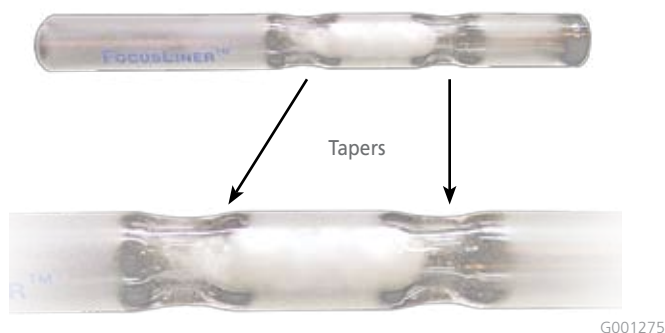


## Product Information

### FocusLiner™ Inlet Liners



#### Introduction

FocusLiner inlet liners incorporate a unique design to prevent shifting of the wool plug during repeated injections or sudden inlet pressure changes. Tapers inside the FocusLiner inlet liner hold the wool plug in an optimum position. This positioning results in wool plug penetration by the needle tip during an injection. This provides a larger surface area for sample vaporization, and allows a wiping action to remove residual liquid sample from the needle tip, thus preventing droplet formation. Reproducibility can be improved as much as 10 fold, with reduced solvent tailing, and lower mass discrimination during split injections, without any cost disadvantage compared to alternative liners.

#### Features and Benefits

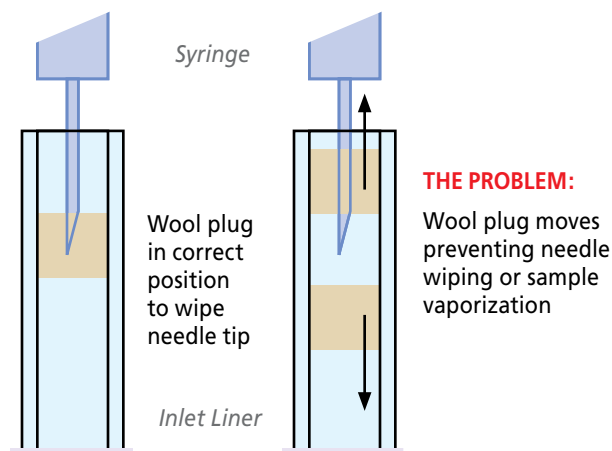
- High temperature deactivation
- Enhanced sample vaporization
- Precision, accuracy, and reliability
- Maximum sensitivity/detection levels

#### The Problem with Wool Plugs in Traditional Liners

In addition to preventing non-volatile material from entering the column, a wool plug exhibits two benefits that assist in reducing injection volume variability. 1) The increased surface area facilitates the maximum vaporization of the sample. 2) Any droplets formed on the outside of the needle are wiped off. Both of these benefits require that the needle tip penetrate the wool plug. Therefore, the position of the wool plug in the injection liner is critical. Unfortunately, there is no guarantee that once a liner is installed in the injector that the wool plug will stay in the correct position.

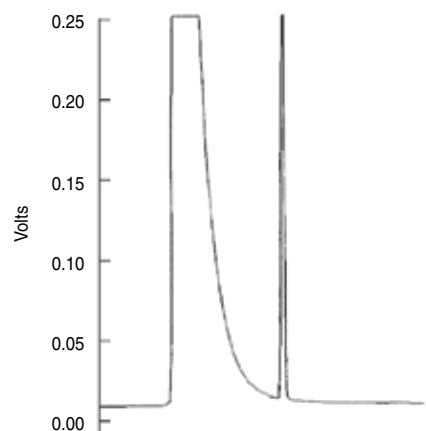
The wool plug can be easily dislodged without the chromatographer's knowledge. As shown in Figure 1, a common cause of wool plug displacement within the liner is that repeated injections progressively

