PRODUCT NOTE

GAS CHROMATOGRAPHY / MASS SPECTROMETRY

Clarus 560 S GC/MS

Performance meets value

The PerkinElmer® Clarus® 560 S Gas Chromatograph/Mass Spectrometer (GC/MS) delivers high-sensitivity analyses through a combination of state-of-the-art electronics and ion optics, the widest mass range and fastest scanning rates available, as well as a 75-L/s turbomolecular pump – all of this in an integrated solution that's within your reach.

Coupled with the robust Clarus 500 GC, featuring a choice of sampling accessories, two GC detector channels and a variety of detector/injector combinations, the Clarus 560 S GC/MS is the ideal solution for routine as well as research-grade analyses for environmental, food, pharmaceuticals and forensics applications.

With the Clarus 560 S GC/MS, PerkinElmer delivers a system beyond your expectations through outstanding versatility, ruggedness and performance. Advanced technology and ease-of-use mean you will maximize your uptime.

Key Benefits

- 75-L/s turbomolecular pump delivers enhanced signal-to-noise
- State-of-the-art electronics provide the fastest scanning rates and increased productivity
- Widest mass range allows the analysis of heavy pollutants and derivatized compounds
- TurboMass™ GC/MS software offers flexible standard and customized report formats
- Robust autosampler and a variety of injector/detector options optimize analytical capability
- Simultaneous data acquisition from up to two GC detectors allows complementary analyses

PerkinElmer® precisely.

Design logic maximizes uptime

Our exclusive gold-component technology enhances overall instrument stability and significantly reduces downtime by minimizing contamination.

The logical design of the Clarus 560 S GC/MS means that you save time on routine maintenance tasks including:

- Quick ion source changeover reduces the risk of contaminating the quadrupole analyzer: you have easy access to the source from the front of the instrument without exposing the ion optics or vacuum manifold
- Routine, easy cleaning of electron ionization (EI) inner source
- "Plug-and-play" capability – no wire connections are needed
- Filament replacement is quick and easy due to the robust filament system's self-aligning design, which also means consistent performance, analysis after analysis
- Cleanable RF-only prefilters are easy to maintain: located in front of the quadrupole analyzer
- Optional MSVent™ hardware to change your analytical column in less than one minute without losing vacuum

System safeguards

Internal safeguards in the Clarus 560 S GC/MS reduce breakdowns and lower operating and repair costs:

- Programmable pneumatic control (PPC) on the Clarus 500 GC safeguards the system from column damage and ion-source contamination by automatically turning off the GC oven and transfer-line heating, should carrier-gas pressure drop
- Standard, single vacuum gauge allows you to monitor the MS vacuum and to quickly recognize and isolate any possible leak source
- Sealed, long-life photomultiplier detector (Figure 1) eliminates expensive and contamination-prone electron multipliers that need periodic replacement

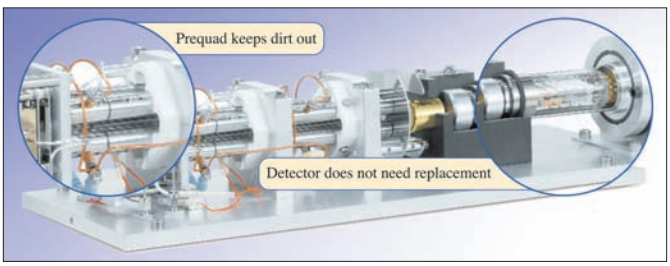

Figure 1. Clarus GC/MS mass analyzer.

- Independent control of the instrument ion source and transfer-line temperatures maximizes spectral quality, reduces contamination and protects thermally labile compounds from uncontrolled fragmentation. The temperatures can be set up to 350 °C.

Productivity-enhancing tools boost operating efficiency

The Clarus 560 S GC/MS features an array of innovative and unique tools that help laboratories operate effectively and efficiently.

Fast scanning for the most accurate and precise data ever

The Clarus 560 S GC/MS acquires up to 65 scans/sec in full scan mode and 100 scans/sec in Selected Ion Monitoring (SIM). The result is the most accurate and precise data ever, easily meeting the generally accepted criteria of at least 7-10 data points (Figure 2) across even the fastest GC peaks – performance unmatched by any other competitive quadrupole GC/MS system.

Improved productivity and sensitivity with SIFI scanning

With a powerful process called Selected Ion and Full Ion (SIFI™) scanning, SIM data can be collected, while simultaneously acquiring data in the full-scan mode (Figure 3). Invented by PerkinElmer, SIFI provides significant laboratory benefits. Because only a single injection is required, laboratories will incur savings in productivity and sample preparation. This allows laboratories the ability to obtain full-scan library-searchable data and supplement with SIM sensitivity in the same run when needed for trace components.

