Agilent Ultra Inert GC 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 has never been more critical

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

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.

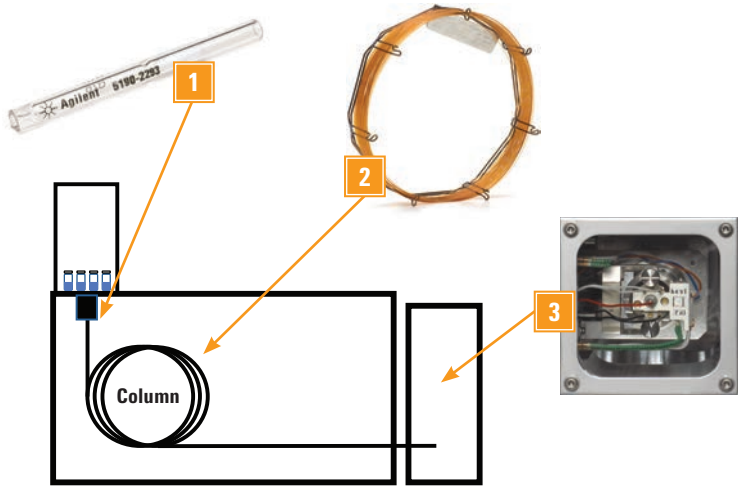
An integrated approach to inertness:

The Agilent advantage

Flow path inertness is vital to your analysis; it is also on the cutting edge of GC. Agilent is leading the way with **Ultra Inert liners**, **Ultra Inert columns**, and **detectors** that, together, create the most inert flow path – giving you the utmost confidence in your results.

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

Agilent Ultra Inert components work together to deliver industry-leading results



1. **Agilent Ultra Inert liner:** With or without deactivated glass wool, Agilent 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. **Agilent J&W Ultra Inert GC column:** 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.

3. **Inert MS source:** Precision design, material selection, surface deactivation, and rigorous testing ensure unmatched sensitivity when analytes reach the mass spectrometer.

Inside: everything you need to build your inert flow path

To learn more about creating the most inert flow path, visit **www.agilent.com/chem/ultrainert**

Agilent Ultra Inert Inlet liners:

Ensure a reliably inert flow path – *even when containing wool*

Whether you are analyzing difficult, active environmental samples or screening for drugs of abuse, our Ultra Inert Inlet liners help ensure an inert GC flow path for higher sensitivity, accuracy, and reproducibility, especially at trace levels.

For samples that contain active or labile compounds, labs typically use liners without wool to prevent degradation or loss of active analytes. However, with Agilent Ultra Inert deactivation, liners with wool are recommended for no loss of sensitivity. The benefits provided by wool, such as homogeneous sample mixing and vaporation, non-volatile residue trapping, and column and detector protection, are gained without compromising detection of active analytes. Plus Ultra Inert liners are more stable than liners with other deactiviations, as shown on the following page. More samples can be analyzed before inlet or column maintenance is required when using Ultra Inert liners with wool.

Certified performance:

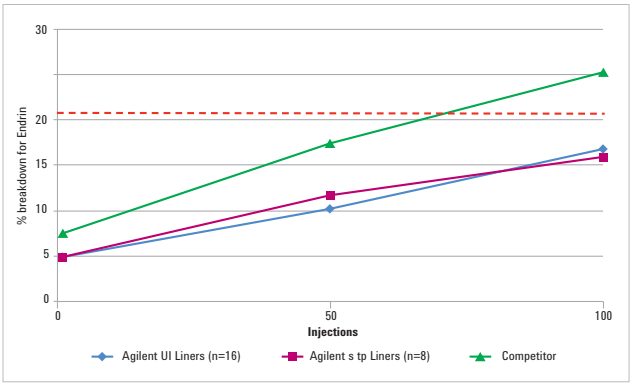
Each deactivation lot is certified to ensure efficient, consistent coverage using both acidic and basic probes at trace (2 ng) levels on-column. In addition, every liner is packaged with a Performance Certificate that you can peel and stick into your lab notebook for quick compliance reference.

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

Unequalled manufacturing and quality control deliver best-in-class liner deactivation performance

Agilent's proprietary manufacturing process produces Ultra Inert liners that are rigorously *tested* and *certified* to ensure exceptional batch-to-batch uniformity, low (to no) bleed or background contamination, and superior coverage – even with highly active compounds. This rigorous process includes:

- Lot testing to ensure reproducible deactivation coverage – and the stability of deactivation over time
- QC testing with probes specifically chosen to reveal activity
- A GC method that tests *liner* (not column or system) inertness
- The elimination of contamination – a common side effect of manufacturing and packaging



Agilent Ultra Inert Liners with wool are superior vs. the competition as shown in this Endrin breakdown comparison.

Touchless packaging – an Agilent exclusive – eliminates O-ring hassles

Ultra Inert Inlet liners are delivered in pharmaceutical-grade PTEG tubing approved by GC/MS extraction testing. But what *really* sets Agilent's packaging apart is a **pre-installed O-ring** that has been pre-cleaned, conditioned, and non-stick plasma treated. This unique touchless packaging allows you to quickly and easily install the new liner without searching for and installing the O-ring – saving time and improving productivity, without the risk of contamination from touching.