**Figure 1. The Problem – Wool Plug in Traditional Inlet Liner**

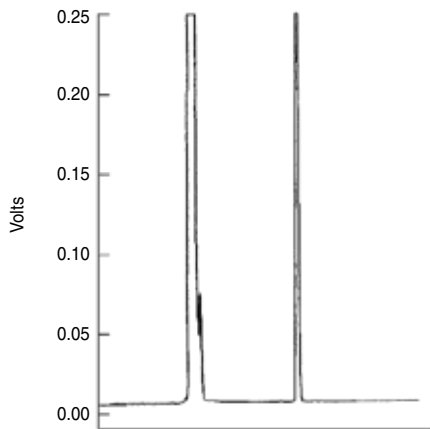


move the wool plug until no further contact with the needle is made. A sudden change in the inlet pressure, like changing the septum, can also result in the movement of the wool plug. Relocation of the wool plug from the correct position can be characterized by excessive tailing of the solvent peak, as shown in Figure 2. As shown in Figure 3, sharp solvent peaks are only observed when the wool plug is in the correct position to wipe the needle tip.

**Figure 2. Tailing Solvent Peak – Wool Plug in Incorrect Position**



**Figure 3. Sharp Solvent Peak – Wool Plug in Correct Position**

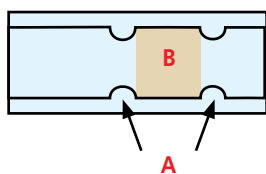


G004312

## How FocusLiner Inlet Liners Overcome These Drawbacks

FocusLiner inlet liners utilize an innovative design that overcomes the drawbacks observed with the use of wool plugs in traditional inlet liners. With FocusLiner inlet liners, the wool plug is held in position by two tapered sections. As shown in Figure 4, these tapered sections secure the wool plug in the correct position, even after repeated injections and exposure to sudden pressure changes. With a FocusLiner inlet liner, the chromatographer can be assured that the wool plug is always in the correct position, ensuring that the needle tip penetrates the wool plug to wipe any residual liquid sample from the needle tip while providing sufficient surface area for maximum volatilization of the sample.

**Figure 4. The Solution – FocusLiner Inlet Liner**



### THE SOLUTION:

Two tapered sections (A) secure the wool plug (B) in the correct position to ensure improved reproducibility

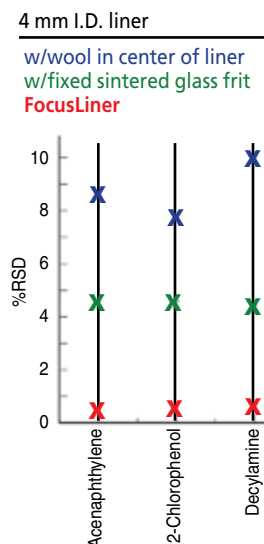
G004313

## Sample Precision: Percent Relative Standard Deviation (%RSD)

The effect on sample precision (measured as %RSD) caused by the position of the wool plug in the liner was measured. A 4 mm I.D. traditional inlet liner with the wool plug moved to the center was evaluated against a 4 mm I.D. FocusLiner inlet liner. Another frequently used split liner was also evaluated. This liner design substitutes the wool plug with a sintered glass frit, which can be either fixed or removable. In this experiment a 4 mm I.D. fixed frit liner was used.

As shown in Figure 5, when the wool plug is moved to the center of the traditional inlet liner, %RSD values are in the 8-10% range. Impressively, the FocusLiner inlet liner was able to achieve %RSD values for the same probe compounds in the 0.2% range! This is up to 50 times lower than those measured with the traditional inlet liner.

**Figure 5. %RSD of Different Wool Plug Positions**



G004314

The fixed sintered glass frit liner is also unable to match the precision provided by the FocusLiner inlet liner. This result is not surprising as a key element to achieving good sample reproducibility is the needle tip being wiped during injection. Therefore, liners with fixed or removable frits can only be used with limited success.

## Sample Accuracy

Sample accuracy is also a critical factor in providing confidence in sample quantitation. Peak areas for probe compounds using the FocusLiner inlet liner were found to be, on average, 25% higher than a liner where the wool plug is positioned incorrectly.

