

Agilent Dynamax Modular Macro-HPLC Column Systems 21.4 mm id and 10.00 mm id Data Sheet

1. Description

The Agilent Dynamax Macro-HPLC System is a modular column system for preparative HPLC. It uses unique Dynamic Axial Compression technology to maintain the structure of the packed bed during extended use. Dynamic Axial Compression compensates for bed reduction without end-fitting removal and topping-off procedures, and in many instances increases column life.

Each Dynamax column consists of a replaceable prepacked column module and two reusable end-fittings, which form high-pressure seals on the inside surface of the column module. No tools are required for tightening.

Optional stainless steel guard assemblies are available. A guard assembly consists of special fittings and a replaceable prepacked guard module. Installed between the inlet end-fitting and the column module, the guard assembly protects the column module from chemical contamination. Optional accessories include column coupler assemblies to join multiple Dynamax column modules together in series and a stand-alone guard holder for using guard modules separately.

Dynamax 25 cm long stainless steel column modules are available in both 21.4 mm id and 10 mm id. Dynamax-TI Titanium 10 cm long 10 mm id column modules are available for protein LC with Hydropore chemistries. For protein LC scale-up, Hydropore chemistries are also available in 10 cm long 21.4 mm id stainless steel column modules equipped with titanium bed supports.

Dynamic axial compression and modular hardware allow the Dynamax system to provide high preparative HPLC performance with low initial cost, maximum column life, and low column replacement cost.

2. Dynamic axial compression mechanism

Dynamic Axial Compression is shown in Figure 1.

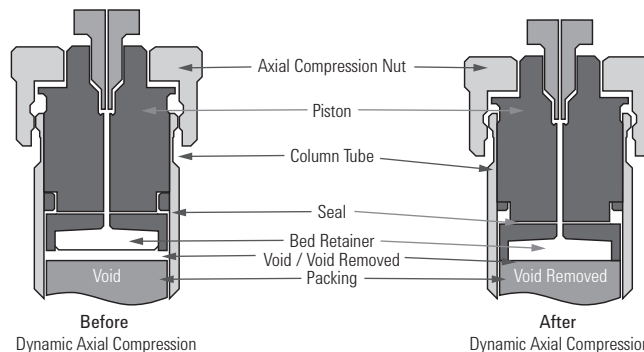


Figure 1. Dynamic Axial Compression Mechanism

Each prepacked Dynamax column module contains a high pressure slurry-packed adsorbent bed with a movable bed retainer at the inlet end. The outlet end contains a fixed bed retainer. The bed retainers are inside the column tube, set in a short distance from each end.

Inlet and outlet ends of the column module can be distinguished in two ways: the flow-direction arrow on the label points toward the outlet. The wrench flats or groove in the outer wall of the column module is closest to the inlet.

Inserting an axial compression piston into the column module causes the high-pressure seal to contact the interior wall of the tube between the end and the bed retainer. The seal will slide easily whenever the column is not pressurized.

Threading an axial compression nut over the end of the column module captures the axial compression piston. Hand tightening the axial compression nut causes the axial compression piston to slide inward toward the bed retainer. With the piston in contact with the bed retainer, hand tightening the nut applies axial force through the piston to the bed retainer. This axial force causes the inlet bed retainer to move slightly, thereby compressing the packing bed to maintain optimal bed structure and compensate for any reduction of bed volume that has occurred during use.



Axial compression pistons and bed retainers contain flow passages, optimized for minimal band spreading, for conducting solvent to the inlet end and from the outlet end of the packing bed. Tubing (1/16" od) from the HPLC system attaches to the axial compression pistons via 10-32 threaded compression nuts and ferrules.

Dynamax high-pressure seals are passive seals. Each seal is a hollow molded ring with one end open and the other end closed. The open end always faces the interior of the column module.

With the column unpressurized, a spring inside the seal maintains contact with the column wall with sufficient force to seal at low pressures, but does not prevent the seal from sliding when the axial compression nut is hand-tightened. When the column is pressurized, solvent entering the seal from the open side presses the seal against both the column wall and the piston body with increased force. This additional force maintains sealing action at HPLC system pressures.

