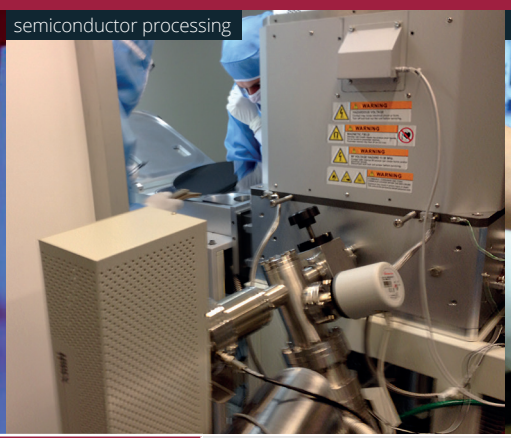
HIDEN ANALYTICAL

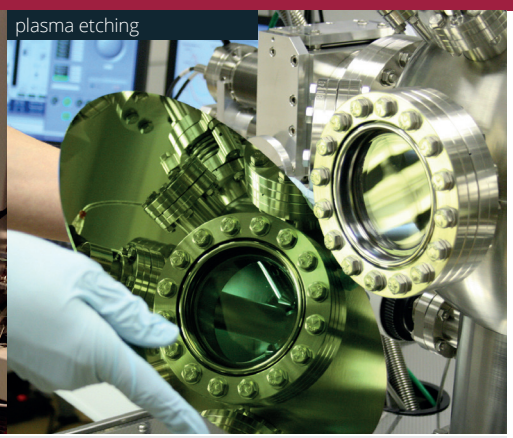
High Performance Mass Spectrometers

For Vacuum and Semiconductor Process Monitoring

Detailed product information / introduction

MOCVD


semiconductor processing


plasma etching

Applications:

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

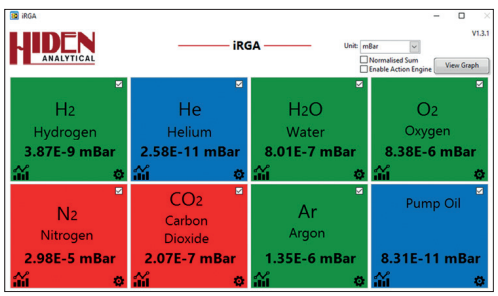
Key Features

- **Robustness** and **stability** for permanent process monitoring
- Versatile systems for **different** process **pressure ranges**
- **Precision** analyses of residual gases, detection limit to $2x10^{-15}$ 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.



RGA Tablet mode

MASsoft

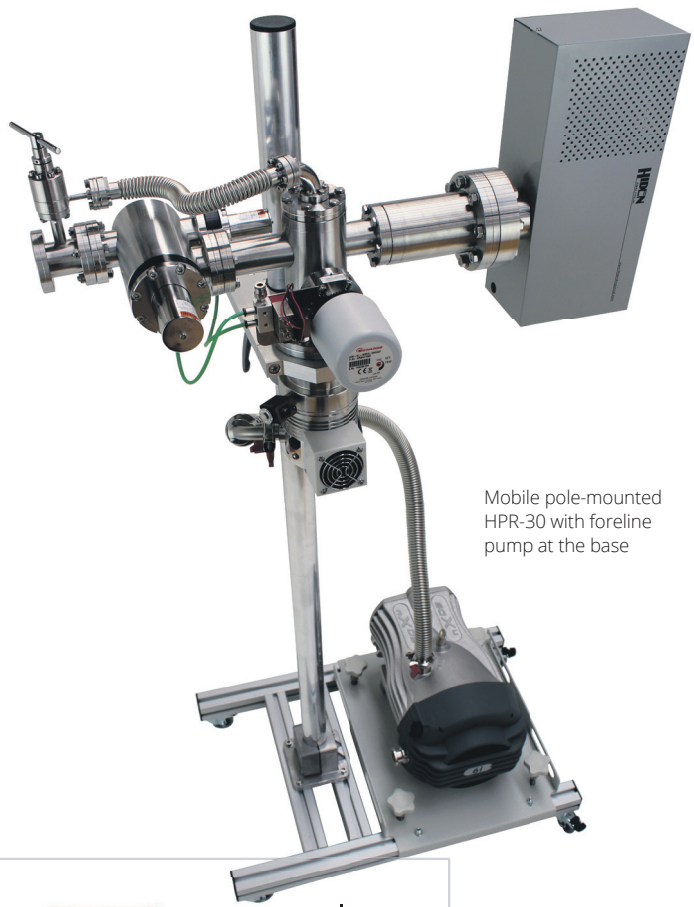
Hiden's MASsoft is a comprehensive software program giving access to trend view, histogram and peak profile modes. The user can set up scan sequences mixing the different modes and customising the scan parameters with additional statistical analysis functions available.

