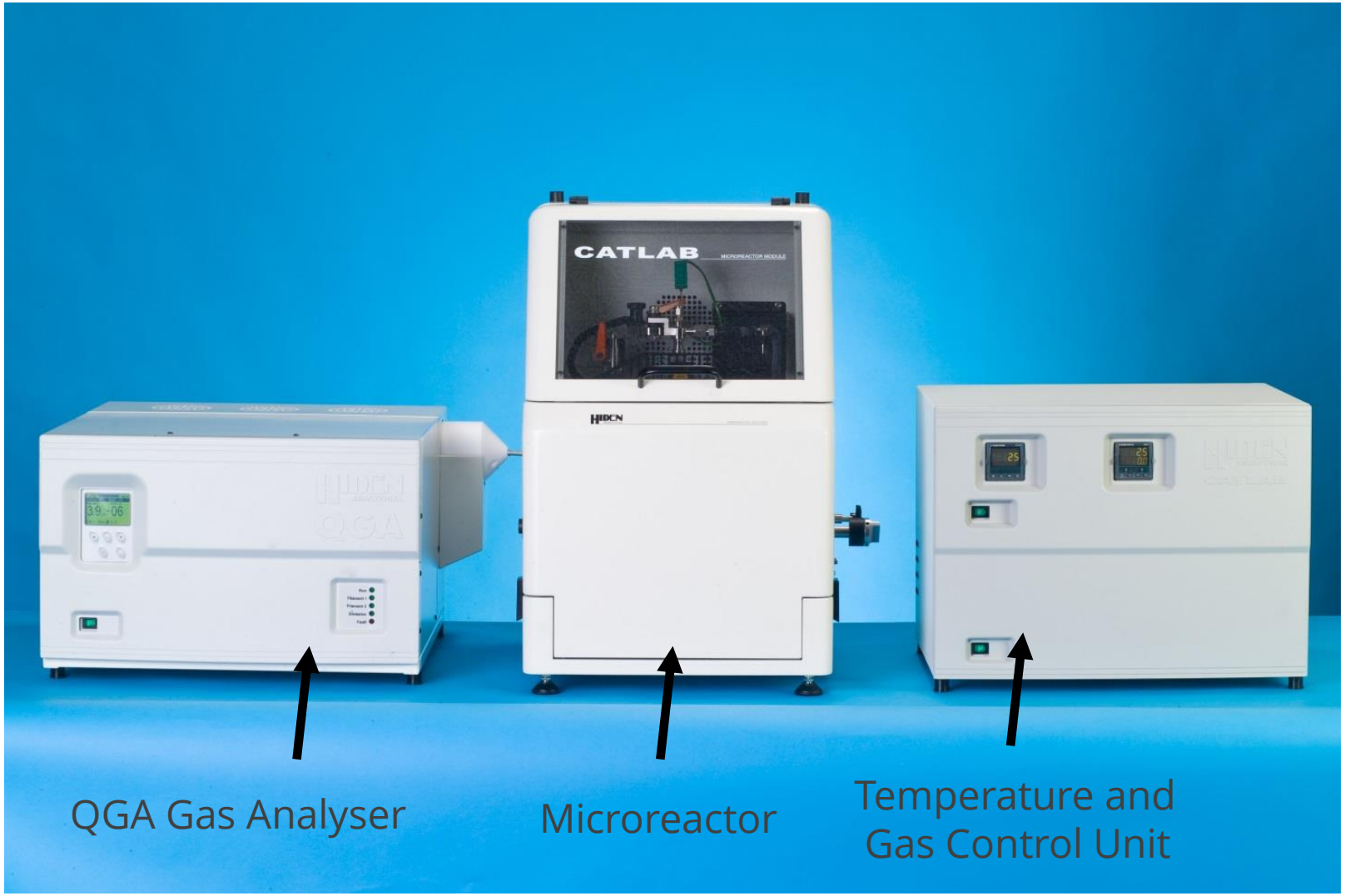
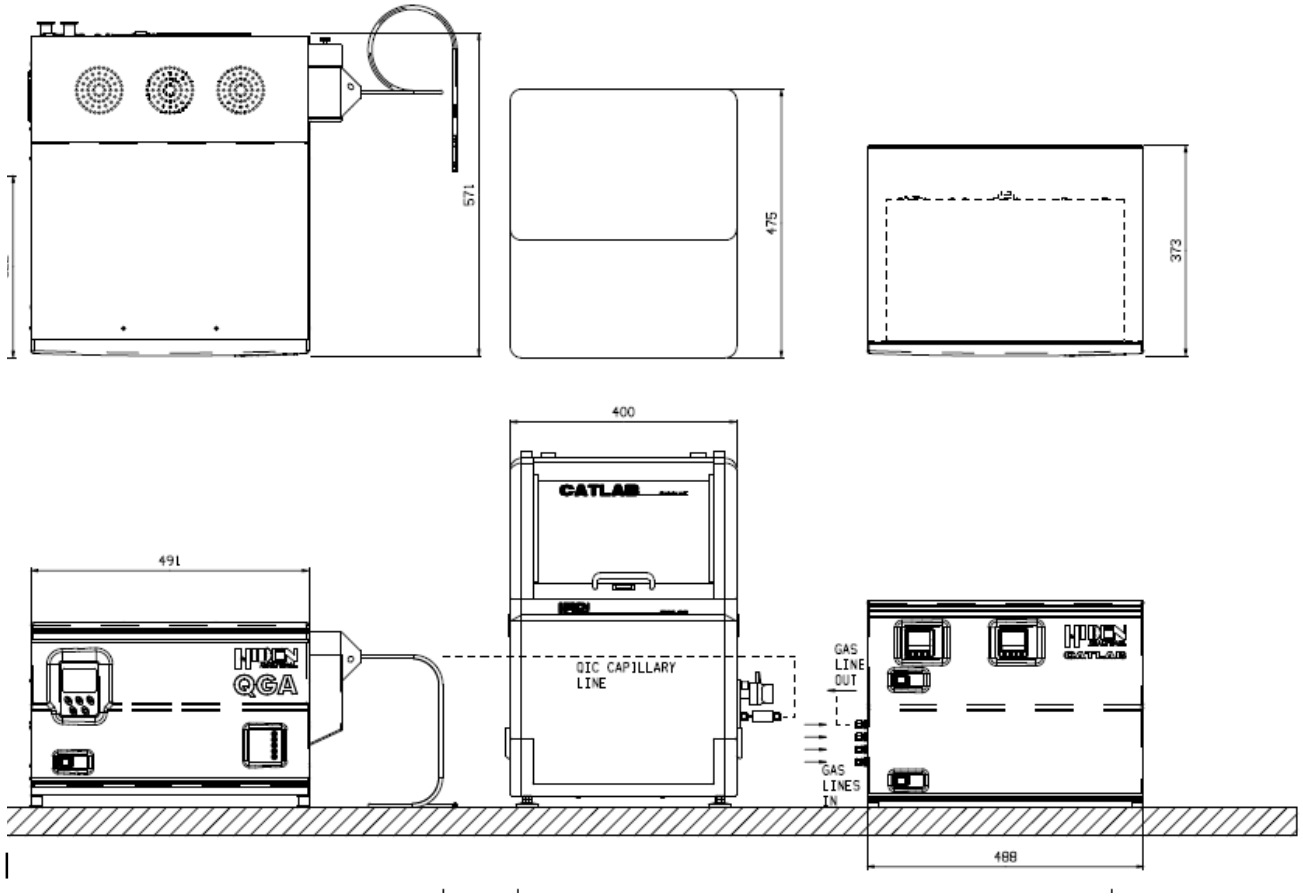
Hiden CATLAB

