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HIDEN ANALYTICAL

Hiden QGA

Quantitative Gas Analysis System

Hiden QGA System



A compact bench-top gas analyser configured for real time analysis.

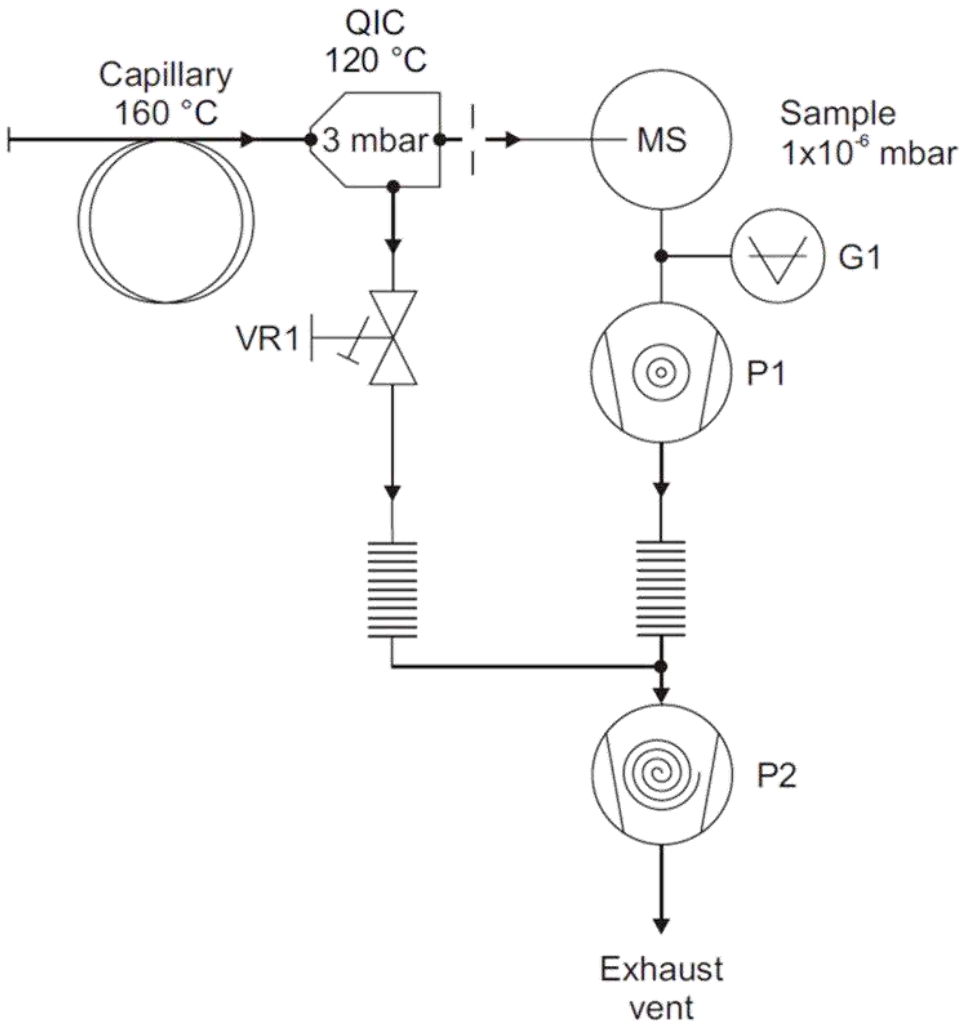
Introduction

The Hiden QGA quantitative gas analysis system is configured for continuous analysis of gases and vapours at pressures near atmosphere.

Operating to 200°C, the QIC (quartz inert capillary) flexible 2m capillary inlet provides fast response times of less than 300ms.

The QGA system has a mass range of 200 amu (300 amu option) and a detection capability from 100% to less than 100ppb.