View the Touchless Packaging demonstration video at **www.agilent.com/chem/touchless**

To learn more about creating the most inert flow path, visit **www.agilent.com/chem/ultrainert**

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

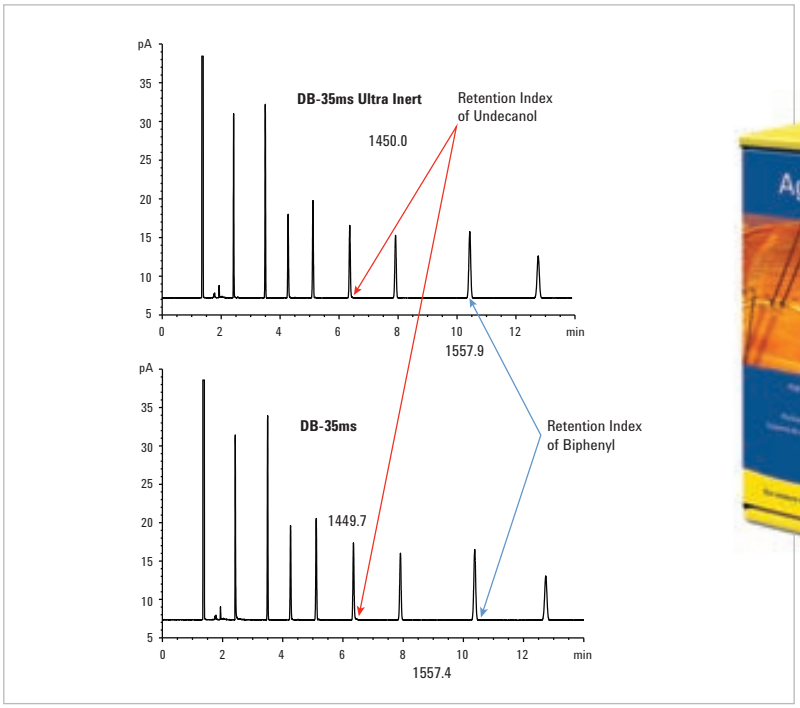
Agilent's leading-edge manufacturing processes – combined with our optimization of chemistries and manufacturing design advancements – improve the inertness of our Ultra Inert columns while maintaining the selectivity of their non-ultra inert counterparts.

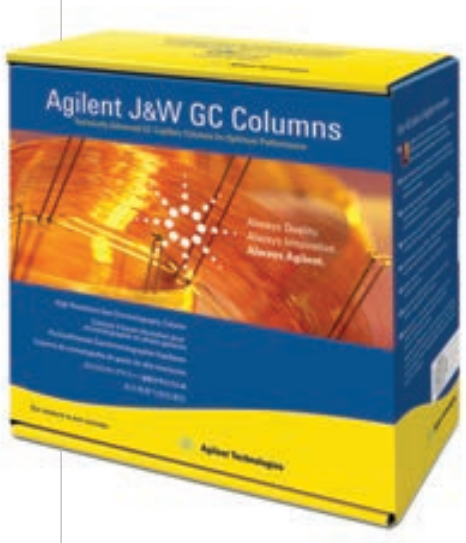
In addition, every Agilent J&W Ultra Inert GC column is tested using probes with varying chemical characteristics to avoid subtle polymer selectivity variations. This ensures that Agilent J&W Ultra Inert GC columns have the same selectivity as Agilent MS columns – eliminating the need for method revalidation, 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 **Agilent's 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
2. n-Undecane
3. 2,6-Dimethylphenol
4. 2,6-Dimethylaniline
5. n-Dodecane
6. Naphthalene
7. 1-Decanol
8. n-Tridecane
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	Trimeththyl 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-methylphos-phonate	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

View the Ultra Inert DB-8270D test chromatogram at **www.agilent.com/chem/library** and search for 5991-0250EN.

To learn more about creating the most inert flow path, visit **www.agilent.com/chem/ultrainert**

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.

Agilent's industry-leading GC/MSD instruments 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 mass spectrometer portfolio includes **GC/MSD, GC ion trap MS, GC triple quadrupole MS,** and **GC/Q-TOF MS**.

The Agilent 5975C Series GC/MSD combines innovative hardware and software features to optimize performance from injection to final report – and to take your LODs and LOQs to an all-time low.

