

AAAnalyst 700

Atomic Absorption Spectrometer



Introduction

The AAAnalyst™ 700 Atomic Absorption Spectrometer offers productivity enhancing features for flame and furnace atomic absorption in a proven cost-effective design. The fully integrated benchtop system includes flame and heated graphite furnace atomizers (HGA) with continuum source background correction. Both

atomizers are motorized and switching between flame or furnace occurs in seconds with a click of the mouse. The unique automated atomizer changing system, high-speed automatic wavelength drive, automatic lamp selection and stored analytical methods let the AAAnalyst 700 determine up to 20 elements in one completely automated run, maximizing your productivity.

Key Features

- ▶ Proven cost-effective HGA graphite furnace
- ▶ Automatic switching and alignment of flame and furnace atomizers
- ▶ Fully automated eight-lamp mount with built-in EDL power supply
- ▶ Continuum source background correction
- ▶ High-efficiency optical system with solid-state detector
- ▶ WinLab32™ software for AA provides maximum productivity and compliance

High-efficiency optical system for unmatched performance

The AAnalyst 700 system includes a high light throughput optical system featuring a unique solid-state detector, providing the highest efficiency in the UV region. Combine our state-of-the-art detector with proven monochromator efficiency and spectrometer throughput and even elements such as As and Ba can be measured with outstanding signal-to-noise ratios.

Fast, accurate background correction

The AAnalyst 700 utilizes a high-intensity deuterium arc lamp for the correction of non-specific background (Figure 1). Sampling frequency and background interpolation are optimized to provide exceptional correction accuracy and detection limits.

Real-time continuous measurement for unmatched flame stability

The revolutionary double-beam design of the AAnalyst 700 system (Figure 2) provides continuous simultaneous measurement of both sample and reference beams. Utilizing a high-efficiency fiber-optic cable, the sample and reference beams are simultaneously focused on the solid-state detector. This translates into increased signal integration time (without increasing analysis times) for improved detection limits and reproducibility.

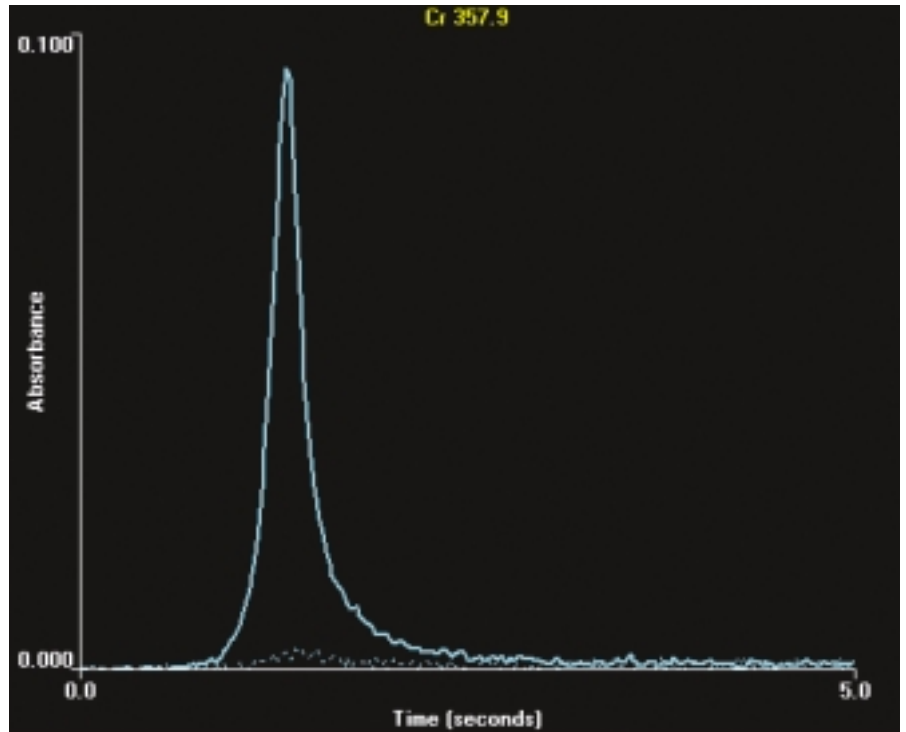


Figure 1. Determination of 1 µg/L chromium in an aqueous solution, using the AAnalyst 700 graphite furnace.

