

# Varian 225-MS Ion Trap Mass Spectrometer

## THE FIRST TRUE BENCHTOP GC/MS SYSTEM

### Internal Vacuum Module

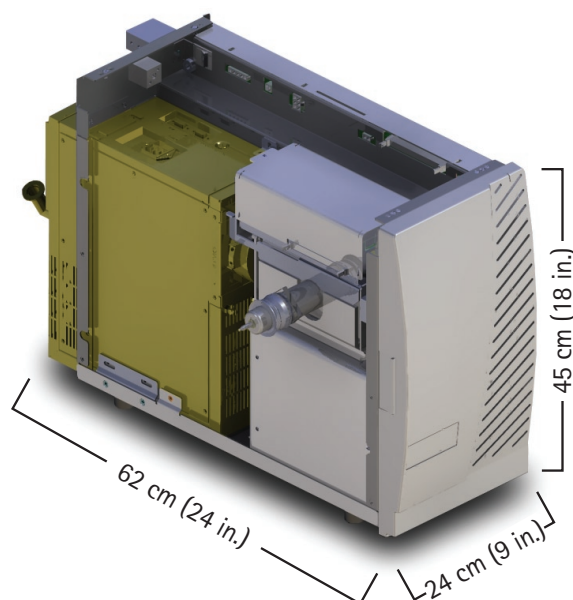
*Advantage Statement:* For laboratories where space limitations restrict analytical capacity, the Varian 225-MS GC Ion Trap delivers excellent selectivity and sensitivity in an extremely compact unit.

### Improved Performance, Less Space

The 225-MS is an easy-to-use, reliable, flexible and powerful analytical tool suitable for both routine and research laboratories.

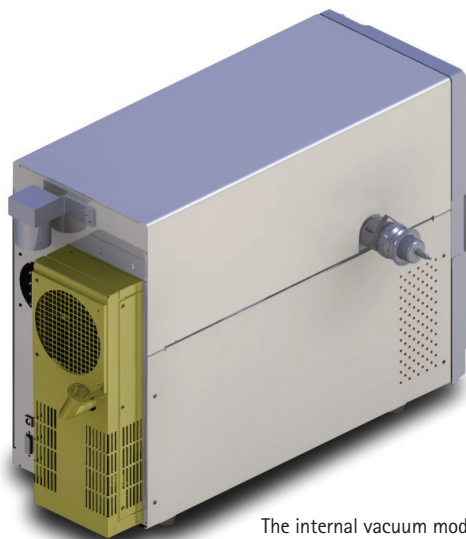
The self-contained vacuum yields a number of significant benefits.

- Because the turbomolecular pump is closer to the foreline pump, it can work at lower speeds and operating temperatures. This reduces the background which allows improved sensitivity.
- Elimination of the hose from the foreline pump to the turbomolecular pump reduces the space requirement significantly.
- The module does not require oil changes during its lifetime, eliminating the inconvenience of changing (and disposing of) the oil.
- The much quieter vacuum module reduces noise in the laboratory.



The Varian 225-MS (shown here with the 450-GC) is the world's first mass spectrometer to enclose all of its components, including the foreline pump, in one compact design.

Use MS/MS and MS<sup>n</sup> to reduce matrix influences and provide more detailed structural information. Take advantage of liquid or gas reagent based chemical ionization (CI) for compound confirmation and increased selectivity. The result is enhanced qualitative and quantitative information about the sample.

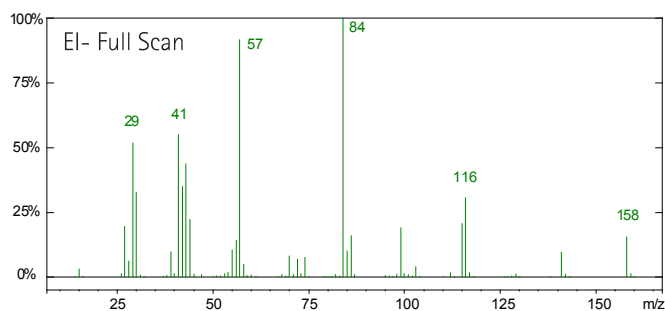
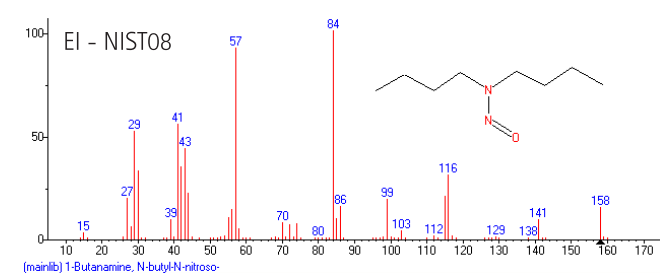


The internal vacuum module (highlighted in gold) eliminates the external foreline pump and the inconvenience of periodic oil changes.

