

PRESSURE MEASUREMENT



Ion Gauge Controller



The NGC3 ion gauge controller is a 19 inch rack mountable (1U) control unit providing simultaneous control of two Pirani gauges, one ionization gauge and one capacitance manometer. The NGC3 is capable of continuous pressure measurement in the range: 1 bar to 3×10^{-11} mbar.

Pirani Gauges



We stock flange mounted Pirani gauges suitable for use with the NGC3 controller.

Ion Gauges



We offer flange mounted UHV Bayard-Alpert ionisation gauges designed for use with the NGC3 controller. In addition to these gauges, we also offer a range of nude ion gauges and glass enveloped gauges for use with third party controllers.

UHV Pressure Gauge Controller



Active gauge input - Industry standard RJ45 jack for connection of most low power (24 V, 1 W max.) active gauge heads. Selectable linear or log formats. Ideally suited for use with our APG Active Pirani gauge head.

Ion gauge operation - Four modes of operation; Auto and Interlock use Active or Pirani gauge pressure to automatically start/stop the Ion gauge, or prevent it from starting based on Active or Pirani gauge pressure. External inhibit allows start/stop of Ion gauge from an externally supplied logic signal. Use manual mode to force Ion gauge on and off as required.

Serial interface - Read back pressure measurements or control the NGC3 via the easy to use serial interface. Full documentation of the protocol is provided, making it easy to integrate into your application. Software is available for download on our website which demonstrates the interface features offered by the NGC3

Features:

- 1200 mbar to 3×10^{-11} mbar continuous measurement range.
- Controls 2 ion gauges sequentially, 1 active gauge and 2 AML legacy pirani gauges.
- Bright green LED display; measurements are easy to read. Assignable custom gauge labels.
- Multiple Ion gauge modes, including start/stop and interlock based on Active or Pirani gauge pressure.
- 1U high full-width for easy rack-mounting.
- Display pressure in mBar, Torr or Pascal, or Ion current in Amps.
- Password protection feature; prevent inadvertent changes to important setup.
- Automatic or manual emission current setting; sensitivity adjustable 1 mBar^{-1} to 140 mBar^{-1} .
- Manual and automatic electron-bombardment degas programs.
- 4 power relays for process control.
- System bake-out program with control of temperature, time and over-pressure limit. Integral K-thermocouple amplifier.
- RS-232C interface for data-logging and control, 1.0 volt/decade Recorder output.
- Operates from 100 V to 240 V, 48 to 65 Hz supply without adjustment

Specifications:

Controller

Pressure Display

Scientific notation (1 or 2 decimal place resolution) or bar graph displays in mbar, Torr or Pascal.

Supply Voltage

100V to 240V nominal at 48 to 65Hz, without adjustment.

Current Display

Whole values in pA, nA, μA and mA.

Operating Temperature

5°C to 35°C for specified performance. Incoming air temperature is measured and displayed and operation is inhibited at $>40^\circ\text{C}$.

Power Consumption

<20 Watts idling, <75 Watts in emission.

Ionization Gauge

Type

PM-AIG1xG is recommended. Bayard-Alpert gauges with coiled filaments from many other manufacturers are suitable without adjustment other than sensitivity.

Range

From 1×10^{-3} to below 3×10^{-11} mBar with a UHV gaugehead with tungsten filaments. The lower limit is dependent on gaugehead, cable construction, cable length and conditions of use. The upper limit is determined by the acceptable life of the filament and may be extended by the use of thoriated or yttria-coated iridium filaments.

Accuracy & Repeatability

Determined principally by the gaugehead: controller errors are much smaller. Emission at 0.5mA is recommended.

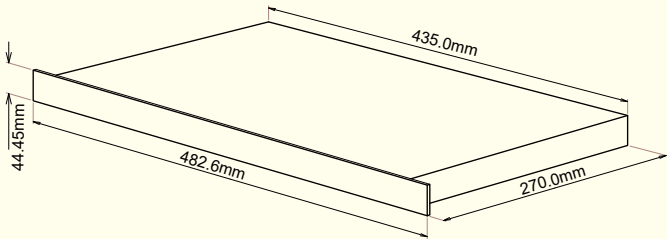
| Electrometer Logarithmic Conformance | | |
|--------------------------------------|---------|-------------|
| Range | 21°C | 5°C to 35°C |
| 1 mA to 350 pA | $<1\%$ | $<1\%$ |
| <350 pA to 10 pA | $<1\%$ | $<4\%$ |
| <10 pA to 2 pA | $<10\%$ | $<20\%$ |