Solvent peak tailing is also observed if the wool plug is incorrectly positioned, caused by slow vaporization near the cool septum cap as the needle is wiped during withdrawal. As shown in Figure 2, a tailing solvent peak may interfere with the quantitation of peaks that elute shortly after the solvent peak. As shown in Figure 3, the correct positioning of the wool plug results in sharp solvent peaks and more accurate quantitation of peaks that elute shortly after the solvent peak.

## Conclusion

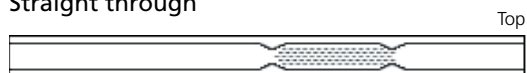
Poor reproducibility and severe tailing may be observed if the needle tip is not wiped during injections. As the sample is being delivered from the syringe, droplets will form that wet the syringe needle tip. The volume of sample that remains on the needle tip varies from injection to injection. The key to the improved reproducibility provided by the FocusLiner inlet liner is the proper positioning of the wool plug in the liner, allowing the needle tip to be wiped. The use of a FocusLiner inlet liner provides precise, accurate, and reliable sample injections, resulting in improved reproducibility.

## Did You Know?

The purpose of an inlet liner is to minimize mass discrimination by ensuring complete vaporization of the sample before it reaches the column inlet. The volume of the liner must be larger than the volume of the vaporized sample. Adding a wool plug in an optimum position within the liner will dramatically increase the vaporization surface area and promote mixing. Additionally, the liner should be deactivated so it does not react with the sample.

## Types of FocusLiner Inlet Liners and Their Applications

### Straight through



- Dirty samples

### Single taper



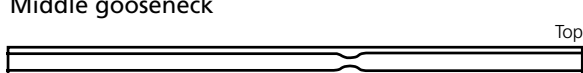
- Dirty samples
- Active Compounds

### Dual taper



- Dirty samples
- Active Compounds

### Middle gooseneck



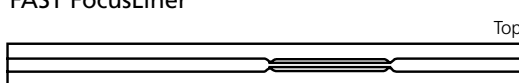
- General purpose

### Recessed gooseneck



- Dirty samples

### FAST FocusLiner



- Use with Fast GC columns (0.10 mm I.D.– 0.18 mm I.D.)
- Active compounds

G003105, 3059, 4319, 3100, 3061, 3063

## Ordering Information

Description	Cat. No.
<b>Agilent® 5890/6890/7890</b>	
Split/Splitless, 78.5 x 6.3 x 4.0 mm	2879801-U 2879805-U 2879825-U
Split/Splitless, 78.5 x 6.3 x 2.3 mm, FAST FocusLiner	2879601-U 2879605-U 2879625-U
Split/Splitless, 78.5 x 6.3 x 4.0 mm, single taper	2879901-U 2879905-U 2879925-U
Split/Splitless, 78.5 x 6.3 x 2.3 mm, single taper, FAST FocusLiner	2879501-U 2879505-U 2879525-U
Split/Splitless, 78.5 x 6.3 x 4.0 mm, recessed gooseneck	2879701-U 2879705-U 2879725-U
<b>Finnigan Model 9001, GCQ</b>	
Same catalog numbers as Agilent	
<b>PerkinElmer® AutoSystem™ and Clarus</b>	
Split/Splitless, 92 x 6.2 x 4.0 mm	2879201-U 2879205-U
Split/Splitless, 92 x 6.2 x 4.0 mm, single taper	2879101-U 2879105-U
<b>PerkinElmer AutoSystem for PSS Injector and Autosystem XL</b>	
Split/Splitless, 86.2 x 4.0 x 2.0 mm	2878901-U 2878905-U
<b>Shimadzu® 14/15A/16 with SPL-14 Injector</b>	
Split/Splitless, 99 x 5.0 x 3.4 mm	2878101-U 2878105-U
Split/Splitless, 99 x 5.0 x 3.4 mm, single taper	2877801-U 2877805-U
Split/Splitless, 99 x 5.0 x 3.4 mm, middle gooseneck	2877701-U 2877705-U
<b>Shimadzu 17A with SPL-17 Injector</b>	
Split/Splitless, 95 x 5.0 x 3.4 mm	2878601-U 2878605-U
Split/Splitless, 95 x 5.0 x 3.4 mm, single taper	2878401-U 2878405-U
Split/Splitless, 95 x 5.0 x 3.4 mm, middle gooseneck	2878301-U 2878305-U
Split/Splitless, 95 x 5.0 x 3.4 mm, recessed gooseneck	2877901-U 2877905-U

