enduro T2100

Atomic Absorption Spectrometer

AAS

GBC

ISO 9001
Quality Accreditation

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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 commitment to meeting the needs and expectations of our customers.

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GBC's Product lines

Visionary Technology

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

GBC

Tandem Zeeman AAS

enduro T2100
Atomic Absorption Spectrophotometer

The enduro T2100 is the next generation of Zeeman atomic absorption spectrophotometer. It uses horizontal heating, vertical Zeeman background correction, and continuous variable magnetic field intensity technology, which improves the background correction.

The enduro T2100 atomic absorption spectrophotometer can be widely used in the fields of metallurgy, petrochemical, geology, medical science, environmental protection, scientific research, agriculture, disease control, food, material science, quality inspection, and others. The enduro T2100 can be used to analyze over 70 elements from ppm to ppb levels.

Features

Advanced Optical System

• The enduro T2100 features a unique suspension design for the optical system. Moderate shaking or environmental temperature changes will have no effect on the instrument's stability.
• Features 1800 lines/mm diffraction grating, that increases resolution and energy efficiency.
• A compact optical system allows for a strong signal and very low detection limits for elements such as As and Se.
• Carefully designed GBC longitudinal Zeeman and deuterium lamp background reduction results in more accurate calibration.

Integrated Design

• The enduro T2100 features an integrated flame and graphite furnace design that contains the optical system, atomizer, graphite furnace power supply and electronics all in one unit. It is one of the most compact AAS in the world.
• Flame atomizer and graphite furnace atomizer are designed in parallel, with a compact optical path, there is less optical energy loss and high sensitivity.
• Optimized lamp power supply technology prolongs the lifetime of hollow cathode lamps.

Automated Switch between Flame and Graphite Furnace

• Features automated or manual switching between flame and graphite furnace in less than 2 seconds.
• Optics do not need to be adjusted between switches.

Reliable Safety System

• Fully interlocked gas control system.
• Pressure protection for combustion gas/protection gas, acetylene leakage interlock, over heating protection of graphite furnace and protection against abnormal flame.

Safety and Simplicity

Unique functional design enhances ease of use

Flexibility

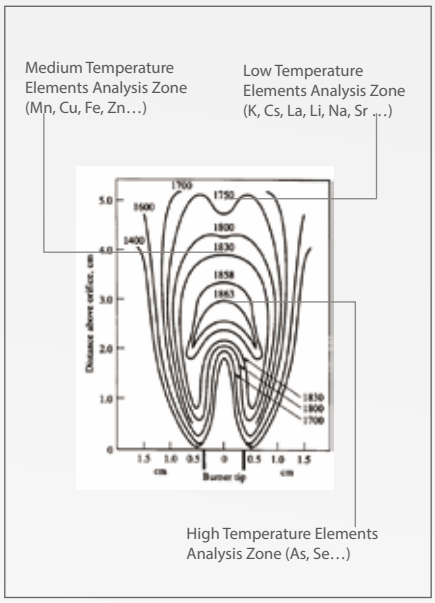
•Optional HG-01 hydride generator that utilizes a heated ceramic tube can be used to perform trace analysis of As, Pb, Se, Hg, Bi, Sb, Sn, and Te with high sensitivity.
•Flame/Graphite furnace autosampler that allows for automated preparation of standard solutions and sample analysis.

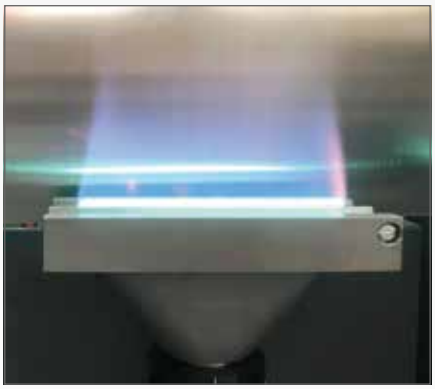
High Degree of Automation

•Automatic wavelength positioning, slit setting, and optimization of lamp current and gain. All of these operations can be completed within 40 seconds.
• The eight lamp rotating turret is controlled by computer for automated hollow cathode lamp selection, which allows for automated analysis of up to eight elements in sequence.
• Automatic flame ignition, automatic control of the deuterium lamp and Zeeman system.
• The software intelligently identifies the power frequency and automatically matches it.