All dimensions are nominal in millimetres unless otherwise specified

UHV Pressure Gauge Controller



| Description | Part Code | Price £ | Price € |
|--|------------|---------|---------|
| UHV Pressure gauge controller | PM-NGC3 | £1769 | €2035 |
| Replacement 30mm cooling fan for NGC3 controller | PM-FAN03 | £30 | €35 |
| Replacement cooling fan for NGC2D controller | PM-FAN30MM | £30 | €35 |



| Pressure Unit Conversion | | | | | | |
|--------------------------|------------------------|-----------------------|--------------------|----------------------|-----------------------|-----------------------|
| = | Pa N/m ² | bar | mbar | Torr mm Hg | atm | psi |
| 1 | 1 | 1×10^{-5} | 1×10^{-2} | 7.5×10^{-3} | 9.87×10^{-6} | 1.45×10^{-4} |
| Pa | 1 | 1×10^5 | 1×10^3 | 750 | 0.987 | 14.5 |
| bar | 1×10^5 | 1 | 1×10^3 | 750 | 0.987 | 14.5 |
| mbar | 100 | 1×10^{-3} | 1 | 0.75 | 9.87×10^{-4} | 1.45×10^{-2} |
| Torr | 133 | 1.33×10^{-3} | 1.33 | 1 | 1.32×10^{-3} | 1.93×10^{-2} |
| atm | 1.01×10^5 | 1.013 | 1013 | 760 | 1 | 14.7 |
| psi | 6.89×10^3 | 6.89×10^{-2} | 68.9 | 51.71 | 6.8×10^{-2} | 1 |

Gauge Supplies

Grid: +200 V in emission, +500 V at ≤ 60 mA in degas. Filament: +50 V bias, ≤ 12 V at ≤ 4.2 A (Tungsten), ≤ 2.6 A (Iridium) with power limited to 30 W maximum.

Pirani Gauge

PM-PVU2 and PM-PVB2.

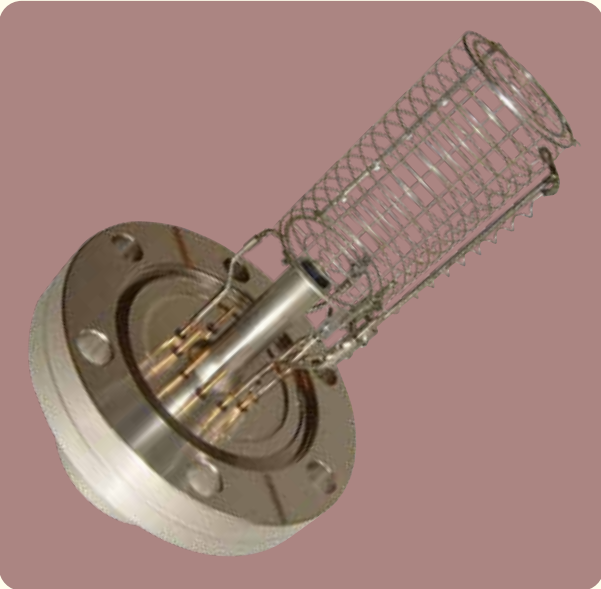
A constant-voltage bridge circuit reduces contamination at high pressures. AML Pirani gaugeheads may be exchanged or extension leads may be connected without adjustments being necessary.

Active Gauge

Self-powered or Active Gauge with +10 V full-scale output. Format selectable between linear (1, 10, 100, 1000 mBar or Torr full scale) or log (1 V/decade, 0.5 V at 1×10^{-6} mBar). The instrument provides a regulated +24 Vdc supply, 1 W maximum, protected by a 50 mA self-resetting fuse to power a connected Active gauge.

All dimensions are nominal in millimetres unless otherwise specified

Ion Gauge For Use With NGC2 Controller



Features:

- Spare filaments available.
- Bakeable connection cables available.

Specifications:

Sensitivity - mbar⁻¹

| | | | |
|------------------|-----|-----------------|-----|
| H ₂ O | 19 | N ₂ | 19 |
| O ₂ | 21 | CO | 19 |
| H ₂ | 6.2 | CO ₂ | 27 |
| He | 2.4 | Ne | 5.4 |
| Ar | 21 | CH ₄ | 27 |

