

# The importance of Agilent's inertness for columns, consumables and hardware

Better Business Solutions for GC  
and GC/MS

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Consumables Products

MS Users Day  
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# What Does GC System Inertness Look Like?

**Easier question: What does poor inertness look like?**

Symptoms of poor GC system inertness:

- \* Tailing peaks
- \* Reduced peak response
- \* No peak response
- \* Extra peaks!
- \* Poor linearity of a peak – usually at low concentrations
- \* Unstable detector baseline

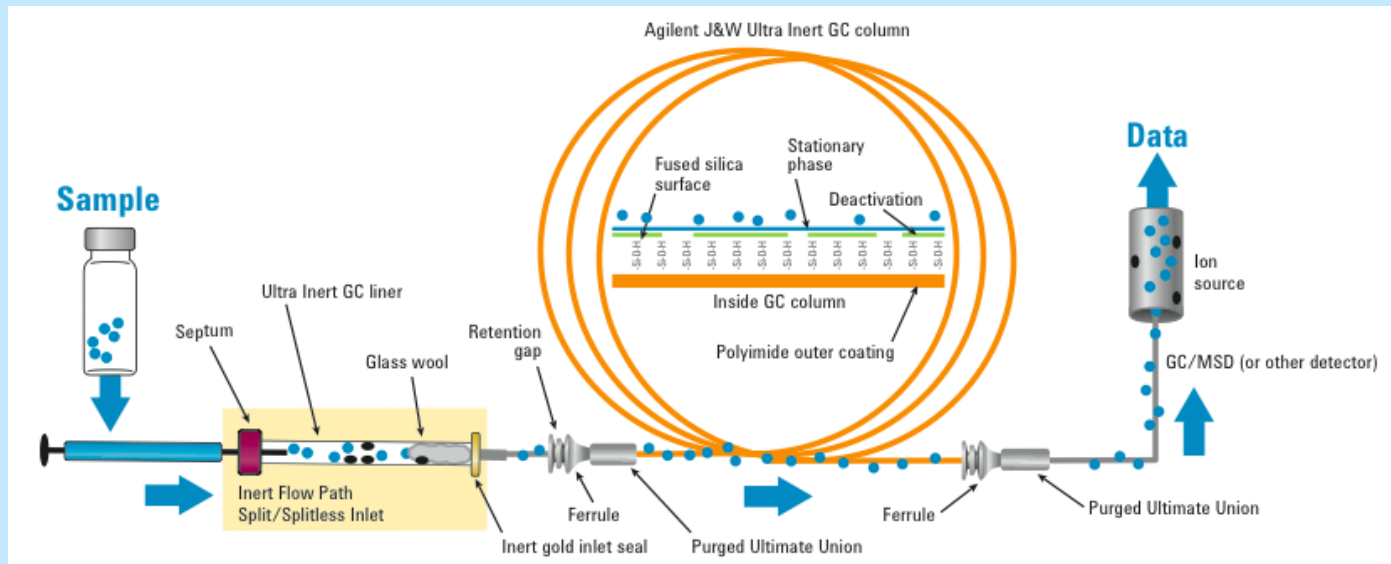
# Protection from Injection to Detection

Agilent UltraInert and UltiMetal-Plus Technologies



## C o r e C o m p e t e n c y

Two Proprietary Deactivation Chemistries for Glass, Steel, Gold, Fused Silica, Glass Wool are required to improve GC and GC/MS for trace analysis



# Improved Performance

## Improving the Entire Flowpath



...now from a single supplier

# What is the Surface Area Contribution to Overall Flowpath Inertness?

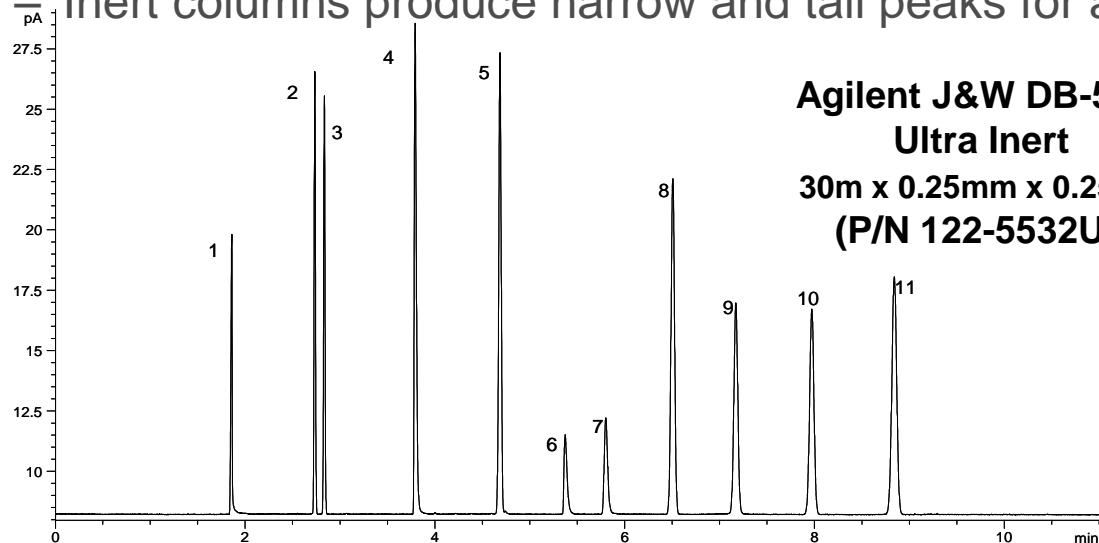
## GC Flowpath Surface Areas

	L (cm)	d (cm)	$\pi$	Surface Area (cm <sup>2</sup> )
Liner (No wool)	7.85	0.4	3.142	9.86
Gold Seal		0.8	3.142	0.5
Column	3000	0.025	3.142	235.6

# Column Inertness and Sensitivity

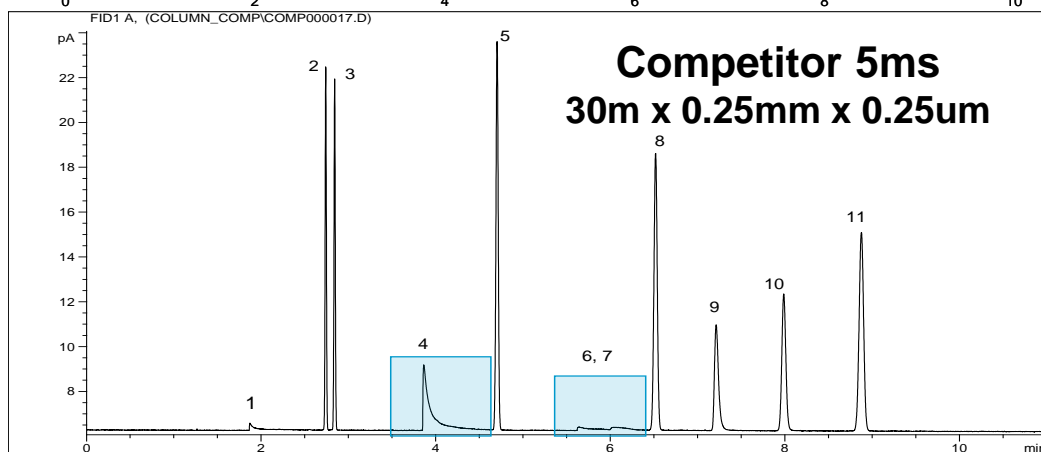
- Increasing signal

Inert columns produce narrow and tall peaks for active analytes.



**Agilent J&W DB-5ms  
Ultra Inert  
30m x 0.25mm x 0.25um  
(P/N 122-5532UI)**

- 1-Propionic acid
- 1-Octene
- n-Octane
- 4-Picoline
- n-Nonane
- Trimethyl phosphate
- 1,2-Pentanediol
- n-Propylbenzene
- 1-Heptanol
- 3-Octanone
- n-Decane



**Competitor 5ms  
30m x 0.25mm x 0.25um**

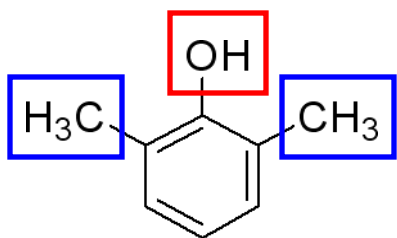
All highlighted peaks have poor peak shape with obvious compound adsorption.



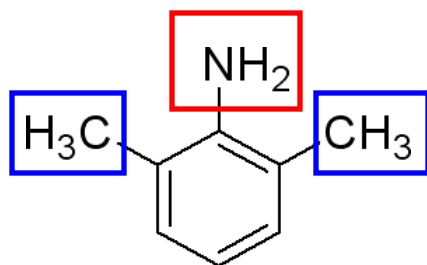
# Test Probes and Column Activity QC Testing

- Test probes are vital to ensure the quality and reproducibility of GC columns
  - Properly deactivated
  - Contain the correct amount of stationary phase
  - consistent column-to-column relative retention time
- Test probes can either highlight or mask the deficiencies of a column
  - An organic acid
  - A base
  - An alcohol
  - Non-active probes (e.g. alkanes)
- Good test probes allows the probative portion of the test module to penetrate and fully interact with the columns stationary phase and surface.
  - Low molecular weight
  - Low boiling points
  - No steric shielding of active group

# Weak Probes vs. Strong Probes



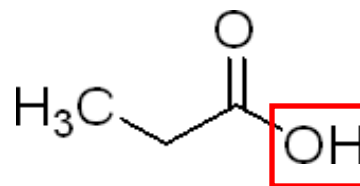
2,6-Dimethylphenol



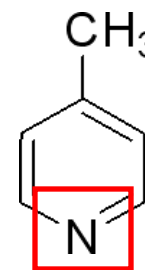
2,6-Dimethylaniline

## Weak Probes

Acidic and basic portion of the molecules are shielded by the methyl groups of the 2,6-dimethyl substituted phenyl ring



