



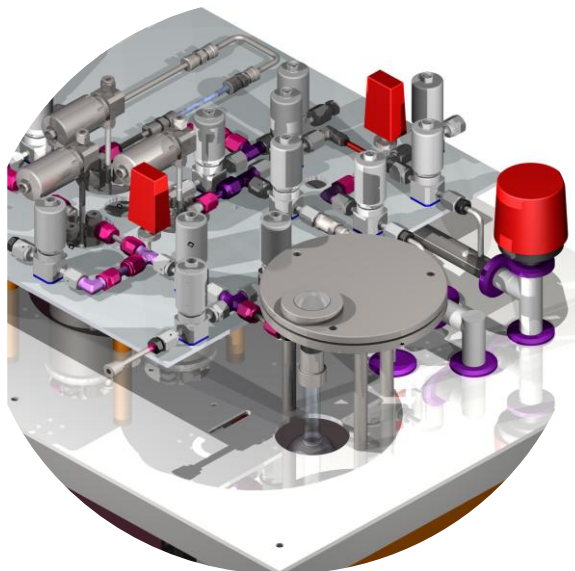
Isotope Extraction System

# IMPALA Methane

# Introduction

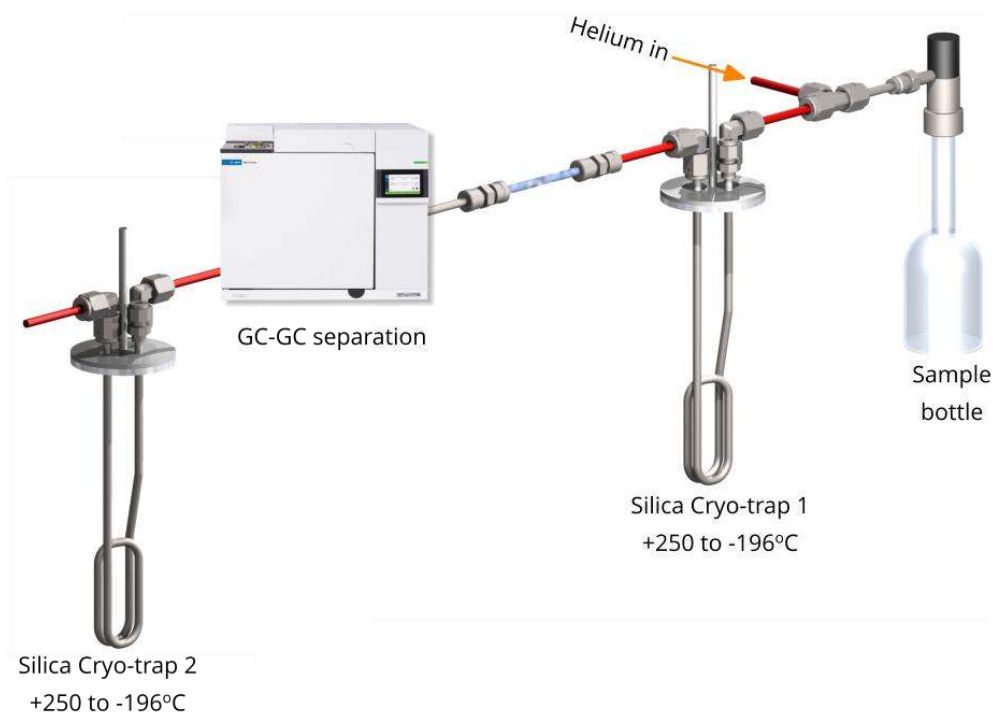
The IMPALA methane is a fully automated system for preparing and purifying CH<sub>4</sub> gas samples for clumped isotope analysis.

The IMPALA can be integrated with most modern IRMS systems, including the Thermo Ultra. Gas connections are made directly to the IRMS bellows and/or systems inlet block.

