

# PPCMA

## Integrated Pressure Controller with Mass Flow Meter



The PPCMA pressure controller with integrated mass flow meter provides pressure measurement and control while monitoring mass flow rates for critical process applications (e.g. backside wafer cooling) in a compact package that saves critical space when compared to the previous multi-component systems necessary to accomplish the task.

The PPCMA utilizes leading Baratron® capacitance manometer technology for pressure measurement and patented thermal flow meter to monitor gas mass flow. Both are integrated along with a proportioning control valve and the latest in control electronics providing fast and accurate pressure control with critical flow monitoring as a system diagnostic. The PPCMA can be configured for 10 to 1000 Torr Full Scale pressure with a control range from 5 to 100% of Full Scale. The PPCMA pressure

controller is suitable for transport chamber pressure control, critical backside wafer pressure control and process gas panel pressure balancing as well as run-vent pressure control applications. The valve and flow meter can be configured for Full Scale flow rates from 5 to 5000 sccm Full Scale depending on process conditions.

The PPCMA is available with either digital (DeviceNet™ or EtherCAT®) I/O allowing for straightforward integration into new or retrofit applications. In-situ tuning and component diagnostics are enhanced through the device's micro USB user interface accessible via virtually any PC with a web browser.

### Product Features

- Backside wafer cooling
- Fast response to set point with minimal overshoot
- Metal-sealed, cleanroom manufactured units meet critical high purity application needs
- Pressure measurement and control with flow metering in a single package requires less space and reduces system cost

\*Protected under the following U.S. patents: No. 6,779,394, No. 6,668,641, No. 6,810,308, No. 7,004,191 or International Patents and Patents pending.



### Key Benefits

- Compact package
- Integral Baratron capacitance manometer technology provides accuracy, reliability, and wide range
- Patented mass flow sensor\* provides exceptional long-term accuracy and zero stability

| Performance  |  |
|--|--|
| Pressure Type  | Absolute   |
| Pressure Full Scale Ranges   | 10, 20, 50, 100, 200, 500 or 1000 Torr   |
| Transducer Over Pressure Limit   | 2x Full Scale for all ranges   |
| Maximum Differential Pressure  | 45 psid  |
| Burst Pressure   | 1500 psig  |
| Flow/Orifice Full Scale Ranges <sup>1</sup>  | 50, 200, 1000, 5000 (sccm)   |
| Control Mode   | Downstream   |
| Pressure Measurement Accuracy  | ±0.5% of Reading   |
| Temperature Coefficients<br>Zero Span  | <ul style="list-style-type: none"> <li>• ±0.02% of Full Scale/°C</li> <li>• ±0.04% of Reading/°C</li> </ul>  |
| Pressure Readout Units <sup>2</sup>  | Torr, kPa, mbar, psi   |
| Pressure Resolution  | 0.1 Torr   |
| Pressure Control Accuracy <sup>3</sup>   | <ul style="list-style-type: none"> <li>• ±1.0% of Reading (≥10% Full Scale)</li> <li>• ±0.2% of Full Scale (&lt;10% Full Scale)</li> </ul>   |
| Control Range  | >5 to 100% of Full Scale   |
| Typical Response Time <sup>4</sup>   | <1.0 second (excluding system time constant)   |
| Flow Reading<br>Full Scale Flow Rates (N <sub>2</sub> equivalent)<br>Measurement Range<br>Accuracy<br>Repeatability<br>Resolution<br>Temperature Coefficients<br>Zero Span | <ul style="list-style-type: none"> <li>• 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000</li> <li>• 2% to 100% of Full Scale</li> <li>• ±1.0% of Reading &gt;20% of Full Scale; ±0.2% of Full Scale (&lt;20% of Full Scale flow) (including non-linearity, hysteresis, and non-repeatability referenced to 760 mmHg and 0°C)</li> <li>• ±0.3 of Reading</li> <li>• 0.1% of Full Scale</li> <li>• &lt;0.05% of Full Scale/°C</li> <li>• &lt;0.08% of Reading/°C</li> </ul> |
| Operating Temperature Range  | 10° to 50°C (50° to 122°F)   |
| Storage Temperature Range  | -20° to 80°C (-4° to 176°F)  |
| Storage Humidity Range   | 0 to 95% relative humidity, non-condensing   |

<sup>1</sup> Orifice Full Scale ranges are nominal Full Scale flow rates for Nitrogen with 15 psig on the inlet and atmosphere on the outlet side.