CAUTION:

Effective sealing in Dynamax columns is a function of this passive sealing mechanism only. There is no reason to tighten end-fittings with more force than can be applied by hand. Overtightening with tools will not improve the seal and may damage the column module.

Dynamax guard coupling assemblies and column couplers employ special double-ended pistons called axial coupling pistons. Each axial coupling piston contains an optimized flow path to conduct solvent between a guard module and column module, or between two column modules. With respect to axial compression and sealing mechanisms, operation of axial coupling pistons is similar to axial compression pistons.

Assembling Dynamax Columns

3. Single column without guard

The simplest Dynamax column assembly consists of a single prepacked column module and End-fittings Kit No. 1. Make sure the end-fittings kit and column module you have purchased are for the same diameter column, either 21.4 mm id or 10 mm id. To assemble the Dynamax column:

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3.1. Remove the column module from its box. The column module will have plastic shipping plugs on each end to protect the packed bed from drying and prevent the inlet bed retainer from moving outward. Unscrew the plug from each end. Save these plugs! You will need them if you remove the column module from your system for storage.

3.2. Remove the end-fittings kit from its shipping container. Check that you have received two axial compression nuts and two complete axial compression pistons. (See Figure 2). You should also have two 10-32 bushings and two ferrules. In case replacements are required in future, these are Rheodyne extra-long bushings and Parker-type ferrules. For 10 mm id Dynamax columns, only the Rheodyne extra-long bushing may be used.

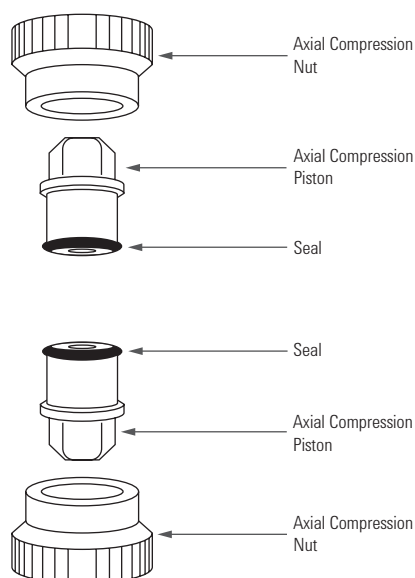


Figure 2. Components of End-fittings Kit No. 1.

3.3. Slide the inlet axial compression piston into the inlet of the column module. Direction of flow is indicated by an arrow on the column label and the wrench flats or groove in the outside of the column module is closest to the inlet end. Push the axial compression piston into the column as far as you can by hand. The seal should now be located inside the column tube.

3.4. Place an axial compression nut over the axial compression piston. Hand tighten until snug. "Snug" means as tight as can be achieved by hand. DO NOT USE TOOLS. Tightening by hand assures proper axial force, preventing overtightening.

3.5. Slide the outlet axial compression piston into the outlet of the column module.

3.6. Place the other axial compression nut over the outlet axial compression piston and hand-tighten until snug.

3.7. Connect the column assembly to the HPLC system with the bushings and ferrules provided, so the flow is in the direction of the arrow on the column. Use 1/16" od x 0.030" id tubing (Cat. No. 38-3060, 38-3061, 1533, U-175 or U-176) for all connections.

3.8. Follow the equilibrium procedure when first using your Dynamax column. Then depressurize the system and snug the end-fittings again by hand to ensure that they are tight. DO NOT overtighten the 10 mm end-fittings, even by hand: this may damage the column.

4. Column Equilibration

Dynamax columns must be equilibrated to starting conditions before use, as follows:-

- 4.1. Ensure that the mobile phase is miscible with the shipping solvent for the column. Shipping solvents for Dynamax columns are indicated in their enclosed chemistry manuals.
- 4.2. Pump sufficient mobile phase for equilibration through the column under run conditions. Monitor the effluent with your detector. The volume required will depend on the solvent. Bed volumes are approximately 90 mL for 21.4 mm id column modules and 20 mL for 10 mm id column modules.
- 4.3. The column is equilibrated when baseline drift is minimal and when peak retention volumes are reproducible in successive runs.

