



UPDATED VERSION

Agilent Inert Flow Path Solutions

# LOWER YOUR DETECTION LIMITS AND QUANTIFY ACTIVE ANALYTES WITH CONFIDENCE

The Measure of Confidence



Agilent Technologies

## ENSURING AN INERT FLOW PATH FROM INJECTION THROUGH DETECTION IS CRITICAL—AND NOW, EASY TO ACHIEVE

As regulatory agencies drive limits of detection lower for increasingly active and more complex samples, you cannot afford adsorption caused by flow path activity. This is particularly critical for food, environmental, and forensic sample matrices.

Having to repeat or verify suspect analyses wastes valuable resources, hinders productivity, and hurts your bottom line. With the clock ticking on sample viability and limited available sample, you might not get a second chance because there is no viable sample left to analyze.

Unreliable results can also have catastrophic implications in terms of environmental safety, the quality of the foods we eat, and inaccurate drugs-of-abuse accusations. Since identification and quantification are more difficult in complex matrices such as fruits, vegetables, soils, and biological fluids, you must be especially vigilant to make sure your flow path is not compromising your results by adsorbing analytes of interest.



Detecting melamine and other dangerous substances in milk, milk products, and eggs



Performing trace-level analyses of active analytes in environmental matrices



Testing drinking water for semi-volatile contaminants that threaten public health



Determining drugs of abuse in biological fluids

## An integrated approach to inertness: The Agilent advantage

Flow path inertness is vital to your analysis; it is also on the cutting edge of GC.

As the GC industry's premier measurement company, Agilent is uniquely positioned to ensure the inertness of every surface that touches your sample, so you can achieve the parts-per-billion—or parts-per-trillion—detection levels that today's analyses demand.

In 2008, Agilent laid the groundwork for flow path inertness with **Agilent J&W Ultra Inert columns**—the *first* GC columns proven to deliver on the promise of consistent column inertness and exceptionally low column bleed. Since then, we have *continued* to lead the way with Ultra Inert liners and—most recently—inert fittings, ferrules, guard columns and retention gaps, and supplies for inlets and detectors.

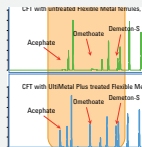
By minimizing activity along every step of the GC and GC/MS flow path, Agilent Inert Flow Path solutions improve system performance, ensure better results, and allow you to process more samples without unplanned maintenance and recalibration.

## Inside: everything you need to build your inert flow path



**Solutions: liners, components, columns, and instruments**

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**Applications**

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### Agilent Inert Flow Path solutions

ensure a reliably inert GC flow path for higher sensitivity, accuracy, and reproducibility... especially at trace levels.

## Agilent CrossLab

Built upon Agilent's decades of leadership and innovation, Agilent CrossLab is a comprehensive, coordinated method of providing services, supplies and software that dramatically improves laboratory efficiency and productivity.

Whats more, Agilent CrossLab supplies come with a risk-free warranty and are compatible with other instrument brands. In the unlikely event of a problem, we guarantee a 90-day refund on supplies, technical support consultation, and free instrument repair or service if necessary.

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

To learn how Agilent Inert Flow Path solutions can give you the utmost confidence in your results, visit [www.agilent.com/chem/inert](http://www.agilent.com/chem/inert)

# WITH AGILENT INERT FLOW PATH SOLUTIONS, YOU WON'T MISS A THING IN YOUR GC AND GC/MS ANALYSIS



**1** Ultra Inert liners



**2** Inert Flow Path Split/Splitless inlet



**3** Ultra Inert gold seals



**4** Inert MS source



**5** IDP-3 pump



**6** Inert Capillary Flow Technology devices, including UltiMetal Plus 3-way splitter



**7** UltiMetal Plus Flexible Metal ferrules



**8** Agilent J&W Ultra Inert GC column and Ultimate Plus deactivated fused silica tubing



**9** Gas Clean purifier



#### 1 Ultra Inert liners

With or without deactivated glass wool, Ultra Inert liners are certified to provide both low surface activity and highly reproducible sample vaporization, facilitating best-in-class delivery for active analytes.

#### 2 Inert Flow Path Split/Splitless inlet

The hot metal surfaces of each weldment are treated to prevent adsorption and degradation.

#### 3 Ultra Inert gold seals

Only Agilent combines the best mechanical sealing with an inert surface. Unlike traditional machined seals, Ultra Inert gold inlet seals are manufactured using metal injection molding, followed by gold plating to ensure a smooth, consistent surface. We then apply our Ultra Inert chemistry on top of the gold plating to produce a leak-free seal that reduces active analyte adsorption.

#### 4 Inert MS source

Precision design, material selection, surface deactivation, and rigorous testing ensure unmatched sensitivity when analytes reach the mass spectrometer.

#### 5 Go green, go dry with the IDP-3 oil free Vacuum Pump

It offers a quieter laboratory environment, no oil contamination and lower cost of ownership compared to standard oil rotary vane pump.

#### 6 Inert Capillary Flow Technology devices, including UltiMetal Plus 3-way splitter

With their highly inert surfaces, Capillary Flow Technology tools extend your GC capabilities by modifying the flow path *without the risk of sample loss*. Our purged union allows you to backflush high boilers in heavy-matrix samples, increasing column lifetime and system productivity.

#### 7 UltiMetal Plus Flexible Metal ferrules

With their proprietary surface deactivation, Agilent's NEW UltiMetal Plus Flexible Metal ferrules are the *only* ferrules that won't introduce active sites into the flow path. Unlike graphite/Vespel ferrules, our inert flexible metal ferrules *don't* have to be retightened. Their flexible metal construction also solves the problem of column breakage (or leakage) associated with standard metal ferrules. Compatible with Capillary Flow Technology (CFT) and inlet/detector fittings. (Note: color variations between ferrules are a normal result of the UltiMetal coating).

#### 8 Agilent J&W Ultra Inert GC column and Ultimate Plus deactivated fused silica tubing

Each column is rigorously tested to ensure exceptionally low bleed and consistently high inertness for optimal active analyte delivery to the GC or MS detector. Available in a variety of phases to support environmental, food safety, and toxicology applications.

For applications of complex or heavy matrices where guard columns are typically used, Ultimate Plus deactivated fused silica tubing is designed for the best inertness.

#### 9 Gas Clean purifier

Contaminants such as oxygen, moisture, and hydrocarbons can increase the risk of column damage, sensitivity loss, and instrument downtime. Installing an Agilent Gas Clean purifier in your carrier gas line removes these contaminants, which helps maintain flow path inertness, ensure the highest quality gas, and keep your gas lines clean and leak-free. Sensitive indicators protect your instrument and GC column, while fast stabilization enhances productivity and reduces helium gas consumption.

Visit [www.agilent.com/chem/gasclean](http://www.agilent.com/chem/gasclean) for more strategies on clean gas delivery.



## ENSURE A RELIABLY INERT FLOW PATH— AND IMPROVE RESPONSE WITH ACTIVE ANALYTES

Whether you are analyzing difficult, active environmental samples or screening for drugs of abuse, Agilent Inert Flow Path solutions help ensure an inert GC flow path for higher sensitivity, accuracy, linearity, and reproducibility, especially at trace levels. They also minimize the need for frequent inlet maintenance and system recalibration.

### Agilent Ultra Inert liners:

#### Best-in-class deactivation performance makes trace-level analysis easier

Inertness is critical inside the heated injection port, where labile analytes are prone to adsorption or degradation. Agilent's proprietary manufacturing process produces Ultra Inert liners with superior deactivation coverage that ensures reproducibility, reliability, and more accurate sample transfer onto the GC column.

- Highly inert glass wool is compatible with samples containing active compounds
- Liners with inert wool keep non-volatiles inside the inlet, extending column life and increasing the time between source maintenance
- Greater sensitivity boosts your productivity by allowing you to run more samples

Remember, too, that Agilent CrossLab Ultra Inert GC liners deliver flawless performance for *all* instruments in your lab—regardless of make or model.



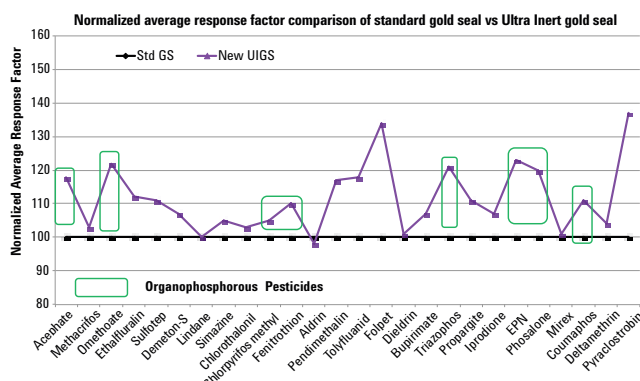
### Inert Flow Path components:

#### Prevent active sites from ruining your analysis

*All* flow path surfaces can contribute to sample loss or degradation, which is why Agilent now applies proprietary chemistries to *all* sample flow path surfaces:

- **Ultra Inert gold seals** offer the best inlet sealing surface with unsurpassed inertness
- **UltiMetal Plus Flexible Metal ferrules** prevent sample loss while using inert capillary flow technology devices, such as backflush or ultimate unions. The novel design of these ferrules provide a reliable leak-free seal, and robust column connections even at high temperatures for extended periods of time.
- **UltiMetal Plus treatment** of inlet weldments further reduces the chance of analyte interaction with active sites on the inlet

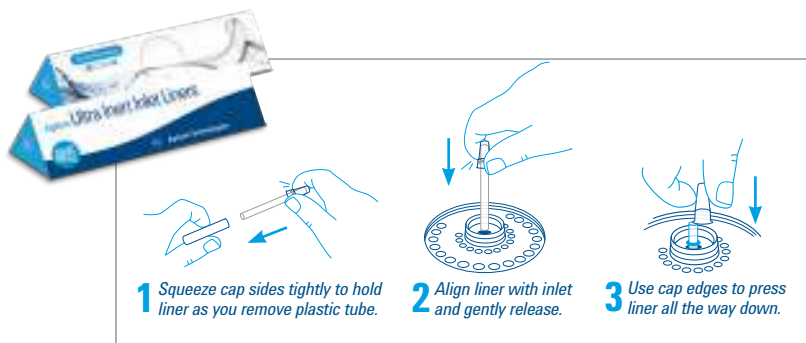
#### Improvement on organophosphorous pesticide peak shapes and responses using Ultra Inert gold seal



Ultra Inert gold seals give you better response and results than standard gold seals.

## Touchless packaging—an Agilent exclusive—reduces contamination concerns

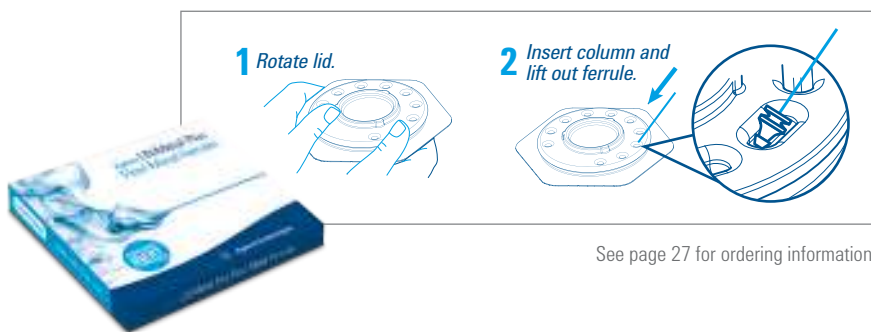
Agilent Ultra Inert liners are packaged with a **pre-installed O-ring** that has been cleaned, conditioned, and non-stick plasma treated. This unique touchless packaging allows you to easily install the new liner without searching for and installing the O-ring—saving time and reducing the risk of contamination from touching.