Agilent 5975C GC/MSD

Optimized performance from injection to final report

The Agilent 5975C inert MSD lets you spend *more time* running your analysis and *less time* maintaining your system. It brings together these essential elements for trace-level analysis:

- **Advanced capabilities:** a solid inert ion source, quartz quadrupole analyzer, and high signal-to-noise Triple-Axis Detector dramatically improve MS resolution, spectral integrity, and detection limits
- **A thermally controlled quadrupole** yields more stable calibration without being subject to ambient temperature
- **Powerful Deconvolution Reporting Software** for fast, confident identification and quantification
- **Higher throughput:** comprehensive automation, faster separations, and shorter detection cycles enable you to process more samples in less time
- **Maximum uptime:** real-world engineering and system intelligence features ensure easier upkeep, predictive support, enhanced self-maintenance and powerful remote diagnostics

Agilent 7890A GC

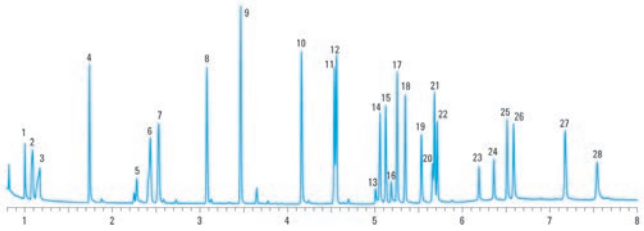
Advanced separation capabilities, powerful productivity features, and real-time self-monitoring intelligence

For more than 40 years, Agilent GC instruments have produced reliable results by controlling as many variables as possible. Our 7890A GC continues this tradition of excellence with:

- **Industry-leading performance:** 5th-generation electronic pneumatics control and digital electronics raise the bar on retention time locking precision, making the 7890A Agilent's most dependable GC ever
- **Higher productivity:** Faster oven ramp up and cool down and advanced automation features let you get more done in less time – at the lowest cost per sample
- **Robust backflush techniques** increase column life, minimize detector maintenance, and reduce cycle times
- **Expanded chromatographic potential:** A flexible EPC design enables sophisticated hydrocarbon analyses, and an optional 3rd detector lets you run more types of analyses on a single GC
- **Easier operation:** user-friendly software facilitates method setup and minimizes training time, while time-saving design features simplify routine maintenance

The Agilent 7890A Gas Chromatograph brings important separation capabilities and productivity features to the industry-leading Agilent GC platform.

5 ng test mix: Agilent J&W DB-35ms Ultra Inert Fast Toxicology Analyzer



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

NPD chromatogram of underivatized drugs of abuse 5 ng/component on an Agilent J&W DB-35ms Ultra Inert column fast screening conditions.

The above example shows the separation of 28 underivatized drugs of abuse on an Agilent J&W DB-35ms Ultra Inert column with a nominal on-column loading of 5 ng per component. 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.

To learn more about creating the most inert flow path, visit **www.agilent.com/chem/ultrainert**

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 Ultra 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.

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 analyzed how an inert flow path can minimize peak tailing and decrease sample adsorption.

Test conditions:

GC/MSD	Agilent 7890/5975C
Sampler	Agilent 7683B, 5.0 µL syringe
CFT device	Purged 2-way splitter Split Ratio 1:1 MSD:FPD
Inlet	1 µL splitless; 250 °C, Purge flow 60 mL/min at 0.25 min, gas saver on at 2 min 20 mL/min
Column	Agilent J&W DB-35ms Ultra Inert 30 m x 0.25 mm x 0.25 µm
Postrun backflush	7.5 min at 290 °C, Aux EPC pressure 54 psi during backflush, 2 psi inlet pressure during backflush
MSD	300 °C transfer line, 300 °C source, 150 °C quad
FPD	230 °C, Hydrogen 75 mL/min, Air 100 mL/min, Carrier + makeup (N_2) 60 mL/min

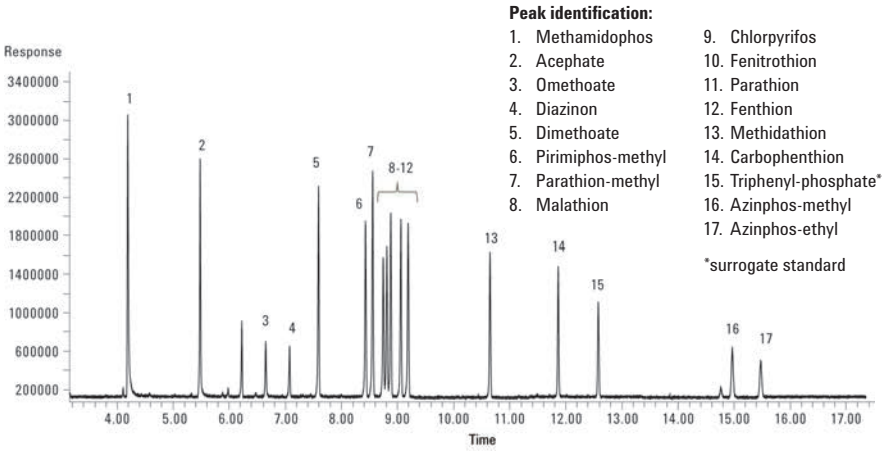
Flow path supplies:

Vials	Amber crimp top glass vials (P/N 5183-4496)
Vial caps	Crimp caps (P/N 5181-1210)
Vial inserts	250 µL glass/polymer feet (P/N 5181-8872)
Syringe	5 µL (P/N 5181-1273)
Septum	Advanced Green (P/N 5183-4759)
Inlet liner	Ultra Inert single taper splitless liner with wool (P/N 5190-2293)
Ferrules	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