5. Column Module Replacement

You can replace the Dynamax column module without disconnecting the end-fittings from the HPLC System. To do so:

- 5.1. Depressurize the HPLC system.
- 5.2. Remove the axial compression nut from each end of the column module by turning the nut counter-clockwise by hand.
- 5.3. Pull the axial compression piston from each end of the column module. If the column has been disconnected from the system, inserting bushings in the end-fittings will provide a convenient grip for pulling them from the column module.
- 5.4. Check that the end-fittings are snug after equilibrating.

6. Column Module Storage

To remove a Dynamax column module from your HPLC system and store it, follow this procedure:

- 6.1. With the column module still in the system, equilibrate with storage solvent. (See Sec. 4.0 for equilibration instructions, as well as the chemistry instruction manual for your stationary phase.)
- 6.2. Remove the column module from the system. (See 5.1-5.3.)
- 6.3. Place the storage caps on both ends of the column module. Tighten the caps snugly by hand and place the column module in its original carton for storage.

7. Column With Guard Module

To assemble a column with guard module you will need one prepacked column module, a prepacked guard module, and End-fittings Kit No. 2. The column module and the guard module must be the same diameter and contain the same packing material. To add a guard module to an existing column, see Section 9.0.

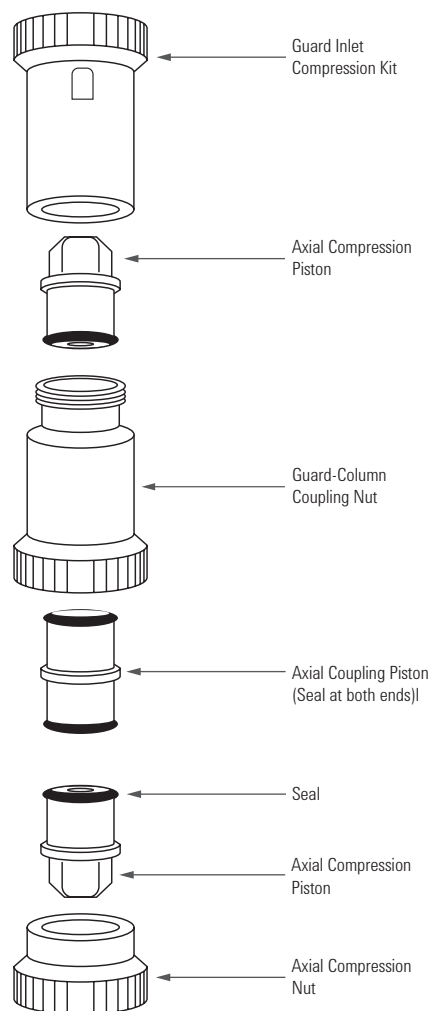


Figure 3. Components of End-fittings Kit No. 2.

- 7.1. Remove the storage caps from the column module and the shipping caps from the guard module.
- 7.2. Remove the end-fittings kit from its shipping container and check the contents (Fig. 3):

Contents:

- An inlet axial compression piston
- An outlet axial compression piston
- An axial coupling piston (double piston)
- An axial compression nut
- A guard/column coupling nut
- A guard inlet compression nut
- Two 10-32 bushings
- Two ferrules

- 7.3. Check each piston to ensure the seal is properly orientated. (Section 3.3.) Also check the walls of the column and guard modules to see that any particulate material has been removed.

7.4. Slide the axial coupling piston into the inlet of the column module. (See Section 3.4.)

7.5. Place the guard/column coupling nut over the coupling piston; hand tighten until snug.

7.6. Place the guard module outlet inside the guard/column coupling nut and slide it over the axial coupling piston. An arrow on the label shows flow direction through the guard module. Also, if you look into the ends of the guard module, the PTFE bed retainer on the inlet end is snow white and opaque. The Kel-F bed retainer of the outlet is translucent.

7.7. Slide the inlet axial compression piston (with filter) into the inlet of the guard module.

7.8. Place the guard inlet compression nut over the guard module. Hand tighten until snug.

7.9. Wait a few minutes. This wait is absolutely necessary. It allows air forming a cushion between the guard module and the column module to flow out. If not removed this air can produce dead volume and result in reduced column performance.

