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Technology for Productivity

Gas Analysis

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# HPQ2/HPQ2S

## HIGH PRESSURE COMPACT QUADRUPOLE PROCESS MONITORS WITHOUT DIFFERENTIAL PUMPING

The HPQ2 and HPQ2S represent the latest in high pressure, pump free, process RGA technology, with performance consistent with traditional RGA instrumentation. Although designed to meet the rigorous requirements of semiconductor processing, the HPQ2 and HPQ2S are ideal for other process monitoring applications because they do not require a support pumping package. The resulting system is less complex, with reduced installation requirements, offering a higher level of reliability at a substantially lower cost. In addition, the HPQ2S uses special gas-specific algorithms to compensate for sensitivity variations resulting from ion-molecule interactions that occur at higher pressures. These algorithms address the specific characteristics of species including water, oxygen, nitrogen, methane, helium, and hydrogen in argon.

## Features & Benefits

- Compact quadrupole process monitors offer high pressure operation without the need for differential pumping
- Ideal for a range of vacuum process monitoring applications including the detection of contaminants and outgassing
- Stable, rugged, reliable design
- Optimized for very high intrinsic sensitivity
- Includes Process Eye 2000 software for
  - — Recipe based operation
  - — Advanced tracking of various process phases
  - — User configurable, intelligent alarms
  - — Advanced data presentation (i.e. simultaneous bar chart/trend screen displays)
  - — High level tool integration

## Applications

With their ability to operate at the pressures encountered in the degas, pre-clean, buffer, transfer, and PVD chambers on semi-conductor process tools, HPQ2 and HPQ2S are able to gather vital information through-out a process which can be used to speed-up PM recovery and improve yield. For other types of process tools, the HPQ2 and HPQ2S monitor vacuum quality, high-lighting issues from outgassing to contamination. The HPQ2 and HPQ2S help optimize vacuum quality with

- — Helium leak hunting
- — Pump performance monitoring (e.g., hydrogen levels from cryopumps)
- — Residual gas monitoring, including air and water
- — Contaminants monitoring, including hydrocarbons
- — Process gas purity

The analyzer is extremely compact with an insertion length of less than 1.0” into the process chamber, and the RGA electronics are housed in a compact control module, which mounts directly onto the analyzer. This configuration is particularly attractive in applications where space is at a premium, such as clean room areas in semiconductor fabs.

The maintenance-conscious design of the HPQ2 and HPQ2S incorporates twin filaments, where the second "back-up" filament enables continued operation in the event of a filament failure. The user-serviceable HPQ2 and HPQ2S analyzer designs allow the ion source to be removed and dismantled for cleaning.

**Process Eye 2000 Control Platform**

The HPQ2 and HPQ2S analyzers use Process Eye 2000, a highly flexible, 32-bit modular application operating under Microsoft® Windows NT® 4.0, 95, 98, Millennium or 2000. Designed with a client/server structure, Process Eye 2000 incorporates TCP/IP protocol for full network compatibility.

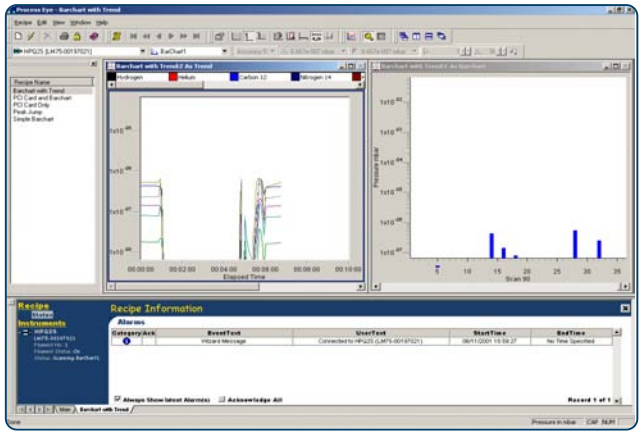
Process Eye 2000 uses recipes to specify the way in which the instrument scans, displays data, and responds to the data acquired. Recipes are user configurable using the Recipe Wizard and are ideal for monitoring repetitive processes and analyses. In addition, Process Eye 2000 provides Live History for quick on-line review of data trend events. Associated bar chart spectra and recently captured spectra are stored in a data buffer for easy review. The recipes can be linked together to address different monitoring conditions or to facilitate automatic calibration (using pre-defined calibration recipes). The single button push (or external signal) initiation of a Process Eye 2000 recipe eliminates the need for highly skilled, full time operators. The flexibility of Process Eye 2000 allows recipes to be configured that will:

- Define data acquisition and data display parameters, along with any on-line data processing required to convert data into relevant units and information
- Display data in multiple, simultaneous “bar chart” and “data trend” formats, allowing the comprehensive and clear investigation of significant trend events
- Incorporate custom warnings and alarms, triggered or terminated when data highlights the fact that process conditions have deviated from normal conditions, or when specific events occur (e.g. valves opening/closing)
- Monitor and display other parameters as trends in relevant units (temperature, gas flow rate, power, pressure, etc.) which are linked into the HPQ2 and HPQ2S analyzers through their flexible analog and digital I/O

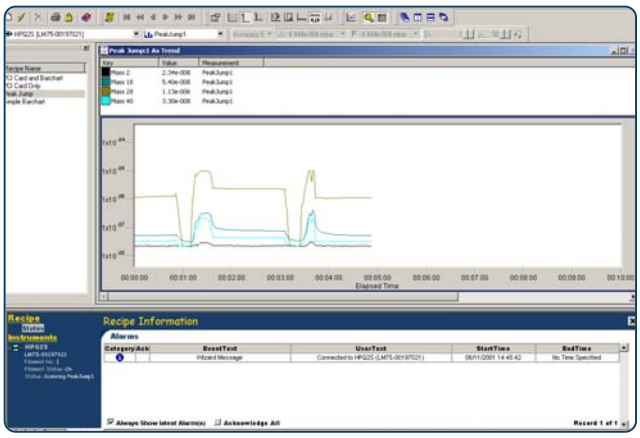
In addition, the Process Eye 2000 software platform allows the HPQ2 and HPQ2S analyzers to

- Monitor gas composition trends as well as other critical parameters (temperature, flow rate, etc.)
- Alert the operator to deviations from normal conditions using custom messages

The MKS, Spectra Products HPQ2 and HPQ2S can meet your high pressure process monitoring needs without the need for differential pumping systems.