See page 26 for ordering information.

View the Touchless Packaging demonstration video at [www.agilent.com/chem/touchless](http://www.agilent.com/chem/touchless)

UltiMetal Plus Flexible Metal ferrules are conveniently packaged to let you thread the column through the ferrule *while the ferrule is still in the package*—so you don't risk handling or dropping.



See page 27 for ordering information.

## Certified performance:

Each Ultra Inert Liner deactivation lot is certified to ensure efficient, consistent coverage using both acidic and basic probes at trace (2 ng) levels on-column. In addition, every liner is packaged with a Performance Certificate that you can peel and stick into your lab notebook for quick compliance reference.



**Easy traceability:** The deactivation lot number is printed directly on the Performance Certificate; the liner lot number and part number are permanently etched on the glass.

## Agilent proprietary surface treatments further expand your inert flow path

Ultra Inert and UltiMetal Plus surfaces are tested for inertness with stringent chromatographic quality control processes based on decades of GC experience and leadership.

# Agilent J&W Ultra Inert GC columns: **PERFORM TRACE-LEVEL ANALYSIS WITH THE UTMOST CONFIDENCE**

The Agilent J&W Ultra Inert GC column family pushes industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes. Each Ultra Inert GC column is tested with the industry's most demanding test probe mixture—and we *prove* it with a performance summary sheet shipped with each column.

## Confidently analyze active compounds, trace-level samples, and unknowns without changing selectivity

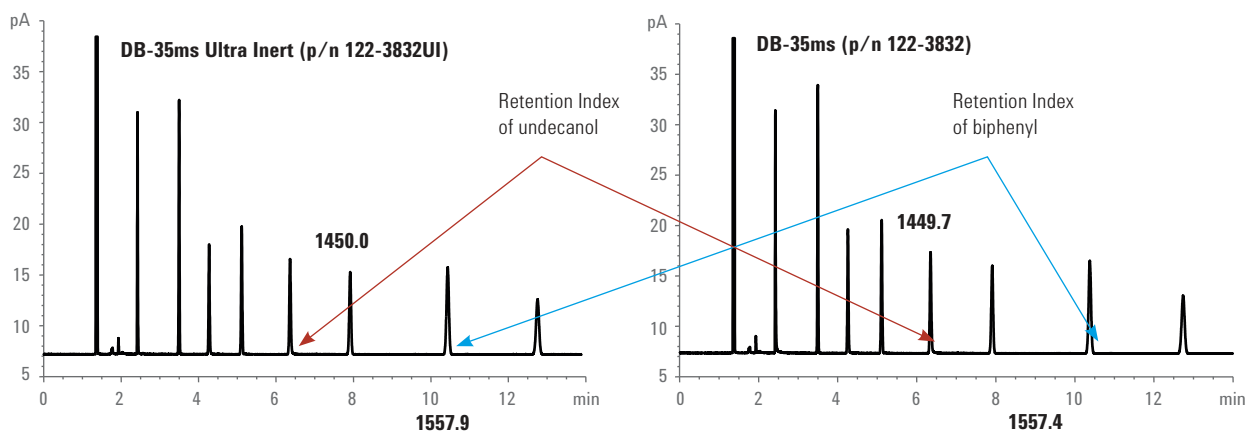
Agilent's leading-edge manufacturing processes—combined with our optimization of chemistries and manufacturing design advancements—improve the inertness of our Ultra Inert columns while maintaining the selectivity of their non-ultra inert counterparts.

In addition, every Agilent J&W Ultra Inert GC column is tested using probes with varying chemical characteristics to avoid subtle polymer selectivity variations. This ensures that Agilent J&W Ultra Inert GC columns have the same selectivity as Agilent MS columns—eliminating the need for method revalidation, as you can see below.

## Low column activity for your sensitive, trace-level applications

### Benefits of high column inertness

- Increased signal for more accurate peak identification
- Minimum peak tailing for active analytes
- Longer maintenance-free instrument uptime
- Minimal compound loss and degradation for more accurate quantitation



With Agilent J&W Ultra Inert GC columns, selectivity remains the same, allowing you to confidently integrate Ultra Inert columns into your current methods.



## The industry's most rigorous test probe mixture ensures consistent column inertness—and results

A strong test probe mixture can highlight deficiencies in column activity, while a weak mixture can actually mask such deficiencies.

The test probes in the **Agilent Ultra Inert test probe mixture** have low molecular weights, low boiling points, and no steric shielding of their active groups. These characteristics allow the probative portion of the test molecules to penetrate—and fully interact with—the stationary phase and column surface.

### Commonly used, less demanding test probes

- |                       |                        |                    |
|-----------------------|------------------------|--------------------|
| 1. 1-Octanol          | 4. 2,6-Dimethylaniline | 7. 1-Decanol       |
| 2. n-Undecane         | 5. n-Dodecane          | 8. n-Tridecane     |
| 3. 2,6-Dimethylphenol | 6. Naphthalene         | 9. Methyldecanoate |

## Agilent's more demanding Ultra Inert test probe mixtures

### Ultra Inert 5ms columns

Elution Order	Test Probe	Functional Test
1	1-Propionic acid	Basicity
2	1-Octene	Polarity
3	n-Octane	Hydrocarbon marker
4	4-Picoline	Acidity
5	n-Nonane	Hydrocarbon marker
6	Trimethyl phosphate	Acidity
7	1,2-Pentanediol	Silanol
8	n-Propylbenzene	Hydrocarbon marker
9	1-Heptanol	Silanol
10	3-Octanone	Polarity
11	n-Decane	Efficiency

### Ultra Inert 1ms columns

Elution Order	Test Probe	Functional Test
1	1-Propionic acid	Basicity
2	1-Octene	Polarity
3	n-Octane	Hydrocarbon marker
4	1,2-Butanediol	Silanol
5	4-Picoline	Acidity
6	Trimethyl phosphate	Acidity
7	n-Propylbenzene	Hydrocarbon marker
8	1-Heptanol	Silanol
9	3-Octanone	Polarity
10	tert-Butylbenzene	Hydrocarbon marker
11	n-Decane	Efficiency

### Ultra Inert 35ms columns

Elution Order	Test Probe	Functional Test
1	1-Octene	Polarity
2	1-Butyric acid	Basicity
3	n-Nonane	Hydrocarbon marker
4	4-Picoline	Acidity
5	n-Propylbenzene	Polarity
6	1-Heptanol	Silanol, Polarity
7	1,2-Pentanediol	Silanol
8	3-Octanone	Polarity
9	Trimethyl phosphate	Acidity
10	n-Undecane	Hydrocarbon marker
11	tert-Butylbenzene	Efficiency

### Ultra Inert DB-624 columns

Elution Order	Test Probe	Functional Test
1	Ethanol	Activity
2	Methylene chloride	Polarity
3	1-Propanol	Activity
4	Acetic acid	Basicity
5	Pyridine	Acidity
6	Octane	Hydrocarbon marker
7	1-Pentanol	Polarity
8	1,2-Propanediol	Silanol
9	Butyric acid	Basicity
10	m-Xylene	Polarity/efficiency
11	4-Methylpyridine	Acidity
12	Bromoform	Polarity
13	Dimethyl-methylphosphonate	Acidity
14	Decane	Hydrocarbon marker

### Ultra Inert DB-8270D columns

Elution Order	Test Probe	Functional Test
1	Propionic acid	Basicity
2	Pyridine	Acidity
3	1-Pentanol	Silanol
4	1-Octene	Polarity
5	n-Octane	Hydrocarbon marker
6	1,2-Butanediol	Silanol
7	1-Chloro-2-fluorobenzene	Polarity
8	m-Xylene	Polarity
9	p-Xylene	Efficiency
10	2-Heptanone	Polarity
11	n-Nonane	Hydrocarbon marker
12	Isopropylbenzene	Efficiency

### Ultra Inert DB-WAX Ultra Inert columns

Elution Order	Test Probe	Functional Test
1	5-Nonanone	Polarity
2	Decanal	Activity
3	Propionic acid	Basicity
4	Ethylene glycol	Silanol
5	Heptadecane	Hydrocarbon marker
6	Aniline	Acidity
7	Methyl dodecanoate	Polarity
8	2-Chlorophenol	Silanol, Polarity
9	1-Undecanol	Silanol, Polarity
10	Nonadecane	Hydrocarbon marker
11	2-Ethylhexanoic Acid	Basicity
12	Ethyl maltol	Activity

View the Ultra Inert DB-8270D test chromatogram at [www.agilent.com/chem/library](http://www.agilent.com/chem/library) and search for 5991-0250EN.

## Agilent GC/MSD and GC instruments: **MAXIMIZE YOUR QUANTIFICATION SENSITIVITY AND ACCURACY**

To ensure accurate quantification and high sensitivity, the entire flow path must be highly inert, including detector surfaces. This is especially true for mass spectrometers, as they are often used for sensitive analyses.

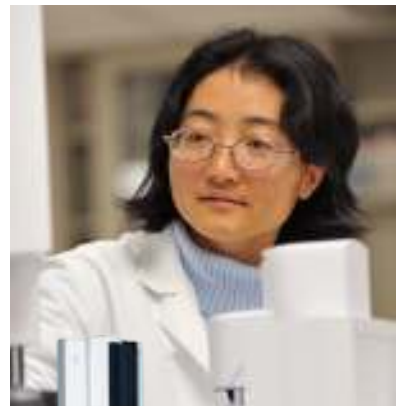
Our industry-leading GC/MS systems combine an inert ion source with the analytical capabilities you need to keep pace with the most stringent new methods—and your most demanding sample loads. Our instrument portfolio includes **GC single quadrupole MSD**, **GC ion trap MS**, **GC triple quadrupole MS**, and **GC/Q-TOF MS**.

### Agilent 5977 Series GC/MSD

#### **Resolve your search for performance and integration**

The Agilent 5977 Series GC/MSD takes your lab to a higher plane of productivity and confidence with increased sensitivity, superior workflow, and software tools that simplify method optimization and lower your operating costs.

- **The most sensitive MSD:** New High Efficiency Source (HES) produces up to 20x more ions, resulting in a great improvement in sensitivity, performance, and workflow efficiency that leads to reduced lab operating costs. The patented quadrupole operates at up to 200 °C—to prevent contamination by high-boiling compounds and ensure long-lasting tune and calibration.
- **Maximum productivity:** Integrated hardware and software features simplify your workflow and help you get more done with fewer resources
- **Eco-friendly GC/MSD:** Integrated sleep/wake modes—plus smart startup features in the turbo pump—reduce gas and energy usage
- **The best software options:** Continue to use our versatile and robust ChemStation—or choose our proven MassHunter software



The Agilent 5977 Series GC/MSD has all the elements for faster vent times, eco-friendly resource management, and GC/MSD system protection—including the ability to use hydrogen as a carrier gas.

