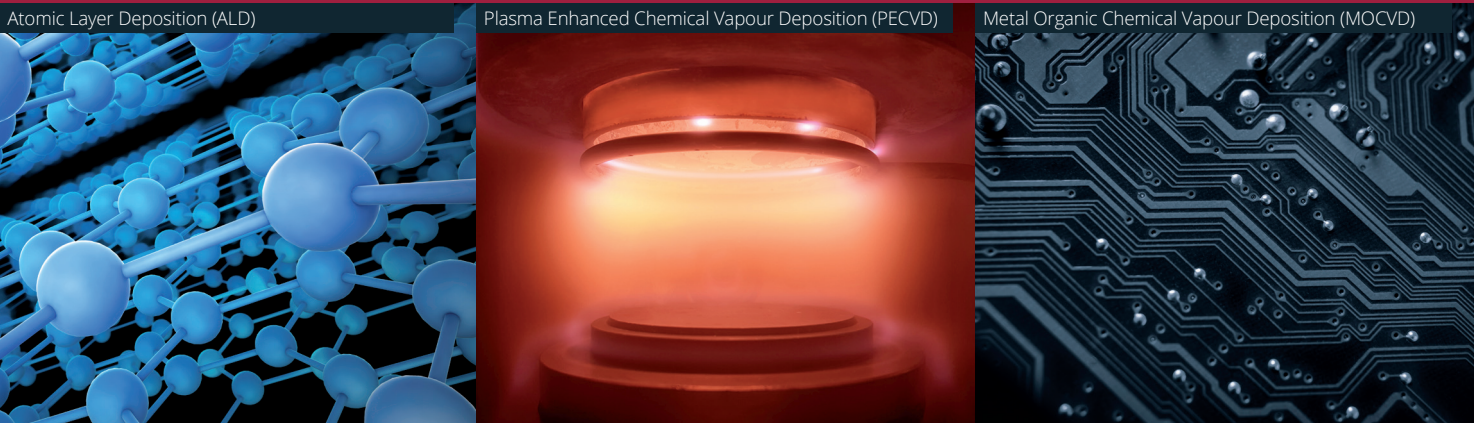


HPR-30 Process Monitoring Mass Spectrometers

▶ Differentially Pumped and High Pressure RGA Systems for Process Monitoring

HPR-30 Mass Spectrometer - Applications



Applications:

- ▶ CVD/MOCVD
- ▶ PECVD
- ▶ ALD
- ▶ Sputtering
- ▶ Vacuum coating
- ▶ Plasma etching
- ▶ MBE

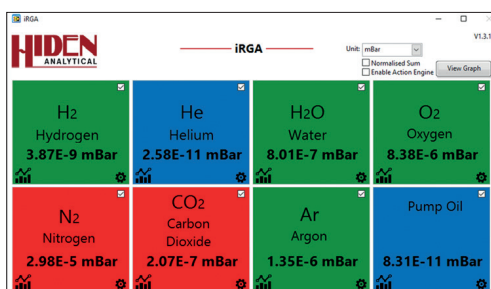
Key Features

- ▶ **Robustness** and **stability** for permanent process monitoring
- ▶ Versatile systems for **different** process **pressure ranges**
- ▶ Ultra-fast 300 ms response time
- ▶ **Precision** analyses of residual gases, detection limit to 2×10^{-15} mbar
- ▶ Customised systems available
- ▶ Communication interfaces for external data analysis in real time

PC Software for process monitoring and control:

iRGA

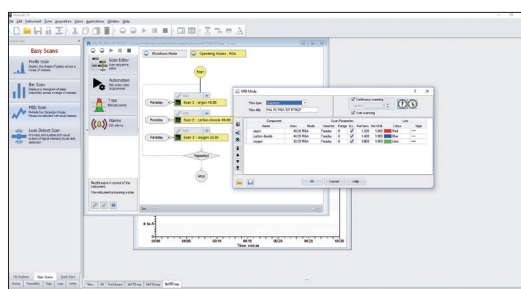
This newly developed LabVIEW®-based software allows a very straightforward analysis of frequently observed residual gases. The visual interface displays measured partial pressures in real time and indicates critical parameters in colour code. Trips can be set to send alarms via the internal I/O system or to external devices.



iRGA Tablet mode

MASsoft

Hidden's MASsoft is a comprehensive software program giving access to trend view, histogram and peak profile modes. The user can set up scan sequences mixing the different modes and customising the scan parameters with additional statistical analysis functions available.