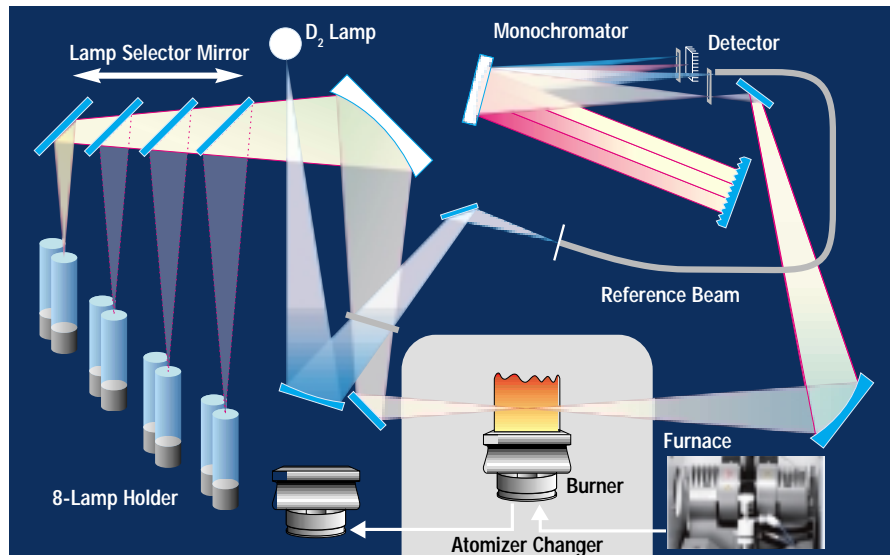


Figure 2. Revolutionary optical system for maximum performance.

Proven furnace capabilities

The PerkinElmer HGA graphite furnace has demonstrated its capabilities in thousands of laboratories around the world. The HGA furnace is an integral part of the AAnalyst 700 and features a closed furnace design that is sealed at both ends with easily removable bayonet-mount windows. The closed design is a prerequisite for controlled, reproducible analytical conditions.

An external protective gas stream around the graphite tube prevents the entrance of outside air. The separate independently controlled external and internal gas streams provide maximum flexibility, tube life and sensitivity.

Integrated platform tubes for uncompromised multi-element analysis

With the integrated platform graphite tubes (Figure 3), all elements—including refractories—can be atomized from the platform under Stabilized Temperature Platform Furnace (STPF) conditions. Sequential multi-element determinations of significantly different elements can be performed without compromising analytical performance. The curved design of the integrated L'vov platform also improves detection limits by allowing use of large sample volumes, up to 50 μL .



Figure 3. HGA Integrated Platform Tubes provide STPF conditions for even refractory elements.

Consistent temperature control enhances performance

In conventional furnace systems, the heating rate during atomization depends on the input-line voltage. As voltage varies from day to day, season to season or among laboratory locations, so does the heating rate. The AAnalyst 700 system uses enhanced power control circuitry to maintain a uniform heating rate, so no matter where a system is located, you can be sure that it provides outstanding and consistent performance.

Burner system maximizes stability

The PerkinElmer premix burner chamber has been proven in thousands of laboratories worldwide. The corrosion-resistant solid titanium burner head easily installs in the burner chamber, while a fail-safe mechanism ensures it is always properly restrained without the need for hold-down cables. An inert polymer spray chamber provides superior performance for corrosive and high-solids matrices. Manufactured from a high-strength composite, the spray chamber eliminates the need for pressure-relief devices. The high-precision nebulizer maximizes stability and sensitivity so a wide variety of sample matrices—aqueous or organic, acids or bases, dilute or concentrated—can be analyzed under optimum conditions.

Safety First

Safety features are of foremost importance in any flame AA spectrometer. The AAnalyst 700 system includes sensors and interlocks to ensure the utmost in safety. Operation is permitted only if all conditions are satisfied for totally safe operation. Flame ignition and switchover from air-acetylene to nitrous oxide-acetylene are computer controlled and automatic. In the event of a power failure, the flame is extinguished safely and automatically.

Easy to use for maximum productivity

The AAnalyst 700 system with automatic lamp selection and alignment makes setup easier than was ever thought possible. High-capacity autosamplers along with WinLab32 software bring a new level of productivity to the laboratory.

