-1169
Chromalytic Technology Pty Ltd



This guide presents information that will help you prolong the lifetime of your capillary column and maximize the number of sample injections before sample residue degrades column performance. Many extracted samples contain salts, particulates, pyrolyzates, and high molecular weight residues that rapidly build up on the front of the column. These contaminants eventually degrade analytical results and require inlet and column maintenance to restore the chromatographic performance to acceptable levels. By using a packed inlet sleeve and attaching a Smeter guard column to the inlet of the analytical column, analysts can greatly increase the number of sample injections before maintenance is required. The reduction in down time makes packed inlet sleeves and guard columns a cost effective technique for handling dirty samples.

Index

Dirty Samples	2
Use Packed Inlets to Filter Residue	3
Guard Columns	5
Accessories	
Guard Columns & Transfer Lines	9
Press-Tight" Connectors	10
Scoring Tools	11
Inlet Sleeve Packing Materials	12

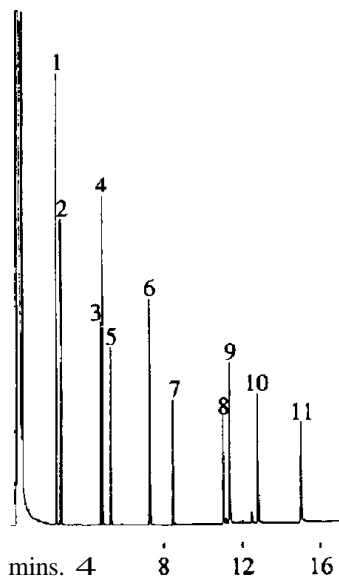
Dirty Samples

Dirty samples drastically affect quantitative results and increase the down time in your laboratory. Non-volatile contaminants such as high molecular weight compounds, septa particles, derivatization reagents, salts, or pyrolyzates adhere to the inlet sleeve wall and begin to interact with target analytes. As the layer of residue thickens, active compounds adsorb or break down causing reduced response. Figure A illustrates this effect when highly active phenols are analyzed on a clean and dirty inlet sleeve. The response of the 2,4_dinitrophenol is reduced due to adsorptive affects in the inlet liner.

Figure A - 2,4-dinitrophenol is adsorbed after several injections of a dirty sample.

Initially, 2,4-dinitrophenol responds well on a clean, deactivated inlet sleeve. After several injections of a contaminated sample, response is greatly diminished due to the sample's interaction with non-volatile residue.

Clean, deactivated inlet sleeve

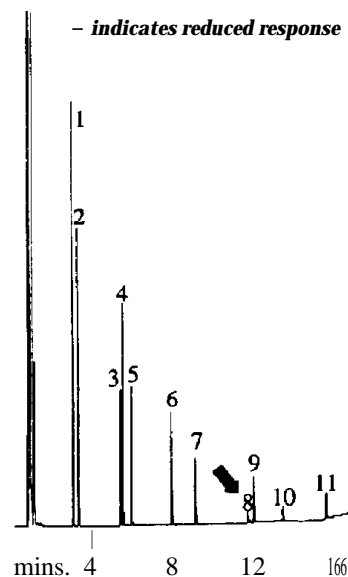


1. phenol
2. 2-chlorophenol
3. 2-nitrophenol
4. 2,4_dimethylphenol
5. 2,4-dichlorophenol
6. 4-chloro-3-methylphenol
7. 2,4,6-trichlorophenol
8. 2,4_dinitrophenol
9. 4-nitrophenol
10. 2-methyl-4,6-dinitrophenol
11. pentachlorophenol

15m, 0.32mm ID, 1.0um Rtx"-5 (cat.# 10251)
0.2-1 split injection of 604 Phenols Mix (cat.# 31029)

Oven temp.: 80°C to 290°C @ 8°C/min.
Inj. & det. temp.: 310°C
Carrier gas: hydrogen
Linear velocity: 45cm/sec. set @ 80°C
HD sensitivity: 16 x 10⁻¹¹ AES
Split ratio: 9:1

After dirty sample injections



mins. 4 8 12 16

Use Packed Inlets to Filter Residue

The best place to start removing contaminants is with sample preparation. However, if you do not have control over sample preparation or if you have cleaned the sample and still have not removed all of the contamination, the next best place to remove contaminants is in the inlet. By using an inlet packed with wool or beads, most of the contaminants can be removed before they reach the analytical column. Cycles or glass screws are also very effective in filtering contaminants and offer additional benefits over glass wool or beads.



Precautions when using packed inlets:

Never use stationary phase coated packings in the inlet because the stationary phase can bleed onto the analytical column. This problem is particularly pronounced if a packing coated with a silicone stationary phase bleeds onto a Carbowax-type capillary column, causing a polarity change. In addition, support materials used in packed columns are often active and contain impurities that increase adsorptive effects.

Are all wool types the same?