Multi Element Analysis

• Automatic multi element analysis: After editing method, in cooperation with AS-600 autosampler, the instrument can automatically set method parameters, including automatic wavelength selection, automatic slit setting, automatic hollow cathode lamp position adjustment, automatic deuterium lamp switch, automatic Zeeman switch, automatic atomizer switch, and so on.
• Multi-element analysis in same project: Multiple elements can be established in same project, analysed according to sequence, and the comprehensive report can be printed out.

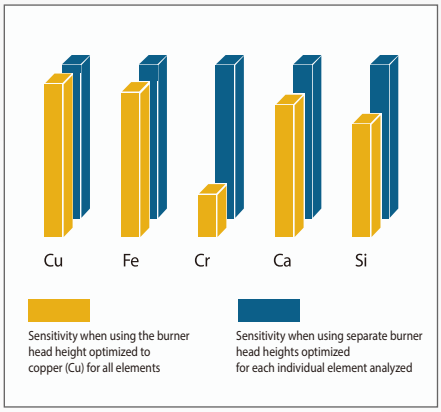




Automatic Burner Head Height Adjustment

The automatic burner adjuster provides motorized adjustment in both the vertical and horizontal directions. This is software controlled enabling the burner or accessory to be accurately and reproducibly positioned in the light path every time for optimum performance.

The position is stored with each method so that with an unattended multi-element flame the optimum sensitivity can be obtained for each element. So that if you are analysing air-acetylene for some elements and nitrous oxide acetylene for others, the correct burner position relative to the optics will always be used. The graph below shows signal optimized individually (blue) compared to signal optimized for Cu (yellow).



Two Background Correction Modes

The user can select between Zeeman effect and deuterium lamp background correction. The continuously adjustable magnetic field (0.6T-1.1T) of the Zeeman background correction effectively reduces the reversal effects on analytical sensitivity. When using the deuterium lamp, the position of the deuterium lamp can be optimized via the adjustment mechanism, which optimizes the superimposition of the beam with that of the HCL beam. This will improve the background correction effect of the deuterium lamp.

Boosted Discharge Lamp Power Supply

The boosted discharge lamp is a specially designed ultra high intensity HCL used to provide stronger light intensity. For some elements such as As, Se, Cd, Ni and Pb, the boosted discharge lamp can significantly improve detection limit, sensitivity and linearity of measurement. The enduro T2100 is configurable with up to 4 boosted discharge lamp power supplies.

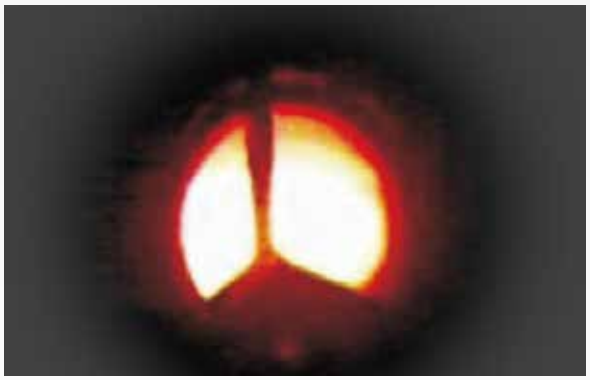
Element	Standard HCL (µg/mL)	Boosted Discharge Lamp (µg/mL)	Detection Limit Improvement
As	0.5	0.1	5.0
Se	0.4	0.06	6.7
Cd	0.014	0.007	2.0
Pb	0.14	0.05	2.7

Coded Lamp Recognition

Simply insert coded lamps into the turret and the software recognizes the element and what position in the lamp turret it is located. This feature eliminates any errors which could occur by an operator entering an incorrect element in the lamp table.