## Agilent 7890B GC

### Resolve your search for value

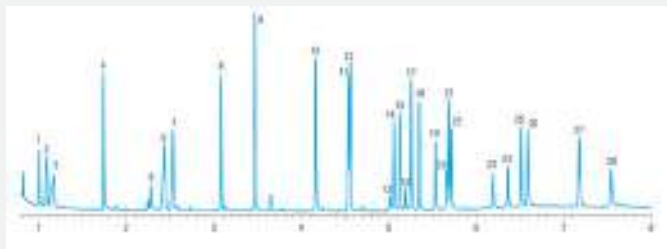
Agilent's 7890B GC system has everything you need to boost productivity and generate data with confidence. Its seamless communication with the Agilent 5977 MSD provides faster vent times, better resource management, and safer operation.

- **Inert Flow Path option—an Agilent exclusive:** Inert inlets, together with Ultra Inert liners and columns, ensure that your entire sample reaches the detector for confident trace-level analysis
- **Enhanced Capillary Flow Technology:** CFT modules enable leak-free, inert in-oven connections while improving throughput and reliability
- **Choice of inlets and detectors:** A variety of inlet and detector modules allows you to customize your GC in minutes
- **GC and GC/MS system tools:** Reduce downtime with simplified maintenance and status monitoring
- **Intuitive system and data handling software:** Choose the software package that fits *your* lab's needs—and turn your results into answers, faster
- **Less dependence on helium:** Integrated calculators help you convert He methods to more available—and less expensive—gases such as hydrogen or nitrogen
- **Interactive Parts Finder software:** Image-based inventory helps you quickly identify the parts and supplies you need



The Agilent 7890B GC adds powerful capabilities and productivity features to the industry-leading GC platform.

### 5 ng test mix: Agilent Inert Fast Toxicology Analyzer



- |   |                      |
|---|----------------------|
| 1. Amphetamine                          | 16. Lorazepam        |
| 2. Phentermine                          | 17. Diazepam         |
| 3. Methamphetamine                      | 18. Hydrocodone      |
| 4. Nicotine                             | 19. Oxycodone        |
| 5. Methylenedioxymphetamine (MDA)       | 20. Temazepam        |
| 6. Methylenedioxymethamphetamine (MDMA) | 21. Diacetylmorphine |
| 7. Methylenedioxyethylamphetamine       | 22. Flunitrazepam    |
| 8. Meperidine                           | 23. Nitrazepam       |
| 9. Phencyclidine                        | 24. Clonazepam       |
| 10. Methadone                           | 25. Alprazolam       |
| 11. Cocaine                             | 26. Verapamil        |
| 12. SKF-525a (RTL Compound)             | 27. Strychnine       |
| 13. Oxazepam                            | 28. Trazodone        |
| 14. Tetrahydrocannabinol                |                      |
| 15. Codeine                             |                      |

NPD chromatogram of underivatized drugs of abuse 5 ng/component.

The above example shows the separation of 28 underivatized drugs of abuse. The check-out mix contained a broad range of basic and acidic drugs from several drug classes, providing an effective tool for quick assessment of column and system performance.

**In this study, the liner, column, and instrument performed well.** Note that the peak shapes for these very active analytes are sharp and symmetrical—even at relatively low levels – facilitating good quantification and demonstrating the value of system inertness.

## Foods and flavors:

# ENSURE CONSISTENT QUALITY AND UNCOMPROMISING SAFETY THROUGHOUT THE FOOD PRODUCTION CHAIN

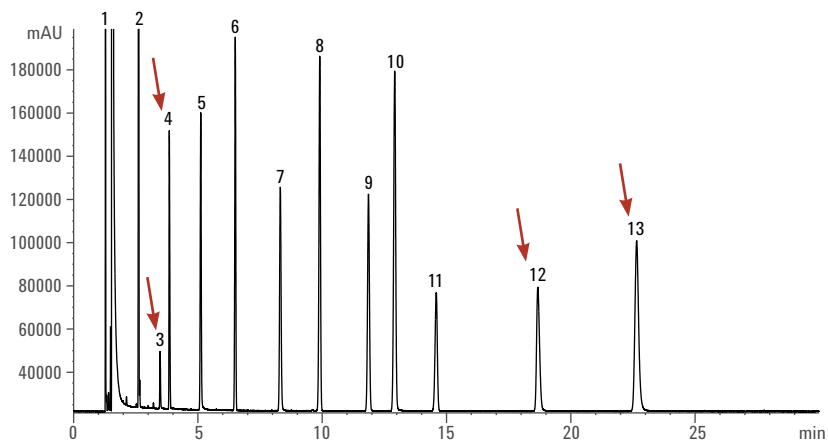
Food supply globalization, novel food-borne pathogens, and aging populations have combined to increase the demand for highly sensitive food testing applications.

Flow path inertness is the next frontier in food analyses, and Agilent is breaking new ground with our ongoing development of inert flow path solutions including liners, columns, and instruments—as well as test mixes and procedures. Together, these innovations ensure a highly inert flow path, improving your ability to analyze difficult, active compounds at trace levels.

## Get the best peak shape performance and consistency with DB-WAX Ultra Inert

Improved inertness provides extended utility and expanded range of analyses for analytes that have diverse functional groups. The DB-WAX Ultra Inert column is great for acidic compounds—no need for a specialized FFAP type column. Engineered and tested for reliable peak shape performance, DB-WAX Ultra Inert columns represent the ultimate performance of PEG stationary phase inertness. Upgrading to DB-WAX Ultra Inert is easy with minimal validation because it has the same selectivity as DB-WAX. There is no need to recreate or modify existing compound libraries that are based on DB-WAX.

### DB-WAX Ultra Inert test mix



DB-WAX Ultra Inert QC test mix contains strong inertness probes including decanal, propionic acid, 2-ethylhexanoic acid and ethyl maltol to ensure consistent inertness for challenging flavor compounds.

#### Peak identification:

- |                    |                          |
|--------------------|--------------------------|
| 1. Methane         | 8. Methyl Dodecanoate    |
| 2. 2-Nonanone      | 9. 2-Chlorophenol        |
| 3. Decanal         | 10. 1-Undecanol          |
| 4. Propionic Acid  | 11. Nonadecane           |
| 5. Ethylene Glycol | 12. 2-Ethylhexanoic Acid |
| 6. Heptadecane     | 13. Ethyl Maltol         |
| 7. Aniline         |                          |

## Excellent peak shape for acidic compounds with DB-WAX Ultra Inert

### Test conditions:

**Column:** Agilent J&W DB-WAX Ultra Inert,  
30 m x 0.25 mm, 0.25 µm  
(p/n 122-7032UI)

**Oven:** Agilent 7890/5975C

**Carrier Gas:** Agilent 7683B, 5.0 µL syringe

**Injection:** Purged 2-way splitter,  
split ratio 1:1 MSD:FPD

**Detector:** 1 µL splitless, 250 °C,  
purge flow 60 mL/min at 0.25 min,  
gas saver on at 2 min 20 mL/min

### Flow path supplies:

**Inlet liner:** Ultra Inert low pressure drop liner  
with wool (p/n 5190-2295)

**Seals:** Ultra Inert gold seal (p/n 5190-6144)

**Column nut:** Self Tightening Column Nut  
(p/n 5190-6194)

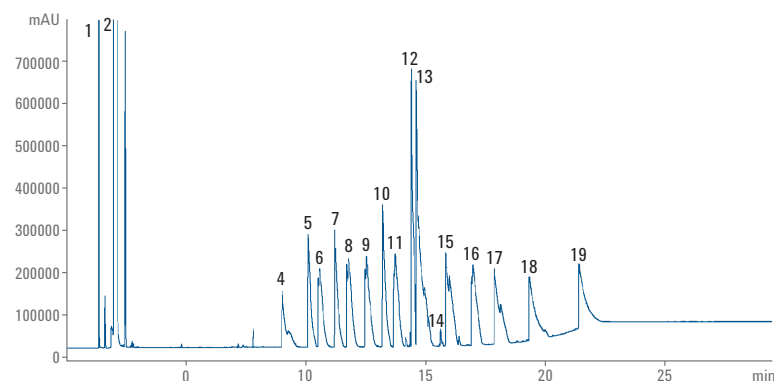
**Ferrules:** Graphite-vespel ferrules  
(p/n 5181-3323) 10 pk

**Septum:** Long life septa (p/n 5183-4761) 50 pk

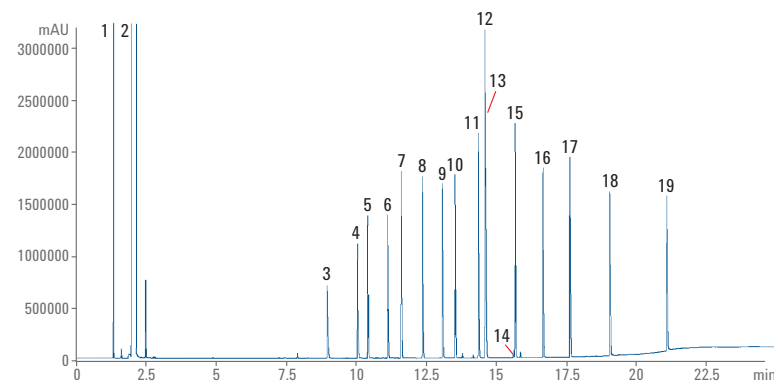
### Peak identification:

- |                         |                           |
|-------------------------|---------------------------|
| 1. Methane              | 11. 4-Methylhexanoic Acid |
| 2. Acetone (solvent)    | 12. 2-Ethylhexanoic Acid  |
| 3. Acetic Acid          | 13. Heptanoic Acid        |
| 4. Propionic Acid       | 14. Pyruvic Acid          |
| 5. Isobutyric Acid      | 15. Octanoic Acid         |
| 6. Butyric Acid         | 16. Nonanoic Acid         |
| 7. Isovaleric Acid      | 17. Decanoic Acid         |
| 8. Valeric Acid         | 18. Undecylenic Acid      |
| 9. 4-Methylvaleric Acid | 19. Myristic Acid         |
| 10. Hexanoic Acid       | (Tetradecanoic)           |

### Free fatty acids on a standard WAX column



### Free fatty acids on DB-WAX Ultra Inert



DB-WAX Ultra Inert exhibits excellent peak shape for this mixture of free fatty acids compared to standard WAX.

## Retention time locked DB-WAX methods can easily be ported to DB-WAX Ultra Inert

DB-WAX methods with analytes containing active compounds such as glycols, alcohol, carboxylic acids, aldehydes etc are easily upgraded to DB-WAX Ultra Inert. Confidently switch to DB-WAX Ultra Inert and experience fast implementation for improved qualitative and quantitative results.

