Core-Shell Optimization Kit

(PN: AQ0-8892)

- Increase method efficiency, resolution, and detection
- Improve results for sensitive and demanding applications
    - Minimize dead volume between injector and detector
    - Facilitate quick and reliable connections
    - Create small volume peaks that can be defined at high detector acquisition rates

phenomenex®
...breaking with tradition℠

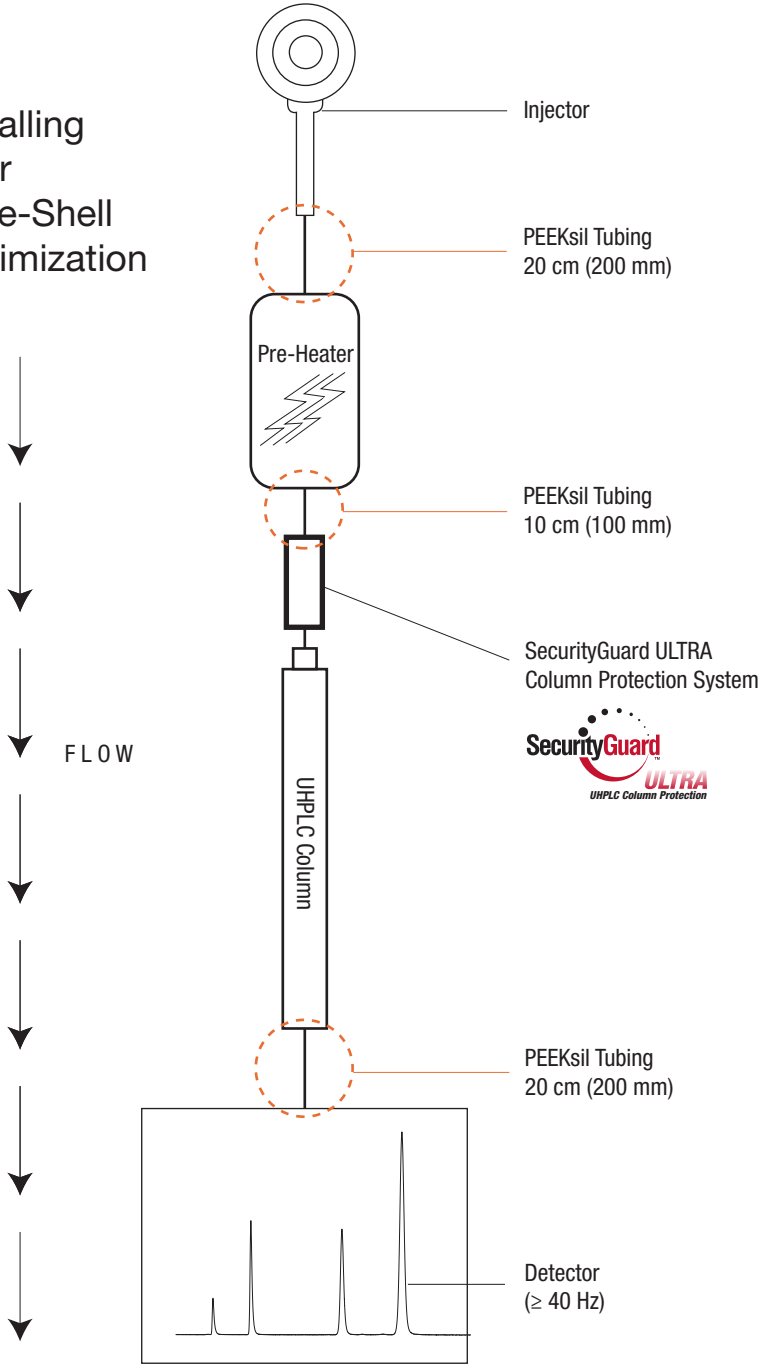
This Core-Shell Optimization Kit installation guide outlines a few changes that should be made to your current HPLC system to provide UHPLC-like performance improvements.

The fittings and tubing used in this kit are carefully chosen to minimize dead volume and reduce band broadening. Combined with your Core-Shell column and a column protection system such as SecurityGuard™ ULTRA, this kit will provide reliable connections and quality performance every time.