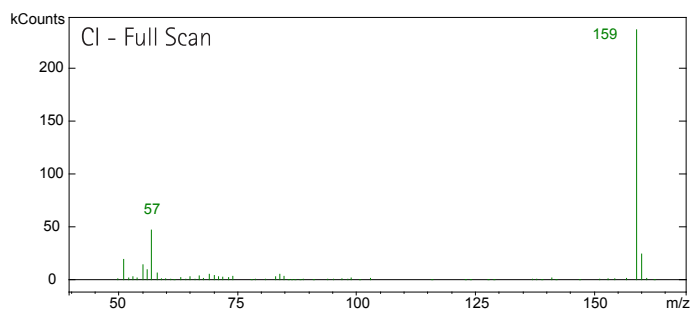


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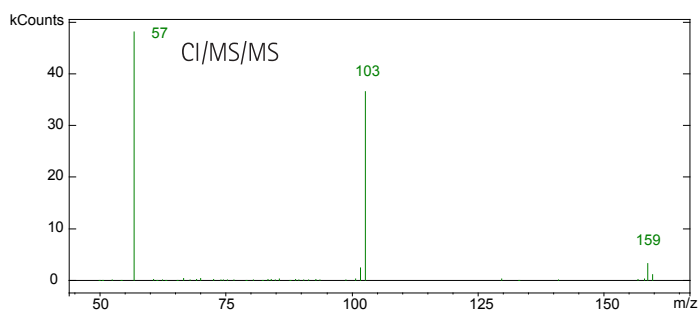
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EI spectrum from the NIST08 library for N-Nitrosodibutylamine. The low molecular ion intensity at  $m/z$  158 renders the spectrum non-distinctive and makes identification difficult if matrix is present.



Using methanol positive chemical ionization, the characteristic, protonated molecule ( $m/z$  159) is the base peak of the spectrum.



CI/MS/MS provides added, unique spectral information about the compound while enhancing detection levels. The precursor ion was  $m/z$  159 and CID was performed using resonant mode at 0.48 V.

The CI sensitivity of an internal ionization ion trap can be 50 fold or greater than single quadrupole mass spectrometers using high-pressure sources. The 225-MS allows confident identification of compounds by effortlessly switching between EI (electron ionization) and CI, even in the same run, along with different scanning modes such as full scan, Selected Ion Storage (SIS), and MS/MS.

Use CI to increase selectivity and reduce background for better qualitative and quantitative data employing gas or liquid reagents.

In many cases, EI analysis can result in a spectrum with no molecular ion or one of low intensity, making identification difficult, as demonstrated by the spectrum of N-Nitrosodibutylamine (NDBA  $m/z$  158). CI delivers a spectrum dominated by the protonated molecule  $[M + H]^+$  for easy identification ( $m/z$  159). This intense ion is an excellent starting point for CI/MS/MS, which, in addition to increased selectivity, provides more spectral information. CI/MS/MS measurements offer increased sensitivity with reliable quantitation in a wide concentration range (0.5–50 pg) as demonstrated by 0.9999 correlation coefficient for NDBA.

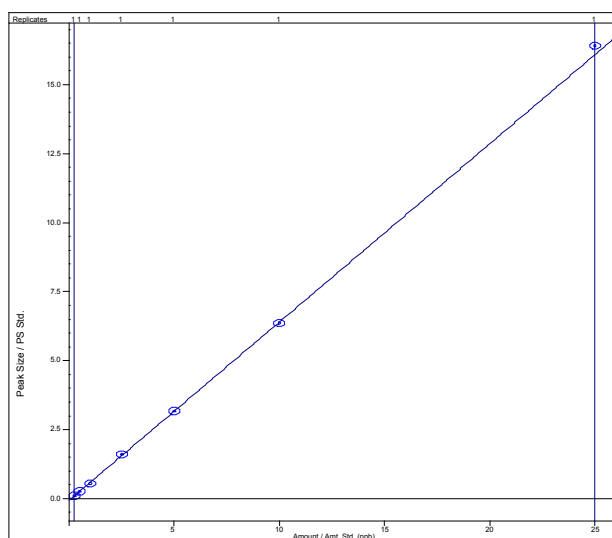
Low pressure CI allows the use of liquid reagents such as methanol and acetonitrile. Using common solvents extends the range of available soft to hard CI reagents and widens selectivity, while reducing costs. Eliminating the need for gas cylinders increases safety and convenience.

