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Series 356
Micro-Ion® Plus Modules

The Micro-Ion® Plus Vacuum Gauge Module combines the new miniature Conductron Heat-Loss Sensor with proven Micro-Ion Gauge technology in the same vacuum envelope to extend pressure measurements from high vacuum to atmosphere. The Micro-Ion Plus design combines the control electronics and the gauge in a compact module that provides convenient high vacuum measurement and is easy to interface to a control system.

The combination of two sensors in the same vacuum envelope saves space. Vacuum system control is simplified by using the heat-loss sensor to automatically turn-on and turn-off the ionization gauge. Convenient push button controls allow for module operation and adjustment of the two trip point relays without the need for electrical or computer interfacing. Two versions of the module are available – an RS-485 interface with analog output or a DeviceNet™ interface.

The wide dynamic range of high vacuum systems require multiple sensor technologies to measure the entire pressure range. Traditionally this has been accomplished with multiple gauges, requiring multiple vacuum ports, cables and electronic controls. There is great benefit in combining multiple sensors in a miniature vacuum envelope, as long as the sensors do not interfere with each other and measurement performance is not compromised. This is achieved in the Micro-Ion Plus design. It maintains the high performance of the Granville-Phillips® Micro-Ion Gauge design while incorporating a new miniature heat-loss sensor underneath the ionization volume. The patented Conductron Heat Loss Sensor is based on the understanding and insights gained in over 35 years of experience in making the industry standard Convectron® Gauge.

The wide range, high performance and compact size make the Micro-Ion Plus Module a wise choice for pressure measurement on high vacuum systems.



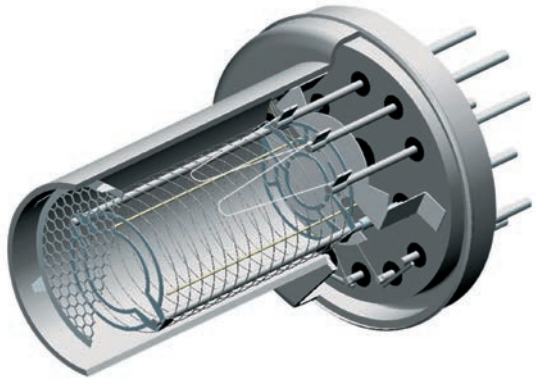
Product Features

- Extended measurement range from high vacuum to atmosphere
- Auto turn-on and turn-off of ionization gauge
- Push buttons for manual operation and adjustments
- Two trip point relays for safety interlocking
- Optional local display aids in setup and diagnostics

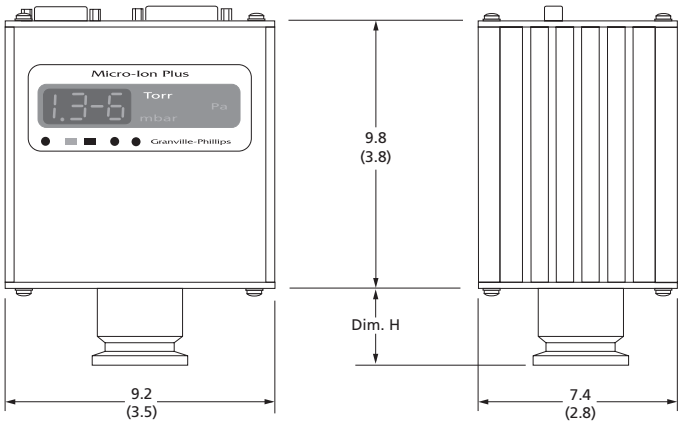
Key Benefits

- Two sensors in one saves space
- Dual ion gauge filaments increase equipment uptime
- Available with RS-485 with analog output or DeviceNet™ digital interface

- **Compact Combination Gauge:** Micro-Ion Plus combines the new miniature Conductron Heat-loss sensor with a Micro-Ion sensor in one gauge envelope, at less than 10% of the volume of a conventional ionization gauge.
- **High Performance:** The complete Micro-Ion design has been retained with the patented dual ion collector that increases the electron path length and ion collection efficiency, providing high performance in a small volume.
- **Dual Ionization Sensor Filaments:** Dual, burn-out resistant yttria-coated iridium filaments provide long gauge life. Unscheduled downtime is avoided by using the second filament as a back-up until the gauge can be replaced during regular maintenance procedures.
- **Cooler Operation:** At only 8% of the power consumption of a traditional glass or nude gauge, the Micro-Ion sensor generates much less heat to disturb a process or experiment.
- **Robust All-Metal Design:** Welded components, vacuum fired and assembled in a cleanroom environment, are enclosed in a stainless steel envelope to ensure sensor integrity.
- **Port Shield:** Protects the electrode assembly from damage during assembly or vacuum chamber maintenance, and provides a stable electrical environment for improved measurement performance.
- **Wide Selection of Vacuum Fittings:** Simplifies installation on your vacuum system.
- **Replaceable Gauge:** Gauge can quickly and easily be replaced using only a screwdriver.



