

Clarus 600

Gas Chromatograph/Mass Spectrometers



your GC/MS results.
better.
faster.

whatever you need it for

the Clarus 600 GC/MS family delivers



Clarus 600 Gas Chromatograph/Mass Spectrometer (GC/MS)

Take your GC/MS to the limits of your performance and throughput needs with the family of high-performance Clarus® Gas Chromatograph/Mass Spectrometers (GC/MS). It masters quadrupole MS with a high-sensitivity, wide mass range solution that is one of the fastest quadrupole GC/MS systems available. Its versatile, application-focused software platform drives your data handling and reporting. With our latest innovation in GC, PerkinElmer delivers just what your applications require.

robust, precise and accurate

for any application

The Clarus 600 GC/MS combines our Clarus 600 Gas Chromatograph (GC), featuring the fastest available heat-up and cool-down conventional oven, with our Clarus 600 Mass Spectrometer (MS) for a superior GC/MS.

The rugged Clarus 600 MS is the fastest quadrupole mass spectrometer available, acquiring more spectra (up to 65 scans/second and 12,500 amu/sec) across a GC peak than any other quadrupole system. It features the widest mass range (1-1200 u) and best-in-class detection limits available. The combination of these MS features with the fast analytical cycle time of the Clarus 600 GC provides opportunities for new applications, increased sample throughput and higher levels of productivity.

The Clarus 600 GC/MS runs on our proven TurboMass™ software, a sample-centric, application-focused platform. The instrument's advanced hardware coupled with this versatile software results in a powerful package that provides a complete characterization of samples to drive your laboratory analyses.

Whether you do routine “workhorse” applications or challenging research requiring more capabilities, the Clarus 600 GC/MS is an extremely robust, precise and accurate system that can handle all your demands.



QUICK GLANCE

Hardware:

- **El and CI:** *best-in-class* signal/noise specifications offer *new possibilities* for analysis.
- **Plug-and-play ion source:** loosen two screws and *easily* change when needed.
- **Three pumping systems:** provide the right *performance* to fit your needs and budget.
- **Fastest scan rates (12,500 amu/sec):** for the most *accurate* determination of peaks.
- **Smaller footprint:** for economical space use.
- **System stays clean longer with real samples:** pre-quad removes undesirable contamination before the main analytical quadrupole.
- **Innovative photomultiplier detector:** does not require periodic replacement because it is not a consumable.
- **Widest mass range (1–1200 u):** encompasses a *variety of applications*, such as brominated flame retardants.
- **El and CI run with the same ion source:** increases *productivity*.
- **Optional PreVent™ system:** eliminates *performance* and *productivity* barriers.
- **Rugged autosampler:** provides optimized, *reliable throughput*.

Software:

- **Access your data easily** with sample-centric software! Two clicks and you can view the mass spectrum or other information collected on a sample.
- **SIFI™ simultaneous collection of *selected ion* and *full ion* scanning data** for the most productive analytical work.
- **UltraTune™ automated tuning** for BFB/DFTTP or custom tuning on any compound for *faster setup*.
- **AutoBuild™ quantitative method creation** to *speed startup*.
- **More than 70 standard templates** provided for *rapid* reporting.
- **Easily customizable reporting templates**, including forensic and environmental U.S. EPA.
- **Choice of El or positive or negative CI** for the *best match* to application.
- **Advanced features** such as NIST AMDIS deconvolution, noise-reduction algorithms and other tools *speed* complex projects.

fast scanning

for the most accurate and precise data ever

The fast Clarus 600 GC/MS acquires spectra at up to 65 scans/second across a GC peak. Up to 100 scans/second is achieved for Selected Ion Monitoring (SIM). The result is the most accurate and precise data ever, easily beating the generally accepted criteria of at least 8–10 data points per chromatographic peak, for performance unmatched by any other quadrupole GC/MS system. More spectra per peak means that you will:

- **Easily define and quantify extremely narrow chromatographic peaks**, which previously could not be resolved with full-scan quadrupole mass spectrometry.
- **Generate more accurate and precise results with better spectral fidelity** for the most complete information and the highest confidence in analytical data reporting (Figure 1).