7.10. Retighten the guard inlet compression nut. Wait a few minutes and check that the nut is still tight. Repeat this step, if necessary, until the nut remains snug.

7.11. Slide the outlet axial compression piston into the column module outlet.

7.12. Place the axial compression nut over the outlet and hand tighten until snug.

7.13. Connect your Dynamax column to the HPLC system as described in Section 3.8.

7.14. When using the column for the first time, equilibrate according to the procedure outlined in Section 4.0. Then depressurize the system and snug all fittings again by hand to ensure tightness.

8. Guard Module Replacement

Replace the guard module periodically to protect the column module against chemical contamination. The required replacement frequency will depend on your samples. To replace the guard module:

8.1. Depressurize the HPLC system.

8.2. Remove the guard inlet compression nut by turning it counterclockwise by hand.

8.3. Pull the inlet axial compression piston from the guard module. If the column has been disconnected from the HPLC system, a bushing inserted in the piston will provide a convenient grip.

8.4. Remove the old guard module and replace with a new one. Be sure to heed the flow direction indicated by the arrow on the guard module label.

8.5. Slide the inlet axial compression piston into the new guard module and reattach the guard inlet compression nut. Tighten by hand until snug.

8.6. Remove trapped air as described in Sections 7.9 and 7.10.

9. Adding A Guard Module To An Existing Column

You can add a guard module to an existing column using a guard/column coupling assembly. The column and guard module must be the same diameter and should contain the same packing material.

The guard/column coupling assembly consists of:

- An axial coupling piston
- A guard/column coupling nut
- A guard inlet compression nut

These parts may be identified in Figure 3. Check that all parts have been received and that seals on the axial coupling piston are properly orientated as described in Section 3.3.

To couple the guard module to the column:

9.1. Disconnect the column inlet from the HPLC system.

9.2. Remove the axial compression nut from the column inlet by turning it counterclockwise by hand.

9.3. Pull the inlet axial compression piston from the column module.

9.4. Slide the axial coupling piston into the column module in place of the axial compression piston.

9.5. Place the guard/column coupling nut over the coupling piston. Hand tighten until snug.

9.6. Place the guard module outlet inside the guard/column coupling nut and slide it over the axial coupling piston. The direction of flow is indicated by an arrow on the guard module.

9.7. Take the inlet axial compression piston you just removed from the column module. Slide it into the inlet of the guard module.

9.8. Place the guard inlet compression nut over the guard module. Hand tighten until snug.

9.9. Remove trapped air as described in Sections 7.9 and 7.10.

9.10. Attach the column inlet to the HPLC system.

10. Connecting Column Modules In Series

You can connect two Dynamax column modules in series using a column coupler assembly. The two column modules must be the same diameter and should contain the same packing material. A column coupler assembly consists of:-

An axial coupling piston (Figure 3)

A column/column coupling nut (not shown)

Ensure that the seals are properly orientated on the axial coupling piston as described in Section 3.3.

10.1. Remove the caps from both column modules.

10.2. Slide the axial compression coupling piston into the outlet of one column module. Flow is shown by an arrow on the label.

10.3. Place the column/column coupling nut over the coupling piston. Hand-tighten until snug.

10.4. Thread the second column module inlet into the column/column coupling nut and over the coupling piston. Hand-tighten until snug.

10.5. Wait several minutes and remove trapped air (Sec. 7.9 and 7.10).

10.6. Complete the column assembly as described in Section 3.0 if no guard module is to be used, or Section 7.0 if the column is to be protected by a guard module

11. Using A Guard Module As A Column

The stand-alone guard holder permits a guard module to be used separately as a column. The stand-alone guard holder consists of:

- An inlet axial compression piston
- A guard inlet compression nut (Figure 3)
- A guard outlet compression nut (not shown)
- Two 10-32 bushings
- Two ferrules

Check that you have these parts. Check the axial compression pistons for proper seal orientation as described in Section 3.3.