Graphite Furnace Viewing System

The graphite furnace viewing system utilizes an online camera to perform real-time observation on flame or graphite furnace. This feature is highly valuable in graphite furnace method development. The whole analysis process from sample injection to atomization can be observed in real-time by the user. This is helpful to optimize parameter settings in the sample desolvation and drying and ashing stages in order to obtain repeatable and accurate results.



Graphite Furnace Gas Saving Mode

Upon analysis completion, the instrument will automatically turn off the inert gas. The inert gas will only be turned back on during the next analysis. This feature maximizes the inert gas usage efficiency and can halve gas usage, reducing instrument operating cost.

Sensitive and Efficient

Excellent Graphite Furnace System

Advanced Technology With Transverse Heating, Longitudinal Zeeman Background Correction

• Compared to horizontal Zeeman effect graphite furnace designs, the longitudinal Zeeman effect graphite furnace doesn't require a polarizer in the optical path; this doubles the light intensity reaching the detector, resulting in higher sensitivity and better calibration linearity.

• Transverse graphite furnace heating method allows higher temperature in all areas within graphite tube and greater uniformity in temperature distribution; which ensures high efficiency and uniformity in sample atomization, and guarantees data with high precision.

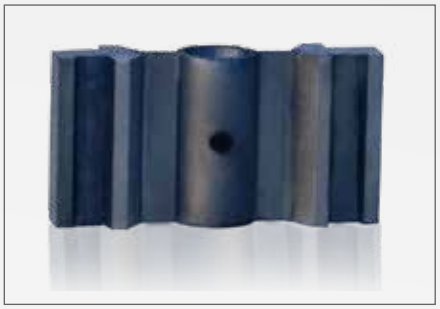
Optimized Transverse Heating Graphite Tube

• Two horizontal wings of graphite tube have greater mass, allowing maximum heat transfer.

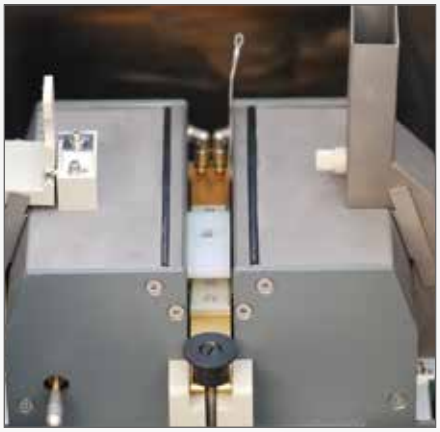
• Maximum heating rate of 2500℃/s guarantees optimal atomization conditions for high temperature elements.

• Graphite furnace clamping assembly with pivot structure, equipped with safety interlock device, ensures safe and error free graphite furnace operation.

• Graphite tube has characteristics of unidirectional fit and automatic sample injection port centering; ensures automatic alignment of the graphite tube and simplifies the cleaning and replacement of graphite furnace.



Easy to detach or install, self-aligning graphite tube



Graphite furnace components

Transverse heating ensures uniform atomization of whole sample. Sample injected into the highest temperature region between graphite tube wings; both wings have large thermal mass, therefore with maximum heat conductivity, heats the sample uniformly.

Unique Variable Magnetic Field Strength

Advanced variable magnetic field strength technology, with 0.1T increment from 0.6T~1.1T; allows to achieve the best magnetic field strength for each element, to obtain the best background correction effect while ensuring its best sensitivity. Once the optimal magnetic field strength is selected, the field strength remains unchanged throughout the measurement process. Operator can set the optimal magnetic field strength for each element to maximize Zeeman effect and improve spectral interference in elemental analysis.

Dual Protection Gas Paths

Dual protection gas paths in graphite furnace, can be used simultaneously, separately, or as programmed.

Significantly Increased Maximum Injection Volume

Maximum graphite furnace injection volume up to 70 µL, beneficial for multiple injections and lower concentration analysis.

Smart Frequency Conversion

• Intelligent identification of power supply frequency by software, automatic matching to the operating frequency. Especially suitable for power supply with unstable frequencies or for power grid at other frequencies.