Max Bakeout Temperature 250°C

Pressure Range 10⁻³ to 10⁻¹¹mbar

Mounting Flange DN40CF

Recommended Operating Conditions

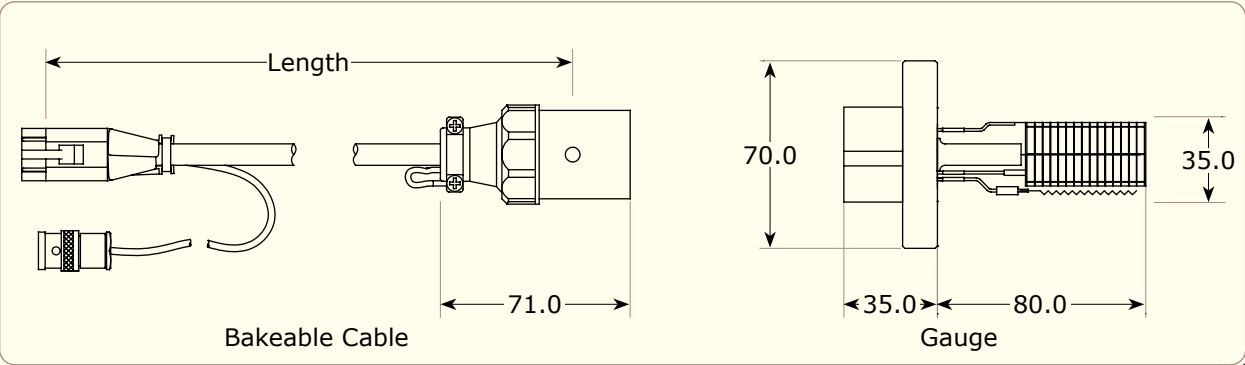
| | Emission | Degas |
|---------------|----------|------------------|
| Collector | +0V | +0V |
| Grid | +200V | +500V |
| Filament bias | +50V | +0V |
| Max. emission | 10mA | 100mA W, 60mA Ir |

PM-AIG17G is a nude UHV Bayard-Alpert gauge intended for electron-bombardment degas. It has an individual glass compression seal around each feedthrough pin. These seals are more economical and robust than ceramic, resulting in a less expensive and more rugged gaugehead, with the central collector pin inherently guarded against leakage currents by the grounding bulk of the flange. Twin tungsten filaments are standard. The grid has a closed-end, light, rigid structure, resulting in high sensitivity. The X-ray induced electron desorption current at the collector is minimised by geometry and screening. The connector pins are gold plated, shrouded and polarized. Gold plating ensures that oxidation on the air side cannot occur, even after repeated bakeouts.

Ion Gauge, Filaments & Cables



| Description | Part Code | Price £ | Price € |
|---|-----------|---------|---------|
| UHV BA gauge on DN40CF twin tungsten filaments | PM-AIG17G | £353 | €406 |
| UHV BA gauge on DN40CF twin thoriated iridium filaments | PM-AIG18G | £502 | €578 |
| UHV BA gauge on DN40CF twin yttria coated iridium filaments | PM-AIG19G | £502 | €578 |
| Bakeable UHV BA gauge lead 3 metres | PM-AIGL3 | £224 | €258 |
| Bakeable UHV BA gauge lead 6 metres | PM-AIGL6 | £289 | €333 |
| Bakeable UHV BA gauge lead 9 metres | PM-AIGL9 | £353 | €406 |
| Twin tungsten filament assembly for PM-AIG17G | PM-FIL17 | £37 | €43 |
| Twin thoriated iridium filament assembly for PM-AIG18G | PM-FIL18 | £122 | €141 |
| Twin yttria-coated iridium filament assembly for PM-AIG19G | PM-FIL19 | £122 | €141 |



All dimensions are nominal in millimetres unless otherwise specified

Pirani Gauges For Use With NGC2 Controller



Features:

- Mounted on either DN16CF flange (bakeable) or DN16KF flange (non-bakeable).
- Integral 3m connection cable.
- Extension cables available.
- Materials exposed to vacuum are: stainless steel, nickel-cobalt-iron, glass and tungsten.

Specifications:

Pressure Range 1 bar to 1 x 10⁻³mbar

Max Bakeout Temperature

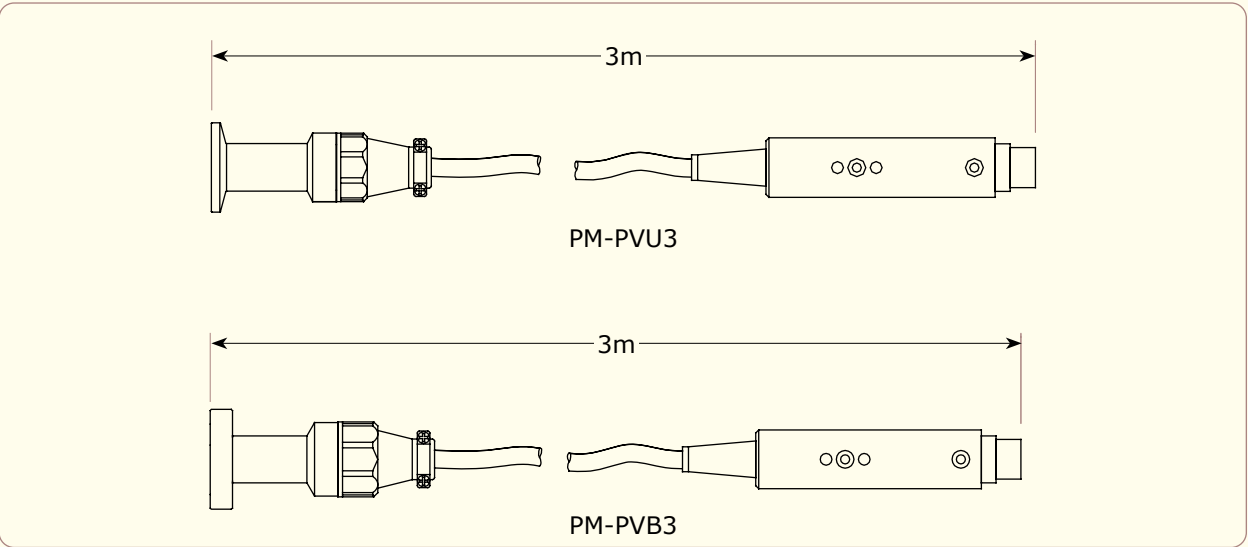
| | |
|---------|-------|
| PM-PVB3 | 200°C |
| PM-PVU3 | n/a |

PM-PVB3 and PM-PVU3 gauge heads are designed for use with the PM-NGC2 controller. These are general purpose gauges for measurement of pressures in the range 1 bar to 1 x 10⁻³ mbar. Both gauges are supplied with integral 3m cable. Pirani gauges detect the cooling effect of residual gas molecules on a heated filament. The rate of heat transfer to the gas is related to pressure and causes a change in the electrical resistance of the filament or the amount of power required to maintain it at a constant temperature. The filament is normally connected in a bridge circuit.

Pirani Gauges & Extension Cables



| Description | Part Code | Price £ | Price € |
|--|-----------|---------|---------|
| Pirani gauge bakeable DN16CF with 3 metre lead | PM-PVB3 | £226 | €260 |
| Pirani gauge non-bakeable DN16KF with 3 metre lead | PM-PVU3 | £169 | €195 |
| Pirani extension lead non-bakeable 10 metres | PM-PVX10 | £53 | €61 |



All dimensions are nominal in millimetres unless otherwise specified

Wide Range MEMS Pirani Gauge



Features:

- Measurement range: 1 x 10⁻⁶ mBar to 1333mBar (7.5 x10⁻⁷to 1000 Torr)
- Ultra-wide range high performance MEMS Pirani sensor
- Advanced innovative digital signal processing
- Precision gas-independent sensor from 5 to 1333 mBar
- 0 - 10 Vdc programmable voltage output
- Mountable in any orientation without impact on performance
- Programmable voltage output signal
- Digital RS-232 interface
- One solid-state relay for process control
- High overpressure tolerance of 10 bar (145 psi) absolut

The M-APG-1 Pirani gauge incorporates cutting edge MEMS (Microelectromechanical Systems) sensor technology with precision digital signal processing and advanced measurement algorithms. Combined with precision automated manufacturing and calibration processes, this product provides uncompromised measurement performance. The well-known gas dependency in the rough vacuum range of thermal conductivity gauges has been eliminated by integrating a MEMS diaphragm sensor that offers precision performance comparable to more expensive capacitance manometers. This feature ensures more accurate control of vacuum system venting processes and can prevent over-pressurization of the vacuum system

Transducer settings and parameters are user-programable from the serial interface enabling diagnostics, predictive maintenance, service, calibration, setpoint configuration, analog output scaling and acquisition of real-time vacuum pressure measurements. A wide selection of analog output scaling options to emulate other vendors' vacuum gauges and transduces is available. Active temperature compensation and calibration provides an ultra-stable zero-point which enables a reliable, wide dynamic range – it also eliminates the need for frequent user re-zeroing due to zero-point drift commonly known from legacy Pirani and convection gauges. The active temperature compensation also compensates for measurement signal errors introduced by fluctuations in the ambient temperature. One independent solid-state switch relay. The basic control uses on/off regulation with a programmable setpoint and hysteresis value and offers both normally closed and normally open contacts.

