

VanGuard Column Protection

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I. INTRODUCTION

Waters VanGuard™ Column Protection Products help improve analytical column performance by removing particulate and chemical contamination that may be present in the mobile-phase stream. Contaminants that may damage your analytical column are intercepted by the guard column.

The packing materials used in Waters VanGuard Pre-columns and Cartridge Columns are identical to the packaging materials used in Waters HPLC and UPLC® Columns. For the best analytical performance, select a guard column with the same packing material as your analytical column. Use Table 1 as a guide to properly size the VanGuard Pre-column and Cartridge Column.

VAN GUARD™
COLUMN PROTECTION



Table 1. Recommended VanGuard Configurations

VanGuard Configuration	VanGuard Dimension	Recommended Analytical Column (Inner diameter)
Pre-column	2.1 x 5 mm	2.1 mm ACQUITY UPLC® Columns 3.0 mm ACQUITY UPLC Columns
Cartridge Column	2.1 x 5 mm	2.1 mm HPLC and XP Columns 3.0 mm HPLC and XP Columns
Cartridge Column	3.9 x 5 mm	3.9 mm HPLC Columns 4.6 mm HPLC and XP Columns

II. INSTALLATION

a. VanGuard Pre-columns

VanGuard Pre-columns are designed as a single unit to be attached directly to the inlet side of an ACQUITY UPLC Column.

Note: In order to ensure void-free and leak-free connections, VanGuard Pre-columns are shipped with the collet and ferrule NOT permanently attached. Care must be taken when removing the o-ring that holds these two pieces on the pre-column tubing.

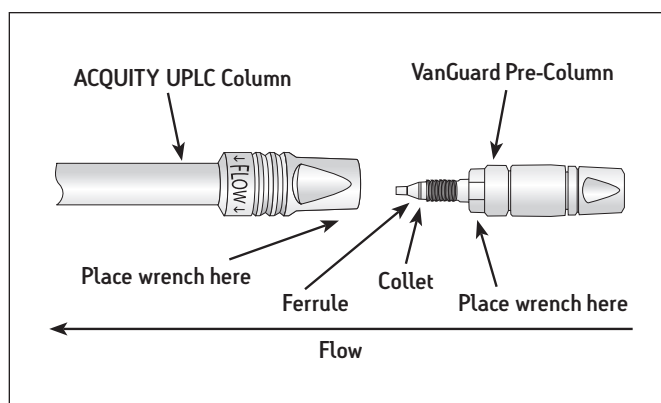


Figure 1. VanGuard Pre-column connection to an ACQUITY UPLC Column.

Installation Instructions

1. Remove the VanGuard Pre-column from its box and shipping tube and unscrew the plastic plug.
2. Orient the pre-column so that male end is facing up and carefully remove the rubber o-ring that holds collet and ferrule in place during shipping (collet and ferrule are not yet permanently attached).
3. Orient the ACQUITY UPLC Column perpendicular to the work surface so that column inlet is on the bottom (column outlet on top).
4. From below, insert the VanGuard Pre-column into the ACQUITY UPLC Column inlet and hand-tighten (collet and ferrule are not yet permanently attached).
5. While pushing the VanGuard Pre-column into the column inlet, turn the assembled column and pre-column 180° so that pre-column is now on top.
6. Tighten the connection using two 5/16-inch wrenches placed onto ACQUITY UPLC Column flats and VanGuard Pre-column hex nut (male end) as shown in Figure 1.
7. Tighten 1/4 turn to set collet and ferrule. Ensure that the tubing is seated in the bottom of the fitting before tightening the compression screw.
8. Check that the ferrule is set by loosening connection and inspecting the ferrule depth. A properly set ferrule depth will resemble other connections in the ACQUITY UPLC System.
9. Reattach the VanGuard Pre-column, apply mobile-phase flow and inspect for leaks.

b. VanGuard Cartridge Columns

VanGuard Cartridge Columns are a two piece design comprising of a holder and cartridge. The assembly is designed to be attached directly to the inlet side of the analytical LC column.