MASsoft Professional - overview

The HPR-30 Series

The HPR-30 Series systems are designed for fast response, high sensitivity analysis of gas and vapour species in vacuum processes. Equipped with Hiden's multi-level software package, offering simple control of mass spectrometer parameters and complex manipulation of data and control of external devices.

Applications include leak detection, contamination monitoring, process trend analysis and analysis of high mass species and precursors used in ALD and MOCVD.

Optional upgrades include the innovative Hiden 3F series triple filter quadrupole system providing enhanced abundance sensitivity, part-per-billion (ppb) detection levels and high contamination resistance, particularly suited to the analysis of aggressive gases in CVD and RIE applications.

Three sampling configurations are offered to suit a range of process pressure and geometry requirements.

HPR-30 RGA Cart

Configured with dual conductance sampling inlet featuring a close-coupled re-entrant aperture for sampling directly within the process region, providing maximum data integrity and fast confirmation of process status.

The HPR-30 RGA Cart is a differentially pumped dual conductance RGA system capable of sampling from UHV up to 5 mbar incrementally. Mounted on a compact cart that includes an adjustable height support for ease of maneuverability between process tools. Suitable for a range of processes including CVD, MOCVD, ALD and PECVD.

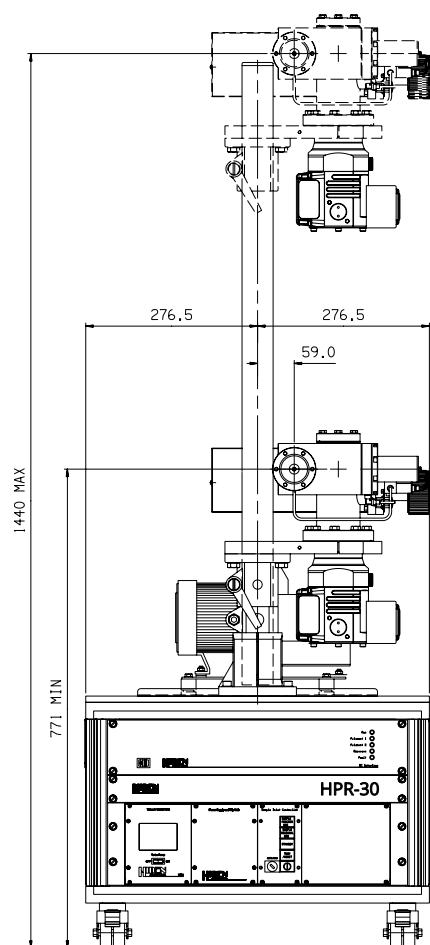
The height adjustment is straightforward and enables the sampling point to be connected to the vacuum process chamber from 771 mm up to 1440 mm giving a high degree of mounting flexibility.

Custom configurations are available to accommodate alternative mounting requirements.

The UHV sampling head is terminated with a DN-35-CF conflat type flange for UHV compatibility, and is typically used with an adaptor flange, KF-40 for example, for connection to the process chamber.

Heating options are available for the sampling manifold to enable monitoring of low vapour pressure volatile species.

Mass range options from 50 to 510 amu.



HPR-30 RGA Cart

The HPR-30 Series

HPR-30 Multi RGA cart

Equipped with multiple flexible inlets, including an innovative 1 m long and tri-valve manifold connection. This offers automated switching to suit pressure range allowing maximum process pressure flexibility.

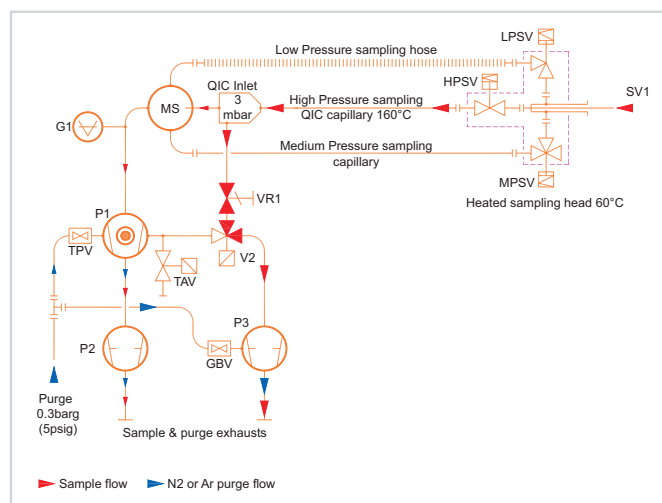
The HPR-30 Multi RGA Cart is a versatile process gas analysis system capable of sampling across a wide pressure range in real-time.

