

VARIAN, INC.

# 325-MS

TRIPLE QUADRUPOLE MASS SPECTROMETER



NOTICE: Varian, Inc. was acquired by Agilent Technologies in May 2010. This document is provided as a courtesy but is no longer kept current and thus will contain historical references to Varian. For more information, go to [www.agilent.com/chem](http://www.agilent.com/chem).

VARIAN, INC.

# Small Molecules – Big Challenges

Your samples are precious and turnaround times are critical to the success of your organization. A rugged instrument that provides day-in, day-out performance is a cornerstone to your workflow.

The Varian 325-MS is a robust, reliable option for many applications, including: environmental, food safety, clinical research and forensics. Designed to handle difficult small molecule analyses, it offers a choice of ionization modes and scanning techniques to ensure you obtain the information you are looking for.

The Varian 325-MS innovative technologies facilitate increased productivity in a high throughput environment.

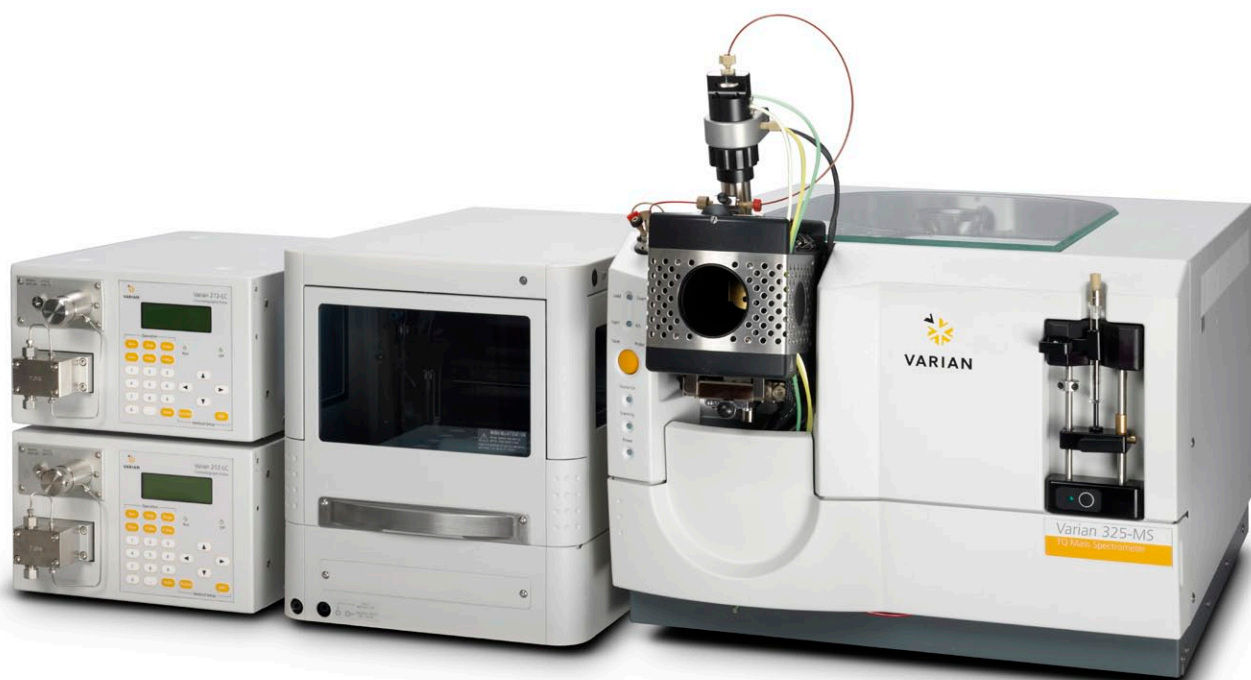
It features Varian's patent pending vESI™ ion source, a vortex API, and patent pending Gold Guard™ ion optics that jointly enhance sensitivity, ruggedness and throughput. The higher sensitivity means you can analyze more compounds in a single run. The more rugged design means less downtime for cleaning the source. That adds up to an extremely productive solution.