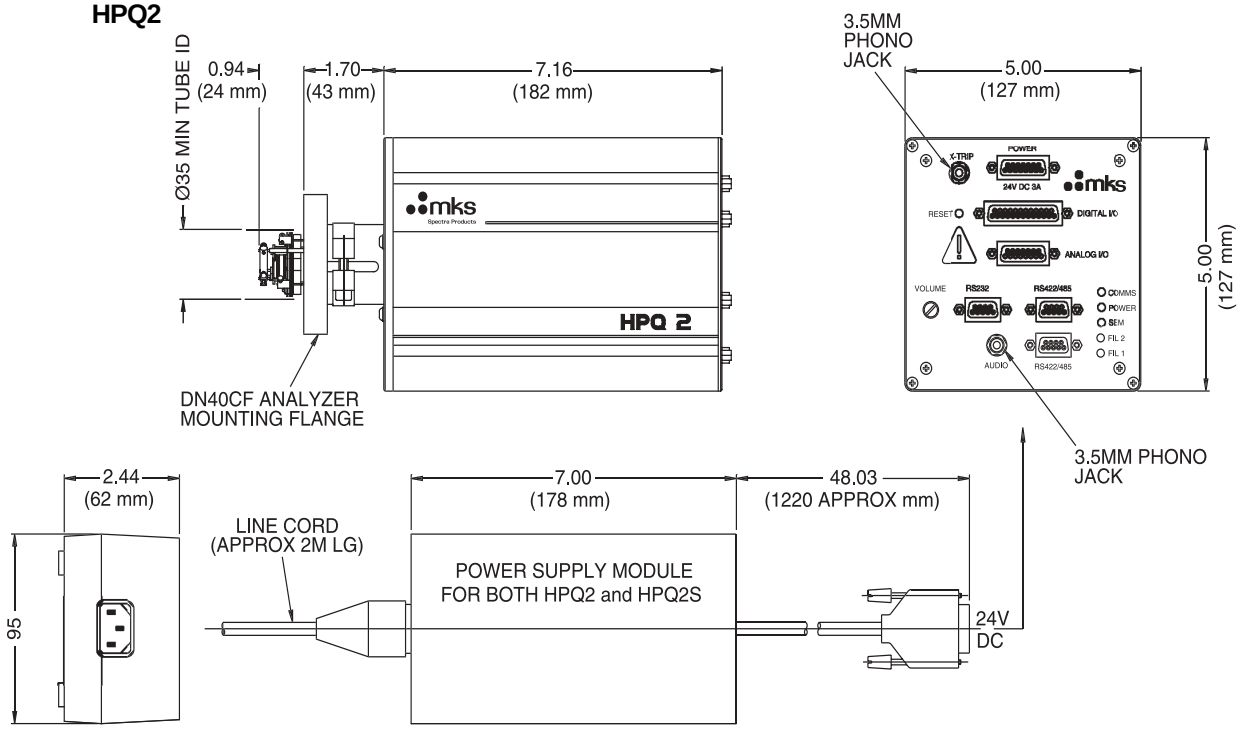

*Simultaneous log bar chart/trend analysis display illustrating wide dynamic range scanning*



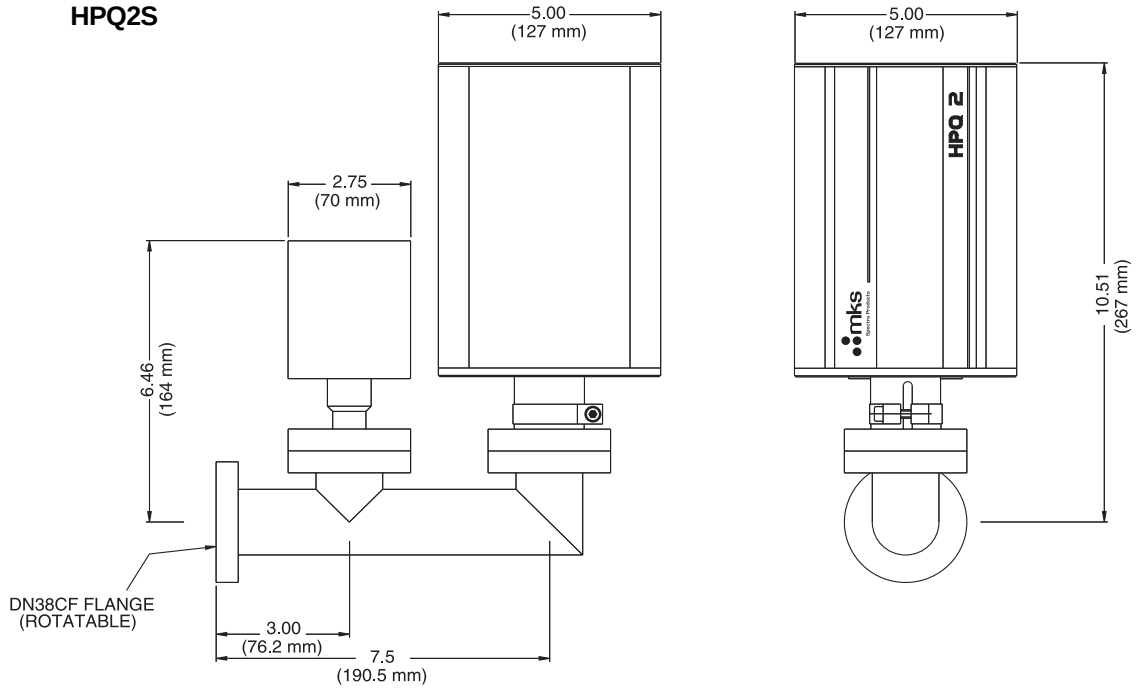

*Peak jump mode with associated trend display, highlighting variations in gas composition versus time*