Integrated Microreactor-Mass Spectrometer for Reaction Testing, TPD/R/O and Pulse Chemisorption

CATLAB Modules



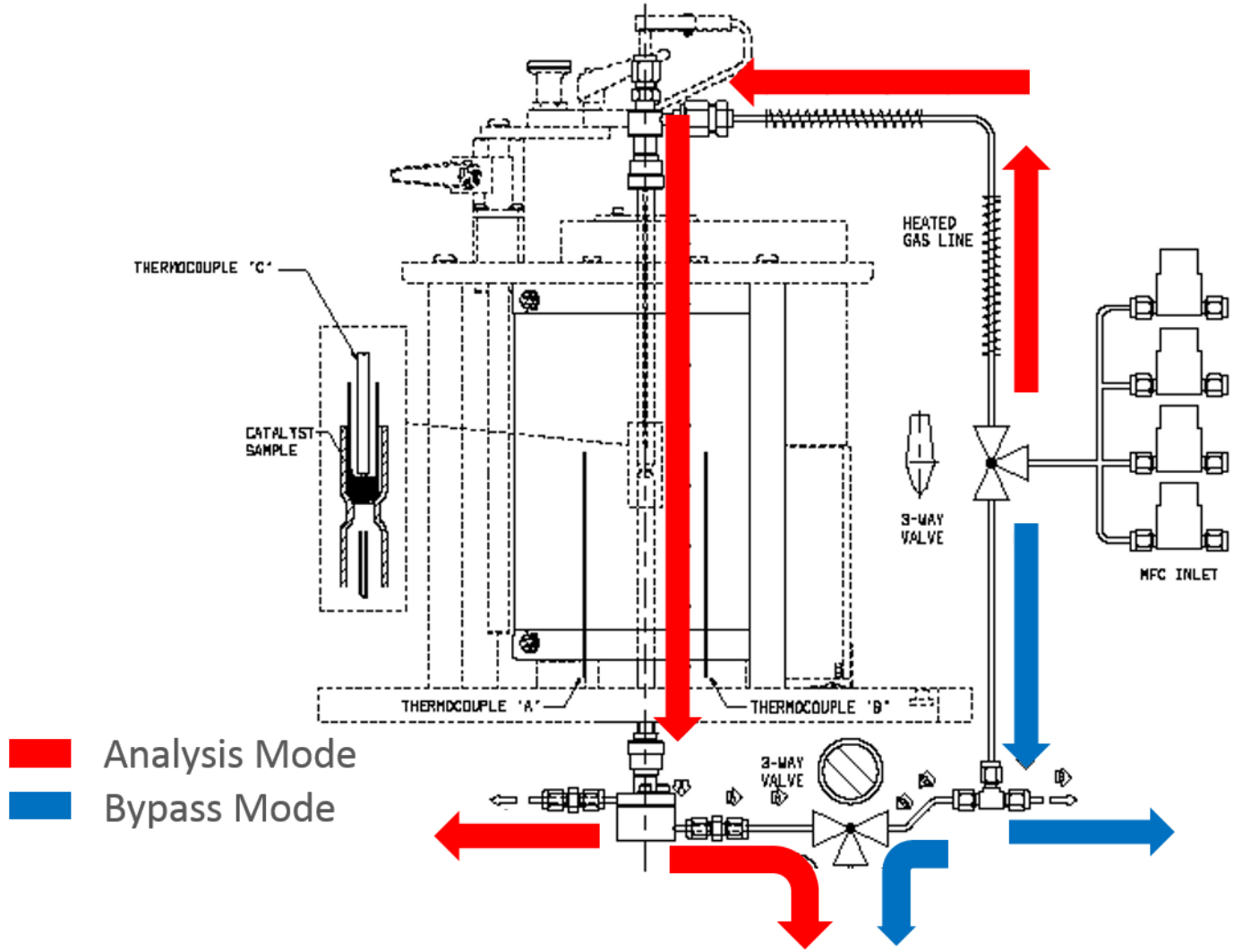
Standard CATLAB Layout



Module 2
Mass Spectrometer

Module 1
Microreactor and TCU/GCU

CATLAB Schematic



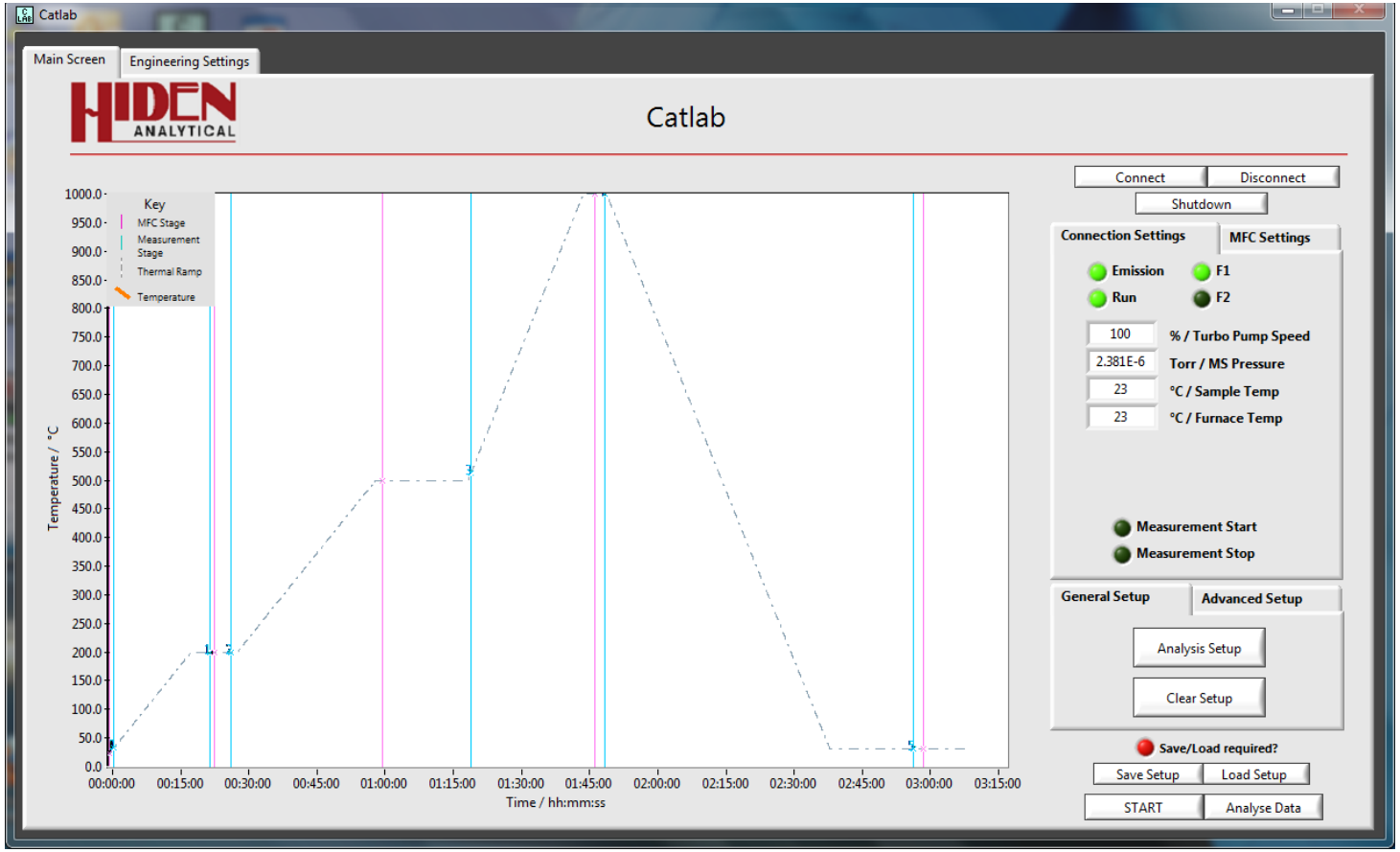
CATLAB Options

- Corrosion resistant upgrade - includes upgrade of one gas flow line and corrosive gas resistant sample line seals, and a gas dilution/purge valve mass spectrometer pumping system.
- Additional corrosion resistant feed lines if required.
- Additional 4 channel gas control unit integrated to provide 8 stream gas selection in total.
- Option to choose the maximum flow of each MFCs.
