

932



933

plus

GBC

COMPACT
ATOMIC ABSORPTION
SPECTROMETERS



Multi-element capability using the patented GBC Application Source puts the 932 Plus and 933 Plus in a class of their own

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GBC Scientific Equipment was founded in 1978 and is now the world's third largest and fastest growing manufacturer of atomic absorption spectrometers with a sales and service network covering over 80 countries.

GBC's growth has been fuelled by its extensive AA expertise, innovative thinking and an obsession for quality and reliability. GBC now produces the widest range of AA spectrometers in the world, with options and accessories to suit every analytical requirement.

This innovative thinking is exemplified by the double beam 932 Plus and the single beam 933 Plus spectrometers, both of which utilize the revolutionary, patented Application Source to give multi-element capability with no compromise in performance.

The compact design of the spectrometer is perfectly complemented by an IBM-compatible computer and Windows® operating system.

The system includes complete software for flame, furnace, vapour generation and high solids analysis. Simply add the SDS-270 autosampler for automated flame analysis and, optionally, the PS-270 prep station for totally automated sample preparation and dilution.

The further addition of the System 3000 graphite furnace provides fully automated graphite furnace analysis. Other add-ons include the HG3000 for automated hydride generation or cold-vapour mercury analysis, the MC3000 for trace level mercury analysis and the HSA3000 for high dissolved solids analysis. The computer provides complete control of the spectrometer and accessories for simplified set-up and ease-of-use.

THE GBC VISION

GBC Scientific Equipment will advance people's knowledge and their capacity to enhance the quality of life for all humankind.



Advanced features include:

- Automatic wavelength and slit setting for maximum convenience and error-free set-up.
 - Optional automatic flame control system with a full range of safety interlocks.
 - The unique GBC ULTRA-PULSE background correction system, included as standard with all models.
 - The GBC performance guarantee—sensitivity and precision superior to that of any other instrument manufacturer.
 - Data storage using a high capacity hard disk. Storage is provided for applications, results, graphics, sample labels, weights and dilutions, report headings, etc.
- Storage of signal graphics. Since graphics traces are stored, the operator can view the graphics for previous samples and zoom in for a close-up if necessary.
 - Complete report presentation. This includes printing of operator-defined text, headings, sample labels, calibration graphs, operating conditions, results and statistics.
 - Simple operation is ensured with the easy-to-use Windows® environment, together with an extensive on-line help facility.

No other AA spectrometer can offer the simplicity and user-friendly operation for your specific application. Even the most demanding applications are made easy with the superior performance of the 932 Plus and 933 Plus.



ISO 9001 QUALITY ACCREDITATION

GBC has always placed a strong emphasis on quality in all aspects of our operation, from design and manufacture to the provision of service and support to our customers, and we are fully committed to continuous evaluation and improvement in all areas.

The GBC Quality Management System has been accredited to the ISO 9001 quality standard by Lloyd's Register Quality Assurance Limited. This certification is your assurance that the procedures and processes used to produce the goods and services which GBC provides comply with the relevant International Standard, and demonstrates our commitment to meeting the needs and expectations of our customers.



Unsurpassed optical performance

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Automatic wavelength and slit setting for maximum convenience

The large, self-calibrating 0.33 metre monochromator has been specifically designed to provide the high light throughput and stability needed for atomic absorption. Spectral bandwidth is continuously adjustable between 0.2 and 2 nm and, for furnace work, reduced slit height is available with all slit widths. You simply select the required element, and the wavelength, lamp current, slit width and slit height are set automatically. Graphical displays of wavelength scans are available for flame emission work or as a trouble-shooting aid. A wide-range photomultiplier tube covers the full wavelength range.

933 Plus for maximum energy

The GBC 933 Plus uses the simplicity and high energy of single beam optics to provide the best possible performance/price ratio. An automatic baseline zero between samples allows the 933 Plus to be used for extended periods with flame or furnace autosamplers without the problem of baseline drift.

932 Plus for true double beam stability

The genuine double beam optical system of the GBC 932 Plus measures the sample and reference signals every mains cycle to give the best correction for lamp noise and the most stable baseline possible.

Application Source

The heart of the 932/933 Plus is the patented Application Source which brings new levels of simplicity, performance and cost savings to atomic absorption spectrometry. The Application Source is configured to provide line spectra for specific applications such as environmental, mining, food and beverage, petroleum, and clinical applications. In addition, the Application Source can be configured to meet the customer's specific requirements. All this is achieved at performance levels equal to that provided by single element hollow cathode lamps. This saves money and simplifies operation as there is no need to change lamps when changing elements. Naturally, the instrument can still be used by those customers with a stock of older hollow cathode lamps.