Note: In order to ensure void-free and leak-free connections, VanGuard Cartridge Holders are shipped with the collet and ferrule NOT permanently attached. Care must be taken when removing the o-ring that holds these two pieces on the pre-column tubing.

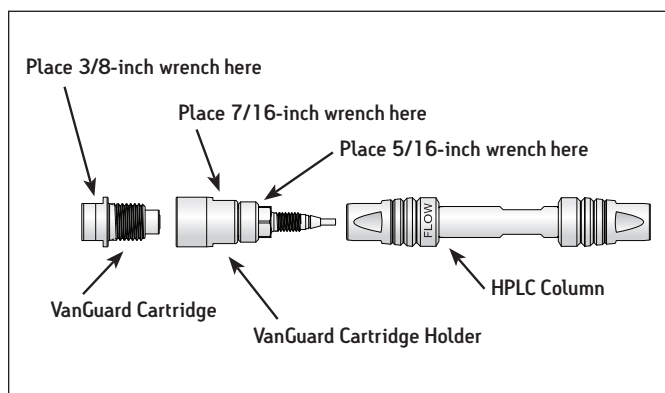


Figure 2. Connection of the VanGuard Cartridge Column, VanGuard Cartridge Holder, and Analytical Column.

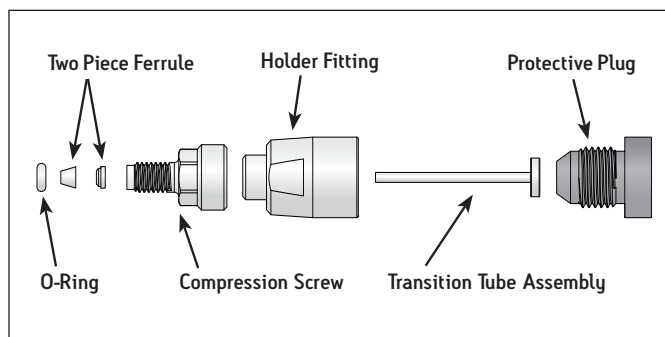


Figure 3. Exploded View of the VanGuard Cartridge Holder.



DO NOT remove the protective plug from the holder assembly until Step 5. The plug is used to seat the tubing securely prior to final assembly.

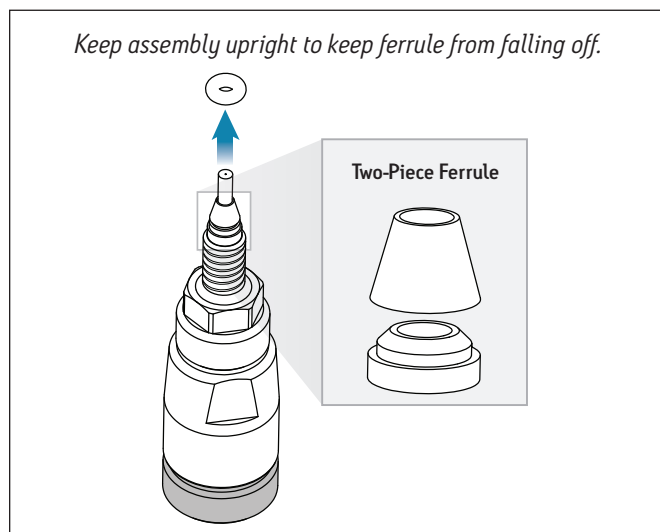
In order to ensure void-free and leak-free connections, the VanGuard Cartridge Holder is shipped with the ferrule **NOT** permanently attached. **Care must be taken when assembling the holder to the column.**