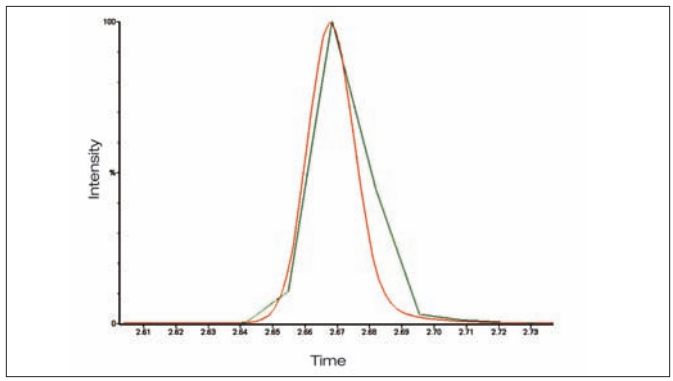

Figure 2. Chromatographic signal at fast scan speed (red) compared to slow scan speed (green).

PreVent and MSVent capabilities enhance throughput

Our exclusive PreVent™ pressure-balanced system is an innovative tool that works in concert with the temperature programmable split/splitless (PSS) injector and Programmable Pneumatic Control (PPC) to prevent performance and productivity barriers.

MSVent is a technical enhancement to the PreVent system. The MSVent hardware, when added to an existing PreVent system, not only retains the functionality of PreVent, but provides some significant additional technical capabilities.

With PreVent and MSVent, you can:

- Remove and change columns without cooling and venting the MS
- Backflush a single capillary column (TimeSaver mode)
- Perform large-volume injections (ELVI)
- Perform injector maintenance without cooling and venting the MS
- Use any capillary column at any carrier gas flow rate and deliver a fixed flow rate into the detector (equivalent to an open split interface)
- Connect vented column effluent to a second detector for dual-signal capability

Flexibility and automation through a variety of sampling options

The integral liquid autosampler on the GC provides a mechanically robust, dependable system with the flexibility and automation capability you need in split/splitless and on-column modes. It provides complete application flexibility, accommodating three syringe sizes (0.5, 5.0 and 50 µL) and three injection speeds (slow, normal and fast). Its smart design assures efficient utilization of the GC, providing unobstructed access to either injection port, allowing any combination of analyses – only one autosampler is needed to reach the two injection ports. Also, the autosampler incorporates built-in quality assurance; optical sensors consistently monitor system performance.

You also have the option of integrating one of our market-leading TurboMatrix Headspace or Thermal Desorber sampling accessories to further enhance your productivity and extend the application capabilities of your system. For headspace sampling, you can choose from a variety of models, depending on your throughput and sensitivity requirements. If your application requires thermal desorption, our family includes 5 different models, whose capabilities also address diverse throughput and application capabilities.

Choose from a wide range of injectors to meet your application needs

The Clarus 500 GC can be equipped with a variety of injectors, including up to two independent programmable split/splitless (PSS) injectors for optimum flexibility. With the capability to change the standard liner in a matter of seconds, the user will perform split/splitless or real on-column injections. This, together with its programmable temperature up to 500 °C, make the PSS injector the ideal choice for many routine applications, including the analysis of thermally labile as well as high-boiling components.

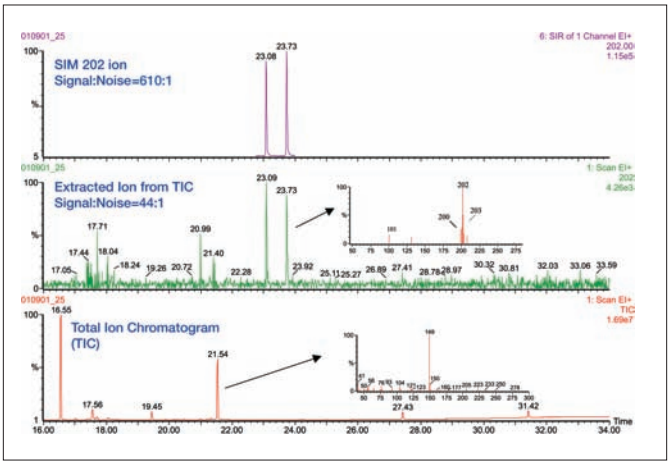

Figure 3. SIFI scanning ensures accurate identification, while simultaneously providing enhanced quantifiable sensitivity from the selected ion signal.

