

Clarus 500

Gas Chromatograph



redefines **ease-of-use**
for **everyday** applications

sleek design and easy touch screen revolutionize GC interaction

The sleek Clarus® 500 Gas Chromatograph (GC) from PerkinElmer offers a whole new approach to the way you interact with your GC instrument. An intuitive touch-screen interface features real-time signal display and eight-language support. It's what makes the Clarus 500 GC so easy to use and so hard for competitors to beat.

This cutting-edge user interface is combined with the proven dependability of a PerkinElmer® GC. In fact, PerkinElmer was recognized in both 2001 and 2002 with the *Scientific Computing and Instrumentation* Reader's Choice Award for GC. The GC systems have the performance needed for the demands of both research and quality-control environments. Additional unique features like our integrated autosampler tower, the PreVent™ pressure-balanced system and easy serviceability enable the Clarus 500 to deliver enhanced GC productivity.

Available in hundreds of configurations ranging from easy-to-use, flexible analyzers to dedicated, turnkey systems for petrochemical and air analysis, the Clarus 500 GC is extremely versatile. The PerkinElmer TurboMatrix™ Headspace and Thermal Desorption sample-handling devices can be integrated with the GC, providing solutions for applications such as beverage analysis, ambient air testing, environmental



QUICK GLANCE

- Intuitive touch screen is easy to use, no training required
- Dual-channel, real-time signal display on the touch screen
- Flexible configurations with integrated headspace or thermal desorption
- Robust, proven design provides reliable performance year after year
- Access to worldwide PerkinElmer service and support team

work and more. For data management and reporting, PerkinElmer's award-winning TotalChrom® Chromatography Data Systems (CDS) make managing data easier than ever.

PerkinElmer also backs all its products with factory-trained field support in more than 125 countries worldwide. The only vendor with a complete offering from sample handling to gas chromatography to data analysis and reporting, PerkinElmer offers an integrated single-vendor solution. You can rely on one company for service and applications support.

innovative touch screen makes operation simple

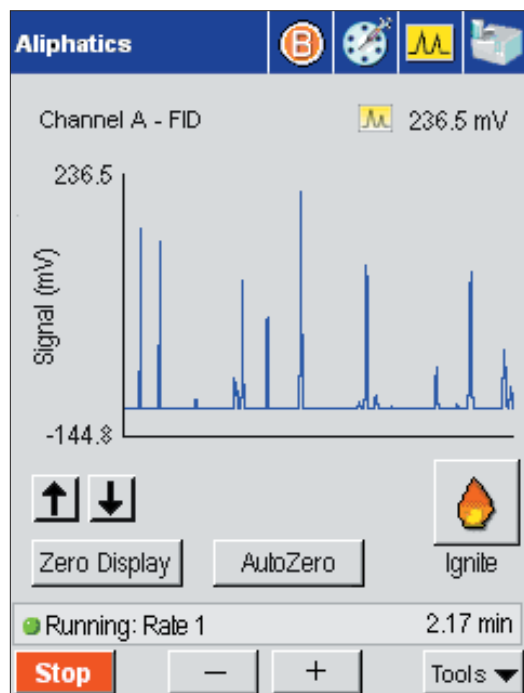
When you invest in a new instrument, you do not want to waste time learning how to navigate a complicated interface. Most interfaces require drilling down multiple layers to locate fragments of information. By the time you reach the function you were looking for, it is difficult to remember how you got there, or how to get back. Many interfaces even require you to continually reference the manual in order to operate the system effectively.

GC analysis at your fingertips

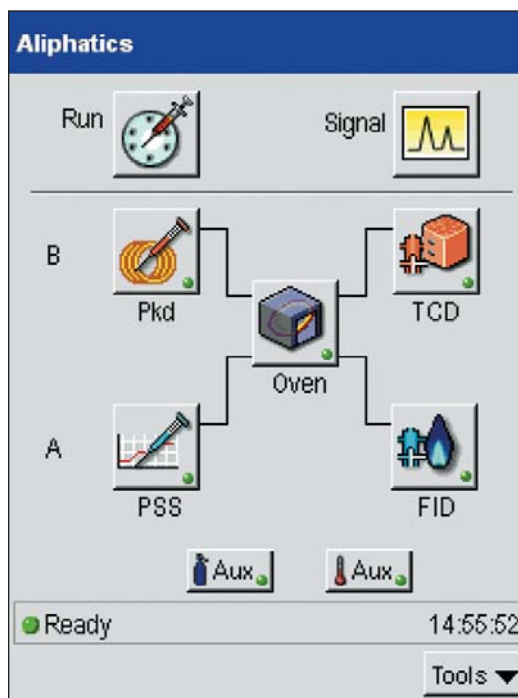
The Clarus 500 is the first GC to replace the cumbersome and confusing keypad user interface with a large, full-color touch screen. The signal screen displays a real-time chromatogram, allowing you to monitor the current state of the system at a glance. You can get a complete picture of what is happening with your analysis just from walking by. The signal monitors both channels

simultaneously. To view the channels on the touch screen, simply press a button to alternate the view, providing immediate access to key information. You do not need to wait for the run to complete to view the results.