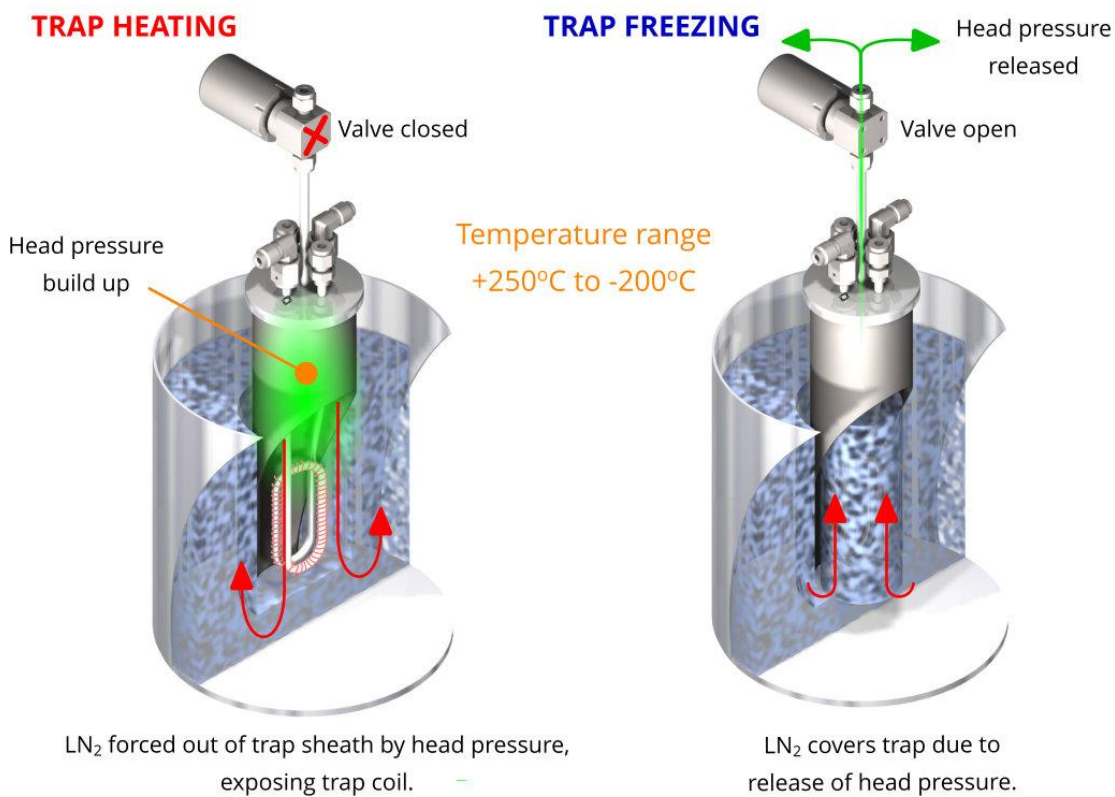


## How the IBEX Methane works

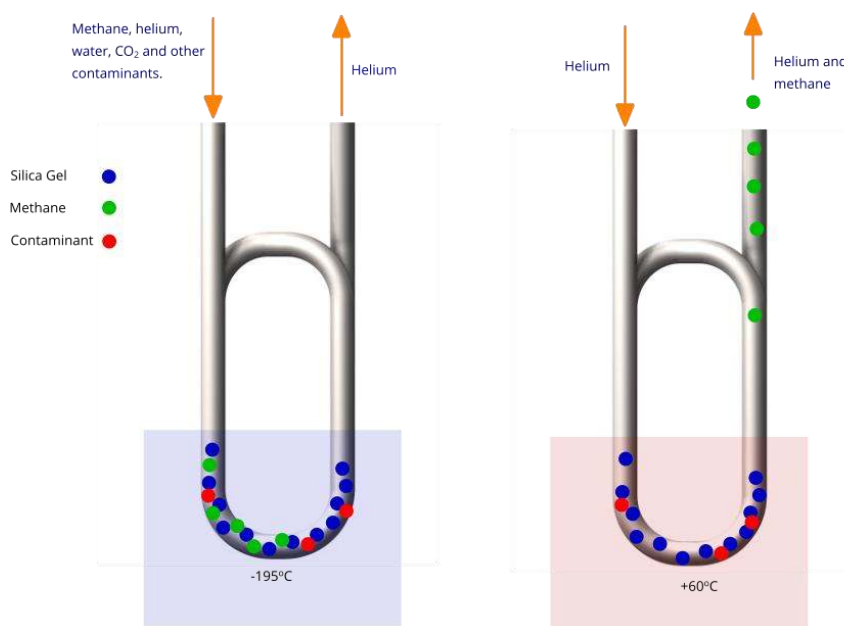
The IMPALA utilises a series of variable-temperature silica traps and a GC-GC purification process to purify CH<sub>4</sub> from gaseous samples.



The cryo-traps use a variable head-pressure system to raise and lower the liquid nitrogen level without physically moving the trap. This provides safe and accurate trap cooling and heating.



As the freezing point of CH<sub>4</sub> is close to LN<sub>2</sub> temperatures, a silica stationary phase is added to the IMPALA cryo traps. This ensures nearly 100% recovery of CH<sub>4</sub> samples.



# Automated helium flow control

Helium flow through the system is regulated using high-precision mass flow controllers. This enables flow rates from 0 to 100 ml min<sup>-1</sup> (1 ml increments).

The flow rates are software-controlled and can be altered directly through the ICC software interface. Automated changes can also be added to the sample preparation method.

The ability to control flow rates in real time provides two benefits:

1. Bi-directional flow across the GC columns, allowing back-flushing during the cleaning process.
2. The ability to place the IMPALA in gas saver mode between sample preparations.

