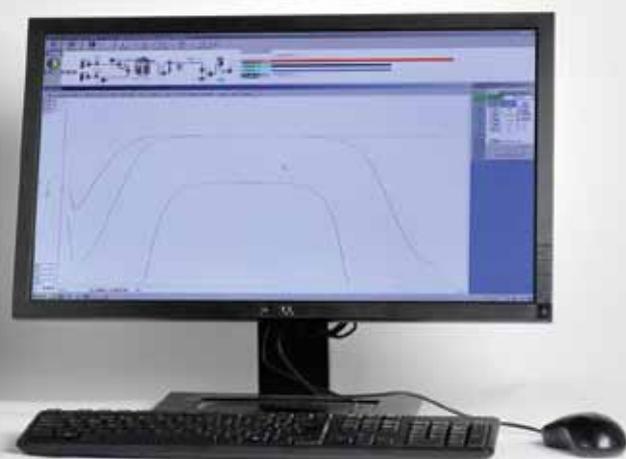


THE SERCON GROUP

INTEGRA2

INTEGRATED ^{15}N AND
 ^{13}C ANALYSER



sercon
The *Stable* Isotope Company



INTEGRA2 INTEGRATED ¹⁵N AND ¹³C ANALYSER

Sercon are dedicated to the design, manufacture and support of **Isotope Ratio Mass Spectrometers** and their associated **sample preparation systems**.

The Integra2 is a combination of our 20-22 mass spectrometer and the SL elemental analyser. This unique product provides the isotope researcher with the most compact instrument. Capable of analysing samples for both ¹⁵N and ¹³C simultaneously with an ¹⁸O option, the Integra2 provides the most cost effective and easy to use isotopic analyser available.

The Integra2 is the instrument of choice for both natural abundance and enriched sample analysis.

The space saving Integra series were designed to be the workhorses for ¹³C and ¹⁵N analysis. These instruments have a pedigree that goes back to the world's first bench-top isotope ratio mass spectrometer that was introduced by Europa Scientific in 1986. These instruments provide simplicity of operation, ease of maintenance and performance on a budget.

Based on the high performance 20-22 stable isotope analyser and SL sample preparation module the Integra2 is a fully integrated combustion, purification and measurement system for ¹⁵N and ¹³C.

The novel 120° ion optics of the Integra's analyser came out of a design study to find the best geometry for continuous flow use and to improve sensitivity for new applications. True stigmatic focusing results in high sensitivity. Novel ion optical design results in an instrument having high dispersion with a short ion path length.

During operation, a capsule containing the sample falls into the combustion tube and is converted in the presence of oxygen to CO₂, N₂, NO_x and H₂O. An elemental copper stage reduces NO_x, a MgClO₄



trap removes water vapour, a switchable Carbosorb trap can be used to remove CO₂ (for ¹⁵N only analyses) and a GC column separates CO₂ from N₂ (allowing dual isotope analysis). Organic ¹⁸O analysis can be made by possible by changing to pyrolysis chemistry and analysing CO.

- 120° extended geometry with an 11 cm radius magnetic sector giving an effective 21 cm radius dispersion and double direction focusing.
- Truly universal Faraday triple collectors for simultaneous collection of adjacent masses in the range 28, 29, 30 - 44, 45, 46 with no adjustment of collectors or amplifiers.
- Asymmetric extended geometry to give true stigmatic focusing with twice the dispersion of normal geometry with the same radius sector. Design allows greater tolerance of the known variables of ion optics making the manufacture of the analyser more reproducible and less sensitive to magnet positioning. Small analyser footprint and wide flat peak shape reduce the effect of temperature drift.
- Shorter path length than traditional extended geometry to decrease ion/molecule interactions and produce near 100% transmission through the analyser and therefore achieve high sensitivity (<1500 molecules/ion).
- Flange-mounted high sensitivity electron impact ion source with thoria-coated iridium filament for long-life and easy replacement. Use of a permanent magnet, active pressure gauge and turbomolecular vacuum pump to keep maintenance down to a minimum.
- 66 place autosampler for unattended operation. 130 place and large sample version available as options.
- High quality stainless steel diaphragm regulators for gas control, digital flow and pressure sensors, normally closed valves configured to save gas and preserve consumables in the event of a power failure.