Specifications:

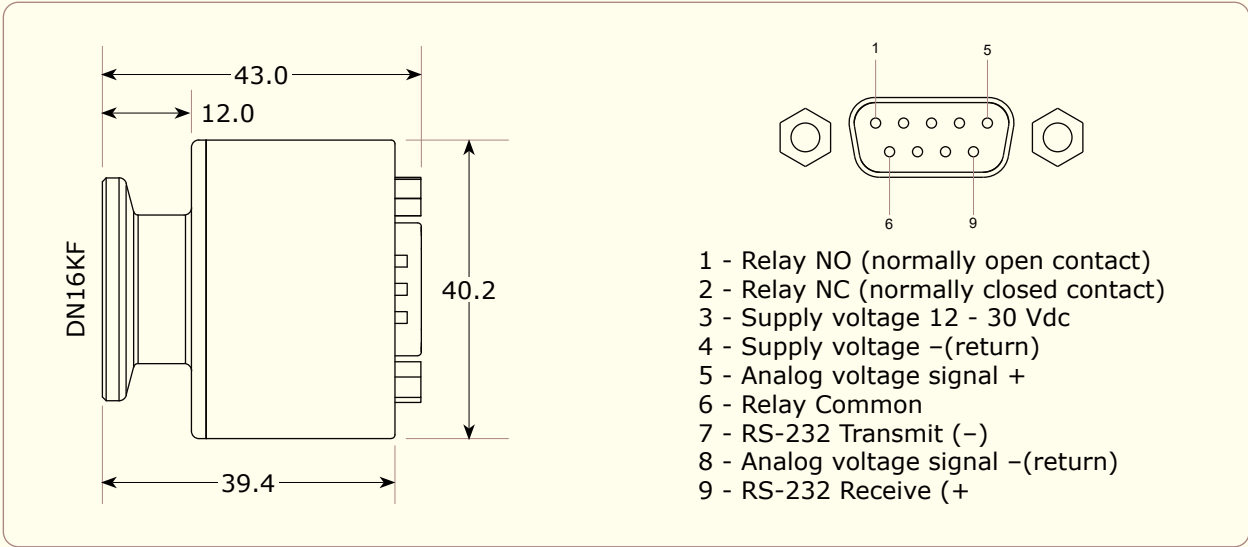
| | |
|--|--|
| Measurement range | 1 x 10 ⁻⁶ to 1333 mBar (7.5 x 10 ⁻⁷ to 1000 Torr) |
| Measuring principle 1 x 10 ⁻⁶ to 1.5 mBar | MEMS Pirani thermal conductivity |
| Measuring principle 1.5 to 2 mBa | Blended MEMS Pirani / piezo reading |
| Measuring principle 2 to 1333 mBa | MEMS piezo resistive diaphragm |
| Accuracy 1 x 10 ⁻⁵ to 9.99 x 10 ⁻⁵ mBar4 | 25% of reading |
| Accuracy 1 x 10 ⁻⁴ to 7.99 mBar | 5% of reading |
| Accuracy 8.00 to 99.9 mBar | 1% of reading |
| Accuracy 100 to 800 mBar | 0.5% of reading |
| Accuracy 800 to 1099 mBar | 0.25% of reading |
| Accuracy 1100 to 1333 mBar | 0.5% of reading |
| Hysteresis 1 × 10 ⁻³ to 10 mbar (ISO19685:2017) | 1% |
| Hysteresis 10 to 1333 mbar (ISO19685:2017) | 0.1% |
| Analog output resolutio | 16 bit (150 µV) |
| Analog output update rat | 124 Hz |
| Response time (ISO 19685:2017) | <20mS |
| Temperature compensation | +10°C to +50°C |
| Solid state relay set point range | 5 x 10 ⁻⁶ to 1333 mbar (3.75 x 10 ⁻⁶ to 1000 Torr) |
| Solid state relay contact rating | 50 Vdc/Vac peak, 100 mA _{rms} /mA _{dc} |

All dimensions are nominal in millimetres unless otherwise specified

Wide Range MEMS Pirani Gauge



| Description | Part Code | Price £ | Price € |
|---|------------|---------|---------|
| MEMS active Pirani and piezo gauge | PM-AGP-1 | £517 | €595 |
| PM-AGP-1 to PM-NGC3 Adapter with 3m shielded cable | PM-XAD1-03 | POA | POA |
| PM-AGP-1 to PM-NGC3 Adapter with 5m shielded cable | PM-XAD1-05 | POA | POA |
| PM-AGP-1 to PM-NGC3 Adapter with 10m shielded cable | PM-XAD1-10 | POA | POA |



Environmental Conditions:

| | |
|--------------------------------------|--------------------|
| Operating ambient temperature | -20°C to +50°C |
| Media temperature | -20°C to +50°C |
| Storage ambient temperature | -40°C to +120°C |
| Bake-out temperature (non-operating) | +120°C |
| Maximum media pressure | 10 Bar absolute |
| Mounting position | Arbitrary |
| Protection rating, EN 60529/A2:2013 | IP 40 |
| Humidity, IEC 68-2-38 | 98%, no-condensing |