The unique automated tri-switching sampling manifold switches between 3 pre-configured pressure ranges to suit process conditions.

Typical pressure ranges are:

- ▶ < 10-3 mbar; 5 – 50 mbar; 100 – 1000 mbar, a variety of options are available.
- ▶ The tri-switching manifold terminates with either CF, VCR, KF or Swagelok™ as required.

Flexible sampling lines allow for easy connection, even in the confined spaces often seen around typical ALD process and R&D tools. Standard sample lines are 1 m, alternative lengths are available to suit specific requirements.



HPR-30 Multi Configuration Schematic



HPR-30 Multi RGA Cart System

The HPR-30 Series

HPR-30 SGL

Equipped with a single heated sampling line for applications where there is limited tool space for sampling connection, and where the requirement for analysis of less volatile reaction products requires a fully heated inlet solution. Time resolved data acquisition suited to pulsed deposition process monitoring is offered as a system option.

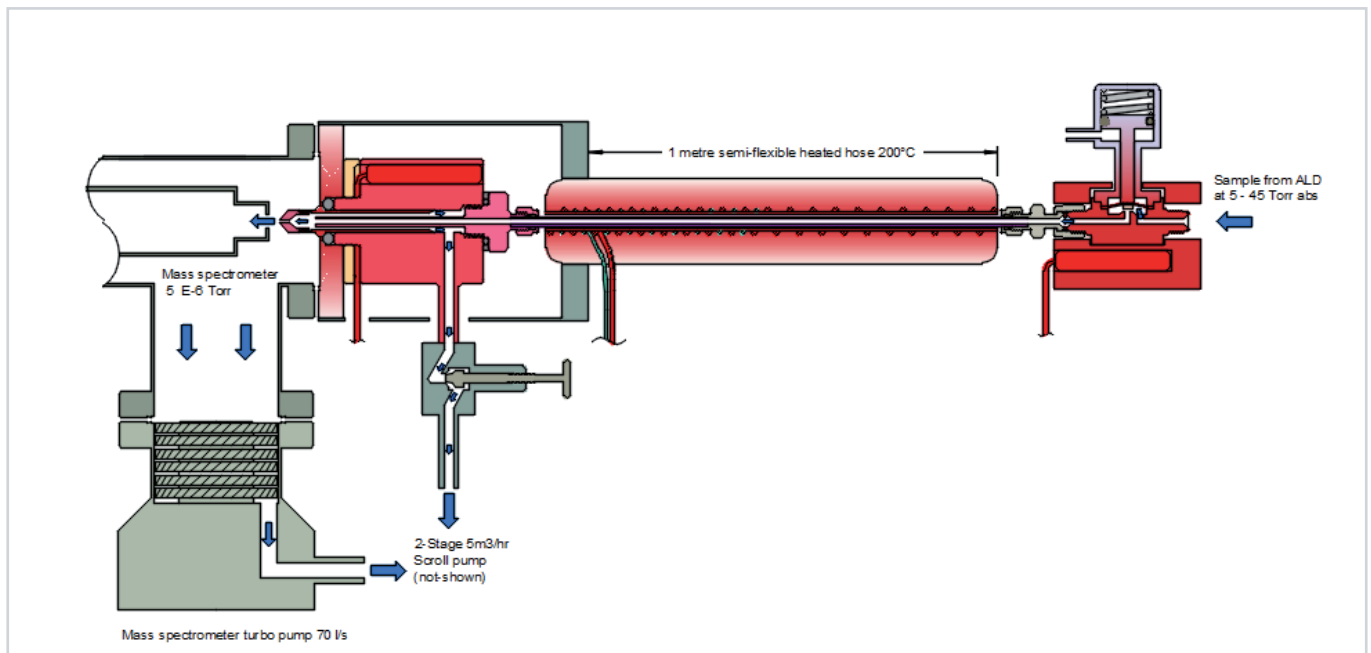
The HPR-30 SGL system is designed for applications where volatile, low vapour pressure species are amongst those to be analyzed. With a focus on Atomic Layer Deposition processes it is designed with a 1-metre, semi-flexible 200°C heated inlet line to allow tool connection in confined spaces. Available with an air actuated heated ALD shut-off valve.