Automatic lamp selection and alignment ensure proper installation

The system includes an eight-lamp mount with built-in power supplies for both hollow cathode and electrodeless discharge lamps (EDLs) (Figure 4). EDLs provide much higher light output and longer lifetime when compared to conventional hollow cathode lamps.



Figure 4. Eight-lamp mount for maximum flexibility.

The patented PerkinElmer cableless Lumina™ lamps ensure proper connection. Just slide them in—you can't connect them incorrectly. The Lumina lamps are then recognized by the AAnalyst 700 system and the wavelength, slit and lamp parameters are automatically set and the lamps aligned.

Switching between techniques has never been easier

A simple mouse click is all that is needed to change between flame and graphite furnace. Switching between flame and graphite furnace is computer controlled, ensuring each atomizer is returned to its previously determined optimum position. The AAnalyst 700 system offers fully automated alignment of both the flame and furnace for optimized performance and day-to-day reproducibility.

Automated optimization for maximum sensitivity

Sensitivity and accuracy in flame AA are directly correlated to the optimization of the burner position as well as the gas flows (Figure 5). Careful optimization of these parameters, which can be different for each element, maximizes sensitivity and can significantly reduce or eliminate interferences. The unique computer-controlled motorized burner system and gas controls allow precise, automated

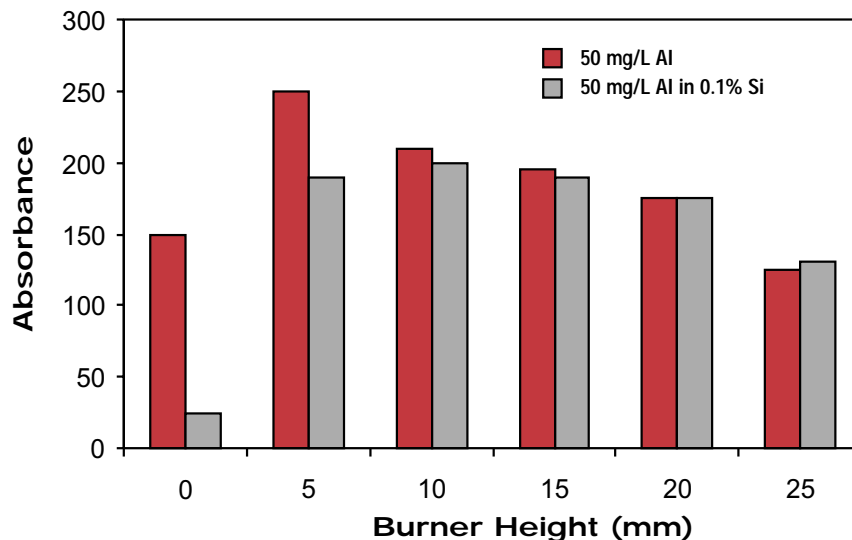


Figure 5. Optimizing burner height minimizes the interference of silicon on aluminum.

STPF increases accuracy and productivity

More than 20 years ago, PerkinElmer pioneered the Stabilized Temperature Platform Furnace (STPF) technique to provide interference-free graphite furnace analyses. By eliminating the need for standard additions, STPF improves accuracy, precision and detection limits while dramatically improving sample throughput. While some other instrumentation offers partial STPF implementation, the AAnalyst systems have fully implemented the technique, providing the best furnace performance.

adjustments. Since the WinLab32 software allows optimized burner position and gas flows to be stored with an element method, each element in a sequential multi-element run can be determined using its own optimized parameters.

Furnace autosampler ensures high throughput

The AS-800 Furnace Autosampler can accommodate up to 146 samples with true random sampling (Figure 6). Digital micro-stepper, motor-driven pumps provide unmatched accuracy and reproducibility. The autosampler completely automates calibration, reducing operator time and eliminating dilution errors. The autosampler can be easily programmed to automatically add spikes and matrix modifiers, perform multiple injections and dilute over-range samples. Solutions can be automatically injected into preheated tubes to optimize drying conditions and increase analysis speeds.



Figure 6. The AS-800 Furnace Autosampler easily swings out of the way for flame analyses.

Additionally, the AS-800 offers variable pipetting speeds to maximize reproducibility for viscous solutions.

