



Minimize Adsorption of Active Analytes, Using a Drilled Uniliner® GC Inlet Liner

Two Configurations, to Match Chromatographic Conditions

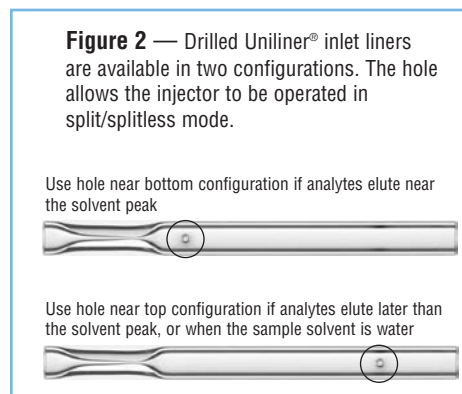
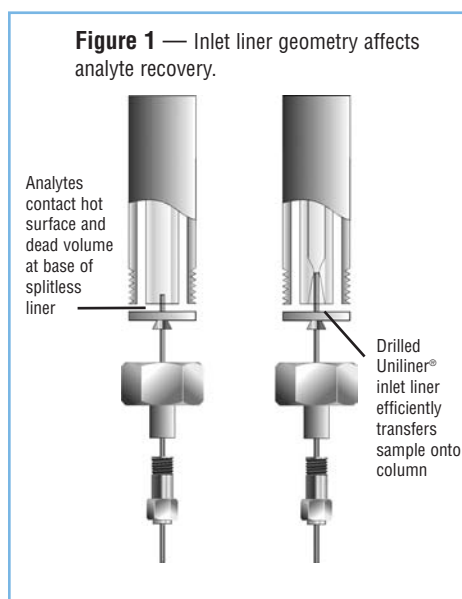
In sample injections into a hot splitless injection port liner, a typical 1 μ L sample expands to a volume of hundreds of microliters.¹ The sample solvent vapor, and the analytes, fill the entire injector system. During sample expansion, analyte molecules come in contact with hot, active surfaces outside the injection port liner, and occupy the dead volume at the bottom of the injection port, below the inlet end of the column (Figure 1). In splitless injection mode, there is very little carrier gas flow in this area to carry the analytes back up to the column inlet. This situation is most noticeable with active compounds that degrade when they come in contact with active surfaces; recoveries can be significantly reduced. In addition, late-eluting compounds that do not readily vaporize are affected by injection port discrimination.

The innovative geometry of a Drilled Uniliner® inlet liner minimizes active sites in the sample pathway, and reduces injection port discrimination. The analytical column connects to the bottom of a Drilled Uniliner® inlet liner via a Press-Tight® seal (Figure 1), eliminating sample contact with any part of the injector below the column inlet. Recoveries of active analytes are significantly improved.² Additionally, the hole in the side of the liner allows the injector to be operated in traditional split/splitless mode.

Restek offers Drilled Uniliner® inlet liners in two configurations (Figure 2). The liner to use depends on the analysis, and how closely the early-eluting compounds elute to the solvent peak.

In flash on-column injections, all of the solvent is transferred from the injector to the column, producing a substantial solvent peak tail. Splitless injection eliminates the solvent tail, because the injector goes into the split mode after the compounds of interest are transferred to the column, and all solvent remaining in the injection port is flushed out through the purge vent. The solvent peak ends abruptly, as shown in Figure 3a. Elimination of the solvent peak tail is an advantage to using the splitless injection technique when analyzing compounds that elute close to the solvent.

A Drilled Uniliner® inlet liner produces a distinctly different solvent peak shape than the single gooseneck splitless liner, as shown in Figure 3. The most noticeable difference is the peak width; the peak is considerably narrower than the peak from the single gooseneck liner. The position of the hole in the Drilled Uniliner® also affects solvent peak shape. A Drilled Uniliner® with the hole near the bottom produces a sharply ending solvent peak, similar to that from a single gooseneck liner (Figure 3b). This liner is a direct replacement for a splitless liner, and should be used when analytes elute closely behind the solvent.