Both silanized glass and fused silica wool are commonly used for packing inlet sleeves. Glass wool tends to be easier to handle because it is more flexible than fused silica wool. Fused silica wool tends to be more inert due to the reduced metal content.

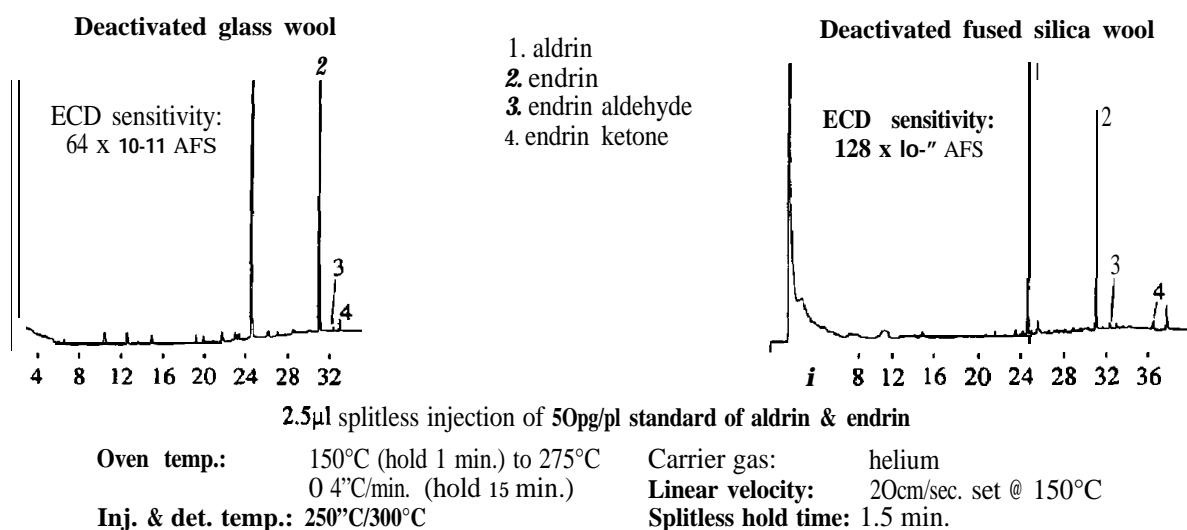
Wool should be chosen based upon the types of compounds to be analyzed. When analyzing the active compounds, deactivated wool is required since untreated wool can cause breakdown and adsorption of certain components. Silanized fused silica wool is recommended over glass wool when active samples containing phenols are analyzed. When analyzing non-reactive compounds such as hydrocarbons, any type of wool can be used.

Can wool activity be monitored?

Several tests have been developed to monitor wool activity. One such test is the Endrin Breakdown Assay. Endrin, an organochlorine pesticide, has been shown to break down into endrin aldehyde and endrin ketone when exposed to active surfaces at elevated temperatures. It was felt that by monitoring endrin breakdown levels, the inertness of a wool sample could be determined. The determination of endrin breakdown on various types of wool often does not give a true indication of wool activity. Figure B shows endrin breakdown on deactivated glass wool compared to deactivated fused silica wool. Both types of wool show virtually no endrin breakdown. This indicates that using inlet sleeves packed with borosilicate or fused silica wool will not significantly effect endrin breakdown.

Another more stringent test that can be used to monitor wool inertness, is the response of phenols. Several phenols specified in EPA method 604 can be adsorbed by active wool. Adsorption leads to reduced response, and in extreme cases, will completely eliminate all response for certain phenols. Figure C (pg.4) shows the analysis of

Figure B - The endrin breakdown test shows that both borosilicate and fused silica wool perform well for pesticide analysis.

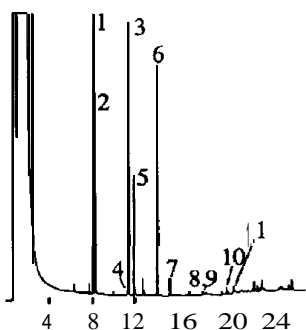


EPA method 604 phenols using deactivated glass wool and deactivated fused silica wool. The low response of 2,4-dinitrophenol, 2-methyl-4,6-dinitrophenol, and pentachlorophenol on the deactivated glass wool indicates

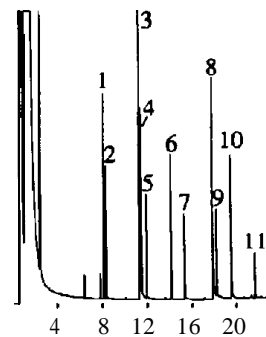
adsorption of these compounds. The deactivated fused silica wool shows good response for all phenols specified in EPA method 604.

Figure C - Analysis of EPA method 604 phenols shows adsorption on deactivated glass wool, but not on deactivated fused silica wool.