Description	Cat. No.
<b>Shimadzu GC-2010</b>	
Direct, 95 x 5.0 x 3.4 mm	2877601-U 2877605-U
<b>Thermo® ThermoQuest 8000/TRACE™</b>	
Split (for use with 50 mm needle) 105 x 8.0 x 5 mm	2877001-U 2877005-U
Splitless (for use with 70 mm needle) 105 x 8.0 x 5 mm	2877201-U 2877205-U
Split/Splitless, 105 x 8.0 x 5 mm, single taper	2877501-U 2877505-U
<b>Varian® 1075/1077 Injector</b>	
Split, 72 x 6.3 x 4.0 mm	2875401-U 2875405-U
Split, 72 x 6.3 x 4.0 mm, single taper	2874801-U 2874805-U
Split, 72 x 6.3 x 4.0 mm, with top-end restriction	2874901-U 2874905-U
Splitless, 72 x 6.3 x 4.0 mm, with top-end restriction	2874601-U 2874605-U
Split, 72 x 6.3 x 2.3 mm, FAST FocusLiner	2874701-U 2874705-U
<b>Varian 1078/1079 Injector</b>	
Split/Splitless, 54 x 5.0 x 3.4 mm, single taper	2875701-U 2875705-U
Split/Splitless, 54 x 5.0 x 3.4 mm, dual taper	2875501-U 2875505-U
<b>Varian CP-1177 Injector</b>	
Split/Splitless, 78.5 x 6.3 x 4.0 mm	2879801-U 2879805-U 2879825-U
Split/Splitless, 78.5 x 6.3 x 2.3 mm, FAST FocusLiner	2879601-U 2879605-U 2879625-U
Split/Splitless, 78.5 x 6.3 x 4.0 mm, single taper	2879901-U 2879905-U 2879925-U
Split/Splitless, 78.5 x 6.3 x 2.3 mm, single taper, FAST FocusLiner	2879501-U 2879505-U 2879525-U
Split/Splitless, 78.5 x 6.3 x 4.0 mm, recessed gooseneck	2879701-U 2879705-U 2879725-U

---

**Trademarks**

Agilent – Agilent Technologies  
FocusLiner – SGE International Pty Ltd.  
PerkinElmer, AutoSystem – PerkinElmer Inc.  
Shimadzu – Shimadzu Corporation  
Thermo, TRACE – Thermo Electron Corp.  
Varian – Varian Associates

[sigma-aldrich.com/focusliner](http://sigma-aldrich.com/focusliner)

---

**World Headquarters**





3050 Spruce St., St. Louis, MO 63103  
(314) 771-5765  
[sigma-aldrich.com](http://sigma-aldrich.com)

**Order/Customer Service** (800) 325-3010 • Fax (800) 325-5052

**Technical Service** (800) 325-5832 • [sigma-aldrich.com/techservice](http://sigma-aldrich.com/techservice)

**Development/Bulk Manufacturing Inquiries** **SAFC**™ (800) 244-1173

---

©2008 Sigma-Aldrich Co. All rights reserved. SIGMA, , SAFC, **SAFC**, SIGMA-ALDRICH, ALDRICH, , FLUKA, , and SUPELCO,  are trademarks belonging to Sigma-Aldrich Co. and its affiliate Sigma-Aldrich Biotechnology, L.P. Sigma brand products are sold through Sigma-Aldrich, Inc. Sigma-Aldrich, Inc. warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product(s) for their particular use. Additional terms and conditions may apply. Please see reverse side of the invoice or packing slip.

KOX  
T408101



**Mixed Sources**

Product group from well-managed  
forests, controlled sources and  
recycled wood or fiber  
[www.fsc.org](http://www.fsc.org) Cert no. SGS-COC-003338  
© 1996 Forest Stewardship Council