Run “fast GC” with the Clarus 600 GC/MS

- **Faster scan speeds enable fast GC applications** – new and attractive opportunities not possible with slower systems.
- **Achieve greater productivity using fast GC/MS techniques**, such as in separation of solvent mixtures or semivolatile components.

How does the Clarus 600 GC/MS' fast scan speed improve your data?

Scan speed is the rate of data acquisition across a chromatographic peak, measured as scans per second. In a quadrupole mass spectrometer, scan speed is critical in ensuring data integrity. Too few scans across a GC peak lead to a poorly recorded peak shape, limiting quantitative accuracy and precision. A slow scan rate on a fast peak causes spectral distortion, or “skewing”, reducing spectral fidelity (Figure 2, top). Faster scanning minimizes the skewing and gives better overall spectral fidelity (Figure 2, bottom).

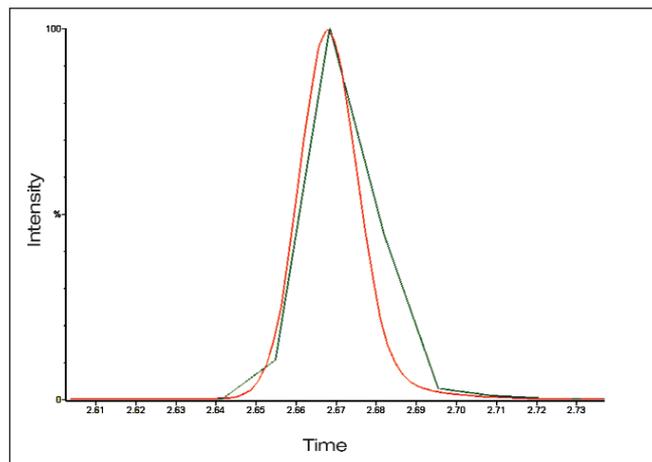


Figure 1. Chromatographic signal at fast scan speed (red) compared to slow scan speed (green).

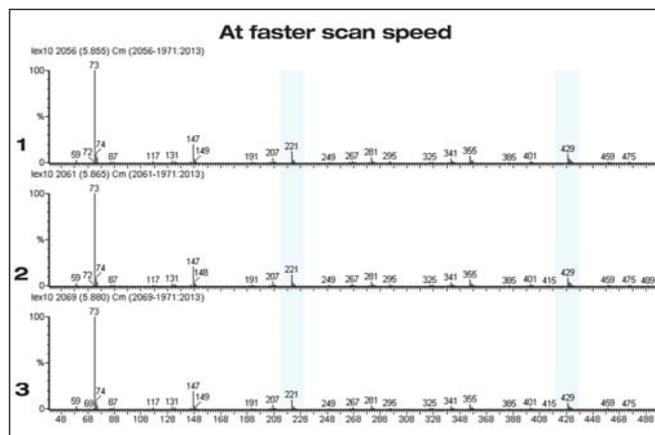
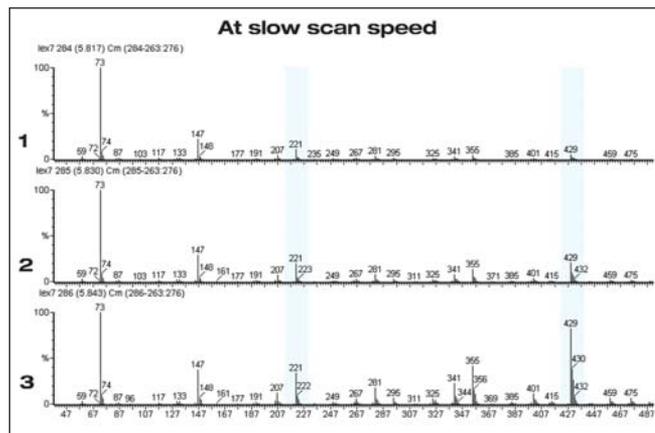


Figure 2. Better spectral fidelity with fast scan speeds, increasing confidence in results. Top and bottom figure with spectra acquired from (1) fronting, (2) apex and (3) tailing point along a chromatographic peak.

rugged design

for maximum uptime

The Clarus 600 GC/MS is built tough to deliver reliability, reduced cost of ownership and easy maintenance.

