



How to Select the Right LC Guard Column

By Terry Reid and Carrie Sprout

LC guard columns are installed in front of an analytical column in order to protect it from strongly retained impurities and particulates, thus prolonging the life of the analytical column. Guard columns are just like analytical columns, except they are shorter and are intended to be a consumable with a limited lifetime. Understanding how to choose the correct LC guard column can help you protect your analytical column and save money by extending analytical column lifetime.

Choose a Guard Column Based on Your Analytical Column

LC guard columns are composed of several parts: a holder, a cartridge containing packing material that retains chemical contaminants, and in some cases, an extra filter to remove particulate matter. In order to obtain maximum protection without compromising selectivity or efficiency (theoretical plates), you should select a holder and a cartridge that are both compatible with your analytical column. Table I specifies the LC guard column cartridges and holders that are compatible with each of Restek's analytical column lines. From the list of compatible cartridges, it is best to choose an LC guard column cartridge that contains the same packing material (stationary phase and silica) as your analytical column. For example, the best LC guard column to use with a Raptor Biphenyl analytical column is a Raptor Biphenyl guard cartridge housed in an EXP direct connect holder.

Once you have identified the holder and cartridge lines that are compatible with your analytical column and have chosen a cartridge packing that matches your analytical column, you need to select a cartridge with the correct inner diameter (ID). A good general rule is that the LC guard column cartridge ID should be the same as, or one size smaller than, the ID of the analytical column. Therefore, a 4.0 mm ID guard cartridge should be used with a 4.6 or 4.0 mm ID analytical column, while a 2.1 mm ID guard cartridge is recommended for 3.2, 3.0, and 2.1 mm ID analytical columns. If you are using a Trident system, Table II will help you find the best guard cartridge ID for your analytical column. Details on the specific options available within each LC guard column line are provided below as well as in Table I.

Table I: Use Table I to find the LC guard column cartridges and holders that are compatible with your Restek analytical column. Match the guard cartridge phase with the analytical column phase for best results.

Analytical Column Line	LC Guard Column (Cartridges and Holders)
Raptor SPP	<ul style="list-style-type: none"> Raptor guard cartridges EXP direct connect holder
Roc FPP	<ul style="list-style-type: none"> Roc guard cartridges Roc LC guard column holder
Allure	<ul style="list-style-type: none"> Allure guard cartridges Trident holders: <ul style="list-style-type: none"> Trident LC column protection system Trident HPLC in-line guard holder Trident integral guard holder
Pinnacle II	<ul style="list-style-type: none"> Pinnacle II guard cartridges Trident holders: <ul style="list-style-type: none"> Trident LC column protection system Trident HPLC in-line guard holder Trident integral guard holder
Pinnacle DB	<ul style="list-style-type: none"> Pinnacle DB guard cartridges Trident holders: <ul style="list-style-type: none"> Trident LC column protection system Trident HPLC in-line guard holder Trident integral guard holder
Ultra	<ul style="list-style-type: none"> Ultra guard cartridges Trident holders: <ul style="list-style-type: none"> Trident LC column protection system Trident HPLC in-line guard holder Trident integral guard holder
Viva	<ul style="list-style-type: none"> Viva guard cartridges Trident holders: <ul style="list-style-type: none"> Trident LC column protection system Trident HPLC in-line guard holder Trident integral guard holder

Table II: If using a Trident system, choose the cartridge and cap frit filter ID based on the ID of your analytical column.

Analytical Column ID (mm)	Guard Cartridge ID (mm)	Cap Frit Filter ID (mm)
2.1	2.1	2
3.0/3.2	2.1	2
4.0	4.0	4
4.6	4.0	4

Raptor Guard Cartridges and EXP Holders for Raptor Analytical Columns

The Raptor LC column family employs the EXP direct connect holder from Optimize Technologies. This holder is for Raptor EXP guard cartridges only. If you use Raptor EXP guard cartridges, you must use the EXP direct connect holder because Raptor EXP cartridges will not fit into any other holder. All Raptor EXP cartridges are 5 mm in length, and they are available in 2.1, 3.0, and 4.6 mm IDs and in both 2.7 and 5 µm particle sizes for an exact match to your Raptor analytical column. All Raptor EXP guard cartridges fit in the same holder: Restek cat.# 25808.