Power Supply:

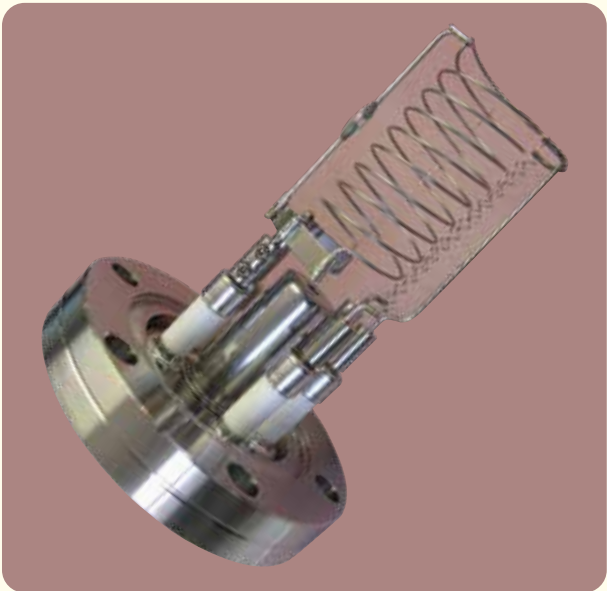
| | |
|--|-----------------------------|
| Supply voltage | 12 - 30 Vdc |
| Power consumption | 240mW maximum |
| Reverse polarity and over voltage protection | Yes |
| Internal fuse | 100mA (thermal recoverable) |

Materials:

| | |
|--|---|
| Vacuum process flange | SS 1.4404 / AISI 316 stainless stee |
| Enclosure | SS 1.4404 / AISI 316 stainless steel / Aluminium |
| Vacuum exposed material (media wetted) | 316 Stainless steel, Kovar, glass, silicon, nickel, aluminum, SiO ₂ , Si ₃ N ₄ , gold, Viton®, low out-gassing epoxy resin |
| Process leak tightness | < 1 · 10 ⁻⁹ mBar · l/sec |

All dimensions are nominal in millimetres unless otherwise specified

Nude Ionization Gauges



In addition to the ion gauges designed specifically for use with the PM-NGC2 controller, shown on the previous page, we also offer a variety of alternative nude gauge heads suitable for use with other manufacturers controllers.

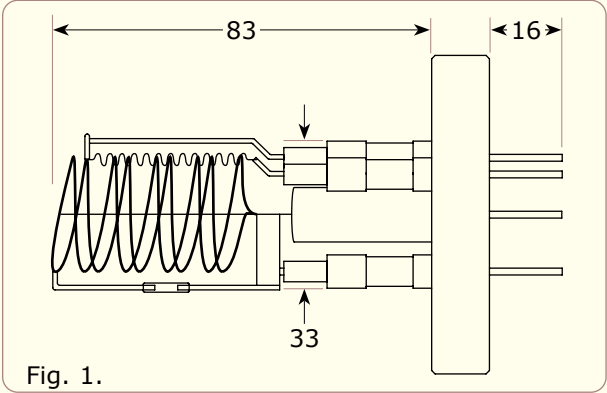


Fig. 1.

Features:

- Spare filaments available.
- EB & resistive degas available

Specifications:

Max Bakeout Temperature 450°C

Pressure Range 10⁻³ to 10⁻¹¹ mbar

Mounting Flange DN40CF

Recommended Operating Conditions

PM-IG-TT & PM-IG-SI, Fig. 1.

| Filament(s) | PM-IG-TT - 2 x tungsten PM-IG-SI - 1 x thoria coated iridium |
|-------------------|---|
| Collector voltage | -30V |
| Grid voltage | +150V |
| Filament voltage | +30V |
| Degas method | Resistive |
| Sensitivity | 7.5mbar ⁻¹ |

PM-IG-TT-EB & PM-IG-TI-EB, Fig. 2.

| Filament(s) | PM-IG-TT-EB - 2 x tungsten PM-IG-TI-EB - 2 x thoria coated iridium |
|-------------------|---|
| Collector voltage | +0V |
| Grid voltage | +180V |
| Filament voltage | +30V |
| Degas method | Electron-bombardment |
| Sensitivity | 18.8mbar ^{-1v} |

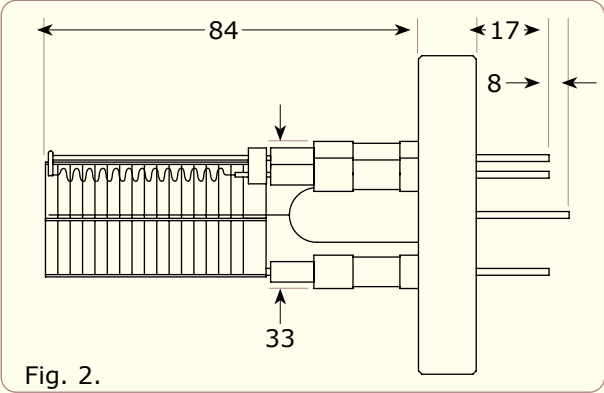


Fig. 2.