1-Propionic acid



4-Picoline

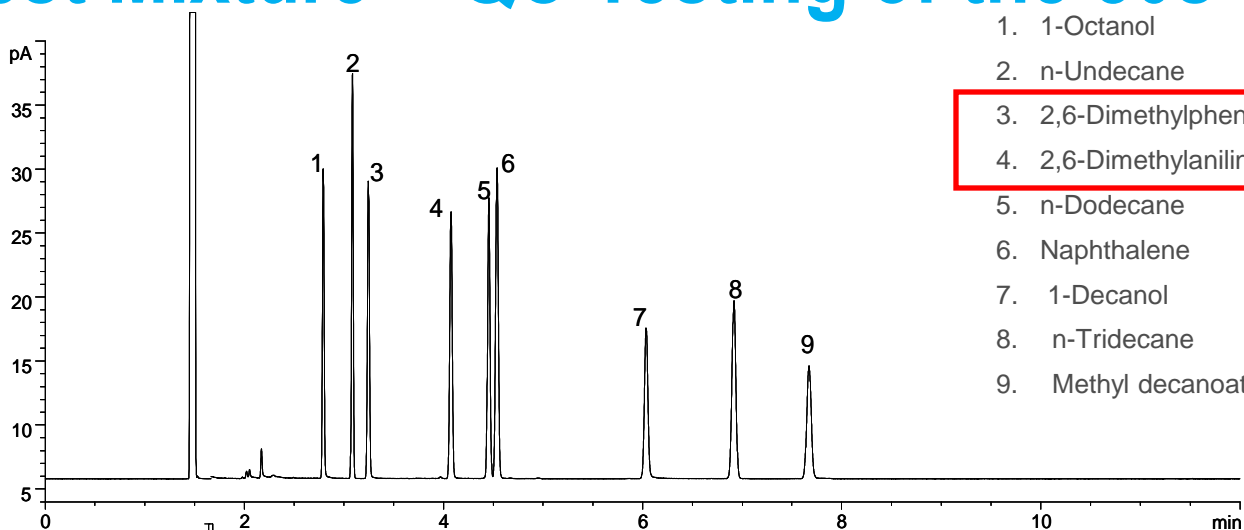
## Strong Probes

Active end of each compound is available to interact with any active sites on the columns

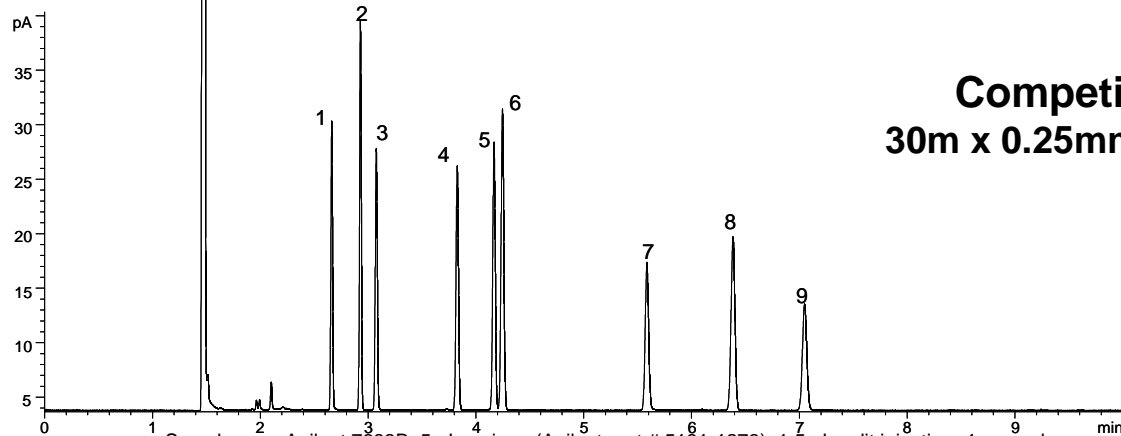


# Grob-Type Test Mixture - QC Testing of the 80s

**Agilent J&W DB-5ms  
Ultra Inert  
30m x 0.25mm x 0.25um  
(P/N 122-5532UI)**



- Elevated oven temperature at 120°C
- Probes sweep past active sites and mask solute/column interactions.
- Least probative probes for column activity



Sampler: Agilent 7683B, 5 µL syringe (Agilent part # 5181-1273), 1.5 µL split injection, 4 ng each component  
Carrier: Hydrogen constant pressure 37 cm/s  
Inlet: Split/splitless; 250 °C, 1.4 ml/min. column flow, split flow 100 ml/min.  
Liner: Deactivated single taper w glass wool (Agilent part # 5183-4647)  
Oven: 120 °C isothermal  
Detection: FID at 325 °C, 450 ml/min. air, 40 ml/min. hydrogen, 45 ml/min. nitrogen makeup

**NOT Probative**



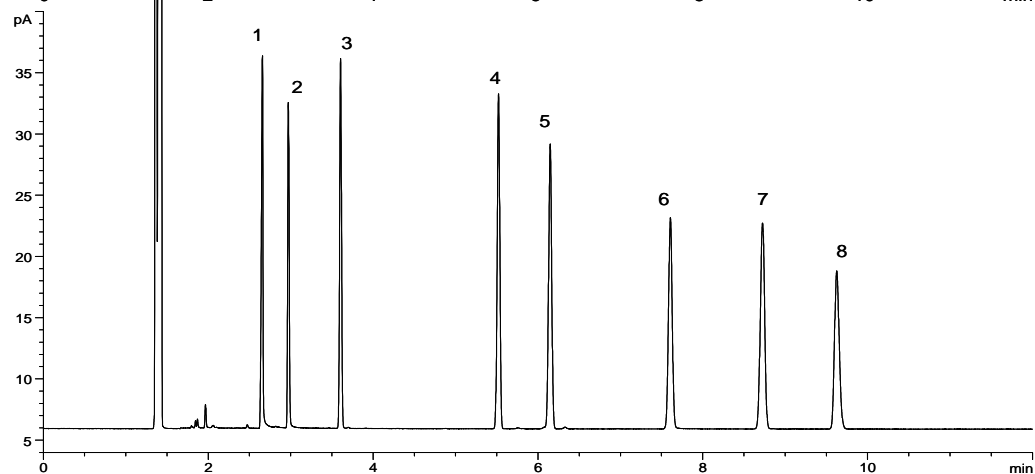
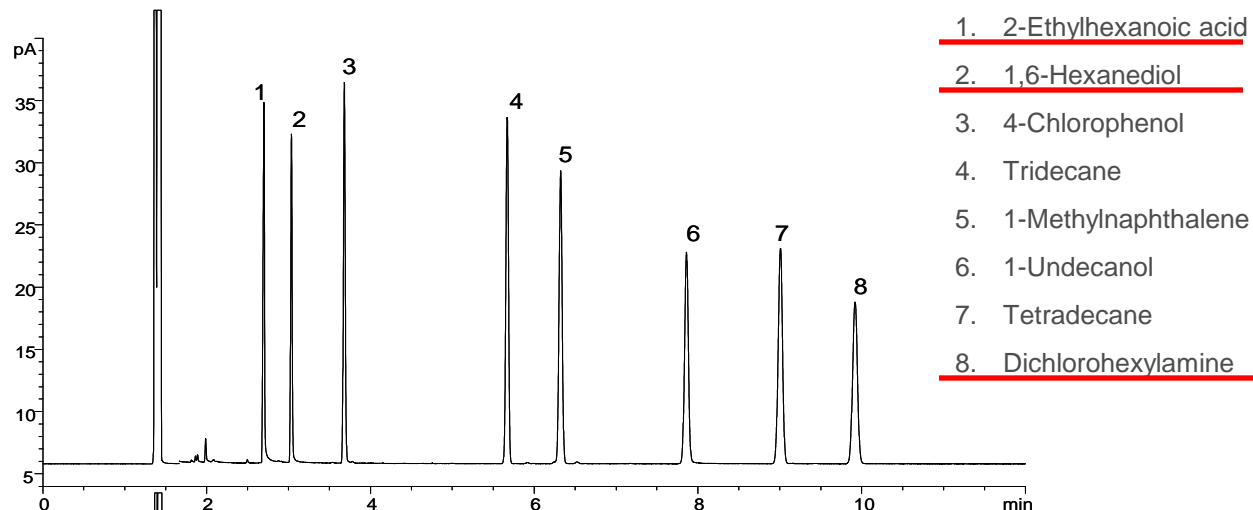
Agilent Technologies

# DB-5ms Test Mix – QC Testing of the 90s

**Agilent J&W DB-5ms  
Ultra Inert  
30m x 0.25mm x 0.25um  
(P/N 122-5532UI)**

**Competitor 5ms  
30m x 0.25mm x 0.25um**

**More Probative**



**Sampler:** Agilent 7683B, 5  $\mu$ L syringe (Agilent part # 5181-1273), 1.5  $\mu$ L split injection, 4 ng each component  
**Carrier:** Hydrogen constant pressure 38 cm/s  
**Inlet:** Split/splitless; 250  $^{\circ}$ C, 1.4 ml/min. column flow, split flow 75 ml/min.  
**Liner:** Deactivated single taper w glass wool (Agilent part # 5183-4647)  
**Oven:** 125  $^{\circ}$ C isothermal  
**Detection:** FID at 320  $^{\circ}$ C, 450 ml/min. air, 40 ml/min. hydrogen, 45 ml/min. nitrogen makeup



# Ultra Inert Test Probe Mixture – QC Testing for Today's Demanding Applications

Probe	(ng on column)	Column functional test
<u>1. 1-Propionic acid</u>	1.0	Basicity
2. 1-Octene	0.5	Polarity
3. n-Octane	0.5	Hydrocarbon marker
<u>4. 4-Picoline</u>	1.0	Acidity
5. n-Nonane	1.0	Hydrocarbon marker
<u>6. Trimethyl phosphate</u>	1.0	Acidity
<u>7. 1,2-Pentanediol</u>	1.0	Silanol
8. n-Propylbenzene	1.0	Hydrocarbon marker
9. 1-Heptanol	1.0	Silanol
10. 3-Octanone	1.0	Polarity
11. n-Decane	1.0	Hydrocarbon marker

**Sampler:** Agilent 7683B, 0.5 µL syringe (Agilent part # 5188-5246), 0.02 µL split injection

**Carrier:** Hydrogen constant pressure, 38 cm/s

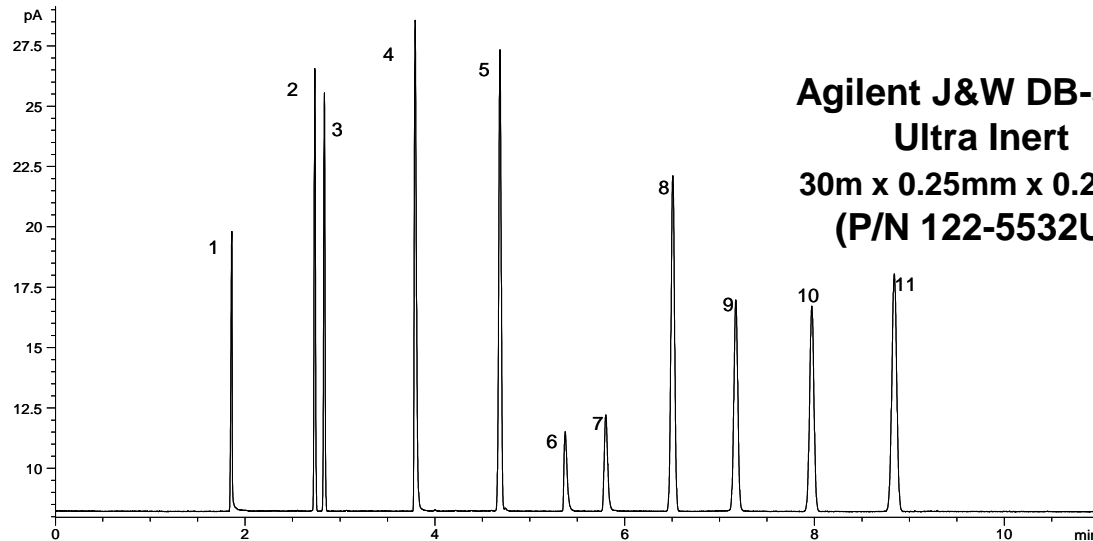
**Inlet:** Split/splitless; 250 °C, 1.4 ml/min. column flow, split flow 900 ml/min., gas saver flow 75 ml/min. on at 2.0 min.