Installation Instructions

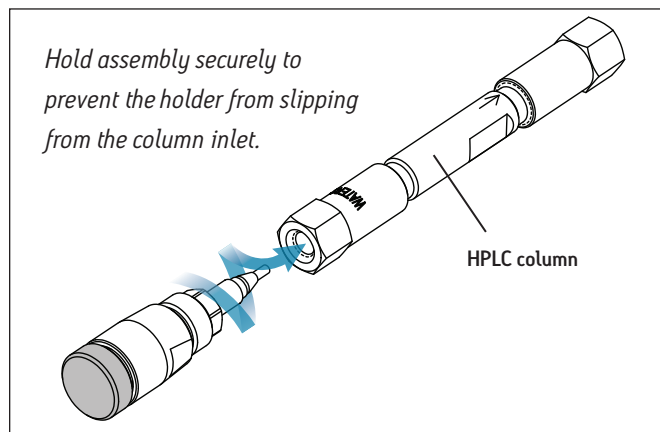
To watch a short video on the proper assembly of VanGuard Cartridge Columns, go to www.waters.com/vanguard

1. Remove the VanGuard Cartridge from the box and shipping tube and remove the protective plastic cap. Avoid touching the frit to prevent contamination.
2. Remove the VanGuard Cartridge Holder from its box and shipping tube. While keeping upright, remove the rubber o-ring that holds the two-piece ferrule in place (the ferrule is not yet permanently attached).

Note: Do not remove the protective plug at this time. It is used in Step 3 to properly set the holder into the column inlet. If the holder components become separated refer to Figure 3 for proper reassembly.

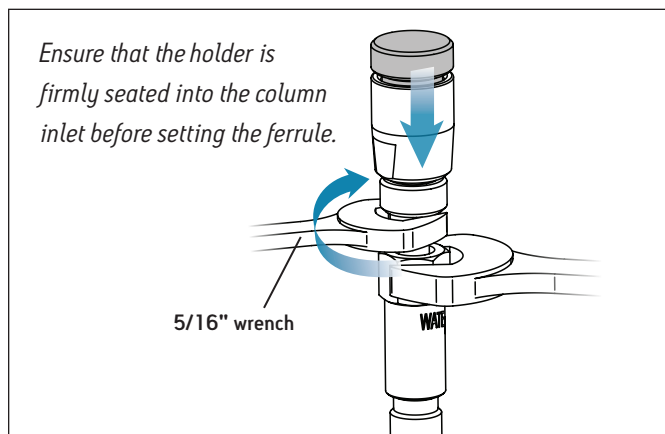


3. Insert the holder into the column inlet and hand tighten. It is recommended to keep the ferrule pointed upright to prevent it from slipping from the holder assembly.

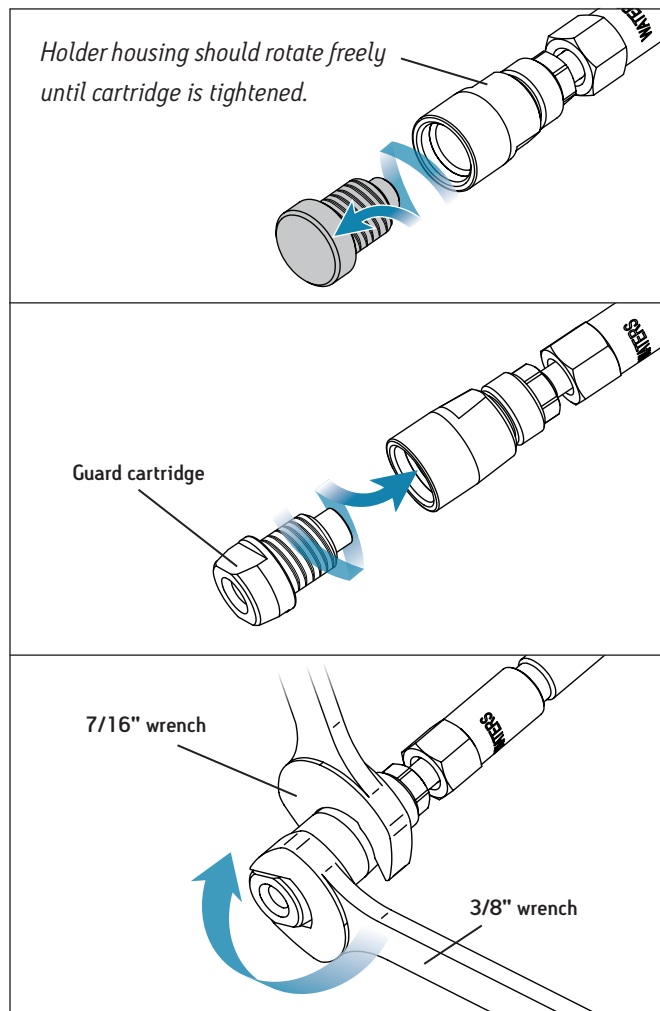


4. While securely pushing the VanGuard Cartridge Holder into the column inlet, tighten the hexagonal nut using a 5/16-inch wrench. Proper tightening should not require more than 1/4 turn. Refer to Section IV to ensure a leak-free connection and a properly-seated ferrule.