Design controls maximize system safeguards

Built-in controls reduce breakdowns and minimize operating and repair costs.

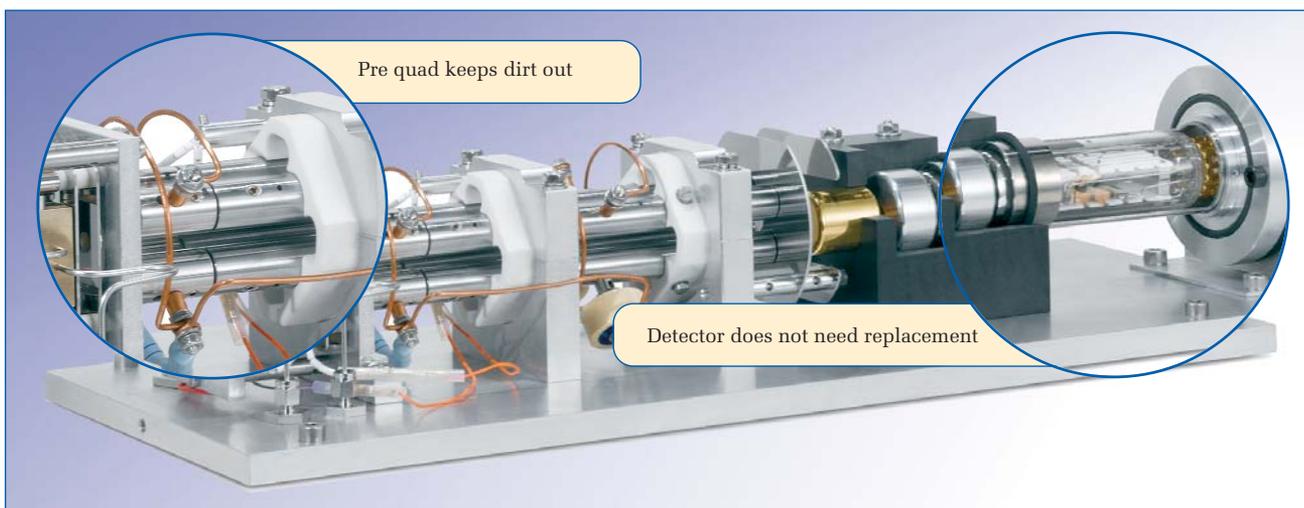
- **Sealed, long-life photomultiplier detector lowers operating costs:** eliminates expensive and contamination-prone electron multipliers that need periodic replacement.
- **Gold-plated critical components:** enhance overall instrument stability and significantly reduce downtime by minimizing contamination.
- **Unique programmable pneumatic control (PPC) safeguards the system from column damage and ion-source contamination:** automatically turns off the GC oven and transfer-line heating, if carrier-gas pressure drops.
- **Independent control of the instrument ion source and transfer-line temperatures maximizes spectral quality:** reduces contamination and protects thermally-labile compounds from uncontrolled fragmentation. Temperatures can be set up to 350 °C.

- **Power outages will not damage the system:** the Clarus 600 MS can be attached to a nitrogen purge gas stream. This prohibits oxygen from entering the system during venting, minimizing contamination.