While easy accessibility is a critical measure of usability, smooth navigation is equally important. A clear and concise visual language guides users through the system. With single-touch access to the functions you need, the Clarus 500 GC touch screen eliminates drill-down, simplifying instrument control for novices and experienced users alike. The status screen presents a comprehensive overview of the system. Icon buttons define the type and status of each heated zone and each injector and detector is identified by a unique icon, which is color coded by channel.



Real-time chromatogram is displayed continuously, allowing you to monitor your runs.



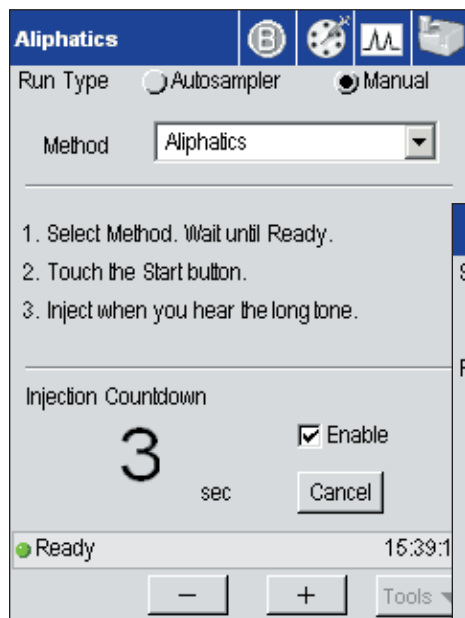
The status screen displays the type and status of each zone.

The touch screen is like having a complete GC software program on the instrument. When you want to make a manual injection, the countdown feature helps you time the injection precisely every time, giving repeatable sample injections. And the functions you need are exactly where you would expect to find them. If you need to light the FID, just press the ignite button. If you want to access the oven-temperature program, the oven button gets you there in one touch and the graph shows you exactly where you are in the run.

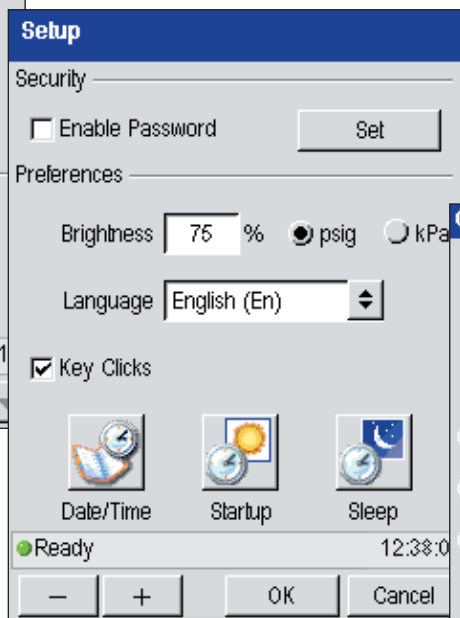
Easy setup/method development

Even if you don't use the system frequently, the touch-screen interface makes method development easy. The screen provides immediate access to all method parameters (including detectors, columns, injectors, temperature-controlled devices, pressure controllers, relays and valves) in any order, eliminating the need for linear entry of analytical conditions. The system can save up to five methods with unique names so experiments can be quickly and accurately replicated.

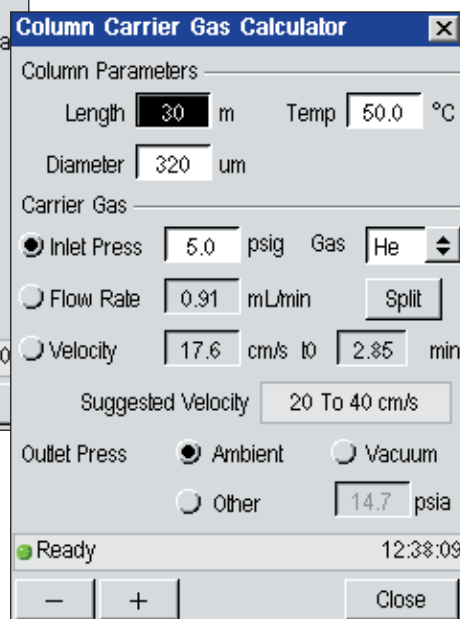
Our exclusive, integrated flow calculator allows optimized adjustment of carrier-gas conditions without a separate software program. Simply pick the variable level you want to achieve and the system will automatically determine the correct conditions for your analysis.