Flame autosamplers offer exceptional sampling capacity

The AS-90*plus* or the AS-93*plus* Flame Autosamplers automate standard and sample introductions for instrument calibration and sample analysis, extending the capabilities of the AAAnalyst 700 to those of a fully automated analytical workstation. Both PerkinElmer autosamplers come with a self-rinsing sampling probe and the flexibility to select from multiple tray configurations. An advanced drive system moves the sampling arm in the X and Y coordinates simultaneously, minimizing changeover time between samples (Figure 7). Random access gives you exceptional flexibility in the placement of samples and reference solutions. Corrosion-resistant sampling components are made

entirely of acid- and solvent-resistant materials ensuring longer life. With the AS-93*plus*, a built-in peristaltic pump permits continuous rinsing of the sampling capillary between samples, significantly reducing the risk of carryover. In addition to the standard sample trays, the AS-93*plus* is compatible with trays from many third-party suppliers, providing increased flexibility.

AutoPrep 50 automatic dilution system

The AutoPrep™ 50 system provides automatic, intelligent on-line dilution capabilities, eliminating the time-consuming manual tasks in flame AA analysis. The AutoPrep 50 also eliminates problems such as carry-over and contamination. When used in conjunction with a PerkinElmer autosampler, the AutoPrep 50 provides fully automated sample introduction.



Figure 7. AS-93*plus* Flame Autosampler for fully automated analysis.

Improve productivity with WinLab32 software

WinLab32 software combines ease of use and flexibility to bring a new level of productivity to your laboratory (Figure 8). Designed with extensive input from laboratory managers and AA users around the world, WinLab32 software provides all the tools and features needed to start running samples quickly and meet the requirements of today's laboratory.

Easy to learn and easy to use

The extensive Wizard features of WinLab32 make complex tasks easy with step-by-step instructions (Figure 9). Tool Tips, available in multiple languages, provide additional information about screen text and entry fields. Status Panels display the status of each instrument component for easy monitoring. The Analysis List combines standard, sample and method

information into one list showing the exact order in which the analysis will be run. This list also displays the analysis status at all times and can be printed as a summary at the end of the run.

Improved productivity

WinLab32 software improves laboratory productivity by reducing the time required for method development, sample analysis and report generation. Furnace method development is completely automated, helping to optimize the pyrolysis and atomization temperatures as well as sample and modifier volumes (Figure 9). You can create methods, review or reprocess data offline, and even add samples anytime during an analysis without interrupting the active analysis. Recall Calibration eliminates the need for initial calibration, while Edit Calibration gives you complete control over the quality of your calibration curve before you proceed with QC and sample analysis.

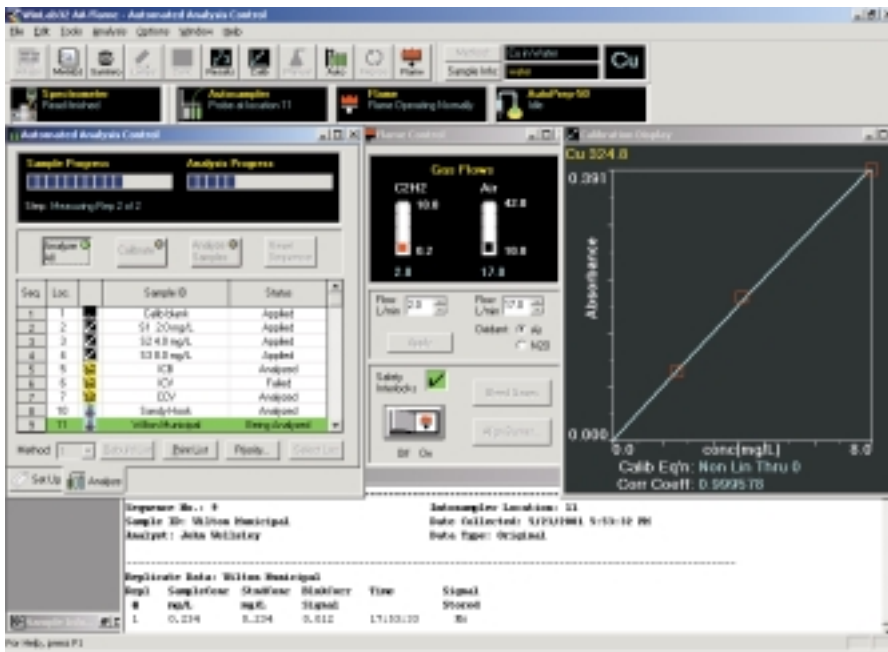


Figure 8. A suite of task-oriented windows can be displayed.