MASsoft Professional – overview

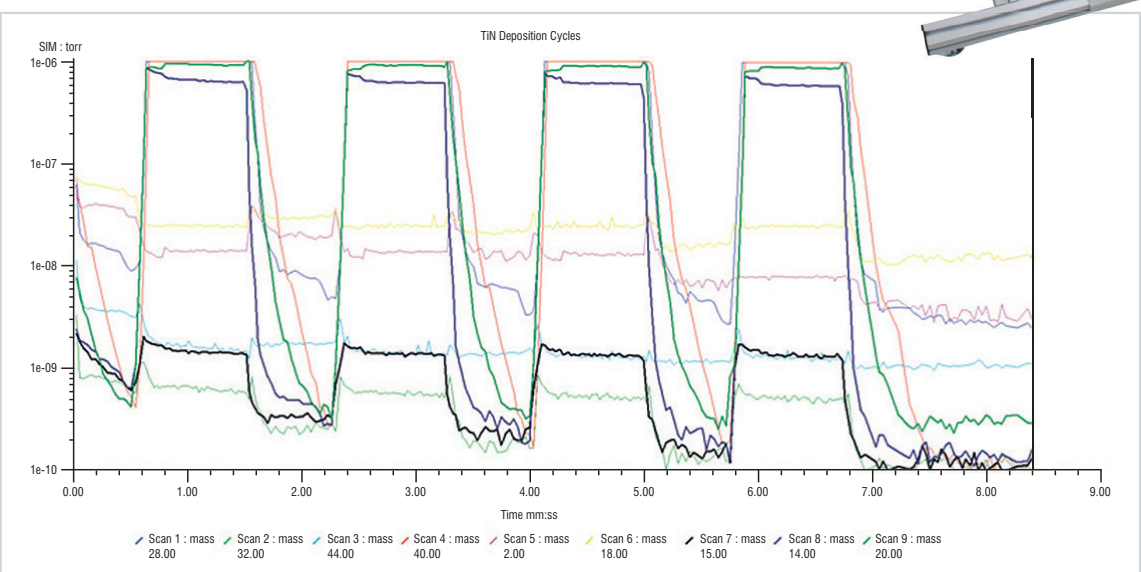
Process and Residual Gas Analyser (HPR-30 system)

Hiden's HPR-30 system is a gas analyser optimised for the analysis of gases and vapours in vacuum processes and vacuum diagnostics.