KIT COMPONENTS

Description	Kit UOM
PEEKsil™ Tubing 0.100 mm ID x 1/16 in. OD x 20 cm L, Red	2/Pk
PEEKsil™ Tubing 0.100 mm ID x 1/16 in. OD x 10 cm L, Red	Ea
Sure-Lok™ High Pressure PEEK™ 1-Pc Male Nut Fitting, 10-32, For 1/16 in Tubing	10/Pk
Sure-Lok™ Male Nut Fitting Tightening Tool, Aluminum	Ea

Installing Your Core-Shell Optimization Kit



INSTALLING YOUR CORE-SHELL OPTIMIZATION KIT:

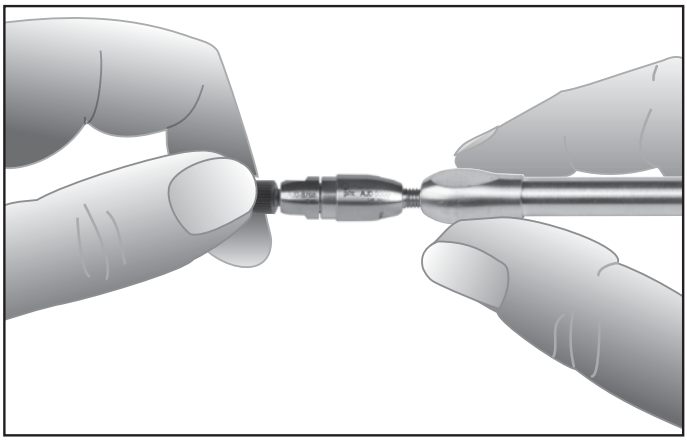
1. Inspect the 1/16 in PEEKsil™ tubing pieces to ensure the tubing is clean and defect-free. PEEKsil tubing is precision pre-cut and should not be cut again. If additional tubing is needed or shorter lengths are desired, replacement tubing is available. See Ordering Information on page 5.
2. It is recommended that kit connections be made through your system in the same direction as the flow, i.e., begin at the injector and complete your connections at the detector end.
3. Select the proper length of tubing for the connection between the injector and the column, or between injector and column pre-heater, if a pre-heater is present. A 200 mm length is recommended for this connection.
4. Inspect each Sure-Lok™ PEEK male nut fitting before use.
   a. Note: – Before re-use inspect and replace the nut if thread compression and/or wear is observed.
5. Slide one Sure-Lok PEEK male nut fitting onto the tubing and insert the tubing end with the fitting into the injector port. Seat the tubing all the way down into the injector port. The tube should be centered and pushed into the port until it bottoms out.
6. While holding the tubing in place, turn (screw clockwise) the PEEK male nut fitting by hand as far as it will go. Seating (sealing) of fittings is made by the increased friction from compression. A secure connection usually takes only about a ¼ turn beyond the point where the fitting ferrule first starts to grab the tubing.

IMPORTANT: For applications over 3000 psi (207 bar), it is imperative that the Aluminum Tightening Tool (AQ0-8530), included in this kit, be used to prevent the tubing from leaking or slipping. Tighten the nut about ¼ to ½ turn, but do not over tighten.

Note: If you experience leaking, tighten another ¼ turn.

7. Slide a second PEEK male nut fitting onto the tubing and complete the connection to your guard column (see Figure 1), column, or pre-heater, repeating the positioning and tightening steps (5 and 6) above.

Figure 1. Connecting PEEKsil Tubing with PEEK male nut fitting to Guard Column



8. If a column pre-heater is present with compatible fittings, use the 100 mm of PEEKsil tubing and two PEEK male nut fittings to make the connections between the pre-heater and the inlet of your guard column or Core-Shell column.
9. Lastly, using the second piece of 200 mm tubing and two more PEEK male nut fittings, make the connection between the outlet of the column and the detector, in the same manner that the connection between injector and column is made.

Congratulations!
The installation of your Core-Shell Optimization Kit is now complete!

COMPONENT REORDERING INFORMATION:

Description	Kit UOM	Replacement Part No.
PEEKsil Tubing 0.100 mm ID x 1/16 in. OD x 20 cm L, Red	2/Pk	AT0-8896 (5/Pk)
PEEKsil Tubing 0.100 mm ID x 1/16 in. OD x 10 cm L, Red	Ea	AT0-8897 (5/Pk)
Sure-Lok High Pressure PEEK 1-Pc Male Nut Fitting, 10-32, For 1/16 in Tubing	10/Pk	AQ0-8503 (10/Pk)
Sure-Lok Male Nut Fitting Tightening Tool, Aluminum	Ea	AQ0-8530 (Ea)