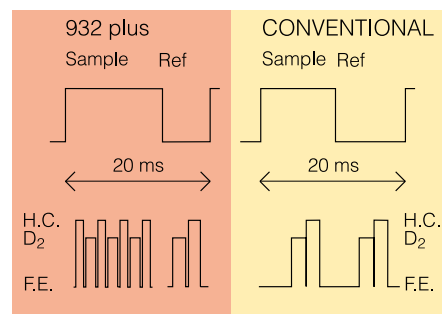
Protected optical system ensures long-term performance

The 932 Plus and 933 Plus use mirrors throughout the optical system to ensure that correct focus and high energy throughput are maintained at all wavelengths. To protect the optical surfaces, a dust cover is fitted over the optical system and additional protection is provided by coating the mirrors with quartz.

Asymmetric modulation reduces noise

Asymmetric Modulation for double beam instruments is a GBC innovation introduced in 1985 and now continued with the 932 Plus. Since that time the technique has been optimized for the best possible double-beam performance, and further refined for use in the 932 Plus.

Most of the noise in an atomic absorption measurement comes from the sample beam. By spending more time measuring the sample beam—twice that of most conventional systems—the GBC 932 Plus reduces noise by up to 40%.



Ultra-Pulse background correction—the only D₂ system fast enough for graphite furnace work

In the 932/933 Plus the GBC Ultra-Pulse background corrector, already the fastest system available, has been further improved by pulse interpolation.

With all background correction systems, there is a small time delay between the measurement of background and total absorbance. When the background is changing very rapidly, as is often the case with graphite furnace work, this delay can lead to an error in the background corrected reading. Systems with slower sampling rates and longer delay times show greater errors.

Most background correctors measure the background absorbance 50 or 60 times per second and the delay between the measurement of background and total absorbance can be as much as 10 milliseconds.

The GBC Ultra-Pulse system takes 200 (50 Hz) or 240 (60 Hz) sample measurements per second and the delay between the measurement of background and total absorbance is about 1 millisecond. This produces a dramatic reduction in background correction errors. Accuracy is further improved by interpolating between background measurements to calculate the background when the atomic signal is measured.

This system also allows correction for higher background levels than most systems—up to 2.5 total absorbance. In addition, the design of the high intensity D₂ lamp and associated power supplies ensures unequalled lamp lifetime. The GBC lamp will operate for 1000 hours even at full current. Compare this to some competitive instruments where the D₂ lamp is guaranteed to last only 90 hours of operation, and add up the savings!

Guarantee of performance

GBC is so confident of instrument quality that it guarantees both sensitivity and precision. GBC's guaranteed performance is superior to that of any other company in the world—greater than 0.75 absorbance for 5 mg/L copper with an RSD less than 0.45% for ten 10-second integrations. This performance is achieved by an efficient blend of good design and durable materials.

Flame atomization system delivers reliability and performance

All materials in contact with the sample have been selected for maximum corrosion resistance. The spray chamber is made from inert polypropylene. The burner is made entirely of titanium. The nebulizer has a platinum-iridium capillary and a titanium venturi.

The nebulizer also has an adjustable sample uptake rate, essential for optimum performance with refractory elements or organic solvents. The whole flame atomization system is easily removed for cleaning or for changeover to graphite furnace.

Flame atomization system delivers guaranteed performance

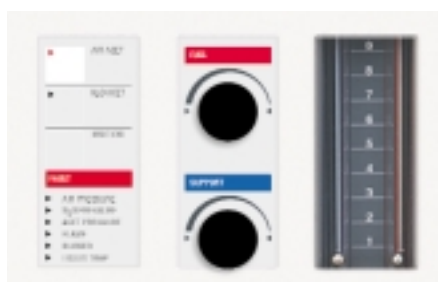
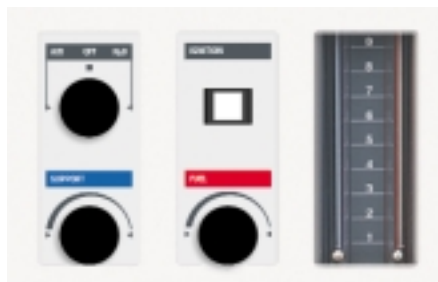
Choice of flame control systems