The injection countdown ensures high precision for manual sample injections.



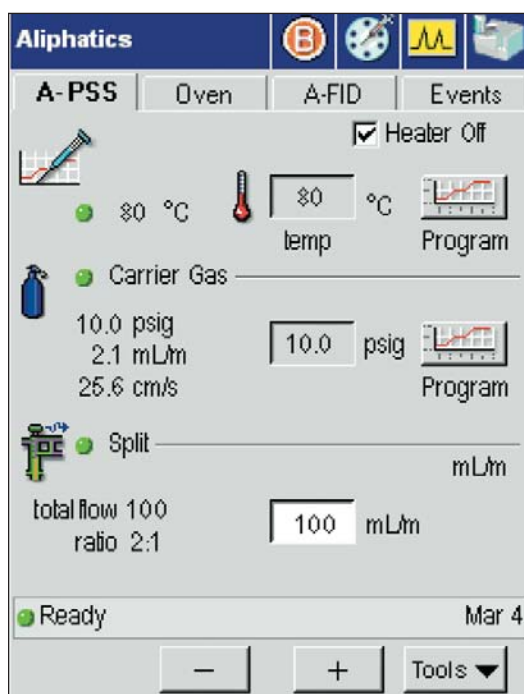
Setup enables user-preferences for Startup and Sleep modes, as well as other options.



The exclusive PerkinElmer built-in flow calculator determines flow rate at a given column length and diameter.

Multiple language support

The Clarus 500 GC comes with multilingual capability, including error messages, so you can work in the language of your choice – and you can easily switch to different languages. This ensures your entire staff is at ease when working with the system. So whether you speak English, Spanish, French, Russian, Japanese, Chinese, German or Italian, the Clarus 500 GC makes perfect sense.



View and modify instrument parameters using the Active Method screen.

Simplify maintenance

The touch-screen interface keeps track of the number of injections so you know when to replace septa and perform routine maintenance on the system, eliminating the need to track this important information on paper. It tracks total number of injections and elapsed time; both can be reset. It gives proactive warning and user error messages, using real words instead of cryptic codes. The Clarus 500 GC also offers the ability to turn off the FID and other instrument parameters overnight or over the weekend.



Available in eight languages, the Clarus 500 speaks everyone's language (Italian shown above).

advanced capabilities enhance system throughput

Integrated autosampler

The totally integrated Clarus GC autosampler provides flexibility and automation capability for the gas chromatograph. This best-in-class autosampler accommodates three autosampler syringe sizes (0.5, 5.0 and 50 μ L) and three injection speeds (slow, normal and fast) for complete applications flexibility. Unobstructed access to either injection port with one autosampler permits any combination of analyses for the most efficient utilization of the gas chromatograph.

The autosampler is fully controllable from the Clarus 500 GC touch screen, featuring run status and automation logs that tell whether there was any deviation from the preprogrammed method conditions. The autosampler provides a mechanically robust, dependable system. Performance is assured by optical sensors that consistently monitor the system to make certain all is proceeding as planned.

Temperature-programmable inlets maximize flexibility and performance

For more demanding applications, the Clarus 500 GC inlet positions are programmed with a range of temperature-programmable inlets. Options include two enhanced capillary injectors, the programmable split/splitless (PSS) and programmable on-column (POC). Clarus 500 split/splitless inlets significantly reduce risk of sample degradation, thereby maximizing accuracy and precision over a wide range of sample volumes.

For analyses including those where the sample is sensitive to thermal degradation or susceptible to discrimination due to non-representative vaporization, choose a PSS inlet and programmable on-column injector.

The PSS system manages sample vaporization, reducing the boiling-point discrimination that is caused by injecting into a hot inlet. The integrated charcoal trap cleans the split effluent to prevent contamination of gas lines and regulators, while removing the possibility of analyte discharge to the atmosphere. The trap also provides a “pressure buffer” for vaporizing samples, delivering the lowest available discrimination.