**Liner:** Deactivated single taper w glass wool (Agilent part # 5183-4647)

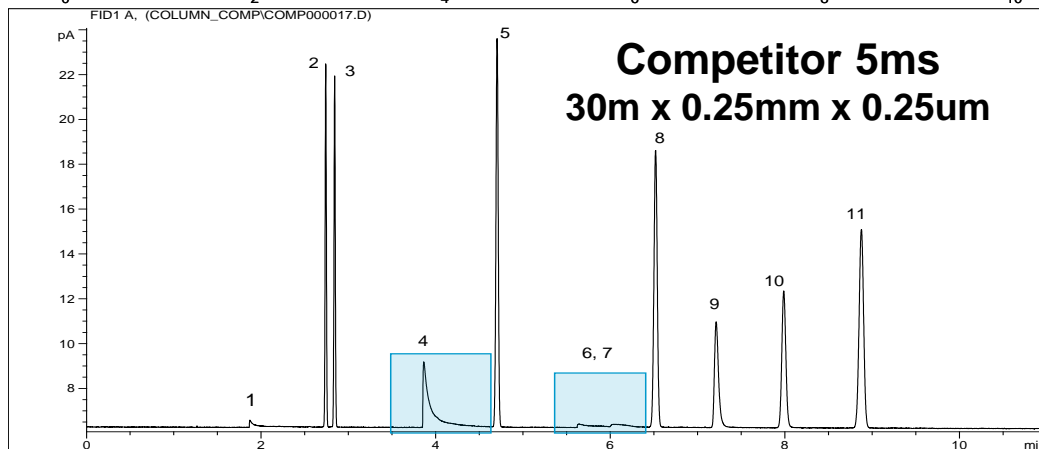
**Oven:** 65 °C isothermal

**Detection:** FID at 325 °C. 450 ml/min. air, 40 ml/min. hydrogen, 45 ml/min., nitrogen makeup

# Ultra Inert Test Probe Mixture shows the difference



1. 1-Propionic acid
2. 1-Octene
3. n-Octane
4. 4-Picoline
5. n-Nonane
6. Trimethyl phosphate
7. 1,2-Pentanediol
8. n-Propylbenzene
9. 1-Heptanol
10. 3-Octanone
11. n-Decane



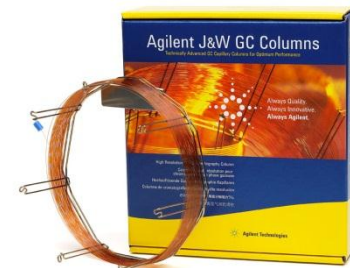
Ultra Inert test mix probes inertness and differentiates an excellent column from a mediocre one!

# Ultra inert columns – Individually Tested

- Each column is individually tested against the Ultra Inert test probe mixture
- Test mixture optimized for column polarity / selectivity
- Performance Summary Sheet is shipped with each column

Performance Results		Compound Identification	Retention Time (t <sub>r</sub> )	Partition Ratio (k)	Peak Width (w <sub>1/2</sub> )
<b>Theoretical Plates/Meter:</b>		1. PROPIONIC ACID	1.557	0.31	0.029
n-DECANE	3472	2. 1-OCTENE	2.224	0.87	0.014
<b>Retention Index:</b>		3. n-OCTANE	2.304	0.94	0.015
n-PROPYLBENZENE	953.1	4. 1,3-PROPANEDIOL	2.591	1.18	0.022
1-HEPTANOL	968.0	5. 4-METHYLPYRIDINE	3.108	1.62	0.021
<b>Resolution:</b>		6. n-NONANE	3.795	2.19	0.026
1-OCTENE, n-OCTANE	3.25	7. TRIMETHYLPHOSPHATE	4.577	2.85	0.033
		8. n-PROPYLBENZENE	5.283	3.45	0.037
		9. 1-HEPTANOL	5.799	3.88	0.039
		10. 3-OCTANONE	6.498	4.47	0.045
		11. n-DECANE	7.077	4.96	0.052

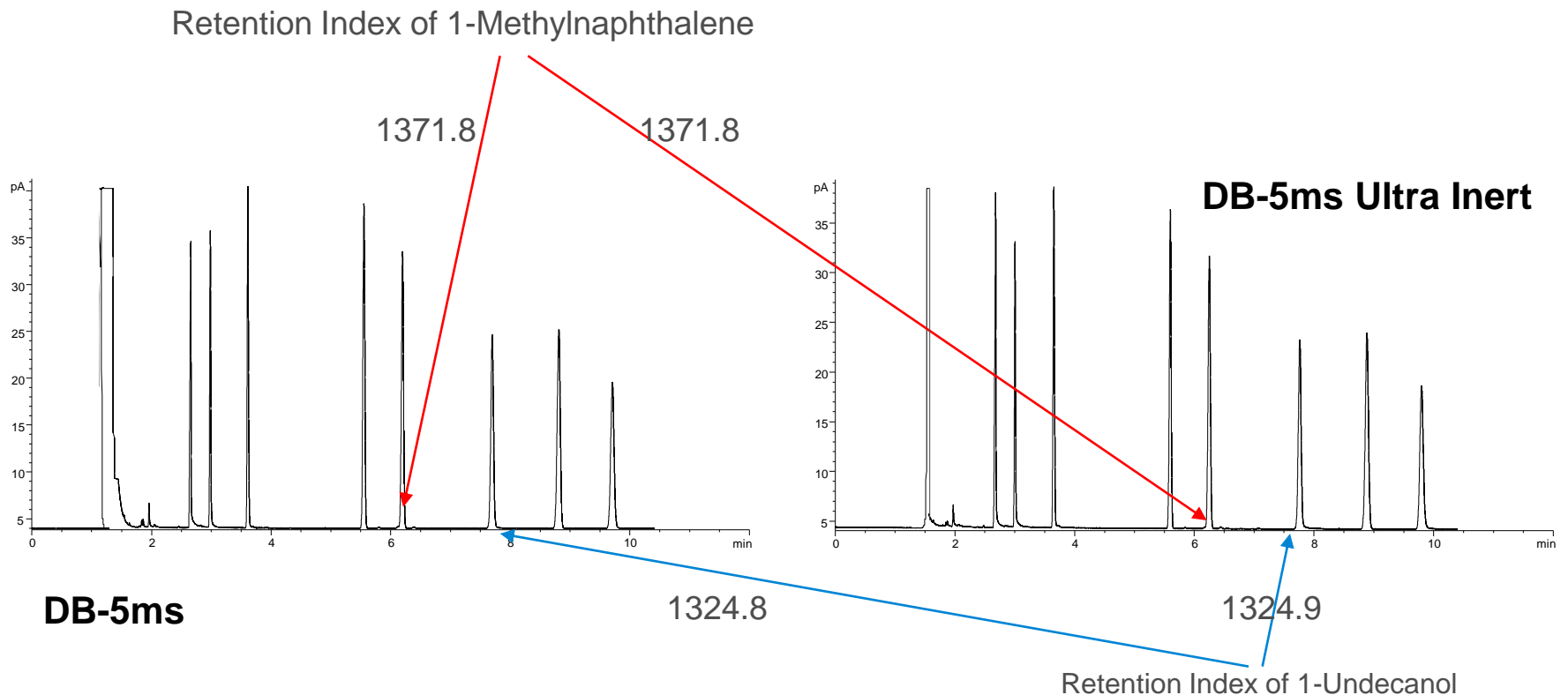
# Agilent UI GC columns: chemistries



GC Column Phase	Caractéristiques	Application	Configurations Fast GC
DB-1MS UI, HP-1MS UI	apolar	Classic separations, hydrocarbons	yes
DB-5MS UI, HP-5MS UI	apolar	<b>First choice for trace analytes!</b>	yes
DB-35MS UI	Medium polarity	Excellent for analysis of pesticides and drugs of abuse	yes
DB-624MS UI	Medium polarity	Analysis of solvents and volatiles	yes
DB-UI 8270D	Application specifique, apolar	Environmental analysis (semi- volatiles)	yes

