# InstruTech®

## *Series 402 Hornet™ Hot Cathode Miniature-Ionization Vacuum Gauge with Dual Convection*

***Hot Cathode Bayard-Alpert Ionization gauge with space-saving built-in controller and display operates 3 different gauges***

***Full range measurements from 1 x $10^{-9}$ to 1,000 Torr plus monitoring of your foreline***

***Low cost of ownership: Significant cost reduction in controller, space, cabling costs and sensor replacement***

***Built-in bright digital OLED display with wide viewing angle, RS485 digital interface, 3 setpoint relays and 3 log-linear analog outputs***

***Dual hot filament design, rugged and compact metal construction***

***The first modular ionization vacuum gauge capable of operating two convection gauges***

***IGM402 Ionization Gauge with Dual Convection***

### *InstruTech IGM402 Hornet™ Modules*

#### *Technology*

***Gauge*** The IGM402 *Hornet* ionization vacuum gauge module provides the basic signal conditioning required to turn the gauge into a complete measuring instrument. It incorporates numerous design features to enhance performance and reduce cost. The electrometer circuit auto zeroes to ensure that the readings are not subject to temperature drift, eliminating the need for unnecessary, expensive circuitry which further reduces the cost.

***Multiple Gauges*** The IGM402 *Hornet* is capable of operating two external convection vacuum gauges simultaneously.

***Wide Range Measurement*** The IGM402 *Hornet* can combine the vacuum measurement from the ion gauge and a convection gauge to provide wide range measurements from 1 x $10^{-9}$ Torr to 1,000 Torr, or simply operate the ion gauge and the two convection gauges as individual gauges.

***Display*** The standard built-in bright OLED display provides a convenient user interface for setup and operation of the vacuum gauges. The display screen can show all three measurements on the same screen or display them sequentially. Service screens allow monitoring of filament operation. Error messages are displayed for several common fault conditions.

***Operation*** The operation of the gauge including degas, filament on/off and emission current is set by the front panel push buttons, digital inputs or RS485 commands.

**Sensor** For general vacuum applications, dual yttria coated filaments are offered for use with air and inert gases such as $N_2$, argon, etc. Dual tungsten filaments are available for use with gases that may not be compatible with yttria coated filaments.

#### *Low Cost of Ownership*

***Controller*** The compact modular design with the built-in controller and display operates three different gauges without requiring expensive external controllers.

***Space*** No rack space required. The modular design negates the need for expensive and limited rack space.

***Cabling Cost*** The cabling cost to connect a nude/glass ionization gauge to a rack-mount controller can be excessive and installation is time consuming. With the IGM402 no ion gauge cable is required and one 10 ft. convection gauge cable is included.

***Sensor Replacement*** Many wide range combination gauges provide measurements from atmosphere to high vacuum with multiple sensors built into one assembly. A sensor failure may require replacement of the entire sensor assembly often approaching 50% of the initial cost of the vacuum gauge itself.

The IGM402 *Hornet* provides an alternative to these other gauges by combining the vacuum measurements from the ion gauge and one of the convection gauges to provide a wide range gauge. A sensor replacement requires only the replacement of the damaged sensor and not all the other sensors at once.

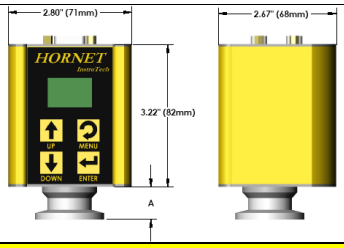
The IGM402 *Hornet* sensor assembly can be easily replaced in the field.

***Additional Point of Use*** In addition to the ion gauge and one convection gauge, the IGM402 *Hornet* can provide vacuum measurements from a second convection gauge without the need for another expensive controller. This results in significant cost savings for monitoring the foreline or an additional point of use.