Programmable pneumatic control (PPC)

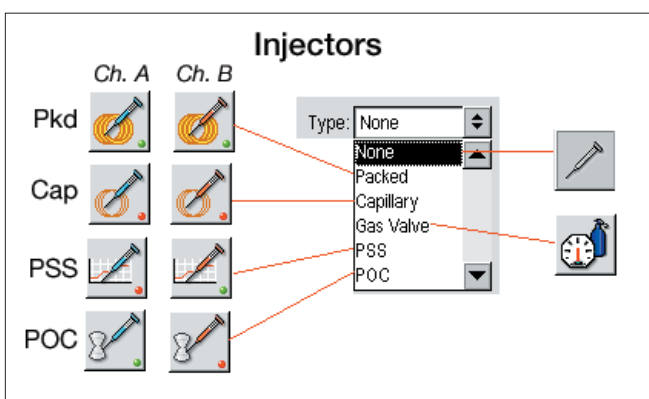
PPC offers additional capability and levels of performance not attainable with manual pneumatic systems, allowing analysis of a wide range of samples. PPC gives you the capability to control and monitor all injector, detector and auxiliary gases electronically, using the Clarus 500 color touch screen.

PPC eliminates complexity by removing labor-intensive and complex steps associated with measuring and setting flows manually. You set all flows and pressures of all the instrument gases on the touch screen – no more knobs or complicated software. For instance, to set up split ratios, you simply enter the required ratios on the touch screen and the Clarus 500 GC automatically calculates and adjusts the split vent to the correct flow for the selected column flow. Additionally, automatic control of detector gases allows quick and easy setup of the detector combustion or makeup gases, reducing variability in instrument setup due to operator bias or environmental conditions. You can enter published methods exactly as written, without trial and error, saving time and increasing reproducibility.

How does PPC work?

Using PPC, the Clarus 500 GC automatically adjusts carrier-gas flows to compensate for variations of ambient temperature and pressure, providing constant retention times under widely varying conditions. This greatly enhances system stability even in extreme environments. With flexible flow velocity and pressure control, users can program the carrier gas for optimal column performance.

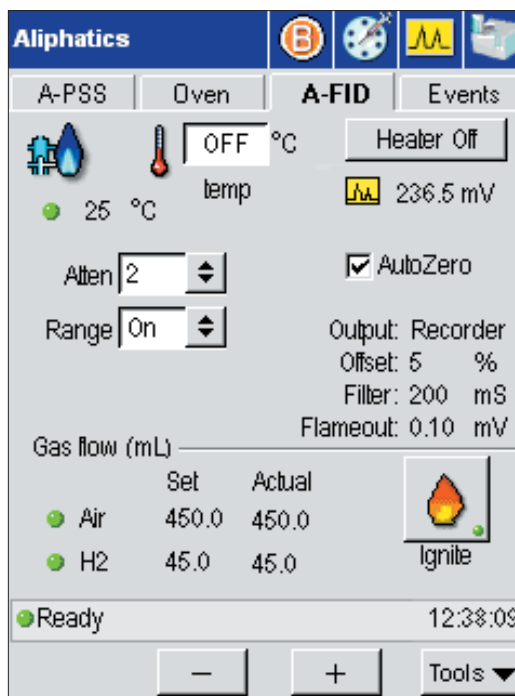
Constant mass-flow control simplifies setup and shortens analysis time while improving performance of certain detectors, including those sensitive to mass-flow changes such as thermal conductivity detectors and nitrogen phosphorus detectors.



Icons allow quick and easy recognition of selected injectors and other devices.

A single PPC method stores all the temperatures, gas flows and pressures so that it is easy to follow standard operating procedures (SOPs). Simply recall the method to establish complete operating conditions. If a greater level of data management is required, PerkinElmer TotalChrom CDS can control and store all operating conditions with the chromatographic data and the method.

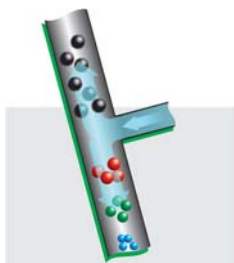
Using PPC also greatly enhances confidence in system performance and accuracy. By monitoring deviations from the pneumatic set-points, the Clarus 500 GC can automatically shut down if leaks are suspected. The system constantly monitors the status of the combustion gas. If the Clarus 500 GC detects that the flame is out and automatic reignition fails, it turns off combustion gas supplies, preventing injection and possible loss of valuable samples.