Specification	Integra-CN
Design	Integrated bench-top unit of a mass analyser and Dumas combustion unit with vertical mounted furnaces. Built in pressure and flow sensors, isothermal GC and software controlled variable oxygen input.
Analyser Geometry	120° extended geometry with an 11 cm radius magnetic sector giving an effective 21 cm radius dispersion and double direction focusing. Truly universal Faraday triple collectors for simultaneous collection of masses 28, 29 and 30 or 44, 45 and 46.
Analytical Mode	Samples in capsules are converted to N ₂ and CO ₂ by combustion and measured by the integrated isotope ratio mass spectrometer.
Ion source	High sensitivity, electron impact, plug-in design.
Magnet	Permanent.
Resolution	mΔm/ = 95 (N ₂) 10% valley definition.
Sensitivity	< 1500 molecules per mass 44 ion.
Abundance Sensitivity	< 300 ppm for CO ₂ at 4 x 10 ⁻⁶ mbar in continuous flow mode. (Software function allows calibration to zero to ensure accuracy.)
Linearity	Changing from 100 to 150 μg C will effect a change of ≤0.2%.
Vacuum	Turbomolecular pump (70 L/s) backed by a two-stage rotary pump. Ultimate vacuum of 1 x 10 ⁻⁸ mbar. Source pressure monitored by active gauge.
Inlet	Built-in capillary inlet with fail-safe pneumatic valve.
Combustion Furnace	Operating range, ambient to 1200°C.
Reduction Furnace	Operating range, ambient to 1100°C.
Column Oven	Operating range, ambient to 250°C (isothermal).
Combustion Packing (Standard)	Chromium Trioxide, Copper Oxide and Silver wool
Water Removal	Re-chargeable magnesium perchlorate trap.
CO ₂ Removal	Re-chargeable Carbosorb trap. Software selectable.
Gas Control	High quality stainless steel diaphragm regulators. Gas flow rates controlled by crimps. Software controlled oxygen pulse for efficient and economical combustions. A software controlled flow diverter valve selects the GC effluent to go to the mass spectrometer or to waste. Normally closed solenoid valves to prevent gas wastage during laboratory power cuts.
Referencing	References of known isotopic and elemental composition are placed in the autosampler carousel as for normal samples.
Sample Range	Solids/Liquids:- 5 to 1000 μg N, 5 to 2000 μg C. (NB. samples down to 0.5 μg can be measured with reduced precision).
Analytical Cycle	4 min per sample (¹⁵ N only) 7 min per sample (¹⁵ N and ¹³ C)
Autosampler	66 position pneumatic autosampler that takes (standard) capsules with dimensions up to 12 x 6mm. Software controlled. Extra carousel (to allow up to 130 samples) or large hole version available as options.
Data acquisition	Data acquisition system uses state of the art highly stable and linear high frequency converters which produce integral slices with zero dead time and quantisation below the beam statistical noise floor at all signal levels.
Software	Proprietary operational software for system control and data handling. System uses Sercon Callisto which is Windows 7 based.
Electronics	Flashover resistant source electronics. Full control and monitoring of all instrument parameters through software and on-board micro-processors.

- Data acquisition system uses state of the art highly stable and linear high frequency converters which produce integral slices with zero dead time and quantisation below the beam statistical noise floor at all signal levels.
- Two long-life furnaces capable of operating to 1100°C.
- On-board microprocessor for storage of furnace temperatures and valve status (guards against PC failure or temporary detachment).
- Total software control of the instrument system and data processing. Allows storage of sample analysis protocols to comply with good laboratory practice. Standby mode to preserve consumable life during periods of low use. Inter-file import/export facility from instrument PC to laboratory server or internet (allows rapid updating of software or transfer to common spreadsheet packages). Fully compatible with all versions of Windows, currently systems are installed with Windows 7.
- Original dual isotope analysis of ¹⁵N and ¹³C in a single sample developed by Europa Scientific. Proprietary GC column to achieve baseline separation of N₂ and CO₂ which is essential for this mode of analysis.
- Software controlled oxygen injection to match sample requirements thereby preserving the life of the consumables.
- Re-chargeable water and carbon dioxide chemical traps. CO₂ trap is switched in/out of line by software to avoid leaks on changing analytical mode.

Power and Gas Requirements

Power	100-240 VAC
Helium	99.999%
Oxygen	99.998%
Compressed Air	50 psi





EXTERNAL PRECISION

All specifications are for n=5 samples.

Gas	Reference Gas (Injections (% _o vs. Ref) (10 Nano amps)	Combustion/Pyrolysis (% _o vs Ref)
N ₂ (¹⁵ N)	0.1	0.3 (100 µg*, n=5)
CO ₂ (¹³ C)	0.1	0.2 (100 µg*, n=5)
CO (¹⁸ O)	0.1	0.5 (100 µg*, n=5)

* denotes amount of element per capsule

Integra2 Typical Data (from Test Records)

¹⁵ N	100ug	0.3	0.14
¹³ C	100ug	0.2	0.07
Dual	400ugC=0.15	0.15	0.07
	100ugN = 0.4	0.4	0.08

OPTION LHA

Large hole autosampler designed to accept wholeglass fibre filters pressed into large tin capsules. 30 position carousel and capsule crushing tool.

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