Design logic saves maintenance time

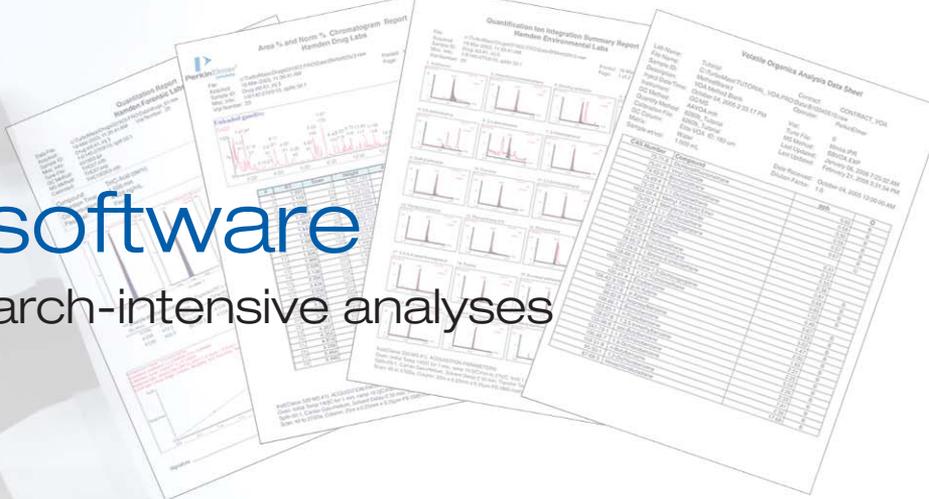
The logical design of the Clarus 600 GC/MS means that you save time on routine maintenance tasks.

- **Quick source changeover (less than 15 minutes) reduces the risk of contaminating the quadrupole analyzer:** you have easy access to the ion source from the front of the instrument without exposing the ion optics or vacuum manifold.
- **Routine cleaning of electron ionization (EI) or chemical ionization (CI) sources is simple:** no wire connections needed.
- **Filament replacement is quick and easy** due to the self-aligning design of the robust filament system, which also means consistent performance, analysis after analysis.
- **Cleanable RF-only prefilters are easy to maintain:** located in front of the quadrupole analyzer.



TurboMass software

drives routine or research-intensive analyses



The Clarus 600 GC/MS runs on PerkinElmer's proven TurboMass data-handling and reporting software, a uniquely versatile platform that meets the needs of both the routine and advanced user.

- **Provides easy-to-use, intuitive tools for everyday use** in routine applications to maximize productivity and compliance.
- **Provides the sophisticated functionality** required to support the advanced user. Advanced software features, such as customized reporting, noise-reduction algorithms, a variety of ionization options and optional AMDIS deconvolution software give the advanced user additional tools for research and complex analyses.

Secure, stable application environment

TurboMass is a fully integrated Microsoft® Windows®-based software application. It handles GC/MS setup, data analysis, processing, review, evaluation and reporting. The software provides compliance, productivity and reliability for environmental, forensic and research labs.

- **Provides a high level of security, network connectivity and operating stability.**
- **Ensures data integrity by securing files from unauthorized modification:** different levels of user access can be defined.
- **Enables import or export of mass-spectral data to or from industry-standard AIA or JCAMP-DX format:** a variety of mass spectral libraries for compound identification – including NIST, Wiley and Pfleger/Maurer/Weber – are available.
- **Makes report creation both intuitive and quick for any lab's needs:** TurboMass includes report templates designed to meet the specific needs of users conducting environmental, forensic and other analyses. Modification, without programming, adds flexibility for the advanced user.

- **LIMS-compatible** for simple data transfer of work-lists from LIMS and GC/MS 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.

Data acquisition

It's easy to acquire data for either qualitative or quantitative sample analysis.

- **Sample-centric software is intuitive** to learn and use.
- **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.
- **Use the AutoBuild feature to speed development of quantitative methods.** Just a few clicks and the necessary information is transferred from the chromatogram, spectrum and library search results to the method.
- Coupled with rapid scanning and the widest mass range for a quadrupole GC/MS, **data collection for a range of applications is easily achieved.**

Efficient, effective data review ensures correct peak selection and compliance

Data review 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 environment speeds this step of the process (Figure 3).