Deactivated glass wool



Deactivated fused silica wool



- 1, phenol
- 2, 2-chlorophenol
- 3, 2-nitrophenol
- 4, 2,4-dimethylphenol
- 5, 2,4-dichlorophenol
- 6, 4-chloro-3-methylphenol
- 7, 2,4,6-trichlorophenol
- 8, 2,4-dinitrophenol
- 9, 4-nitrophenol
- 10, 2-methyl-4,6-dinitrophenol
- 11, pentachlorophenol

30m, 0.32mm ID, 1.0um XTI[®]-5 (cat.# 12254)
 2.0ul direct injection of 20pg/ml 604 Phenols Mix (cat.# 31029)

Oven temp.: 40°C (hold 1 min.) to 240°C @ 8°C/min. (hold 10 min.)
 Inj. & det. temp.: 230°C/290°C
 Carrier gas: hydrogen
 Linear velocity: 40cm/sec. set @ 40°C
 FID sensitivity: 8 x 10⁻¹¹ AFS

Positioning the wool in an inlet sleeve:

GC manufacturers usually specify the exact depth and length of the wool plug in an inlet sleeve. Normally, the wool is placed approximately 1cm from the maximum penetration distance of the syringe needle tip. But, some GC manufacturers position the wool so that the needle penetrates the wool plug and wipes any remaining sample droplets from the needle tip after an injection. Usually, a 1 to 2cm wool plug is lightly packed into the sleeve. It is better to use a smaller plug of wool and replace it more often. Longer lengths or densely packed wool plugs increase active sites and decrease system inertness. It is important to pack wool loosely or a loss of inertness can occur.

Care should be taken when inserting wool into a sleeve.

Care must be taken when inserting the wool into a sleeve or the fibers will fracture, exposing active sites that cause sample adsorption. The more manipulation during insertion, the greater the risk of creating active sites on the wool. Special wool insertion tools are available to minimize the manipulation of wool when inserting it into the sleeve (mini wool puller, cat.# 20114). These tools incorporate a miniature fork on one end to force the wool



through small orifices. The other end usually incorporates a hook that makes removal easy. Care should be taken to handle wool with gloves and forceps to prevent finger oil contamination.

Using a Cyclosplitter* in place of wool*:

A Cyclosplitter" sleeve employs a cylindrical glass screw to increase vaporization and trap non-volatile residue, making it a good alternative to wool. Unlike wool, the Cyclosplitter" can be cleaned and reused. In addition, wool tends to fragment and expose active sites as it is being packed in the inlet. Since the entire Cyclosplitter" sleeve is deactivated as a single unit, the variability between sleeves is reduced and all active sites can be covered. Analysts have reported that they can achieve five times more injections with a cycle sleeve design compared to sleeves packed with glass wool. Glass wool tends to layer the dirt throughout the wool plug increasing the adsorptive surface area, while cycle inlet liners stop the dirt on the first two turns of the glass screw.



* See Restek's general catalog for a full line of inlet sleeves.

Guard Columns

Packed inlets only remove a portion of the residue. High molecular weight compounds can still deposit on the column inlet and degrade chromatographic performance. The use of guard columns to protect the analytical column from highly retentive compounds and particles has been commonplace for many years in HPLC. Their use as safeguards is well understood. It has only been in the past few years that the benefits of guard columns have been associated with capillary gas chromatography. Although guard columns prolong the life of capillary columns and protect them from sample contamination, they are not widely used in many laboratories. Understanding the basics of guard columns helps to dispel confusion and apprehension about their use.

What is a guard column?

A guard column for capillary chromatography is a short length of deactivated, uncoated fused silica tubing that is placed between the injection port and the analytical column. Figure D shows a diagram of a guard column connected to an analytical column.

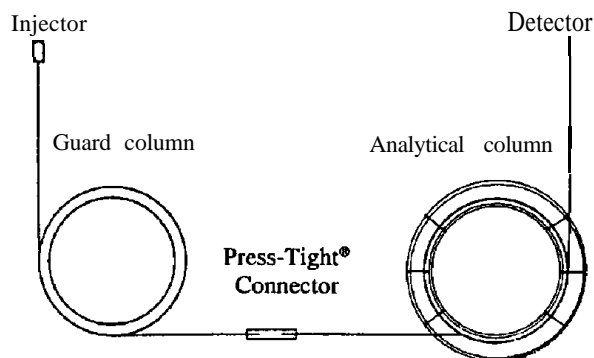
What advantages do guard columns offer?

Prolong column lifetime

A guard column protects and prolongs the lifetime of an analytical column in several ways. It traps non-volatile residues and prevents them from collecting at the head of the analytical column. These non-volatile residues may be very high molecular weight organic compounds, inorganic salts, or particulate materials. 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, some resolution is lost, and column length is decreased, eventually resulting in a useless column. By removing contaminated loops from the guard column, the inertness and length of the analytical column remains intact.

Figure D - A guard column connected to an analytical column.