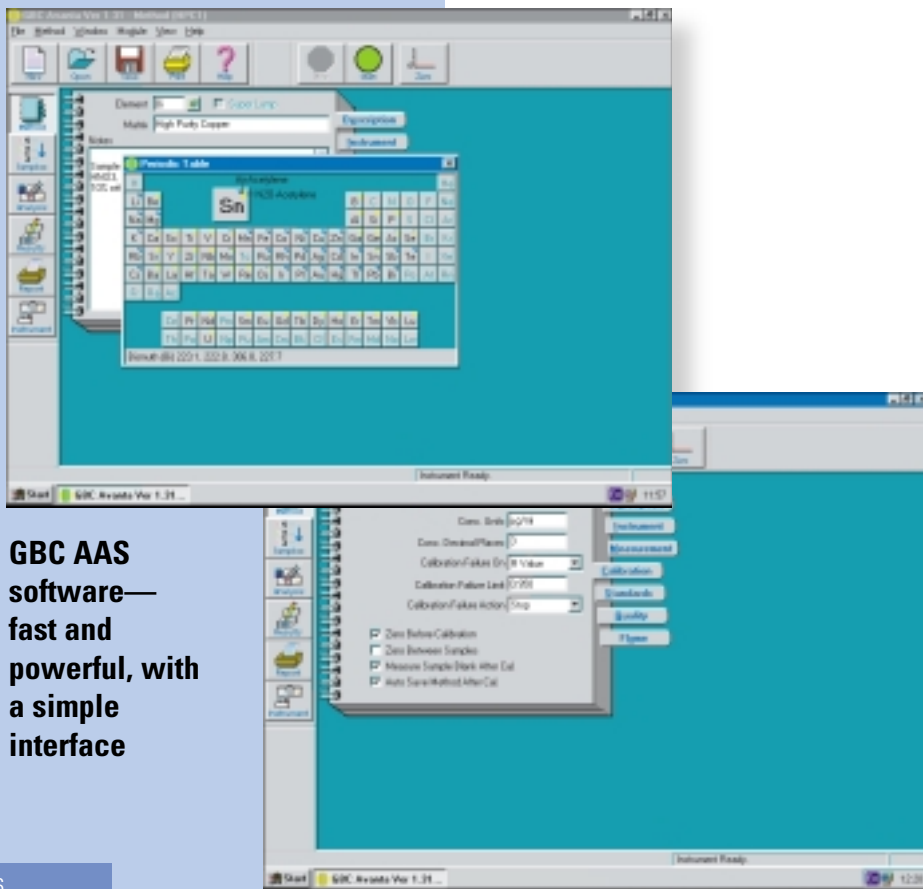
Interlocked flame control

This system allows the flame to be ignited only if a burner is installed, the liquid trap is full and an air-acetylene flame is selected. Changeover to the nitrous oxide-acetylene flame is allowed only if a nitrous oxide-acetylene burner is present. Push-button flame ignition is included.

Automatic flame control for added safety and convenience

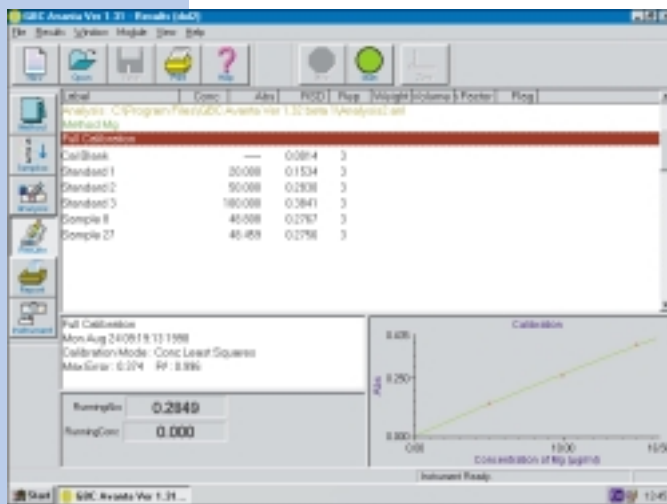
This system is interlocked to gas supplies, burner type, flame detector, mains power and liquid trap. It provides a programmed ignition and shutdown sequence—if nitrous oxide-acetylene is selected, an air-acetylene flame is first established and then the acetylene flow is automatically boosted before automatic changeover to the nitrous oxide-acetylene flame.