- Vapour Generation (gives vapour pressure equivalent to max liquid temperature ~30 °C). Other options available for higher flow rates.
- 300 amu mass range option. Mass range to 1000 amu available for specialised applications

QIC Series Gas Analysers

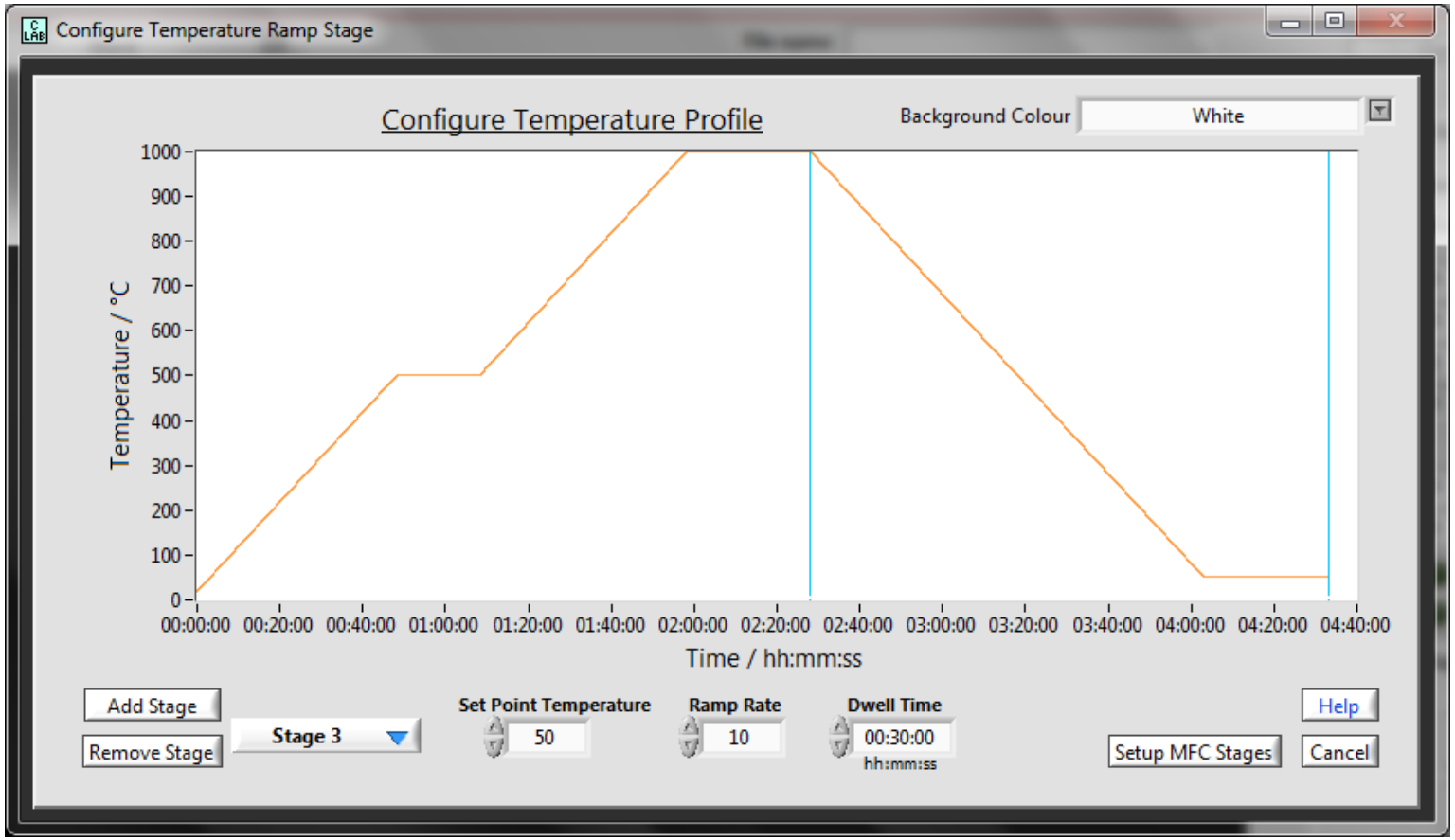
- 200 amu mass range, dual Faraday/ Electron Multiplier detector.
- Detection capability from 100 % to 0.1ppm.
- Fast scan speeds of100 amu/s.
- <500 ms response time to changes in gas concentrations.
- Low dead volume, flexible heated inlet capillary for fast response to gases and vapours.
- Soft ionisation for analysis of complex mixtures and organics.
- Can be used as a stand-alone gas analysis system or in combination with other equipment i.e. Thermal Analysis.