Note: Do not use the flat surfaces on the column barrel for wrench placement.



5. Remove the protective plastic plug from the holder and replace with the VanGuard Cartridge. Tighten the cartridge and holder using a 7/16-inch wrench and a 3/8-inch wrench applied to the flats on the cartridge and holder. Proper sealing should not require more than 1/4 turn.



6. For easy identification of the assembled cartridge and holder, the supplied label can be affixed to the holder housing.
7. Attach the assembled guard column, holder and analytical column to the LC inlet tubing. Apply mobile-phase flow and inspect for leaks.

III. REPLACEMENT

It is recommended to replace the guard column before contaminants affect the analytical column. Changes in peak shape, peak splitting, shoulders on the peak, shifts in retention, change in resolution or increasing backpressure are indications of LC column contamination. For best results, replace the guard column at regular intervals based on method performance, for example:

- After completion of a set of analyses
- After running 50 to 100 samples
- Weekly

If the quality of the separation deteriorates, or if the initial backpressure increases significantly (more than 20%), replace the guard column. If contaminants appear in the chromatogram, replace the guard column immediately and follow the column manufacturer's recommendations for cleaning the column.

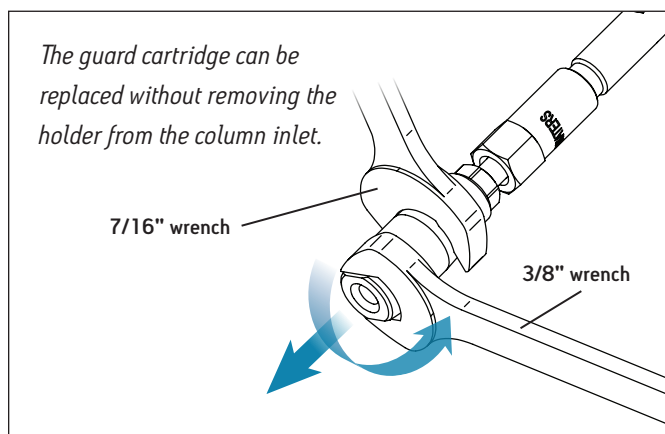
a. VanGuard Pre-columns

VanGuard Pre-columns are designed as a disposable one piece design and are replaced as a single unit. Refer to Section II for instructions.

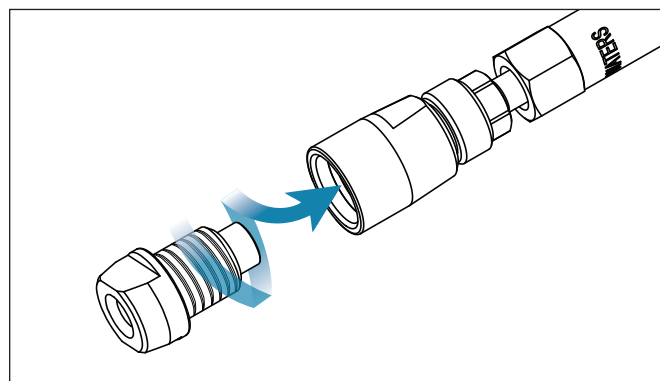
b. VanGuard Cartridge Columns

VanGuard Cartridge Columns are a two-piece design comprising of a reusable holder and disposable cartridge. The following procedure describes the cartridge replacement.