To assemble:

- 11.1. Remove the caps from the guard module. Inspect the guard module walls and remove any particulate material present.
- 11.2. Slide the inlet axial compression piston into the inlet end of the guard module. Flow direction is shown by an arrow on the label.
- 11.3. Slide the outlet axial compression piston into the outlet end of the guard module.
- 11.4. Place the guard outlet compression nut over the outlet of the guard module and the guard inlet compression nut over the inlet. Thread the two nuts together and hand tighten until snug.
- 11.5. Connect into the HPLC system using the bushings and ferrules.
- 11.6. Equilibrate as described in Section 4.0. The bed volume is approximately 18 mL for a 21.4 mm id guard module and 4 mL for a 10 mm id guard module.

Care And Use Guidelines

12. Testing Your Column

When a new column module is installed, or after prolonged storage, always evaluate performance using the standard test procedures. Consult your chemistry manual for specific test conditions.

For Dynamax column care and usage, please refer to the appropriate chemistry manual provided with your column.

13. Important Recommendations

For long column life, depressurize the HPLC system periodically and hand-tighten all axial compression fittings. This optimizes the packed bed structure and minimizes void formation, which would decrease column performance.

Never attempt to tighten Dynamax axial compression fittings while the column is under pressure. Seals will not slide easily under these conditions. Always depressurize the HPLC system completely before tightening.

Never use tools to tighten Dynamax axial compression fittings. The Dynamax column system has been designed so that hand tightening is always sufficient. Overtightening with tools will damage important internal parts.

IMPORTANT: Leaking around a Dynamax seal cannot be corrected by increasing the torque on the axial compression nut. In case of leakage, the seal should be replaced.

When connecting a column to the HPLC system, use minimum lengths of tubing and avoid introducing dead volumes at fittings and connectors.

Do not overtighten bushings when making system connections. Overtightening can cause damage to bushings and axial compression pistons.

When connecting a guard to a column module, or two column modules in series, always remove trapped air from the axial coupling fitting. Failure to do so can result in dead volume in the fitting and reduced column performance.

Use only HPLC-grade solvents. Solvents should be degassed with helium or by vacuum filtration, and filtered through microporous membrane filters to remove particulates. This is essential when using solvents which contain dissolved salts or which may support bacterial growth. Nylon-66 membrane filters are recommended because of their resistance to all common HPLC solvents.

Fully equilibrate the column to the starting conditions before each chromatographic run.

Use a pressure filter to reduce pulsation, which is a major cause of decreased column life.

Columns that lose performance due to chemical contamination can often be regenerated by washing with stronger solvents than used during normal chromatographic procedures. Refer to the chemistry manual for further information.

Column Maintenance

14. Changing The Piston Seal

14.1. Depressurize the column completely. Turn the axial compression nut at the leaking fitting counterclockwise to remove it.

14.2. Remove the axial compression piston from the column.

14.3. Remove the seal and replace it with a new one. The seal is a tight fit. Use an implement such as a spatula to remove the seal, and take care not to scratch the sealing surface of the piston. The open side of the seal (spring visible) should be toward the column interior.

14.4. Reassemble the fitting

15. Agilent Dynamax Parts List, 316Stainless Steel

Part Number	Description
Dynamax End Fitting Kits	
R000083820	End-fittings Kit No. 1 for 21.4 mm id Dynamax Column
R000083822	End-fittings Kit No. 2 for 21.4 mm id Column and Guard
R000083810	End-fittings Kit No. 1 for 10.0 mm id Dynamax Column
R000083812	End-fittings Kit No. 2 for 10.0 mm id Column and Guard
Guard/Column Coupling Assembly	
R000083821	Guard Column Coupling Assembly for 21.4 mm id Column
R000083811	Guard Column Coupling Assembly for 10 mm id Column
Column Coupler Assembly	
R000083823	Column Coupler Assembly for 21.4 mm id Column Modules
R000083813	Column Coupler Assembly for 10 mm id Column Modules
Stand Alone Guard Holder	
R000083824	Stand-Alone Holder for 21.4 mm id Guard Module
R000083814	Stand-Alone Holder for 10.0 mm id Guard Module
Replacement Seals	
R000083927	Replacement Seals for 21.4 mm id System, package of 2
R000083917	Replacement Seals for 10.0 mm id System, package of 2