# Dimensional Drawings

## HPQ2




## HPQ2S




*Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).*

# Specifications and Ordering Information

## Performance

| | |
|---|---|
| **Mass Range** | 2-80 amu |
| **Detector** | Faraday cup |
| **Maximum Recommended Operating Pressure** | 1 mTorr ($1.3 \times 10^{-3}$ mbar); up to 8 mTorr* ($1.0 \times 10^{-2}$ mbar) for HPQ2S - *Application dependent. Please consult the factory for details. |
| **Maximum Permissible Operating Pressure** | 15 mTorr (will withstand 40 mTorr transient pressure bursts) |
| **Minimum Detectable Partial Pressure** | $8 \times 10^{-11}$ Torr ($1.0 \times 10^{-10}$ mbar) |
| **Minimum Detectable Concentration** | 5ppm at $1.0 \times 10^{-3}$ Torr ($1.3 \times 10^{-3}$ mbar) |
| **Mass Alignment Stability** | Better than +/- 0.1 amu over 8 hours under constant conditions |
| **Resolution** | 1 amu at 10% peak height |

## Analyzer & Housing

| | |
|---|---|
| **Bakeout Temperature** | 250°C, electronics removed |
| **Mounting Flange** | DN38CF (70 mm/2.75 inch OD) Conflat® flange |
| **Insertion Length** | 1.0 inch (25mm) |
| **Ion Source Sensitivity** | $5 \times 10^{-5}$ A/Torr |
| **Electron Energy** | Set through Process Eye 2000 recipe |
| **Emission Current** | Set through Process Eye 2000 recipe |
| **Filaments** | Twin tungsten (optional $ThO_2$/Ir or $Y_2O_3$/Ir) |
| **Housing** | Application specific. Options include 2.75" CFF elbow, with custom side lengths or 2.75" CFF to KF-40 elbow, with custom lengths |

## Control Unit

| | |
|---|---|
| **Electronics Module Weight** | 2.3 Kg |
| **Power** | 24 VDC, 3A external supply (included) |
| **Maximum Ambient Operating Temperature** | 35°C, 80% RH (non condensing) |
| **LED Status Indication** | Filament 1, filament 2, power & communications |
| **I/O Capability** | 4 analog inputs (0-10 volt, 16 bit), 1 analog output (0-10 volt, 16 bit), 16 digital TTL I/O, 1 opto-isolated filament control input |
| **I/O Capability (optional PC based)** | Generic I/O card support for ISA slots, DTS300 I/O card support for PCI slots Modbus/GEM SECS support for some product configurations |
| **Other Facilities** | Leak check headset socket with audio adjustment, external filament trip socket, instrument reset |
| **Software** | Process Eye 2000 fully network compatible control platform operating under Microsoft® Windows® NT® 4.0, 98, Me, 2000* or XP* (*recommended) |
| **Communication between PC and Analyzer** | RS232C, 56K baud, 50ft [15m] maximum. RS422, 115000 baud, 1.2 Km (4000ft) maximum |
| **Minimum PC Requirements** | Pentium III 233 MHz, 64MB RAM, 6 GB disk drive. Multi-sensor installations may require higher specifications |
| **Total Shipping Weight** | 20 lbs (9.0 Kg) |

Please contact your local MKS office for price and availability information.

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HPQ/HPQ2S - 1/08


Specifications are subject to change without notice.