### Test conditions:

**Column:** DB-WAX Ultra Inert,  
30 m x 0.25 mm, 0.25 µm  
(p/n 122-7032UI)

**Inlet:** Ultra Inert Split/splitless weldments  
(p/n G3970A)

**Detector:** FID

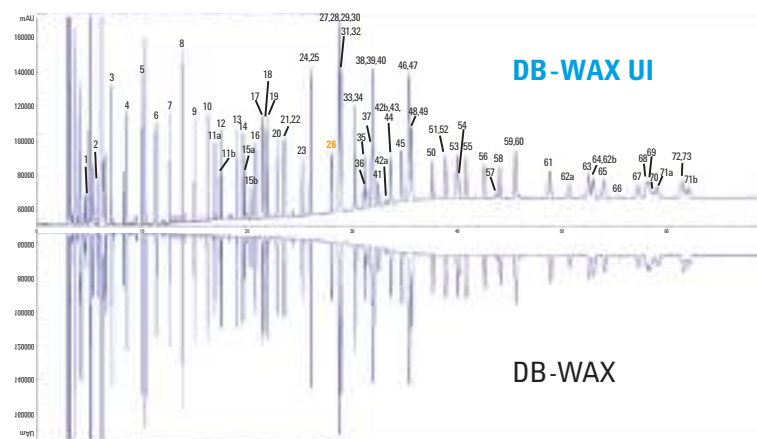
**Inlet temperature:** 250 °C

**Injection volume:** 1 µL

**Slit ratio:** 1/50

**Carrier gas:** Hydrogen

**Head pressure:** Methyl Stearate is retention time  
locked at 14.000 min. Carrier gas  
pressure set to constant pressure  
mode, velocity approximately 36 cm/s  
at 50 °C and 53 kPa



DB-WAX Ultra Inert has the same selectivity as DB-WAX as demonstrated with this separation of 72 FAME compounds.

**Oven temperature:** 50 °C, 1 min, 25 °C/min to  
200 °C, 3/min to 230 °C, 18 min

**Detector temperature:** 280 °C

**Detector gases:** Hydrogen: 40 mL/min,  
Air: 450 mL/min,  
Helium make-up gas: 30 mL/min

### Flow path supplies:

**Inlet liner:** Ultra Inert low pressure drop liner  
(p/n 5190-2295)

**Seals:** Ultra Inert gold seal (p/n 5190-6144)

**Column nut:** Self Tightening Column Nut  
(p/n 5190-6194)

**Ferrules:** Graphite-vespel ferrules (p/n 5181-3323) 10 pk

**Septum:** Long life septa (p/n 5183-4761)



## Organophosphorus residues in olive oil

Chromatographically active compounds such as organophosphorus (OP) pesticides can adsorb onto active sites in the sample flow path (particularly at trace levels), compromising analyte response and increasing the risk of peak tailing. An inert flow path is, therefore, essential for accurate quantitation.

In this study, we demonstrate that the complete transfer of analytes from inlet to detector is critical. To avoid activity, we recommend using a total Agilent Inert Flow Path.

### Test conditions:

<b>GC/MSD:</b>	Agilent 7890/5975C
<b>Sampler:</b>	Agilent 7683B, 5.0 µL syringe
<b>CFT device:</b>	Purged 2-way splitter, split ratio 1:1 MSD:FPD
<b>Inlet:</b>	1 µL splitless, 250 °C, purge flow 60 mL/min at 0.25 min, gas saver on at 2 min 20 mL/min
<b>Column:</b>	Agilent J&W DB-35ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm (p/n 122-3832UI)
<b>Postrun backflush:</b>	7.5 min at 290 °C, Aux EPC pressure 54 psi during backflush, 2 psi inlet pressure during backflush
<b>MSD:</b>	300 °C Transfer line, 300 °C source, 150 °C quad
<b>FPD:</b>	230 °C, Hydrogen 75 mL/min, air 100 mL/min, carrier + makeup (N <sub>2</sub> ) 60 mL/min

### Flow path supplies:

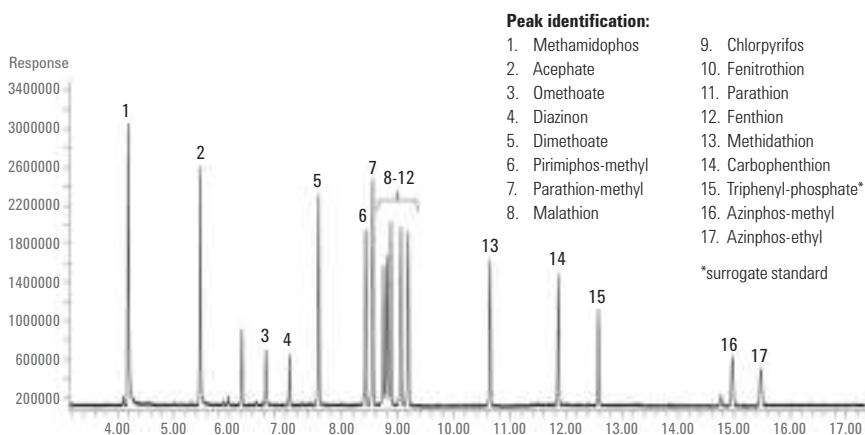
<b>Vials:</b>	Amber crimp top glass vials (p/n 5183-4496)
<b>Vial caps:</b>	Crimp caps (p/n 5181-1210)
<b>Vial inserts:</b>	250 µL Glass/polymer feet (p/n 5181-8872)
<b>Syringe:</b>	5 µL (p/n 5181-1273)
<b>Septum:</b>	Advanced Green (p/n 5183-4759)
<b>Inlet liner:</b>	Ultra Inert single taper splitless liner with wool (p/n 5190-2293)
<b>Ferrules:</b>	0.4 mm id short, 85/15 Vespel/graphite (p/n 5181-3323)



### Organophosphorus residues test

The Agilent J&W DB-35ms Ultra Inert capillary column and Ultra Inert liner with wool resolved the targeted OP pesticides and provided excellent peak shape for the polar pesticides—allowing for more reliable quantitation at low levels.

### Resolution of 16 organophosphorus pesticides with an Agilent J&W DB-35ms Ultra Inert column



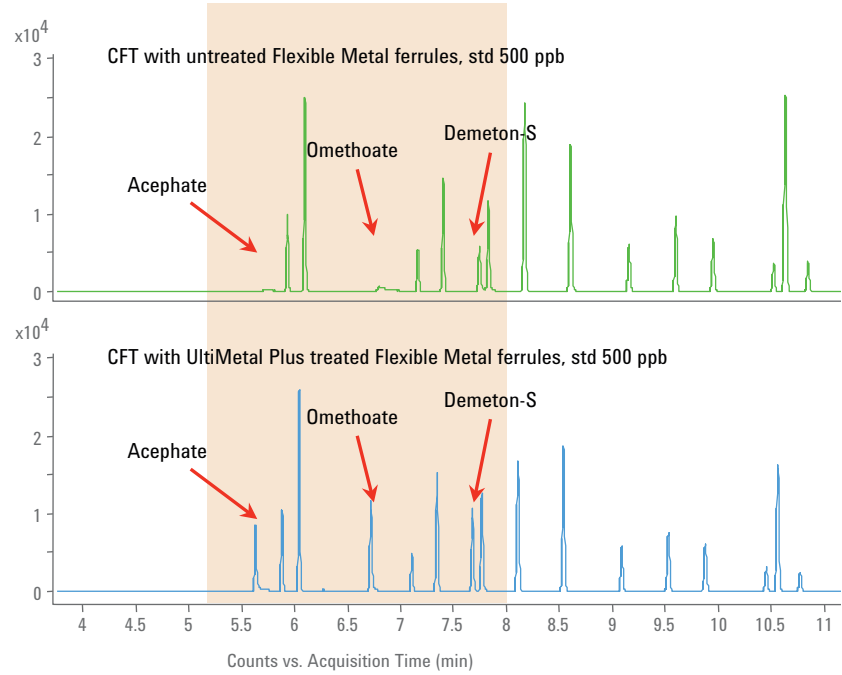
GC/FPD chromatogram of a 100 ng/mL matrix-matched organophosphorus pesticide standard with analyte protectant analyzed on an Agilent J&W DB-35ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm capillary GC column (p/n 122-3832UI).



### Optimal recovery of active analytes

At trace levels, even the exposed surface of metal ferrules can be a source of activity—causing loss of active, labile analytes. Agilent UltiMetal Plus Flexible Metal with proprietary UltiMetal Plus treatment reduce active analyte loss, increase response, and improve your results.

Note: we recommend post-column backflush to increase the productivity of heavy-matrix samples, common in food safety labs.



UltiMetal Plus Flexible Metal ferrules, which connect the column to the backflush module, reduce the loss of analyte response for pesticides acephate, omethoate, and demeton-S.



UltiMetal Plus  
Flexible Metal ferrules



## Environmental:

# MEET PRESENT AND FUTURE DEMANDS FOR SPEED, ACCURACY, AND PRODUCTIVITY

Whether you're quantifying pesticide residues in water, analyzing contaminants in soil, or measuring atmospheric impurities—environmental analysis must be done more reliably, more efficiently, and with higher quality data than ever before. Agilent's Inert Flow Path solutions let you address these challenges head-on. An inert flow path helps you achieve excellent peak shapes for problematic compounds—plus reliable quantitation at low levels. So you can get the right answers the *first* time.

## US EPA Method 8270 test for active semi-volatiles

US EPA Method 8270 is widely used to determine the concentration of semi-volatile organic compounds in environmental matrices—many of which contain a mix of acids, bases, and neutrals. This test is challenging, due to interactions between analytes and flow path surfaces. In this evaluation, the test mix included difficult compounds in the 8270 method.

### Test conditions:

<b>Column 1:</b>	Agilent J&W DB-UI 8270D Ultra Inert, 20 m × 0.18 mm, 0.36 µm (p/n 121-9723)
<b>Column 2:</b>	1.0 m × 0.15 mm id deactivated fused silica tubing (p/n 160-1625-10)
<b>Carrier:</b>	Helium, constant flow 1.58 mL/min set at 40 °C
<b>Oven:</b>	40 °C (2.5 min), 25 °C/min to 320 °C (4.8 min)
<b>Inlet:</b>	S/SL 1 µL pulsed splitless, 300 °C, 44 psi pulse to 1.4 min, purge flow 50 mL/min at 1.42 min, gas saver off
<b>Inlet liner:</b>	Agilent Ultra Inert single taper with wool (p/n 5190-2293) MSD, 325 °C transfer line, 300 °C source, 150 °C quad, 30-550 AMU range
<b>GC/MSD:</b>	Agilent 7890 Series GC/5975C Series GC/MSD
<b>Sampler:</b>	Agilent 7683B liquid sampler (5.0 µL syringe, p/n G4513-80206)
<b>Aux EPC:</b>	2 psi with 5 mL/min bleed during run
<b>Backflush:</b>	Post run 3.5 min at 75 psi aux EPC, 2 psi inlet pressure

### Flow path supplies:

<b>Vials:</b>	Amber silanized screw top vials (p/n 5183-2072)
<b>Vial caps:</b>	Blue screw caps (p/n 5185-5820)
<b>Vial inserts:</b>	250 µL Glass/polymer feet (p/n 5181-8872)
<b>Syringe:</b>	5 µL (p/n 5181-1273)
<b>Septum:</b>	Advanced Green (p/n 5183-4759)
<b>Inlet liner:</b>	Ultra Inert single taper (p/n 5190-3162)
<b>Gold seal:</b>	Ultra Inert gold seal with washer (p/n 5190-6144)
<b>Ferrules:</b>	0.4 mm id short, 85/15 Vespel/graphite (p/n 5181-3323)
<b>CTF fittings:</b>	Internal nut (p/n G2855-20530)
<b>CTF ferrules:</b>	UltiMetal Plus Flexible Metal ferrules, 0.25 mm id columns (p/n G3188-27501)
<b>Magnifier:</b>	20× Magnifier loop (p/n 430-1020)

Download the full version of this Application Note 5991-0250EN at [www.agilent.com/chem/inert](http://www.agilent.com/chem/inert)



Ensure the highest-quality gas—and clean, leak-free gas lines—with Agilent's high-capacity gas filter.

