

Fab Bulletin 9702

Capacitance Manometer Retrofit Kits for AMAT 8100/8300 Etch Systems

(replaces Fab Bulletin 96.1)

Problem

Today's advanced etch processes have much tighter process pressure control limits than original recipes, requiring a more stable and repeatable pressure sensor. The original MKS Type 370 Baratron sensor that was designed into the 8100/8300 systems in 1981 may experience performance problems due to today's complex process recipes. The Type 370 sensor is temperature-controlled at 45°C. Users may experience zero drift or shift due to one or more of the following:

- Ambient temperature surrounding the MKS Type 370 Baratron is either unstable and /or above the 40°C ambient temperature specification limit.
- A "cold trap effect" can be created by an advanced poly (AME-8120/8320) and aluminum (AME-8130/8330) etch process generating effluent by-products that condense inside the Type 370 Sensor's piping or valve assembly.

Background

Ambient temperature issues, such as cycling ambient temperatures or temperatures above the maximum ambient specification limit of 40°C for the Type 370 sensor, can adversely effect functional performance. In fact, any capacitance manometer used in any application beyond its specified limits can result in sub-standard performance. These temperature changes often cause minute geometry changes in the sensor, thereby altering its output. The temperature coefficient specification for zero and Full Scale defines the maximum potential allowable variation.

The manometer sensor control temperature is also a factor. Condensable gas processes, such as advanced poly and aluminum etch, generate effluent by-products that condense out at ambient temperatures. For example, a by-product of AME aluminum etch processes is $AlCl_3$ vapor. Consulting the $AlCl_3$ partial pressure vapor phase curve, at typical total process pressure below 50 millitorr for the AME-8130/8330 etch systems, a sensor control temperature in the 60° to 70°C range is sufficient. For this application MKS recommends the Type 590 sensor, because its 70°C control temperature design protects against condensable effluent by-products generated during a metal etch process. For the AME 8110/8310 oxide etch process systems, MKS recommends the Type 690 sensor, temperature controlled at 45°C. Symptoms of advanced etch process problems when using the Type 370 sensor could be:

- Process pressure points vs. process results either appear to drift or are inconsistent, and/or the zero repeatability at base pressure appears to drift (thus requiring more frequent zero compensation).
- Unreasonable sensor zero adjustments over time and pressure set point inconsistency, ultimately leading to sensor failure.
- Manometer piping/valve assembly becomes clogged over time, requiring periodic cleaning or replacement.

Solution Choices

This solution provides a heated manometer, utilizing existing MKS electronics, the same AME procedures and does not require any software modifications.



Type 690 Baratron®
Temperature Controlled at 45°C
(for oxide etch processes)



Type 590 Baratron®
Temperature Controlled at 70°C
(for condensable gas with aluminum
and some advanced poly etch processes)



Mounting brackets

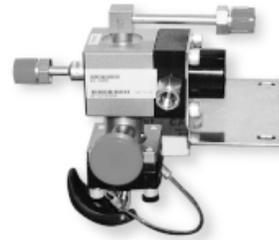
Additional Low-Cost Kit Option — IDA Valve

The IDA Valve (Insitu Diagnostics Access Valve) is MKS' multi-function, multi-port, dual valve for capacitance manometer/gauge isolation. The IDA Valve also allows easy access to the manometer and chamber for in situ manometer calibration and diagnostics. In fact, the access port on the IDA Valve also serves as a leak test port to the chamber/system, thus eliminating the need for an auxiliary leak test port. This valve provides a "standard" access port for those customers who have implemented routine PM in situ manometer calibration check using portable calibration verification systems. In addition, the IDA Valve offers enhanced conductance characteristics (Cv of 2.7 versus 0.35 for the typical single-function isolation valve (originally used in AME systems), which improves gauge response and process pressure stability and repeatability from tool to tool.

IDA Valve
(basic model)



IDA Valve,
sensor, and
bracket assem-
bly



Sensor Signal Conditioner/Electronics

The Type 270 Series Signal Conditioner is available for those who prefer back-up/local readout in addition to the standard AME system display. This kit represents an upgrade to MKS' 170M-6C Series Electronics and includes all applicable mounting hardware.



Type 270 Signal Conditioner

Benefits

MKS' Retrofit Kit for Applied Materials' 8100/8300 has been reviewed and tested by AMAT. This solution has the following benefits:

- The Type 590 and 690 sensors in this Fab Solution are a direct replacement for the Type 370 sensor, utilizing the existing 170M-6C electronics.
- The Type 590 and 690 sensors have temperature coefficients about 10 times better than the originally installed manometer to provide enhanced stability and repeatability.
- The Retro-Fit Kits are complete with all hardware and instructions. Average installation time for sensor upgrade is less than 30 min.

With over two years experience with AME upgrade kits and CES changes, this solution has a proven track record for success.

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For further information on these upgrade kits, call your local MKS Sales Engineer, or contact the MKS Applications Engineering Group at 800-227-8766.

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