Pressure range options are:

- ▶ 1 – 5 mbar or 5 – 50 mbar.

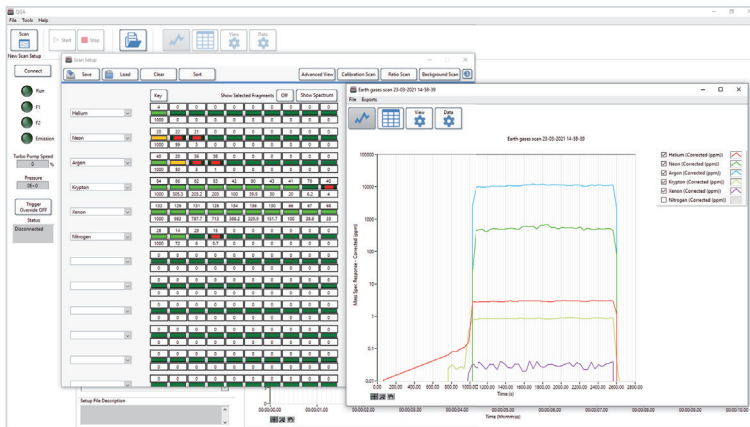
The sampling connection is compact and connects via a VCR-4 or Swagelok™ fitting. The sampling line is heated to 200°C and is bypass pumped to optimize the analyzer response time.

Cart mounted and rack mounted options are available.



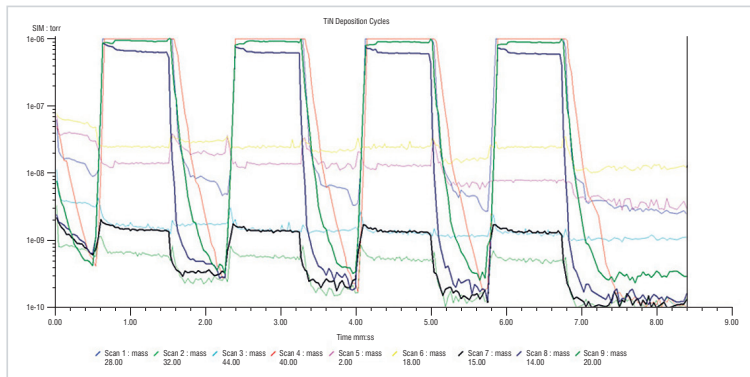
The HPR-30 Series

Software and Data



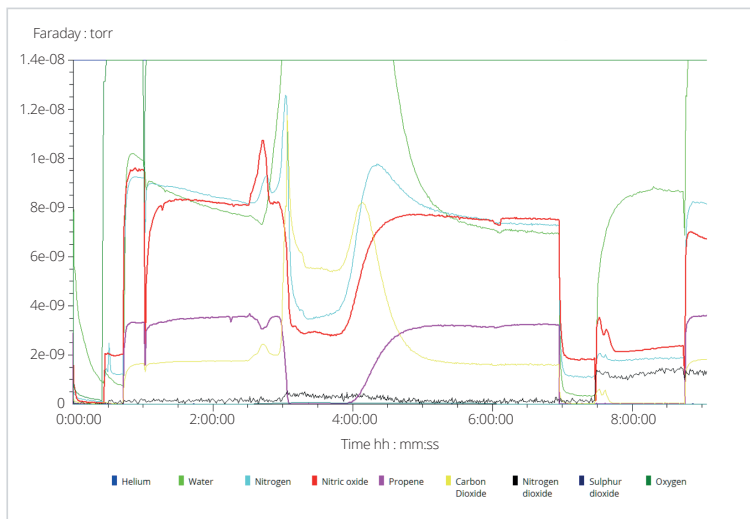
Easy gas selection, setup and scan execution