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



## US EPA Method 8270 semi-volatiles test

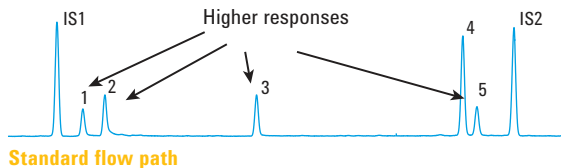
Ultra Inert liners with wool are perfect for high throughput analyses of environmental samples. The glass wool traps non-volatiles present in the samples, preventing residue build-up.

The Ultra Inert deactivation also gives the wool a highly inert surface so recovery of active analytes such as 2,4-DNP is not compromised.

Download the full version of this Application Note 5991-0250EN at [www.agilent.com/chem/inert](http://www.agilent.com/chem/inert)

## Semi-volatiles suitability

### Agilent Inert Flow Path



### Standard flow path



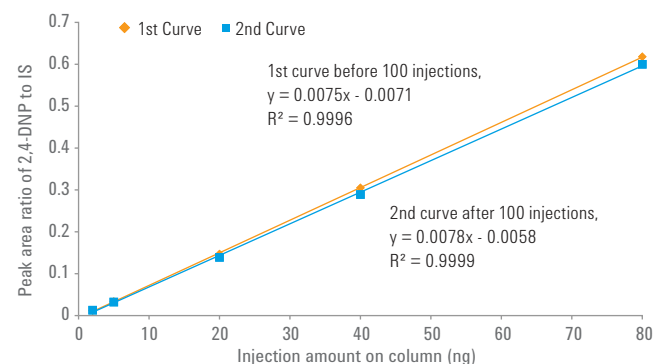
Agilent Inert Flow Path provides high responses for sensitive acidic compounds such as semi-volatile 2,4 DNP. A standard flow path, similarly configured, shows activity and adsorption.

### Peak identification:

1. 2,4-Dinitrophenol
2. 4-Nitrophenol
3. 4,6-Dinitro-2-methylphenol
4. 4-Aminobiphenyl
5. Pentachlorophenol
- IS1. Acenaphthene-d10
- IS2. Phenanthrene-d10

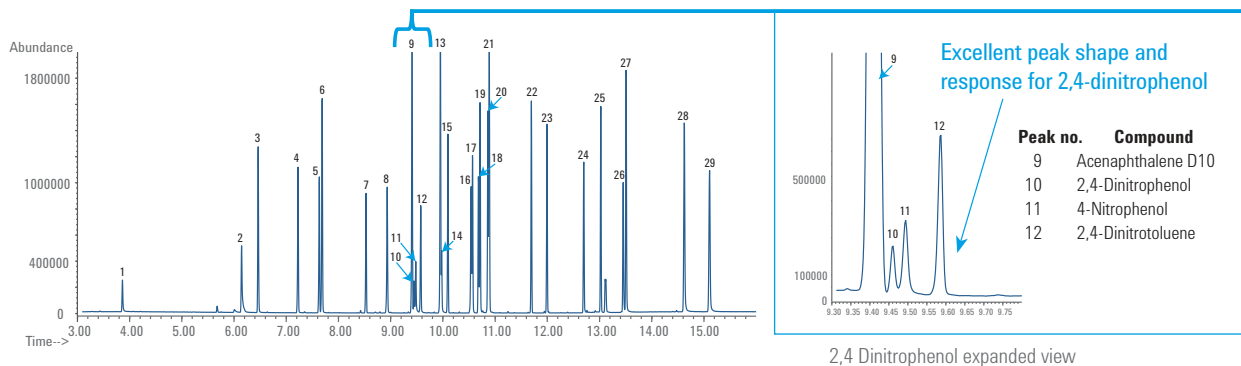
## Excellent linearity of calibration curves and reliable durability for active semi-volatile compound

### 2,4-DNP calibration curves before and after 100 injections using Agilent Inert Flow Path components



Improved deactivation provides excellent linearity over an extensive calibration range (2 to 80 ng) for active compounds such as 2,4-dinitrophenol.

## 10 ng/μL semi-volatile checkout standard on an Agilent J&W DB-UI 8270D Ultra Inert, 20 m x 0.18 mm, 0.36 μm capillary GC column using an Ultra Inert liner with wool



- |                                |                              |                                 |                       |                        |                            |
|--------------------------------|------------------------------|---------------------------------|-----------------------|------------------------|----------------------------|
| 1. N-Nitrosodimethylamine      | 6. Naphthalene               | 11. 4-Nitrophenol               | 16. Simazine          | 21. Phenanthrene-d10   | 26. 3,3'-Dichlorobenzidine |
| 2. Aniline                     | 7. Hexachlorocyclopentadiene | 12. 2,4-Dinitrotoluene          | 17. Atrazine          | 22. Aldrin             | 27. Chrysene d-12          |
| 3. 1,4-Dichlorobenzene-d4      | 8. Mevinphos                 | 13. Fluorene                    | 18. Pentachlorophenol | 23. Heptachlor epoxide | 28. Benzo[b]fluoranthene   |
| 4. Isophorone                  | 9. Acenaphthene-d10          | 14. 4,6-Dinitro-2-methyl phenol | 19. Terbufos          | 24. Endrin             | 29. Perylene-d12           |
| 5. 1,3-Dimethyl-2-nitrobenzene | 10. 2,4-Dinitrophenol        | 15. Trifluralin                 | 20. Chlorothalonil    | 25. 4,4'-DDT           |                            |

Example chromatogram of a 29-component mix on an Agilent J&W DB-UI 8270D Ultra Inert, 20 m x 0.18 mm, 0.36 μm capillary GC column (p/n 121-9723).

## Optimized Volatile Organic Compound Analysis using Agilent's VOC Application Solution

In many regions of the world, the primary method for VOC analysis of drinking water is based on US EPA Method 524.2 and 8260B. The Agilent 5977B GC/MS has a very successful legacy of implementing these methods that goes back many years. Requirements for lower levels of detection drive this analysis, and so new and improved technologies play a significant part in its success.

The Agilent VOC solution optimizes instrument setup and conditions by incorporating Ultra Inert technology, important components, updated software, and method setup tips—to get the highest level of sensitivity, robustness, and stability while meeting all of the required method quality control elements.

For comprehensive VOC method and instrument configuration details, see Application Note *Volatile Organic Compound Analysis Using Purge and Trap* (5991-0029EN).

### Test conditions:

#### GC Acquisition GC/MSD Column:

Agilent 7890/5977B  
Agilent J&W DB-624 Ultra Inert,  
20 m x 0.18 mm, 1.0 µm (p/n 121-1324UI)

#### Oven:

35 °C for 4 min, 15 °C/min  
to 240 °C for 0.3333 min (run time 18 min)

#### Front split/splitless inlet:

He, split 150:1 at 200 °C

#### Septum purge flow:

5 mL/min

#### Thermal aux 2 (MSD transferline)

##### Temperature:

250 °C

##### Initial temperature:

35 °C

##### Constant flow:

0.7 mL/min

#### MS Acquisition:

##### Solvent delay:

1.05 min

##### Scan:

Low mass 35.0, high mass 260.0

##### MS zones:

MS Source 250 °C, MS Quad 200 °C

#### Sampler conditions:

Atomx

##### Method:

Method 524\_5 mL—VOCARB

##### Sample volume:

5.0 mL

##### Sweep sample time:

0.25 min

##### Sweep sample flow:

100 mL/min

##### Spurge vessel heater/temperature:

OFF/20 °C

##### Purge:

11.0 min, 40 mL/min, 20 °C

##### Dry purge time:

2.00 min

##### Dry purge flow:

100 mL/min

##### Desorb preheat temperature:

245 °C

##### Desorb time/flow:

4.00 min/100 mL per min

##### Desorb temperature:

250 °C

### Agilent VOC Kit (p/n G7022A)

Description	Part No.
6 mm Drawout Plate (Inert) for Agilent 5973 and Agilent 5975 MSD Inert EI Ion Source	G2589-20045
DB-624UI Column (20 m x 0.18 mm, 1.0 µm film)	121-1324UI
Straight-through 1.0 mm Ultra Inert straight 1 mm id liner	5190-4047
Tekmar VOCARB 3000 (#K) Trap	5188-8820
Agilent GC/MS VOC Application Kit Disk with application note, kit instructions, instrument methods, and applicable technical notes	G7022-60001