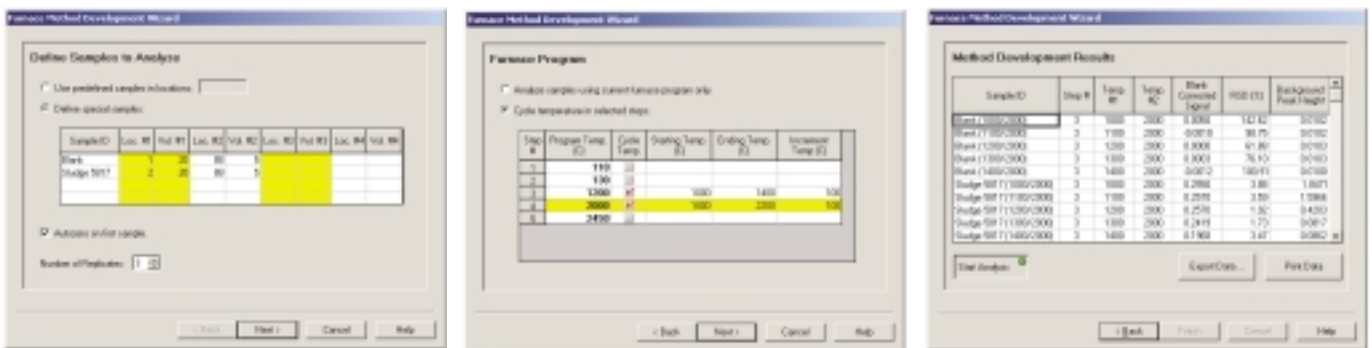


Figure 9. Method development is simplified using the Furnace Method Development Wizard.

Easily work with data

Once you have performed an analysis, WinLab32 software makes it easy to work with your data in any way you wish. The Reporting Wizard in Data Manager allows you to report and save data in a variety of formats compatible with commercial word processing and spreadsheet formats, even HTML (Figure 10). The Export Wizard in Data Manager allows comma- (or other character) delimited files to be created. You can also select and export data items describing the

sample, mean values or replicate values from the Results Library. Peak profiles can be exported and read by most spreadsheet programs. Use a PerkinElmer LABWORKS® LIMS system to create sample information files from backlog lists or QA batches and to store results.

Meeting regulated laboratory requirements

Many laboratories must comply with a variety of regulations imposed by government agencies

or quality protocols and WinLab32 software helps your laboratory meet these regulations. The optional Enhanced Security (ES) software adds additional capabilities needed for regulatory requirements such as 21 CFR Part 11. Some of the regulatory features include:

- A Master Event Log records all actions performed by the user.
- Version numbers are added to all files and data sets.
- Options are provided to prevent analysis without data storage.