Micro-Ion® Plus Cutaway



Vacuum Connections	Dim. H
1/2 inch 8VCR-type female	5.8 (2.3)
1.33 inch (NW16CF) ConFlat®-type	4.3 (1.7)
2.75 inch (NW35CF) ConFlat®-type	4.3 (1.7)
NW16KF	2.0 (0.8)
NW25KF	2.0 (0.8)
NW40KF	2.0 (0.8)
NW16KF - Extended	4.2 (1.65)
NW25KF - Extended	4.2 (1.65)
NW40KF - Extended	4.6 (1.8)

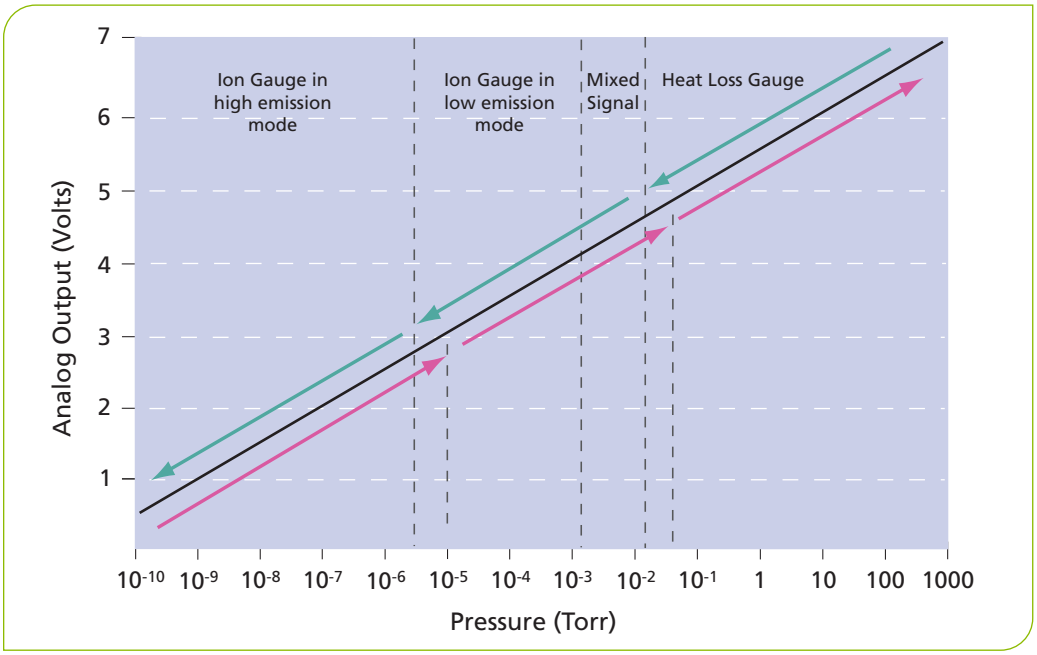
Dimensional Drawing

Note: Dimensions are nominal values in centimeters (inches referenced).

- **Wide Measurement Range:** Allows vacuum system performance to be monitored continuously from $1x10^{-9}$ Torr ($1x10^{-9}$ mbar; $1x10^{-7}$ Pa) to atmosphere.
- **Simple Modular Design:** Electronics and sensors are packaged together in one compact, easy to install module that eliminates the need for multiple gauges, cables, and electronics.
- **Control System Simplification:** The integral heat loss sensor automatically controls activation and deactivation of the ion gauge, eliminating the need for external control of the ion gauge.
- **RS-485, Analog Output and Remote I/O:** In addition to RS-485 communications and analog output, the module provides input control of gauge on/off, degas, atmospheric calibration, and keyboard lock along with outputs of gauge, filament, and degas status.
- **Process Trip Points:** Relay contacts allow control of other vacuum equipment and provide safety interlocking. Settings are adjustable through the local display interface, RS-485 or DeviceNet interface.
- **Local Display/Interface (Optional):** Setup time and diagnostics are improved with a green LED display and pushbutton interface that gives point-of-use pressure indication and local adjustment of process trip points.
- **DeviceNet Interface Version:** Provides high speed access to pressure measurement and easy configuration of gauge parameters.
- **DeviceNet Network Power Flexibility:** Gauge power can be supplied either through the DeviceNet micro connector or through a separate connector.