## The Varian 325-MS Provides:

- Accurate and reproducible results in difficult matrices
- Highest sensitivity among comparable triple quadrupole instruments
- Easy-to-use vESI interface
- Increased number of target analytes possible in multi-residue methods
- Reduced need for front-end maintenance

For more than 40 years, Varian has provided high quality instrumentation to the scientific community. We are committed to providing high performance and reliable analytical instruments. Our main objectives are to satisfy your current needs and future workflow requirements.

Tap into Varian's expertise throughout the lifetime of your instrument. Our network of expert engineers and application specialists are ready to assist you from system installation to method development, all geared towards improving your productivity and lowering your overall cost of ownership.



The standard configuration contains: 325-MS with vESI interface, 212-LC pumps and choice of autosampler (shown here with the 460-LC autosampler).

# Redefining Benchtop LC/MS/MS Performance

## Features of the 325-MS

### vESI™ Ion Source

The patent pending vESI ion source employs a novel vortex mechanism for improved heat transfer and greater desolvation efficiency of sample droplets. More ions and less matrix are transferred into the mass spectrometer, increasing sensitivity and reducing contamination.

### Gold Guard™ Ion Optics

The most robust ion optics system currently available, Gold Guard is engineered to withstand repeated analyses in complex matrices without a loss of signal, resulting in less maintenance and greater uptime.

### Skimmer Cone and Q0 Assemblies

The redesigned skimmer cone and ion guide increase ion sampling and transmission efficiency, resulting in improved gas conductance, lower ion guide pressure and increased signal.

### 180° Collision Cell

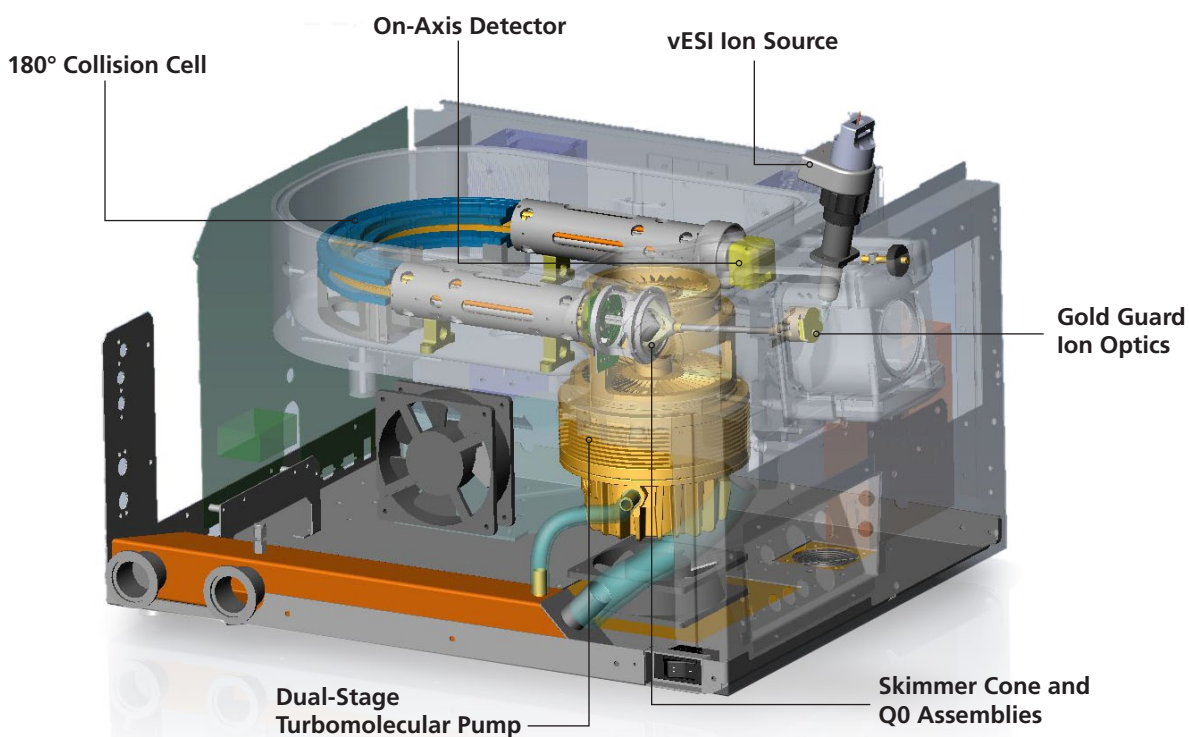
A 180° lens-less assembly with square geometry reduces nodding and increases ion transmission for enhanced sensitivity. A long collision cell path length provides for a wide CID energy range. The geometry of the assembly removes the line-of-sight path to the detector for neutrals, photons and meta-stable ions, reducing noise.