QGA Vacuum Schematic

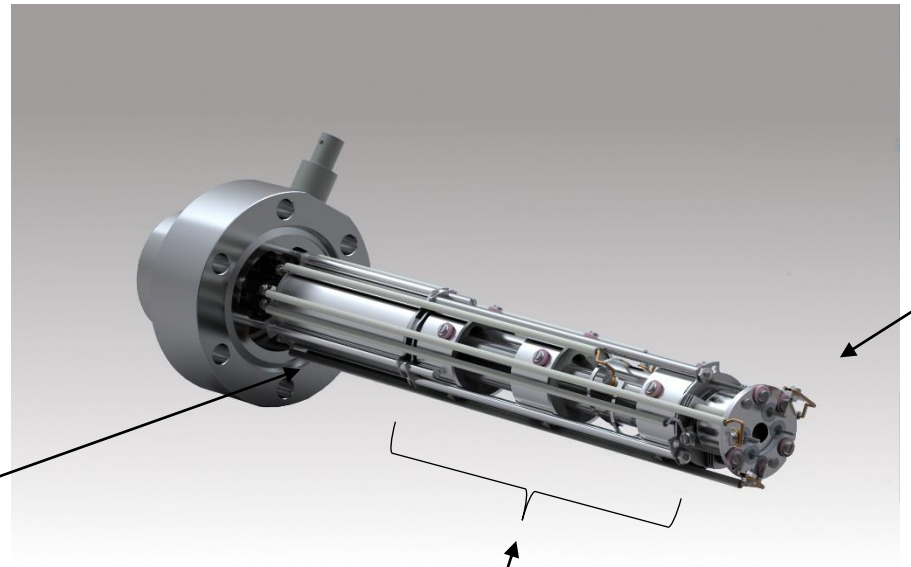


Key
G1 Penning gauge
VR1 QIC Inlet bypass control valve
P1 60 l/s turbo drag pump
P2 Backing and bypass Scroll pump
MS UHV Housing (Mass spectrometer chamber)