**Confidently detect compounds at trace levels and comply with global regulations for environmental monitoring**

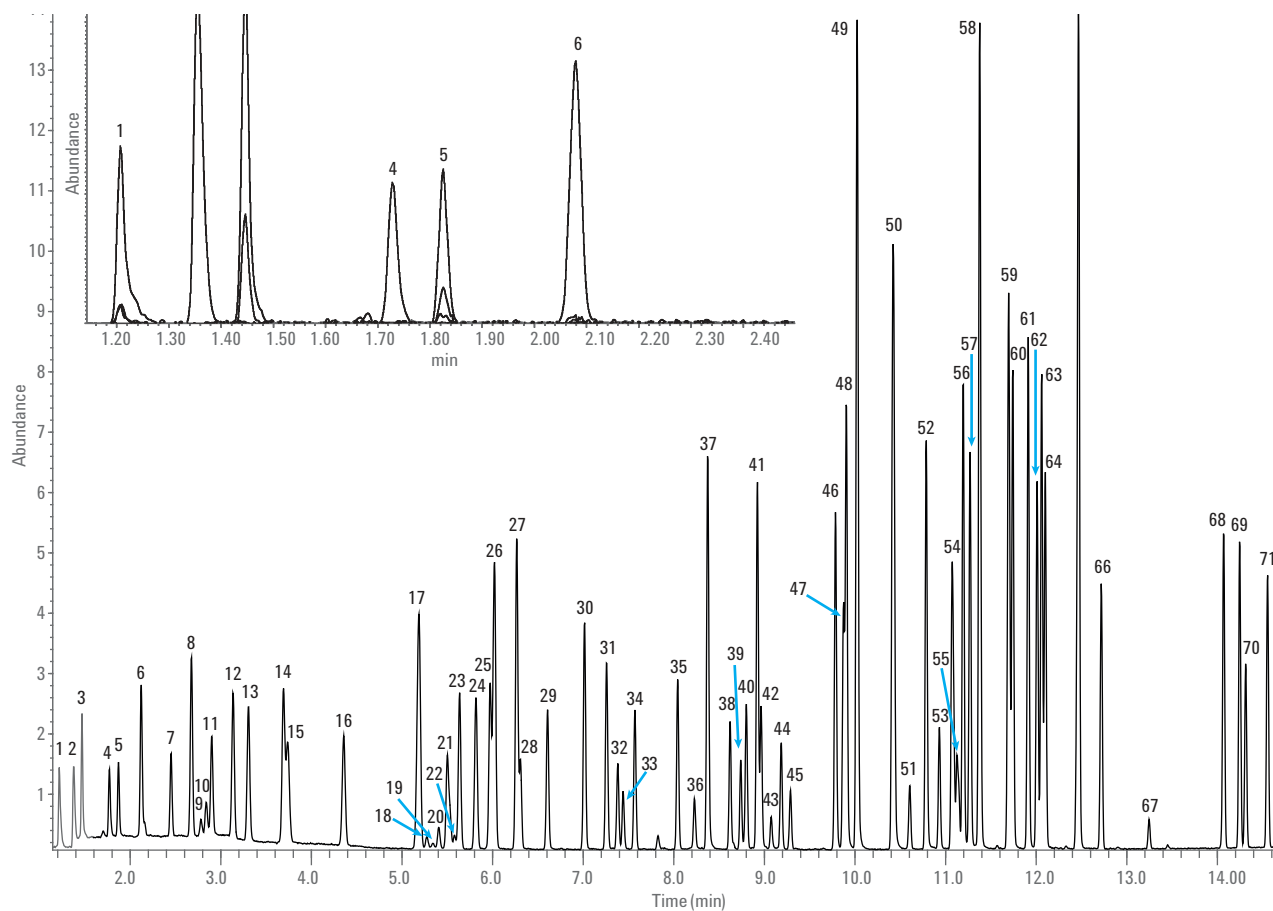
Specifically created for environmental labs, this brochure demonstrates how Agilent J&W GC columns deliver low column bleed and the lowest column activity for sensitive, trace-level applications.

Get more information on Agilent's leading products for environmental analysis: DB-CLP1, DB-CLP2, DB-UI8270D, DB-624UI, Select PAH and more. Also highlighted are Agilent Ultra Inert GC liners—great companion tools with Agilent J&W Ultra Inert GC columns for trace-level analysis.

View the GC column environmental portfolio brochure (5990-5873EN) at [www.agilent.com/chem/envportfolio](http://www.agilent.com/chem/envportfolio)



## EPA method 524.2 Volatiles ICAL standard



Total Ion Chromatogram of Method 524.2 ICAL standard. Inset: extracted ion chromatogram of the gases from left to right: dichlorodifluoromethane (85 m/z), chloromethane (50 m/z), vinyl chloride (62 m/z), bromomethane (94 m/z), chloroethane (64 m/z), and trichlorofluoromethane (101 m/z) in order of their elution. For a detailed list of compound identification, see Optimized Volatile Organic Compound Analysis Using Agilent VOC Application Solution (5991-0896EN).

## Forensic/Toxicology:

# MAKE SURE YOUR DATA CAN WITHSTAND THE TOUGHEST SCRUTINY

In the forensic and toxicology fields, both lives and professions depend on the accuracy of your results—whether you're screening for drugs, checking a crime scene for explosive residue, or monitoring chemotherapy doses. To complicate matters, the continuing emergence of new drugs and toxins can increase your list of target compounds by hundreds every year.

An inert flow path, obtained with Agilent's Ultra Inert and UltiMetal solutions, delivers the selectivity and sensitivity you need for excellent peak shapes and consistent recovery of low-level analytes. The Inert Flow Path Split/Splitless inlet with treated seal and weldments prevents adsorption or degradation, while Ultra Inert liners with wool capture non-volatiles, and help transfer active analytes of interest onto the Ultra Inert column. UltiMetal Plus Flexible Metal ferrules and purged capillary flow union allow backflushing of high boilers in heavy-matrix samples.

Hint: For GC-compatible compounds, you can significantly reduce sample preparation and clean up by using GC/MS in SIM-Scan mode with electron impact ionization (EI).

## Basic drugs of abuse

Heavy-matrix samples (such as plasma or urine extracts) deteriorate the performance of the analytical column and detector, shortening column life and increasing the need for MS source maintenance. This problem can be overcome by using inlet liners with wool to protect the entire GC/MS system; however, if these liners are poorly deactivated, they can cause adsorption or decomposition of target analytes.

Agilent's Ultra Inert deactivation process significantly improves the efficacy and robustness of glass wool deactivation, allowing liners with glass wool to be used for the first time in GC/MS analysis of basic drugs of abuse. For this test, flow path inertness was evaluated using Agilent's Forensic/Toxicology analyzer checkout standards, including 28 popular and difficult basic drugs.

### Test conditions:

<b>Column:</b>	Agilent J&W DB-5MS Ultra Inert, 15 m x 0.25 mm, 0.25 $\mu$ m (p/n 122-5512UI)
<b>Sample:</b>	5 ppm checkout mixture for GC/MS Forensic/Toxicology analyzer (p/n 5190-0471)
<b>Injection:</b>	1 $\mu$ L splitless at 280 °C (hold 0.75 min)
<b>Oven:</b>	100 °C (0.5 min) to 325 °C at 20 °C/min and hold 2.5 min.
<b>Detector:</b>	Agilent 5975C MSD

### Flow path supplies:

<b>Vials:</b>	Amber screw cap (p/n 5182-0716)
<b>Vial caps:</b>	Blue screw cap (p/n 5182-0717)
<b>Vial inserts:</b>	150 $\mu$ L Glass with polymer feet (p/n 5183-2088)
<b>Septum:</b>	Advanced Green non-stick 11 mm (p/n 5183-4759)
<b>Ferrules:</b>	0.4 mm id, 85/15 vespel/graphite (p/n 5181-3323)
<b>Capillary Flow Technology:</b>	Ultimate Union (p/n G3182-61580), internal nut (p/n G2855-20530); UltiMetal Flexible Metal ferrule, (p/n G3188-27501)
<b>Inlet seal:</b>	Ultra Inert gold seal with washer (p/n 5190-6144)
<b>Inlet liners:</b>	Agilent Ultra Inert deactivated single taper splitless liner with wool (p/n 5190-2293)





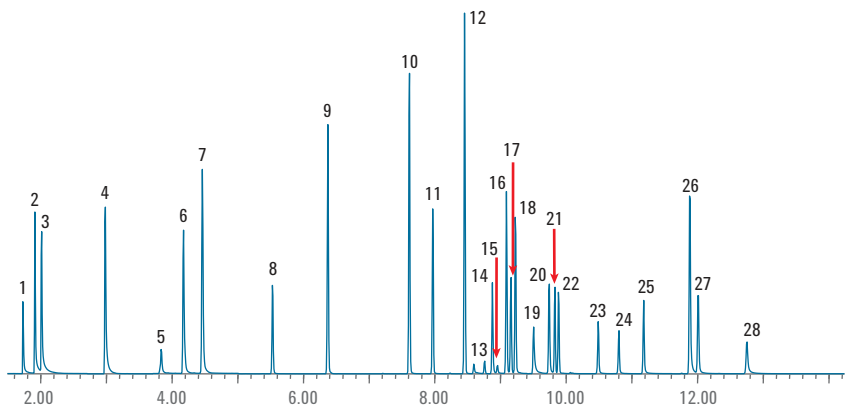
## Drugs of abuse test

In this example, we performed a GC/MS analysis on a complex forensic/toxicology standard at 5 ng on-column using an Agilent Ultra Inert single taper splitless liner with wool. Peak shapes and responses demonstrate a high degree of inertness in both the liner and wool, preventing analyte adsorption and decomposition.

## Toxicology suitability

### Peak identification:

1. Amphetamine	8. Meperidine	15. Lorazepam	22. Heroin
2. Phentermine	9. Phencyclidine	16. Diazepam	23. Nitrazepam
3. Methamphetamine	10. Methadone	17. Hydrocodone	24. Clonazepam
4. Nicotine	11. Cocaine	18. Tetrahydrocannabinol	25. Alprazolam
5. MDA	12. SKF-525a	19. Oxycodone	26. Verapamil
6. MDMA	13. Oxazepam	20. Temazepam	27. Strychnine
7. MDEA	14. Codeine	21. Flunitrazepam	28. Trazodone



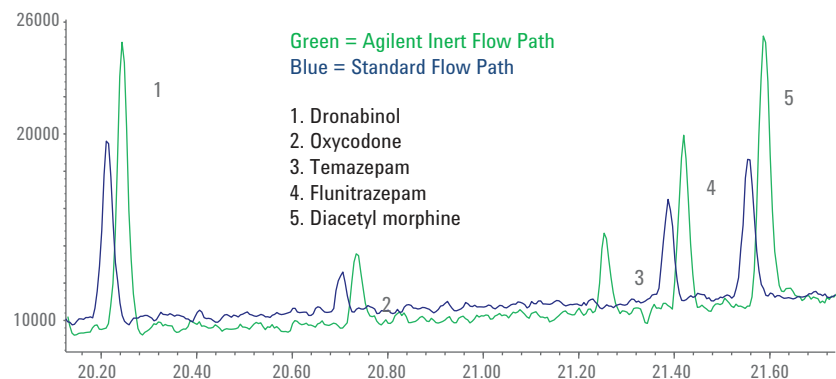
Complex and challenging forensic/toxicology standard at 5 ng on-column using an Agilent GC/MS with Inert Flow Path.



## Better peak shape and higher response for active drugs

Here, inlet and consumable inertness during MSD were compared using the same HP-5MS Ultra Inert column. Always install inert components to reduce inlet activity and avoid significant signal loss—or total analyte adsorption.

## Drugs of abuse overlay 500 ppb complete flow path comparison



An UltiMetal Plus Inert Flow Path Split/Splitless inlet, Ultra Inert liner with wool, and Ultra Inert gold seal prevent the adsorption and loss of active analytes.

