

Series 392

Micro-Ion[®] Plus Module



The 392 Micro-Ion[®] Plus is a second generation full range pressure measurement module that combines industry-standard Micro-Ion[®] ionization gauge technology with a miniature Pirani Conductron heat-loss sensor. The Series 392 Micro-Ion Plus combines Granville-Phillips[®] industry-standard and application-tested Micro-Ion ionization sensor with an innovative miniature Pirani Conductron sensor in a single gauge assembly envelope that is attached to a compact electronics control module. This compact modular design reduces the number of separate gauges, vacuum interfaces, cabling and control electronics that are typically required for full range pressure measurement. The full range pressure measurement is output as a single analog signal or is available through optional EtherCAT[®], RS-485 or DeviceNet[™] interfaces. Up to three optional set point relays are available, they can be configured for process control with the ability to assign the relays at any pressure across a broad vacuum spectrum. The Series 392 Micro-Ion Plus is available with or without display, and can be configured with a wide variety of flanges.

This second generation Micro-Ion Plus has integrated gauge assembly electronic memory that contains factory-calibration information. The electric memory is used by the control module to provide factory-level calibration accuracy for new and replacement gauges, and track gauge-tube usage information so the MKS service team can quickly understand your application environment.

The miniature Pirani Conductron delivers improved accuracy through better thermal management within the gauge envelope. Finally, the Series 392 and Series 390 Micro-Ion ATM now share a common platform for improved product quality through high-volume manufacturing.

Accurate measurement across a wide vacuum range often requires multiple gauge components, additional vacuum ports, associated electrical interfaces and control systems. The Micro-Ion Plus full-range vacuum module combines multiple sensors into a single gauge tube that connects to an advanced control electronics module to create a compact modular gauge design simplifies interface requirements as well and reduces overall cost of ownership, while enhancing vacuum measurement performance.

The next-generation Micro-Ion Plus incorporates knowledge gained through 30 years of vacuum gauge designs and field installations, as well as our extensive work with Original Equipment Manufacturer (OEM) and end-user customers. For high-performance, full range vacuum measurement in a compact single vacuum port design with a low cost of ownership, select the Series 392 Micro-Ion Plus or choose from our full range of MKS pressure measurement solutions.

Product Features

- Compact multi-sensor gauge design
- Eliminates the need for two independent gauges
- Automation of ionization gauge activation and deactivation
- Optional Analog, EtherCAT[®], RS-485 or DeviceNet interfaces
- EtherCAT, RS-485 and DeviceNet have optional set point relays for process control
- Optional flange configurations
- Electronic gauge-tube memory ensures accuracy and repeatability of placement gauges
- Improved miniature Pirani Conductron accuracy
- Second generation product that leverages 30 years of Granville-Phillips vacuum gauge design experience
- Backed by MKS service support program



Key Benefits

- Accurate, continuous pressure measurement from high vacuum to atmosphere
- Dual ionization gauge filaments increase equipment uptime
- Field-replaceable gauge assembly for low cost-of-ownership

- **Wide Measurement Range:** Provides continuous vacuum pressure measurement from 1×10^{-9} Torr to atmosphere. Pressure reading through a single Analog, RS-485 or DeviceNet output.
- **High Performance:** Proven dual filament industry standard Micro-Ion ionization gauge technology and our patented miniature Pirani Conduction heat-loss sensor combine to provide an extended range of operation.
- **Automated Control:** Fully integrated sensors automatically control activation and deactivation of the ionization gauge, simplifying gauge operation.
- **Compact Design:** Dual sensor design and control electronics, integrated into a single compact, modular package.
- **Communication Interface:** Available serial interfaces provide communication between the module and host controller with optional RS-485 or DeviceNet.
- **Optional Process Control Relays:** Up to three set point control relays can be included to simplify process control functions. Settings are configurable through the serial interface.
- **Highly Configurable:** The Micro-Ion Plus is available in display and non-display versions, choice of Tungsten or Yttria-coated Iridium filaments, output measurement units (Torr, mbar, Pa) and a variety of common flange types.
- **Field-Replaceable Gauge Assembly:** Gauge assembly can quickly and easily be replaced in the field using only a screwdriver after removal from the vacuum system. Integrated electronic gauge assembly calibration information ensures replacement gauge accuracy and repeatability.