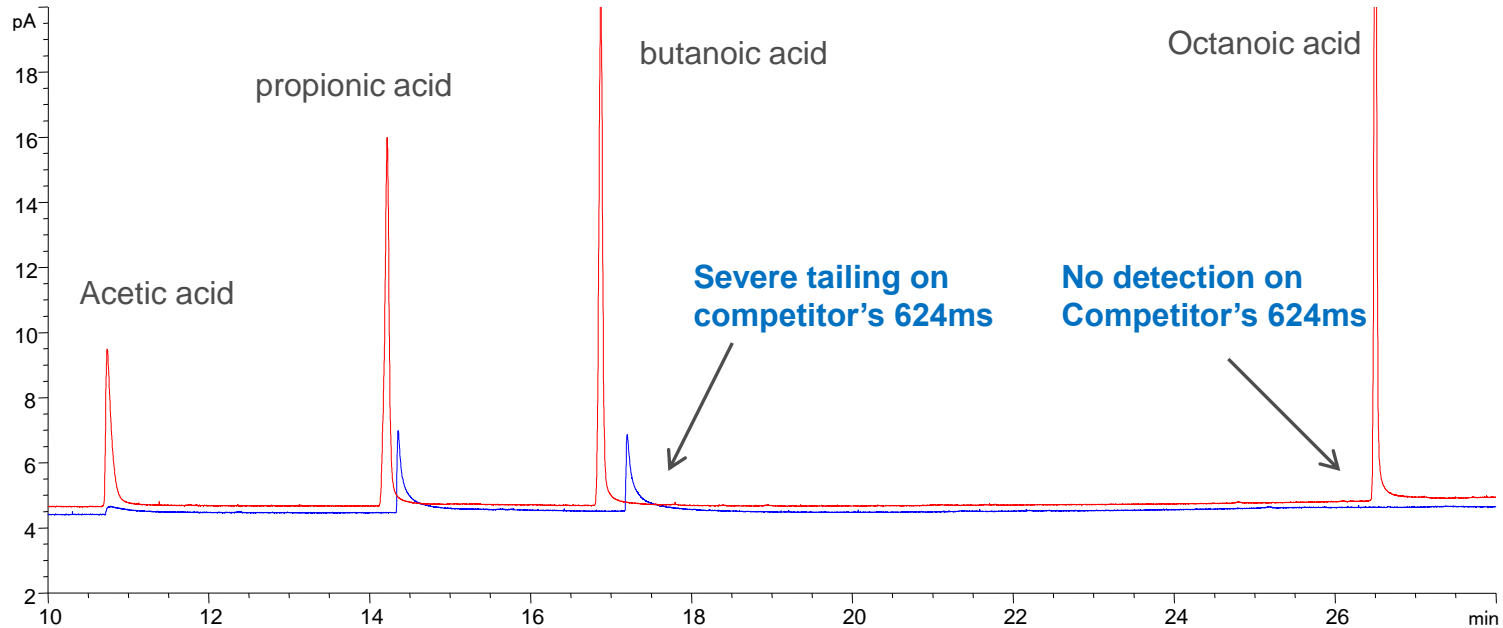
# Ultra inert columns vs. existing GC/MS columns

- Same selectivity without method re-development
- Same exceptionally low bleed
- Added inertness with additional testing procedure



# Agilent J&W DB-624 UI vs. Other Guys 624ms

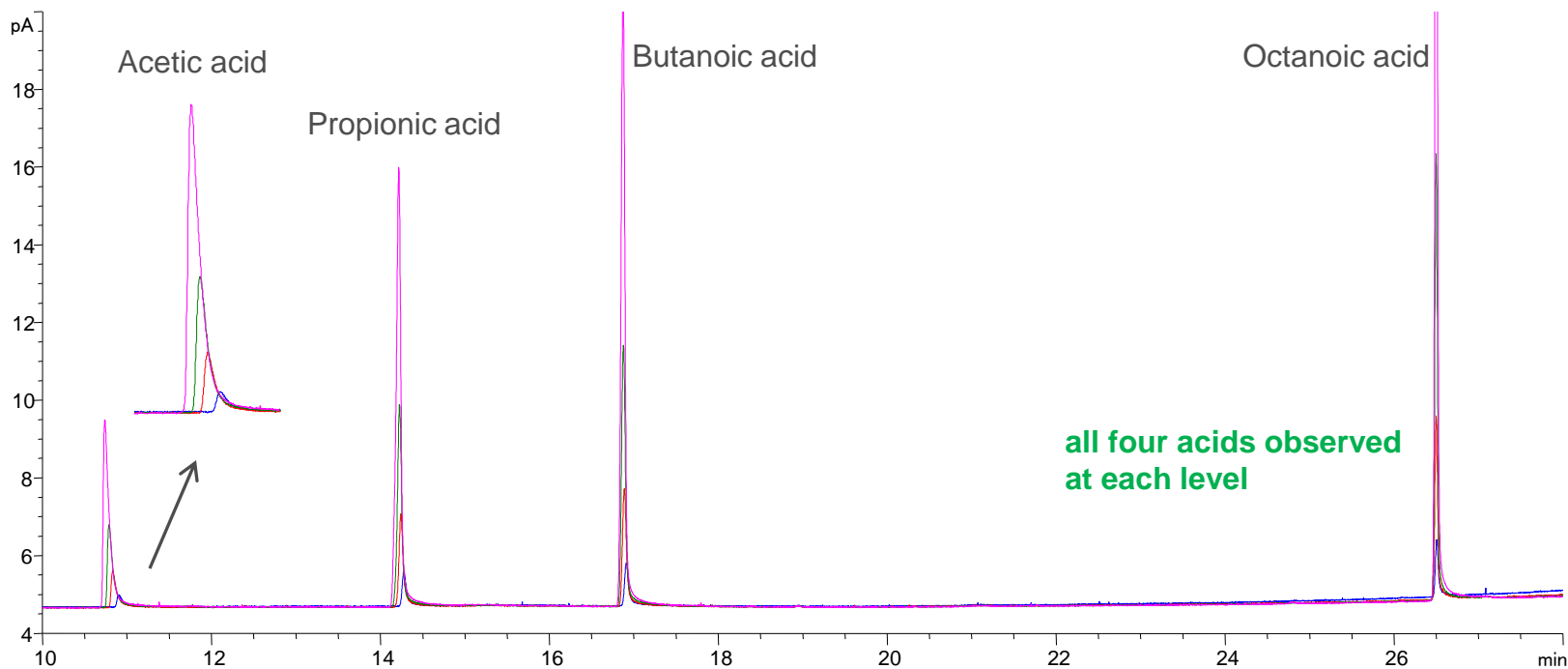
## Organic acid performance at 200 ppm



Column: Agilent J&W DB-624UI 30 m x 0.32 mm x 1.8 um vs . Alternative vendor 624ms  
Oven: 35°C 7.45 min hold, 6.72°/min to 100°C (2.23min hold), 10.08 °/min to 220°C (4.47 min hold), 16.79 °/min (4.17 min hold)  
Carrier : Helium 39.6 cm/s (approx. 2.6 mL/min) set at 35°C, EPC-Constant Flow  
Inlet: Split, 20:1 at 250°C (total flow approx 51 mL/min, and 11.2 psi)  
Inlet liner: Ultra Inert with wool  
Detector: FID at 280°C, H2 @ 40 mL/min, Air @ 400 mL/min, N2 makeup @ 30 mL/min



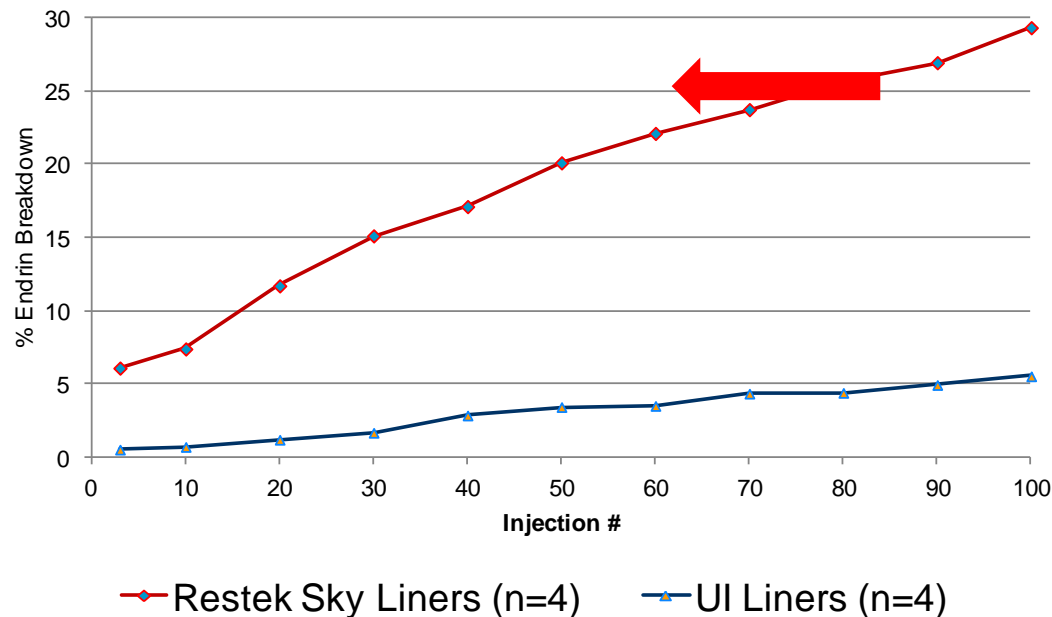
# Agilent J&W DB-624 UI-Organic Acid Proof of Performance 25 to 200 ppm



Column: Agilent J&W DB-624UI 30 m x 0.32 mm x 1.8  $\mu$ m (p/n 123-1334UI)  
Oven: 35°C 7.45 min hold, 6.72°/min to 100°C (2.23 min hold), 10.08 °/min to 220°C (4.47 min hold), 16.79 °/min (4.17 min hold)  
Carrier : Helium 39.6 cm/s (approx. 2.6 mL/min) set at 35°C, EPC-Constant Flow  
Inlet: Split, 20:1 at 250°C (total flow approx 51 mL/min, and 11.2 psi)  
Inlet liner: Ultra Inert with wool  
Detector: FID at 280°C, H<sub>2</sub> @ 40 mL/min, Air @ 400 mL/min, N<sub>2</sub> makeup @ 30 mL/min

# Ultra Inert Inlet Liners

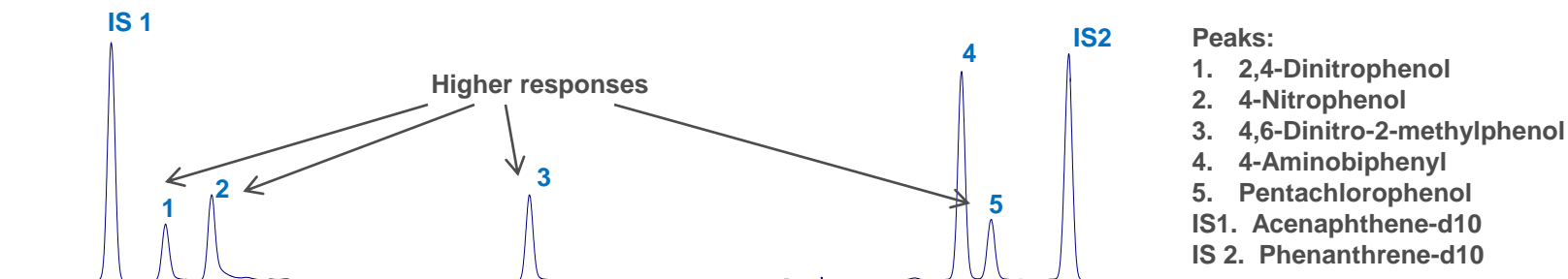
1. Ultra Inert deactivated inlet liners provide higher response for sensitive compounds
2. Ultra Inert **Glass wool liners** deliver benefits of glass wool w/o loss of active compounds
3. QC tested & certified for consistent performance



< 20% breakdown of Endrin after a sequence of 100 injections -- **not just the first injection!**

# Semi-Volatiles Suitability - Ultra Inert

## Agilent Ultra Inert single taper liner with wool (p/n 5190-2293)



### Competitor's deactivated gooseneck liner with deactivated wool

**Even with glass wool**, Agilent Ultra Inert deactivated liners provide high responses for sensitive semivolatile acidic compounds. Competitor's deactivated liners show activity and adsorption

# Reliability / Quality Assurance : Ultra Inert Liner Certificate of Performance

Lot to Lot Liner Reproducibility assured:

Each deactivation lot is Certified to ensure consistent and efficient coverage using both acidic and basic probes at trace (2 ng) levels on column

Certificate with every liner is printed on a label ready to peel and stick into analysts' laboratory notebooks for easier compliance.