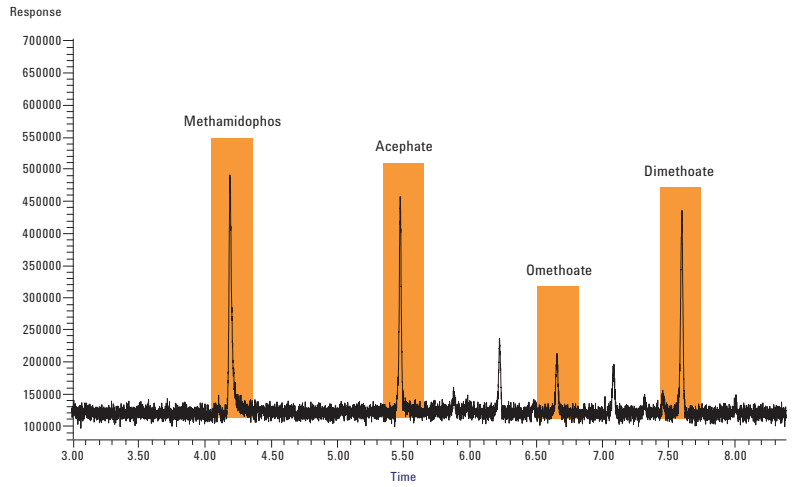


GC/FPD chromatogram of a 100 ng/mL matrix-matched organophosphorus pesticide standard with analyte protectant analyzed on an Agilent J&W DB-35ms Ultra Inert 30 m x 0.25 mm, 0.25 µm capillary GC column (Agilent Part No. 122-3832UI).

Outstanding peak shape and decreased sample adsorption on active sites

Enlarged section of the GC/FPD chromatogram showing a 15 ng/mL matrix-matched pesticide standard with analyte protectant, analyzed on an Agilent J&W DB-35ms Ultra Inert capillary column. Note the excellent peak shape at 15 ppb for the four polar OP pesticides with the Ultra Inert column.

Excellent peak shape for polar OP pesticides on Agilent J&W DB-35ms Ultra Inert column



GC/FPD chromatogram (enlarged section) of a 15 ng/mL matrix-matched pesticide standard with analyte protectant, analyzed on an Agilent J&W DB-35ms Ultra Inert capillary column.

Download the full version of this Application Note 5990-7722EN at **www.agilent.com/chem/ultrainert**

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 Ultra 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:

Column 1:	Agilent J&W DB-UI 8270D, 20 m × 0.18 mm, 0.36 µm (P/N 121-9723)
Column 2:	1.0 m × 0.15 mm id deactivated fused silica tubing (P/N 160-1625-10)
Carrier:	Helium, constant flow 1.58 mL/min set at 40 °C
Oven:	40 °C (2.5 min), 25 °C/min to 320 °C (4.8 min)
Inlet:	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
Inlet liner:	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
GC/MSD:	Agilent 7890 Series GC/5975C Series GC/MSD
Sampler:	Agilent 7683B liquid sampler (5.0 µL syringe P/N G4513-80206)
Aux EPC:	2 psi with 5 mL/min bleed during run
Backflush:	Post run 3.5 min at 75 psi Aux EPC, 2 psi inlet pressure

Flow path supplies:

Vials	Amber silanized screw top vials (P/N 5183-2072)
Vial caps:	Blue screw caps (P/N 5185-5820)
Vial inserts:	250 µL glass/polymer feet (P/N 5181-8872)
Syringe:	5 µL (P/N 5181-1273)
Septum:	Advanced Green (P/N 5183-4759)
Inlet liner:	Ultra Inert single taper (P/N 5190-3162)
Gold seal:	Gold plated inlet seal with washer (10/pk, P/N 5190-2209)
Ferrules:	0.4 mm id short; 85/15 Vespel/graphite (P/N 5181-3323)
CTF fittings:	Internal nut (P/N G2855-20530)
CTF ferrules:	SilTite ferrules, 0.25 mm id (P/N 5188-5361)
Magnifier:	20× Magnifier loop (P/N 430-1020)

Download the full version of this Application Note 5991-0250EN at **www.agilent.com/chem/ultrainert**

US EPA Method 8270 semi-volatiles test

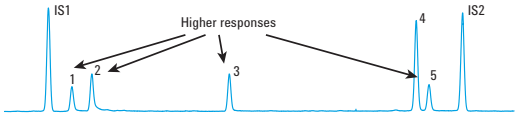
Ultra Inert liners with wool are perfect for high throughput analyses of environmental samples. The glass wool traps non-volatiles present in the samples preventing residue build-up.

