

Series 970B

Cold Cathode Transducer Family



The Series 970B is a family of compact, low cost, general-purpose transducers that utilize from one to four sensors - cold cathode, MicroPirani™, and Piezo technologies. Combining these sensing technologies enables a wide measurement range from atmosphere to 10^{-8} Torr. In addition to its small size, broad range and lower cost, the Series 970B can be operated via digital communication or as an autonomous analog unit.

Product Features

- Small footprint design provides a compact transducer solution saving tool real estate
- Single transducer provides a wide measurement range of 10^{-8} Torr to atmosphere (972B and 974B models), eliminating the need for multiple gauges
- The MEMS based MicroPirani sensor in the 972B and 974B allows low auto cold cathode turn-on pressure (user programmable from 2×10^{-4} to 1×10^{-3} Torr) for enhanced reliability
- The cold cathode anode module design is user serviceable to decrease downtime and save external repair costs
- Ease of operation via analog output, RS232, RS485, and EtherCAT®
- MicroPirani is automatically zeroed during pump down cycle for improved accuracy (972B and 974B models)
- Mountable in any orientation for ease of use and flexibility of design
- Simplified interface via a single smoothed analog output that combines the individual sensor measurements
- Three user configurable relays for process control
- Alternate analog output and electrical connectors available to match other vendors' gauges and facilitate an easy upgrade
- Can be used with the PDR900 controller for easy set up
- Optional integrated touch-screen display available for local pressure indication, etc.



Applications

The Series 970B Transducers are compact, low cost measurement solutions for vacuum users operating within the pressure range of atmosphere to 10^{-8} Torr. The small size of the Series 970B transducers makes them ideal for system integrators looking to reduce footprint and enable miniaturization. Applications include:

- Analytical equipment (mass spectrometer control)
- Scanning electron microscopes
- Coating systems
- Semiconductor loadlock pressure control
- General vacuum base pressure measurement

The Series 970B family consists of 3 models, the 971B, 972B and the 974B.

971B UniMag

The 971B UniMag transducer offers a measurement range from 1×10^{-8} Torr to 5×10^{-3} Torr and is based on cold cathode inverted magnetron sensor technology. The 971B is a cost effective solution for base pressure measurement and control.

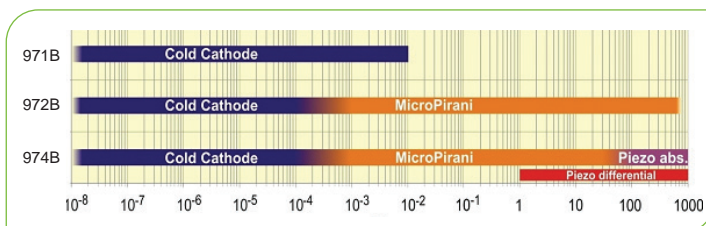
972B DualMag

The 972B DualMag transducer offers a measurement range from 1×10^{-8} Torr to atmospheric pressure and it combines cold cathode inverted magnetron and MicroPirani thermal conductivity MEMS sensor technologies. The MicroPirani automatically controls the cold cathode sensor to ensure optimal ignition pressure. The MicroPirani offers 1-2 decades lower measuring range than a traditional pirani gauge, subsequently by lowering the cold cathode activation pressure gauge, reliability is improved and the service interval extended.

974B QuadMag

The 974B QuadMag offers a measurement range from 1×10^{-8} to 1500 Torr and combines cold cathode inverted magnetron, MicroPirani and Piezo differential sensor technologies. The 974B has been specifically designed for pressure measurement within a vacuum loadlock. It has the capability to replace multiple pressure measurement devices on a loadlock with its absolute pressure measurement from atmosphere to 10^{-8} Torr and atmospheric switching capabilities. Subsequently, OEM's can reduce costs with a simplified loadlock design. The 974B can be used on loadlocks or any vacuum chamber requiring both absolute pressure measurement and atmospheric switching capabilities.

The transducers are available with an optional IP54 (NEMA 3) rated enclosure. The user changeable cold cathode anode module and screen offers easy serviceability without disassembling of transducer electronics.



Sensor and transducer measurement ranges

The Series 970B has RS232, RS485, and EtherCAT digital communications interface for setup of transducer parameters and to provide real time pressure measurement.

