Hiden *XBS* Monitor for the Molecular Beam Epitaxy Process

HIDEN ANALYTICAL

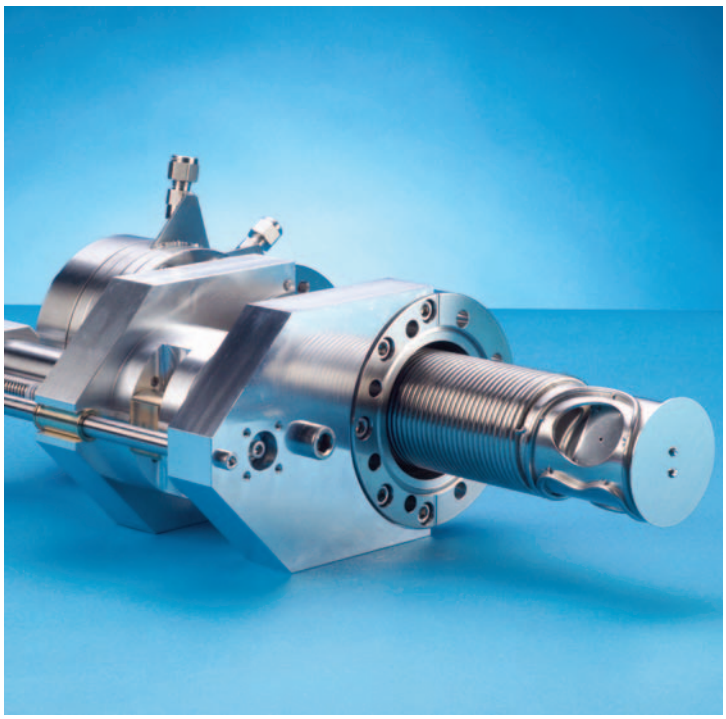
vacuum analysis

surface science

plasma diagnostics

gas analysis

XBS Overview



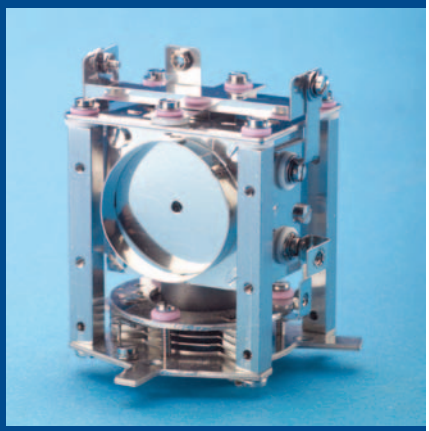
Deposition Control and Vacuum Monitoring in MBE Processes

The Hiden XBS quadrupole mass selective detector fulfils key process requirements:

- **Monitoring of evaporating components and fragments (halides, oxides)**
  - Beam acceptance within a 70° cone
  - Deposition rate control
  - Deposition rate determination
  - Confirmation of beam purity
- **Vacuum quality assessment**
  - Residual gas analysis
  - Leak detection
  - Vacuum diagnostics
- **Comprehensive control programs**
  - Multimode operation, user-programmable
  - Up to 16 species-specific analog outputs
- **High contamination resistance**
  - Fully-shrouded probe, water-cooled
  - Triple-stage mass filter

XBS technology… at a glance

Integral Water-cooled shroud



Integral Ioniser

MBE Monitor

Purpose-designed for condensable molecular beam monitoring, the Hiden XBS probe integrates a unique electron bombardment ioniser with the Hiden 3F series quadrupole system for simultaneous monitoring of multiple beam sources through a wide 70˚ cone, at any predetermined position within this cone of acceptance. Species-specific analog signals are then used for beam intensity output to the users source control modules.

Monitoring of condensable molecular beams with conventional mass spectrometer probes is restricted due to deposition of conducting or insulating films on critical probe insulator and electrode surfaces. To circumvent this, the purpose-designed Hiden XBS probe is totally enclosed in a stainless steel shroud to inhibit probe contamination, with dual plane custom-configured beam defining aperture plates dedicated to simultaneous monitoring of multiple molecular beam sources with no direct contact with internal probe surfaces.