• The power supply is power factor corrected for maximum energy efficiency and minimal power disruption.

• Magnet energy is recycled back into the power supply system.

Easy to use Software

Powerful Windows® enduro T2100 Software

Powerful Automated Data Processing Workstation Meets GMP Certification Requirements

• User friendly operating interface

Windows based operating platform, supports multiple languages, e.g. English, Korean, etc; can obtain analysis report quickly and easily.

• Instrument adopts network port communication, allows remote transfer of instrument data

• Powerful sample analysis functions and fault tolerant processing, flexibility to modify curve fitting equation

• Report printing function

Flexible report printing function to print report(s) according to user settings.

• Data management functions

History management and backup features via functions such as access control, permission allocation, audit trail, electronic signature, and backup recovery.

• QA/QC control function

The QA/QC feature allows for automated determination of whether the analysis result or some function of the result exceeds user-defined limits. If the result exceeds the limit, the system automatically runs the analysis again according to setup parameters. Functions of QA/QC include standard deviation (SD) detection, relative standard deviation (RSD) detection, correlation coefficient detection, QC detection, baseline drift (sensitivity correction) detection, and sample upper limit detection (automatic online dilution).

• Instrument control functions

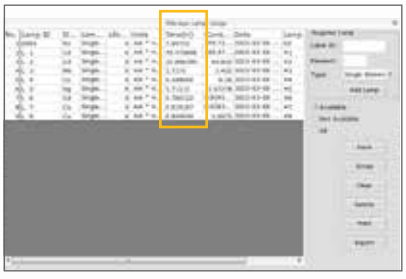
Automated selection of hollow cathode lamps, wavelength scanning, slit switching, setup of lamp current.

• Condition monitoring function

Real time dynamic monitoring of working conditions. For flame method: type of burner head (air + acetylene or nitrous oxide + acetylene), water level of the liquid trap, status and pressure of the combustion gas and the oxidant gas, flow rate of the combustion gas, acetylene leakage alarm. For graphite furnace method: over current protection, water temperature, water flow rate, pressure of the inert gas.

• Light on time management function

Record HCL usage time automatically.



• Graphite tube firing frequency tracking

Comprehensive and Compact

Specifications

• Optical system

Wavelength range: 185~900 nm

Monochromator: Czerny-Turner Grating Monochromator
Wavelength repeatability: ≤0.05 nm
Blaze Wavelength: 250 nm

Spectral bandwidth: Automatic switching between 5 levels: 0.1, 0.2, 0.4, 1.0, 2.0 nm
Wavelength accuracy: ± 0.1 nm
Grating: 1800 lines/mm
Baseline Stability: ≤0.003A/30 min (Static)
≤0.002A/30 min (Dynamic)

• Flame analysis

Cu characteristic concentration: ≤0.02 μg/mL/1%
Precision RSD: ≤0.45%
Position adjustment: optimal adjustment of height and angle, Flame/Hydride exchange in 1 minute

Detection limit: ≤0.003 μg/mL
Burner: 50 mm stainless steel burner and 100 mm interchangeable all titanium burner
Nebulizer: Standard high efficiency glass nebulizer and full titanium metal nebulizer; high efficiency nebulizer has efficiency of more than 20%; full titanium nebulizer suits analysis of samples containing corrosive HF acid

• Graphite furnace analysis

Cd characteristic mass: 0.5×10^{-12} g
Temperature range: ambient to 3000℃
Temperature program: max 20 steps heating program; 3 modes of step, slope, hold
Power heating rate: ≥2500℃/s

Cd Detection limit: 1.0×10^{-12} g
Precision RSD: ≤3.0%
Heating mode: power heating
Temperature control precision ≤1%
Temperature repeatability ≤0.5%

• Background correction

Correction method: Zeeman, D2 lamp
Correction capability: In flame analysis using D2 lamp background correction; when background absorption value ~ 1.0 Abs, instrument has > 60 times background correction capability. In graphite furnace analysis using D2 lamp or longitudinal AC magnetic field Zeeman dual background correction method, when background absorption value ~ 2.0 Abs, instrument has >100 times background correction capability.