Traceability:

Deactivation Lot number is on Certificate  
Liner lot number (and part number) is permanently etched on glass

## *Certificate of Performance*

**5190-2293 Ultra Inert Liner**

Splitless, Sngl taper, Glass Wool

Liner Body Lot: 0023A

Deactivation Lot: B11002

*Tested for: 2ng 4-Aminopyridine  
2ng 2,4-Dinitrophenol*

# Ultra Inert liners and packaging – something for everyone

Ease of Use - exclusive “Touchless” packaging...

Plasma treated Non-Stick O-ring is preinstalled on the liner

Packaging is Pharmaceutical grade PTEG tubing approved by GCMS extraction testing for cleanliness

Install new liner with O-ring without touching – or risk contaminating – the new, clean Ultra Inert liner



Convenient 5 pack in Touchless package



25 pack of liners in Touchless Dispenser



Individual liner in Touchless packaging

# Ultra Inert Liners Available for non-Agilent GC's



## We currently support:

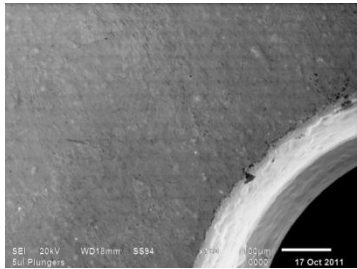
- Bruker, Varian\*
- CTC
- PerkinElmer
- Shimadzu
- Thermo Scientific
- And more coming soon



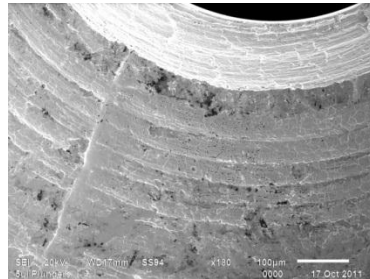
# Agilent UI Inlet Seal: Deactivated gold surface

New

- Soft gold plating is essential for proper sealing
- Ultra Inert chemistry blocks active sites (gold is NOT inert)
- Smooth surface doesn't leak
- Advantage Agilent



Agilent MIM seal



Competitor's  
machined seal



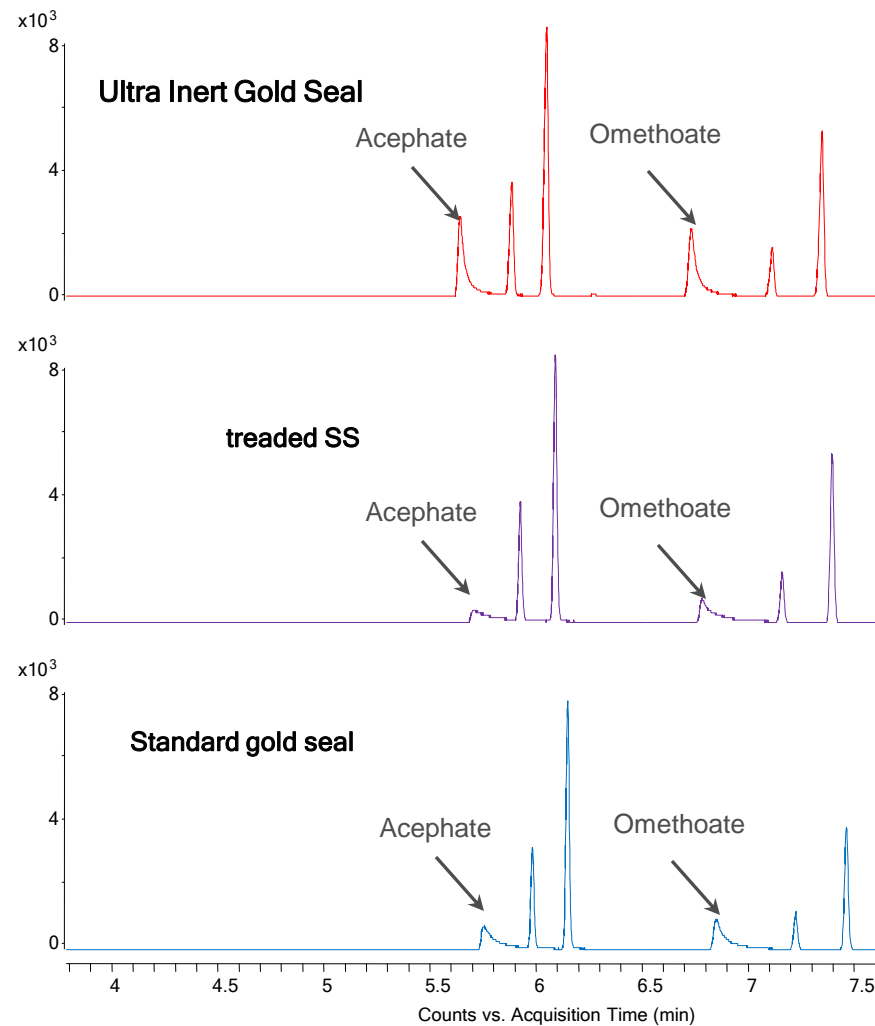
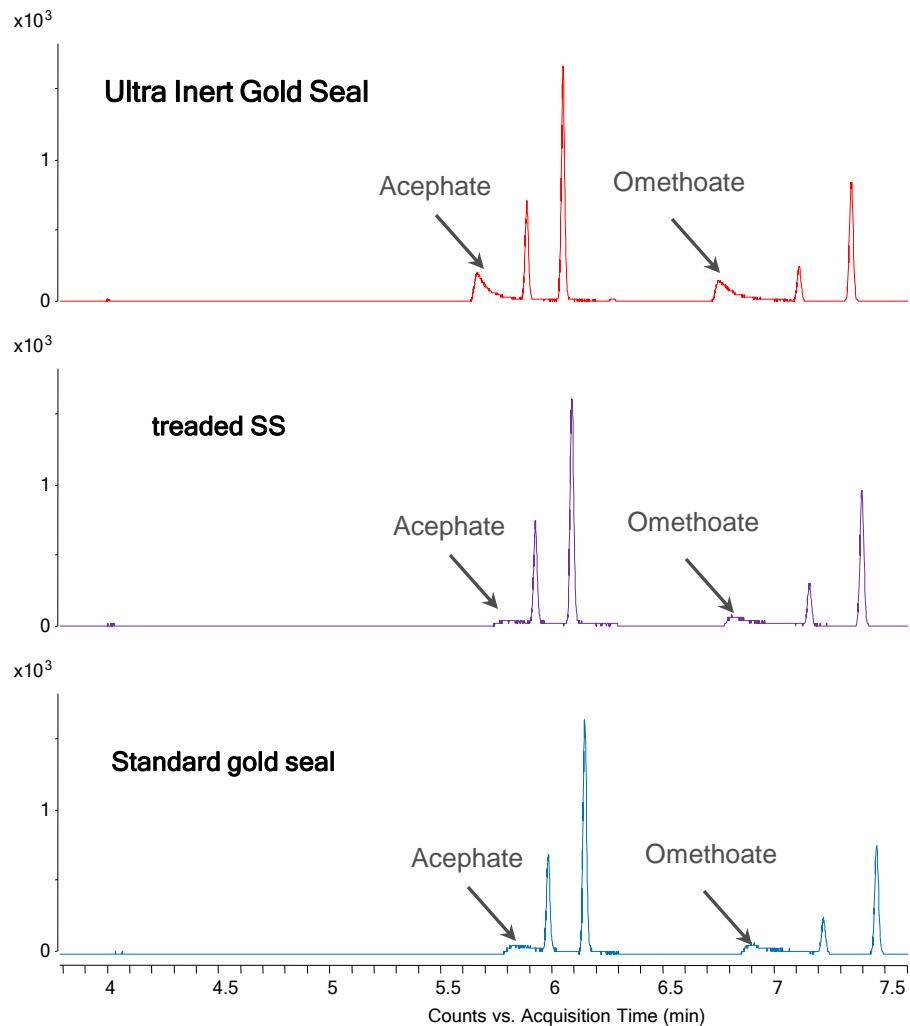
*Reliable ppb and ppt  
measurements require  
attention to the little things!*



# Response Comparison for Sensitive Pesticides

100 ppb STD

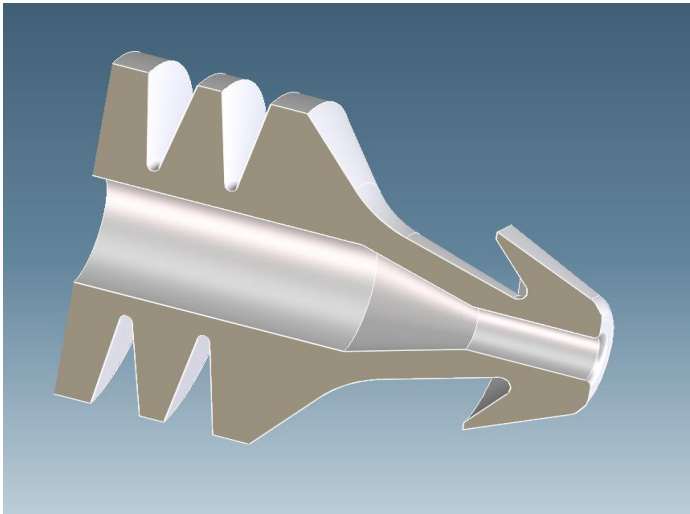
500 ppb STD





# UltiMetal Plus Flexible Metal Ferrule

At ppb Levels, the Small Things Matter



Proprietary design offers improved sealing, easy installation (over tightening) and deactivation

Packaging promotes ease of use and system cleanliness....