### On-Axis Detector

An on-axis detector (with respect to Q3) at  $\pm 5$  kV avoids poor sensitivity for negative ions and inherent noise in conversion dynode systems.

### Dual-Stage Turbomolecular Pump

The single pump design efficiently evacuates the source and analyzer regions for simplicity and lower cost. The Varian-designed and manufactured pump allows for high foreline tolerances and sustainable throughput with lower operating temperatures.



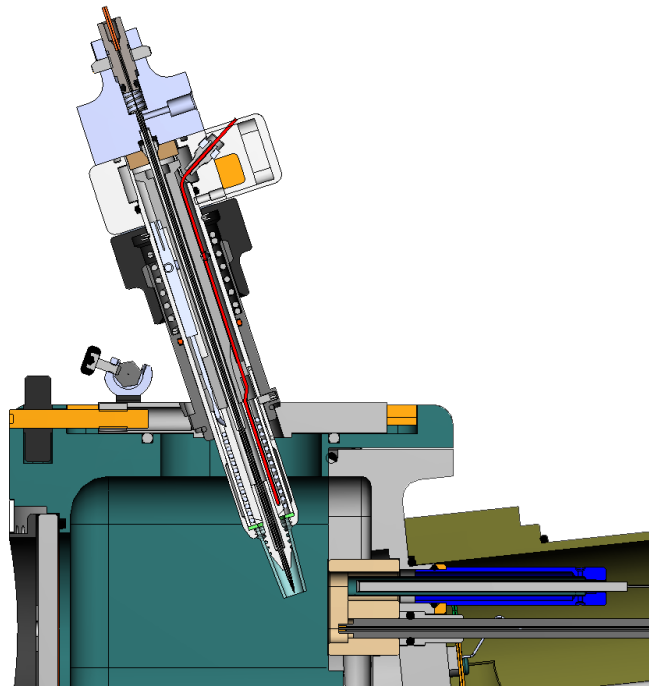
VARIAN, INC.

# vESI™ Ion Source: Increased Sensitivity

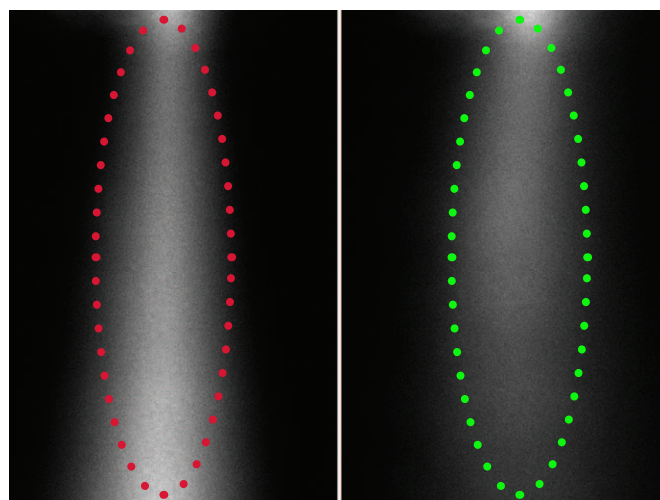
## Novel API Design Features a Highly Efficient Vortex Electro spray Ionization (vESI) Interface