- Direct process analysis through the pressure range 10^{-4} mbar to 1 mbar and extendable to 1000 mbar
- Unique sampling probe orifice can be extended directly into the process region for optimised response and sensitivity
- Sensitivity to 100 parts-per-billion as standard and 5 parts-per-billion with optional triple stage mass filter
- Integrated high conductance valve option for residual gas analysis at chamber pressures < 10^{-4} mbar
- Pneumatic valve control option for automatic sampling operation with manual override and fail-safe interlock in case of over pressure or power failure
- Mass range is 200 amu as standard – with high mass range options to 300 amu, 510 amu and 1000 amu with triple stage mass filter
- Flexible configuration options including pole-mounted/cart integrated systems providing a portable vacuum diagnostics platform that is readily utilized across multiple vacuum chambers and process tools



Mobile pole-mounted HPR-30 with foreline pump at the base



HPR-30 data from a TiN deposition process

Vacuum accessories and systems for RGA operation

HMT – High Pressure RGA

Hiden's HMT RGA system is a unique dual mode RGA that operates as a conventional RGA for vacuum diagnostics and monitoring at pressures of less than 10^{-4} mbar and can switch into a high pressure mode for process analysis at pressures up to $5x10^{-3}$ mbar without a requirement for differential pumping or a sampling system.

Key Features

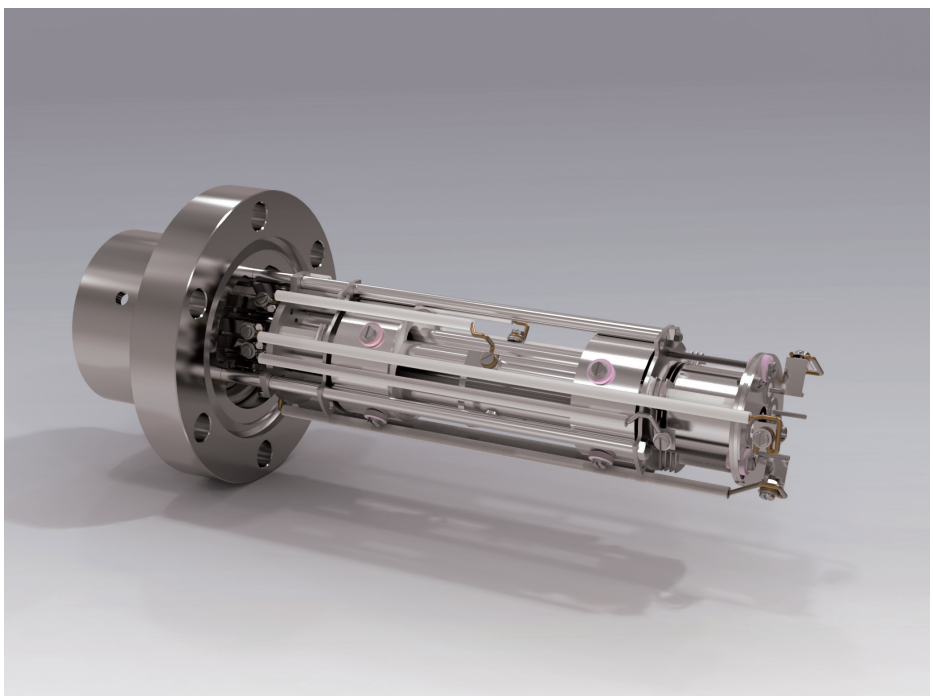
- HMT mode for high pressure operation to $5x10^{-3}$ mbar
- RGA mode for high sensitivity operation to $2x10^{-13}$ mbar
- 100 amu mass range
- stability better than +/- 1% over 24 hours
- fast access mixed mode scanning
- real-time background subtraction

Vacuum process sampling

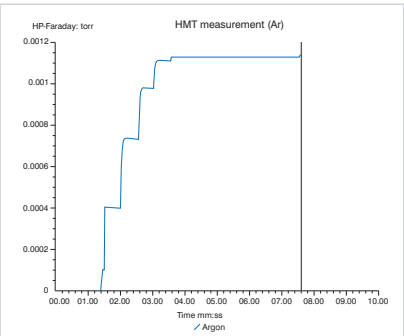
Hiden offers vacuum sampling accessories and components that are available as bolt-on low cost modules or part of an integrated system.