CATLAB Control Software



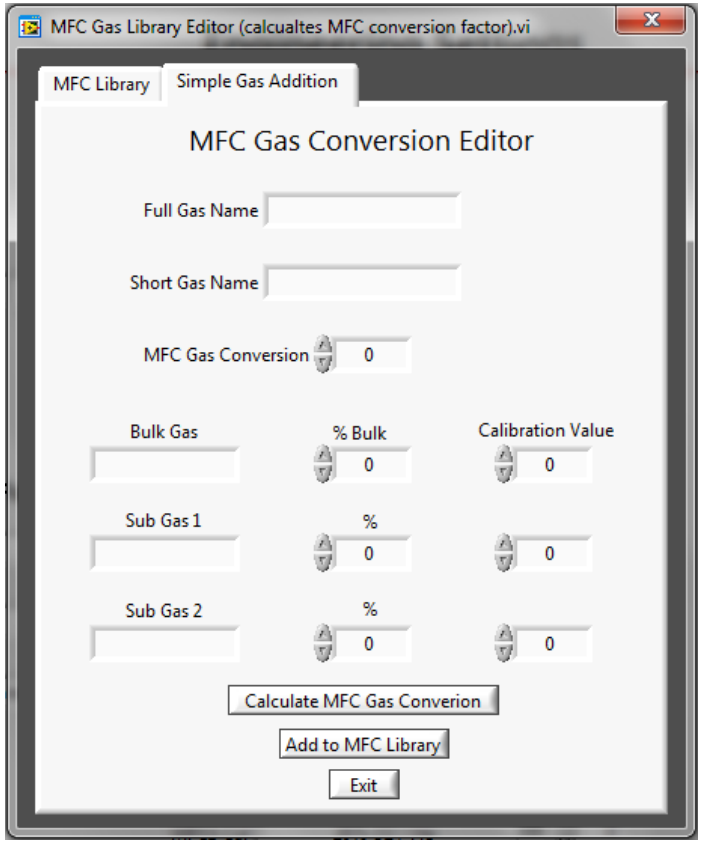
- Control of Mass Spectrometer, Temperature and Gas Flows in one software package