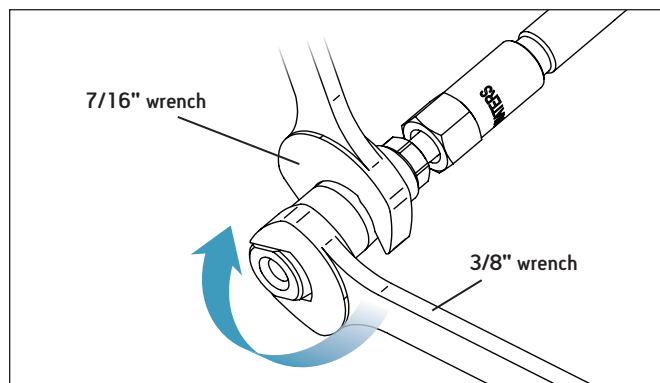
1. Remove the LC inlet tubing from the column assembly.
2. Using a 7/16-inch wrench and a 3/8-inch wrench detach cartridge from the holder. The holder does not need to be removed from the analytical column.



3. Discard the old guard column and install the new guard column.



4. Tighten the cartridge to the holder using a 7/16-inch wrench and a 3/8-inch wrench applied to the flats on the cartridge and holder. Proper sealing should not require more than 1/4 turn.



5. Reattach the LC inlet tubing and apply mobile phase flow to ensure a leak free connection.

Note: For the best performance, it is recommended that the VanGuard Cartridge Holder be replaced after every 3 cartridge replacements. A new holder should be used when switching or replacing the analytical column.

IV. ADDITIONAL INFORMATION

a. Fittings and Hardware

Correct connection of the 1/16-inch outer diameter stainless-steel tubing leading to and from the column is essential for high-quality chromatographic results. Due to the absence of an industry standard, column manufacturers use different types of chromatographic column connectors. The chromatographic performance of the separation can be negatively affected if the style of the column endfitting does not match the existing tubing ferrule settings. This section explains the differences between Waters-style and Parker-style ferrules and endfittings (Figure 4).

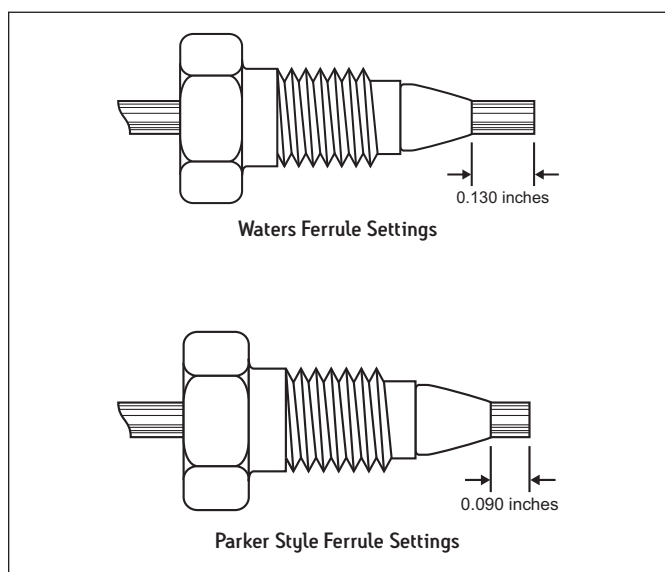


Figure 4. Waters- and Parker-Style Ferrule Types.

In a proper tubing/column connection (Figure 5), the tubing touches the bottom of the column endfitting, with no void between them.

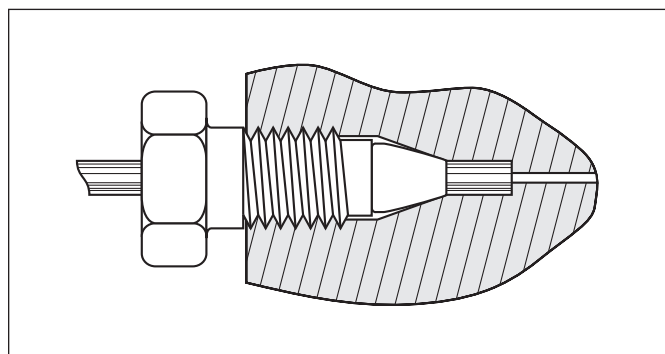


Figure 5. Proper Tubing/Column Connection.