Nude Ion Guages



| Description | Fig. | Part Code | Price £ | Price € |
|---|------|----------------|---------|---------|
| BA ion gauge on DN40CF with twin tungsten filaments | 1 | PM-IG-TT | POA | POA |
| BA ion gauge on DN40CF with single thoria coated iridium filament | 1 | PM-IG-SI | POA | POA |
| BA ion gauge on DN40CF with twin tungsten filaments EB | 2 | PM-IG-TT-EB | POA | POA |
| BA ion gauge on DN40CF with twin tungsten filaments EB (Varian style) | 2 | PM-IG-TT-EB(V) | POA | POA |
| BA ion gauge on DN40CF with twin thoria coated iridium filaments EB | 2 | PM-IG-TI-EB | POA | POA |

Spare Filaments



| Description | Fig. | Part Code | Price £ | Price € |
|---|------|-------------|---------|---------|
| Replacement filaments for PM-IG-TT gauge | 3 | PM-RF-TT | POA | POA |
| Replacement filament for PM-IG-SI gauge | 4 | PM-RF-SI | POA | POA |
| Replacement filaments for PM-IG-TT-EB gauge | 5 | PM-RF-TT-EB | POA | POA |
| Replacement filaments for PM-IG-TI-EB gauge | 6 | PM-RF-TI-EB | POA | POA |

Fig. 3.

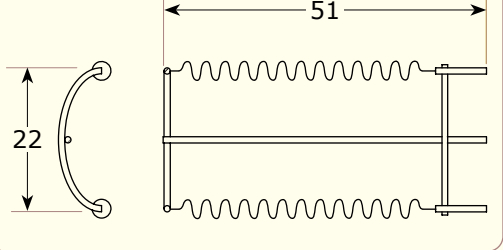


Fig. 4.

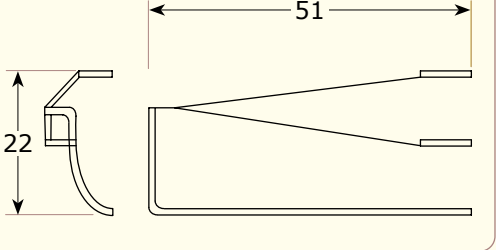


Fig. 5.

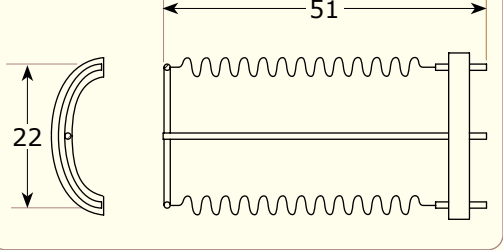
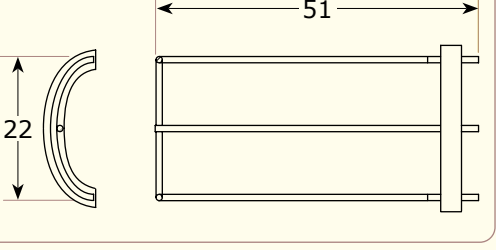


Fig. 6.

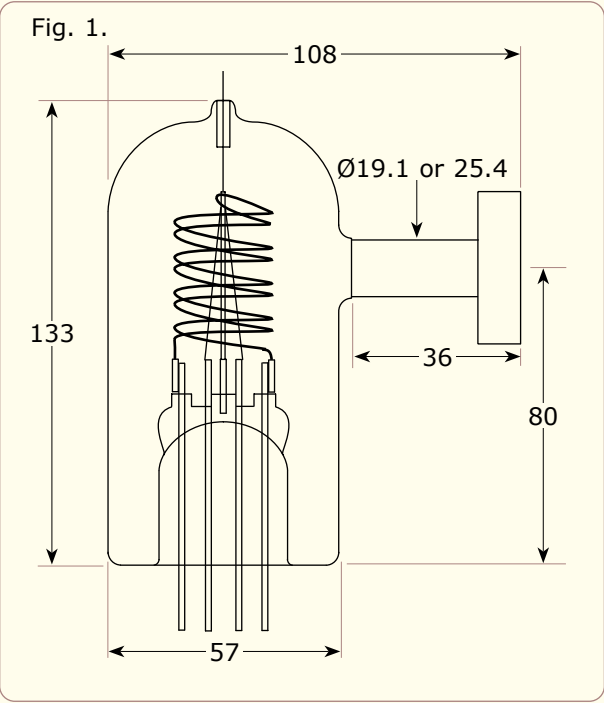


Glass Ionization Gauges



Features:

- CF flanged versions available.
- Pyrex® or Kovar® tube options.