Temperature Control

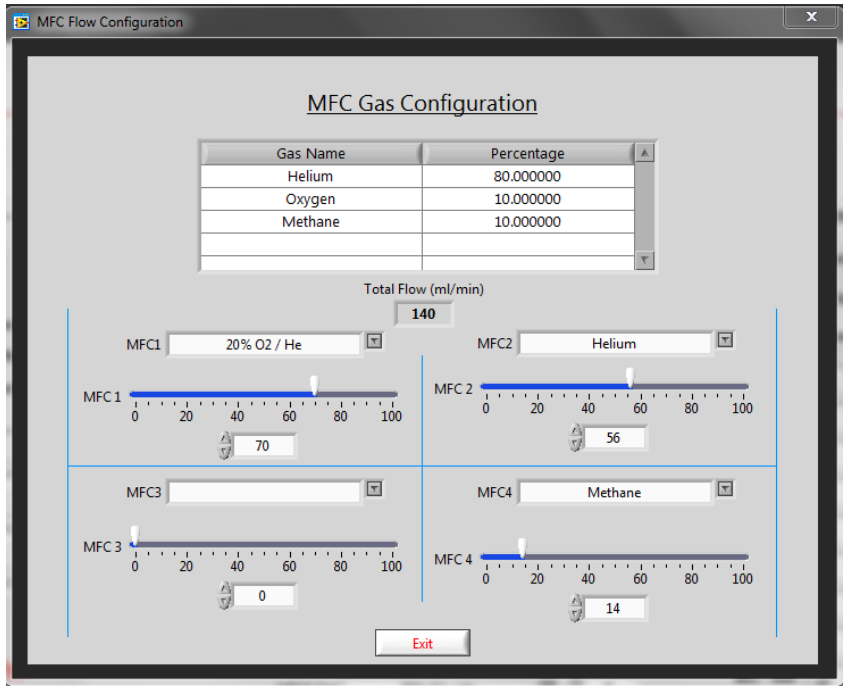


- Multi-stage temperature ramps

Gas Mixing Control

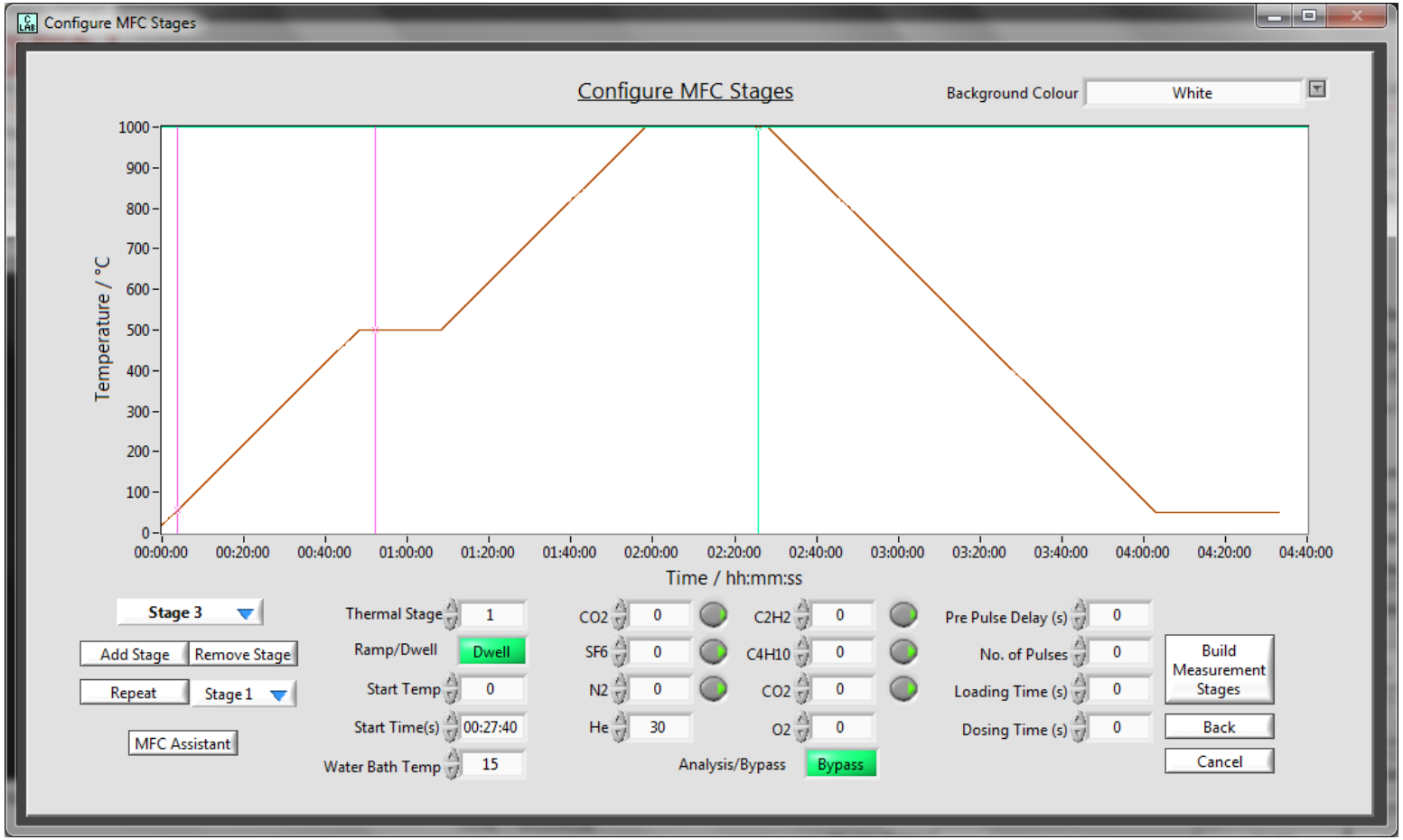


- MFC Gas Mix Library Editor



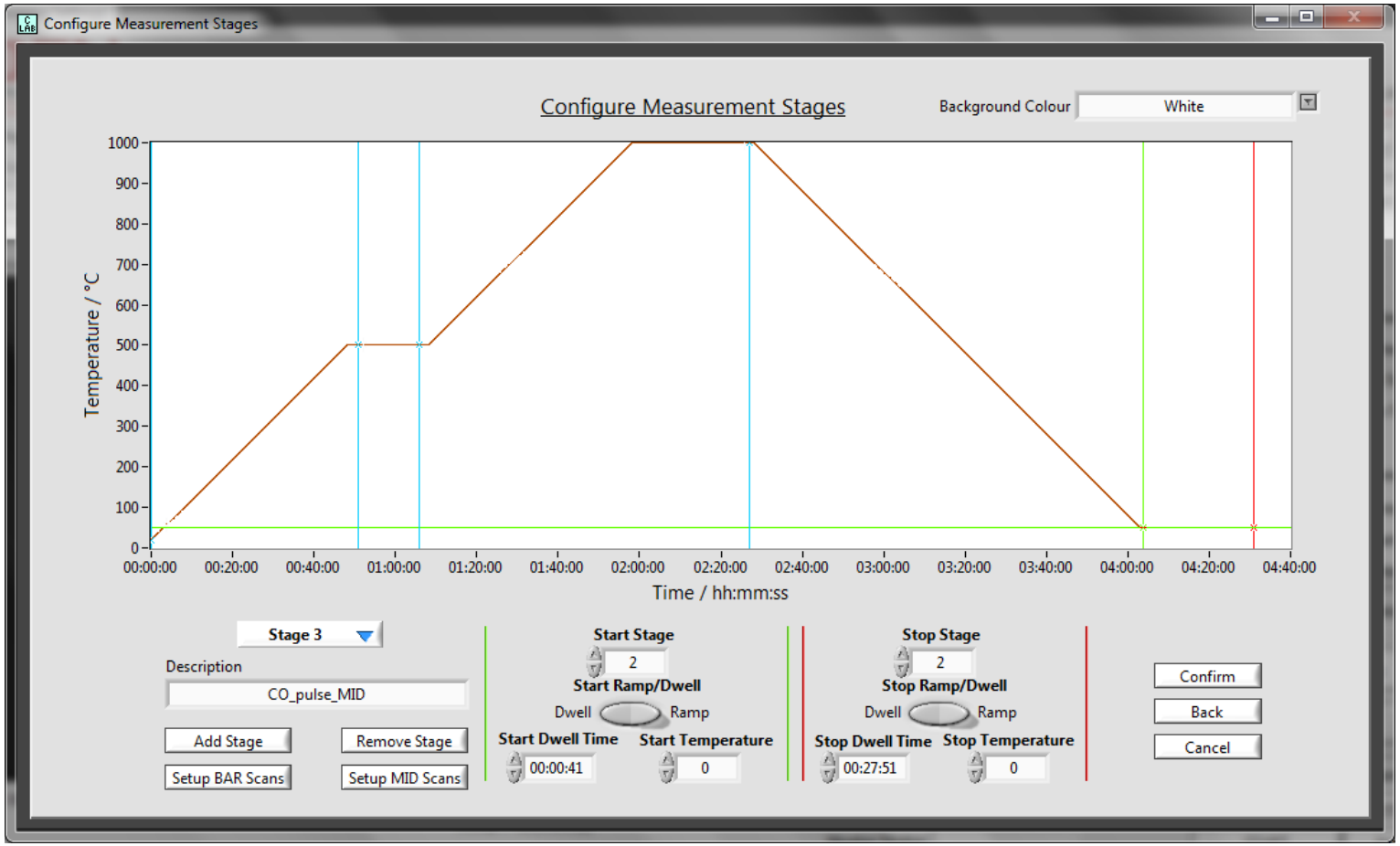
- Gas Mix Calculator

Gas Mixing Control



- Gas switching controlled by either temperature or time

MS Analysis Control



- Optimised multistage analysis - configure different analysis for different parts of the experiment