• Data processing

Measurement method: flame absorption method, flame emission method, graphite furnace method, hydride method.
Analysis method: linear equation, non-linear equation, standard addition method.
Printing output: Calibration curves, signal spectra, instrument conditions, analysis parameters, and analysis results can be automatically stored and printed.

• Integrated instrument with built-in graphite furnace atomizer power supply

Dimensions: 1000 mm (L) x 610 mm (W) x 580 mm (H), 150kg
Power supply: ~ 220V, 50Hz single-phase power supply; instrument 500W, graphite furnace 4kW

Accessories

HG-01 Hydride Generator

Featuring peristaltic pump injection, electrothermal ceramic heated quartz tube atomizer is capable of performing high-sensitivity ultra-micro analysis for eight elements (As, Se, Hg, Pb, Bi, Sb, Sn, Te) with typically low sensitivity by AAS. The HG-01 has simple operation, quick analysis, low interference and can be easily connected with the enduro T2100 instrument to perform hydride-atomic absorption analysis.

Features

- Samples are continuously pumped by 3 channels using a peristaltic pump. Injection volume is 1~5 mL.
- Uses Tygon wear-resistant durable pump tube. The life span of these pump tubes can be as long as 500~1000 hr.
- Using a uniquely designed ceramic electric heating tube, the HG-01 is oxidation resistant and expels no waste. It can withstand temperatures of up to 1000 ℃ for many hours with no damage to the quartz tube.
- Temperature control is fast and accurate. The temperature range is room temperature ~950℃ with an accuracy of ±2℃.The optimal atomizing temperature can be quickly reached and precisely controlled.
- Compact design and can be easily mounted on the AAS in the flame nebulizer base position.

AS-600 Integrated Flame Graphite Furnace Autosampler

- Holds up to 133 sample vials (including 5 reagent vials). Supports various types of sample trays, as well as plastic and quartz sample vials.
- Allows automatic injection for flame and graphite furnace. Eliminates the need to move the autosampler when switching methods, once installed. When not in use, can still inject sample manually without disassembling autosampler.
- Control of sampling depth and injection depth via software.
- Fully automated computer controlled operation, from taking up sample to taking different standards and chemical modifiers.
- After the solution is injected, graphite furnace heating program will start automatically.
- After each injection, system will immediately run automated rinse program, to eliminate sample contamination.
- Automatic concentration and dilution.
- Graphite furnace supports hot injection.

Ordering Information

99-0712-00	**enduro T2100** Each enduro T2100 is supplied with universal autosampler for flame and graphite furnace, air-acetylene burner, nitrous oxide-acetylene burner, spray chamber, titanium nebulizer, gas hoses, operation manual and software for operation of the instrument and all accessories.

	Hydride
99-0702-00	HG-01 Hydride generator

	Accessories
96-0321-00	Super lamp power supply (must be factory fitted)
99-0727-00	AA3-6-03X nitrous oxide device, includes nitrous oxide-acetylene burner
96-0104-00	Refrigerated cooling system 220 V, 50 Hz
96-0104-01	Refrigerated cooling system 115V, 60 Hz
45-0031-00	Tube, graphite Zeeman enduro T2100 (each)
41-0353-00	enduro T2100 coded lamp recognition
99-0728-00	enduro T2100 burner, air-acetylene all-Titanium
99-0729-00	enduro T2100 burner, nitrous oxide-acetylene stainless steel
99-0730-00	enduro T2100 nebulizer, Titanium
99-0734-00	enduro T2100 Nebulizer, high performance glass
75-0054-00	Air compressor 220/240 V, 50 Hz
75-0055-00	Air compressor 110 V, 60 Hz
75-0056-00	Air compressor 220 V, 60 Hz
41-0354-00	Lamp, deuterium enduro T2100
67-0450-00	Valve, oxygen pressure reducing model YQY-12 (available for air, N2, Ar)
67-0451-00	Valve, acetylene pressure reducing model YQY-213

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