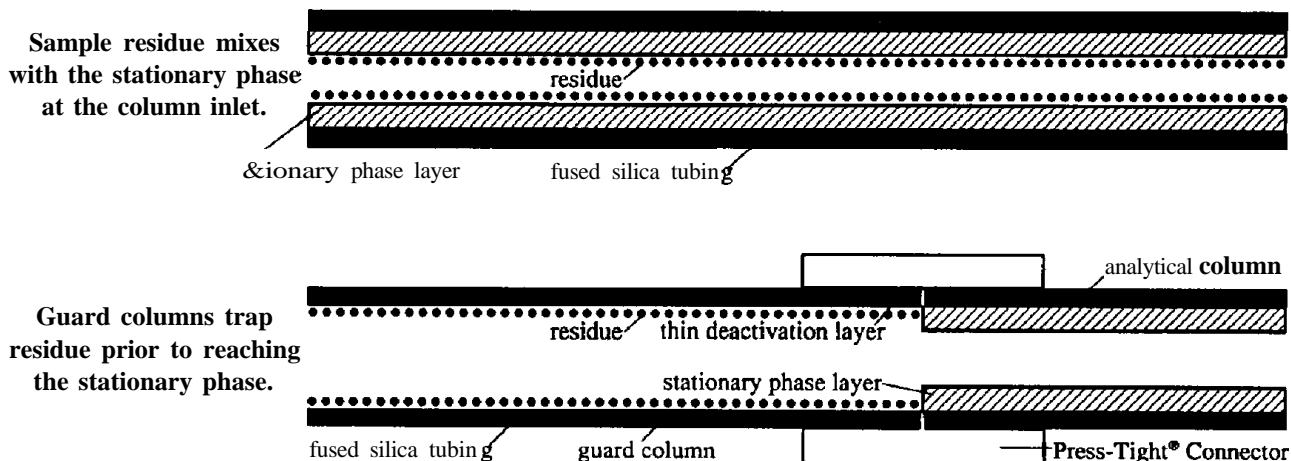


Decrease maintenance requirements

The amount of time the sample spends in the guard column is minimized since there is no stationary phase. This reduces the interaction between sample components and contamination from non-volatile residue (Fig. E). Therefore, guard columns allow more injections to be made before contamination interferes with analytical results.

Figure E

Sample residue deposits approximately 1-meter into the column inlet. When dirt is deposited onto a stationary phase, the sample must partition in and out of this dirty region and adsorptive effects are more likely to occur. Guard columns stop dirt but do not retain the sample since there is no stationary phase. The interaction between the residue and subsequent sample injections is minimal and more injections can be performed before maintenance is required.



Improve resolution

Many analysts are reluctant to use guard columns because they believe that they will lose resolution. In fact, guard columns actually increase separation efficiency. The guard column acts as a retention gap to help focus the sample into a narrow band at the head of the column. When a sample is injected, it first exists as vapor and aerosol. Without a guard column, the vapor begins to partition in and out of the column's stationary phase. The aerosol portion of the sample does not partition in the phase and moves out ahead of the vaporized sample. This results in broader, less efficient peaks and, in extreme cases, can

cause split peaks. Since a guard column is not coated with stationary phase, there is little interaction with the vaporized sample or the aerosol. They move along together in a tighter band. The aerosol vaporizes in the guard column and is uniformly vaporized when the sample reaches the coated column. This produces sharper, more efficient peaks. Table 1 shows the results of analyzing 2,6-dimethylphenol on a 30m, 0.53mm ID, 1.0um Stabilwax™ column with and without a guard column. The efficiency of the 2,6-dimethylphenol peak was measured in each case and the results show a 3.1% increase in efficiency with the guard column.

Table 1 - Column Efficiency Data

(1ul split injection of 2,6-dimethylphenol)

30m, 053mm ID, 1.0um Stabilwax*

Without a guard column	With a guard column
total plates= 51500	total plates= 53100
plates/meter= 1716	plates/meter= 1770

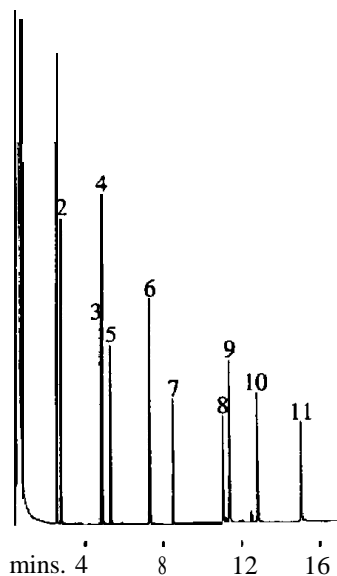
3.1% increase in plates

When should a guard column be replaced?

As the guard column becomes contaminated with non-volatile residue, the performance of the entire chromatographic system will begin to deteriorate. This is normally exhibited as a drastic decrease in the response of active compounds. Figure F shows the analysis of phenols on an Rtx™-5 with a guard column. The phenol response is excellent. Figure F also shows the same analysis after repeated injections of a sample containing significant quantities of non-volatile residue. The reduction in the response of 2,4-dinitrophenol and pentachlorophenol indicates that the guard column is contaminated and must be replaced.