GBC AAS software—fast and powerful, with a simple interface

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GBC has earned a world-wide reputation for superlative AA software. Easy for the first-time user to operate, it has the power to handle the most demanding applications. The software comprises six individual modules which simplify analysis and setup, so that only one mouse click is required to initiate an analysis. Operation is further simplified by an extensive context-sensitive on-line help system which includes tutorials on analytical technique. The system provides fully integrated software for instrument and accessory control, graphics, data acquisition, storage and reporting—there is no need to switch to add-on software packages.

Advanced features of GBC software

- High resolution graphic display for methods development and quality control*

The graphics signal is linked to individual sample readings, allowing atomic and background traces to be displayed simultaneously. For graphite furnace work, graphics are overlaid with the furnace temperature program, simplifying method development.
- Choice of calibration routines to provide the most accurate results*

The 932 Plus and 933 Plus allow for automatic preparation of calibration curves using up to ten standards. Choose an exact fit to the calibration points, rational or linear least squares fit, or linear least squares fit through zero. You may also calibrate using standard additions or bracketing standards.
- Storage of signal graphics provides a valuable quality assurance aid*

To aid in method development and quality assurance, signal traces for all analyzed samples are stored with the corresponding numerical result. If a problem is suspected, simply clicking on the suspect replicate will display the graphical result on the same page. Zoom and cross-hair facilities also enable a close up inspection that can be used to quickly diagnose any problem.
- Choice of measurement mode enhances productivity*

Choose from peak height, peak area, integration or running mean. The automated running mean mode provides a significant reduction in measurement time since the measurement is completed when the required precision is achieved.
- Results editing facility means that samples need to be run only once*

To ensure that samples and calibrations do not need to be repeated, the software features full editing capabilities for individual replicates as well as the ability to delete complete samples or standards. To prevent unauthorised editing, all results are password protected to ensure data integrity.

- *Analytical applications are stored for instant recall*

When you select the element to be determined, the software automatically selects the recommended wavelength, lamp current, slit width and flame type. After selecting the other parameters for your application, all information may be stored in an application file for instant recall at any time.

- *All data is preserved on hard disk*

All results are stored on disk and can be recalled for viewing or printing at any time, or transferred to another disk for archiving. The time and date of analysis is stored with the results, enabling you to monitor the progress of samples, identify batches of results and comply with the statutory regulations.

- *Reporting facility enables fully documented analyses*

Produce printed reports in comprehensive single element or summarized multi-element formats. Single element reports can contain any combination of information including replicates, sample labels, calibration graphs, method parameters and weights and volumes. reports can include page footers, headers and individual margins, and all columns and rows can be individually sized. A full selection of fonts and font sizes may be used. Connect an electronic balance to directly transfer sample weights to the weight and dilution table, or use a bar code reader to directly enter sample labels.

- *Help is instantly available*

Context-sensitive on-line help explains all aspects of the hardware setup, including operation, safety and maintenance. Learning to use the instrument is made easy via multi-media tutorials. While running a tutorial or displaying context-sensitive help, you can work through the software to create an application using as much or as little help as is required.

- *Continuous display of concentration for rapid sampling*

The digital concentration read-out on the results and graphics screens is continually updated, invaluable for optimization and rapid manual sampling.

GMP/GLP compliance

The 932 Plus and 933 Plus hardware and software offer full GMP/GLP compliance for those analyses requiring certification.

- *AA certification procedure package—ISO9001 accredited*
- *Automatic wavelength calibration software*
- *Calibration failure control using calibration algorithm statistics*
- *Comprehensive Quality control software suite*
- *Concentration range checking*