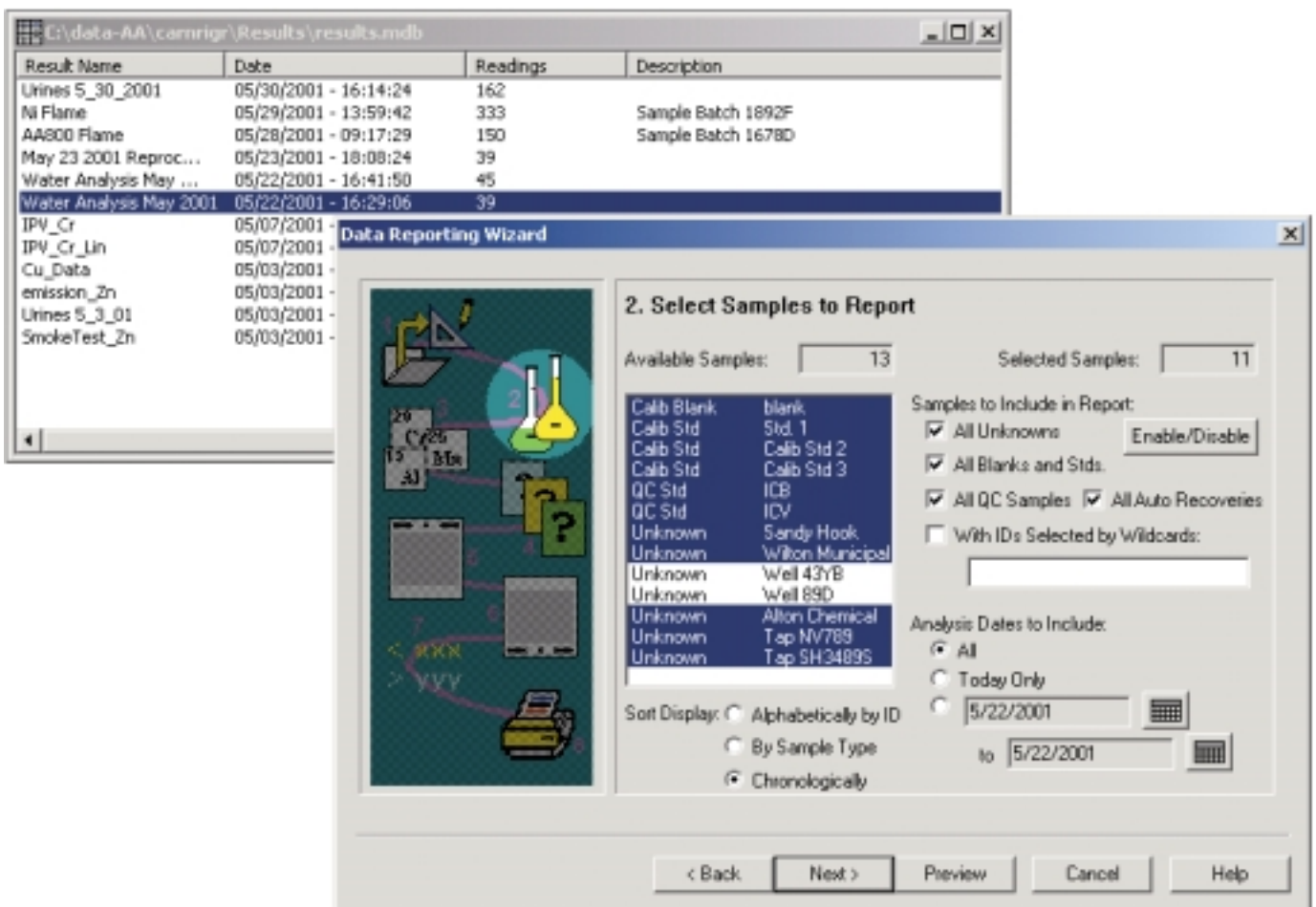


Figure 10. The Reporting Wizard makes data reporting easy.

integrated solutions

for a variety of applications

Based on over 40 years of experience in atomic spectroscopy, we understand your applications and also know the accessories required to meet your analytical needs. You can trust PerkinElmer, the leader in inorganic analysis, to provide you with the right tools for the job.

Mercury/Hydride analysis systems for improved detection limits

The MHS-15 Mercury/Hydride System can adapt your AAAnalyst system for high-sensitivity determinations of Hg and hydride-forming elements such as As and Se. The MHS-15 offers detection limits down to the ng range, while minimizing capital investment and operating costs.

An optional automated flow injection based mercury/hydride system can also be added to the AAAnalyst systems. These Flow Injection Atomic Spectroscopy (FIAS™) systems combine the advantages of mercury/hydride AA with those of flow injection, thus providing true automation and exceptional detection limits even for sequential multi-element determinations (Figure 11).

FIAS-furnace coupling combines the large sample handling capability of a flow injection system with the sensitivity of the graphite furnace. This provides detection limits that are two to three orders of magnitude lower than those obtainable with conventional graphite furnace for hydride-forming elements such as As and Se and for Hg. With flow injection or continuous-flow sampling, you can analyze milliliters of sample instead of the normal microliter volumes typical for graphite furnace AA. Since the matrix is completely removed, the analysis is simplified.



Figure 11. FIAS 100 Flow Injection system with AS-91 Autosampler for improved detection limits.

Microwave digestion system simplifies sample preparation

The Multiwave 3000® system is a versatile and powerful microwave sample preparation system that is easy to operate (Figure 12). Ideally suited for atomic spectroscopy techniques, the Multiwave 3000 simplifies sample preparation for all sample types, including foods, oils, plastics and environmental samples.



Figure 12. Multiwave 3000 for fast, easy sample preparation.

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