Continuous Flow

The Horizon and Perspective instruments are designed to be easily interfaced to an expanding range of continuous flow sample preparation systems, via the automatic isolation valve located on the ion source housing.

Up to 5 variable reference gas injector units and a dilutor are contained within the instrument enclosure and all effluent gas is safely vented. The reference gas signals are under electronic control with automatic pressure monitoring allowing automated selection of beam heights and unattended H_3^+ or linearity determination before sample runs, giving added confidence in data integrity.

Linearity specifications are obtained over the full 50V range of the ion beam amplifiers.

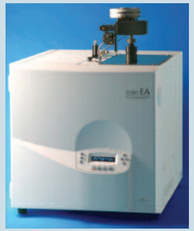
Gas Chromatography

The Agilent 7890 GC is used for separation of complex mixtures before conversion to gases via the Nu GC-IRMS interface unit.

The interface can be used for quantitative conversion to CO_2, N_2, H_2, and CO for $\delta^{13}C$, $\delta^{15}N$, δD, and $\delta^{18}O$ analyses. A wide range of sample preparation and introduction options are available from Agilent and third party vendors.

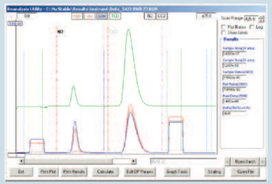
Nu GC-IRMS interface attached to the Agilent 7890 GC

Elemental Analysers

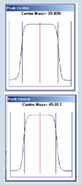


The continuous flow interfacing of standard commercially available C,H,N,O and S elemental analysers to the Horizon and Perspective IRMS instruments allows the unattended analysis of a wide range of samples.

EuroVector Elemental Analyser with VectorSAS "Zero Blank" Autosampler



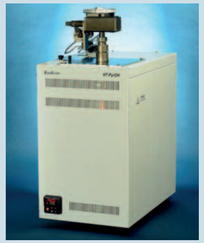
Simultaneous $\delta^{15}N$ and $\delta^{13}C$ analysis



Automatic peak centre on N_2 and CO_2

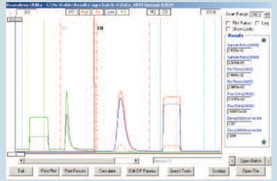
Simultaneous $\delta^{15}N$ and $\delta^{13}C$ analysis in N_2 and CO_2 respectively is performed via peak jumping, using the computer controlled and Hall probe regulated electromagnets. In addition, the user can specify an auto peak centre routine that ensures the ion beams are always centrally located in the collectors, regardless of any variation in the laboratory environment.

High temperature carbon reduction furnace



The interfacing of a high temperature carbon reduction furnace to a Horizon or Perspective allows the reduction of many organic and inorganic compounds to CO and/or H_2 gases for $\delta^{18}O$ and δD determinations. Autosamplers are available for both solid and liquid samples and are easily interchangeable.

EuroVector HT-PyrOH for H and O analyses



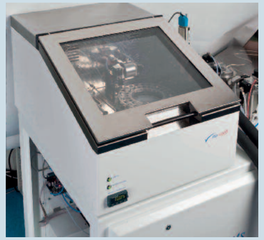
Simultaneous δD and $\delta^{18}O$ analysis

Dual Inlet

The Dual Inlet System is located in a separate cabinet to partner either the Horizon or the Perspective IRMS instruments, with the changeover valve block mounted close to the sample inlet valve on the ion source housing, minimizing dead volume and gas path lengths.

The Nu Carb is a compact bench-top dual inlet carbonate device that offers high precision $\delta^{13}C$ and $\delta^{18}O$ isotope ratio determinations on small carbonate samples.

It can be interfaced with the high sensitivity, high resolution Perspective or The Horizon isotope ratio mass spectrometers.



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Nu Plasma II
Multi-Collector ICP-MS

Nu Plasma 1700
Multi-Collector ICP-MS

Nu TIMS
Thermal Ionisation MS

Attom
High Resolution ICP-MS

Astrum
Glow Discharge MS

Evolution
HR Gas Analysis MS

Noblesse
Noble Gas MS

Panorama
HR Stable Isotope Ratio MS

Horizon
Stable Isotope Ratio MS

Perspective
Stable Isotope Ratio MS

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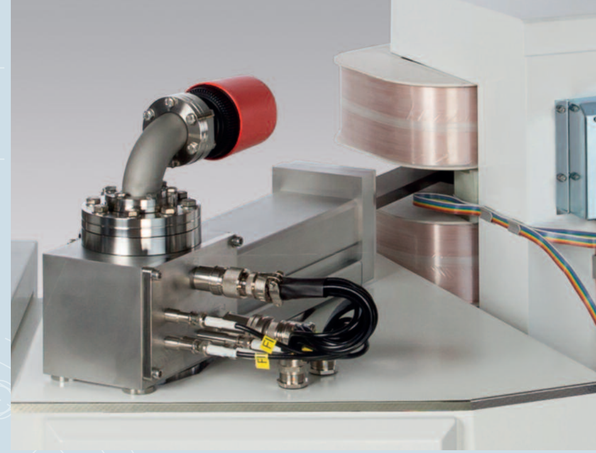