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

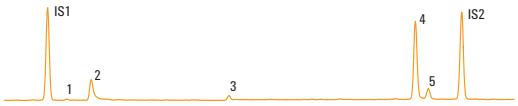
Download the full version of this Application Note 5990-7381EN at **www.agilent.com/chem/ultrainert**

Semi-volatiles suitability

Agilent Ultra Inert single taper liner with wool (Agilent Part No. 5190-2293)



Restek Siltek deactivated gooseneck liner with deactivated wool (cat. # 22406.213.5)



Peak identification:

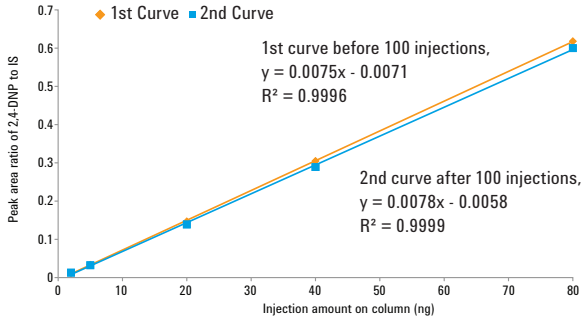
1. 2,4-Dinitrophenol
2. 4-Nitrophenol
3. 4,6-Dinitro-2-methylphenol
4. 4-Aminobiphenyl
5. Pentachlorophenol

IS1. Acenaphthene-d10
IS2. Phenanthrene-d10

Agilent Ultra Inert deactivated liners provide high responses for sensitive acidic compounds like semi-volatile 2,4-DNP – even with glass wool. Similarly configured Restek Siltek deactivated liners show activity and adsorption.

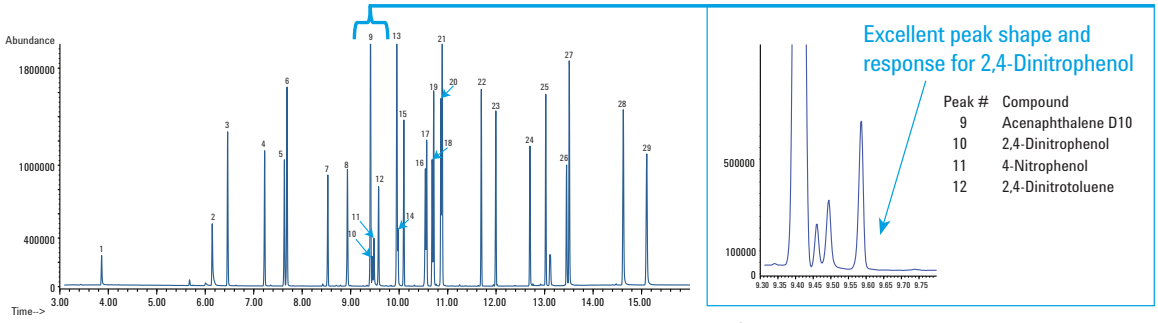
Excellent linearity of calibration curve and reliable durability for active semi-volatile compound

2,4-DNP calibration curves before and after 100 injections using Agilent Ultra Inert deactivated liner with wool



With improved deactivation, Ultra Inert liners – even with wool – provide excellent linearity over an extensive calibration range (2 to 80 ng) for active compounds like 2,4-Dinitrophenol.

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



2,4 Dinitrophenol expanded view

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

Example chromatogram of a 29-component mix on an Agilent J&W 20 m x 0.18 mm, 0.36 µm DB-UI 8270D capillary GC column (Agilent 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 5975C GC/MS has a very successful legacy of implementing these methods that goes back for many years. Requirements for lower levels of detection drive this analysis, therefore 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	Agilent 7890/5975C
Column	Agilent J&W 121-1324UI DB-624UI 20 m x .18 mm id, 1.0 µm
Oven	35 °C for 4 minutes, 15 °C/min to 240 °C for 0.3333 minutes (run time 18 minutes)
Front Split/Splitless Inlet	He, Split 150:1 @ 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 minutes
Sweep sample flow	100 mL/min
Sparge vessel heater/temperature	OFF/20 °C
Purge	11.0 minutes, 40 mL/min, 20 °C
Dry purge time	2.00 minutes
Dry purge flow	100 mL/min
Desorb preheat temperature	245 °C
Desorb time/flow	4.00 minutes/100 mL per minute
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 × 0.18 mm, 1.0 µm film)	121-1324UI
Straight-through 1.0 mm UI 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