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Under the same conditions, a Drilled Uniliner® with the hole near the top produces a solvent peak with a small tail (Figure 3c). This is because solvent remaining in the liner, between the hole and the column entrance, is not swept out of the injection port when the injector goes into the split mode. Consequently, we recommend this liner for analyses in which the analytes would not be affected by a solvent tail, such as chlorinated pesticide analysis. A Drilled Uniliner® with the hole near the top will provide the best transfer of analytes to the column, and is recommended when transfer of analytes to the column is paramount. A Drilled Uniliner® with the hole near the top also exhibits excellent reproducibility for analysis of glycols in water³.

For accurate, reproducible, problem-free split/splitless injections, we recommend you use a Drilled Uniliner® inlet liner—and connect it to a Restek capillary GC column.

References

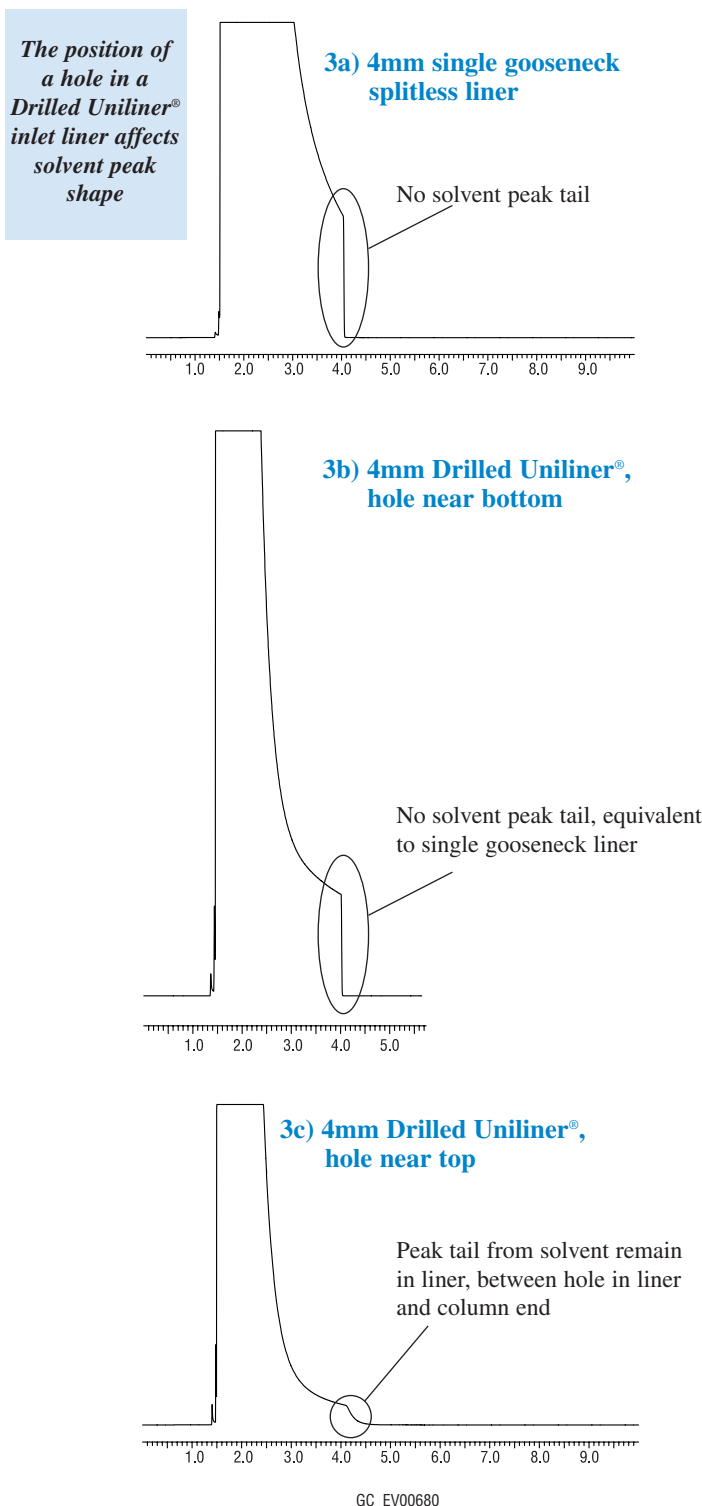
1. *Operating Hints for Using Split/Splitless Injectors* Restek Corporation, Bellefonte, PA, 36pp, 2002. (Reference free on request: cat.# 59880A)
2. *Higher Responses for Chlorinated Pesticides, Using a Drilled Uniliner® GC Inlet Liner and Rtx®-CLPesticides Columns* Restek Corporation, Bellefonte, PA, 4pp, 2003. (Reference free on request: cat.# 59487.)
3. *Techniques to Optimizing GC Analysis of Ethylene glycol in Water* Restek Corporation, Bellefonte, PA, 4pp, 2001. (Reference free on request: cat.# 59187.)