ADDITIONAL TIPS TO ACHIEVE AND KEEP OPTIMAL UHPLC PERFORMANCE ON YOUR HPLC

To optimize your separation, we recommend the following:

Sample
- Minimize sample injection volumes (use low-volume syringes)
- Filter all samples with a 0.20 µm Phenex syringe filter (see details on pages 10 - 11).
- Make sample diluent strength weaker than the mobile phase

Microparticulates
- Filter mobile phase solvents before use
- Make fresh mobile phase often
- Perform routine pump piston seal maintenance (washing and regular replacement)
- Replace purge valve PTFE frits periodically (monitor baseline backpressure for increases)
- Perform routine injection valve rotor maintenance

Injector
- Use low dispersion injection valves and loops
- Use a small-volume injector needle seat
- Use weak solvent injections or gradients

Column
- Select and optimize the column for maximum peak resolution (ruggedness)
- Optimize critical peaks away from early elution
- Reduce column length and/or ID to shorten run time
- Reduce flow rate to reduce backpressure if needed
- Use a low-volume in-line filter or guard system to protect the column such as SecurityGuard ULTRA column protection system
- Match packed guard materials to the column I.D. and phase
- Employ temperature control (including a mobile phase pre-heater before the column)

Connections, Tubing and Fittings
- Make tight, optimized connections at all points, between injector, column and detector
- Use small diameter tubing, micro-volume fittings and unions
- Use pre-cut PEEKsil™ tubing when tubing diameters are less than 0.005 in / 0.127 mm

Detector
- Minimize volume of the associated heat exchanger
- Use optimized detector cell geometry (includes length and radius)
- Decrease detector time constant (use a faster acquisition rate)
    - o For best results when using core-shell columns, collect data at a rate of 40 Hz or more.

For more in-depth tips and hints on optimizing your HPLC, visit **www.phenomenex.com/verify**

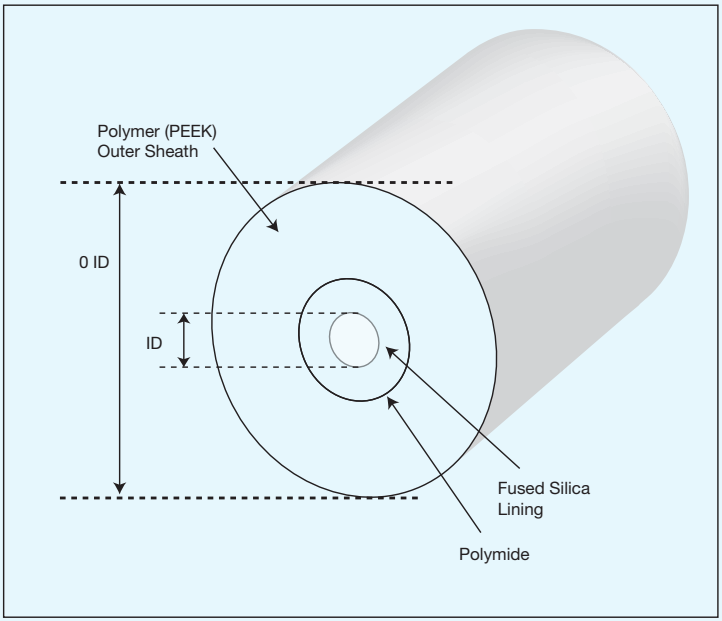
PEEKsil™ TUBING

- **Minimizes extra-column effects and band broadening**
- **Precision-cut, ultra-square tube ends**
- **Exceptionally smooth inner surfaces**

PEEKsil is polymer-sheathed fused silica tubing. The PEEK™ portion is mechanically strong and has ideal sealing characteristics when used with conventional metal or PEEK ferrule systems. The tubing in this kit is capable of withstanding high pressures up to 10,000 psi (689 bar). The exceptionally smooth inner surfaces are free of the imperfections common in steel tubing. This lessens the possibility of path blockages, while also ultimately reducing band broadening. The precision-cut, ultra-square and smooth tube ends enable optimal low volume connections to be made, which will improve overall chromatographic performance. For higher efficiencies and improved resolution, PEEKsil tubing is recommended to help optimize your HPLC/UHPLC system.

Notes: PEEKsil is compatible with most organic solvents and has an effective pH range from 0 to 10.