Obtain up-to-the-minute FID status information.

exclusive PreVent technique

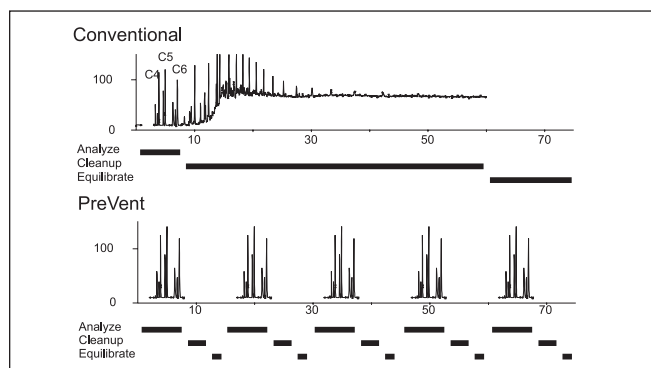
improves performance



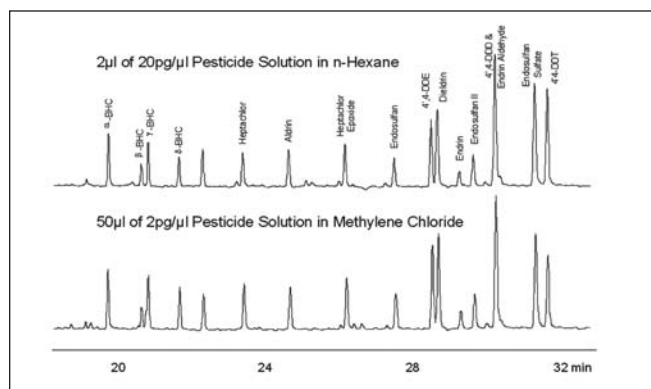
The Clarus 500 GC offers the PerkinElmer-exclusive, optional PreVent operating technique. This powerful technique uses the combined features of the temperature programmable PSS injector and PPC to increase analytical throughput, manage difficult samples, protect the column and chromatograph, and lower detection limits.

Time Saver mode

The PreVent Time Saver mode selectively prevents unwanted components such as high-boiling-point analytes or residues from going through the chromatographic separation system and detector. This reduces analysis time, while improving system stability and overall uptime.



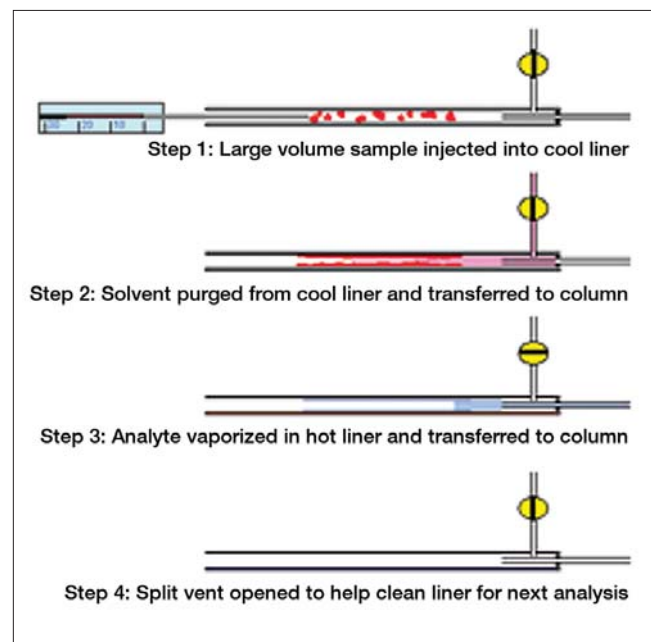
Time Saver mode reduces analysis time.



Enhanced Solvent Purge mode allows the use of chlorinated solvents with an electron capture detector.

Enhanced Solvent Purge mode

The PreVent Enhanced Solvent Purge mode can reduce effects of high solvent levels in the column and detector more completely than PSS alone. This mode eliminates solvent flooding of the column and allows use of methylene chloride as a solvent with an ECD. Enhanced Solvent Purge mode also improves the performance of large-volume injections by removing the influence of excess solvent from the system. Large-volume injections can be made into a cold injector and the solvent vented before the analytes are transferred to the column, providing online solvent evaporation and higher productivity.



Enhanced Solvent Purge mode enables large-volume injections.

Isolation mode

The PreVent Isolation mode minimizes downtime by allowing a septum change without interruption of carrier flow to the column, making it possible to perform routine maintenance on the inlet without impacting system stability. Following maintenance, the system is available immediately for analysis.

New septa can even be conditioned for high-sensitivity analysis, without compromising the established performance of the column and detector. Isolation mode can be used while chromatography is taking place. Isolation mode even works with the Clarus 500 GC autosampler which positions the tower and syringe away from the GC inlets except during injection. This facilitates easy access to the injectors during analysis without interrupting or interfering with the autosampler sequence.