- Figure F

Phenols show excellent response on an newly installed guard column.



1. phenol
- 2.
3. 2-nitrophenol
4. 2,4-dimethylphenol
5. 2,4-dichlorophenol
6. 4-chloro-3-methylphenol
7. 2,4,6-trichlorophenol
8. 2,4-dinitrophenol
9. 4-nitrophenol
10. 2-methyl-4,6-dinitrophenol
11. pentachlorophenol

Mm, 0.32mm ID, 1.0um Rtx™-5 (cat.# 10251)
split injection of phenols

Oven temp.: 80°C to 290°C
det.temp.: 310°C
Carrier gas: hydrogen Split ratio:9:1

Reduced response factors show guard column contamination.



Linear velocity: cm/sec. set @ 80°C
sensitivity: 8 x AFS

How often must a guard column be replaced?

The life expectancy of a guard column depends on the length of the guard column, the amount of non-volatile residue in the samples, and the number of samples run. 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 (1-meter) is used, it must be completely replaced when it becomes contaminated. If a longer guard column (5-meters) is used, the contaminated section can be removed many times without reconnecting the analytical column.

How long should a guard column be?

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 significantly 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 1-meter guard columns. 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 and are not recommended.

How is the guard column connected to the analytical column?

A Press-Tight" Connector is the simplest and most common way to connect a guard column to the analytical column. These connectors do not require ferrules and work on the principle of radial compression. Once heated, the polyimide on the outside of the tubing bonds to the inside of the connector, making a permanent, leak-free seal. There are several key steps to ensure a leak-free seal. First, cut the column ends squarely with a sapphire scribe or a ceramic scoring wafer. (Pointed scoring devices are not recommended.) Second, clean and lubricate the tubing by wiping the ends with a tissue moistened with methanol or toluene. Next, firmly insert the tubing into the connector taper and check for leaks. If no leaks are found, bond the tubing to the connector by heating it to 200°C for 30 minutes.

How does a Press-Tight" Connector work?

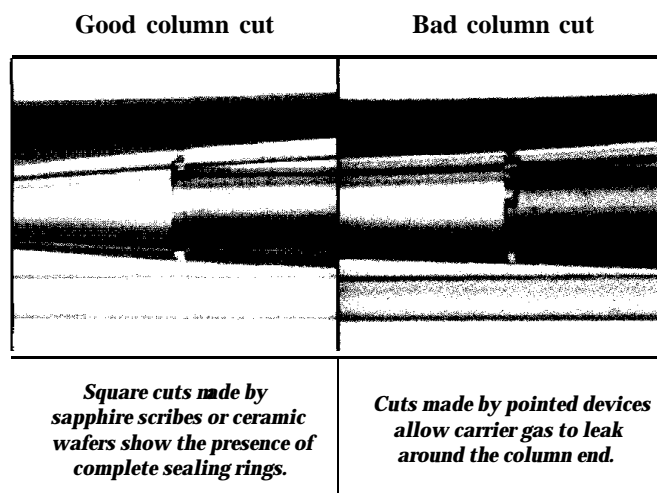
Press-Tight" Connectors form a leak-tight seal by utilizing concentric compressive forces as the tubing end is pushed

into a tightly controlled radial restriction. These forces are strong enough to form a leak-tight seal under the normal pressures used in capillary gas chromatography. The seal is further strengthened as the column's exterior polyimide coating bonds to the inner surface of the connector after several thermal cycles.

Obtaining a leak-tight seal.

In order to achieve optimum performance from any of these connectors, begin with properly cut fused silica and guard columns. A poorly cut capillary column will produce an inadequate seal which will allow oxygen and moisture to permeate into the carrier gas and damage the analytical column.

Fused silica scoring devices have undergone several generations of improvement. Currently, a sapphire scribe (cat.# 20115) or a ceramic scoring wafer (cat.# 20116) appears to be the most effective scoring tool, producing the most consistent cuts. Pointed devices such as diamond tipped pens or tungsten carbide scribes should never be used. Once the type of tool has been decided upon, it is wise to find an old column for practicing scoring and examining the fused silica ends. A good cut allows a leak-free seal to be maintained while a bad cut will always cause the Press-Tight@ to leak unexpectedly. Use a magnifier (cat.# 20124) to closely examine the integrity of the cut.



Once the cut is clean and square, remove finger oils and lubricate the column ends by wiping them with a towel moistened with methanol or toluene. Moistening with a solvent helps lubricate the tubing, allowing it to slide further into the connector, creating a better seal. The tubing should be inserted into the Press-Tight' Connector until the end is firmly gripped by the radial restriction. Be careful not to crush the column end when inserting it into the connector. A proper connection exhibits a brown ring all the way around the column end. This ring indicates

Restek's wizards are always ready to serve your needs.. .
For technical service and orders, call:
800-356-1 688

compression of the polyimide coating around the entire column end and must be present for a proper seal. Use a magnifier (cat.# 20124) to inspect the ring.