GMP/GLP compliance

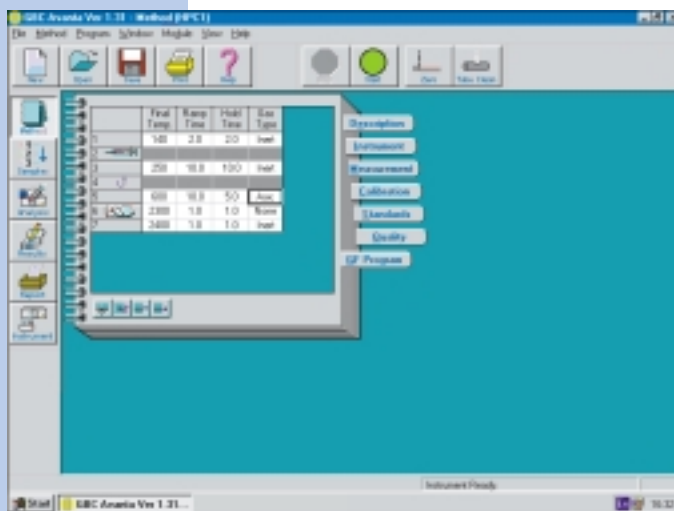


- *QC check samples including a full range of fail actions*
- *Automatic spike recoveries allowing enhancement & suppressive interference checking*
- *Password protection allowing user access control*
- *Full date & time stamping of results*
- *Method linked to results—eliminates confusion and enforces traceability*
- *Real time data export to LIMS, e.g., CCLAS, LIMS1, etc, allowing enhanced flexibility*
- *Y2K compliance certificate provided with software*

System 3000 graphite furnace for ultra-trace analysis

The System 3000 graphite furnace is designed to suit applications requiring the measurement of very low concentrations. This system achieves state-of-the-art performance enabling most elements to be determined at sub-part-per-billion concentrations. It blends all of the latest developments in graphite furnace technology into a fully integrated system. The GF3000 power supply and PAL3000 autosampler are both controlled from the AA computer. The superb System 3000 incorporates all of the features expected in an advanced graphite furnace:

- *High performance furnace assembly*
The furnace enclosure allows the graphite tube to be surrounded by a carefully controlled flow of inert gas. The tube itself is designed for optimum performance, with raised sections ensuring that all samples are safely confined to the central part of the tube.
- *Total pyrolytic graphite platform for reduced interferences*
Chemical interferences can be a problem in many graphite furnace applications. Sensitivity is often reduced and complex sample treatment schemes are required to overcome the interferences. The platform for the System 3000 eliminates or reduces most chemical interferences.
- *Programmable gas selection*
The provision of two gas supplies gives maximum flexibility for handling the widest range of samples.



- *Rapid heating (2000°C/sec) under full microprocessor control*
The unique GBC temperature control system uses true power feedback to ensure reproducible analytical conditions. This system has a fast response and is independent of fluctuations in mains voltage or conductivity of the graphite components and covers the full temperature range.
- *Flexible temperature program*
The temperature program allows any number of steps, enables performance to be optimized for even the most complex samples.



The GF3000 graphite furnace workhead



Performance

The System 3000 is designed to achieve state-of-the-art sensitivities and detection limits. Approximately 50 elements can be determined, most at sub part-per-billion concentrations. The typical characteristic mass for some of the elements is shown in the following table. (Characteristic mass is the mass of the element required to give an absorbance of 0.0044).

Element	Charac. Mass (pg)	Element	Charac. Mass(pg)
Ag	0.9	Fe	1.5
Al	5	Mn	0.7
As	6	Mo	8
Au	4	Ni	5
Ba	12	Pb	2.5
Cd	0.25	Se	20
Co	4	Ti	45
Cr	1.5	V	20
Cu	2.5		



Top view of the PAL3000 autoloader

The PAL3000 Programmable Auto Loader provides automatic calibration with up to 10 standards and automatic analysis of up to 40 samples. Any sample volume between 1 and 100 μ L may be selected.

- *Automatic mixing of standards saves time and improves reliability*

The PAL3000 will automatically prepare a series of up to 10 standards from a single stock solution and can also automatically prepare standard additions from the stock solution. This procedure eliminates errors in the preparation of standards, reduces the likelihood of contamination and saves considerable time.

- *Automatic dispensing of chemical modifier eliminates the need for manual sample treatment*

With many applications, the addition of a chemical modifier to the sample improves sensitivity, reduces background absorbance or reduces chemical interferences. The PAL3000 can automatically add a specified volume of chemical modifier to each sample and standard.

- *Automatic dilution*
Manual dilution is time- and labour-intensive and is also prone to errors and contamination. The PAL3000 eliminates these problems by automatically diluting any over-range samples to bring them into the calibration range.
- *Multiple injections for automatic pre-concentration*

Several aliquots of a sample may be injected and dried prior to atomization. This allows the effective sample volume to be increased and permits very low concentrations to be measured without the need for chemical pre-concentration procedures.