<b>Column:</b>	Agilent J&W HP-5ms UI 30 m x 0.25 mm, 0.25 $\mu$ m (p/n 19091S-433UI)
<b>Oven:</b>	100 °C 4 min hold, 10°/min to 280 °C, 6 °/min to 300 °C (4.67 min hold)
<b>Carrier:</b>	Helium 52.7 cm/s (2 mL/min) set at 100 °C, EPC-Constant Flow
<b>Inlet:</b>	Pulsed Splitless 35 PSI pulse until 0.73 min, 0.75 min purge 50 mL/min, gas saver 20, mL/min at 2 min
<b>Inlet liner:</b>	Ultra Inert with wool/Standard single taper liner with wool (p/n 5190-3165)
<b>Gold Seal:</b>	UI gold seal/Standard gold seal (p/n 5190-6144)
<b>Detector:</b>	MSD Scan mode 40 to 450 m/z, 230 °C source temp, 150 °C Quad temp, 310 °C transfer line

# AGILENT INERT FLOW PATH APPLICATION NOTE LIBRARY

## Food

*Ultra Inert (UI) Wool Liner Performance Using an Agilent J&W DB-35ms UI Column (5990-8235EN)*

*Analysis of Pesticides in Food by GC/MS/MS using the Ultra Inert Liners with Wool (5990-7706EN)*

*Organophosphorus Residues in Olive Oil by GC/FPD with Agilent J&W DB-35ms Ultra Inert (5990-7722EN)*

*Organophosphorus Pesticides in Apple Matrix by GC/MS/FPD Using an Agilent J&W DB-35ms Ultra Inert GC Column (5990-7165EN)*

*Agilent J&W DB-624 Ultra Inert Capillary Column's Utility in Screening Distilled Spirits by GC/MS Static Headspace (5991-0659EN)*

*Analysis of Trace Amounts of Volatile Organic Acids using the New Agilent J&W DB-624UI Ultra Inert GC column (5991-0845EN)*

*Screen Beer by GC/MS Static Headspace with the Agilent J&W DB-624 Ultra Inert Capillary Column (5991-1136EN)*

*Endrin and DDT Breakdown Using an Inert Flow Path Equipped Agilent 7890A GC (5991-1862EN)*

*Improved GC/MS Analysis of Tomato Pesticides with Agilent Deactivated Fused Silica Tubing (5991-5974EN)*

*Analysis of Distilled Spirits using Agilent J&W DB-WAX Ultra Inert Capillary GC Column (5991-6638EN)*

*Analysis of Glycols in Toothpaste using Agilent J&W DB-WAX Ultra Inert Capillary GC Column (5991-6637EN)*

*Analysis of Lavender Essential Oil by Agilent J&W DB-WAX Ultra Inert Capillary GC Columns (5991-6635EN)*

## Environmental

*Evaluation of the Ultra Inert Liner Deactivation for Active Compounds Analysis by GC (5990-7380EN)*

*Analysis of Semivolatiles by GC/FID using the Ultra Inert Inlet Liners with Wool (5990-7381EN)*

*Sub µg/L Level Analysis of Chlorinated Pesticide and Herbicide Analysis in Water by GC/µECD using Agilent J&W DB-35ms UI GC Column (5990-9735EN)*

*Plaguicides Using Agilent J&W HP-1ms Ultra Inert and Agilent J&W DB-1301 Capillary GC Columns (5990-4352EN)*

*Determination of Haloacetic Acids in Water by GC/µECD Using Agilent J&W DB-35ms Ultra Inert and DB-XLB Columns (5990-8765EN)*

*PBDE Analysis Using an Agilent J&W DB-5ms Ultra Inert GC Column (5990-5651EN)*

*PAH Analysis Using an Agilent J&W DB-5ms Ultra Inert Capillary GC Column (5990-5652EN)*

*Volatile Organic Compound [VOC] Analysis via Purge and Trap: Success with VOC Analysis using the Agilent 5975C Mass Selective Detector [MSD] (5991-0029EN)*

*Semivolatile Analysis with Specially Designed Agilent J&W DB-UI 8270D Columns (5991-0250EN)*

*Analysis of Pesticides by GC/QQQ Using Agilent Ultra Inert Flow Path Solutions (5991-1860EN)*

*Quantitative and Repeatability Analysis of Trace Level Pesticides in Plantation Food by GC/MS/MS (5990-9317EN)*

*Optimized Method Development of Large Volume Injection for GC/MS/MS of Food Pesticides (5991-1196EN)*

*Better Pesticide Analysis with Agilent Ultimate Plus Tubing (5991-5404EN)*

*Analyze Semivolatiles with Agilent Ultimate Plus Tubing (5991-5441EN)*

## Forensic/Toxicology

*Agilent Inert Flow Path Enhancements Impact on Drugs of Abuse Testing (5991-1859EN)*

*Analysis of Drugs of Abuse by GC/MS using the Ultra Inert Inlet Liners with Wool (5990-7596EN)*

*Separation of Oxymorphone and Oxycodone Hydroxyl-imino Tri-methy Silyl Derivatives Using an Agilent Fast Toxicology Analyzer and an Agilent J&W DB-35ms Ultra Inert Capillary GC Column (5990-6577EN)*

*Fast and Comprehensive Doping Agent Screening in Urine by Triple Quadrupole GC/MS (5990-7234EN)*

*Analyze Drugs of Abuse with Agilent Ultimate Plus Tubing (5991-5303EN)*

## More Ultra Inert application and technical notes

*DB-624 UI Ultra Inert GC Capillary Column for Challenging Industrial Applications (5991-5197EN)*

*Analysis of Carcinogenic Tobacco-Specific Nitrosamines in Mainstream Cigarette Smoke Using an Agilent J&W DB-35ms Ultra Inert GC Column (5990-8849EN)*

*Addressing Concerns in QC Tests for GC Columns (5990-9961EN)*

*Residual Solvent Analysis with Specifically Designed and Tested Agilent J&W DB-Select 624UI <467> Columns (5991-0616EN)*

*Agilent UltiMetal Plus Deactivation for Inertness of Metal Surfaces in the Sample Flow Path (5991-1861EN)*

*Agilent Ultimate Plus deactivated fused silica tubing (5991-5142EN)*

*Evaluation of Agilent Ultimate Plus Fused Silica Tubing for Active Compounds (5991-5914EN)*



## PHARMACEUTICAL APPLICATION

Residual solvent testing of process intermediates, excipients, and formulated drug products provides an important safeguard to assure the safety of pharmaceutical products worldwide. Changes to United States Pharmacopeia (USP) General Chapter <467> Residual Solvents are closely aligned with International Committee on Harmonization (ICH) Q3C Guidelines for Residual Solvents. Both groups have taken a toxicity/dosage-based approach to assess the level of risk that the presence of these solvents or organic volatile impurities (OVIs) present to the public. The analysis is typically conducted by static headspace with FID detection using a thick film G43-based stationary phase.

**Agilent J&W DB-Select 624UI <467> GC columns are designed specifically for United States Pharmacopoeia Method <467>.**

For more details consult Application Note *Residual Solvent Analysis with a Specifically Designed and Tested Agilent J&W DB-Select 624UI for USP <467> Column (5991-0616EN)*, and *Lower Detection Limits and Quantify Trace-Level Organic Volatile Impurities (5991-0552EN)*.

To get your copy of these applications go to  
[www.agilent.com/chem/library](http://www.agilent.com/chem/library) and search by publication number.



# ENSURE A LIFETIME OF PEAK INSTRUMENT PERFORMANCE AND MAXIMUM PRODUCTIVITY

As the world's chromatography leader, Agilent is uniquely positioned to offer industry-leading GC supplies and sample preparation products. All supplies are engineered or selected by our experienced design teams, manufactured to our demanding specifications, and tested under a variety of strict conditions.

### Inert flow path accessory kit

This all-in-one kit contains the components you need to upgrade your existing split/splitless inlet to an Inert Flow Path Split/Splitless inlet. Includes inlet weldment, shell weldment, Ultra Inert gold seal, and Ultra Inert splitless liner.

### MS analyzed vial kits stop unknown peaks from impacting your results

Agilent vial kits eliminate the possibility of vials being the source of contamination, giving you greater confidence in your results and eliminating the need to pre-test or rerun samples because of unexpected peaks. All kits include a Certificate of Analysis that details critical physical dimensions, as well as product representative and fully traceable LC/MS and GC/MS signal traces.

### Maintain a leak-free seal even after hundreds of injections

Get a tight connection—without expensive upgrades or adaptors with Agilent Self Tightening Column Nuts. This innovative spring-driven piston continuously presses against the short graphite/polyimide ferrule—maintaining a leak-free seal. It is especially well suited for oxygen sensitive detectors, such as mass spec and ECD. Tight column connections provide reduced background noise, reliable results, and save time, due to not needing to retighten fittings.



### Premium non-stick septa

Other suppliers coat their septa with foreign substances such as powder to prevent sticking. However, this coating can accumulate inside split vent lines and interfere with your analysis of active analytes.

Agilent non-stick septa are plasma coated, which eliminates chemical bleed and contamination from foreign substances, and they are delivered in blister packs, to keep each septum clean and ready for use. So your GC system will maintain its integrity, stay cleaner, and require less maintenance. (Always remember to change septa often to prevent leakage.)



### Blue Line autosampler syringes

Designed to support the higher productivity features of the 7693 autosampler, Agilent Blue Line syringes come in a wide range of volumes and configurations to suit your application.



## Bulk GC supplies

Ideal for high usage labs, our bulk supplies provide the same quality and consistency of Agilent GC supplies in convenient and economical packaging:

- Ultra Inert liners in 100 packs
- Ultra Inert gold seals in 10 and 50 packs
- Non-Stick septa in 400 packs

## Sample preparation:

### Reliable and accurate results with fewer repeated samples

Only Agilent offers a complete line of sample preparation products for any type of GC and GC/MS analysis across the full spectrum of instrumentation.

Agilent sample preparation products help you move easily from sample to successful analytical result:

- Extend instrument performance with Captiva filtration
- Reduce costs and save time with Bond Elut QuEChERS Kits
- Achieve lower detection limits with Bond Elut silica and polymeric SPE products

To learn more about Agilent Sample Preparation solutions, please visit [www.agilent.com/chem/sampleprep](http://www.agilent.com/chem/sampleprep)

## Expert service and support

For confident analysis and a productive GC workflow, you need the expert support of a true service partner. Agilent has a wealth of experience in maximizing the uptime, accuracy and efficiency of GC instruments. Agilent CrossLab provides specialized support for all major instrument brands and our dedicated service experts help you tackle your most challenging GC applications.