Backing and bypass Scroll Pump

QGA Mass Spectrometer

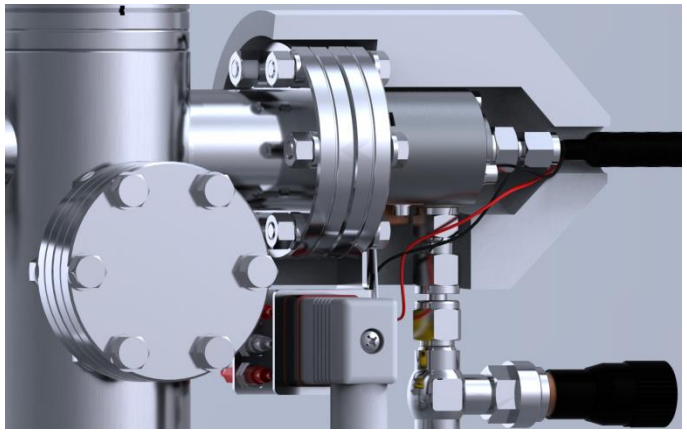


electron impact
ionisation source

dual Faraday / secondary
electron multiplier detectors

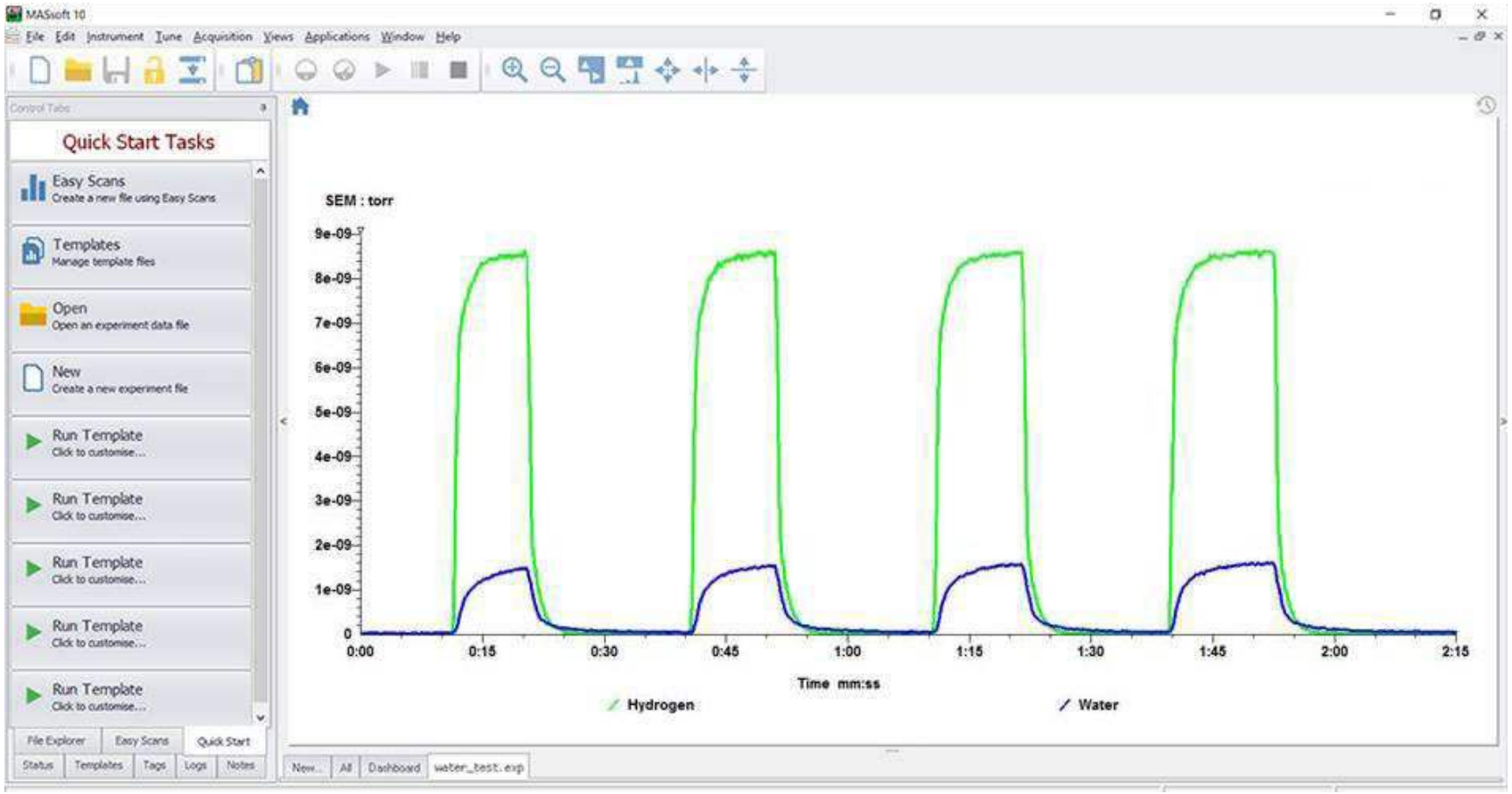
quadrupole mass filter

QIC Inlet Technology