The presence of a void in the flow stream reduces column performance. This can occur if a Parker-style ferrule is connected to a Waters endfitting (Figure 6).

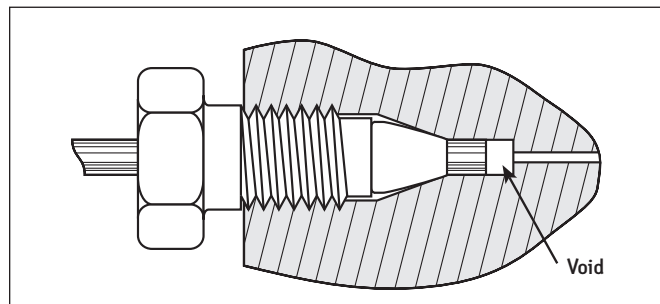


Figure 6. Parker Ferrule in a Waters-style Endfitting.

Note: A void appears if tubing with a Parker-style ferrule is connected to a Waters-style column.

Conversely, if tubing with a Waters ferrule is connected to a column with Parker-style endfitting, the end of the tubing will bottom out before the ferrule reaches its proper sealing position. This will leave a gap and create a leak (Figure 7).

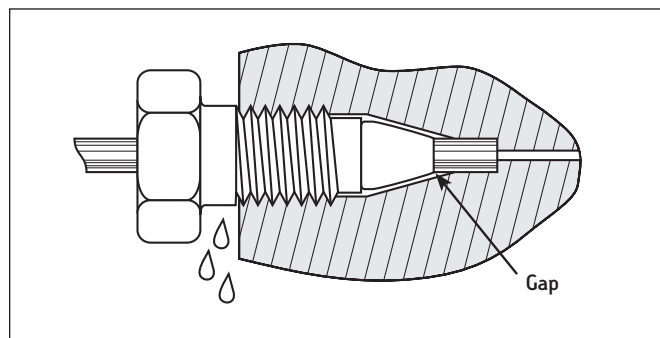


Figure 7. Waters Ferrule in a Parker Style Endfitting.

Note: The connection leaks if a Waters ferrule is connected to a column with a Parker-style endfitting.

When leaks occur at the inlet, it will be necessary to replace the connection by cutting the tubing and replacing the ferrule. Before tightening the screw, make sure that the tubing bottoms out in the endfitting of the column. In some applications, it may be possible to use adjustable slip-free fittings that automatically reset the tubing and ferrule to the proper sealing depth.

To prevent leaks between the column inlet and guard column assembly, VanGuard Pre-columns and VanGuard Cartridge Holders are shipped without the collet and ferrule permanently attached to allow for differences in endnut design. Once the ferrule is set

to a particular column inlet it cannot be reused for a different column design. The inlet to the VanGuard Cartridge is designed to be compatible with its intended column configuration and is available in two formats: Parker-style fittings are designated with a crosshair stamped on the VanGuard Cartridge inlet; Waters-style fittings do not have the stamped crosshair pattern on the inlet. Figure 8 shows the identification marking. For simplicity, the proper cartridge design is predetermined based on the specifications for the analytical column. Refer to Table 2.

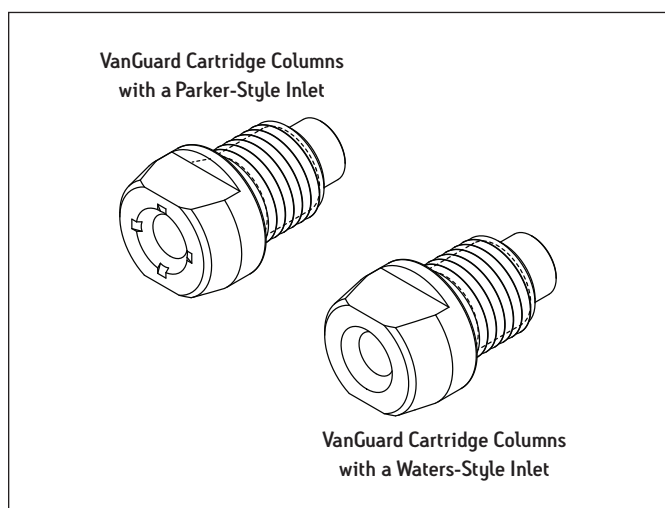


Figure 8. Inlet identification markings for Parker- and Waters-style cartridge connections.