Specifications

| | | |
|---|---|--|
| Absolute Pressure Measurement Range (for Air or N₂) <small>See notes (1), (2), (3)</small> | Torr mbar Pascal | <ul style="list-style-type: none"> • 1×10^{-9} to atmosphere • 1.33×10^{-9} to atmosphere • 1.33×10^{-7} to atmosphere |
| X-ray Limit <small>See Note (4)</small> | Torr mbar Pascal | <ul style="list-style-type: none"> • $<3 \times 10^{-10}$ • $<4 \times 10^{-10}$ • $<4 \times 10^{-8}$ |
| Accuracy (for Air or N₂ absolute pressure) <small>See Note (5)</small> | Torr mbar Pascal | <ul style="list-style-type: none"> • 1×10^{-8} to 100 mTorr: $\pm 15\%$ of Reading; 100 mTorr to 150 Torr: $\pm 10\%$ of Reading • 1.33×10^{-8} to 0.133 mbar: $\pm 15\%$ of Reading; 0.133 to 200 mbar: $\pm 10\%$ of Reading • 1.33×10^{-6} to 13.3 Pa: $\pm 15\%$ of Reading; 13.3 to 2.00×10^4 Pa: $\pm 10\%$ of Reading |
| Repeatability (for Air or N₂ absolute pressure) <small>See Note (6)</small> | Torr mbar Pascal | <ul style="list-style-type: none"> • 1×10^{-8} to 100 mTorr: $\pm 5\%$ of Reading; 100 mTorr to 150 Torr: $\pm 2.5\%$ of Reading • 1.33×10^{-8} to 0.133 mbar: $\pm 5\%$ of Reading; 0.133 to 200 mbar: $\pm 2.5\%$ of Reading • 1.33×10^{-6} to 13.3 Pa: $\pm 5\%$ of Reading; 13.3 to 2.00×10^4 Pa: $\pm 2.5\%$ of Reading |
| Response Time | | <25 mseconds |
| Analog Outputs | Absolute Pressure | Logarithmic, 0.5 to 7.0 VDC, 0.5 V/decade |
| Digital Communications | | RS485, EtherCAT, DeviceNet |
| Operating Temperature | | 10° to 40°C (50° to 104°F), non-condensing |
| Storage Temperature | | -40° to +70°C (-40° to +158°F) |
| Bakeout Temperature | | 105°C (221°F) maximum, with electronics removed |
| Ionization Gauge Emission Current | | Autoranging |
| Automatic Ion Gauge Control Settings (default) Ionization Gauge On Ionization Gauge Off Switch to High Emission Switch to Low Emission | | <ul style="list-style-type: none"> • 2×10^{-2} Torr; 2.66×10^{-2} mbar; 2.66 Pa, with decreasing pressure • 3×10^{-2} Torr; 3.99×10^{-2} mbar; 3.99 Pa, with increasing pressure • 5×10^{-6} Torr; 6.66×10^{-6} mbar; 6.66×10^{-4} Pa, with decreasing pressure • 1×10^{-5} Torr; 1.33×10^{-5} mbar; 1.33×10^{-3} Pa, with increasing pressure |
| Ionization Gauge Degas | | Electron bombardment; 3 Watts for 1 minute/filament |
| Ionization Gauge Filaments | | Tungsten or yttria-coated iridium |
| Filament Operation <small>See Note (7)</small> | | Alternating (yttria default), automatic, manual (tungsten default) |
| Heat-Loss Sensor Wires | | Gold-plated tungsten |
| Gauge Volume | | 10.8 cm ³ (0.65 in ³) |
| LED Indicator | | Module status |

| | | |
|------------------------------------|---|--|
| I/O Connector | RS-485/Analog DeviceNet EtherCAT | <ul style="list-style-type: none"> • 15-pin D-sub male • 5-pin micro connector • 15-pin HD-sub male, RJ45, IN/OUT |
| Maximum Inrush Current | RS-485/Analog DeviceNet/EtherCAT | <ul style="list-style-type: none"> • 2 Amps, for 0.5 seconds • 2 Amps, for 0.5 seconds |
| Power Required | RS-485/Analog DeviceNet EtherCAT | <ul style="list-style-type: none"> • 24 VDC +10% to -15%, 22W • 24 VDC ± 15% (1.5A at 20.4V), 3.0A at 30W Peak • 24VDC ±15%, max 22W |
| Optional Display | | Graphics LCD |
| Optional Set Point Relays | RS-485/Analog/DeviceNet EtherCAT | <ul style="list-style-type: none"> • 2 SPDT(NO/NC) or 3 SPST(NO) • 2 SPDT (NO/NC), each can be independently assigned to absolute or differential pressure |
| Relay Contact Rating | Maximum Minimum | <ul style="list-style-type: none"> • 1 A at 30 VDC, Resistive load • 5 mA at 5 VDC, Resistive load |
| Weight | | 728.5 gm (25.7 oz) (2.75 ConFlat® fitting) |
| Case Material | | Aluminum extrusion with powder-coat |
| Materials Exposed to Vacuum | | 304 stainless steel, tantalum, tungsten, yttria-coated iridium, alumina, CuAg eutectic, Kovar®, gold or nickel plated Kovar, borosilicate glass |
| Compliance | | CE, ETG 5003.1, ETG 5003.2, ETG 5003.2080 |