The seal is made permanent when the column is heated to 200°C. Therefore, flow should be established and the seal leak-checked with a Gow-Mac leak detector (cat.# 20130) prior to heating the system. Once thermally cycled, the polyimide coating on the tubing bonds to the inside of the connector.

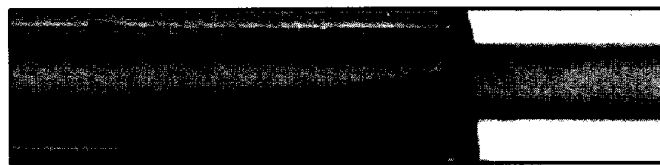
Can I reuse a Press-Tight" Connector?

It is not advisable to reuse Press-Tight" Connectors once a seal has been established. The polyimide layer bonds so tightly to the inside surface of the Press-Tight" Connector after heating, that when the column is forcibly disconnected, fragments of polyimide remain inside.

Can the connection be strengthened?

Yes. A curable polyimide resin is available to create a strong, permanent seal that is mechanically stable. A good initial seal must be made in order for the resin to be effective. After this is done, apply a small amount of resin at the ends of the Press-Tight" and allow it to air dry. The resin should not fill or stream down inside the connector. (We recommend minimizing the amount of resin used because as the solvents evaporate during curing, the vapors tend to push the connection apart.)

A little polyimide glue goes a long way!



Apply polyimide half-way around the column to allow air space for drying.



If polyimide is placed around the entire column, it dries on the outside forming a skin that forces the solvent deep into the connector bore and break the seal.

After thirty minutes of air drying, establish carrier gas flow through the column. It is absolutely necessary to cure the resin slowly or bubble formation will occur. This ensures proper solvent evaporation from the resin and produces a stable, permanent seal. Program the GC oven from 40°C to 150°C at 4C/min. and hold for 30 minutes. Then program to 220°C at 1C/min. with a final hold of 30 minutes. Cool and leak-check again.

Guard columns help prolong the life expectancy of capillary columns and are an excellent and economical alternative to column replacement. Analysts working with dirty samples find that the use of guard columns significantly reduces column replacement costs and time lost in troubleshooting column contamination problems.



Other useful technical information can be found in the following guides available from Restek:

[Helpful Hints for Analyzing Volatile Organics](#)

[Operating Hints for Split/Splitless Injectors](#)

[Guide to Minimizing Septa Problems](#)

[Fused Silica Capillary Column Installation Guide](#)

[Wizard Reference Wall Chart](#)

Call 800-356-1688 to request these publications.

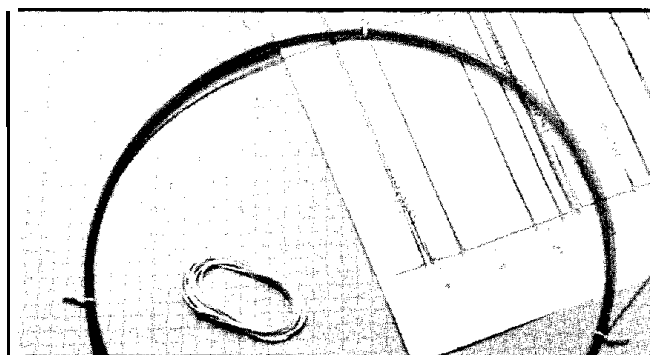
ACCESSORIES

Guard Columns & Transfer Lines

Fused silica guard columns:

- Increase column lifetime
- Allow more injections before sample residue degrades column performance
- Prevent peak splitting during splitless analysis
- Protect expensive analytical columns
- Prevent damage from harmful materials

The life expectancy of a capillary column is greatly increased by using a 5-meter, deactivated, uncoated fused silica guard column. This prevents non-volatile contamination of the analytical column. Since the guard column is uncoated, sample components are allowed to enter the analytical column freely, while non-volatile contaminants are deposited in the guard column. Once contamination degrades performance, short lengths of the guard column can be removed, maintaining the analytical column's original length. When the guard column is totally contaminated, replace it with a new one.



Each guard column/transfer line is pretested with the Grob mix to ensure high inertness.

Transfer lines:

Useful for GC/MS, ITD, MSD, FTIR, purge & trap, headspace analyzers, and other instruments

Ideal for open split interfaces

Transfer lines provide inert flow paths from a sample introduction device, such as a purge & trap system or a headspace analyzer, to the inlet of an analytical column.