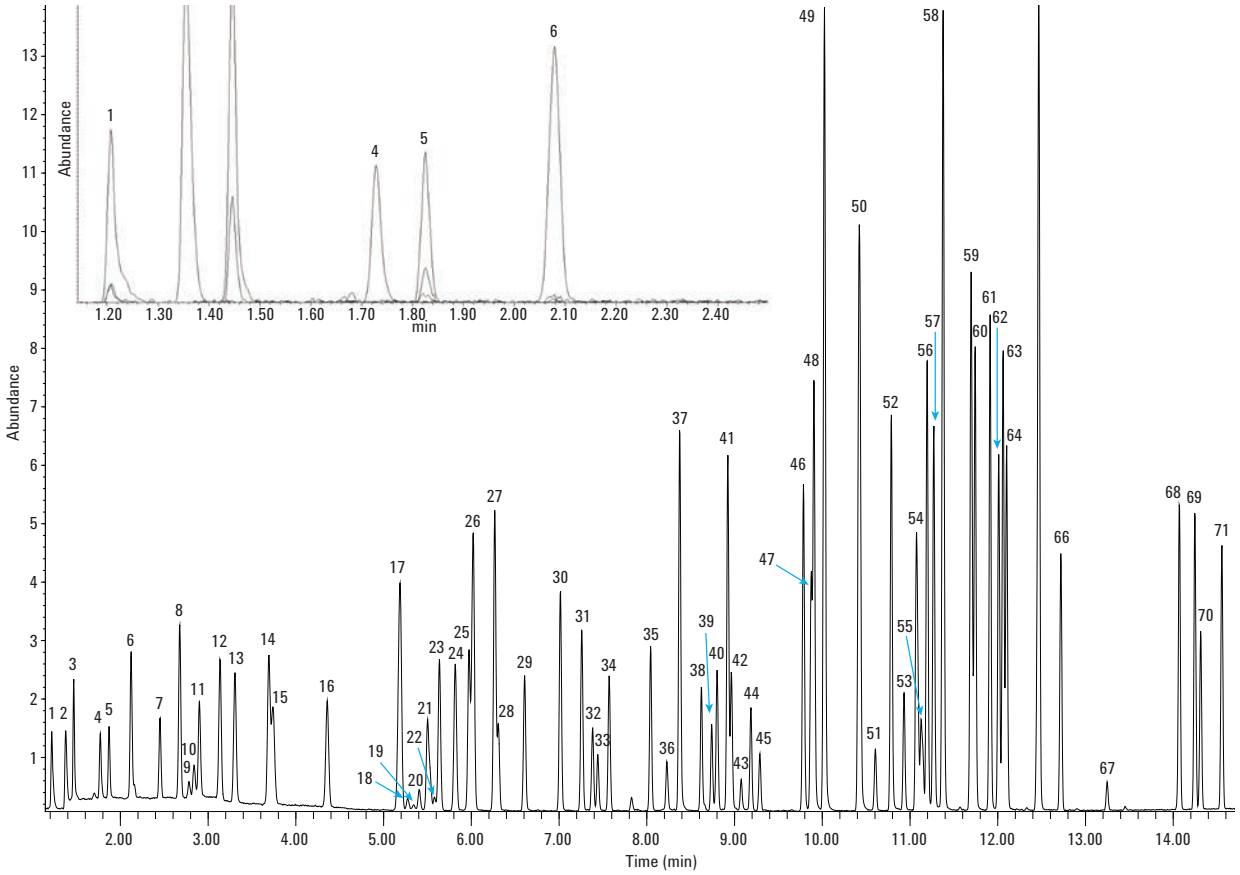
Confidently detect compounds at trace levels and comply with global regulations for environmental monitoring

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.

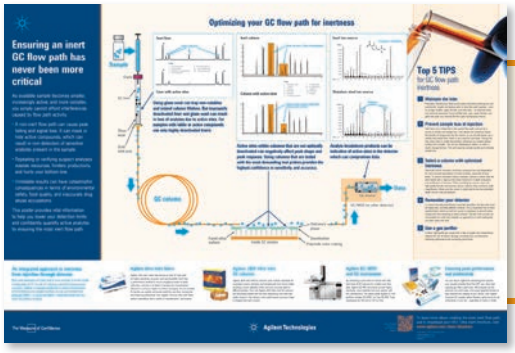
Get more information on Agilent's leading products for environmental analysis: DB-CLP1, DB-CLP2, DB-UI8270D, DB-624UI, Select PAH and more. Also highlighted are Agilent Ultra Inert GC liners – great companion tools with Agilent J&W Ultra Inert GC columns for trace-level analysis.

View this brochure at **www.agilent.com/chem/library**, and search for 5990-5873EN.

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, view Optimized Volatile Organic Compound Analysis Using Agilent VOC Application Solutions (5991-0896EN).



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

To learn more about creating the most inert flow path, visit **www.agilent.com/chem/ultrainert**

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.

An inert flow path, obtained with Agilent's Ultra Inert solutions, delivers the selectivity and sensitivity you need for excellent peak shapes and consistent recovery of low-level analytes. 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:

Column	Agilent J&W DB-5MS Ultra Inert, 15 m x 0.25 mm x 0.25 µm
Sample	5 ppm checkout mixture for GC/MS Forensic/Toxicology analyzer
Injection	1 µL splitless @ 280 °C (hold 0.75 min)
Oven	100 °C (0.5 min) to 325 °C at 20 °C/min and hold 2.5 min.
Detector	Agilent 5975C MSD

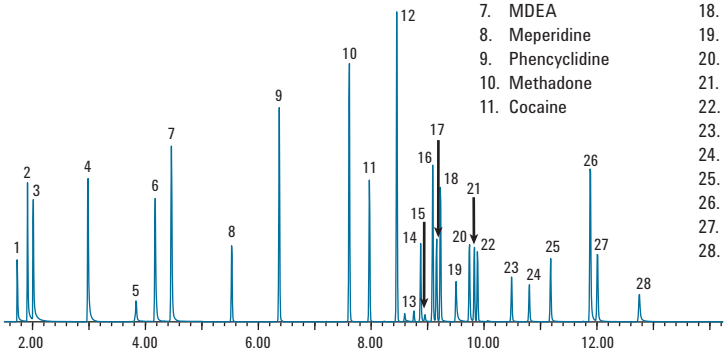
Flow path supplies:

Vials	Amber screw cap (P/N 5182-0716)
Vial caps	Blue screw cap (P/N 5182-0717)
Vial inserts	150 µL glass w/ polymer feet (P/N 5183-2088)
Septum	Advanced Green non-stick 11 mm (P/N 5183-4759)
Ferrules	0.4 mm id, 85/15 vespel/graphite (P/N 5181-3323)
O-rings	Non-stick liner O-ring (P/N 5188-5365)
Capillary Flow Technology	Purged ultimate union (P/N G3182-61580); internal nut (P/N G2855-20530); SilTite metal ferrules, 0.10-0.25 mm id (P/N 5188-5361)
Inlet seal	Gold plated inlet seal with washer (P/N 5188-5367)
Inlet liners	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

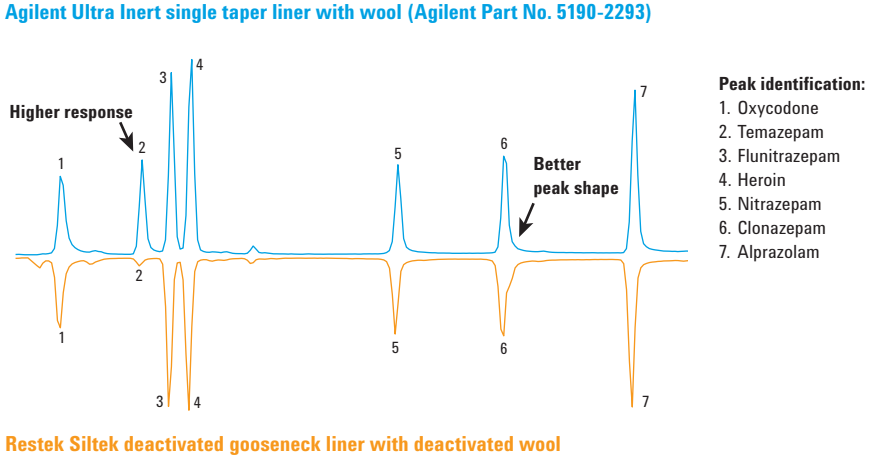


Complex and challenging Forensic/Toxicology standard at 5 ng on-column using an Agilent Ultra Inert single taper splitless liner with wool and GC/MS.

Better peak shape and higher response for active drugs

Here, seven drugs of abuse are shown on GC/MS SIM chromatograms with 5 ng of checkout standard on-column. These active basic compounds were not adsorbed by the Ultra Inert liner with wool.

Better peak shape and higher response for active drugs



GC/MS SIM chromatograms of drugs of abuse, shown on 5 ng of checkout standard on-column. Note that the Siltek liner shows either peak shape distortion or loss of response on several compounds.

Download the full version of this Application Note 5990-7596EN at **www.agilent.com/chem/ultrainert**

Agilent's global applications team has created the latest application notes to demonstrate the performance advantage of Agilent's Ultra Inert technology.

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 (5991-1136EN)

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

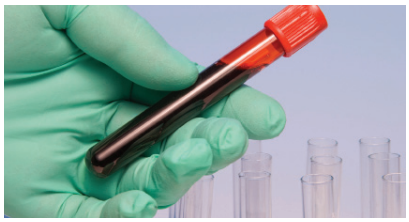
Environmental

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)

Drug Testing

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)

More Ultra Inert application and technical notes

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)

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** and search by publication number.

Agilent supplies and services:

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.

Consistent, high-quality gold seals

Unlike traditional machined seals, Agilent gold inlet seals are manufactured using a proprietary metal injection molding (MIM) process, which ensures a smooth, reproducible surface. This eliminates leaks from machining grooves that can result in column bleed, higher background noise, and lower system detection levels.

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 lot-specific and fully traceable LC/MS and GC/MS signal traces.

Premium non-stick septa

Other suppliers coat their septa with foreign substances like 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.)

Agilent vespel/graphite ferrules

Each ferrule, pre-conditioned for use in MS, is the ideal hardness for GC/MS applications – unlike graphite ferrules that can flake and contaminate your detector. (Be sure to replace all ferrules when installing a new column.)

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**

Agilent high-capacity gas filter:

The cleanest gas delivery for your most reliable analysis

Agilent's easy-to-use Gas Clean Filter System ensures the highest quality gas while keeping gas lines clean and leak free. Clean gases reduce the risk of column damage, sensitivity loss, and instrument downtime, while contaminants in gases can significantly affect your analysis. Sensitive indicators in our gas clean filter protect the instrument and the GC column while fast stabilization enhances productivity and reduces helium gas consumption.

Visit **www.agilent.com/chem/gasclean** for more strategies on clean gas delivery.

With service center operations in 65 countries, a global dispatch system, and call centers ready to assist with Agilent and non-Agilent instruments, Agilent provides the personalized support you need for greater efficiency, productivity, and confidence. And, be sure to protect your instuments' performance by supplementing your regular preventive maintenance efforts with an annual **Agilent Preventive Maintenance Service** – proven to increase instrument uptime, reduce repairs, and cut repair costs compared with other PM sources.