Roc Guard Cartridges and Holders for Roc Analytical Columns

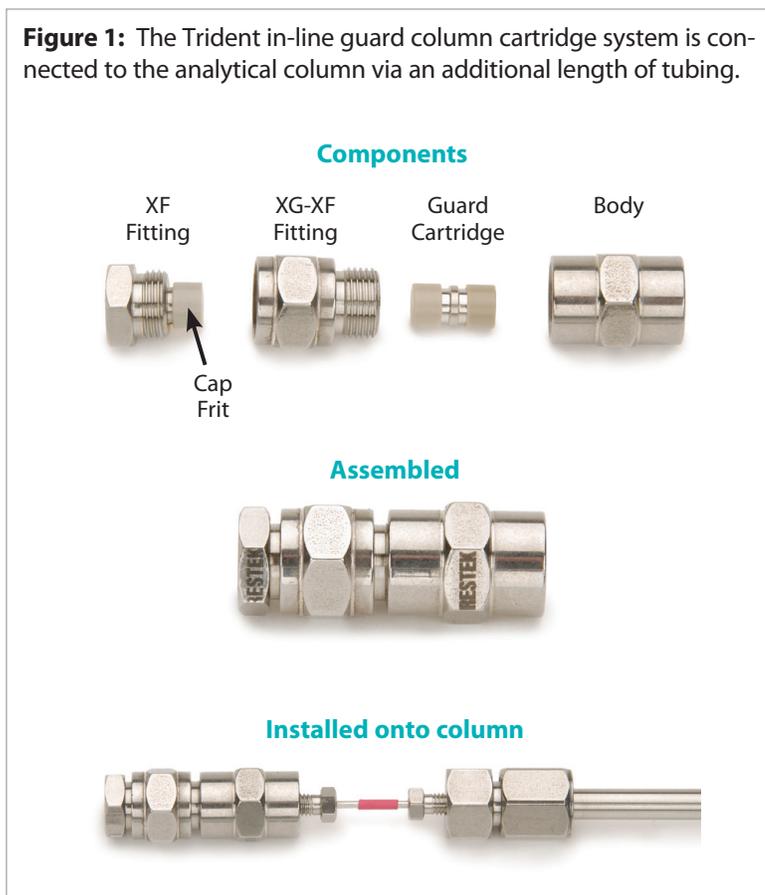
If you are using Roc LC guard cartridges, you must use the Roc guard cartridge holder; Roc guard cartridges will not fit into any other holder. All Roc guard cartridges are 10 mm in length, 4.0 mm ID, and contain 5 µm particle size packing. This is the ideal configuration for all Roc analytical columns. All Roc guard cartridges use the same holder: Restek cat.# 25812.

Trident Guard Columns (In-Line, Direct, or Integral) for All Other Restek Analytical Columns

All Restek Trident guard cartridges are 10 mm in length; are available in two internal diameters: 4.0 mm and 2.1 mm; and are packed with 5 µm particle size material. A guard cartridge with 5 µm particles will protect a 3 µm particle size analytical column as effectively as a 3 µm guard cartridge, without significantly increasing system pressure. A Trident guard containing 5 µm particles will not reduce the overall efficiency (as measured by the absolute number of theoretical plates) when added to a 3 µm particle size analytical column. If you are using Trident guard cartridges, you have several choices. Trident guard cartridges can be used with three different styles of Trident guard holder: in-line, direct, and integral.