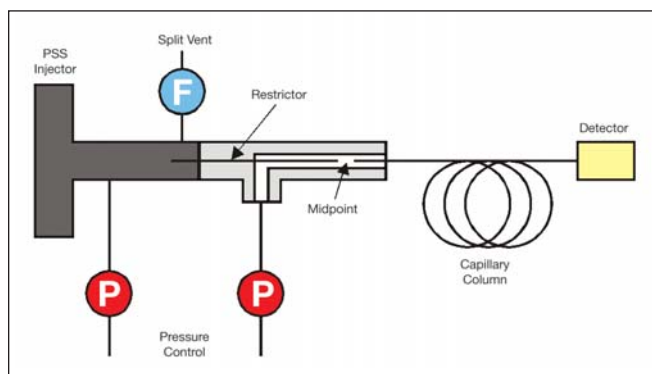
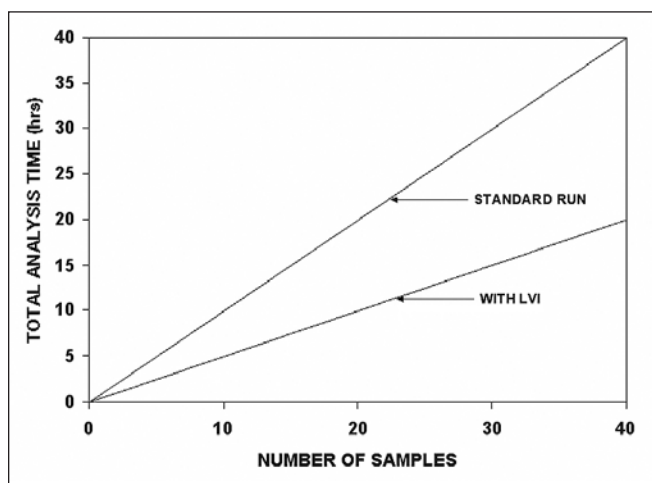


Diagram of PreVent with injector restrictor installed.



By eliminating the final stage of sample evaporation, ELVI can double sample throughput. Note: Total analysis time = GC run time + sample preparation time.

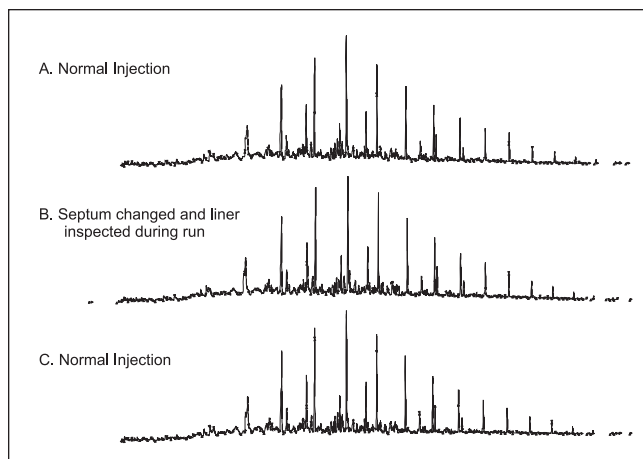
ProTect mode

The ProTect™ mode prevents heavy components in the sample from reaching the separation column by utilizing dual column (precolumn) backflushing. This protects the column and detector and reduces the analytical cycle time, allowing enhanced throughput.

Enhanced large-volume injection mode

Enhanced large-volume injection (ELVI) and solvent-purge capabilities of the Clarus 500 GC and PSS injector make the system extremely flexible. LVI allows injection of a large amount of sample without degradation in chromatographic performance. It reduces sample preparation time by eliminating the need for sample concentration through evaporation. LVI uses standard hardware and is totally compatible with the Clarus 500 autosampler for samples up to 50 µL. Sample volumes greater than 50 µL can be injected manually. The only limit to sample size is the capacity of the PSS liner to contain the liquid sample during injection.

ELVI can also enhance system sensitivity without sacrificing performance. The solvent-purge mode vents the solvent from a sample injection into a cold PSS before analytes are transferred to the column. Compared to a conventional injection of 1 to 5 µL, a 50 µL ELVI results in a 10 to 50 percent increase in sensitivity.



Three successive injections of diesel oil run in Isolation mode. Septum changed and injector liner inspected during run B.

turnkey solutions to application challenges

PerkinElmer develops a broad array of custom analyzers for a wide range of applications and multiple industry segments. These systems combine proven gas chromatography products and accessories with expertise, technology, hardware and software. Because the analyzers and systems are integrated and performance tested before shipment, no complex setup or method development is required during installation.