Automatic furnace sampler improves accuracy and productivity

- *Heated injection reduces analysis time*
The PAL3000 can be programmed to inject the sample after the graphite tube temperature has been raised above the boiling point of the solvent. The sample then dries as it is injected and the time-consuming drying stage is eliminated.
- *Simple set-up and storage of probe co-ordinates*
The sampler capillary tip is conveniently aligned with the furnace tube sampling hole with the use of the cursor keys on the keyboard. Once established, the co-ordinates are stored in the computer, even when the power is switched off.

GBC 932 Plus and 933 Plus AAS

Optics

Single beam (933 Plus) or double beam (932 Plus) with background correction and flame emission capability. The 932 Plus has asymmetric modulation with 2:1 sample-to-reference ratio for noise reduction. All-reflective system with quartz overcoating on mirrors. Dust cover over optical system.

Monochromator

Ebert-Fastie design with 333 mm focal length and 185-900 nm wavelength range. 1800 line/mm grating with dual-blazed profile and 1.6 linear reciprocal dispersion. Automatic wavelength selection and peaking. Continuously adjustable slits with 0.2 to 2 nm spectral bandwidth. Reduced height for furnace operation available with all slit widths. Automatic setting of slit width and height. Automatic scanning. Selected wide range multi-alkali photomultiplier tube.

Choice of lamp types

Plug-in mounting for hollow cathode lamp or Application Source with vertical and horizontal adjustments for optimizing light throughput.

Lamp supply

Allows warm-up for next element using the Application Source.

Background correction

Ultra-Pulse background corrector takes 200 (50 Hz) or 240 (60 Hz) sample readings per second for correction of fast background peaks. With approximately 1 ms between pulses and interpolation between measurements, the best possible accuracy is assured. High intensity deuterium arc lamp provides 185-425 nm correction range. Corrects to 2.5 total absorbance.

Interlocked flame control

Flame ignition only on air based flames. Nitrous oxide ignition inhibited. Push button actuated glow plug ignition system. Safety interlocks on burner and liquid trap. Safety interlock system also prevents nitrous oxide selection with air-acetylene burner. Fast change selection of nitrous oxide-acetylene flame.

Automatic flame control (optional)

Microprocessor controlled. Monitors gas pressures, flame and safety interlocks. Keypress selection of air or nitrous oxide-acetylene flames with automatic fuel enrichment for nitrous oxide flames. Automatic flame shutdown upon mains power failure.

Flame atomization system

Premix design with solid polypropylene mixing chamber. All-titanium burner construction. Nebulizer has platinum-iridium capillary and titanium venturi. Liquid trap with liquid level interlock. Quick-change mounting to enable easy changeover to graphite furnace.

Performance guarantee

Greater than 0.75 abs for 5 mg/L copper with an RSD less than 0.45% for ten 10-second integrations.

Computer

An IBM compatible computer incorporating an Intel Pentium™ microprocessor, 8 Mb RAM, 1.44 Mb floppy disk drive, 540 Mb Hard drive, one parallel port, two serial ports, SVGA video card and SVGA colour monitor. In addition, a quad speed CD drive and Sound Blaster™ compatible sound card, bus mouse and 101 keyboard.

Software

Microsoft Windows®95 (or later) operating system for true multitasking. Controls 932/933 Plus AAS, SDS-270 autosampler, PS-270 auto-diluter, GF3000 graphite furnace and PAL3000 furnace autosampler, HSA3000 high solids analyser and MC3000 mercury concentrator

Data processing

Analysis by atomic absorption or emission. Absorbance range to 2.5. Measurement by integration, running mean, peak height or peak area. Mean and RSD of up to 50 replicate readings. Calibration using up to 10 standards. Curve correction by linear least squares, linear least squares through zero, exact fit or concentration least squares (polynomial), plus standard additions or bracketing standards. Programmable rescale using a single standard or complete recalibration. Result editing to remove unwanted readings. Weight and dilution correction. All editing available either during or post-run.

Graphics

High resolution display of atomic absorbance and background signals, furnace temperature programs, calibration curves, peaking meters and wavelength scans. Different scales may be used for atomic and background signals. Signals may be displayed in the single shot, overlay or overview mode. Consecutive signals may be overlaid. Graphics cursor may be used to obtain numerical information from graphics traces. Zoom function allows graphics traces to be expanded.

Data storage

Storage is provided for signal graphics, applications, results, sample labels, weights and dilutions, and report headers.

Quality

Quality control software satisfying GLP and GMP is supplied as standard.