Autoranging Feature

The autoranging feature makes the Micro-Ion Plus simple and easy to use. As the vacuum system pumps down from atmosphere, the heat loss sensor measures pressure until a sufficiently low vacuum level is achieved, then it automatically turns on the ion gauge in the low emission mode. During the first decade that both sensors are operating, the control electronics mix the signals. As the pressure is reduced, the ion gauge automatically switches from low emission to high emission. As pressure increases, the opposite occurs at slightly higher pressures. This sequence is illustrated in the graph below.



Autoranging switch points and analog output

Specifications

Measuring Range for Air and N_2 See Notes (1), (2), (3)	
Torr	1 x 10^{-9} Torr to atmosphere
mbar	1 x 10^{-9} mbar to atmosphere
Pa	1 x 10^{-7} Pa to atmosphere
Accuracy for N_2	< 15% of reading from 1 x 10^{-8} Torr to 50 Torr See Note (4)
Repeatability	< 5% of reading from 1 x 10^{-8} Torr to 50 Torr See Note (5)
Ion Gauge Emission Current	Autoranging
Autoranging (default values) See Note (6)	
Ion Gauge Auto On	2 x 10^{-2} Torr; 3 x 10^{-2} mbar; 3 Pa, on decreasing pressure
Switch to High Emission (4.0 mA)	5 x 10^{-6} Torr; 7 x 10^{-6} mbar; 7 x 10^{-4} Pa, on decreasing pressure
Switch to Low Emission (0.1 mA)	1 x 10^{-5} Torr; 1 x 10^{-5} mbar; 1 x 10^{-3} Pa, on increasing pressure
Ion Gauge Auto Off	3 x 10^{-2} Torr; 4 x 10^{-2} mbar; 4 Pa, on increasing pressure
Ion Gauge Degas	Electron bombardment, 3.75 W with 2-minute timer
Filament Selection	Alternating (default) See Note (7)
Weight	567 gm (20 oz) with NW16KF flange
Power Required	24 VDC ± 15%, 26 W max
Operating Temperature	10°C to 40°C ambient, non-condensing
Non-Operating Temperature	-40°C to 70°C
Case Material	Aluminum extrusion
Display (optional)	2 digits plus exponent, green LED
Trip Point Relays	Two single-pole, double-throw relays (SPDT)
Relay Contact Rating	1 A at 30 VDC resistive, non-inductive
Range	1 x 10^{-9} to 50 Torr; 1 x 10^{-9} to 70 mbar; 1 x 10^{-7} Pa to 7 kPa
Micro-Ion Plus Gauge	
X-ray Limit	< 3 x 10^{-10} Torr; < 4 x 10^{-10} mbar; < 4 x10^{-8} Pa See Note (8)
Ion Gauge Filament Material	Yttria-coated iridium
Heat Loss Sensor Material	Gold-plated tungsten
Other Materials Exposed to Gas	304 stainless steel, tantalum, tungsten, nickel, nickel iron alloy, borosilicate glass
Internal Volume	10.8 cm^3, (0.67 $inch^3$) to the port screen
Gauge Bakeout Temperature	150 °C (with electronics removed)

Notes:

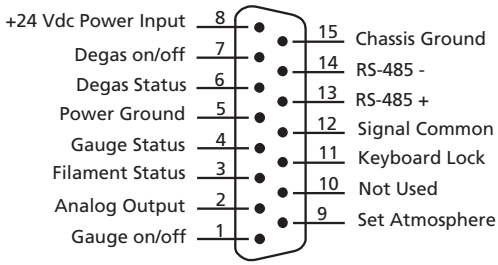
(1) Measurements will change with different gases and mixtures.
(2) Micro-Ion Plus Gauges are not intended for use with flammable or explosive gases.
(3) Atmospheric value is based on calibration at time of use.
(4) Accuracy (the difference between the gauge reading and a calibrated reference standard) is determined statistically and includes the combined performance of the gauge and electronics.
(5) Repeatability refers to the ability of the same module to read the same pressure at different times.
(6) The default switching points for the high and low emission modes can be adjusted through the digital interface.
(7) The module will alternate between filaments with each turn-on of the ion gauge unless the AUTO mode is selected through the digital interface. In AUTO mode, filament 1 is used until failure. When either filament fails, the module automatically switches to the good filament.
(8) The x ray limit is the absolute lowest indication from the gauge. It is not practical to make repeatable measurements near the x ray limit.