In partnership with Arnel™, PerkinElmer has produced more than 100 turnkey solutions that have greatly increased your analytical options. Laboratory and plant-based tools for environmental, QC and process monitoring are available for indoor air monitoring, as well as petrochemical, food, beverage, pharmaceutical and other industries.

Petrochemical analysis from hydrogen to asphalt

The analytical challenges of monitoring and controlling petrochemical processes and products are as complex as the chemical processes themselves. The term “hydrogen to asphalt” categorically represents the breadth and depth of raw materials and products derived from crude oil. Each category has a set of analytical requirements that include single- or multiple-component analysis plus the determination of metals and carbon content.

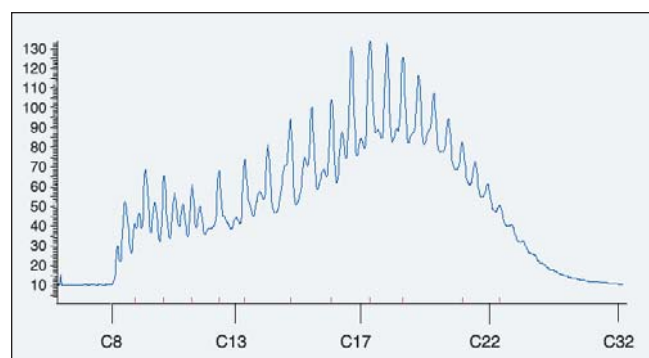
Refinery gas analysis includes hydrocarbon mixtures in refinery feed stocks and products such as naphtha, reformate, alkylate and gasoline. Natural gas analysis includes a family of gas analyzers to address a full range, including H₂, O₂, N₂, CO₂, and C₁ through C₅ as well as C₆ and higher hydrocarbons.

Analytical methodologies play a critical role in ensuring that manufacturing conditions are monitored and that product quality is consistently maintained. PerkinElmer’s analytical solutions complement these methods by

providing gas chromatography solutions from sample handling to data handling. These systems monitor every aspect of your application including refinery gas analysis, natural gas analysis and trace sulfur analysis. PerkinElmer’s analytical solutions meet or exceed published methodologies and address your specific analysis criteria.

Ozone precursors analysis

In the United States, the Clean Air Act of 1970 gave the Environmental Protection Agency (EPA) responsibility for maintaining clean air. Six parameters are measured routinely in ambient air: SO_x, NO_x, PM₁₀, Pb, CO and ozone. In the 1990s, the Clean Air Act was expanded to include volatile organic compounds (VOCs) that contribute to the formation of ground-level ozone. These measurements are implemented through Photochemical Assessment Monitoring Stations (PAMS). Similar recommendations have also been made in Europe following the 1992 Ozone Directive and United Nations Economic Commission for Europe protocol on controlling VOC emissions. PerkinElmer, in conjunction with the U.S. EPA, developed an analyzer and methodology for collecting and automatically measuring C₂-C₁₁ without the use of liquid cryogen. The PerkinElmer Ozone Precursor Analyzer incorporates an on-line TurboMatrix Thermal Desorber and a Clarus Gas Chromatograph.



Chromatogram of Reference Gas Oil standard for ASTM D2887.

Workspace air monitoring helps you breathe easy

Maintaining a safe work environment is a requirement and challenge faced by many companies. Monitoring air quality can be particularly difficult because, unlike other workplace hazards, the problem is invisible. PerkinElmer provides air-quality analyzers that help companies ensure safe environments for workers. These systems utilize gas chromatography to test for single or multiple gaseous contaminants.

The Workspace Air Monitoring System (WAMS) is a laboratory or control room-based tool. It provides protection to the workforce and documents occupational safety, thus meeting regulatory requirements.

The PerkinElmer-Arnel Series 5200 WAMS monitors workspace air for low levels of controlled compounds. Typical environments where the WAMS have been successfully implemented include facilities for ethylene oxide sterilization and those that use industrial solvents such as benzene.

Food and beverage quality control

Trace levels of acetaldehyde develop as an impurity or byproduct in the manufacture of bottles from Polyethylene Terephthalate (PET) and affect the taste of water and carbonated beverages placed in these bottles.