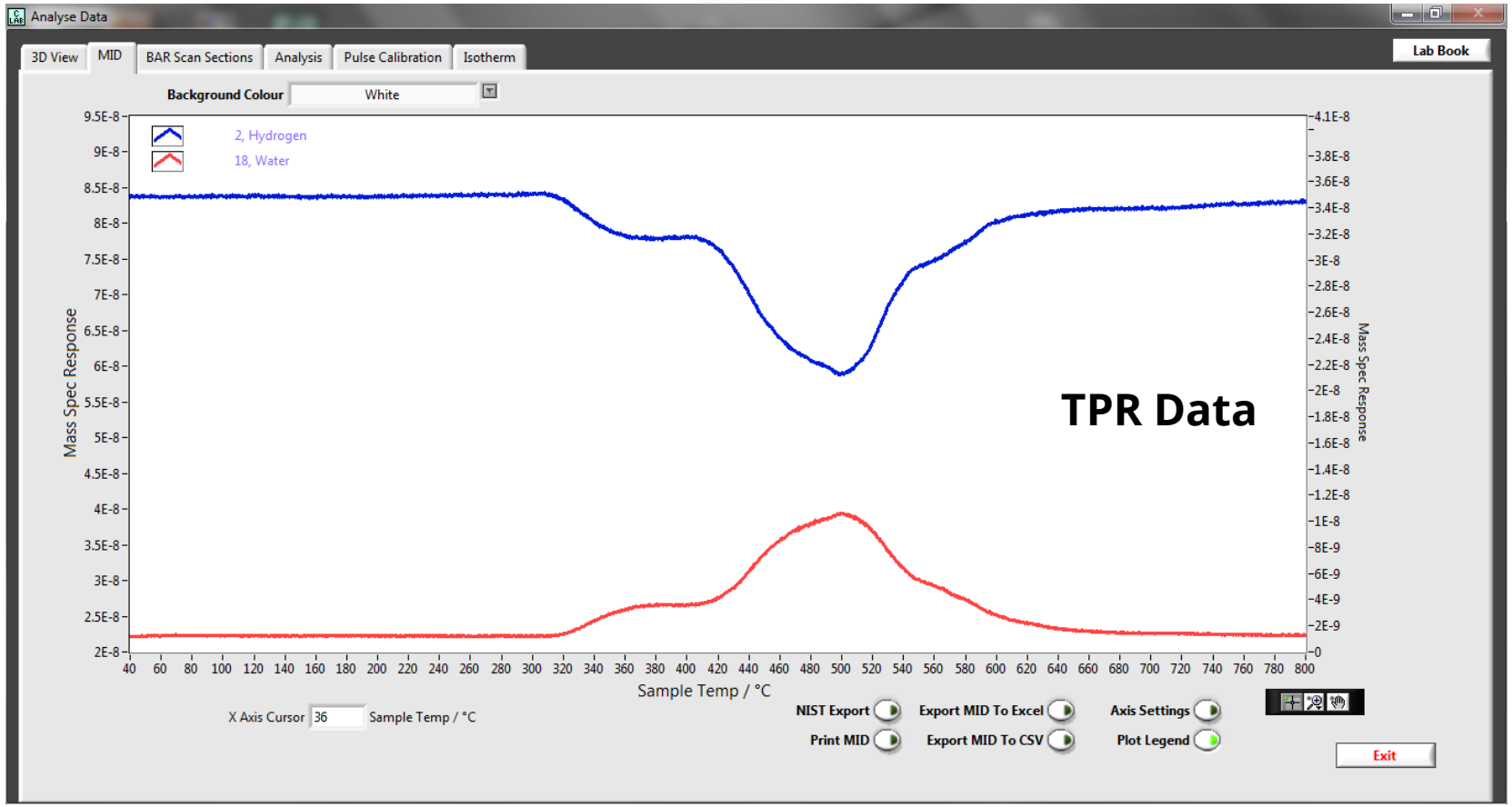
Mass Spectrometer Control

- MID Scan setup for known species
- Automatic overlap removal

Mass Spectrometer Control

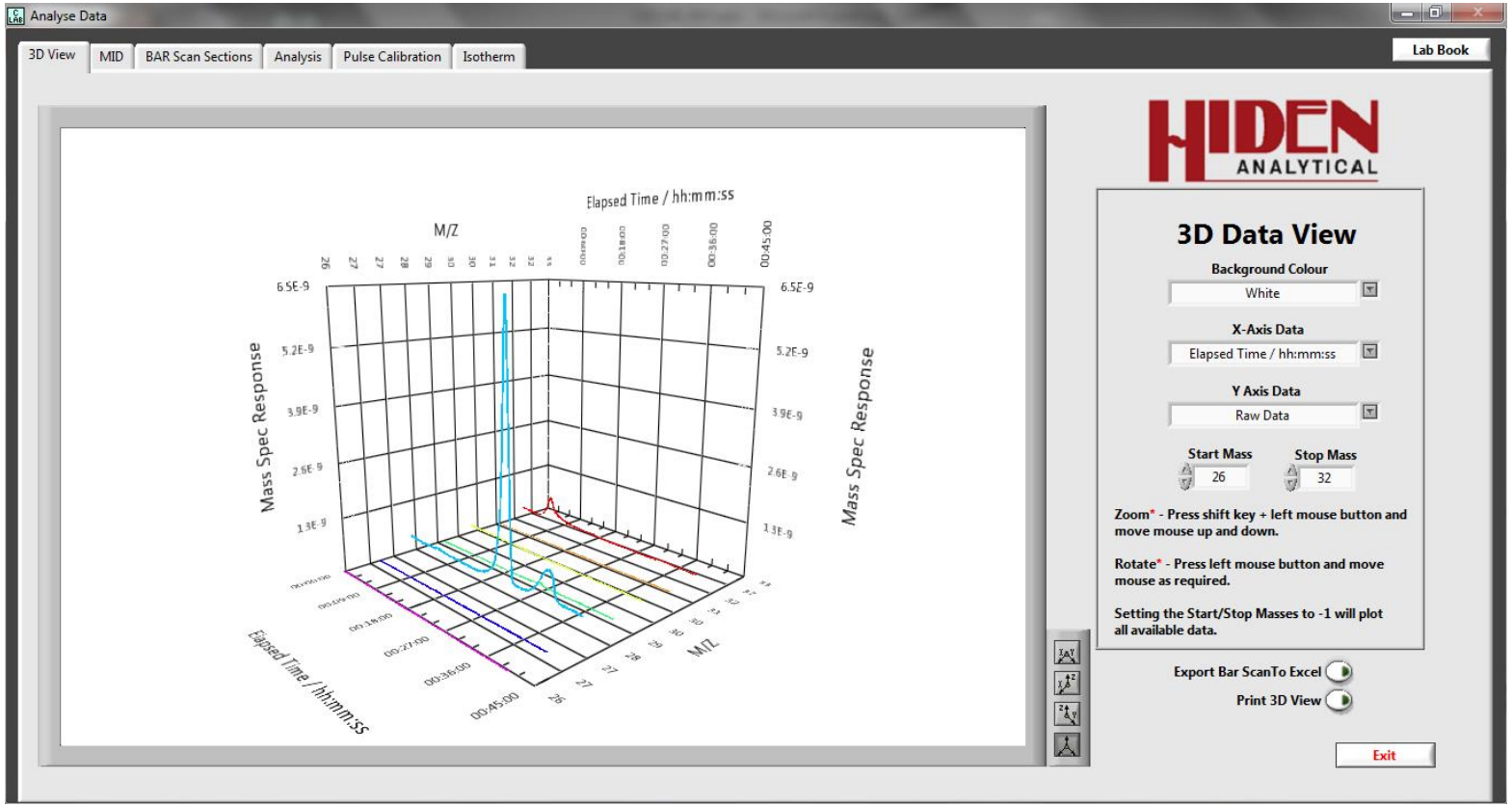
- Multiple Bar scans can be configured for optimised sampling of unknowns