Automated tuning optimizes performance

Tuning is critical to ensure that good library-searchable spectra are generated from analyses. TurboMass

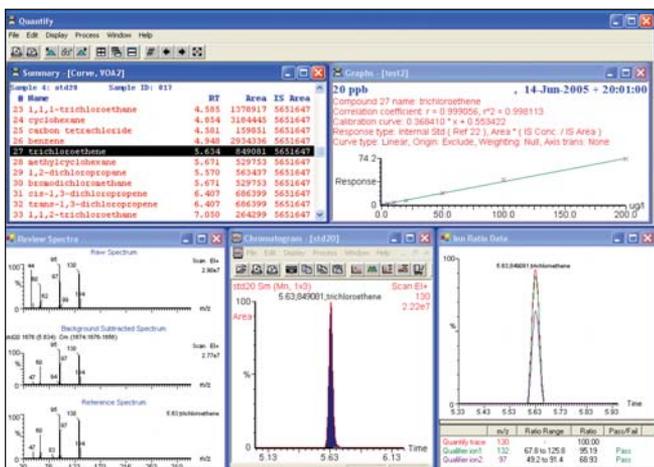


Figure 3. Interactive data review.

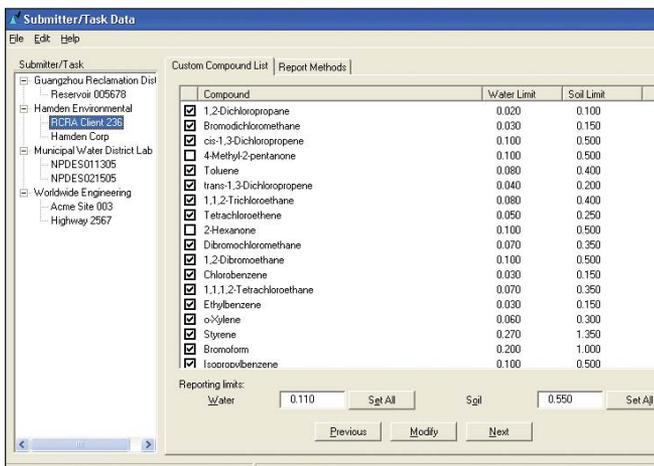


Figure 4. Custom compound list delivers the correct set of compounds to each client.

software automatically tunes the mass spectrometer using a new-generation proprietary tune (UltraTune), providing enhanced stability and reproducibility.

GC detector support adds flexibility

You can use two additional GC detectors simultaneously with your Clarus GC/MS system. All acquisition, display and quantitation can be performed by TurboMass software. Or you have the option of using our TotalChrom® Chromatography Data Systems (CDS) workstation or client/server software for these processes.

Environmental data evaluation and reporting package speeds quality results

TurboMass software is especially designed to meet the strict quality-control (QC) and compliance requirements of environmental and other types of laboratories.

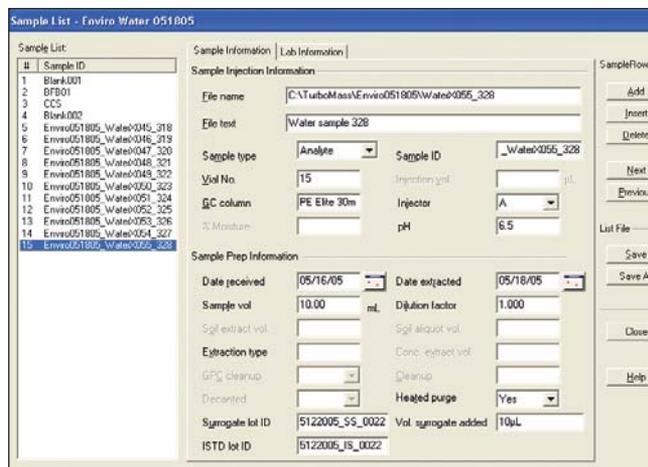


Figure 5. The sample wizard during data entry for a water sample group.