## *Specifications*

| | | |
|---|---|---|
| measurement range: | ionization (IG) | $1 \times 10^{-9}$ to $5 \times 10^{-2}$ Torr / $1.3 \times 10^{-9}$ to $6.7 \times 10^{-2}$ mbar / $1.3 \times 10^{-7}$ to 6.7 Pa |
| | convection (CG) | $1 \times 10^{-4}$ to 1,000 Torr / $1.3 \times 10^{-4}$ to 1,333 mbar / $1.3 \times 10^{-2}$ Pa to 133 kPa |
| | used as a wide range gauge (IG+CG) | $1 \times 10^{-9}$ to 1,000 Torr / $1.3 \times 10^{-9}$ to 1,333 mbar / $1.3 \times 10^{-7}$ Pa to 133 kPa |
| accuracy - $N_2$ (typical) | | $1 \times 10^{-8}$ to $1 \times 10^{-3}$ Torr; ± 15% of reading<br>$1 \times 10^{-3}$ to 400 Torr; ± 10% of reading, 400 to 1,000 Torr; ±2.5% of reading |
| repeatability - (typical) | | $1 \times 10^{-8}$ to $1 \times 10^{-3}$ Torr; ± 5% of reading , $1 \times 10^{-3}$ to 1,000 Torr; ±2% of reading |
| display | | bright OLED display, 3 digits plus 1 digit exponent, user-selectable Torr, mbar, or Pa |
| functionality | | ionization gauge can operate up to 2 convection gauges |
| materials exposed to gases | | dual filaments: yttria coated iridium or optional tungsten<br>Ion collector: tungsten Grid: tantalum Others: 316/304 SS, glass, nickel |
| sensitivity | | factory pre-set. Also user adjustable between 2 to 99 |
| x-ray limit | | $< 5 \times 10^{-10}$ Torr, $< 6.7 \times 10^{-10}$ mbar, $< 6.7 \times 10^{-8}$ Pa |
| emission current | | 100 µA, 4 mA |
| degas | | 3 W, electron bombardment |
| internal gauge volume | | 1.0 $in^3$ (16.4 $cm^3$) |
| overpressure protection | | IG filament turns off at factory default of $5 \times 10^{-2}$ Torr; also user adjustable below 50 mTorr |
| temperature | | operating; 0 to + 40 °C storage; -40 to + 70 °C |
| bakeout temperature | | 200 °C (sensor only - electronics removed) |
| humidity | | 0 to 95% relative humidity, non-condensing |
| weight | | 0.6 lb. (0.27 kg) with NW25 KF flange |
| housing (electronics) | | aluminum extrusion |
| mounting orientation | | any |
| serial communications | | RS485 - User selectable ASCII protocol,<br>or BINARY protocol using InstruTech CRC8, minimum command interval: 50 ms for both protocols |
| analog outputs (3 total) | IG | one log-linear 0 to 9 Vdc, 1 V/decade , or |
| | IG+CG | one log-linear 0.5 to 7 Vdc, 0.5 V/decade, and |
| | CG | two log-linear 1 to 8 Vdc, 1 V/decade or non-linear 0.375 to 5.659 Vdc |
| setpoint relays (3 total) | | three single-pole, double-throw (SPDT), 1A at 30 Vdc resistive, or ac non-inductive |
| status outputs | | degas & filament on/off status via display messages, open collector transistor or RS485 |
| input signal | | degas and filament on/off & emission current are set by continuity to ground<br>using digital inputs, RS485 or manually using front panel push button |
| filament selection | | filament 1 or 2 selectable via front panel push buttons or RS485 commands |
| input power | | 20 to 28 Vdc, 30 W protected against power reversal and transient over-voltages |
| connectors | | (2) 9-pin D-Sub, (2) terminal blocks, (2) convection gauge connectors |
| convection gauge compatibility | | InstruTech CVG101 *Worker Bee™* or Granville-Phillips® 275 Convectron® |
| CE compliance | | EMC Directive 2004/108/EC, EN61326-1, EN55011 Low Voltage Directive 2006/95/EC, EN61010-1 |
| environmental | | RoHS |

| Fitting | dimension A |
|---|---|
| NW16KF | 1.45 in. (37mm) |
| NW25KF | 1.45 in. (37mm) |
| NW40KF | 1.45 in. (37mm) |
| 1 1/3 in. Mini-CF | 1.85 in. (47 mm) |
| 2 3/4 in. Conflat® | 1.70 in. (43 mm) |
| 3/4 in. Tube | 2.16 in. (55 mm) |
| 1/2 in. VCR | 2.58 in. (65 mm) |




## *Ordering Information* — *Part Numbers*

| IGM402 Fittings / Flanges | Yttria Filaments | Tungsten Filaments | Convection Gauge Cable Assembly | Replacement / Spare IG Sensor Yttria | Tungsten |
|---|---|---|---|---|---|
| NW16KF | IGM402YBD | IGM402TBD | HB431-1-3F (3 ft.) | IG4YB | IG4TB |
| NW25KF | IGM402YCD | IGM402TCD | HB431-1-10F (10 ft.) | IG4YC | IG4TC |
| NW40KF | IGM402YDD | IGM402TDD | HB431-1-25F (25 ft.) | IG4YD | IG4TD |
| 1 1/3 in. Mini-CF / NW 16CF Mini- Conflat® | IGM402YED | IGM402TED | HB431-1-50F (50 ft.) | IG4YE | IG4TE |
| 2 3/4 in. CF / NW35CF Conflat® | IGM402YFD | IGM402TFD | > 50 ft. – Consult Factory | IG4YF | IG4TF |
| 3/4 in. Tube (3/4 in. O.D. O-ring compression) | IGM402YAD | IGM402TAD | | IG4YA | IG4TA |
| 1/2 in. Cajon® 8VCR® female | IGM402YHD | IGM402THD | | IG4YH | IG4TH |



**InstruTech®**
**1475 S. Fordham Street**
**Longmont, CO 80503**
**USA**

**Phone +1-303-651-0551**
**Fax +1-303-678-1754**
**E-mail info@instrutechinc.com**
**Web www.instrutechinc.com**