- ▶ Easy, recipe-based scan set up
- ▶ Automatic deconvolution of complicated spectra
- ▶ Fully quantitative analysis



HPR-30 Data on TiN deposition

- ▶ Transient data for real-time analysis of CVD deposition processes
- ▶ Species are quantified in real-time
- ▶ High dynamic range allows precursors, contaminants and carrier gases to be analysed



Process analysis - multiple species monitored over 8 hours

- ▶ Excellent stability allows processes analysis over hours and days

System Configuration and Options

| ITEM | DESCRIPTION | PARTCODE |
|----------------------------------|--|----------|
| BASIC SYSTEM | HPR-30 RGA Cart vacuum process sampling system. Includes HAL 201 RC mass spectrometer with Faraday/Electron Multiplier detector. 200 amu mass range. | 305320 |
| | HPR-30 Multi-Inlet RGA Cart system with 1 m flexible connection to process chamber. Includes HAL 201 RC mass spectrometer with Faraday/Electron Multiplier detector. 200 amu mass range. | 305321 |
| | HPR-30 SGL RGA Modular system with single heated connecting inlet. Includes HAL 201 RC mass spectrometer with Faraday/Electron multiplier Detector. 200 amu mass range. | 305322 |
| HPR-30 MASS SPECTROMETER OPTIONS | 300 amu single filter mass spectrometer. | 305113 |
| | 300 amu mass range triple filter mass spectrometer. | 305021 |
| | 510 amu mass range triple filter mass spectrometer. | 301200 |
| | PIC detection system, including signal gating for time resolved studies. | 301480 |
| HPR-30 RGA CART SYSTEM OPTIONS | Extended sampling pressure range to 1000 mbar. | 305325 |
| | HPR-30 pneumatic valve option in place of HPR-30 manual valve. | 303603 |
| | HPR-30 UHV manifold bakeout heater set. | 303330 |
| PC CONTROL DATA AND I/O OPTIONS | PC Compatible computer with control software pre-installed. | 800624 |
| | Windows version of the NIST/EPA/NIH Mass Spectral Database. | 800500 |
| | iRGA - Intuitive RGA program for simplified RGA process monitoring. | 800585 |
| SPARES AND ACCESSORIES | Spare capillary liner - std flow. | 303140 |
| | Spare platinum orifice - std flow. | 303141 |
| | Twin filament for RGA Source - oxide coated iridium. | 201200 |
| | Filament changing kit for RGA source - with 3 oxide coated iridium twin filaments. | 201600 |

Hidden **APPLICATIONS**

Hidden's quadrupole mass spectrometer systems address a broad application range in:

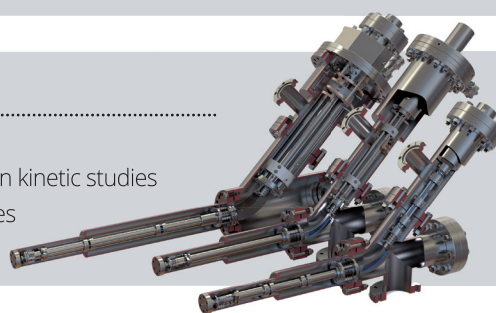
GAS ANALYSIS

- ▶ dynamic measurement of reaction gas streams
- ▶ catalysis and thermal analysis
- ▶ molecular beam studies
- ▶ dissolved species probes
- ▶ fermentation, environmental and ecological studies



SURFACE ANALYSIS

- ▶ UHV TPD
- ▶ ToF qSIMS and SIMS analysers
- ▶ end point detection in ion beam etch
- ▶ elemental imaging – 3D mapping



PLASMA DIAGNOSTICS

- ▶ plasma source characterisation
- ▶ etch and deposition process reaction kinetic studies
- ▶ analysis of neutral and radical species



VACUUM ANALYSIS

- ▶ partial pressure measurement and control of process gases
- ▶ reactive sputter process control
- ▶ vacuum diagnostics
- ▶ vacuum coating process monitoring



Hidden Analytical Ltd.
420 Europa Boulevard
Warrington WA5 7UN England

T +44 [0] 1925 445 225
F +44 [0] 1925 416 518
E info@hidden.co.uk
W www.HiddenAnalytical.com



Sales Offices:

We have sales offices situated around the globe. **Visit our website for further information.**