Table 2. Column Endnut Specifications for Waters Column Brands

Waters Column Brand	Waters-style Inlet	Parker-style Inlet
Atlantis® HPLC Columns	X	
CORTECS® HPLC Columns		X
Symmetry® HPLC Columns	X	
XBridge® HPLC Columns	X	
XBridge <i>XP</i> Columns		X
XTerra® HPLC Columns	X	
XSelect® HPLC Columns	X	
XSelect <i>XP</i> Columns		X

When using the VanGuard Pre-columns or Cartridge Columns for non-Waters column brands, please contact the manufacturer for inlet specifications to choose the correct format.

b. Tips for Maximizing LC Column Lifetimes

To ensure the continued high performance of the analytical LC column, follow these guidelines:

1. Sample Preparation

- a. Sample impurities often contribute to column contamination. One option to avoid this is to use Oasis® Solid-phase Extraction Cartridges or Sep-Pak® Cartridges of the appropriate chemistry to clean up the sample before analysis. For more information, visit www.waters.com/sampleprep
- b. If the sample is not dissolved in the mobile phase, ensure that the sample, solvent and mobile phases are miscible in order to avoid sample and/or buffer precipitation.
- c. Filter the sample with 0.2 µm membrane filters to remove particulates. If the sample is dissolved in a solvent that contains an organic modifier (e.g., acetonitrile, methanol, etc.) ensure that the membrane material does not dissolve in the solvent. Contact the membrane manufacturer with solvent compatibility questions.

2. Solvents

To maintain maximum column performance, use high quality chromatography grade solvents. Filter all aqueous buffers prior to use through a 0.2 µm filter. Pall Gelman Laboratory Acrodisc® filters are recommended. Solvents containing suspended particulate materials will generally clog the outside surface of the inlet distribution frit of the column. This will result in higher operating pressure and poorer performance.

Discourage bacterial growth by minimizing the use of 100% aqueous mobile phases where possible. Change and discard aqueous mobile phases every 24–48 hours (if 100% aqueous mobile phase use is required). Where possible, add 5%–10% organic modifier to the aqueous mobile phase with inhibit bacterial growth. “Topping off” or adding freshly prepared mobile phase to old mobile phase is not recommended.

VanGuard Cartridge Columns use PEEK sealing surfaces to ensure leak free connections. Some solvents, such a tetrahydrofuran (THF) may degrade the seal and promote premature leakage. If solvent compatibility is a concern, it is recommended to use VanGuard Pre-columns for aggressive mobile phase conditions.

3. Pressure

VanGuard Column Protection Products can tolerate operating pressures up to 18000 psi (1241 bar or 124 MPa).

Note: Working at the extremes of pressure, pH and/or temperature will result in shorter column lifetimes. Ensure that the method conditions do not exceed the analytical column specifications.

4. Temperature

Operational temperatures up to 90 °C are recommended for VanGuard Column Protection products.

c. Disposal

Dispose of used cartridges according to applicable government regulations.

V. WARRANTY/SERVICE INFORMATION

Waters Corporation warrants VanGuard Pre-columns, Cartridge Columns and Holders in accordance with the following terms and conditions:

1. Waters will replace without cost any guard column or holder that fails to perform satisfactorily, if notified within 90 days from your receipt. Returned columns and holders must have a Return Authorization Number granted by the Waters Customer Service Department.
2. Approval is subject to the following exclusions:
 - Physical damage to the guard column or holder because of misuse or abuse.
 - Damage to the guard column or holder because of use with incompatible solvents or use at incorrect temperatures or pressures.
 - Failure or decreased performance as a consequence of normal use.

For service and applications questions, contact your Waters representative.

Waters

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