Learn more at **www.agilent.com/chem/services**

Stock up now, and always ensure your most inert flow path, visit **www.agilent.com/chem/GCsupplies**

Agilent Ultra Inert liners and touchless packaging:

High inertness, sensitivity, and reproducibility at your fingertips

Agilent Ultra Inert liners

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk	Bulk 100/pk*
Split Inlet Liners						
Straight, Ultra Inert liner with glass wool	990	4	5190-2294	5190-3164	5190-3168	5190-3172
Splitless Inlet Liners						
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
Universal Inlet Liners						
Low pressure drop, Ultra Inert liner with glass wool	870	4	5190-2295	5190-3165	5190-3169	5190-3173
Splitless						
Dimpled 200 uL 2 mm id			5190-2297			
SPME, Headspace Injection						
Straight, 0.75 mm id			5190-4048			
Straight, 1 mm id			5190-4047			

Each liner ships with a pre-installednon-stick O-ring

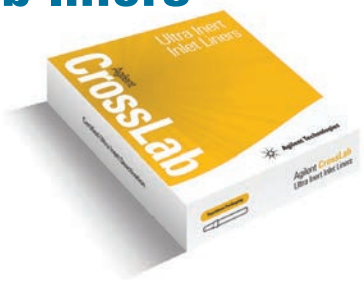
* Bulk 100/pk that are not in touchless packaging

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

Not a problem with Agilent CrossLab liners

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

Below is a sampling of the CrossLab Ultra Inert liner part numbers for specific instrument vendors. For the complete listing, please see the Agilent CrossLab Selection Guide (publication 5990-7773EN) or visit **www.agilent.com/chem/CrossLab**



Agilent CrossLab liners for Bruker*

Description	Part No.
CrossLab Ultra Inert liner, 4 mm id split, quartz wool, 5/pk, V-B	8004-0154
CrossLab Ultra Inert liner, 4 mm id split, gooseneck w/glass frit, 5/pk, V-B	8004-0158

** Formerly Varian GC instruments, now Bruker products*

Agilent CrossLab liners for Perkin Elmer

Description	Part No.
CrossLab Ultra Inert liner, 4 mm id, split, straight-through, 5/pk, PE	8003-0151
CrossLab Ultra Inert liner, 2 mm id splitless, straight-through, 5/pk, PE	8003-0152

Agilent CrossLab liners for Shimadzu

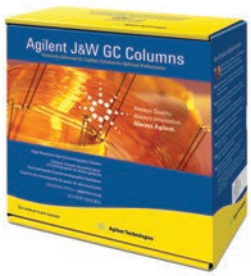
Description	Part No.
CrossLab Ultra Inert liner, splitless, straight-through, 5/pk, SHM	8001-0151
CrossLab Ultra Inert liner, 3.4 mm id, split, straight-through, 5/pk, SHM	8001-0153

Agilent CrossLab liners for Thermo Scientific

Description	Part No.
CrossLab Ultra Inert liner, 5 mm id split, straight-through, 5/pk, TMO	8002-0151
CrossLab Ultra Inert liner, 3 mm id splitless w/single taper, 5/pk, TMO	8002-0154

Agilent J&W Ultra Inert GC columns:

Engineered for low bleed, high thermal stability, and excellent inertness



Ultra Inert 5ms Capillary GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
DB-5ms Ultra Inert			
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
	50	0.25	122-5552UI
	60	0.25	122-5562UI
		1.00	122-5563UI
0.32	30	0.25	123-5532UI
		0.50	123-5536UI
		1.00	123-5533UI
	60	1.00	123-5563UI
HP-5ms Ultra Inert			
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
	60	0.25	19091S-436UI
0.32	30	0.25	19091S-413UI
		1.00	19091S-213UI

Ultra Inert DB-624 GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
DB-624 Ultra Inert			
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
DB-Select 624 Ultra Inert for <467> GC columns			
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 1ms Capillary GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
DB-1ms Ultra Inert			
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
HP-1ms Ultra Inert			
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
			19091S-713UI

Ultra Inert 35ms Capillary GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
DB-35ms Ultra Inert			
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-8270D GC columns

ID (mm)	Length (m)	Film (µm)	Part No.
DB-8270D Ultra Inert			
0.18	20	0.36	121-9723
0.25	30	0.25	122-9732
0.25	30	0.50	122-9736
Economical 6-Packs*			
0.18	20	0.36	621-9723
0.25	30	0.25	622-9732

*Available only in the U.S.

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An Ultra Inert GC 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** push the industry standards for consistent column inertness and exceptionally low column bleed
- **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 contamination and help you maintain the integrity of your results

To learn more about Agilent Ultra Inert Solutions, visit **www.agilent.com/chem/ultrainert**

To find your local Agilent Representative or Agilent Authorized Distributor, visit **www.agilent.com/chem/contactUS**

To download additional application examples, visit **www.agilent.com/chem**

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