Notes:

- (1) Measurements will change with different gases and mixtures.
- (2) Micro-Ion ATM modules are not intended for use with flammable or explosive gases.
- (3) Atmospheric value is based on calibration at time of use.
- (4) X-ray limit is the absolute lowest indication from the gauge. It is not possible to make repeatable measurements near the x-ray limit.
- (5) Accuracy (the difference between the gauge reading and a calibrated reference standard) is determined statistically and includes the combined performance of the gauge and electronics.
- (6) Repeatability refers to the ability of the same module to read the same pressure at different times.
- (7) In alternating mode the module will alternate between filaments with each activation of the ion gauge. In automatic mode filament 1 is used until it becomes inoperable, and the module will automatically switch to filament 2. In manual mode the module operates filaments as in automatic mode, with the exception that manual intervention is required to activate filament 2.

The drawing shows a top view of the EtherCAT module with a width of 9.1 inches [3.6] and a height of 7.1 inches [2.8]. It features an IN connector, an OUT connector, and a 15-pin D-sub connector. The side view shows a total height of A and a mounting bracket height of B. The front panel displays the mks logo and 'SERIES 302 MICRO-ION PLUS TRANSDUCER Granville-Phillips'.

| RS-485/Analog DIM B: 6.2 cm, (2.4 in) | | |
|---------------------------------------|-------------------|-------------------|
| Fitting | Dimension A | |
| | Total Height (cm) | Total Height (in) |
| NW16KF | 11.7 | 4.6 |
| NW25KF | 11.7 | 4.6 |
| NW40KF | 12.2 | 4.8 |
| 1.33" (NW16 CF) | 11.8 | 4.6 |
| 2.75" (NW35 CF) | 11.8 | 4.6 |
| 1/2" VCR male | 13.5 | 5.3 |

| DeviceNet™/EtherCAT® DIM B: 7.9 cm, (3.1 in) | | |
|--|-------------------|-------------------|
| Fitting | Dimension A | |
| | Total Height (cm) | Total Height (in) |
| NW16KF | 13.4 | 5.3 |
| NW25KF | 13.4 | 5.3 |
| NW40KF | 13.9 | 5.5 |
| 1.33" (NW16 CF) | 13.5 | 5.3 |
| 2.75" (NW35 CF) | 13.5 | 5.3 |
| 1/2" VCR male | 15.2 | 6.0 |

Dimensional Drawing - EtherCAT® shown
 Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

| Ordering Code Example: 392710-2-YG-T | Code | Configuration |
|--|--------|---------------|
| Basic Micro-Ion ATM Module | | |
| RS-485 interface no display | 392501 | 392710 |
| RS-485 interface with display | 392502 | |
| DeviceNet interface no display | 392601 | |
| DeviceNet interface with display | 392602 | |
| EtherCAT | 392710 | |
| Set Point Relays | | |
| Two (EtherCAT only available with two set point relays) | 2 | 2 |
| Three | 3 | |
| Ionization Gauge Filament Types | | |
| Yttria-coated iridium filaments (EtherCAT only available with Yttria coated) | Y | Y |
| Tungsten | T | |
| Vacuum Connections | | |
| NW16KF | D | G |
| NW25KF | E | |
| NW40KF | K | |
| 1.33" (NW16CF) ConFlat-type | F | |
| 2.75" (NW35CF) ConFlat-type | G | |
| 1/2" VCR-type Male | H | |
| Measurement Units | | |
| Torr | T | T |

| Ordering Code Example: 392100-Y-E | Code | Configuration |
|--|--------|---------------|
| Micro-Ion Plus Modules | | |
| Replacement gauge | 392100 | 392100 |
| Ionization Gauge Filaments | | |
| Yttria-coated iridium (EtherCAT only available with Yttria coated) | Y | Y |
| Tungsten | T | |
| Vacuum Connections | | |
| NW16KF | D | G |
| NW25KF | E | |
| NW40KF | K | |
| 1.33" (NW16CF) ConFlat-type | F | |
| 2.75" (NW35CF) ConFlat-type | G | |
| 1/2" VCR-type Male | H | |