

# Restek Liquid Chromatography (LC) Columns — Usage & Care

## Column Certificate of Analysis

Each Restek liquid chromatography (LC) column is individually packed and tested to ensure superior performance. An *LC certificate of analysis* is generated for each column. It contains not only a chromatogram, but also other important column-specific information, including the column serial number and the lot number of the packing material. Download your certificate at [www.restek.com/documentation](http://www.restek.com/documentation) and retain this information for as long as you have the column; it will prove invaluable if troubleshooting is ever required.

## Column Hardware

All Restek column hardware is made from 316 stainless steel. Columns with 2.7  $\mu\text{m}$  Raptor particles and columns with other particles greater than 3  $\mu\text{m}$  in diameter have 2  $\mu\text{m}$  frits. All other columns have 0.5  $\mu\text{m}$  frits. Restek LC column end-fittings are compatible with Valco, Parker, Upchurch, Swagelok, and other brands of fittings. However, to ensure a proper fit when assembling fittings into your new column, you may need to reset the nut and ferrule on both the inlet and outlet end of the column. Make sure that the column connectors are correctly seated before tightening; improper seating can negatively affect column efficiency and make it difficult to remove the column. Restek columns are shipped with PEEK end plugs; simply loosen and remove the plugs before installation. Please refer to the LC system's operation manual for complete instructions on installing the column.

## Mobile Phase

When shipped, the column contains the storage solvent listed on its *LC certificate of analysis* (download yours at [www.restek.com/documentation](http://www.restek.com/documentation)). Be sure that your intended mobile phase is compatible with this solvent. If it is not, you must flush the column with an intermediate solvent that is compatible with both the storage solvent and your intended mobile phase. If you are unsure about solvent miscibilities, go to [www.restek.com/solvent-chart](http://www.restek.com/solvent-chart) for more information or contact Restek Technical Service. Be especially careful if you will be using buffers; the storage solvent for most columns contains greater than 50% organic solvent, and contact with a buffer could cause a precipitate to form and plug the column.

## Flow Direction & Flow Rate

The arrows on the column label indicate the recommended flow direction. Begin by connecting the inlet end of the column to the injector or autosampler and allow mobile phase to flow from the outlet end of the column into a beaker for 10–15 minutes. Gradually increase the flow rate to its optimal value (Table I). Then, stop the mobile phase flow and connect the column to your detector.

Because every LC system is unique, especially when used in gradient mode, your results may differ from those obtained in our laboratory. Restek Technical Service can assist you in optimizing your separations. Be sure to record the operating pressure before calling.

## Increasing Column Lifetime

Restek LC column packings are based on silica particles. The pH limitations of these materials can be found at [www.restek.com](http://www.restek.com) by searching for your specific column. Extended use of any column at extreme pH can shorten column lifetime.

Do not exceed the column's upper temperature limit of 80 °C. Elevated temperatures can improve efficiency by lowering solvent viscosity, but again, column lifetime may be compromised.

We strongly recommend you only use solvents prepared specifically for liquid chromatography. Residue and chemical contaminants in non-LC-grade solvents can alter a column's selectivity and, by plugging the inlet frit, significantly increase system pressure. We also recommend that you thoroughly filter and degas all mobile phases before use.

Lifetime is also governed by the stationary phase type. Hydrocarbon phases, such as C18, are relatively chemically inert. However, polar phases, such as amino, require special care because they are chemically active. Mobile phases containing an aldehyde or ketone (such as acetone) will alter the retention of amino phases, and repeated injections will permanently alter the phase over time. Amino phase alteration progresses more quickly at pH 4.5 to pH 5.5, but no pH range is invulnerable.

## Column Maintenance & Cleanup

Continuous monitoring of system pressure will alert you to changes that may require you to perform maintenance, such as washing the column, replacing a guard column or filter, or cleaning the inlet frit.

Increases in column back pressure indicate a plugged inlet frit or other problem. If system back pressure begins to rise during column use, backflushing the column may reduce the pressure by removing particle buildup from the inlet frit. *Please note that backflushing is NOT recommended for any Raptor columns; it is also NOT recommended for any 1.8  $\mu\text{m}$  or 1.9  $\mu\text{m}$  Force or Pinnacle DB column. Contact Restek Technical Service for help troubleshooting increased backpressure with these column types.* Backflush the column by first turning off any flow and then disconnecting it from the injector and the detector. Reverse the column flow direction by connecting the outlet end of the column to the injector or autosampler. Flush the column with partial flow (approximately one half of the optimal flow rate of your column) using a solvent compatible with your mode of separation. (For help selecting the appropriate solvents, contact Restek Technical Service.) Allow the solvent to flow from the inlet end of the column into a beaker. *Do not backflush the column into your detector.* After rinsing, return to the normal flow direction and reequilibrate the column with mobile phase. If back pressure lowers, consider using a guard column or precolumn filter for future analyses.

If peak shape deteriorates due to suspected contamination, flush the column with mobile phase starting with a high aqueous content and moving to a prolonged high organic solvent content, preferably using a gradient elution. For help selecting appropriate flushing solvents, contact Restek Technical Service. After flushing the column, reequilibrate the column with mobile phase and check for improved performance. If the problem persists, consider using a guard column.

**Table I:** Optimal Flow Rates Based on Particle Diameter and Column ID

Column ID (mm)	Optimal Flow Rate (mL/min)		
	1.9 $\mu\text{m}$ d <sub>p</sub>	3 $\mu\text{m}$ d <sub>p</sub>	5 $\mu\text{m}$ d <sub>p</sub>
4.6	–	1.50	1.00
3.2	–	0.73	0.50
3.0	1.12	0.65	0.40
2.1	0.55	0.31	0.20
1.0	–	0.07	0.05

Column lifetime can also be extended considerably through routine column washes. The ideal flushing solvent is a solution identical in composition to the most recently used mobile phase minus any buffered, acidic, or basic components. When rinsing or equilibrating your column, use at least 10–20 column volumes of mobile phase.

Contact Restek Technical Service if you need more information on column maintenance.

#### **Column Storage**

Columns should be flushed prior to storage to remove buffers, acids, or bases. For short-term storage, all columns should be flushed with a solvent identical in composition to the most recently used mobile phase minus any buffered, acidic, or basic components. For long-term storage, reversed phase columns should be stored with 50% water/50% organic solvent (e.g., acetonitrile or methanol), and normal phase columns should be stored with a nonpolar solvent (e.g., hexane). If the long-term storage solvent is not compatible with the most recently used mobile phase, you must first flush the column with an intermediate solvent that is compatible with both the most recently used mobile phase and the storage solvent. Store columns with end plugs securely fastened and be sure to include a description of the storage solvent.

#### **LC Guard Column Systems**

For maximum protection against particulate matter and sample contaminants, consider installing a guard column or filter frit in front of the column. For more information, visit [www.restek.com/LC-guard](http://www.restek.com/LC-guard) or contact your local Restek representative.

**Questions about this or any other Restek product?  
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