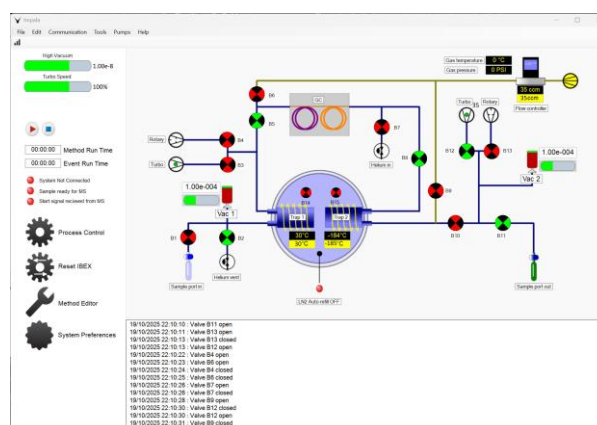


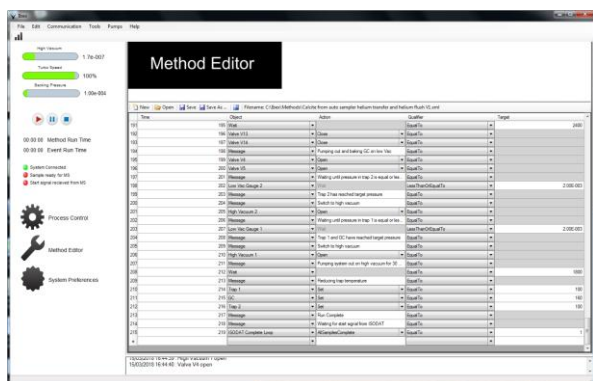
## IMPALA Control Centre Software

The IBEX Control Centre software (ICC) provides a fully integrated control and monitoring platform. Seamlessly linking with ISODAT sequence files, methods and scripting language.

Real-time control and readbacks of all functional objects are accessible on the main ICC screen, including valve state, trap temperatures, and vacuum pressures.

The addition of custom controls and objects is also possible using the system's plug-and-play options. This includes pressure gauges, valves and other bespoke equipment.

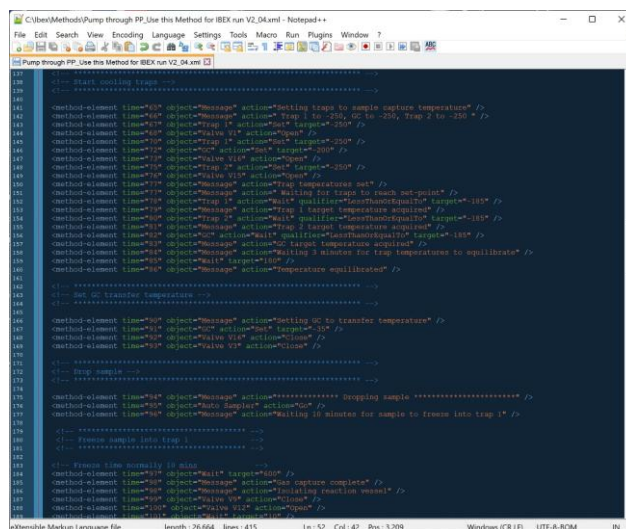




Existing methods can be edited with a few mouse clicks.

Advanced users can also edit and deploy methods using any XML editor.

Custom analytical methods can be created using the ICC method editor. This requires no prior scripting or coding knowledge. New methods can be created and deployed in minutes.



# IMPALA functionality and specifications

| CRYO TRAP PERFORMANCE                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The system includes three silica cryo-traps (two water traps and one cold finger).</p> <p><b>Water traps</b><br/>Max Temp +250 °C<br/>Min Temp -197 °C<br/>CH<sub>4</sub> release temperature +30 to +60 °C<br/>Temperature increments 1°C</p>                                                       |
| MASS FLOW CONTROLLER                                                                                                                                                                                                                                                                                    |
| <p>Helium Mass Flow can be controlled from 0 to 100 ccm<br/>Control resolution 1 ccm<br/>Flow direction is reversible (trapping or backflush)</p>                                                                                                                                                       |
| LIQUID NITROGEN CONSUMPTION                                                                                                                                                                                                                                                                             |
| <p>Approximately 45 litres per day.</p> <p>It is recommended that the customer provide a 90-litre (or larger) LN<sub>2</sub> storage vessel to supply the IMPALA preparation system.</p>                                                                                                                |
| SULPHUR TRAP                                                                                                                                                                                                                                                                                            |
| <p>Silver wool trap<br/>Volume 3 ml</p>                                                                                                                                                                                                                                                                 |
| IBEX CONTROL CENTRE SOFTWARE                                                                                                                                                                                                                                                                            |
| <p>Compatible with ISODAT and Qtegra<br/>Requires Windows 7 or above</p>                                                                                                                                                                                                                                |
| VACUUM SYSTEM                                                                                                                                                                                                                                                                                           |
| <p>1 x DX85 Edwards turbo molecular pump<br/>2 x RV5 Edwards rotary pumps<br/>1 x Edwards Penning gauge<br/>2 x Edwards Pirani gauge<br/>2 x Edwards TIC/gauge controller</p> <p>Please note that alternative components may be used if they provide better performance than those described above.</p> |
| Vacuum Fittings                                                                                                                                                                                                                                                                                         |
| <p>All Vacuum joints and seals use VCR connections. All tubing is Ultron finished or equivalent</p>                                                                                                                                                                                                     |



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