

THE SERCON GROUP

ABCA-G GAS PURIFICATION MODULE





ABCA-G GAS PURIFICATION MODULE

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

For the analysis of gaseous samples, the Sercon G is the preparation unit to choose. Interfaced to a 20-22 or Geo 20-22 the unit can be used for a wide range of analyses such as breath CO₂ for ¹³C, water equilibration for ²H and ¹⁸O and carbonate analysis for ¹³C and ¹⁸O along with other elevated concentration gases.

The Sercon G uses our gas sampler and can be supplied with a heated sample tray and a range of vial racks according to your requirements.

The ABCA-G is a gas purification module which produces clean gas samples for a 20-22 or GEO 20-22 series isotope ratio mass spectrometer. Choosing the ABCA-G module gives the researcher great flexibility for continuous flow gas analyses. It has been designed for isotope analysis of abundant gases from septum sealed containers.

The unit uses a simple and robust helium flushing device to take gas samples from septum sealed containers, dries them through a chemical water trap and purifies the gases on a packed column gas chromatograph. N₂, CO₂ and O₂ can be analysed at atmospheric concentrations while H₂, N₂O, SO₂ and NO can be measured at elevated levels e.g. from a head space. The main applications an ABCA-G and 20-22 would be used for are; carbon-13 breath tests, water equilibrations, continuous flow carbonate measurements and dissolved inorganic analyses.

- 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.
- On-board microprocessor for storage of GC oven temperature and valve status (guards against PC failure or temporary detachment).
- Re-chargeable water chemical trap.
- Gas sampling from septum sealed containers by the original Europa flushing method. Purge facility on needle to prevent sample carryover. Full automation via a choice of software controlled autosamplers that can accommodate up to 240 x 12 ml septum sealed containers (optional bar code reader and temperature controlled reaction block).
- Ability for operator to program the software to purge containers automatically with helium or an equilibration gas (i.e. use the system as a preparation device).
- 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). System uses Sercon Callisto which is Windows 7 based.

The Gas Purification module is ready to be connected to the continuous flow interface of our 20-22 or GEO 20-22 series of isotope ratio mass spectrometers:



Specification	ABCA-G
Design	Bench top gas chromatography purification module. Built in pressure and flow sensors and isothermal GC.
Analytical Mode	Gas samples in septum sealed containers (eg: H ₂ , CO ₂) are purified by gas chromatography.
Column Oven	Operating range, ambient to 250°C (isothermal). Gas chromatograph gives complete separation of CO ₂ from contaminating gases.
Water Removal	Re-chargeable magnesium perchlorate trap. Or hydrophilic membrane technology if required.
Gas Control	High quality stainless steel diaphragm regulators. Gas flow rates controlled by crimps. 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 composition and gas concentration are placed in the autosampler carousel as for normal samples. Option to use reference gas injection at operator defines times through the mass spectrometer reference gas system.
Gas Sampling Method	Total or partial flush of septum sealed containers. Needle purge facility.
Sample Range	Gases: 0.1 to 100% v/v (CO ₂ , N ₂ , H ₂ , O ₂ , SO ₂ , NO, N ₂ O)
Analytical Cycle	3 min per sample (H ₂) 4 min per sample (CO ₂)

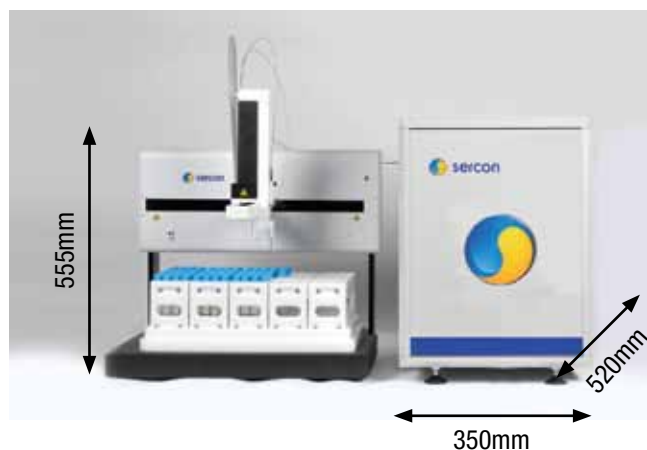
EXTERNAL PRECISION (FOR COMMONLY ANALYSED GASES)

All specifications depend on the module being connected to a 20-22 or GEO 20-22 isotope ratio mass spectrometer and are for n=10 samples.

Gas	Reference Gas (% vs Ref) (10 Nano amps)	Gas Sample (% vs Ref)
CO ₂ (¹³ C)	0.1	0.1 (5% CO ₂)* 0.2 (0.5% CO ₂ or 500 µl DIC)* 0.5 (360 ppm CO ₂)*
CO ₂ (¹⁸ O)	0.1	0.2 (0.5 ml equilibration)
H ₂ (² H)	1.5	2.0 (0.5 ml equilibration)
N ₂ (¹⁵ N)	0.1	0.1 (5% N ₂)
N ₂ O (¹⁵ N)	0.1	0.2 (1% N ₂ O)

* All samples in 12ml containers

Power and Gas Requirements	
Power	100-240 VAC
Helium	99.999%
Hydrogen	5%
Carbon Dioxide	5%



EXAMPLE DATA FROM TEN SYSTEMS:

ABCA-G / ANCA-GSL	Specification	Average	
Gas Analyses (n=5)			
² H	0.5 ml H ₂	1.5	1.16
¹³ C	5% CO ₂ (12ml)	0.1	0.0295
	Air CO ₂ (12ml)	0.5	0.33
¹⁵ N	0.5 ml N ₂	0.1	0.06
	100 ppm N ₂ O (12ml)	0.5	
¹⁸ O	5% CO ₂ (12ml)	0.1	0.03
	100 ppm N ₂ O (12ml)	1.0	
Equilibrations (n=5)			
² H	0.5 ml tapwater	2.0	1.8717
¹⁸ O	0.5 ml tapwater	0.2	0.1067
Carbonates (n=5)			
¹³ C	500 µg CaCO ₃	0.1	0.08
¹⁸ O	500 µg CaCO ₃	0.3	0.2

AUTOSAMPLER OPTIONS

ASX7400 XYZ gas autosampler with changeable sample racks for 12, 125 and 250ml septum sealed bottles.

The gas autosampler has been chosen to be the most robust and reliable gas sampler in the marketplace. With over 17 000 similar units installed, you can be confident in its efficacy. Incorporating a bespoke multiple access rack system, with space for up to 240 samples, the sampler may be reloaded at any time. The sample number is limitless so potentially up to 480 samples can be analysed within a 24 hour period.

Using the optional barcode reader, sample and patient codes can be read into the software as the analysis progresses. This sampler is available as an upgrade for all gas sampling systems to ensure all users can benefit from its versatile performance.



HEATER BLOCK

Thermostatically controlled block for ASX7400. Accommodates 2 x 110 5ml containers, designed to operate at 60°C ± 0.1°C.

The ABCA-G can benefit from our 2x110 heated sample tray which permits up to 220 samples to be analysed. It also enables one batch to be equilibrating whilst the other batch is being analysed and so increases laboratory throughput.

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