Figure 2. PEEKsil tubing cut-away



UHPLC / HPLC SURE-LOK™ PEEK MALE NUT FITTING

- **Pressure-rated to 10,000 psi (689 bar) when used with your Core-Shell Optimization Kit**
- **Seals without the need for wrenches**

AQ0-8503

Made of a proprietary PEEK blend, these ultra-high performance polymeric fittings are suitable for all but the most extreme high-pressure applications, and best for ion- and bio-chromatography. These universal, one-piece male nut fitting will hold any 1/16 in diameter PEEK, stainless or titanium tubing. Use the tightening tool (AQ0-8530, see page 9) to easily secure your connections in order to avoid leaks and tubing slippage.

IMPORTANT! Although the kit male nut fittings are pressure rated to 12,000 psi (827 bar), the kit tubing is pressure rated to only 10,000 psi (689 bar). Therefore, when used with the kit tubing, these fittings CANNOT be used at pressures higher than the rating of the tubing itself. All fittings do have limited lifetimes. Phenomenex recommends inspecting the threads before re-use and replacing your fittings after multiple tightening cycles or whenever thread compression and/or wear is observed.

PEEK MALE NUT FITTING TOOL

- **Quick and easy tightening of PEEK fittings**

AQ0-8503

Use this handy tool to tighten any standard, short- or long-style knurl-headed PEEK male nut fittings like AQ0-8503. The tool can also be used with many of the low-pressure nuts commonly used in the lab.

Quick Use Notes: Push / slide the narrow end of the tool all the way down onto the head of the nut. If the connection is being made to the column side, use a wrench on the column fitting to hold it from moving, while using the fitting tool to turn the nut clockwise until tightened. Slide the tool off the nut to complete the installation.

Note: The torque achieved will depend on the polymer construction of the nut, the degree of nut head engagement, as well as normal manufacturing tolerances.

SAMPLE FILTRATION: Phenex™ Syringe Filters

When using smaller particle HPLC/UHPLC columns with low-volume connections, it is essential that microparticulates be removed first by pre-filtration. Phenex™ syringe filters effectively remove unwanted sample particulates before they can enter the system flow path, causing blocked injectors, tubing, or clogged columns that degrade performance. Pre-filtering will extend your column's lifetime, increase system uptime, and prevent unnecessary troubleshooting and rework.

For Aqueous or Mixed Organic Solutions, use Phenex-RC (Regenerated Cellulose) syringe filters. For 100 % Organic Solutions, use Phenex-PTFE (Polytetrafluoroethylene) syringe filters. For columns packed with ≤ 4 µm chromatographic media, a syringe filter with 0.20 µm filter membrane is recommended. For columns packed with ≥ 5 µm chromatographic media, a syringe filter with 0.45 µm filter membrane is recommended.

See product selection and ordering information on page 10 - 11

UHPLC/HPLC SAMPLE FILTRATION

PHENEX™ SYRINGE FILTERS

- **Rapid filtration of HPLC and GC samples prior to analysis**
- **Particulate, PVC and extractable-free filters**
- **More consistent, reliable performance**

SELECTION GUIDE

1. CHOOSE FILTER DIAMETER BASED ON SAMPLE VOLUME

4 mm Diameter	15 Diameter	25-28 mm Diameter
≤ 2 mL Sample Volume	2 - 10 mL Sample Volume	10 - 100 mL Sample Volume

Phenex Syringe Filter Ordering Information

	4 mm Diameter for ≤ 2 mL sample volumes		15 mm Diameter for 2 - 10 mL sample volumes		25 -28 mm Diameter for 10 - 100 mL sample volumes	
Membrane Type/Size	**Part No.**	**Unit**	**Part No.**	**Unit**	**Part No.**	**Unit**
0.20 µm						
Phenex-RC (Regenerated Cellulose)	AF0-3203-12 AF0-3203-52	100/Pk 500/Pk	AF0-2203-12 AF0-2203-52	100/Pk 500/Pk	AF0-8203-12 [4] AF0-8203-52 [4]	100/Pk 500/Pk
Phenex-PES [2] (Polyethersulfone)	— —	— —	— —	— —	AF0-8208-12 [6] AF0-8208-52 [6]	100/Pk 500/Pk
Phenex-PTFE [5] (Polytetrafluoroethylene)	AF0-3202-12 AF0-3202-52	100/Pk 500/Pk	AF0-2202-12 AF0-2202-52	100/Pk 500/Pk	AF0-1202-12 AF0-1202-52	100/Pk 500/Pk
Phenex-NY (Nylon)	AF3-3207-12 AF3-3207-52	100/Pk 500/Pk	AF0-2207-12 AF0-2207-52	100/Pk 500/Pk	AF0-1207-12 AF0-1207-52	100/Pk 500/Pk
Phenex-GF/NY (Glass Fiber/Nylon)	*An integrated syringe filter unit containing an inert borosilicate glass fiber prefilter and a Nylon (NY) membrane. Excellent for filtration of particle-laden samples, such as foods and beverages, environmental, biofuels, and dissolution samples. Use less hand pressure to filter even the most difficult samples. Outlet connection is luer-lock.*				AF0-1A47-12 AF0-1A47-52	100/pk 500/pk
1.20 µm						
Phenex-GF [1,2] (Glass Fiber)	*Prefiltration of heavily contaminated or highly viscous samples. When used in-line preceding a 0.20 µm membrane filter, clogging of the membrane filter is prevented and sample clean up is*				AF0-8515-12 [6] AF0-8515-52 [6]	100/Pk 500/Pk