HOT Tip!

Drilled Uniliner®

The Drilled Uniliner® with the hole near the bottom is recommended for analysis in which compounds of interest could be affected by a tailing solvent peak. The Drilled Uniliner® with the hole near the top is recommended for aqueous injections, as well as analysis in which the compounds of interest elute away from the solvent peak.

Figure 3 – Solvent peak profiles from Drilled Uniliner® inlet liners and a splitless liner



Rtx®- 5Sil MS 30m, 0.25 ID, 0.25µm (cat.# 12723)
 Sample: methylene chloride, PR grade
 Inj.: 0.5µL, splitless (hold 2.5 min.)
 4mm single gooseneck inlet liner (cat.# 20799)
 4mm Drilled Uniliner® inlet liner (cat.# 21055)
 4mm Drilled Uniliner® inlet liner (cat.# 20756)

Inj. temp.: 260°C
 Carrier gas: helium, constant pressure
 Linear velocity: 17cm/sec. @ 50°C
 Oven temp.: 50°C, isothermal
 Det.: FID @ 330°C

all liners are
100%
deactivated

All liners are shipped intermediate polarity (IP) deactivated unless otherwise requested.

Drilled Uniliner® GC Inlet Liners

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Hole makes direct injection possible with EPC-equipped Agilent 6890 GCs!

Direct Injection Liners for Agilent 5890 & 6890 GCs (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID*/OD & Length (mm)	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk.
Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	21054	21055	20998
Siltek™ Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	21054-214.1	21055-214.5	20998-214.25
Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	G1544-80730	20756	20771	—
Double Gooseneck Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	20508	20509	—
Double Gooseneck Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	G1544-80700	20954	20989	—
Siltek™ 1mm Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	1.0 ID 6.3 OD x 78.5	—	21390-214.1	21391-214.5	—
Direct Injection Liners for Varian 1177 GCs (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID*/OD & Length (mm)	Similar to Varian part #	cat.# ea.	cat.# 5-pk.	cat.# 25-pk.
Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	21470	21471	—
Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.3 OD x 78.5	—	21468	21469	—
Direct Injection Liners for Shimadzu GCs (For 0.32/0.53mm ID Columns)	Benefits/Uses	ID*/OD & Length (mm)	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.
Open-top Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	3.5 ID 5.0 OD x 95	—	21285	21286	—
Open-top Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	3.5 ID 5.0 OD x 95	—	21287	21288	—
Gooseneck Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	3.5 ID 5.0 OD x 95	—	21289	21290	—
Gooseneck Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	3.5 ID 5.0 OD x 95	—	21291	21292	—
Direct Injection Liners for PerkinElmer GCs (For 0.32/0.53mm ID Columns)	Benefits/Uses	ID*/OD & Length (mm)	Similar to PE part #	ea.	cat.# 5-pk.	25-pk.
Auto SYS Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 6.2 OD x 92.1	—	20819	20822	—
Auto SYS Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.2 OD x 92.1	—	21293	21294	—
Auto SYS Gooseneck Drilled Uniliner® (hole on top)	trace, active samples, high recovery & linearity	4.0 ID 5.0 OD x 92.1	—	21295	21296	—
Auto SYS Gooseneck Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery & linearity	4.0 ID 6.2 OD x 92.1	—	21297	21298	—
Direct Injection Liners for Thermo Finnigan 8000 & TRACE™ Series GCs (0.32 & 0.53mm ID columns)	Benefits/Uses	ID*/OD & Length (mm)	Similar to TF part #	ea.	cat.# 5-pk.	25-pk.
Drilled Uniliner® (hole on top)	trace, active samples, high recovery, & linearity	5.0 ID 8.0 OD x 105	—	22411	22412	—
Drilled Uniliner® (hole on bottom)	trace, active samples, high recovery, & linearity	5.0 ID 8.0 OD x 105	—	22413	22414	—