<sup>2</sup> Some readout units may not be available over every primary I/O.

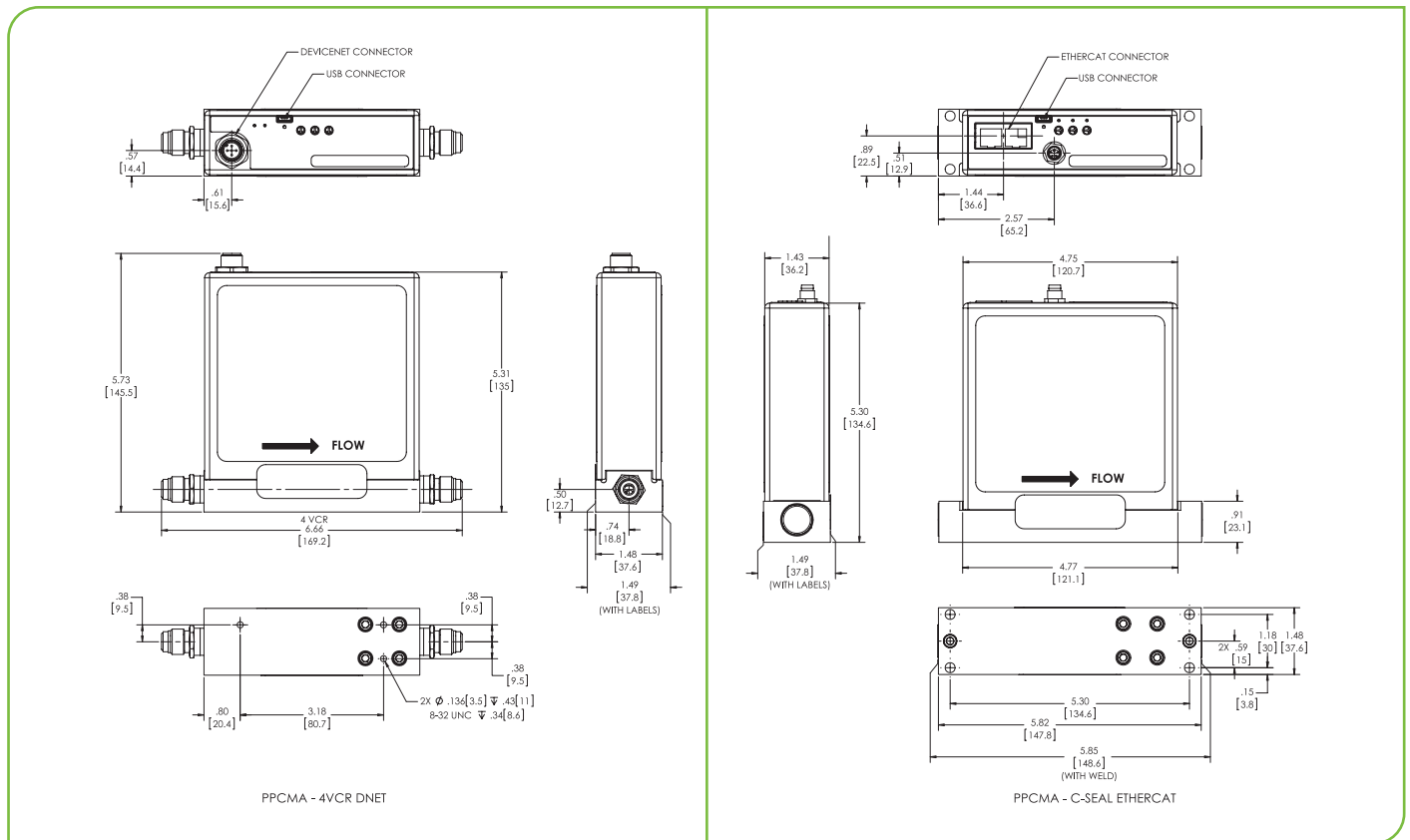
<sup>3</sup> Accuracy includes linearity, hysteresis, and repeatability.