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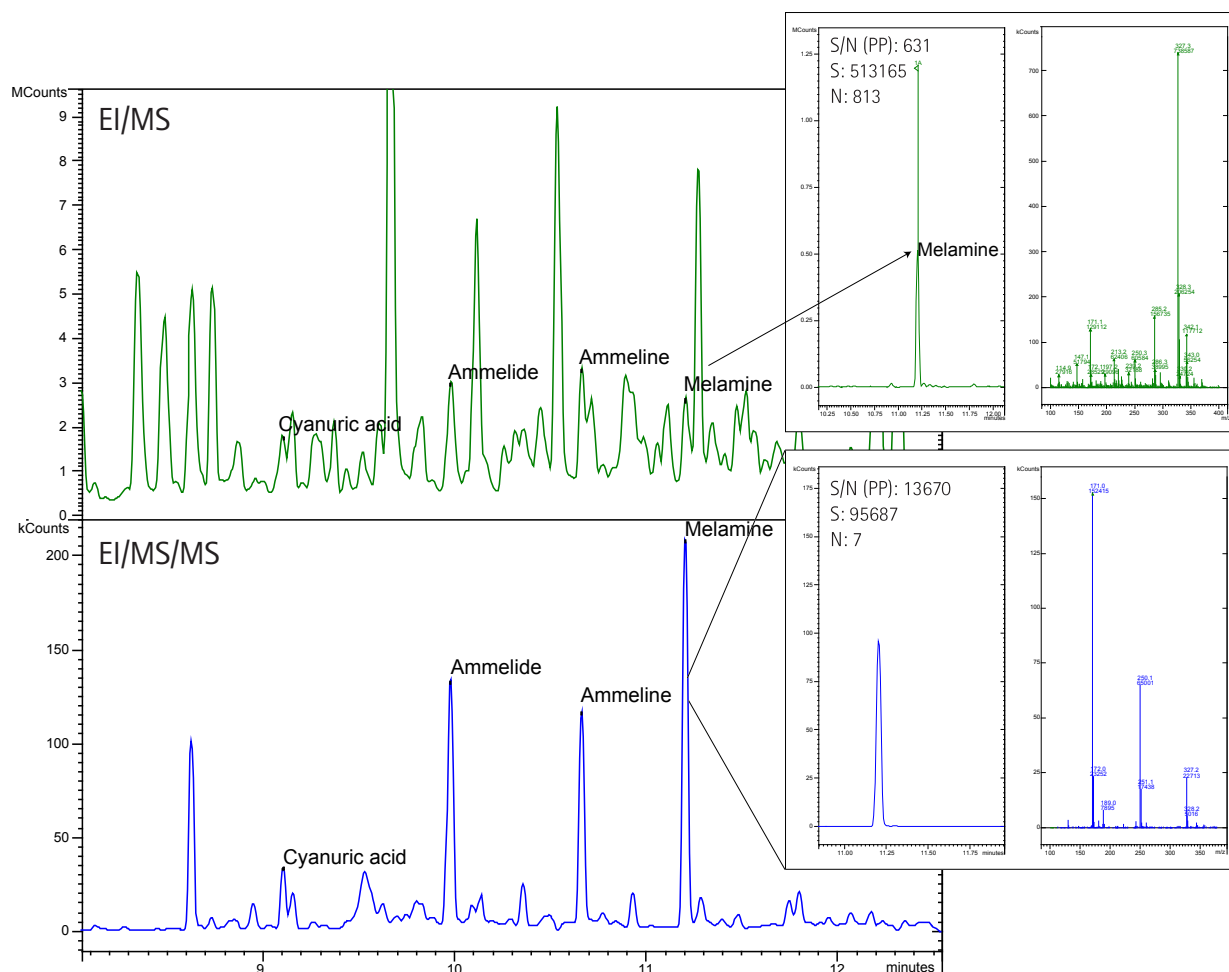
## Lower Detection Limits, Higher Confidence

Take advantage of MS/MS to reliably eliminate background and matrix ions for increased selectivity. MS/MS makes trace level detection possible while still delivering excellent quantitative and qualitative information.

During MS/MS, the precursor ion is isolated from the full scan spectrum, while all other masses are eliminated from the trap, effectively removing background or matrix ions. In the collision induced dissociation (CID) process, the isolated precursor ion is broken into smaller fragments, creating a characteristic product ion spectrum. The result is enhanced spectral clarity, improved signal to noise and lower detection levels.



The measurement of nitrosamines in drinking water (EPA Method 521) by methanol CI/MS/MS. Calibration range from 0.5 to 50  $\mu\text{g}/\mu\text{L}$  generated excellent results for all analytes as represented with  $r^2$  of 0.9999 for N-nitrosodibutylamine.



Detection of melamine and related analytes in cat food extract. In full scan, the spectrum is severely influenced by the background, making identification less reliable, while detection levels are negatively affected by the coeluting matrix. Using MS/MS, the matrix is eliminated providing for clear, confident spectral identification along with significantly improved detection levels as indicated by the over 20 fold increase in S/N values for melamine.

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