Report generation

Reports may be printed during a run or from stored result files. They may include headings, notes, operating parameters, calibration graphs, sample labels, results and statistics. Results from different runs (e.g., flame, furnace and vapour generation) may be combined into a single report. Reports may be printed sequentially by element or in a multi-element format.

Dimensions

Spectrometer module: 870 x 410 x 380 (WxDxH, mm)

Weight

Spectrometer module: Unpacked 48 kg, packed 60 kg

Electrical Requirements

110/220/240 volts AC, 50/60 Hz, 250 VA

System 3000 Graphite Furnace

Automated graphite furnace system. Comprises GF3000 graphite furnace power supply and workhead plus PAL3000 programmable automatic sample loader. Controlled by the AAS computer.

GF3000 furnace assembly

Furnace assembly includes graphite tube (and platform if required) mounted in enclosure with quartz windows. Permanently connected to power supply by umbilical cord carrying gas, cooling water and electrical supplies. Inert and auxiliary gas supplies. Temperature range ambient to 3000°C. Computer-controlled maximum heating rate of 2000°C/sec. Temperature program has unlimited number of steps, each with ramp and hold, gas selection, graphics display option and read option. Temperature controller monitors current and voltage and uses power feedback to provide accurate control over the full temperature range, and during both ramp and hold stages. Interlocked to inert gas and cooling water pressures. Corrects for changes in cooling water temperature.

PAL3000 furnace autosampler

Accommodates up to 49 samples and one stock solution or 40 samples and 10 pre-mixed standards or one stock solution for automatic mixing of up to 10 standards. Container volumes are 2 mL for samples and standards, 5 mL for automix standard, 10 mL for blank and chemical modifier. Dispensed volume is 1–100 µL, programmable in 1 µL increments. All-PTFE capillary. 1 L rinse container. Probe set-up controlled by computer with co-ordinates stored in memory. Program options include automatic mixing of standards, automatic mixing of standard additions, automatic dilution of over-range samples, automatic injection of chemical modifier, multiple injection, heated injection, automatic rescale or complete recalibration, check sample and spike recovery.

Cooling Water Requirement

1–2 L/min at 100–200 kPa (15–30 psi)

Inert Gas Requirement

Argon or nitrogen at a pressure of 70–200 kPa (10–30 psi)

Dimensions

GF3000: 380 x 360 x 290 (WxDxH, mm)

PAL3000: 220 x 209 x 140 (WxDxH, mm)

Weight

GF3000: Unpacked 35 kg, packed 45 kg

PAL3000: Unpacked 7 kg, packed 10 kg

Electrical Requirements

208/220/240 volts AC, 50/60 Hz, Rated current 15A, surge current 40A

SDS-270 Sample Delivery System

The SDS-270 sample delivery system is a full random access X-Y-Z autosampler providing unmatched productivity, capacity for up to 270 samples and ten standards, and a small footprint. Samples are contained in three separate racks allowing for different tube sizes within a batch. The SDS-270 is controlled by the AAS software, providing random access, micro-sampling capability and standard additions analysis, plus check samples and quality control limits, plus programmable measurement time, delay time, rinse time, re-slope and re-calibration rates, number of samples, number of standards and number of replicates. A built-in diaphragm pump provides a continuous stream of clean rinse solution.

Dimensions

260 x 160 x 290 (WxDxH, mm)

Weight

Unpacked 7 kg, packed 10 kg

Electrical requirements

110/220/240 volts AC, 50/60 Hz

PS-270 Prep Station

The PS-270 is used in combination with the SDS-270 auto-sampler, removing the need for manual standard and sample preparation and sample dilution for flame and hydride applications. The PS-270 is totally controlled through the AA software enabling true fully-automated analysis. Simple and reliable automation of standard additions and spike recovery, or sample matrix modification through the addition of up to two chemical modifier solutions provides hands-off operation and versatility. The ability to work in combination with Automatic Burner Rotation (ABR) extends the dynamic range beyond that of other dilution systems.

Dimensions

300 x 200 x 370 (WxDxH, mm)

Weight

Unpacked 5 kg, packed 11 kg

Electrical requirements

110/220 volts AC, 50/60 Hz



Full range of AA accessories

FS3000 Autosampler

For flame and hydride use only. Carousel holds 10 standards and 60 samples. Separate positions for rinse, blank and rescale standard.