Part Number	Description
Replacement Fittings and Tubing	
R00007010062	Extra Long Bushing, Rheodyne, for 25 mm and 10 mm id System
R00001TZ	Ferrules, Parker, for 25 mm and 10 mm id System, pkg of 5
Replacement Piston Assemblies: (Complete with Seals and Retainers)	
R00007001059	Axial Compression Piston Assembly for 21.4 mm id System
R00007001060	Axial Coupling Piston Assembly for 21.4 mm id System
R00007000060	Axial Coupling Piston Assembly for 10 mm id System
Replacement Nuts:	
R00007001106	Axial Compression Nut for 21.4 mm id System
R00007000106	Axial Compression Nut for 10 mm id System
R00007001107	Guard/Column Coupling Nut for 21.4 mm id System
R00007000107	Guard/Column Coupling Nut for 10 mm id System
R00007001108	Guard Inlet Compression Nut for 21.4 mm id System
R00007000108	Guard Inlet Compression Nut for 10 mm id System
R00007001112	Column/Column Coupling Nut for 21.4 mm id System
R00007001113	Guard Outlet Compression Nut for 21.4 mm id System
R00007000113	Guard Outlet Compression Nut for 10 mm id System

16. Agilent Dynamax Parts List, Titanium

Part Number	Description
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Dynamax End Fitting Kits

R000083820	End-fittings Kit SS, 10 µm, for 21.4 mm id Hydropore Dynamax Column
R000083810	End-fittings Kit Ti/Fluoropolymer, 10 µm, for 10.0 mm id Hydropore Dynamax Column
R000083820	Preparative End-fittings Kit, 21.4 mm, 2 µm. One required for each 21.4 mm id Hydropore-5 Preparative Column Module
R000083810	Preparative End-fittings Kit, 10.0 mm, Titanium/Fluoropolymer, 2 µm. One required for each 10.0 mm id Hydropore-5 Preparative Column Module
R000083810	Column-Guard End-fittings Kit 21.4 mm, 2 µm. Required to use 21.4 mm IDJ Hydropore-5 Preparative Column Module with 21.4 mm id Hydropore Preparative Guard Module
R000083812	Column-Guard End-fittings Kit, 10.0 mm, Titanium/Fluoropolymer, 2 µm. Required to use 10.0 mm id Hydropore-5 Preparative Column Module with 10.0 mm id Hydropore Preparative Guard Module

Column-Column Coupling Assembly:

R000083813	Coupler assembly Titanium/Fluoropolymer for 10 mm id Hydropore Dynamax Column Modules
R000083821	Column-Guard Coupling Assembly, 21.4 mm, ss 316. For adding 21.4 mm id Hydropore Guard Module to 21.4 mm id Hydropore Preparative Column Module using 83-820-2TI or 83-820-TI End-fittings kit.
R000083811	Column-Guard Coupling Assembly, 10.0 mm, Titanium/Fluoropolymer, 2 µm. For adding 10.0 mm id Hydropore Guard Module to 10.0 mm id Hydropore Preparative Column Module using 83-810-2TI or 83-810-TI End-fittings Kit.

Part Number	Description
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Replacement Seals:

R0000839171	Replacement Seals, Ti/Fluoropolymer, for 10.0 mm id Hydropore Dynamax Column Module, package of 2
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Replacement Tubing:

R0000U175	Ti Tubing, 1/16" od x 0.030" id x 20 cm
R0000U176	Ti Tubing, 1/16" od x 0.030" id x 30 cm
R00001533	PEEK High-Pressure chemically Inert Plastic Tubing, 1/16" od x 0.030" id x 5 feet, Green
R0000220193	Ti Ferrules for 1/16" od tubing, (for use with Parker-type fittings) pkg of 2

Accessories:

R000083FPKIT FPLC	Adapter Kit, Includes PTFE tubing and all necessary fittings for connecting a Hydropore or Column Module to an FPLC system
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Refer to your chemistry manual for ordering information on column and guard modules.

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