All Series 970B transducers have an analog pressure output of 0.5 VDC/decade that can be interfaced to external analog equipment for pressure readout or control. Other analog outputs and curves can be selected via the digital user interface. The Series 970B has up to three mechanical relays which can be used for process control, examples are interlocking valves or pumps.

The Series 970B have standard 15 pin HD SUBD connector and an analog output voltage pressure signal of 0.5 VDC/decade. It can also emulate analog voltage outputs from a variety of other vacuum transducers. The emulation feature can be used to upgrade and replace other vendors' gauges in OEM applications without changing system software. Contact MKS technical support for details.



The optional integrated touch-screen display is user configurable; the user can change pressure units, orientation and has access to set point parameters as well as gas type. The display also indicates the status of the available set point relays. Displayed pressure reading from individual sensors or combined reading can be seen from >5 meters away on the high contrast display.

| Pin | RS232/485 15 pin Sub-D | EtherCAT 15 pin Sub-D | RJ45 EtherCAT IN/OUT |
|-----|--|-----------------------------|----------------------|
| 1 | RS485 (-)/RS232 transmit | NC | TX+ |
| 2 | RS485 (+)/RS232 receive | NC | TX- |
| 3 | Power (+) | Input Power (+) 9 to 24 VDC | RX+ |
| 4 | Power (-) | Power Return - | NC |
| 5 | Analog Output (+) abs. | Signal Output + | NC |
| 6 | Analog Output (-) | Signal Common | RX- |
| 7 | Relay #1 NO | NC | NC |
| 8 | Relay #1 Common | NC | NC |
| 9 | Relay #1 NC | NC | |
| 10 | Relay #2 NC | NC | |
| 11 | Relay #2 Common | NC | |
| 12 | Relay #2 NO | NC | |
| 13 | Relay #3 NC (971B only - cold cathode enable) | NC | |
| 14 | Relay #3 Common | NC | |
| 15 | Relay #3 NO | Chassis Ground | |

Three (3) set point relays and dual Aout, 15 pin D Subminiature and RJ45 EtherCAT IN/OUT Connectors