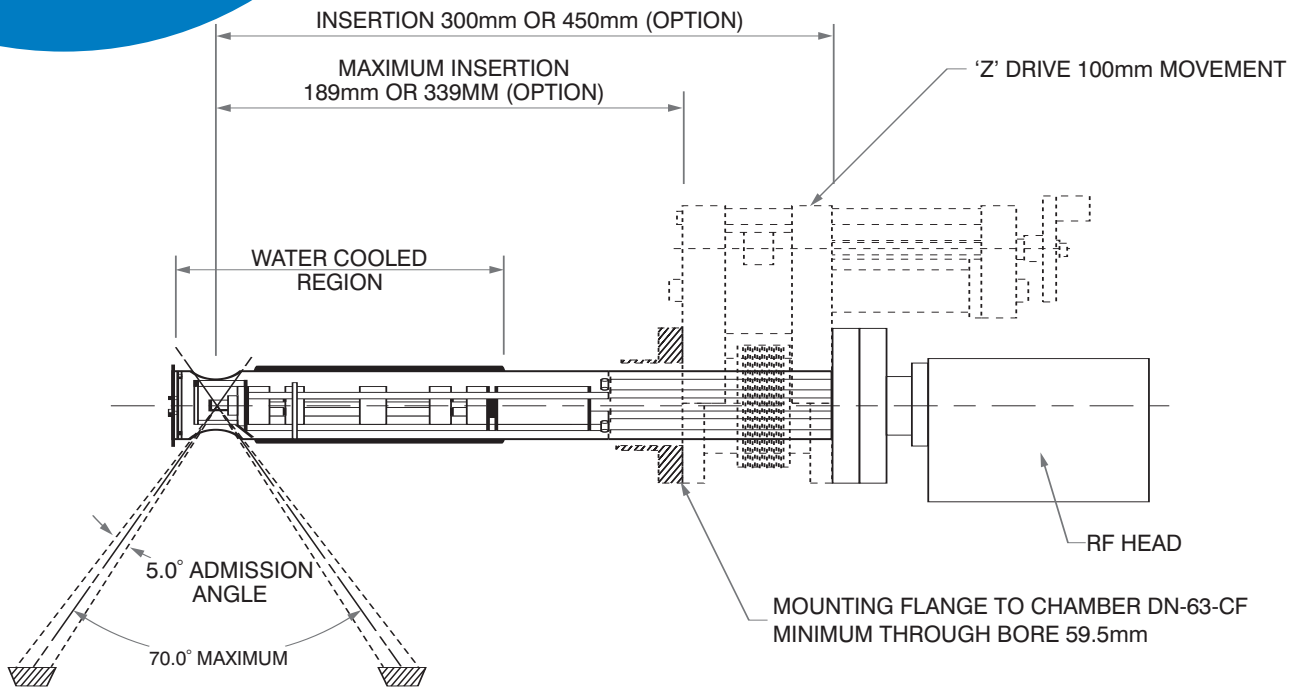
The aperture plates are configured and supplied for the specific user-system source geometries. The plates may be readily changed by the user to accommodate additional or alternative source positions.

The standard mass range of 320amu accommodates species up to and including As_4, with the probe thermally protected from the radiant heat sources by integrated water-cooling of the enclosing shroud. With the stainless steel bellows-sealed linear motion drive the probe can be fine-adjusted for optimum positional alignment and fully retracted to obviate substrate shadowing. All vacuum materials are fully UHV compatible and bakable to 300°C, with copper surfaces specifically excluded from the construction.

The system additionally operates as a conventional, full-function residual gas analyser for vacuum quality verification and diagnostics, complete with dedicated high-sensitivity helium leak check mode.

XBS

XBS technical specifications



Specifications

Mass Range: 320 amu

Ion Detection: Dual Faraday/Electron Multiplier with long-life SCEM.

Partial Pressure Range: 2.5 x 10^{-14} mbar to 10^{-4} mbar

Growth Rate Determination: Typically to less than 0.01Å.s^{-1}. Species dependent.

XBS Ioniser:
Electron bombardment
Twin filament
70° acceptance angle

Inputs/Outputs:
2 analog inputs
3 relay outputs (25VA)
5 digital I/O lines
4, 8 or 16 analog outputs (optional)

Probe Mounting Flange:
DN-63-CF Conflat-type
4.5"/114 mm outer diameter

Probe Materials:
Stainless steel
Molybdenum
Aluminium oxide
Glass (SCEM)

software control

The XBS comes with Hiden MASsoft control software as standard. This powerful data collection, analysis and interpretation program features multiple and flexible operating modes to optimise performance for diverse requirements – from precision monitoring of beam intensities and stabilities through to high-sensitivity helium leak detection and analysis of residual gases. Operating modes are fully user programmable, templates then being stored and recalled for each specific application.

Up to 16 analog outputs may be used to transfer species intensity data to external process monitoring and control systems. Integral and user-programmable threshold level detectors identify beam fluctuations outside preset limits and may be close-set to assist control of overshoot and 'ringing' in control loops, temperature control for instance.

Other products for Surface Technologies

SIMS

Workstations

Add-on Modules

Plasma Diagnostics

EQP for Ion Mass and Energy

ESP*ION* for Langmuir Probe Characterisations

XBS

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