Throttle mass spectrometer flow rates

Change columns without venting the source

Prevent negative pressures

Deactivated fused silica tubing is often used as a transfer line interfacing a mass spectrometer vacuum system directly to a capillary column. This eliminates the time consuming chore of properly positioning the end of the column every time a new column is installed. The restriction created by installing a narrow diameter (0.15mm ID) transfer line into the mass spectrometer source allows analytical columns to be changed without venting the vacuum system. The narrow ID tubing also prevents below ambient pressures from being formed at the outlet of wide bore columns which decreases separation efficiency.

Other benefits of our guard columns and transfer lines:

- Five-meter length offers convenience: make the connection once and break off one-half meter sections as contamination occurs.
- A copy of the Grob test chromatogram is included to illustrate the actual inertness of each 5-meter section.
- Phenyl methyl deactivated surface provides optimum wettability for both polar and non-polar compounds.

5-meter length Guard Columns & Transfer Lines		
Nominal ID	Nominal OD	cat.#
0.05mm	0.35mm	10040
0.10mm	0.35mm	10041
0.15mm	0.35mm	10042
0.18mm	0.35mm	10046
0.25mm	0.35mm	10043
0.32mm	0.45mm	10044
0.53mm	0.70mm	10045

Longer-length Guard Columns & Transfer Lines			
Nominal ID	10-meter	30-meter	60-meter*
0.25mm	10049	10012	10013
0.32mm	10048	10022	10023
0.53mm	10047	10032	10033

* Restek recommends cutting 60m guard columns into shorter lengths. Using them full length may cause peak distortion.

\$\$\$SAVE\$\$\$
Get six guard columns for the price of five with economical 6-packs!

5-meter length Guard Column/Transfer Line 6-pks.		
Nominal ID	Nominal OD	cat.#
0.05mm	0.35mm	10040
0.10mm	0.35mm	10041
0.15mm	0.35mm	10042

Press-Tight? Connectors

Fused silica connectors that seal all common sizes* of fused silica tubing!

New and improved Press-Tight" Connectors:

Connect fused silica tubing with outside diameters ranging from 0.3 to 0.75mm (0.25 and 0.53mm IDs respectively). They are lightweight, install quickly, and are easy to use. Press-Tight" Connectors do not cause solvent tailing or adsorption of active compounds.

Restek's Press-Tight" Connectors are the best!

Not all fused silica or glass connectors are the same. Restek has thoroughly investigated the taper angle and tolerances to ensure a leak-tight fit on every connector. Our QA department checks every Press-Tight" Connector to make sure they will work properly. If you have used other connectors in the past, please try our new improved connectors. We are sure you will be pleased with the results,

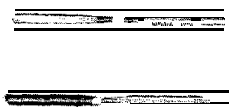
Press-Tights" are most often used to connect guard columns to an analytical column. They are also used to connect different polarity columns for unique separations, or to repair a broken column. Mass spectroscopists also use Press-Tights" for connecting analytical GC capillary columns to smaller diameter transfer lines.

Universal Press-Tight*Connectors

Connect guard columns to analytical columns

Repair broken columns

Connect column outlets to transfer lines



cat.# 20400, 5-pack / cat.# 20401, 25pack
cat.# 20402, 100-pack

Universal "Y" Press-Tight*Connectors

↓ Split sample flow onto two different columns

↓ Split a single column flow into two different detectors

Perform confirmational analysis with a single injection



cat.# 20405, ea. / cat.# 20406, 3-pack

Universal "X" Press-Tight" Connectors

↓ Connect to three detectors or to two detectors and a sniffer port

Make injections onto three columns simultaneously



cat.# 20407, ea. / cat.# 20408, 3-pack

Universal Press-Tight" 5-Way Splitter

* Connect to three detectors and add make-up gas

Connect four detectors to one column



cat.# 20414, ea. / cat.# 20415, 3-pack

* Fits fused silica tubing with OD's ranging from 0.3 to 0.8mm.

Cutting the column for connection

The column end must be cut squarely for a leak-tight, sturdy connection to a Press-Tight™ Connector. To ensure a square, clean cut and a successful connection, we highly recommend using our sapphire scribe (cat.# 20115) or scoring wafer (cat.# 20116) rather than pointed diamond or carbide scribes.

Sapphire scribe - cat.# 20115



Provides a high quality, square cut that is needed in fused silica capillary chromatography.

Ceramic scoring wafer - cat.# 20116, 5pack



Used for scoring a fused silica column and provides a nice, square cut on the column end.

Let Restek make the connection for you!

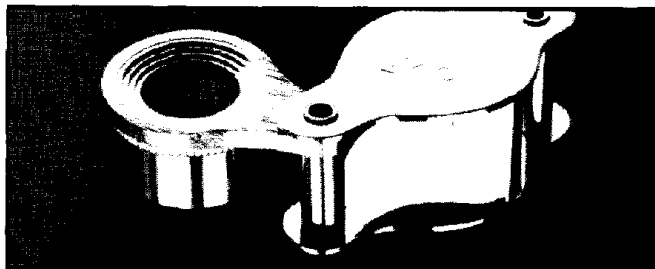
We will connect a guard column/transfer line to an analytical column as a special service to our customers. This service includes attaching a Universal Press-Tight™ Connector with permanent polyimide glue to any analytical column, leak-checking the connections, and confirming analytical integrity by running a test mixture. To order a pre-installed guard column/transfer line, add the three digit suffix (from the chart) to the catalog number of any analytical column when you place an order.