MS Data Display



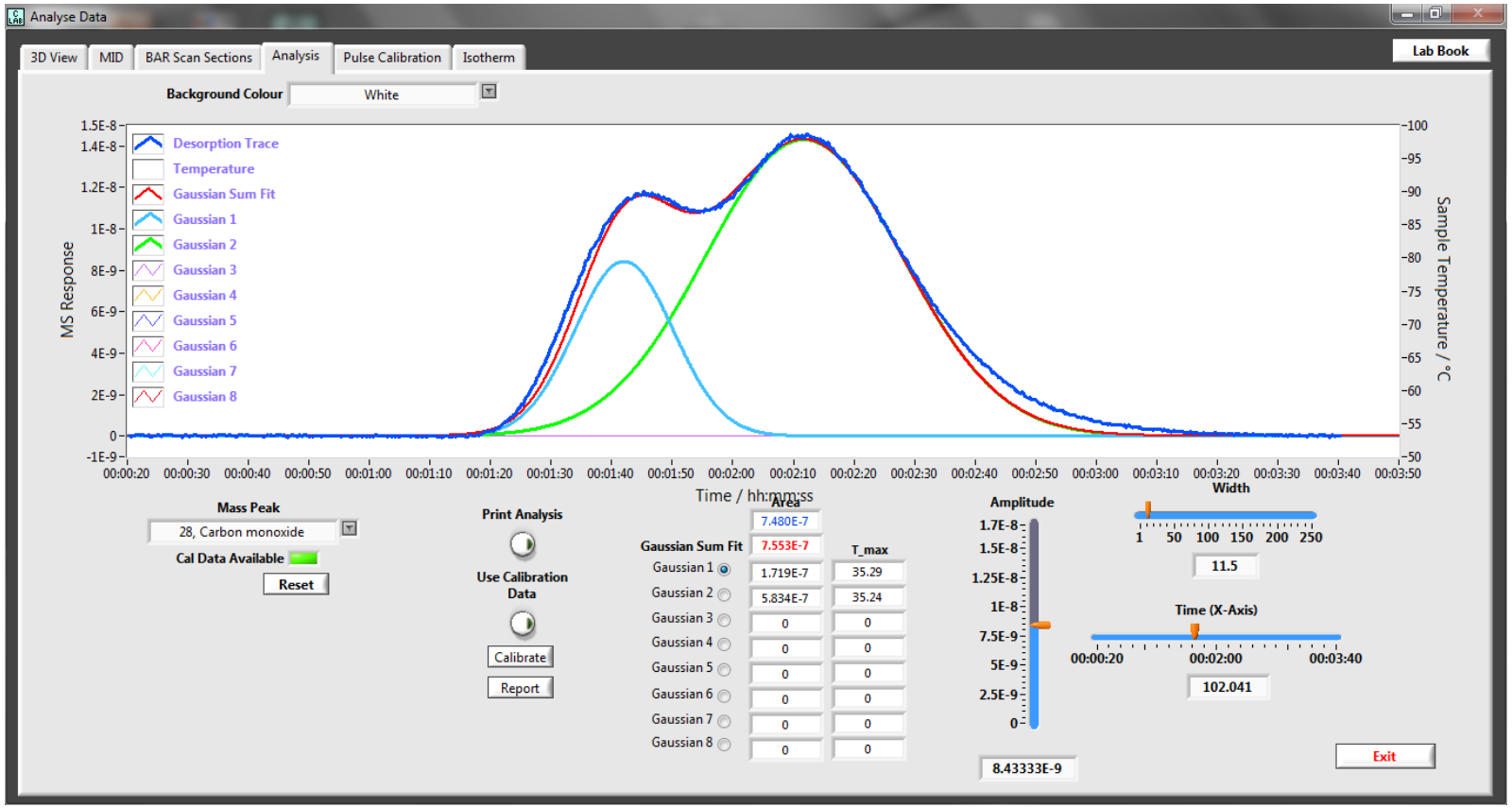
- Data plotted with x-axis as time or temperature

MS Data Display



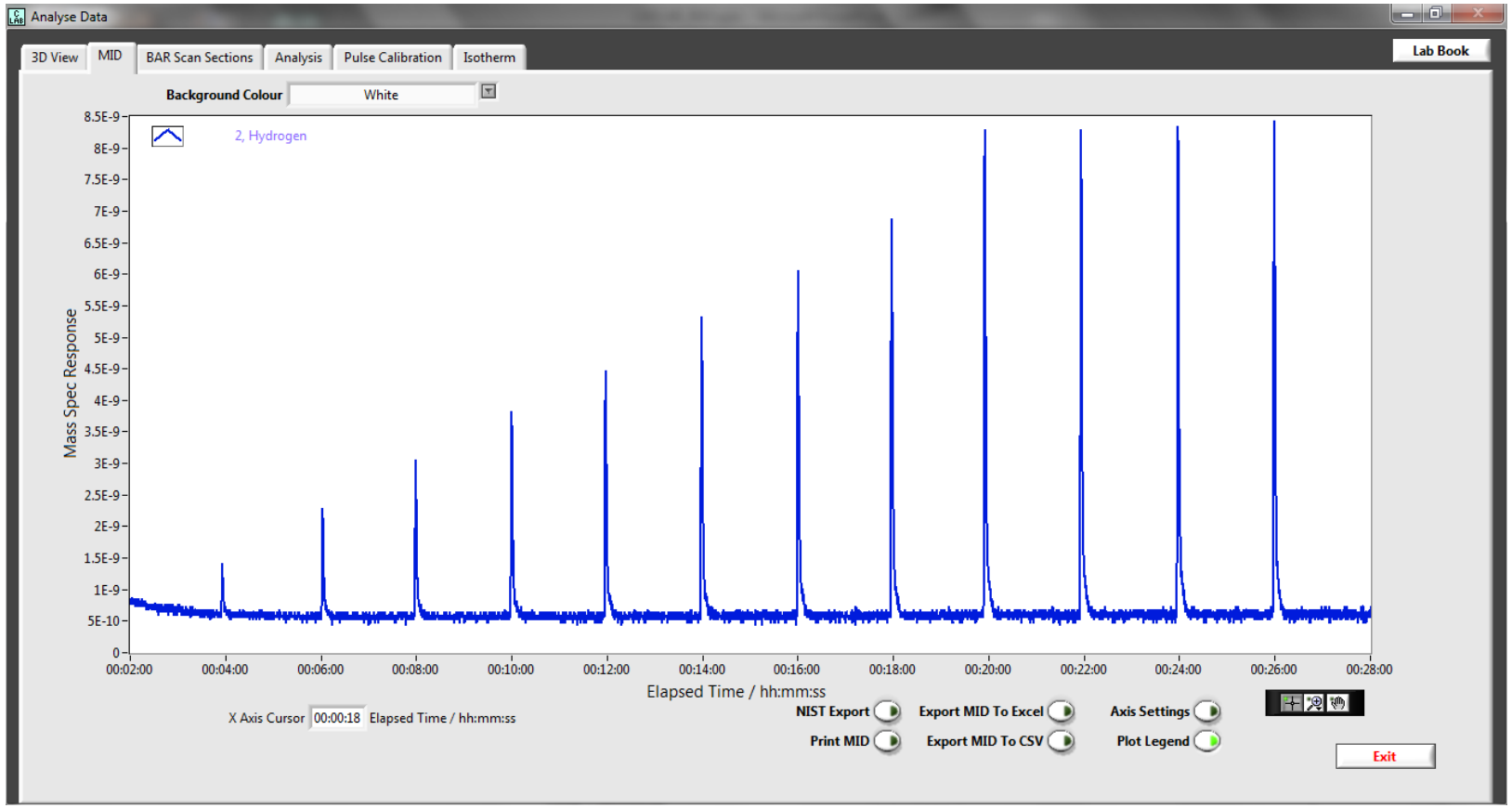
- 3D Bar Graph mode for easy identification of bar mode trends