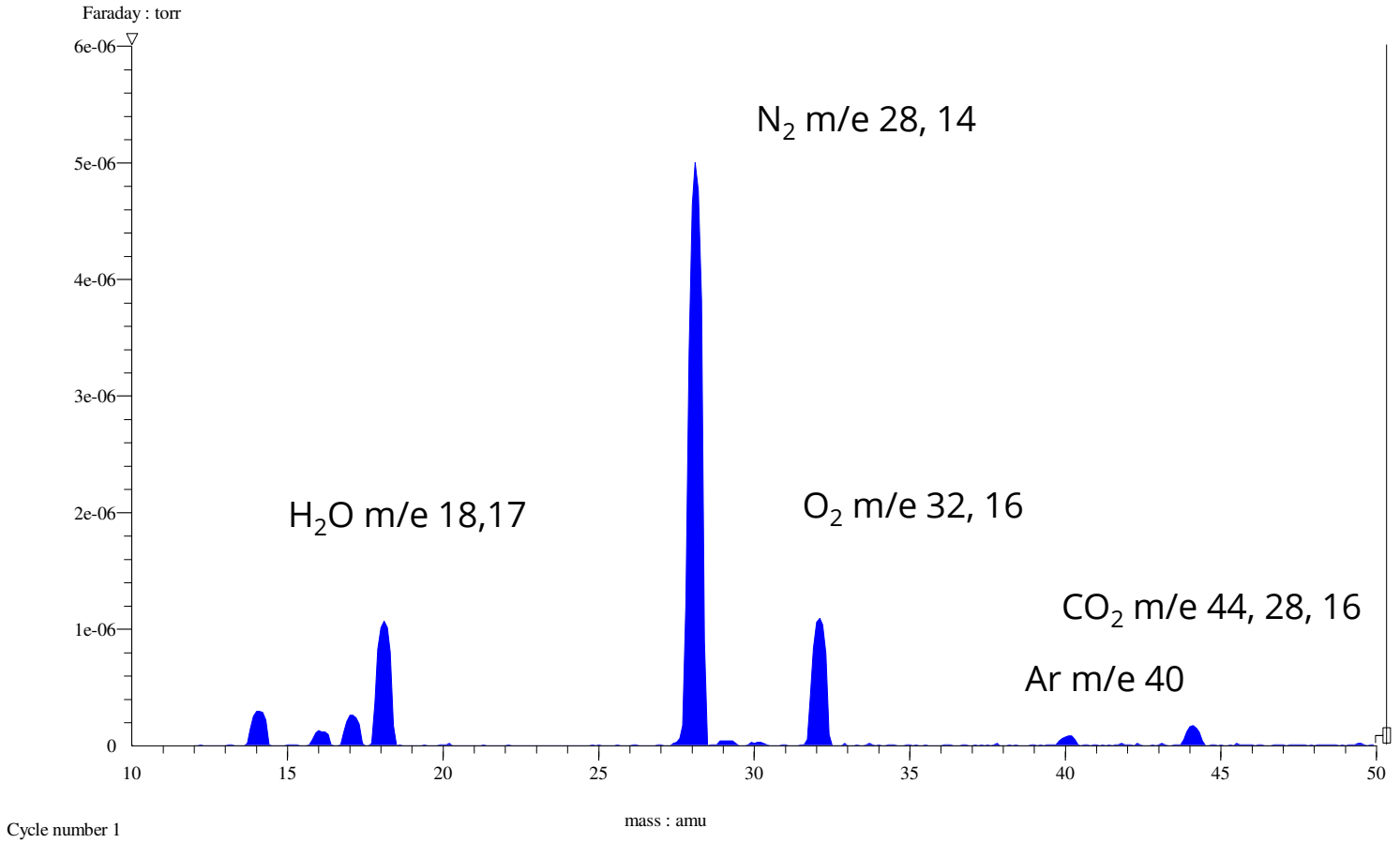
Quartz and Platinum Wetted Surfaces	→	No memory effects
Heated Capillary	→	No condensation effects
Flow Matched	→	Optimum response / recovery
Minimal Internal Volume	→	PPB detection
Interchangeable Sampling Capillaries	→	Analysis from 10 Torr to 2 Bar