Trident in-line holders are traditional standalone style holders that require an additional piece of small ID PEEK or stainless steel tubing to connect the guard holder to the analytical column (Figure 1). The *Trident direct holder* differs in that it connects directly to the analytical column, reducing dead volume and maintaining efficiency. The durable metal tip with replaceable PEEK ferrule allows easy connection onto your analytical column without tools (Figure 2). While the Trident direct holder will thread onto any column with a standard 10-32 port, seat depth can vary among column manufacturers. Please consult your analytical column manufacturer for port detail. Note that guard cartridges from one manufacturer should never be used in another manufacturer's holder. The Trident in-line holder and Trident direct holder are both available in "with filter" and "without filter" versions. The "with filter" versions have a fitting that screws onto the front of the holder and contains a cap frit to provide extra protection against particulates. The filter fitting can be changed independently of the guard cartridge.

Figure 1: The Trident in-line guard column cartridge system is connected to the analytical column via an additional length of tubing.



The *Trident integral system* (Figure 3) is a column manufactured with a special compression-style end fitting; this system protects the analytical column without producing a connection that can create additional system or dead volume. Trident integral columns are available for 2.1, 3.2, and 4.6 mm ID analytical columns. They are shipped with a filter fitting (XF fitting) and filter (cap frit) attached to the special Trident integral column end fitting (Figure 3). To use the Trident integral system as a cartridge holder, install an XG-XF fitting (cat.# 25026) in between the XF fitting and the Trident end fitting on the analytical column. The Trident integral system, when used with guard cartridges, requires four parts that need to be ordered separately: an analytical column with a Trident end fitting (add a “-700” suffix to the analytical column’s catalog number to specify a Trident integral column configuration), a pack of Trident guard cartridges, an XG-XF fitting (cat.# 25026) to house the guard cartridge, and a pack of replacement cap frit filters (the “extra filter” that goes onto the XF fitting as shown in Figure 3). Note that four different cap frit filters are available: 4 mm ID x 2.0 μm , 4 mm ID x 0.5 μm , 2 mm ID x 2.0 μm , and 2.0 mm ID x 0.5 μm .

The ID of the cap frit filters used in the Trident systems should match the ID of the guard cartridge. For 4 mm ID cap frits, the choice of 0.5 or 2.0 μm porosity is largely a matter of preference. The smaller porosity will provide the greatest protection against particles, but it may also mean that the frit needs to be changed more frequently. If the analytical column is packed with 3 μm particles, a 0.5 μm cap frit may be preferred, as it will match the porosity of the analytical column’s frits, minimizing the risk of particles lodging in the column inlet frit. An analytical column with a Trident integral end fitting, a Trident in-line holder “with filter,” and a Trident direct holder “with filter” are all shipped with a 4 mm, 2 μm filter installed on the XF fitting. Table II will help you match the proper cap frit filter ID to your analytical column and guard cartridge.

Summary

Using a guard column will extend the lifetime of your analytical column by effectively protecting it from sample contaminants. Restek offers a wide selection of LC guard columns and choosing the right one is a simple task when you match the guard column phase to your analytical column phase. By selecting the right guard column system (holder, cartridge, and/or filters), you will provide dependable protection and ensure optimum performance from your analytical column for many analyses to come.

Figure 2: Trident Direct guard cartridges attach directly to the analytical column—no extra tubing required. Choose the level of protection that is best for your application.

Level 1: Filter Only

Removes Particulate Matter



Level 2: Guard Cartridge Only

Protects Against Irreversibly Adsorbed Compounds



Level 3: Filter and Guard Cartridge Power Pack

The Ultimate Protection against Both Particulate and Chemical Contaminants



Figure 3: The Trident integral guard column system is the lowest dead volume configuration, but it is available only on specially ordered (“-700”) analytical columns with compression-style end fittings.

Trident End Fitting



Trident end fitting with XF fitting removed

XF Fitting



Cap Frit

Adding a guard cartridge to Trident end fitting

XF Fitting

XG-XFFitting

Guard Cartridge



Cap Frit

Trident end fitting assembled with guard cartridge





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