Stock up now, and always ensure your most inert flow path, visit [www.agilent.com/chem/GCsupplies](http://www.agilent.com/chem/GCsupplies)

# ORDERING INFORMATION

## Agilent Ultra Inert liners and touchless packaging:

High inertness, productivity, and reproducibility

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk	Bulk 100/pk*
<b>Splitless Inlet Liners</b>						
Single taper, Ultra Inert liner	900	4	5190-2292	5190-3162	5190-3166	5190-3170
Single taper, Ultra Inert liner with glass wool	900	4	5190-2293	5190-3163	5190-3167	5190-3171
Double Taper, Ultra Inert liner	800	4	5190-3983	5190-4007		
Dimpled 200 µL 2 mm id			5190-2297			
Volatiles Ultra Inert liner	250	2	5190-6168			
<b>Split Inlet Liners</b>						
Straight, Ultra Inert liner with glass wool	990	4	5190-2294	5190-3164	5190-3168	5190-3172
Low pressure drop, Ultra Inert liner with glass wool	870	4	5190-2295	5190-3165	5190-3169	5190-3173
<b>SPME, Headspace Injection</b>						
Straight, 0.75 mm id	35	0.75	5190-4048			
Straight, 1 mm id	65	1	5190-4047			
Straight, 2 mm id	250	1	5190-6168			

Each liner ships with a pre-installed, non-stick O-ring

\* Bulk 100/pk are not in touchless packaging

## Agilent Ultra Inert Direct Connect liners:

Maximum recovery and minimal decomposition

Description	5/pk
DC dual taper with hole	5190-7011
DC wool, top hole	5190-7012
DC wool, with bottom hole	5190-7020

Each liners ships with a pre-installed, non-stick O-ring

## Agilent Ultra Inert gold seals and washers:

A smooth, leak-free surface for active analytes

Description	1/pk	10/pk	50/pk
Inert gold seal and washer	5190-6144	5190-6145	5190-6149



## Agilent UltiMetal Plus Flexible Metal ferrules:

No column breakage, no leaks, no activity

Description	Part No.
UltiMetal Plus Flexible Metal ferrule with 0.4 mm id for fused silica tubing 0.1-0.25 µm id 10/pk	G3188-27501
UltiMetal Plus Flexible Metal ferrule with 0.5 mm id for fused silica tubing 0.32 µm id 10/pk	G3188-27502
UltiMetal Plus Flexible Metal ferrule with 0.8 mm id for fused silica tubing 0.45-0.53 µm id	G3188-27503
UltiMetal Plus Flexible Metal ferrule with no hole to plug Capillary Flow Technology fittings	G3188-27504
UltiMetal Plus Flexible Metal ferrule for use with 0.25 mm and 0.32 mm UltiMetal column tubing	G3188-27505
UltiMetal Plus Flexible Metal ferrule for use with 0.53 mm UltiMetal column tubing	G3188-27506

## Agilent Inert Flow Path upgrade kit:

The components you need, all in one place

Description	Part No.
<b>Complete Inert Flow Path upgrade kit</b>	<b>G3970A</b>
Cap Inlet Shell Weldment Assembly, UltiMetal Plus treated	G3452-60570
Insert weldment, UltiMetal-Plus treated	G3452-60586
Ultra Inert gold seal	5190-6144
Ultra Inert single taper splitless liner with wool	5190-2293
UltiMetal ferrules for 0.25 mm id fused silica columns	G3188-27501
Self Tightening Column Nut, Inlet/Detector Nut	5190-6194
Column nut, MSD	5190-5233

## Additional flow path supplies:

Complete your inert flow path

Description	Part No.
Purged Ultimate Union Assembly, inert	G3186B
3-Way Splitter with Makeup Gas, inert	G3183B
Ultimate Union Kit, UltiMetal Plus deactivated	G3182-61580
Compact Deans Switch Manifold Assembly, UltiMetal Plus treated	G2855B
Compact Splitter with Makeup Gas, inert	G3180B



## Four easy ways to create your Inert Flow Path:

1. Request **Option 114** when you purchase the new Agilent 7890B GC system
2. Upgrade with our new split/splitless inlet accessory: **p/n G3453B** entire inlet including EPC Pneumatics
3. Order our new inert flow path accessory kit (**p/n G3970A**), which contains the essential weldment parts and consumables
4. Purchase individual Inert Flow Path components separately, as needed



Learn how to optimize your flow path for inertness so you can achieve the ultra low detection levels today's demanding analyses require.

Order your **FREE poster** today at [www.agilent.com/chem/uiorder](http://www.agilent.com/chem/uiorder)

## Agilent J&W Ultra Inert GC columns and Ultimate Plus fused silica tubing:

Engineered for excellent column inertness and longevity

### Ultra Inert 1ms GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
<b>DB-1ms Ultra Inert</b>			
0.18	20	0.18	121-0122UI
0.25	15	0.25	122-5512UI
	30	0.25	122-0132UI
	60	0.25	122-0162UI
0.32	15	0.25	123-0112UI
	30	0.25	123-0132UI
<b>HP-1ms Ultra Inert</b>			
0.18	20	0.18	19091S-677UI
0.25	15	0.25	19091S-931UI
	30	0.25	19091S-933UI
		0.50	19091S-633UI
		1.00	19091S-733UI
0.32	15	0.25	19091S-911UI
	25	0.52	19091S-612UI
	30	0.25	19091S-913UI
		1.00	19091S-713UI

### Ultra Inert 5ms GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
<b>DB-5ms Ultra Inert</b>			
0.18	20	0.18	121-5522UI
		0.36	121-5523UI
0.25	15	0.25	122-5512UI
		1.00	122-5513UI
	25	0.25	122-5522UI
	30	0.25	122-5532UI
		0.50	122-5536UI
		1.00	122-5533UI
0.32	50	0.25	122-5552UI
	60	0.25	122-5562UI
		1.00	122-5563UI
	30	0.25	123-5532UI
		0.50	123-5536UI
		1.00	123-5533UI
0.32	60	1.00	123-5563UI

### Ultra Inert 5ms GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
<b>HP-5ms Ultra Inert</b>			
0.18	20	0.18	19091S-577UI
0.25	15	0.25	19091S-431UI
	30	0.25	19091S-433UI
		0.50	19091S-133UI
		1.00	19091S-233UI
0.32	60	0.25	19091S-436UI
	30	0.25	19091S-413UI
		1.00	19091S-213UI

### Ultra Inert 35ms GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
<b>DB-35ms Ultra Inert</b>			
0.18	20	0.18	121-3822UI
0.25	15	0.25	122-3812UI
0.25	30	0.25	122-3832UI
0.32	15	0.25	123-3812UI
0.32	30	0.25	123-3832UI

### Ultra Inert DB-624 GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
<b>DB-624 Ultra Inert</b>			
0.18	20	1.0	121-1324UI
0.25	30	1.4	122-1334UI
	60	1.4	122-1364UI
0.32	30	1.8	123-1334UI
	60	1.8	123-1364UI
0.53	30	3.0	125-1334UI
	75	3.0	125-1374UI
<b>DB-Select 624 Ultra Inert for &lt;467&gt; GC columns</b>			
0.25	30	1.4	122-0334UI
	60	1.4	122-0364UI
0.32	30	1.8	123-0334UI
	60	1.8	123-0364UI
0.53	30	3.0	125-0334UI



### Ultra Inert DB-WAX GC columns

ID (mm)	Length (m)	Film (μm)	Part No.
<b>DB-WAX Ultra Inert</b>			
0.18	20	0.18	121-7022UI
		0.30	121-7023UI
0.20	25	0.20	128-7022UI
0.25	15	0.25	122-7012UI
	30	0.25	122-7032UI
		0.50	122-7033UI
		0.25	122-7062UI
	60	0.50	122-7063UI
0.32	15	0.25	123-7012UI
	30	0.25	123-7032UI
		0.50	123-7033UI
	60	0.25	123-7062UI
		0.50	123-7063UI
0.53	15	1.00	125-7012UI
	30	0.25	125-7031UI
		1.00	125-7032UI
		0.50	125-7037UI
	60	1.00	125-7062UI

### Ultimate Plus deactivated fused silica tubing

ID (mm)	Length (m)	Part No.
0.12	6	CP801206
0.15	5	CP801505
0.15	10	CP801510
0.18	5	CP801805
0.18	6	CP801806
0.18	10	CP801810
0.25	5	CP802505
0.25	10	CP802510
0.25	30	CP802530
0.32	5	CP803205
0.32	10	CP803210
0.32	30	CP803230
0.53	5	CP805305
0.53	6	CP805306
0.53	10	CP805310
0.53	30	CP805330

### Ultra Inert DB 8270D GC columns

ID (mm)	Length (m)	Film (μm)	Part No.
<b>DB-UI 8270D Ultra Inert</b>			
0.18	20	0.36	121-9723
0.25	30	0.25	122-9732
0.25	30	0.50	122-9736

## Ultra Inert liners for other manufacturer's instruments in your lab



Agilent liners perform seamlessly with a variety of instruments, regardless of make or model.

Below is a sample of the Ultra Inert liner part numbers for specific instrument vendors. For the complete listing, please see the Agilent GC Supplies Selection Guide

(publication 5990-9065EN) or visit [www.agilent.com/chem/SelectCrossLab](http://www.agilent.com/chem/SelectCrossLab)


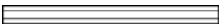
### Agilent UI liners for Bruker/Varian

Liners for 1177 Split/Splitless Injector Ports

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (μL)	Unit	Agilent Ultra Inert Deactivation	Similar to OEM Part No.
<b>Split Liners</b>								
	Straight-through	4.0	6.3	78.5	1000	5/pk	8004-0156	RT207732145 SG092007
	With frit, gooseneck	4.0	6.3	78.5	1000	5/pk	8004-0158	RT210462145

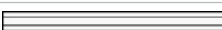

### Agilent UI liners for PerkinElmer

Liners for AutoSystem, AutoSystem XL, Clarus Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (μL)	Unit	Agilent Ultra Inert Deactivation	Similar to OEM Part No.
<b>Splitless Liners</b>								
	Straight	2.0	6.2	92.1	300	5/pk	8003-0162	N6101372
<b>Split Liners</b>								
	Straight-through	4.0	6.2	92.1	1150	5/pk	8003-0151	



### Agilent UI liners for Shimadzu

Liners for 2014 Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (μL)	Unit	Agilent Ultra Inert Deactivation	Similar to OEM Part No.
<b>Splitless Liners</b>								
	Straight-through	2.6	5.0	95	500	5/pk	8001-0151	220-94767-00
<b>Split Liners</b>								
	Straight-through	3.4	5.0	95	860	5/pk	8001-0153	

### Agilent UI liners for Thermo Scientific

Liners for Trace, Focus Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (μL)	Unit	Agilent Ultra Inert Deactivation	Similar to OEM Part No.
<b>Splitless Liners</b>								
	Single taper	3.0	8.0	105		5/pk	8002-0154	45350032
<b>Split Liners</b>								
	Straight	5.0	8.0	105	2000	5/pk	8002-0151	45350030

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. Agilent CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the Agilent CrossLab products may have slightly different designs as compared to the OEM counterparts.

## An Agilent Inert Flow Path is a *must* for active analytes

The increasing need for high-sensitivity analyses of harmful substances is placing new demands on GC methods. Agilent is committed to improving your ability to analyze difficult, active compounds—even at trace levels—by giving you the tools required to ensure a highly inert flow path.

- **Agilent Ultra Inert inlet liners** deliver a robust, reproducible, and reliable inert flow path—with or without glass wool
- **Agilent J&W Ultra Inert GC columns and Ultimate Plus deactivated fused silica tubing** push the industry standards for consistent column inertness and exceptionally low bleed for ms UI columns
- **Agilent GC and GC/MS instruments** bring together all the elements for trace-level analysis, dramatically improving MS resolution, spectral integrity, and detection limits
- **Agilent-engineered supplies** prevent adsorption or degradation to help you maintain the integrity of your results
- **Ultra Inert gold seals and Inert Flow Path Split/Splitless inlet** reduce analyte loss due to contact with hot metal surfaces
- **UltiMetal Plus Flexible Metal ferrules with Capillary Flow Technology devices** allow you to improve your results using techniques such as backflushing, heart-cutting, flow splitting, and Deans switching—*without* the fear of leaks or activity



## For more information

Learn more about Agilent Inert Flow Path solutions, visit **[www.agilent.com/chem/inert](http://www.agilent.com/chem/inert)**

Buy online:

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

To download additional application examples, visit **[www.agilent.com/chem](http://www.agilent.com/chem)**

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Printed in the USA February 16, 2016  
5990-8532EN

Part Number for internal purposes only: 5190-6146



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