Fast Response to Permanent Gases / Vapours



Data shows the response of a QGA system to gas and vapour during switching between a dry He stream and a wet H_2 and Ar flow. For clarity, only the H_2 and H_2O data is shown in the graph.

Typical Mass Spectrum of Air



Note: Different species can have the same mass e.g. CO, N_2 m/e 28

Soft Ionisation

Unique to Hiden gas analysis systems, soft ionisation allows users to selectively ionise different gases by setting the ionisation energy for a particular mass.

This powerful technique can simplify the analysis of otherwise complex cracking patterns from multi-component gas/vapour mixtures.

The ionisation energy can be altered from 4 to 150 eV, in 0.1 eV increments. Standard operation is at 70 e' '

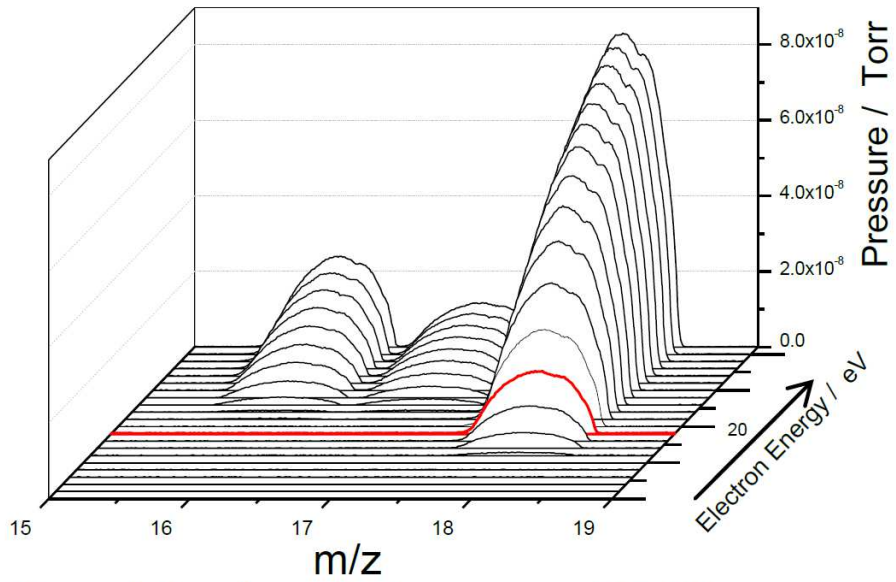


Figure 1 A: m/z *vs* Electron energy-H_2O/Air

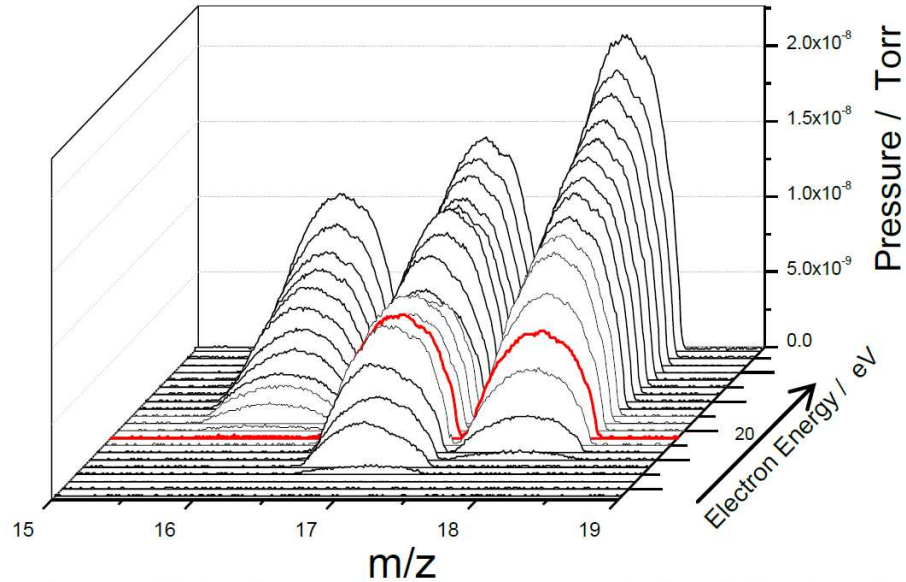
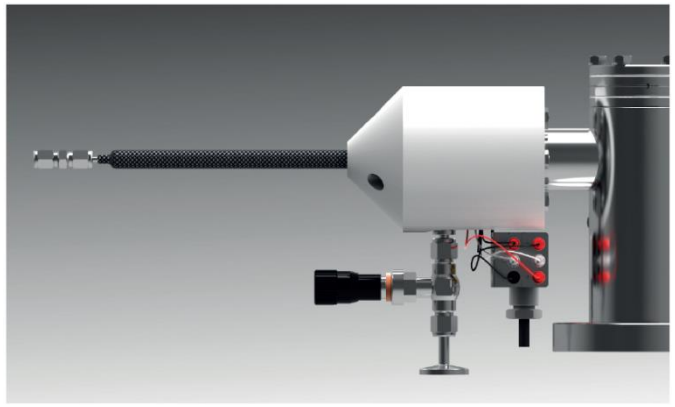


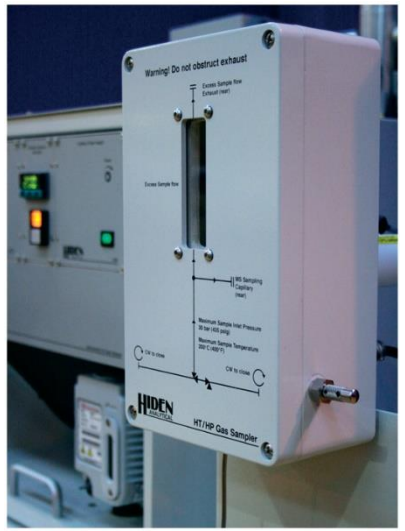
Figure 1 B: m/z *vs* Electron energy-NH_3/ H_2O/Air mix

Gas Sampling Options

Pressure:

Inlet options are available for sampling both above and below atmospheric pressure. High pressure inlets for sampling at up to 30 bar and special capillaries for sampling down to 1 mbar.