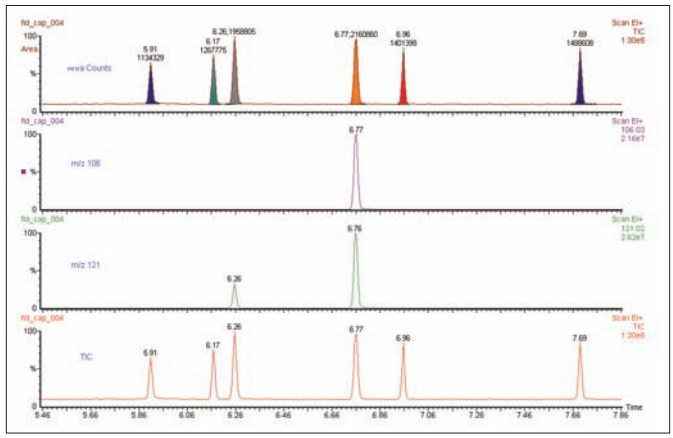

Figure 4. TIC (total ion chromatogram), extracted ions (121 and 106), and TIC integration.

TurboMass software drives routine and research-grade analyses

Trouble-free data acquisition

TurboMass GC/MS software makes it easy to acquire data for either qualitative or quantitative sample analysis. Key benefits include:

- Sample-centric software is intuitive to learn and use
- Methods are easy to set up and store
- Project-based organization collects all the necessary method information and data in one location, facilitating archiving
- Data collection uses a simple checklist – just check off the desired steps and press the "OK" button to initiate data collection and reporting
- AutoBuild feature in TurboMass software can be utilized to speed development of quantitative methods – just a few clicks and the necessary information are transferred from the chromatogram, spectrum and library search results to the method

Chromatogram and spectrum viewers for easy data screening during and after acquisition

Screening data using the powerful chromatogram and spectrum viewers is a simple and easy process. Chromatograms and spectra can be displayed at any point during or after acquisition (Figure 4), saving you valuable time during post-run processing. Chromatograms from up to 16 different acquisitions (including the one currently being acquired with real-time updating) can be displayed simultaneously with a single drag-and-click of the mouse. This enables quick comparison to reference chromatograms. Single mouse clicks allow selection of extracted mass ions, chromatogram overlays, peak integration and more. Spectrum-peak averaging and background subtraction of unwanted ions are flexible and easy, as is verification of spectrum quality to environmental method criteria. Similarly, the spectrum viewer allows for spectral comparison of up to 14 spectra from the same or different chromatograms using single mouse clicks at any time during acquisition or post run. Mass-spectral library search is just a single mouse click away.

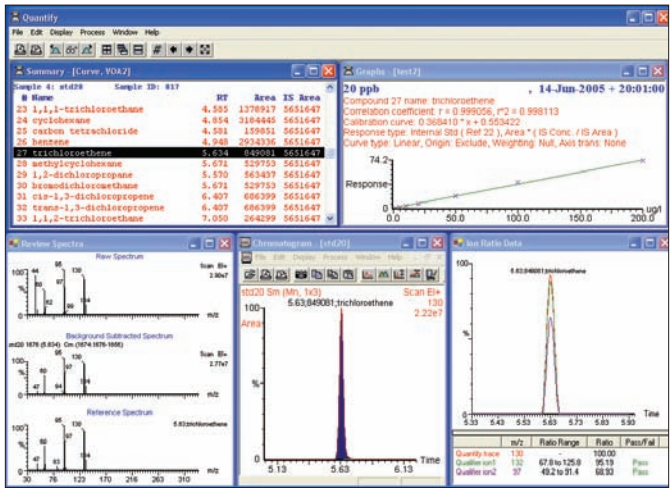

Figure 5. Interactive data review, showing enhanced rapid viewing features.

Efficient, effective post-run data review ensures correct peak selection and compliance

Data evaluation is an important preliminary step in any quantitative application, to ensure that only correctly integrated and identified peaks are used in quantitation and further evaluation. The interactive data-review page (Figure 5) in TurboMass software can speed this step of the process.

Automated tuning optimizes mass spec performance

Tuning the mass spectrometer is critical to ensure that good library-searchable spectra are generated from analyses. TurboMass software automatically tunes the mass spectrometer using UltraTune®, a new-generation proprietary algorithm for enhanced stability and reproducibility.

GC detector support adds flexibility

You can use two additional GC detectors simultaneously with the Clarus 560 S GC/MS system and all data acquisition, display and quantitation can be performed by TurboMass software. You also have the option of using our TotalChrom® Chromatography Data Systems (CDS) workstation or client/server software for enhanced post-run data handling.