nu instruments

PERSPECTIVE
HORIZON

STABLE ISOTOPE RATIO MASS SPECTROMETERS

HORIZON

STABLE ISOTOPE RATIO MASS SPECTROMETER

Bringing high technology to the routine market

The Horizon IRMS instrument is designed for flexibility, reliability and high performance, with user friendly instrument control and data analysis software.

This next generation instrument possesses unique features for both Dual Inlet and Continuous Flow Analysis, interfacing with a wide range of sample preparation peripherals.

The collector array uses the patented Variable Dispersion Zoom Optics to monitor masses from 2 to 100 with exact coincidence.

HORIZON

Horizon Features

- Simultaneous ion beam collection using 2-6 Faraday collectors
- Large mass dispersion - 30cm effective magnetic deflection radius for CO_2
- All masses measured at full 5kV accelerating potential
- Mass resolution CNOS and H (m/△m) >110 (10% valley)

PERSPECTIVE

Perspective Features

- Simultaneous ion beam collection using 2-12 Faraday collectors
- Largest mass dispersion available on a commercial IRMS instrument - 60cm effective magnetic deflection radius for CO_2
- All masses measured at full 8kV accelerating potential
- Mass resolution CNOS (m/△m) >200 (10% valley)

Common Features

- High efficiency ion sources with integral focusing lenses
- Full differential pumping as standard, maximising performance for both dual inlet and continuous flow applications
- Electromagnets stabilised with Hall probe control
- High efficiency, narrow entrance, deep Faraday collectors
- Amplifiers capable of measuring signals above 55V
- State-of-the-art electronics with full self-diagnostics
- 100% analyser transmission
- Unique SIRMS collector arrays using Patented "Variable Zoom Optics"
- All masses, including H_2, are measured at the full deflection radius
- Integral ion source heater (temperature up to 200°C)

Optimised Collector Geometry

The fundamental difference between the Nu Instruments Horizon and Perspective IRMS instruments and competitive products concerns the collector geometry.

By using a "Universal Triple Collector" detector array other instruments have to compromise the width of the collectors that are used for the measurement of nitrogen, carbon, oxygen, and sulphur isotope ratios.

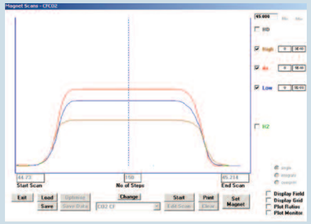
In these designs the central collector is narrow, but the outer collectors have wide slits to accommodate the different mass ratios.

This design suffers from a number of pitfalls, including:

- Collectors are not deep enough to ensure uniform efficiency as the peak is scanned across the entrance aperture, leading to sloping peaks.
- Collectors are more susceptible to collecting stray ions – leading to poor abundance sensitivity (overspill of ions from mass m to mass m±1).
- Most importantly, collectors are liable to accidentally receive part of an undesired neighbouring peak (e.g. in CO_2 measurements the 47 amu beam will be incident in the mass 46 amu detector and will be measured concurrently).

These effects limit the accuracy that an instrument is capable of achieving, which is why up to now all the more accurate IRMS instruments are fitted with separate and fixed narrow collector arrays.

The Patented "Variable Zoom Optics" technology used on the Horizon and Perspective instruments now permits these shortcomings to be overcome at a reasonable price. By altering the dispersion of the IRMS electronically using the zoom lens, the ion beams are made to image simultaneously on fixed and narrow detectors for all masses.



Peak shape for all 3 CO_2 ion beams at 44, 45, and 46amu

PERSPECTIVE

STABLE ISOTOPE RATIO MASS SPECTROMETER

Bringing high technology to the research market

The Perspective IRMS instrument is designed as the ultimate next generation IRMS with the largest mass dispersion by far (60cm for CO_2) of any IRMS.

The collector array can accommodate up to 12 Faraday collectors giving flexibility for all current and future IRMS research applications.

It uses the patented Variable Zoom Optics to monitor masses from 2 to 150 with exact coincidence.