- Lower detection limits
- Faster maintenance

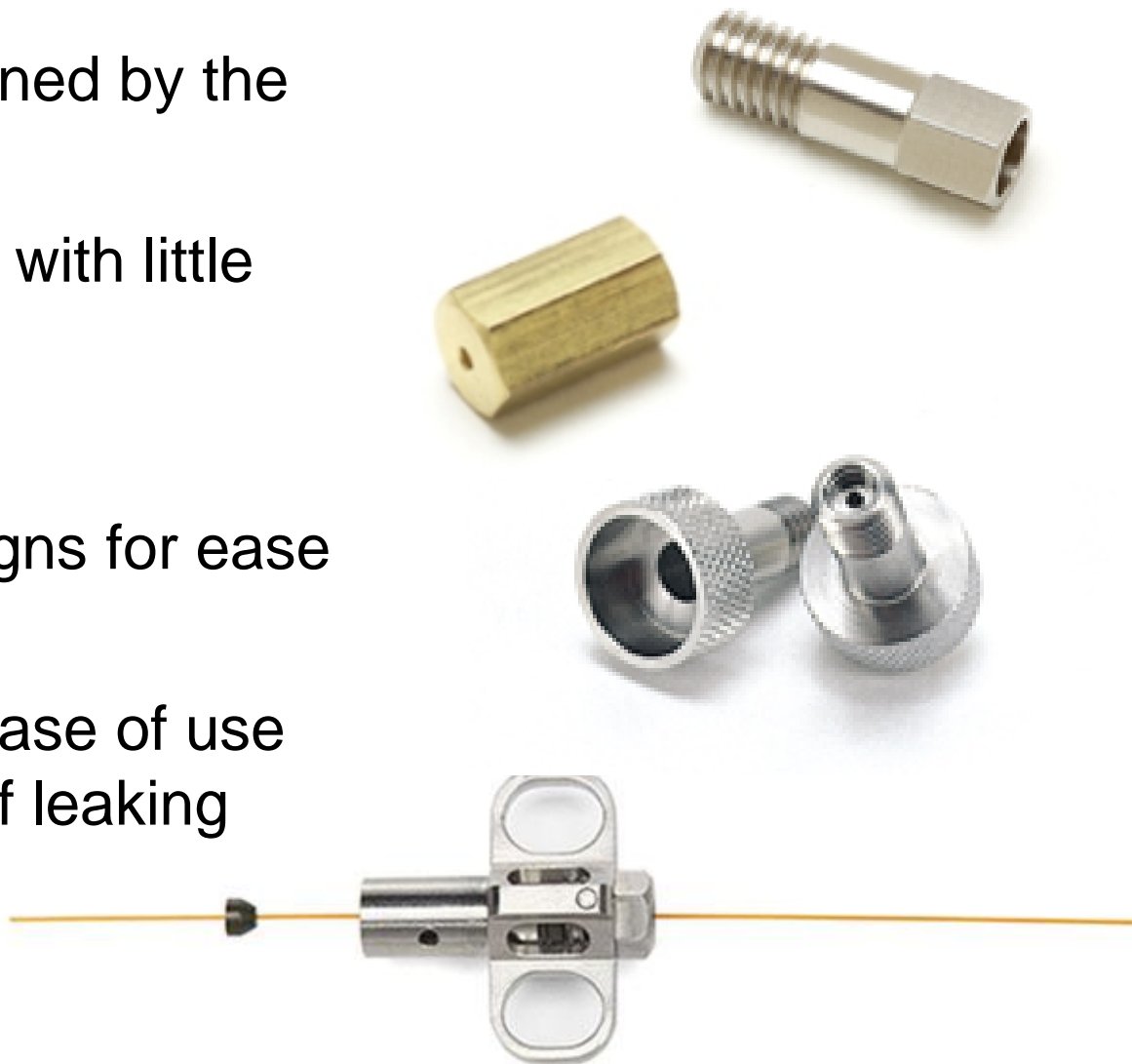
# Intermezzo: capillary column nuts

Column nuts are determined by the instrument fitting

Basic mechanical fittings with little enhancements

- Brass for the MS
- Some finger tight designs for ease of use

New design addresses ease of use and productivity issues of leaking and over tightening



# Better Connections: Capillary Flow Technology Devices

## UltiMetal Plus Ultimate Union/UltiMetal Plus Tee

- Stainless Steel Micro Fluidic plates technology
- Deactivation essential to block active sites
- Column connection easy to assemble Release hole for stuck ferrules



## Using Flexible Metal ferrules to overcome issues

- UltiMetal Plus surface chemistry prevents activity
- Flexible design reduces risk of over tightening or column breaks
- Leak free seal remains after repeated temperature cycles



# Application of Flexible Metal Ferrules

Replace stainless steel SiLTite ferrules in:

- Capillary flow technology devices
  - QuickSwap
  - Backflush
- Ultimate union
- LTM



*Important installation instructions ->*



## Parts Supplied

The available UltiMetal Plus Flexible Metal Ferrule packages are listed in Table 1 and Figure 1.

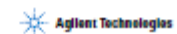
Table 1 Available UltiMetal Plus Flexible Metal Ferrule packages

Item	Part number	Ferrule description
1	G2188-27581	0.1 - 0.25 mm column id, 10/pkg
2	G2188-27582	0.32 mm column id, 10/pkg
3	G2188-27583	0.45 - 0.53 mm column id, 10/pkg
4	G2188-27584	Plug, 10/pkg
5	G2188-27585	0.25 - 0.32 mm UltiMetal column id, 10/pkg
6	G2188-27586	0.53 mm UltiMetal column id, 10/pkg

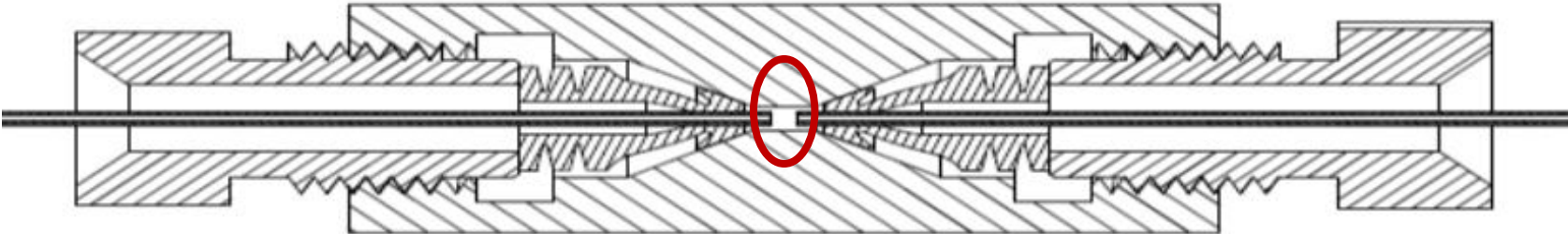


Figure 1 UltiMetal Plus Flexible Metal Ferrules

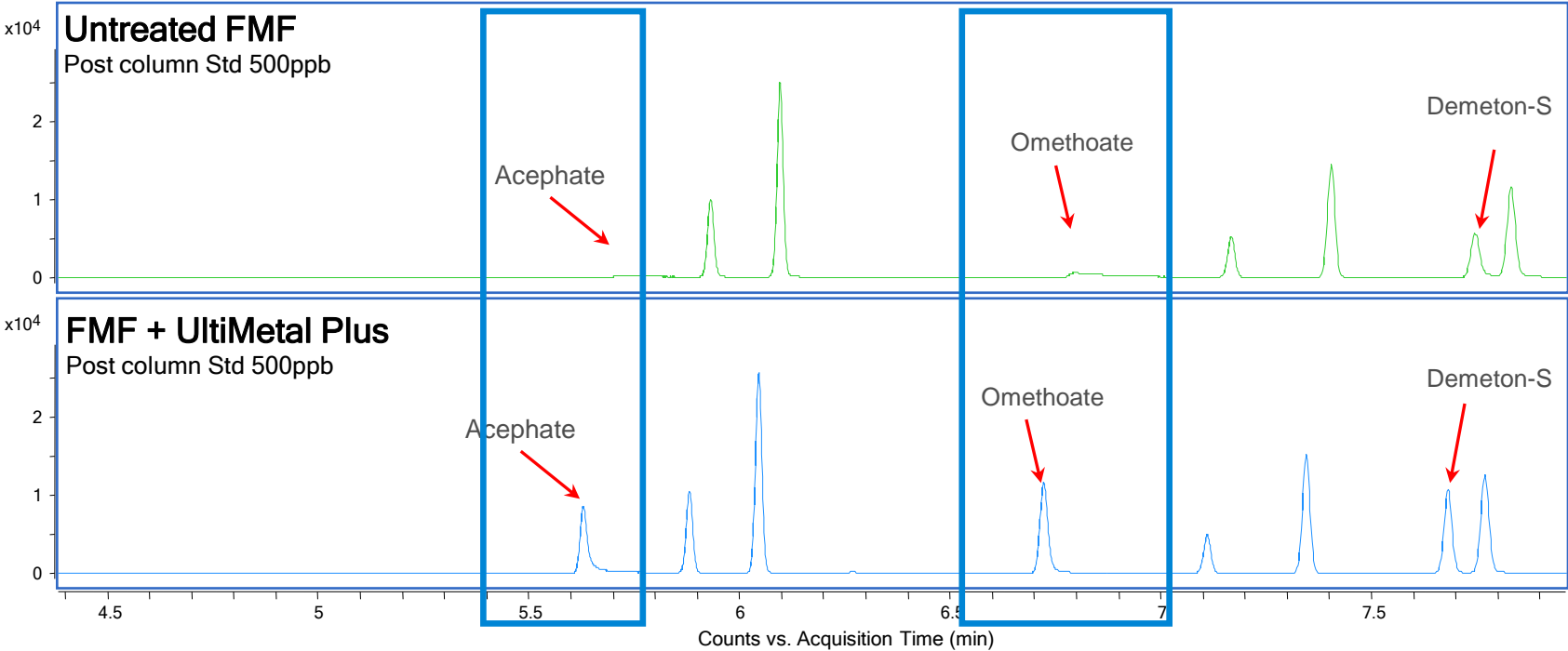
Each UltiMetal Plus Flexible Metal Ferrule part number is uniquely designed to prevent inventory mix-ups, and to help you find the ferrule you need quickly. Color variations between ferrules are a normal result of the UltiMetal coating.