Environmental data evaluation and reporting package speeds quality results

TurboMass software is especially designed to meet the strict quality-assurance (QA) and quality-control (QC) compliance and reporting requirements of environmental and other types of laboratories. You can maximize your lab's productivity with the superior data review, evaluation and report-generating capabilities of TurboMass software, while ensuring complete compliance with required methodologies.

Fast, simple and flexible reporting completes the process

Most labs must present their data in an attractive, standardized format for reporting to internal or external clients. TurboMass software includes over 70 standard templates, allowing report generation with just a few clicks. Report templates are designed to meet the specific needs of labs conducting environmental, forensic, clinical or toxicological diagnostics, as well as general chemical analysis. Examples of reports are included as PDF files in the TurboMass software disk.

TurboMass software offers a wide variety of design elements that can be used to create the customized report a client requires, using a graphical interface – without programming.

TurboMass software is LIMS-compatible for transfer of worklists from the Laboratory Information Management Systems (LIMS) to the GC/MS, and results back to your LIMS. Standard report templates for data transfer are provided to smooth the path to your LIMS, either before or after method QC evaluation.

CLARUS 560 S MS SPECIFICATIONS

Hardware

Mass range	1.0-1200 u (amu)
Detector	Sealed long-life photomultiplier
Analyzer	Quadrupole with prefilter: 131 mm x 12 mm circular rods; 16 mm x 12 mm prefilter rods
Mass stability	±0.1 *m/z* mass accuracy over 48 hours
EI voltage	10-100 eV
Pump	Air-cooled 75-L/sec turbomolecular
Vacuum gauge	Standard, single wide-range gauge for all pumping options
GC transfer line	Settable from 20 °C to 350 °C
Ion source	Temperature settable up to 350 °C; No wires – plug and play
MSVent	Optional accessory for MS isolation to change column without venting

Performance

Scan rate	Up to 12,500 amu/sec
Maximum	Up to 65 scans/second full scan, depending on mass range
Acquisition rate	Up to 100 scans/second, selected ion monitoring (SIM)
Linear dynamic range	Electronic: 10^6-10^7 depending on acquisition rate
Scan functions/run	32 sets (full scan/SIM) of up to 32 ions per function

Data system

Methods	Electronically transferable between Clarus 600, Clarus 560, Clarus 500, TurboMass Gold and TurboMass GC/MS systems
Acquisition	MS detector with two GC detectors (optional)
SIFI	Simultaneous full-scan data acquisition with selected ion monitoring (SIM)
UltraTune autotune	User selectable: standard (BFB/DFTPP) or custom tuning
Reporting	Environmental: standard; Forensic: standard; Customizable: standard

Sensitivity

Test	Amount	Detection Limits (S/N)
EI full scan	1 pg of octafluoronaphthalene	150:1 RMS at *m/z* 272

Optional libraries and software

Libraries	NIST Mass Spectral Library Wiley Mass Spectral Library Maurer/Pfleger/Weber Drugs, Pollutants, Pesticides and Metabolites Library
Software	Ion Signature Deconvolution MS Software

Physical

Power	120 VAC ±10% @ 50/60 Hz ±1% 1000 VA; 230 VAC ±10% @ 50/60 Hz ±1% 1000 VA
Operating temperature	10 °C to 30 °C
Relative humidity	20-80%, non-condensing
Weight	Clarus 560 S GC/MS: 46.3 kg (102 lb); Forepump: 25.9 kg (57 lb)
Dimensions (HxWxD)	51 x 33 x 74 cm (20 x 13 x 29 in) With Clarus 500 GC and Autosampler: 79 x 99 x 74 cm (31 x 39 x 29 in)

Create an integrated analytical solution

Combine the Clarus 560 S GC/MS with our market-leading TurboMatrix Headspace or Thermal Desorption sample handling, flexible user-friendly software, a full range of consumables and accessories, and world-class service and support for an integrated, complete analytical solution.

PerkinElmer – the clear choice in gas chromatography

PerkinElmer is the only GC supplier who develops, manufactures, supports and services every product it offers to provide a truly integrated system. This means one expert supplier – with best-in-class instruments and a world-class service and support organization – can address all of your applications and troubleshooting needs, from sample handling to data handling.

PerkinElmer, Inc.
940 Winter Street
Waltham, MA 02451 USA
Phone: (800) 762-4000 or
(+1) 203-925-4602
www.perkinelmer.com

PerkinElmer®
precisely.

For a complete listing of our global offices, visit www.perkinelmer.com/lasoffices

008239_01 KG070808 Printed in USA