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 (Figures 4 and 5).

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 to make the choice simple.

Multiple-ion-ratio analysis

Multiple-ion-ratio (often called "3-ion-ratio" for historical reasons) is a mass spectrometry technique where specific selected ions of a mass spectrum are ratioed to determine if they match a reference spectrum within certain pre-defined tolerances. Only if the calculated ion ratios are within user-defined limits is the peak "identified" as the presumptive target compound. A match adds additional certainty to a compound confirmation, beyond that available through only a GC retention time and the presence of a peak at a single mass. A powerful set of tools is included with TurboMass software to use multiple ions for maximum benefit. TurboMass software allows the choice of absolute, relative or ISO-compliant ratio calculation for up to 5 ions.

innovative tools...

bring productivity to new levels

The Clarus 600 GC/MS features innovative and unique productivity-enhancing tools that help laboratories operate effectively and efficiently.

Improve detection limits with SIFI scanning

With a powerful process called Selected Ion and Full Ion (SIFI) scanning, a Selected Ion Monitoring (SIM) scan is obtained while simultaneously acquiring data in the full-scan mode. First implemented by PerkinElmer in 1998, SIFI enhances your analytical productivity by allowing you to:

- **Receive more information in less time:** provides information from both full scan and SIM in one chromatographic run. Up to 32 full scan and/or SIM acquisition functions can be acquired in parallel, in series, or in combination.
- **Save time and money on costly solvents:** labor-intensive pre-concentration and sample cleanup steps may be reduced or eliminated.
- **Detect and quantify compounds difficult to determine at low levels** with greater accuracy and sensitivity, such as pentachlorophenol.

What is SIFI scanning?

Our unique SIFI scanning provides more complete sample information in less time by performing a SIM scan while simultaneously acquiring data in the full-scan mode (Figure 6). SIFI scanning ensures accurate identification, while simultaneously providing enhanced quantifiable sensitivity from the selected ion signal.

Powerful SIM mode increases sensitivity by selectively scanning for individual masses, while omitting or ignoring unwanted or irrelevant masses. By focusing on masses of interest, detection limits are extended to the femtogram range. In full-scan mode, low picogram levels can be detected, allowing acquisition of library-searchable spectra over a wide concentration range.

SIFI is NOT an extracted chromatogram from a full-scan acquisition. Extracted ion chromatograms offer no improvement in signal strength for the ions of interest, only noise rejection from the unwanted masses. SIFI provides significant improvements in detection limits.

- **Increase the throughput of your lab:** reduces the number of analyses by combining a wider range of analyte responses in a single chromatographic run.
- **SIM detection limits and full-scan library searching in a single run.**

Optional PreVent system enhances performance and productivity

Our exclusive PreVent™ pressure-balanced system is an innovative productivity 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. When MSVent hardware is added to an existing PreVent system, it adds significant technical capabilities. With MSVent or PreVent, you can:

- **Remove and change columns rapidly** without cooling and venting the MS.
- **Backflush a single capillary column** (TimeSaver mode).
- **Perform large volume injections** (ELVI mode).

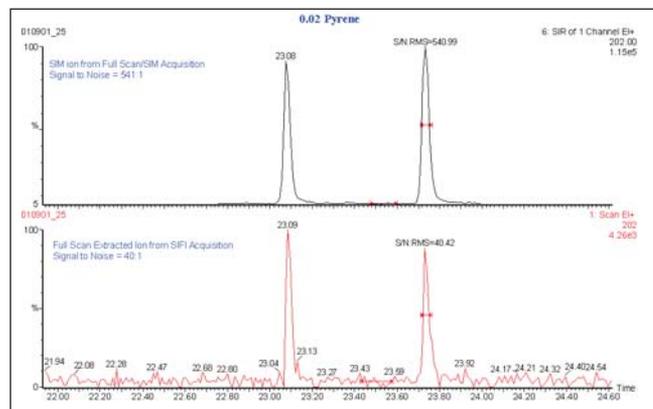


Figure 6. SIFI scanning ensures accurate identification, while simultaneously providing enhanced quantifiable sensitivity from the selected ion signal.