Data Analysis



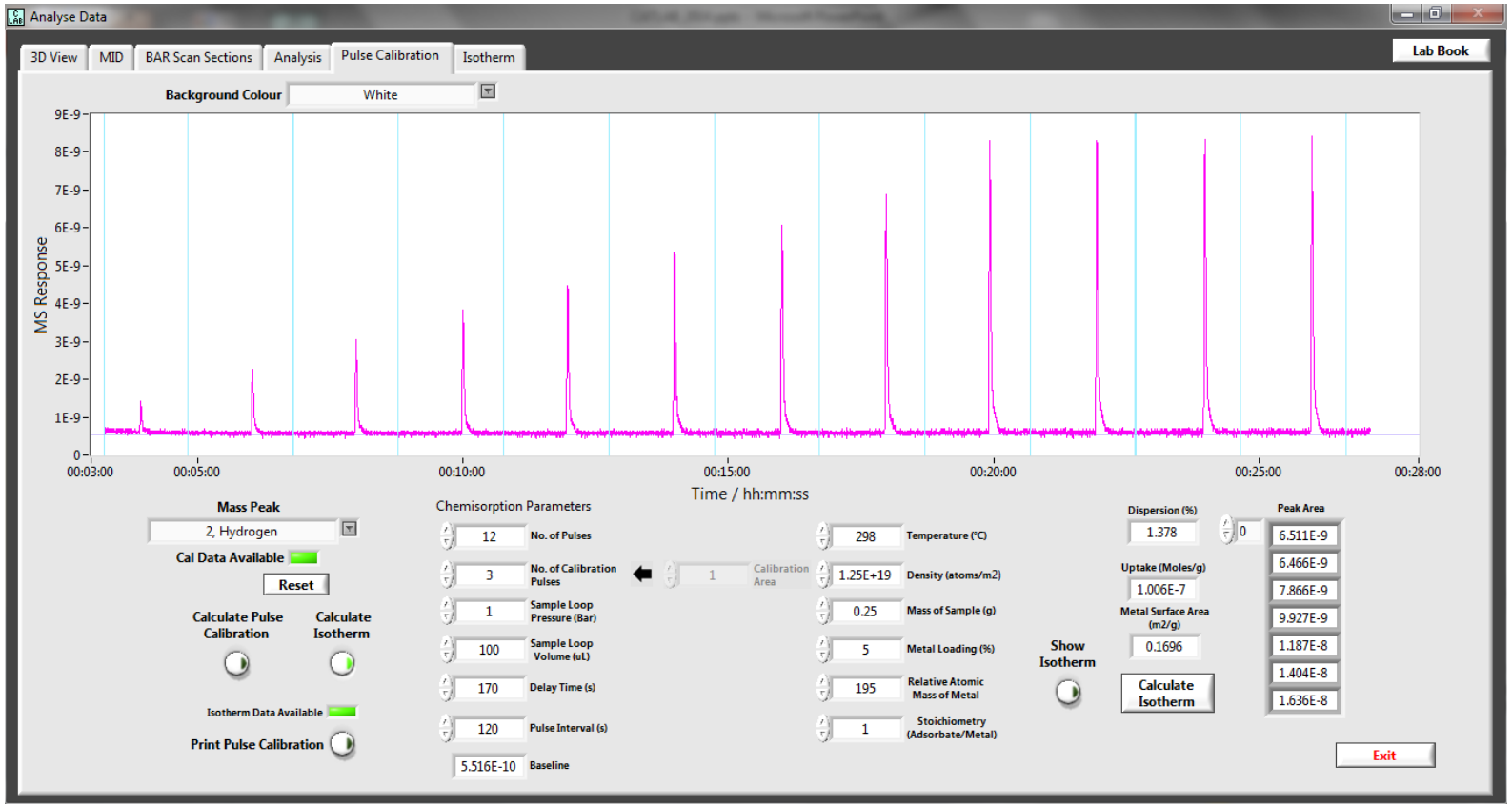
- Peak fitting analysis routines
- Integrated area
- Baseline subtraction

Pulse Chemisorption



- Injection of single gases or multiple reactants

Pulse Chemisorption Quantification



- Uptake measurements
- Dispersion calculation
- Metal surface area
- Pulse Adsorption Isotherm

Selected CATLAB Users

- Johnson Matthey
- Texas A&M University
- Hong Kong University
- Cambridge University
- Bayreuth University
- Research Complex at Harwell
- Sao Paolo University
- Bulgarian Academy of Sciences
- Université Catholique de Louvain
- Kunming University
- ETH Zurich
- PDVSA

Selected Academic References

- **Electronic and Geometric Structure of Ce^{3+} Forming Under Reducing Conditions in Shaped Ceria Nanoparticles Promoted by Platinum** . *J. Phys. Chem. C*, 2014, 118 (4), pp 1974–1982. O. V. Safonova, A. Guda, C. Paun, N. Smolentsev, P. M. Abdala, G. Smolentsev, M. Nachtegaal, J. Szlachetko, M. A. Soldatov, A. V. Soldatov, and J. A. van Bokhoven
- **The effect of coke deposition on the activity and selectivity of HZSM-5 zeolite during ethylbenzene alkylation reaction in the presence of ethanol.** *Catal. Sci. Technol.*, 2014, **4**, 1017-1027. S. S. Khattaf, C. D'Agostino, M. N. Akhtar, N. O. Al-Yassir, N. Tan and L. F. Gladden.
- **Reaction Kinetics of C_3H_6 Oxidation for Various Reaction Pathways Over Diesel Oxidation Catalysts** .*Topics in Catalysis,* December 2013, Volume 56, Issue 18-20, pp 1916-1921. H. Oh, I. S. Pieta, J. Luo, W. S. Epling
- **An investigation of the role of surface nitrate species in the oxidation of propene on a Pt-based diesel oxidation catalyst**.. *Catal. Sci. Technol.*, 2013, **3**, 2349-2356 , S. Chansai, R. Burch, C. Hardacre, H. Oh, and W. S. Epling.
- **Molybdenum oxide on Fe2O3 core-shell catalysts; probing the nature of the structural motifs responsible for methanol oxidation catalysts** .*ACS Catal.*, **2014**, *4* (1), pp 243–250, C. Brookes , P. P Wells , G. Cibin , N. Dimitratos , W. Jones , D. J. Morgan , and M. Bowker.
- **Chiral Co(II) metal-organic framework in the heterogeneous catalytic oxidation of alkenes under aerobic and anaerobic conditions**. *ACS Catal.*, 2014, 4, pp 1032–1039 Giulia Tuci, Giuliano Giambastiani, Stephanie Kwon, Peter Curran Stair, Randall Q. Snurr and Andrea Rossin

Summary

- Integrated microreactor and mass spectrometer
- Both microreactor and mass spectrometer manufactured by Hiden
- Single integrated software package to control MS and microreactor
- Ideal for catalyst characterisation and reaction testing
- Designed for optimum mass spectrometer performance