# Impact of ferrule surface on inertness



Very small amount of ferrule surface exposed to active pesticides



# Better Connections: Agilent Self Tightening Column Nuts

Designed for use with *short* graphite/polyimide blend ferrules – both at the inlet and the MS interface – so only one type of ferrule needed for both ends of the column!



For inlet or detector



For mass spec transfer line

Short ferrule exposes more thread of the fitting for better sealing

# How do Self Tightening Column Nuts work?

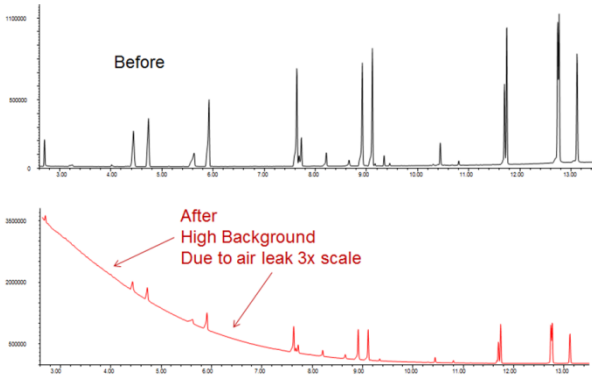
- Ease of use – install in dark, small space in GC oven without wrenches
- Wing design for finger tight installation with graphite/polyimide blend ferrules
- No tools dramatically reduces force preventing over tightening or damage
- Robust stainless steel construction

Plus....

- Novel **spring driven piston** design that continuously presses against the ferrule to **maintain a leak-free fitting** even when the ferrule shrinks during temperature program!

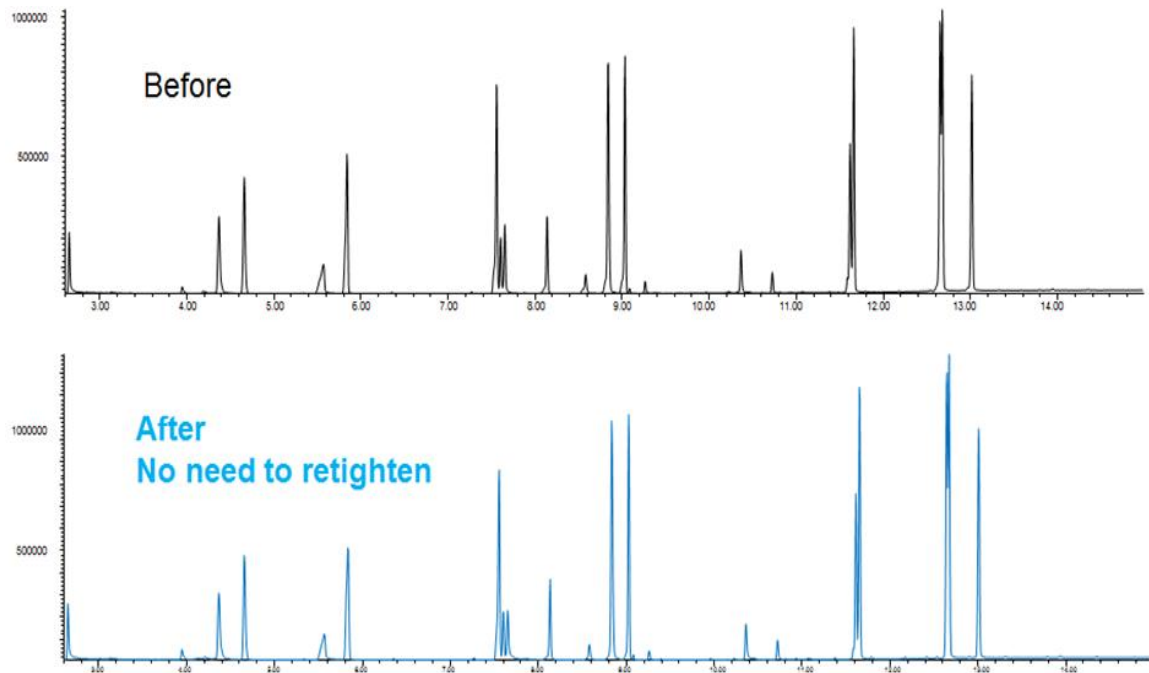


# Benefit of Self Tightening Column Nuts



Take you from this....

.... to this!



*Without retightening*, the baseline remains flat after 400 runs with no indication of leaks when using the Self Tightening Column Nuts





# Better Connections: Glass column connectors

## Ultra Inert Press Fits

Join retention gap or guard column to analytical, or split effluent

Dependable inertness performance at a lower cost

Improved robustness, holding strength

Batch certified inertness

Improved packaging and installation instructions

Easier to use - transparent deactivation gives visibility of the column connection



# Better connections: UltiMetal Plus Tubing and Fittings



- UltiMetal Plus Deactivated metal tubing and valves
- 0.53 and 0.25 mm id guards and transfer lines
- Metal fittings (unions, tees and nuts)
- Steel tubing (1/16", 1/8", 1/4")



Ensure the entire chromatographic solution is inert and corrosion resistant to provide superior performance with improved peak shapes even for active compounds

# Agilent Inert Inlet

***UltiMetal Plus*** treatment for inert surface 7890 inlet shell & top weldments

- Limit adsorption/degradation active analytes in contact hot metal parts.
- Target trace GC/MS and GC-ECD pesticide analysis
- Combine with Agilent's UI Liners, UI gold seals, UI GC columns
- Inert Flowpath option on the 7890B (#114 ) *or* upgrade existing 7890's in the field

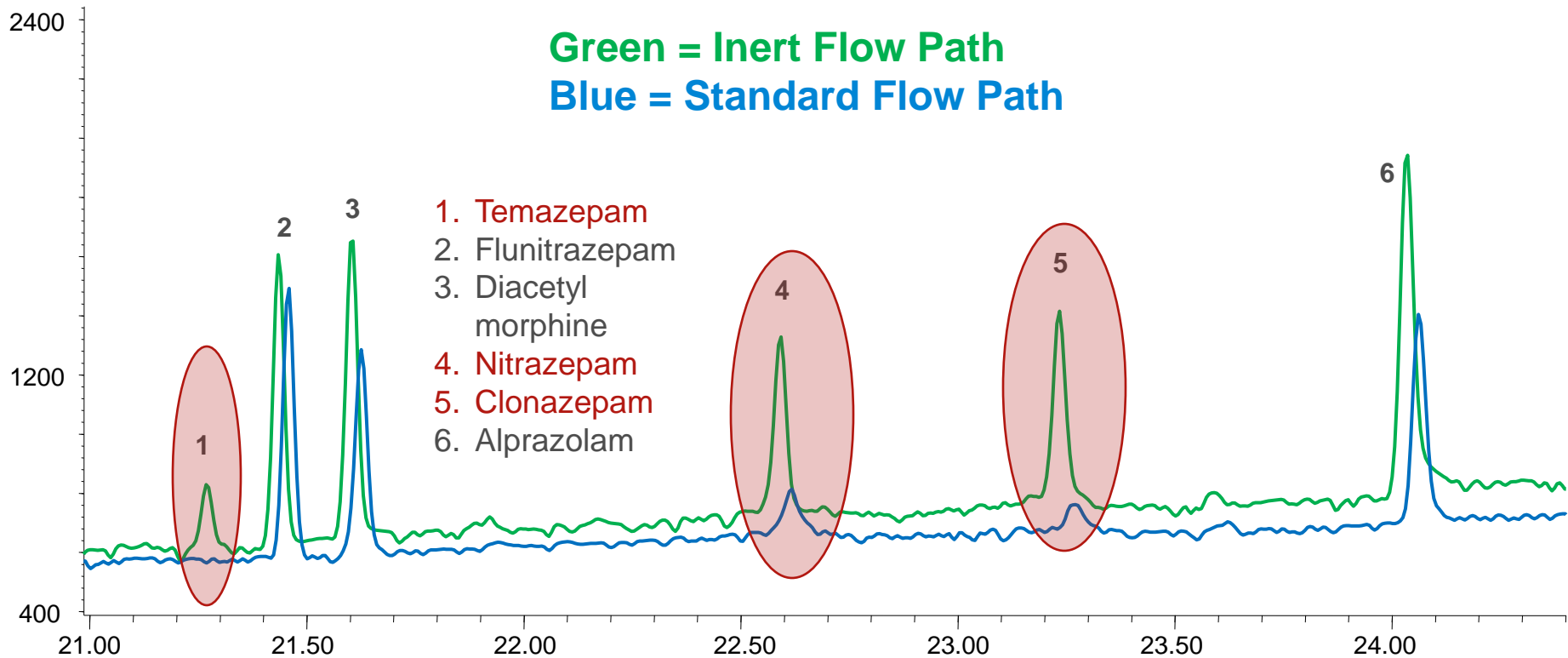


***Agilent's proven  
proprietary UltiMetal Plus  
surface treatment***

# Putting It All Together — Agilent Inert Flowpath

Dramatic Improvement at Low Levels

Drugs of Abuse 0.25 ng Column SIM Mode



# Summary: inert and clean flow components improve results in today's chromatography laboratory.

- Less adsorption of analytes results in improved detection limits from increased **response** (s/n) and better **precision**
- Improved peak shape at low concentration improves **resolution** and peak integration
- Higher response per unit concentration results in **more injections** before required system maintenance
- Less chemical noise from clean packaging, touchless packaging and pre-conditioned consumables means less “conditioning” time and increased **productivity**

# Literature and ordering guides: Inert Flowpath

[www.agilent.com/chem/inert](http://www.agilent.com/chem/inert)

**OPTIMIZING YOUR GC FLOW PATH FOR INERTNESS**

**Ensuring an inert GC flow path has never been more critical**

As available sample becomes smaller, knowledge skills, and more complex, the sample cannot afford noninertness caused by flow path activity.

- A noninert flow path can cause peak tailing and signal loss. It can mask or hide active compounds, which can result in false detection of sensitive analytes present in the sample.
- Repeating or retesting suspect analyses wastes resources, increases productivity, and leads to lost hours.
- Unavailable results can have catastrophic consequences in terms of environmental safety, food safety, and consumer drug abuse accusations.

This guide provides vital information to help you derive your detection limits and confidence in your data by ensuring the most inert flow path.

**Agilent JMW Ultra Inert GC columns**

Ultra inert GC columns are designed to minimize active sites and provide the most inert flow path available. They feature a unique surface chemistry that is highly resistant to adsorption and desorption of analytes, ensuring consistent and accurate results.