- **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 open split interface).
- **Connect the vent to a second detector** for dual-signal capability.

Gain flexibility and automation capability with the integrated Autosampler

The integrated Clarus GC Autosampler provides a mechanically robust, dependable system with the flexibility and automation capability you need.

- **Complete application flexibility:** accommodates three syringe sizes (0.5, 5.0 and 50 μ L) and three injection speeds (slow, normal and fast).
- **Smart, single-autosampler design assures efficient utilization of the gas chromatograph:** provides unobstructed access to either injection port, allowing any combination of analyses.
- **Quality assurance built in:** optical sensors consistently monitor system performance for accurate injections, run after run.
- **You are in full control using the Clarus 600 GC touch screen:** you also see run, status and automation logs that indicate any deviation from the pre-programmed method conditions.

Choice of ionization to suit your application

The Clarus 600 MS can acquire data in both Electron Ionization (EI) and Chemical Ionization (CI) modes.

- **EI produces high-quality classical spectra** that are the basis for compound identification by library searching.
- **Positive ion and negative ion CI mode (optional)** can be used for obtaining molecular weight information, additional selectivity with complex samples, or when detailed characterization is required.
- **EI mode can be run with the CI ion source** for rapid screening without changing the ion source, a productivity benefit for your lab.



Choice of acquisition-mode options provides further flexibility

- **Full-scan mode** is available with Centroid mode and Continuum mode running independently or simultaneously.
- **SIM mode** can run independently or concurrently with the various full-scan modes.

More column choices

The Clarus 600 C and T GC/MS turbomolecular pump models allow a carrier-gas flow of up to 5 mL per minute in EI mode. This means you have more column choices than with other GC/MS systems. Narrow-, medium- and wide-bore columns can be used with an almost unlimited choice of stationary-phase column diameters and analytical methods.



create an integrated

Create the complete GC/MS system you need by choosing the options that best meet your application, performance and throughput needs.

Then combine the high-performance Clarus 600 GC/MS with our market-leading TurboMatrix™ sample handling, flexible user-friendly software and world-class service and support for an integrated, complete analytical solution. Whatever your performance and throughput needs, for any application – environmental, chemical, flavor and fragrance, food and beverage, forensic or pharmaceutical – PerkinElmer delivers on your expectations.

Choose the pump that meets your requirements

The family of Clarus 600 GC/MS systems is available with three different vacuum pumping capacities.

- **Clarus 600 C GC/MS:** EI and CI with 255 L/sec turbomolecular pump allows higher column flow rates and pump-down times under 3 minutes.
- **Clarus 600 T GC/MS:** EI with 255 L/sec turbomolecular pump allows higher column flow rates and pump-down times under 3 minutes.
- **Clarus 600 S GC/MS:** EI with 75 L/sec turbomolecular pump offers affordable, faster pump-down times.
- **Clarus 600 D GC/MS:** EI with an air-cooled oil diffusion pump provides a lower system cost.

You choose the pumping system to fit your applications, performance and budgetary needs.

Clarus 600 Gas Chromatograph

The high-performance Clarus 600 Gas Chromatograph (GC) meets the needs of every fast-paced, high-volume laboratory to speed up injection-to-injection times.

It features a unique high-performance oven with the fastest available heat-up and cool-down rate in a conventional GC. Other features such as the PreVent pressure-balanced system, Programmable Pneumatic Control (PPC) configurations, TotalChrom Chromatography Data Systems (CDS), and an intuitive touch-screen interface with real-time signal display and eight-language support, further increase productivity.