The vESI source for the 325-MS system maximizes ionization efficiency by application of a heated auxiliary gas rotating with respect to the nebulizing gas flow; it is used to accelerate evaporation of the liquid droplets. The droplet stream, nebulizing gas and circular gas form a vortex, which enhances heat exchange between liquid droplets and hot gas. The increased ion yield in the gas phase equates to greater sensitivity (10x) and reduced noise.

The vESI source provides greater efficiency in ionization over a wide range of liquid flow rates and mobile phase combinations routinely used in food safety, forensic, toxicology, environmental and drug discovery applications.



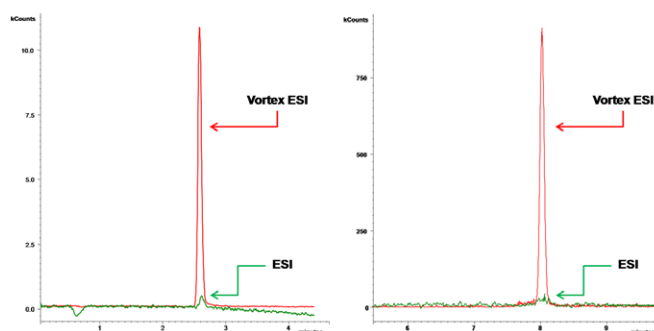
The vESI source delivers improved heat transfer and desolvation of sample droplets, over a wide range of mobile phase flow rates and compositions. More ions are transferred into the mass spectrometer, increasing sensitivity and reducing noise.



vESI gas off

vESI gas on

Photos of light scattered by liquid droplets within the vESI ion source with the vortex gas off (left) and on (right). With the vortex gas on, less light is scattered due to faster evaporation, demonstrating greater desolvation efficiency. This leads to increased sensitivity.



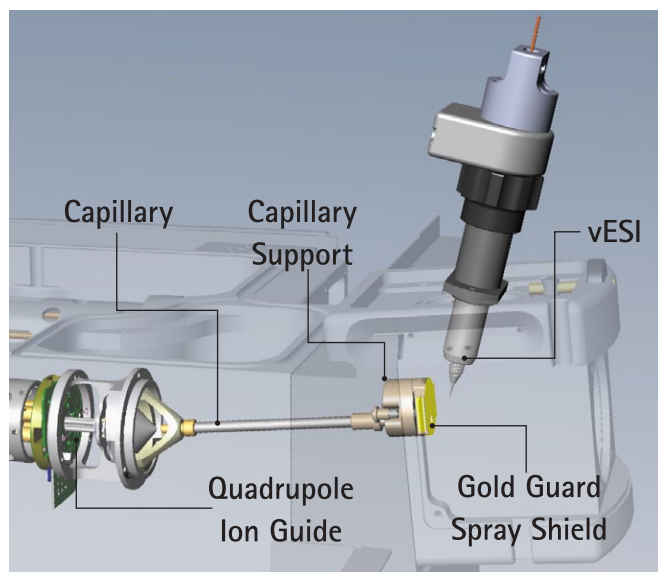
Caffeine and carbamazepine were separated on-column using a gradient elution. Representative chromatograms of caffeine and carbamazepine show improvement with the vESI source, when compared to standard ESI operation. Conditions used for both methods were fully optimized.