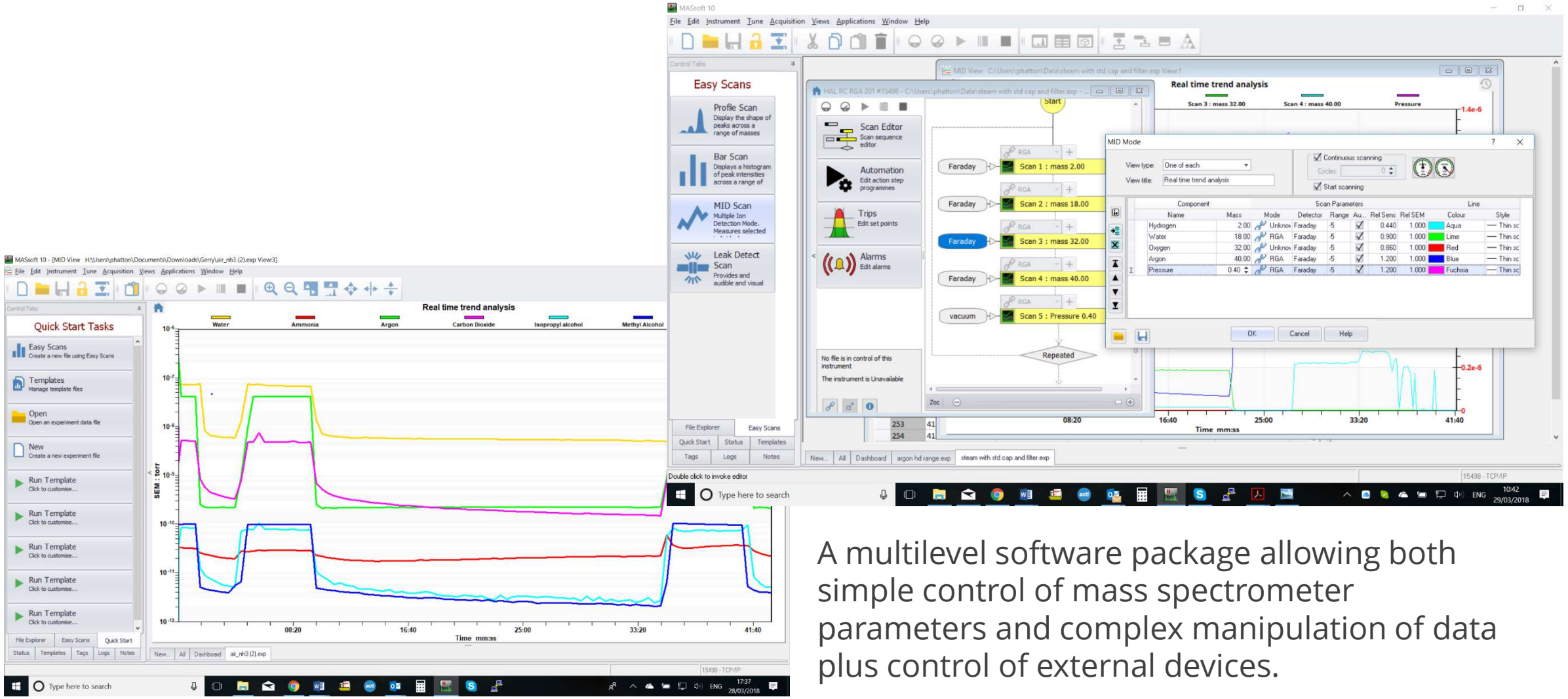
Multi-stream selectors:

2, 8, 16, 20, 40 and 80 way options

Temperature:

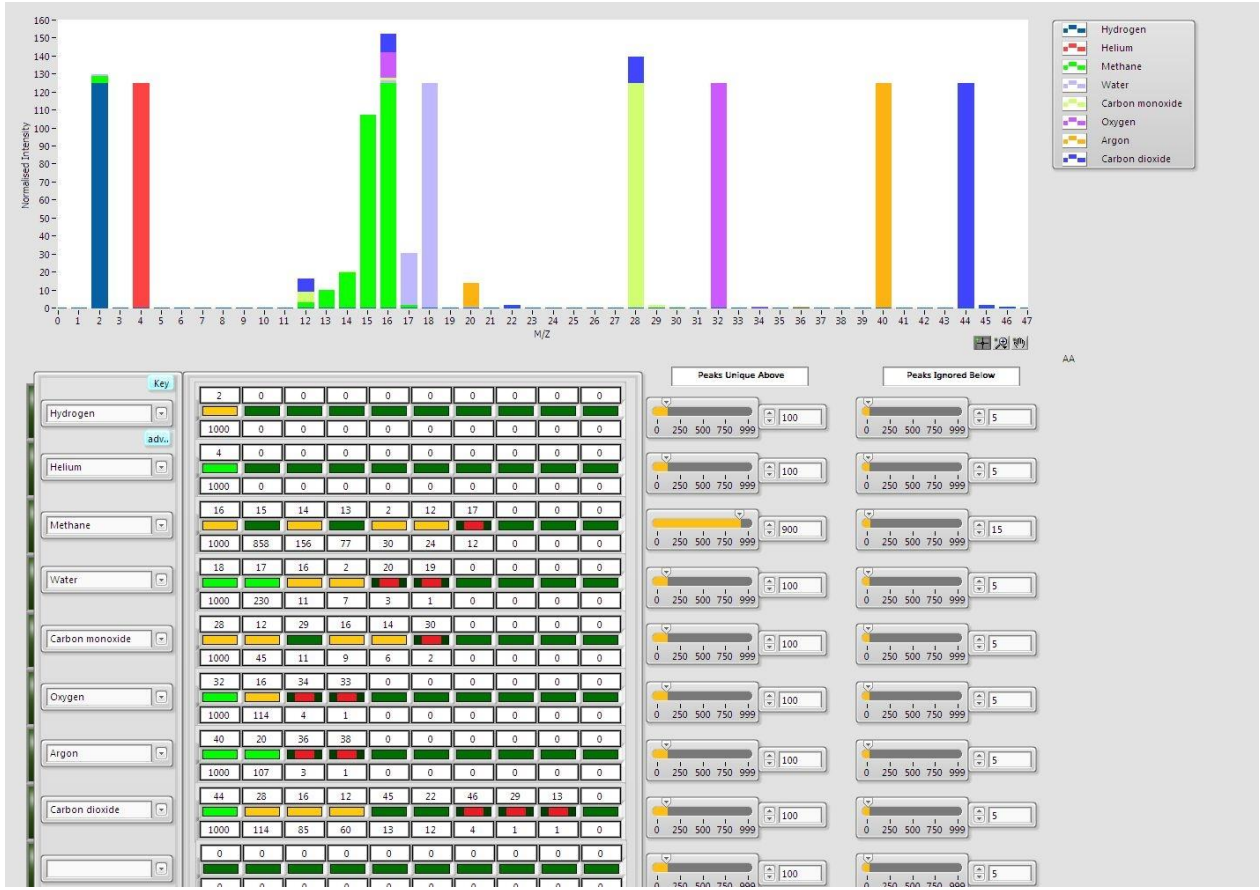
- Heated capillary extensions
- High temperature capillary inlets
- Hot-zone adaptors
- Heated multi-stream inlets

MASsoft Professional Control software



A multilevel software package allowing both simple control of mass spectrometer parameters and complex manipulation of data plus control of external devices.

QGA Professional Software for Quantitative Gas Analysis



An application specific software package for quantitative gas and vapour analysis providing real time continuous analysis of up to 32 species with concentrations measured in the range 0.1PPM to 100%.

- Automatic subtraction of spectral overlaps
- Automated calibration routines
- Mass spectral library with intelligent scan feature
- Multi-stream support

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QGA Professional Software for Quantitative gas Analysis

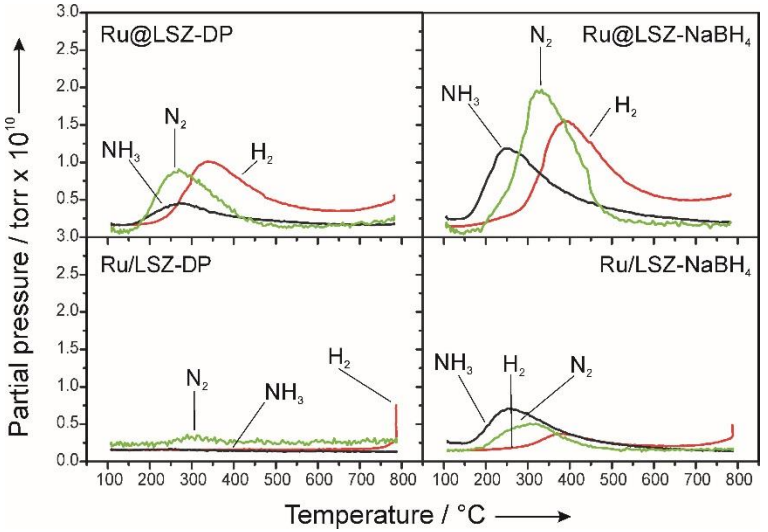
Applications

- Catalysis
- Reaction Kinetics
- TPD/TPR/TPO
- Thermal Analysis Mass Spectrometry
- Gas Purity Analysis
- Process Characterisation
- Fermentation Off Gas Analysis
- Environmental Gas Analysis
- Combustion Studies
- CVD/MOCVD