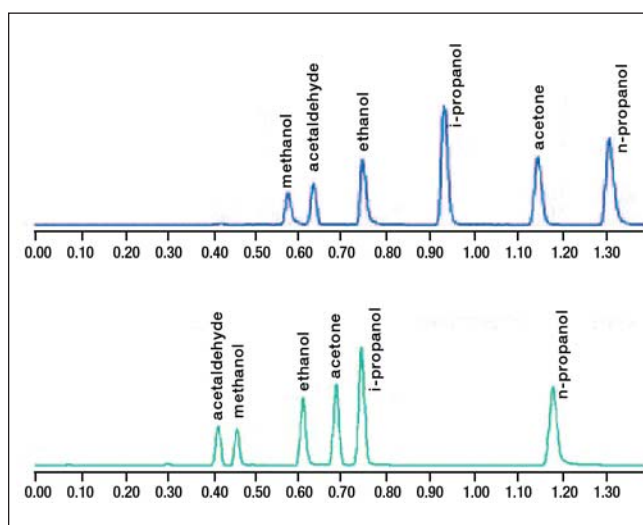
The PerkinElmer-Arnel Series 5100 analyzers are designed as a QC tool to batch sample bottles sequentially and automatically at the rate of about one bottle per minute as well as report and store data with a software/computer system.

The PerkinElmer-Arnel Series 6000 analyzers are designed to meet or exceed ISBT (International Society of Beverage Technologists) specifications for trace-impurity compounds in beverage-grade CO₂. These analyzers provide a complete solution to test at each stage of manufacture, during product delivery and in the final use at the beverage producer, from sample handling and instrument calibration to analyzing compounds and data handling.

Rapid blood-alcohol analysis

Accuracy and precision are critical in blood-alcohol analysis because the toxicologist not only has to be confident in his or her results, but also must be prepared to withstand tough cross examination by defense attorneys. In addition, crime laboratories must comply with state regulations regarding blood-alcohol testing, including proficiencies which require the result to be within $\pm 10\%$.

For this application, you can couple a Clarus GC with a TurboMatrix Headspace sampler, the industry standard around the world for the determination of alcohol in blood. The simultaneous chromatograms below illustrate the ability of the headspace samplers to deliver confirmatory results within 1.5 minutes for ethanol and other required analytes for blood analysis. For high throughput, the TurboMatrix HS 110 can process a full magazine of 110 vials in three hours.



Simultaneous chromatograms of blood-alcohol analysis, showing confirmatory results.

PerkinElmer, Inc.

Combine the Clarus 500 GC with our market-leading TurboMatrix sample handling, flexible user-friendly software and world-class service and support for an integrated, complete analytical solution from a single source.

Headspace sample handling

Our TurboMatrix Headspace and high-sensitivity Headspace Trap samplers provide unparalleled precision and ease-of-use for any GC or GC/MS (see Clarus 600 GC/MS below) application. You choose the system you need based on your performance and throughput requirements. Our proven TurboMatrix Headspace technology delivers on your expectations.

Thermal desorption sample handling

Our family of five different TurboMatrix Thermal Desorber (TD) 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. Use this clean technique to simplify and speed up a wide range of GC applications.

Flexible, expandable data-handling solutions

With its scalable architecture, 21 CFR Part 11 compliance features and proven algorithms, TotalChrom CDS offers a computing strategy to manage your growing volume of chromatography data quickly, efficiently and safely in both regulated and non-regulated environments. Operating in a Microsoft® Windows® environment, TotalChrom CDS can control up to eight instruments.

Clarus 600 gas chromatograph

For fast-paced, high-volume laboratories, the high-performance Clarus 600 GC provides the fastest analytical cycle times in conventional GC, featuring a unique, high-performance oven. The resulting shorter injection-to-injection time will significantly increase your throughput and productivity by speeding your analytical cycle time.

Clarus 600 gas chromatograph/mass spectrometer

Combine the Clarus 600 GC with our Clarus 600 Mass Spectrometer (MS) for a high-performance GC/MS. The Clarus 600 GC/MS is a best-in-class quadrupole GC/MS with a fast scanning speed and wide mass range. Multiple pumping options and robust hardware features, coupled with easy-to-use TurboMass™ software, create a powerful package to drive your laboratory analyses.

Expert, end-to-end service and support

PerkinElmer manufactures and supports the broadest range of instruments, reagents and consumables in the industry. 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.

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



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

©2006 PerkinElmer, Inc. All rights reserved. The PerkinElmer logo and design are registered trademarks of PerkinElmer, Inc. PreVent, SIFL, TurboMass and TurboMatrix are trademarks and Clarus, PerkinElmer and TotalChrom are registered trademarks of PerkinElmer, Inc. or its subsidiaries, in the United States and other countries. Arnel is a trademark of Arnel, Inc. Microsoft and Windows are registered trademarks of Microsoft, Inc. All other trademarks not owned by PerkinElmer, Inc. or its subsidiaries that are depicted herein are the property of their respective owners. PerkinElmer reserves the right to change this document at any time without notice and disclaims liability for editorial, pictorial or typographical errors.