<sup>4</sup> Typical response time is excluding system time constant.

| Mechanical  |   |
|---|---|
| Fittings  | Swagelok® 4 VCR® Male, 1.5" surface mount (C-seal)  |
| Valve Options<br>Type<br>Seat Material                          | <ul style="list-style-type: none"> <li>• Normally Closed</li> <li>• PTFE (Teflon®) or Elastomer (Viton®), Buna, Neoprene, EPDM</li> </ul>   |
| Leak Integrity<br>External (scc/sec He)<br>Through Closed Valve | <ul style="list-style-type: none"> <li>• &lt;1 x 10<sup>-10</sup></li> <li>• &lt;1.0% of orifice Full Scale (Nitrogen at 25 psig on inlet to atmosphere)</li> <li>• &lt;0.1% of orifice Full Scale - Elastomer</li> </ul>     |
| Wetted Materials<br>Standard<br>Optional (Valve Seat)           | <ul style="list-style-type: none"> <li>• 316L S.S. VAR (equivalent to 316 S.S. SCQ for semiconductor quality), 316 S.S., Elgiloy®, KM-45, Inconel® 718, 825 Incoloy®</li> <li>• PTFE (Teflon) or Elastomer (Viton)</li> </ul> |
| Surface Finish  | 10 μinches, average Ra  |
| Weight  | <5 lbs (1.36 kg)  |

Note: The pressure controllers require flow to operate, and will not control pressure in "dead-ended" (zero flow) applications.

| Digital I/O                | DeviceNet™   | EtherCAT®   |
|----------------------------|--|---|
| Input Power Required       | +11 to +25 VDC per (< 4 watts)                                     | +24 VDC (<5 watts)  |
| Connector                  | 5 pin micro connector (power and comm.)                            | 2 x RJ-45 (comm.) male, M8 male, 5 pin (power)                              |
| Data Rate Switch/Selection | 4 positions: 125, 250, 500K (Default), (programmable over network) | No switch   |
| Comm. Rate (s)             | 125 Kbps, 250 Kbps, 500 Kbps                                       | 100 Mbps  |
| MAC ID Switches/Addresses  | 2 switches, 10 positions; 0,0 to 6,3, 1 to 254                     | 3 switches, 16 positions  |
| Network Size               | Up to 64 nodes   | Up to 4095 nodes  |
| Visual Indicators          | LED Network (green/red)<br>LED Module (green/red)                  | LED Power (green)<br>LED Run (green)<br>LED Error (red)<br>LED Comm (green) |
| Compliance                 | CE   | CE  |



Dimensional Drawings  
Unless specified, dimensions are nominal values in inches (mm referenced).

| Ordering Code Example: PPCMA51T01102R8AV120   | Code   | Configuration |
|---|--|---------------|
| <b>Model</b>  |  |               |
| PPCMA Pressure Controller with Integral MFM   | PPCMA  | PPCMA         |
| <b>Pressure Range Full Scale and Units</b>  |  |               |
| 10 Torr<br>50 Torr<br>100 Torr<br>500 Torr<br>1000 Torr<br>100 mBar<br>500 mBar<br>1000 mBar<br>1 kPa<br>5 kPa<br>10 kPa<br>100 kPa | 11T<br>51T<br>12T<br>52T<br>13T<br>12M<br>52M<br>13M<br>10K<br>50K<br>11K<br>12K | 51T           |
| <b>Gas (Consult Factory For Other Gases)</b>  |  |               |
| Helium (001)<br>Argon (004)<br>Hydrogen (007)<br>Nitrogen (013)   | 01<br>04<br>07<br>13   | 01            |
| <b>Full Scale Flow Rate (sccm) - (minimum is 5 sccm N<sub>2</sub>, equivalent)</b>  |  |               |
| 5<br>10<br>20<br>50<br>100<br>200<br>500<br>1000<br>2000<br>5000  | 500<br>101<br>201<br>501<br>102<br>202<br>502<br>103<br>203<br>503               | 102           |
| <b>Fittings</b>   |  |               |
| Swagelok 4 VCR<br>C-Seal  | R<br>C   | R             |
| <b>Electrical Connector</b>   |  |               |
| DeviceNet<br>EtherCAT   | 6<br>8   | 8             |
| <b>Orifice Size</b>   |  |               |
| A (50 sccm)<br>#1 (200 sccm)<br>#2 (1000 sccm)<br>#3 (5000 sccm)  | A<br>1<br>2<br>3   | A             |
| <b>Plug Material</b>  |  |               |
| Buna<br>EPDM<br>Neoprene<br>Teflon<br>Viton   | B<br>E<br>N<br>T<br>V  | V             |
| <b>Valve Type</b>   |  |               |
| Normally Closed   | 1  | 1             |
| <b>Firmware</b>   |  |               |
| DeviceNet<br>EtherCAT   | 10<br>20   | 20            |