# Gold Guard™ Ion Optics: Ultimate Resistance Against Contamination

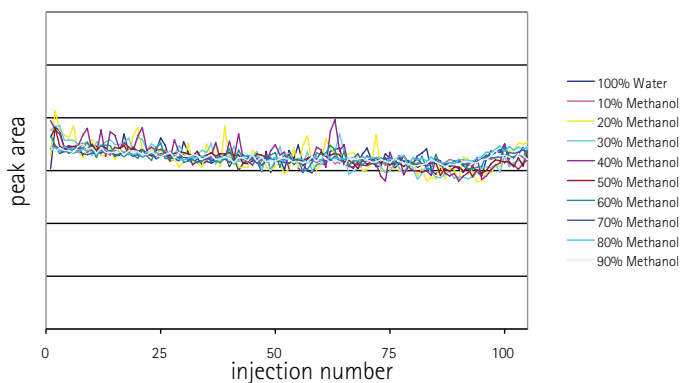
## Effectively Limit Front-End Contamination

The patent pending Gold Guard ion optics provide enhanced contamination resistance when analyzing compounds, particularly those derived from complex matrices. After repeated injections of analytes suspended in a complex matrix, the 325-MS requires little-to-no cleaning to maintain a high level of reproducibility and accuracy. The resistance against contamination provided by the Gold Guard ion optics means that downtime for cleaning and servicing the API interface and front-end ion optics is greatly reduced.

As a test of system robustness, a carrot mixture was extracted using the QuEChERS approach, without any cleanup. Flow injections of chlorpheniramine were made directly into the vESI™ source with no observable changes in signal intensity or precision of the measurements. After the injections were complete, the spray shield was noticeably fouled but the contamination did not affect instrument performance, due to the protection provided by the Gold Guard ion optics.



The Gold Guard and patented off-axis angle of the capillary combine to reduce noise and matrix contamination.



1,050 total flow injections (105 injections at each of 10 mobile phase conditions) of chlorpheniramine in a QuEChERS carrot extract, RSD=5.31%. The data were collected with a gradient method that performed 10 flow-injection events (evenly spaced) that progressed from 100% water to 100% methanol.



The complex, dirty matrix that accumulates on the spray shield (left) is easily removed. Cleaning the Gold Guard with a moist wipe restores the chemically resistant shield to its original condition (right).

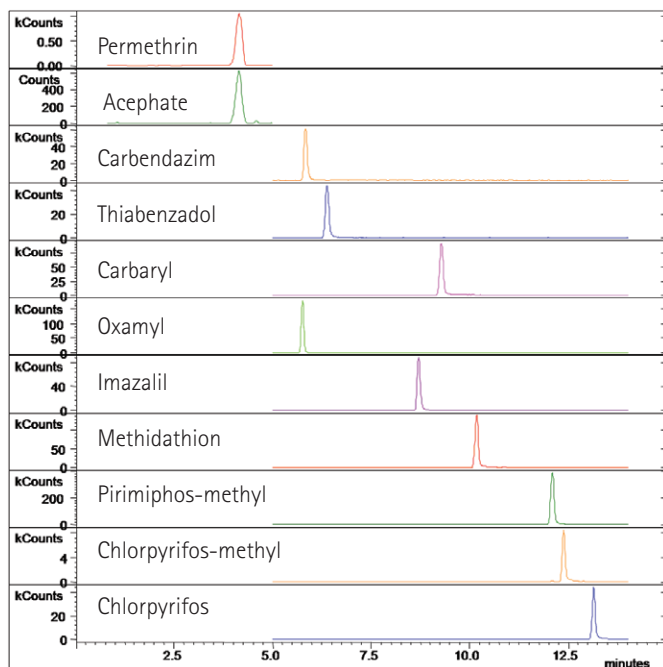
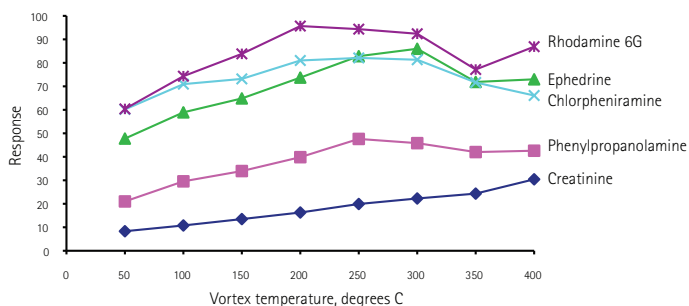
VARIAN, INC.