Expert, end-to-end service and support

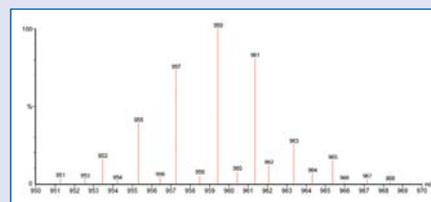
PerkinElmer manufactures and supports the broadest range of instruments, reagents and consumables in the industry. With over 60 years of experience, our knowledge, skills and expertise are unparalleled. We have the largest and most experienced service force in the industry, so you can count on us to be there when you need us. Our 1200 factory-trained and certified engineers have an average 15 years of experience maintaining leading-edge scientific equipment, including preventative maintenance, validation support and instrument repair. Plus, you can rely on end-to-end training and technical and applications support, from sample handling through data handling.

analytical solution

for your performance and throughput needs

Clarus 600 GC/MS

- Semivolatile organics in environmental matrices
- Pesticides in soil, water and food
- Drugs-of-abuse testing for purity analysis and in bodily fluids
- Brominated flame retardants in electronic components

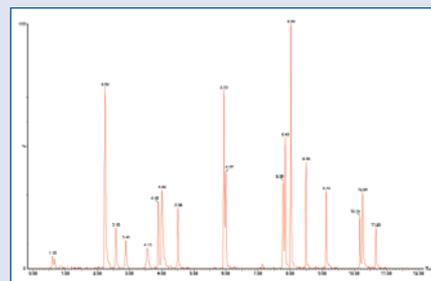


Molecular ion cluster for Decabromodiphenyl Ether (BDE-209).

With TurboMatrix Headspace

Our TurboMatrix Headspace and high-sensitivity Headspace Trap samplers provide unparalleled precision and ease-of-use for any GC or GC/MS application. You choose the system you need based on your performance and throughput requirements.

- Volatile organics in environmental matrices
- Blood-alcohol analysis
- Off-odors and off-flavors in food-packaging films

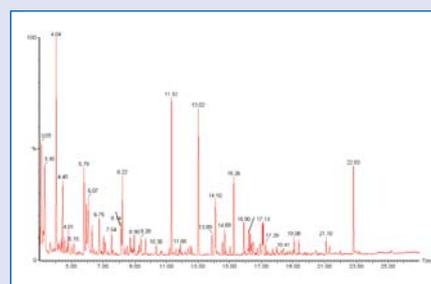


Fuel oxygenates measured using U.S. EPA Method 8260B after Headspace Trap extraction from water.

With TurboMatrix Thermal Desorption

Our family of five different TurboMatrix Thermal Desorber models allows you to match throughput and technology to your laboratory and applications needs. Choose from single-tube and automated 50-tube configurations, with PPC or manual pneumatics.

- Air Toxics (U.S. EPA Method TO-17)
- Occupational health and safety samples
- VOCs in food/pharmaceutical packaging
- Arson accelerants



Air toxics analysis of outdoor air sample.



PerkinElmer, Inc.

PerkinElmer, Inc. is a global technology leader focused in the following businesses – Life and Analytical Sciences and Optoelectronics. Combining operational excellence and technology expertise with an intimate understanding of its customers' needs, PerkinElmer creates innovative solutions that accelerate drug discovery, enhance research productivity, help meet regulatory requirements, improve time-to-market and increase manufacturing efficiencies.

PerkinElmer – the clear choice in gas chromatography

PerkinElmer is the only chromatography 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.

Clarus 600 GC/MS – our latest innovation in GC delivers for you!

Get more information about how you can boost your GC/MS productivity with the high-performance Clarus 600 GC/MS. Learn how a total integrated system and the support to go with it can benefit your lab.

Visit www.perkinelmer.com/GC or call your local sales office.

PerkinElmer Life and Analytical Sciences
710 Bridgeport Avenue
Shelton, CT 06484-4794 USA
Phone: (800) 762-4000 or
(+1) 203-925-4602
www.perkinelmer.com



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