Example: A 30m, 0.32mm ID, 1.0µm Rtx™-5 with a connected 0.32mm ID guard column is cat.# 10254-304.

Guard Column/ Transfer Line ID	cat& suffix
0.15mm	-301
0.18mm	-302
0.25mm	-303
0.32mm	-304
0.53mm	-305

Pocket magnifier:

This magnifier is small and easy to handle. The 10x magnification enables you to get a much closer look at the column end and examine it for a square cut. *Pocket magnifier, cat.# 20124, ea.*



Polyimide resin:

Permanently connects Press-Tights™ to a fused silica column

Useful as a high temperature glue

350°C maximum operating temperature

*Polyimide resin, cat.# 20445,
10 grams (two 5-gram bottles)*



Deactivated glass wool:

Flexible and easy to handle

Tested for endrin breakdown

Not recommended for phenols analysis

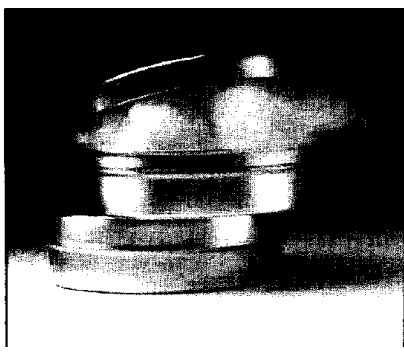
In response to customer demand, Restek now offers deactivated glass wool. The wool is deactivated using a high temperature reaction that provides maximum coverage and thermal stability. Most wool available from other manufacturers is deactivated using chlorosilanes that tend to strip off when samples containing water are injected. Restek's high temperature silanized wool will withstand water injections and prolonged exposure to inlets up to 350°C. This wool is flexible for easy insertion into inlet sleeves. It is batch tested for endrin breakdown to ensure consistent inertness for pesticide analysis. (When analyzing phenols, fused silica wool is still recommended.) Ten grams is enough to pack over 600 sleeves.

Deactivated glass wool, cat.# 20789, 10 grams

Call 800-356-1688 for technical service!

High Purity Deactivated Fused Silica Wool

Fused silica wool helps ensure uniform vaporization in split or splitless sleeves and is highly recommended for autosamplers with fast injection rates. Fused silica wool also prolongs column life by trapping septa particles and decreasing damage caused by sample residue. Fused silica wool is deactivated, heat treated, and tested to ensure complete inertness.* The wool is deactivated using a high temperature reaction that provides maximum coverage and thermal stability. Most wool available from other manufacturers are deactivated using chlorosilanes that tend to strip off when samples containing water are injected. Restek's high temperature silanized wool will withstand water injections and prolonged exposure to inlets up to 350°C. It is purer, and more inert than borosilicate glass wool, and slightly more pliable. It is especially recommended for the analysis of phenols and other active compounds. Ten grams is enough to fill over 600 sleeves!
Deactivated fused silica wool, cat.# 20790, 10 grams



Let Restek pack your inlet sleeve.

For an additional charge we can prepack any of our sleeves with wool or beads. To order prepacked sleeves, add the correct suffix to any sleeve catalog number. For sleeves prepacked with fused silica wool, add the suffix "-200.1" per single sleeve, "-200.5" for 5-packs, and "-200.25" for 25-packs. For sleeves prepacked with beads, add the suffix "-201.1" per single sleeve, "-201.5" for 5-packs, and "-201.25" for 25-packs. For example, a 4mm HP splitless sleeve prepacked with FS wool is cat.# 20772-200.1, one prepacked with beads is cat.# 20772-201.1.

Deactivated Fused Silica Beads

Fused silica beads increase the sample vaporization surface and minimize splitter discrimination which improves quantitation of compounds with dissimilar boiling points. They are also highly efficient traps that can stop non-volatile or inorganic residue from damaging the column inlet. Fused silica beads are purer than borosilicate glass beads and are deactivated, heat treated, and tested to ensure complete inertness.* Place a small plug of fused silica wool near the bottom of the splitless sleeve and pour in one to two centimeters of the 60/80 mesh beads.

Deactivated fused silica beads, cat.# 20791, 25 grams



* Inertness testing includes endrin pesticide breakdown calculations.

Mini Wool Puller / Inserter Tool

The one end of the puller is a hook for removing wool and the other end is a fork for inserting wool. The body OD has been decreased to 0.8mm so that the tool can be used to insert or remove fused silica wool from Restek's single gooseneck sleeves.

Mini wool puller/ inserter tool, cat.# 20114, 2-pack



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