# Ease of Use

## Increase Productivity

The Varian 325-MS system provides cost-effective, rapid and confident sample analysis for a variety of analytical applications. The easy-to-use vESI ion source requires practically no user intervention or optimization, facilitating data acquisition over a wide range of flow rates with no flow split. Furthermore, the vESI ion source delivers unprecedented robustness for demanding analytical applications, while maintaining a high level of reproducibility and accuracy.

One of the major problems faced by ESI is rapidly delivering thermal energy into liquid droplets in order to quickly desolvate the solvent-solute clusters. The problem is exacerbated with higher liquid flows and/or higher fractions of hydrophilic solvents. The graph below represents flow injections of rhodamine 6G, ephedrine, chlorpheniramine, phenylpropanolamine and creatinine at a linear velocity of 400  $\mu\text{L}/\text{min}$  in 75%  $\text{H}_2\text{O}$ : 25% acetonitrile, while adjusting the vESI gas temperature. Even at a flow rate of 400  $\mu\text{L}/\text{min}$  in predominantly aqueous solvent, the analyte signal intensity continues to maintain a steady response, representing a broad optimization range.



Methods can be developed to allow one set of vESI source conditions to be used throughout a method. The MRM chromatograms above depict the detection of 11 compounds in a 15-minute run. The method contains over 25 MRM transitions containing both positive and negative ions, but only one set of vESI conditions for this diverse compound set. For very labile compounds or unusually large changes in mobile phase composition, the temperature can be adjusted if needed. The 325-MS is equipped with SelecTemp™ control, which affords changing the drying gas and vESI gas temperatures throughout an analytical run.

# Setup, Acquire, Analyze and Report

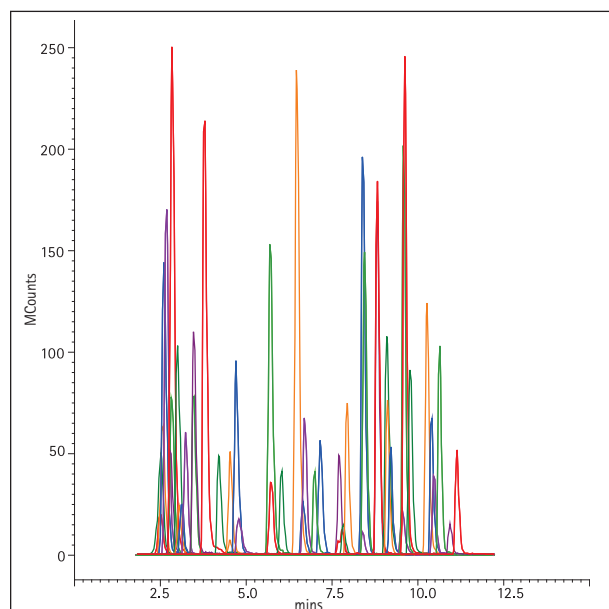
## The Complete Solution...

The vast majority of mass spectrometry-based methods require various forms of sample preparation and chromatographic techniques prior to mass analysis. Varian can offer this exact blend of sample preparation, chromatography systems, HPLC columns, software and support required to meet the rigorous needs of your application.

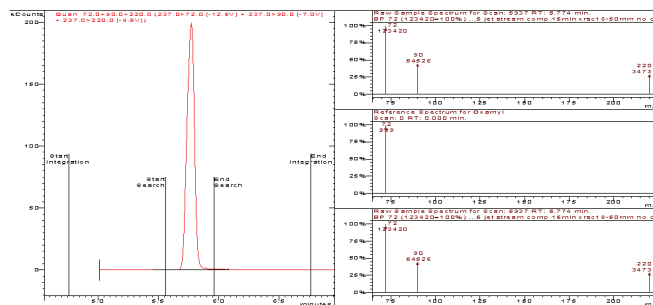
## MS Workstation Software

Instrument control and data processing are simple with Varian MS Workstation software.