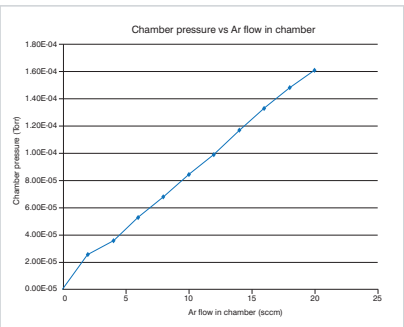
Vacuum accessories for process monitoring:

- Sample lines and options for sampling over a range of process pressures
- RGA gauge housing with ports for vacuum pumping, pressure gauge and sampling line
- RGA gauge head sampling tube with aperture for sampling
- UHV turbomolecular pump system



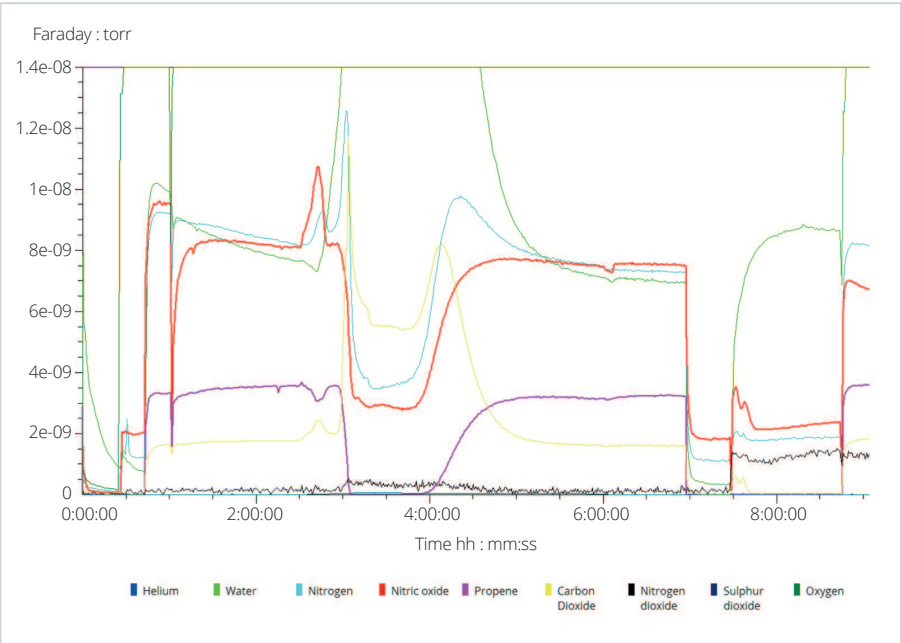
HMT



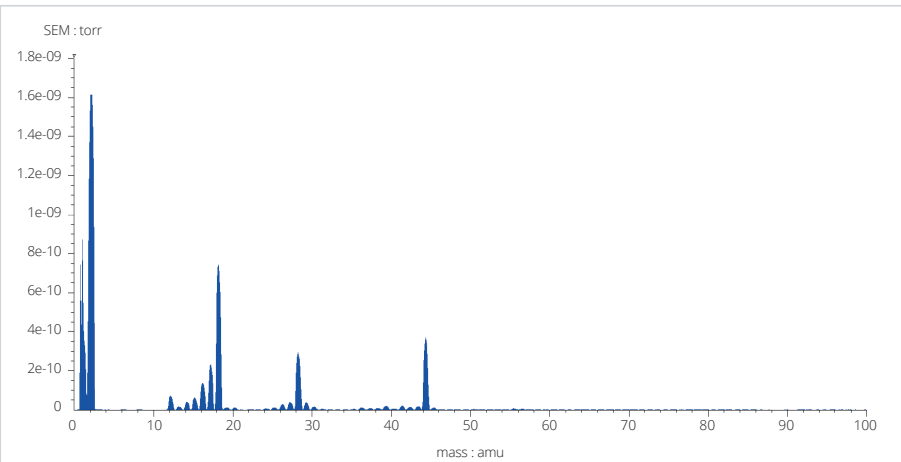


HMT Analyser measuring Argon in the process chamber

RGA - Residual Gas Analysis



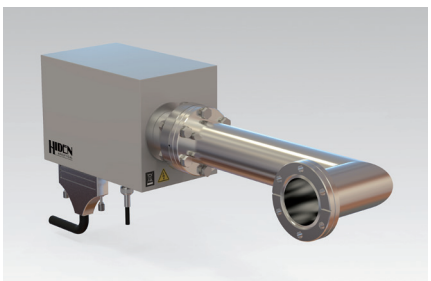
Process analysis – multiple species monitored over 8 hours



Residual gas spectrum of a clean chamber at UHV

- Quadrupole mass spectrometers provide for fast sensitive measurement of all vacuum residuals from light elements, hydrogen and helium through to volatile organic species.