*Nominal ID at syringe needle expulsion point.

FAST FACTS

At-a-Glance Product Information from Restek

Restek is your free technical literature source!

- For details about Siltek™ performance, request **FREE** publications **59803A** and **59111** – or view them on our website.
- Many Siltek™ treated accessories are listed in **Genuine Restek Replacement Parts for Agilent GCs** (59627D), also **FREE** on request.

For literature:

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Liner Deactivations

Intermediate Polarity (IP) Deactivation

- Phenylmethyl-deactivated surface for better recovery of polar and nonpolar compounds.
- Compatible with most common solvents.
- Our standard deactivation—every Restek liner is IP deactivated unless otherwise requested.

Siltek™ Deactivation

- Revolutionary deactivation for difficult matrices and reactive compounds.
- Inertness retained over a wide sample pH range.
- Minimal bleed.
- Ideal for chlorinated pesticide analysis; lowers endrin breakdown to less than 1%.
- Recommended for use with Rtx®-CLPesticides, Stx™-CLPesticides, Stx™-IHT, and Rtx®-TNT columns.

Base Deactivation

- Excellent inertness for basic compounds.
- Recommended for use with Rtx®-5 Amine, Rtx®-35 Amine, and Stabilwax®-DB columns.

Siltek™ Deactivation—The Next Generation

- Maximizes the inertness of the sample pathway.
- Minimizes breakdown.
- Low bleed.
- Thermally stable.
- “Clean and green”—manufactured without the use of harmful organic solvents.



Restek offers the next generation of deactivation. The Siltek™ deactivation process (US Patent 6,444,326) produces a highly inert glass surface, that features high temperature stability, extreme durability, and low bleed. Try Siltek™ liners, guard columns, wool, and connectors for better recovery of sample analytes.

Add the corresponding suffix number to the liner catalog number. (Additional cost.)

qty.	Siltek™	Siltek™ with Siltek™ wool	Siltek™ with CarboFrit™
each	-214.1	-213.1	-216.1
5-pk.	-214.5	-213.5	-216.5
25-pk.	-214.25	-213.25	-216.25

A Good Word

“I installed Siltek™ liners on one of our GCs to replace standard quartz liners that required deactivating daily. I found the results to be excellent, saving many hours of instrument time with no detrimental effects on the analysis.”

Matthew Turner, Laboratory Manager—food contaminants, Global Analysis (UK)

Base-Deactivated Inlet Liners for Agilent GCs

Add the corresponding suffix number to the liner catalog number. (Additional cost.)

Ideal for amines and basic compounds!

qty.	Base-Deactivated	Base-Deactivated w/ Base-Deactivated Wool
each	-210.1	-211.1
5-pk.	-210.5	-211.5
25-pk.	-210.25	-211.25