**Top 5 TIPS for GC flow path inertness**

- Minimize the inlet**
- Prevent sample loss at the inlet**
- Select a column with optimal ID to ID ratio**
- Prevent the peak tailing**
- Use a gas purifier**

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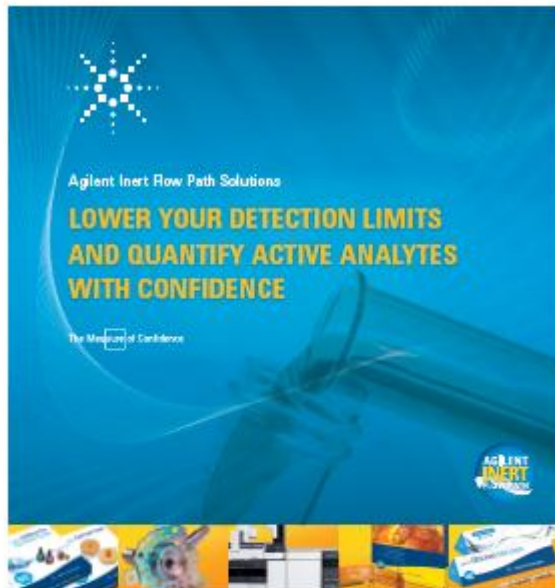
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# Literature and ordering guides: Inert Flowpath



## Agilent Inert Flow Path Solutions Quick Reference Guide

Agilent's Ultra Inert Flow Path Solutions literature ensures the optimum of flow path solutions, allowing analysts to safely quantify complex samples. For more information, visit our website, contact your local Agilent representative, or call 1-800-352-2742.

Agilent Ultra Inert liners and touchless packaging:  
High inertness, productivity, and reproducibility



Description	Volume (µL)	ID (mm)	1 µL	50 µL	250 µL	1000 µL
<b>Optimize Inert Liners</b>						
Single apex, Ultra Inert liner	500	4	5190-2192	5190-2193	5190-2194	5190-2195
Single apex, Ultra Inert liner with glass seal	500	4	5190-2192	5190-2193	5190-2194	5190-2195
Double apex, Ultra Inert liner	500	4	5190-2282	5190-4287		
<b>Optimize Washers</b>						
Crystal	200	7	5190-2287	5190-4286		
<b>Optimize Washers</b>						
Single apex, Ultra Inert liner with glass seal	500	4	5190-2192	5190-2193	5190-2194	5190-2195
Low pressure tip, Ultra Inert liner with glass seal	500	4	5190-2196	5190-2195	5190-2198	5190-2197
<b>SPME Washers</b>						
Single apex, Ultra Inert liner for SPME	25	0.5	5190-4288			
Single apex, Ultra Inert liner	25	1	5190-4287			

Agilent Ultra Inert gold seals and washers:  
A smooth, leak-free surface for active analytes



Description	1 µL	50 µL	100 µL
Ultra Inert gold seal and washer	5190-2194	5190-2195	5190-2196

Learn more at [www.agilent.com/chem/inertflow](http://www.agilent.com/chem/inertflow)

The Measure of Confidence



# Literature and ordering guides: GC connections

[www.agilent.com/chem/betterGCconnections](http://www.agilent.com/chem/betterGCconnections)

Order the poster...

View the video...

**SIX TIPS FOR TIGHTER GC CONNECTIONS AND BETTER RESULTS**

Inspecting your GC column connections is a key part of good preventive maintenance – and a laboratory practice that you simply cannot afford to overlook. That's because poor, leaky connections can cause:

- Dirty baselines
- Loss of expensive, high-quality gas
- Shorter column and detector life
- Decreased system sensitivity
- Reduced system productivity

This poster highlights the critical GC connection "hotspots" to help you fix problems before they compromise your results.

The Maximum of Confidence

Keep in mind that other factors affect the quality and consistency of your data:

- Poor quality reagents
- Poor quality gas
- Poor quality column
- Poor quality detector
- Poor quality software

- 1. The Agilent Ferrule and nut are not interchangeable for your application.** Ferrules and nuts are not interchangeable. Ferrules are designed for use with Agilent Self Tightening Ferrule (STF) and Agilent Self Tightening Ferrule Plus (STF Plus) ferrules. Ferrules are not interchangeable with other ferrules.
- 2. The ferrule and nut are not interchangeable for your application.** Ferrules and nuts are not interchangeable. Ferrules are designed for use with Agilent Self Tightening Ferrule (STF) and Agilent Self Tightening Ferrule Plus (STF Plus) ferrules. Ferrules are not interchangeable with other ferrules.
- 3. Avoid the column at the ferrule and nut connection.** Avoid the column at the ferrule and nut connection. The column should be secured to the ferrule and nut connection. The column should be secured to the ferrule and nut connection.
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To learn more about creating and maintaining leak-free GC connections, go to [agilent.com/chem/betterGCconnections](http://agilent.com/chem/betterGCconnections)

Agilent Technologies

Better\_GC\_Connections\_08c\_FINAL\_3280x720

Agilent Technologies  
Part Number 0187 0020

Agilent Self Tightening Column Nut with short graphite polyimide blend ferrule

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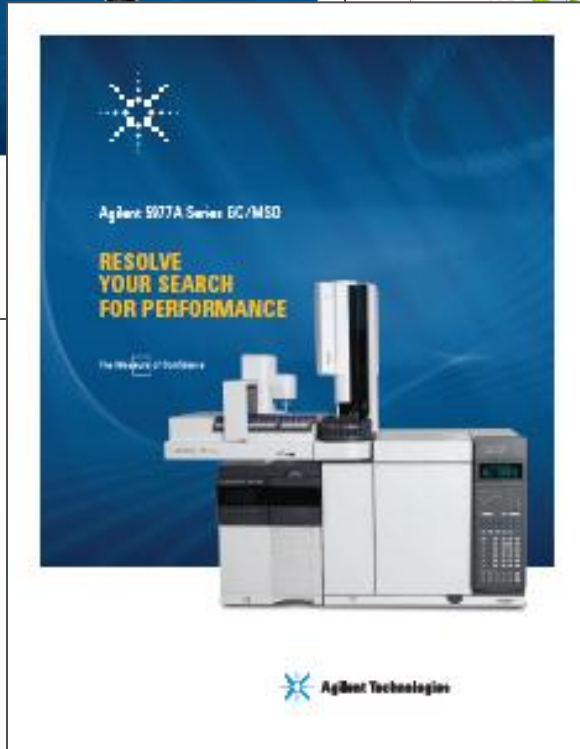
# Instrumentation



**Agilent 7890B Gas Chromatograph**

**RESOLVE YOUR SEARCH FOR RELIABILITY**


The Measure of Excellence



**Agilent 507A Series GC/MSD**

**RESOLVE YOUR SEARCH FOR PERFORMANCE**

The Measure of Excellence



**Agilent Technologies**

*Resolve your search for integration*

**Smart features take supportability, performance, and safety to new heights**

**Integrated two-way GC $\leftrightarrow$ MSD Communication and Safety Controls**

Direct two-way communication between the 7890B GC and 507A MSD enhances and protects your investment.

- If the MSD vents, the system suppresses the flow of carrier gas, shortening vent times.
- If the pump fails, the system shuts off the carrier gas, saving expensive helium or avoiding hydrogen build-up.
- If communications are lost, the system shuts down the GC thermal zones.

**Save time**

- Columns and supplies database with optional bar code reader make it easy to keep track of these items.
- Parts ID tool quickly identifies parts and part numbers for easy reordering.

**Environmentally friendly**

- Can also be used with hydrogen or nitrogen carrier gas to reduce operating costs.
- Sleep/Wake modes reduce gas and energy consumption.



*See more about the*

**Work smarter with integrated GC, MSD, and software technologies**

**Integrated GC $\leftrightarrow$ MSD communication and safety controls**


- Direct communication between GC and MS helps detect faults—protecting both instruments:
  - If the EPC drops, the GC shuts down the MSD heater.
  - If the pump fails, the system shuts off the carrier gas.
- Certified for hydrogen carrier gas, so you can switch from helium to less expensive carrier gases for faster analyses and greater resolution.

**40% less power**

**Power Save**

**Eco-friendly operation**

- Switch to a lower cost gas, **sleep** mode, or **hibernate** period of use.
- "Smart start" **auto pump** saves air.
- High sensitivity **arm** **pre** reduces the need for excessively **slow** columns during sample prep.

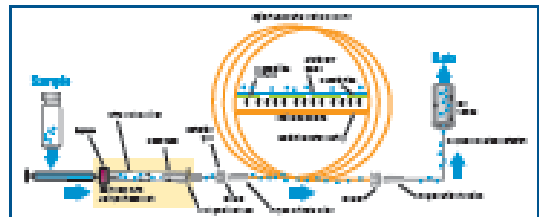


**Ensuring an inert flow path has never been more critical**

As complex as some smaller, low-budget units, and more complex, you simply cannot afford the wear caused by flow path oxidation.

For starters, looking to repair or retrofit suggests analysis errors, reduced accuracy, limited productivity, and hard gear to combine. And with thousands of active analytical years, you might not even get a second chance, because there might be one more sample left to analyze.

Agilent's Inert Flow Path (IFP) technology option ensures the inertness of the flow path, allowing analysis to safely pass from injection to detector.



**The integrated approach to hardware**

**The Agilent advantage**

As the GC industry's premier measurement company, Agilent is uniquely positioned to help ensure the longevity of every surface that touches your sample, so you can achieve the peak performance you require for today's analysis demands.

- **Agilent-MSD** flow back-OC columns are coated at the injection's inlet and the outlet to ensure maximum column lifetime and sample integrity from column inlet to detector.
- **Agilent flow back** flow delivery is more consistent and reliable than **zero** flow, with no solvent gas vent.
- **Low split** technology (Matsuda) provides an extra level of protection to the sample pathway.

- **Flow back** technology features the stainless steel inlet and outlet that will give you the most consistent and highly reproducible.
- **Uncoated** **MSD** flow back flow delivery is more consistent and reliable than **zero** flow, with no solvent gas vent.
- **Flow back** technology also features stainless steel gas retaining systems, ensuring sensitivity and detection.

For the Agilent flow back flow delivery, see [www.agilent.com/chem/flowback](http://www.agilent.com/chem/flowback) or [www.agilent.com/chem/flowback](http://www.agilent.com/chem/flowback)

**For more information about creating an inert GC pathway, visit [www.agilent.com/chem/flowback](http://www.agilent.com/chem/flowback)**

## Inert Flow Path

# Questions?