RS-485 Analog

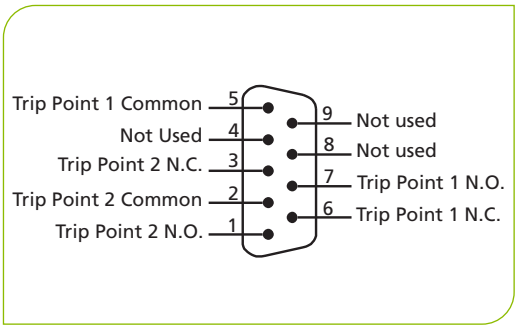
Adjustable Parameters	Atmospheric calibration, Data format (baud rate, data bits, parity), Trip points (value, direction and hysteresis), Gauge on/off, Degas on/off, Ion gauge emission switch point, Filament mode, Measurement units, Keyboard lock/unlock
Baud Rate	1200, 2400, 4800, 9600, 19200 (default value), 38400
Data Format	ASCII, 8 data bits, one stop-bit, no parity (default values)
Analog Output	Logarithmic, 0.5 to 7.0 Vdc, 0.5 Volt/decade
Remote Input Signals	Gauge on/off, degas on/off, keyboard lock, and gauge calibration are set by connecting to ground
Remote Output Signals	Gauge, filament and degas status are output by an open collector transistor



Note: Pin 1 must be continuously connected to Pin 5 (LOW) to turn the gauge ON. Removing the ground connection turns the gauge OFF.



User Interface Connector 15-pin subminiature-D male



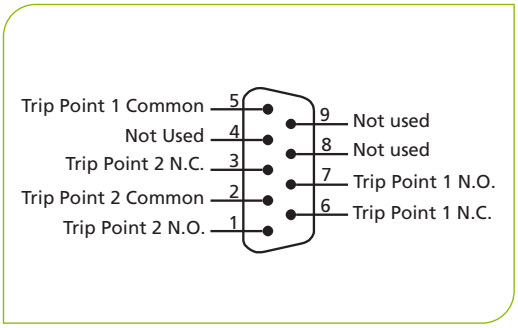
Trip Points Connector 9-pin subminiature-D male

DeviceNet™

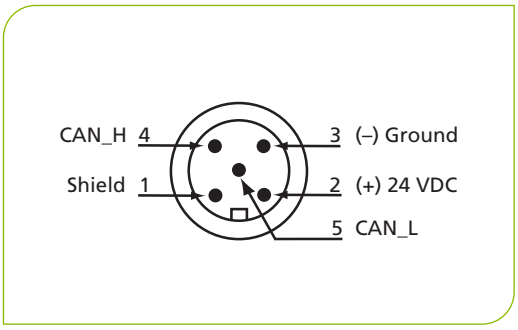
Adjustable Parameters	Gauge calibration, Trip points (value, direction, hysteresis), Gauge on/off, Degas on/off, Ion gauge emission switch point, Filament mode, Measurement units, Keyboard lock/unlock
Device Type	Vacuum/pressure gauge device
Messaging	Polled I/O and explicit
Data Rates	125K, 250K, or 500K switch selectable



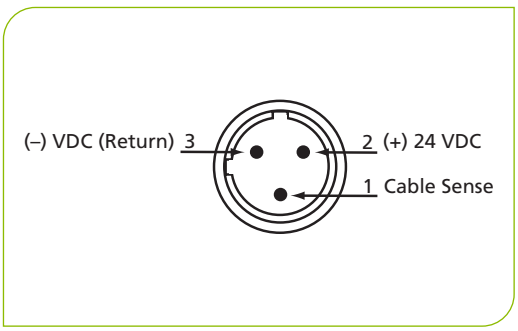
Note: Pin 1 (cable sense) must be connected to Pin 3 (VDC return).



Trip Points Connector 9-pin subminiature-D male



DeviceNet Connector 5-pin micro



Auxiliary Power Connector 3-pin micro

Ordering Information

Micro-Ion® Plus Modules

Ordering Code Example: 356002-YE-T	Code	Configuration
Base Micro-Ion Plus Modules		
RS-485 and analog output, no display	356001	356002
RS-485 and analog output, digital display	356002	
DeviceNet, no display	356004	
DeviceNet, digital display	356005	
Filament		
Yttria-coated iridium	Y	Y
Vacuum Connection		
NW16KF	D	E
NW25KF	E	
NW40KF	K	
1.33-inch (NW16CF) Conflat-type	F	
2.75-inch (NW35CF) Conflat-type	G	
1/2 inch VCR-type male	H	
NW16KF - Extended	M	
NW25KF - Extended	N	
NW40KF - Extended	L	
Measurement Units		
Torr	T	T
mbar	M	
Pa	P	

Replacement Gauges

Ordering Code Example: 356006-YE	Code	Configuration
Replacement Gauge	356006	356006
Filament Type		
Yttria-coated iridium	Y	Y
Vacuum Connection*		
NW16KF	D	E
NW25KF	E	
NW40KF	K	
1.33-inch (NW16CF) Conflat-type	F	
2.75-inch (NW35CF) Conflat-type	G	
1/2 inch VCR-type male	H	
NW16KF - Extended	M	
NW25KF - Extended	N	
NW40KF - Extended	L	



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