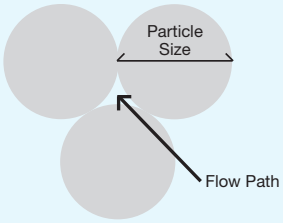
Above syringe filters are non-sterile. Housing is made of medical-grade polypropylene (PP) and offer luer lock inlet/slip outlet connections, unless otherwise indicated.

2. CHOOSE FILTER MEMBRANE ACCORDING TO THE CHARACTERISTICS OF YOUR SAMPLE AND FILTERING OBJECTIVE

Membrane Type / Recommended Uses	
RC	Regenerated Cellulose(RC) - Hydrophilic Regenerated Cellulose filter membranes are compatible with a very broad range of aqueous and mixed-organic solutions, making them one of the most universal filter materials prior to chromatography. Phenex-RC filters also exhibit fast-flow and ultra-low protein and non-specific binding characteristics. Due to the beneficial material characteristics, Phenex-RC membranes are broadly recommended as an excellent general purpose/high-performance sample filter for most applications.
PTFE	Polytetrafluoroethylene(PTFE) - Phenex-PTFE membranes are inherently hydrophobic and excellent for filtration of 100 % organic or highly acidic or basic samples.
PES	Polyethersulfone(PES) - Polyethersulfone membranes exhibit very fast-flow and ultra-low protein binding characteristics and are ideally suited for use in many life science clarification applications. Phenex-PES membranes typically offer better chemical resistance than cellulose acetate and are broadly recommended for filtering critical biological samples, tissue culture media, additives and buffers.
NY	Nylon(NY) - Nylon has inherent hydrophilic characteristics and works well for filtration of many aqueous and mixed-organic sample types. For applications that require low protein or non-specific binding characteristics, Phenomenex recommends Phenex-RC Regenerated Cellulose filters.
GF	Glass Fiber(GF) - Phenex-GF Glass Fiber filters are made of inert borosilicate glass and have a nominal 1.2 µm pore size. They are commonly used with highly viscous samples or samples that contain high concentrations of particulate matter (e.g. food analysis, biological samples, soil samples, fermentation broth samples, removal of yeasts, molds, etc.). Can be used alone or in series with other Phenex filter membranes such as the 0.20 µm pore Phenex-RC filter to reduce clogging of the membrane and optimize flow.

WHY SELECT 0.20 µm SYRINGE FILTERS?

For columns packed with ≤ 3 µm chromatographic media, a syringe filter with 0.20 µm filter membrane is recommended. Phenex 0.20 µm syringe filters provide an effective barrier against unwanted particulates from entering the system flow path. This reduces column plugging leading to longer column lifetimes and increased system uptime.



Particle Size (µm)	Flow Path (µm)	Effective Filter Pore Size (µm)
5	0.72	0.45
3	0.43	0.20
2.6	0.38	0.20
1.7	0.25	0.20

FOOTNOTES:

1. *Glass fiber filters are 28 mm diameter and made of borosilicate. They will remove 90 % of all particles >1.2 µm.*
2. *Housing material is methacrylate butadiene styrene (MBS) polymerisate. Also known as Cyrolite™.*
3. *Cellulose acetate is surfactant-free.*
4. *26 mm diameter.*
5. *Hydrophobic membrane. Can be made hydrophilic by pre-wetting with IPA.*
6. *28 mm diameter.*
7. *Additional dimensions and membrane types are available. Please contact your local Phenomenex technical consultant or distributor for availability or assistance.*
8. *Larger quantity purchases at significant savings are available.*

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www.phenomenex.com
support@phenomenex.com