- Complete single-point control of pumps, autosamplers and other accessories
- Fully automated tuning and calibration
- Superior data transfer rate with dual processors
- Simple navigation for reviewing and processing result
- Full featured network compatibility for file management, printing and remote access
- Extensive reporting for complete analyses
- Automated MS/MS optimization



Varian 325-MS LC/MS with SRM transitions offers high quality quantification with more than 10 data points per peak and an analysis of 48 pesticides in less than 11 minutes.



## HPLC Pumps

**212-LC** pumps deliver pulse-free flow at low flow rates, ideal for analyzing limited amounts of sample on a small (2 mm) diameter column. The low flow rates reduce maintenance on the spectrometer and increase the sensitivity for analyses of small samples.

## Autosamplers

**HTS PAL™** is a low loss, high speed, high capacity, robust autosampler offering outstanding flexibility and productivity.

The **460-LC** handles well plates and sample vials, open or sealed. Internal standard addition, sample dilution or derivatization steps are easily programmed to reduce sample preparation time and errors associated with manual procedures.

## HPLC Columns

**Pursuit™** columns are available in a variety of phases and deliver faster separations without sacrificing resolution. Pursuit Diphenyl offers unique pi-pi selectivity for aromatic and double bond containing analytes and improved LC/MS sensitivity. Pursuit PFP delivers optimal separation of polar analytes under high aqueous conditions.

**Polaris™** columns provide unique bonded phases that maximize polar retention and selectivity, while virtually eliminating silanol activity. Polar-modified chemistries of this class are very effective for separations that are difficult on conventional alkyl-bonded phases, and they are stable in all commonly used HPLC and LC/MS eluents from pH 1.5 to 10.0.

VARIAN, INC.

# 325-MS

## TRIPLE QUADRUPOLE MASS SPECTROMETER

Varian offers robust instrumentation, application-based consumables, and customer-focused services, backed by our global team of product and applications experts, ready to help you solve your analytical challenges. Whether you're monitoring impurities in drinking water, designing new therapeutic drugs, or developing cleaner fuels, our solutions deliver the sensitivity, flexibility and productivity your laboratory requires.



### Varian Care Program

Our goal is to help you increase your productivity, maximize your uptime and achieve the highest return possible on your investment. Our experienced and highly-qualified support organization is strategically located throughout the world to ensure rapid response.

Be confident knowing that your instrument will deliver maximum performance, your users are fully trained and expert technicians will respond quickly to your support needs – because Varian cares.

### Shop Online

Varian offers the added convenience of purchasing products online. The products you need are just a few clicks away at [www.varianinc.com](http://www.varianinc.com)

We are committed to meeting your needs with a full range of consumable products and supplies. Call today to request your free copy of our comprehensive analytical supplies catalog or download it from our web site.

Varian, Inc.

[www.varianinc.com](http://www.varianinc.com)

**North America:** 800.926.3000, 925.939.2400

**Europe The Netherlands:** 31.118.67.1000

**Asia Pacific Australia:** 613.9560.7133

**Latin America Brazil:** 55.11.3238.0400

Other sales offices and dealers throughout the world— check our Web site.

Chromatography • Spectroscopy • Mass Spectrometry • Magnetic Resonance Spectroscopy and Imaging • X-Ray Crystallography • Dissolution • Consumables • Data Systems • Vacuum

vESI, Gold Guard, SelecTemp, Pursuit, Polaris, Varian, the Varian logo and the Varian Care logo are trademarks or registered trademarks of Varian, Inc. in the U.S. and other countries. HTS PAL is a trademark of CTC Analytics AG. © 2009 Varian, Inc.