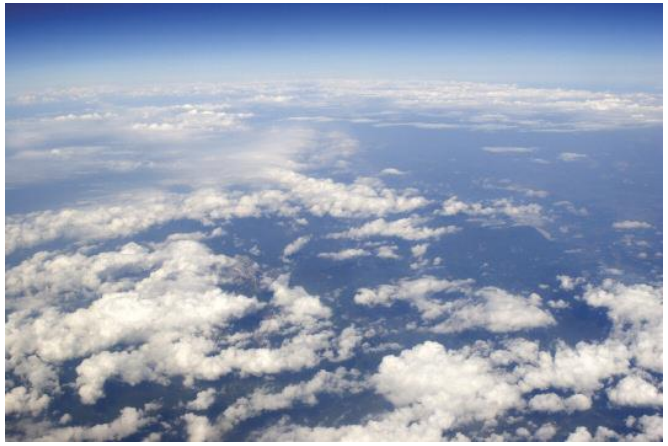
Applications: Catalysis Research

- Catalyst characterisation
- Kinetic and thermodynamic measurements
- TPD, TPO, TPR, TP-Reaction
- On-line continuous product analysis
- Total Surface Area / Metal Surface Area
- Mechanisms of Surface Reactions
- Heats of Adsorption and Co-adsorption
- Operando Studies

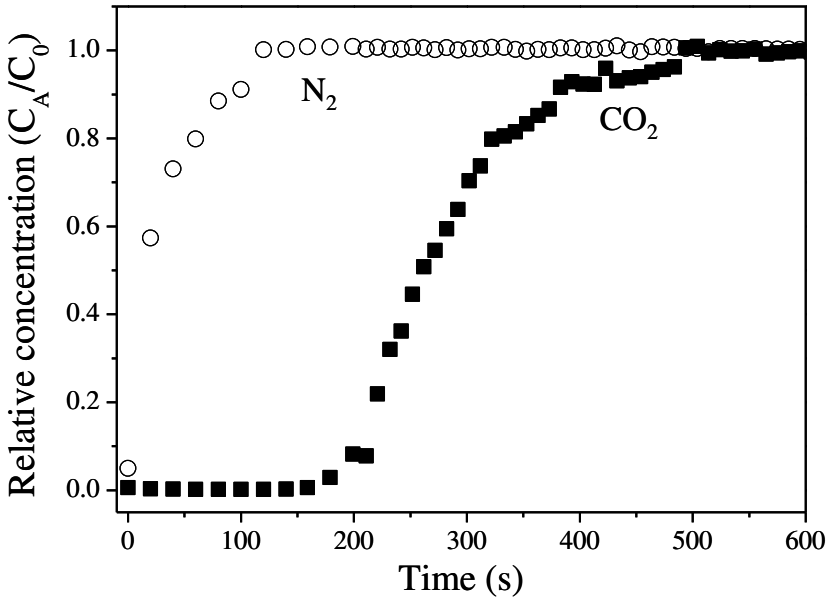


NH_3-TPD on embedded Ru@LSZ and impregnated Ru/LSZ catalysts.
Ref: Lorenzut et al. (2011) *Hydrogen production through alcohol steam reforming on Cu/ZnO-based catalysts*, Applied Catalysis B, **101** (3&4), 397-408.

Applications: Environmental Gas Analysis







Breakthrough curve of CO_2 (15% CO_2, 85% balance N_2) on mesoporous alumina.
Ref: Yang et al. (2010) *CO_2 adsorption over ion-exchanged zeolite beta with alkali and alkaline earth metal ions*, Mesoporous Materials **135** (1-3), 90-94.

Hiden QGA Users

- Johnson Matthey
- Imperial College London
- NASA
- Poitiers University
- Nissan
- KTH Stockholm
- Karlsruhe Institute of Technology
- University of Florida
- The University of Hong Kong
- Paul Scherrer Institut
- ULB Brussels University
- Texas A&M University
- University of Sao Paolo
- University College London
- Technical University Denmark
- Beijing Forestry University
- CSIR – Indian Institute of Petroleum
- Diamond Light Source
- Shanghai Institute of Technology
- Janssen Pharmaceutica
- PDVSA
- Air Liquide
- BASF
- TU Delft
- Seoul National University
- University of Manchester
- University of British Columbia
- USTB
- University of Nottingham

Summary

- Compact bench-top gas analysis system
- Real-time, multi-species analysis – 100 ppb to 100%
- Fast response to permanent gases and vapours – less than 300 ms response time
- Automated calibration routines for accurate quantitative analysis
- Soft ionisation for reduced spectral fragmentation and simplified data interpretation