Dimensions

420 x 230 x 380 (WxDxH, mm)

Weight

Unpacked 12 kg, packed 19 kg

Electrical requirements

110/220/240 volts AC, 50/60 Hz, 120 VA

HG3000 automatic hydride analysis

The HG3000 hydride generator is an automatic continuous flow system. Coupled with the SDS-270 autosampler, it provides totally automated analysis of arsenic, selenium, and the other hydride forming elements at part-per-billion levels. It can also be used to determine mercury by the cold vapour method.

The optional EHG3000 electric heater provides controlled heating of the hydride cell to temperatures up to 1000°C, allowing hydride analysis to be performed without the use of a flame. With a precision of around 1% at ppb concentrations and a sample throughput of 60 samples per hour, the HG3000 provides the ultimate in fast, accurate and convenient hydride analysis.

MC3000 Mercury Concentrator

Regulations for mercury analysis are pushing the required detection limits well below the level achievable using the standard cold vapour technique. The MC3000 mercury concentrator accessory for the HG3000 addresses this problem. By concentrating the mercury vapour on a gold foil, detection limits of 5 ppt can be readily achieved. The MC3000 accessory is fully controlled by the AAS software and unattended analysis can be carried out when used in conjunction with the SDS-270 sample delivery system.

HSA3000 High Solids Analysis

The HSA3000 high solids analyzer enables analysis of solutions containing high concentrations of dissolved solids. In conventional sample introduction, samples with more than about 2% dissolved salt can cause blockage of the nebulizer or burner. The HSA3000 allows analysis of samples containing up to 30% dissolved solids. Samples may be presented manually or automatically with the autosampler.

Ordering Information

GBC 932 Plus / 933 Plus Spectrometers

Model	Optics	Background Correction	Flame Control	Part Number
933B Plus	.Single beam	.Yes	.Interlocked	.99-0241-x1
933AB Plus	.Single beam	.Yes	.Automatic	.99-0242-x1
932B Plus	.Double beam	.Yes	.Interlocked	.99-0239-x1
932AB Plus	.Double beam	.Yes	.Automatic	.99-0240-x1
932G Plus	.Double beam	.Yes	.None	.99-0238-x1

x-varies with location. Consult your local agent for correct suffix.

The 932G Plus is configured for operation with a graphite furnace and is not capable of flame operation. All other versions are supplied complete with air-acetylene burner, spray chamber, adjustable nebulizer, gas hoses, dust cover, Operation Manual, Flame Methods Manual and software for flame, furnace and hydride operation. A computer is required for operation and must be ordered separately.

Accessories

Nitrous oxide-acetylene burner	.99-0133-01
Recommended spares and consumables for 2 years operation with 932/933 Plus	.95-0103-00
Fume extraction system	.99-0012-0X
Compressor, 220 V	.75-0006-00
Compressor, 110 V	.75-0005-00
Gas purification system	.99-0284-00
Computer (Pentium™ PC)	.99-0335-00

Flame Autosampler

FS3000 flame autosampler	.99-0106-00
Supplied complete with test tubes, beakers, stainless steel probes, cables, tubing and three 60-position sample racks	
Flame sampler trolley	.96-0021-00
SDS-270 sample delivery system	.99-0326-x1
Supplied complete with test tubes, PTFE-coated probes, cables, tubing and three 60-position sample racks	
PS-270 prep. station	.99-3533-00

Graphite Furnace

System 3000 complete automated graphite furnace system	.99-0108-00
Comprises GF3000 power supply and workhead plus PAL3000 automatic sample loader.	
Supplied complete with 10 pyrocoated graphite furnace tubes, 5 platforms, 500 sample vials, Furnace Methods Manual, beakers, hoses, cables and tubing.	
Graphite furnace tubes, pyrolytically coated (pack of 10)	.99-0059-00
Total pyrolytic graphite platforms (pack of 10)	.99-0060-00
Graphite furnace tubes with integrated platform (pack of 10)	.99-0342-00
Pair of electrodes	.99-0061-00
Sample vials for PAL3000 (pack of 500)	.99-0022-00
Recommended spares and consumables for 2 years operation with System 3000	.95-0015-00



Designed and manufactured by
GBC Scientific Equipment
Pty Ltd A.C.N. 005 472 686
GBC reserves the right to change
specifications without prior
notice.

GBC publication number
01-0127-02
June 1999 Australia

GBC SCIENTIFIC EQUIPMENT

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HPLC and UV-VIS

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