- The RGA gauge head protection accessory is recommended for applications where the RGA can be used pre-process, placing the analyser out of the line of sight of potentially harmful condensing species and isolating it when the processing at higher pressures begins.
- Hiden's range of residual gas analysers are based on high performance quadrupole mass spectrometers, and provide a unique window into the vacuum environment for contamination monitoring, leak detection, and for analysis of species of interest within the vacuum chamber.

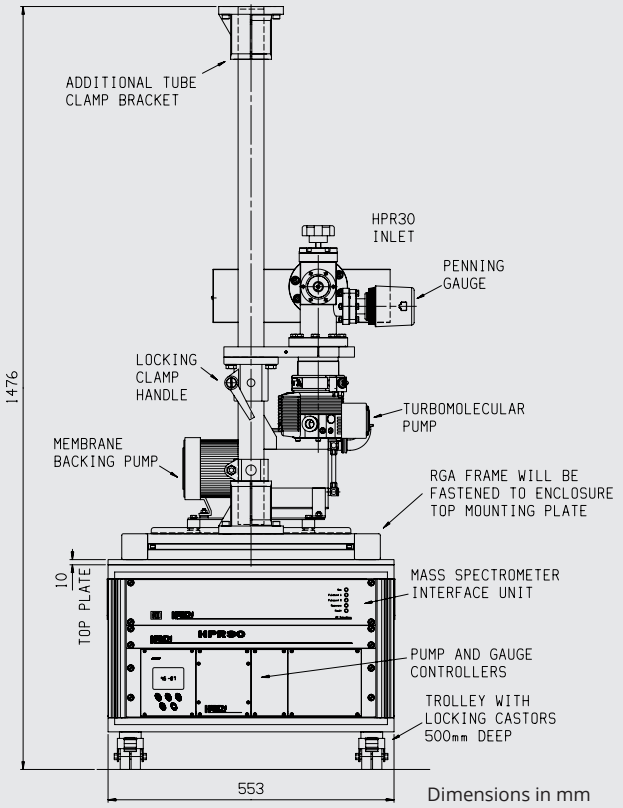
RGA analyser gauge



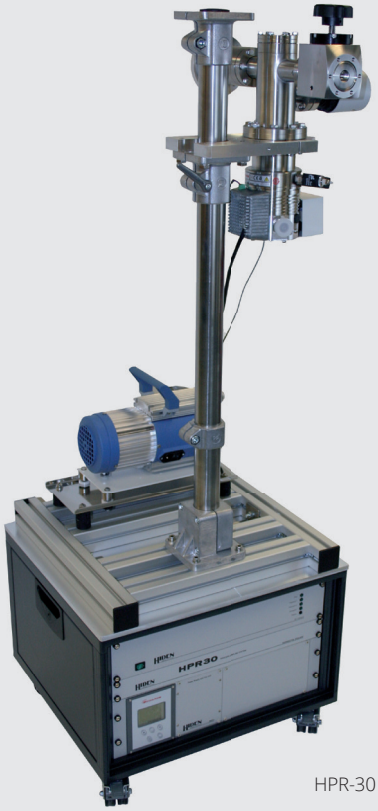
RGA gauge head protection accessory – a UHV housing with 90 degree elbow (RAH-9 housing).