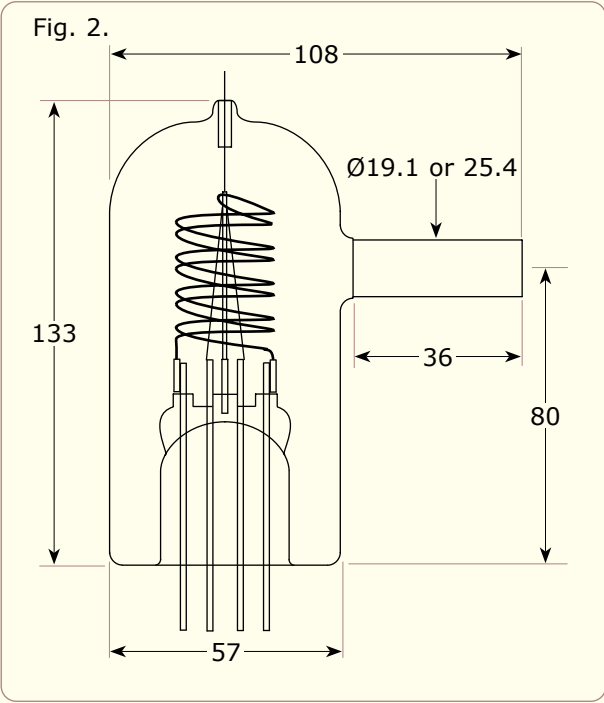
Specifications:

Vacuum Range 10⁻³ to 10⁻¹⁰mbar

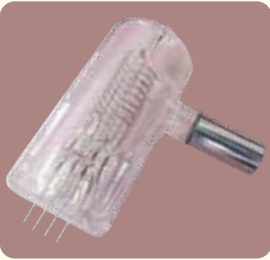
Filament Tungsten or thoria coated iridium

Recommended Operating Conditions

| | |
|---------------------|-------|
| Collector voltage | +0V |
| Grid voltage DC | +150V |
| Filament voltage DC | +30V |
| Filament voltage AC | 4V |
| Filament current AC | 3.5A |



Glass Ion Guages



| Connection / flange | Filament | Fig. | Part Code | Price £ | Price € |
|---------------------|----------|------|-------------|---------|---------|
| DN16CF flange | Th/Ir | 1 | PM-IGT-16CF | POA | POA |
| DN40CF flange | Th/Ir | 1 | PM-IGT-40CF | POA | POA |
| Ø19.1mm Pyrex® tube | W | 2 | PM-IGTT-19P | POA | POA |
| Ø19.1mm Kovar® tube | W | 2 | PM-IGTT-19K | POA | POA |
| Ø19.1mm Pyrex® tube | Th/Ir | 2 | PM-IGI-19P | POA | POA |
| Ø19.1mm Kovar® tube | Th/Ir | 2 | PM-IGI-19K | POA | POA |
| Ø25.4mm Pyrex® tube | Th/Ir | 2 | PM-IGI-25P | POA | POA |
| Ø25.4mm Kovar® tube | Th/Ir | 2 | PM-IGI-25K | POA | POA |

LewVac gauge tubes will interchange with those from other manufacturers. Details of some equivalents are shown in the table below. Pin out and pin out dimensions may differ between manufacturers.

| Cross Reference Table | | | |
|-----------------------|--------------|----------------|-------------|
| Granville-Phillips | Perkin-Elmer | Varian | LewVac |
| 274020 | | | PM-IGT-16CF |
| 274008 | 605-7152 | 0571-K2471-303 | PM-IGT-40CF |
| 274012 | | | PM-IGTT-19P |
| 274013 | | | PM-IGTT-19K |
| 274002 | | | PM-IGI-19P |
| 274005 | 605-7000 | 0571-K2471-304 | PM-IGI-25P |
| 274003 | | 0571-K2471-305 | PM-IGI-19K |
| 274006 | | 0571-K2471-302 | PM-IGI-25K |

All dimensions are nominal in millimetres unless otherwise specified