Residual Gas Analysers for vacuum process monitoring

ITEM	DESCRIPTION	PARTCODE
	Vacuum Process Sampling Systems	
HPR-30	HPR-30 Vacuum process sampling system, including HAL 201 RC mass spectrometer with Faraday and Electron Multiplier Detectors. Mass range 200 amu. Process pressure range for sampling: 1 mbar to 10^{-4} mbar. The sampling pressure range may be extended with special options. The HPR-30 system includes: ▸ Re-entrant probe with user changeable sampling orifice ▸ Vacuum system – all dry turbomolecular pump set with total pressure gauge and safety interlock for protection of the mass spectrometer in case of over pressure	**305300**
HPR-30 CART	HPR-30 Vacuum process sampling system mounted on a compact mobile cart with flexible height adjustment for coupling to multiple chamber types	**305320**
QC 2.1	Extended mass range to 300 amu with triple filter mass spectrometer	**305021**
QC 2.2	Extended mass range to 510 amu with triple filter mass spectrometer	**301200**
QA 1.0	Extended mass range to 1000 amu with triple filter mass spectrometer	**301300**
LKV-30	Extended sampling pressure range up to 1000 mbar Process sampling leak valve with flexible stainless steel bellows and DN-35-CF flanged coupling	**305325**
VS 3.3	Pneumatic valve option with automatic control module	**303603**
	Vacuum Process Sampling Accessories And Components	
RAH-9	RGA analyser housing with 90° elbow	**202110**
HTM	HPR-30 UHV Manifold bakeout heater set	**303330**
VPA-1	1 m long sampling line for optimum conductance for sampling the pressure regime: 10^{-4} mbar to 10^{-2} mbar	**303331**
VPA-2	2 m long sampling line for optimum conductance for sampling the pressure regime: 10^{-2} mbar to 1 mbar	**303332**



Dimensions in mm



HPR-30 Cart

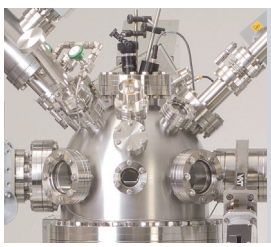
ITEM	DESCRIPTION	PARTCODE
	High Pressure Residual Gas Analysers	
HMT 100	High pressure RGA system 100 amu Faraday Detector Minimum detectable partial pressure $2x10^{-11}$ mbar Maximum operating pressure $5x10^{-3}$ mbar	**151100**
HMT 101	High pressure RGA system 100 amu Faraday and Electron Multiplier Detector Minimum detectable partial pressure $2x10^{-13}$ mbar Maximum operating pressure $5x10^{-3}$ mbar	**151101**
	Residual Gas Analysers	
HAL0 100 RC	RGA sytem 100 amu Faraday Detector Minimum detectable partial pressure $2x10^{-11}$ mbar Maximum operating pressure $1x10^{-4}$ mbar	**141100**
HAL 201 RC	RGA sytem 200 amu Faraday and Electron Multiplier Detector Minimum detectable partial pressure $5x10^{-14}$ mbar Maximum operating pressure $1x10^{-4}$ mbar	**144100**

Hiden**APPLICATIONS**

Hiden'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

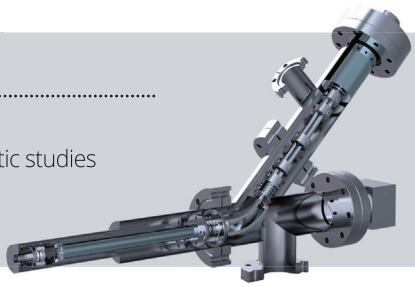


SURFACE ANALYSIS

- UHV TPD
- SIMS
- 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

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