Specifications

| | Series 971B | Series 972B | Series 974B |
|--|---|---|---|
| Sensor Type | Cold Cathode | Cold Cathode / MicroPirani (MEMS Thermal Conductivity) | Cold Cathode / MicroPirani (MEMS Thermal Conductivity) / Piezo Differential (MEMS Diaphragm) |
| Measuring Range Absolute | 1 x 10 ⁻⁸ Torr to 5 x 10 ⁻³ Torr | 1 x 10 ⁻⁸ Torr to Atmosphere | 1 x 10 ⁻⁸ Torr to 1500 Torr |
| Measuring Range Differential | not available | not available | -760 to +760 Torr |
| Set Point Range Absolute | 1 x 10 ⁻⁸ Torr to 5 x 10 ⁻³ Torr | 1 x 10 ⁻⁸ Torr to Atmosphere | 1 x 10 ⁻⁸ Torr to 1000 Torr |
| Set Point Range Differential | not available | not available | -760 to +100 Torr |
| Calibration Gas | Nitrogen | Nitrogen | Nitrogen |
| Operating Temperature Range | 0° to 40°C (32° to 104°F) | 0° to 40°C (32° to 104°F) | 0° to 40°C (32° to 104°F) |
| Maximum Bakeout Temperature | 80°C (176°F), non-operating | 80°C (176°F), non-operating | 80°C (176°F), non-operating |
| Digital Communications | RS485 or RS232 | RS485, RS232 or EtherCAT | RS485 or RS232 |
| Electrical Connectors RS232/RS485/Analog EtherCAT (972B only) | 15-pin D-subminiature male | 15-pin D-subminiature male 15-pin D-subminiature male Two (2) RJ45 female | 15-pin D-subminiature male |
| Controls | Pressure units, baud rate, address, factory default, user tag, RS485 test, gas correction; set point functions: value, hysteresis, direction, HV enable, protect, control set point, gas type | Pressure units, baud rate, address, factory default, user tag, RS485 test, gas correction; set point functions: value, hysteresis, direction, HV enable, protect, control set point, gas type | Pressure units, baud rate, address, factory default, user tag, RS485 test, gas correction; set point functions: value, hysteresis, direction, HV enable, protect, control set point, gas type |
| Status | Pressure reading and units, set point, transducer temperature, user tag, model, device type, serial number, firmware and hardware versions | Pressure reading and units, set point, transducer temperature, user tag, model, device type, serial number, firmware and hardware versions | Pressure reading and units, set point, transducer temperature, user tag, model, device type, serial number, firmware and hardware versions |
| Analog Output (Absolute Pressure) | 0.5 VDC / decade | 0.5 VDC / decade | 0.5 VDC / decade |
| Relays, Optional RS232/RS485 | 3 relays, SPST | 3 relays, SPST | 3 relays, SPST |
| Relay Contact Rating | 1 A @ 30VAC/DC, resistive | 1 A @ 30VAC/DC, resistive | 1 A @ 30VAC/DC, resistive |
| Power Requirements | 9-30 VDC, 2 W | 9-30 VDC, 2 W | 9-30 VDC, 2 W |
| Accuracy (Typical) Combined Absolute | 5 x 10 ⁻⁸ Torr to 10 ⁻³ ± 30% of reading | 5 x 10 ⁻⁸ Torr to 10 ⁻³ ± 30% of reading 10 ⁻³ to 100 ±5% of reading | 5 x 10 ⁻⁸ Torr to 10 ⁻³ ± 30% of reading 10 ⁻³ to 50 Torr ±5% of reading 50 to 1000 Torr ± 1% of reading |
| Repeatability (Typical) Combined Absolute | 5 x 10 ⁻⁸ Torr to 10 ⁻³ ± 30% of reading | 5 x 10 ⁻⁸ Torr to 10 ⁻³ ± 30% of reading 10 ⁻³ to 100 ±2% of reading | 5 x 10 ⁻⁸ Torr to 10 ⁻³ ± 30% of reading 10 ⁻³ to 50 ±2% of reading 50 to 1000 Torr ± 1% of reading |
| Accuracy (Typical) ¹ Differential | not available | not available | -10 to +10 Torr ±10% of reading -100 to -10 Torr ±8% of reading -760 to -100 Torr ±1% of reading +10 to 100 Torr ±5% of reading |
| Repeatability (Typical) ¹ Differential | not available | not available | -760 to +10 Torr ±1% of reading |
| Zero Stability (Typical) ¹ Differential | not available | not available | ±0.1% of Full Scale (Full Scale = 760 Torr) |
| Overpressure Limit | 1500 Torr | 1500 Torr | 1500 Torr |
| Installation Orientation | Any | Any | Any |
| Internal Volume | 21 cm ³ | 21 cm ³ | 21 cm ³ |
| Materials Exposed to Vacuum | 304 and 403 stainless steel, Viton®, Cu-Ni and Ag-Cu alloy, ceramic, titanium | 304 and 403 stainless steel, silicon, SiO ₂ , SiN ₄ , gold, Viton®, epoxy resin, ceramic, titanium | 304 and 403 stainless steel, silicon, SiO ₂ , SiN ₄ , gold, Viton®, epoxy resin, ceramic, titanium |
| Electronic Casing | 304 stainless steel | 304 stainless steel | 304 stainless steel |
| Weight (with NW25 KF Flange) | 12.7 oz (360 g) | 12.7 oz (360 g) | 12.7 oz (360 g) |
| Compliance | CE | CE, ETG.5003.2080 Vacuum Pressure Gauge | CE |

¹ Note: Accuracy and repeatability are typical values measured with Nitrogen gas at ambient temperature after zero adjustment.

Ordering Information

| Ordering Code Example: 972B-21034 | Code | Configuration |
|---|--|---------------|
| 971B UniMag 972B DualMag 974B QuadMag | 971B- 972B- 974B- | 972B |
| Flange | | |
| NW25 KF 2 3/4" CF NW40 KF | 2 7 9 | 2 |
| Interface | | |
| RS232 RS485 EtherCAT | 1 2 7 (972B only) | 1 |
| Analog Out | | |
| Standard MKS | 0 | 0 |
| Connector Relays | | |
| SubD 15pin HD male/no relay SubD 15pin HD male/3 relays SubD 15pin HD male/3 relays/Dual Aout (piezo differential) - 974B only SubD 15pin HD male/3 relays/Dual Aout (Absolute) - 972B/974B only | 2 3 (not available with EtherCAT) 4 (not available with EtherCAT) 5 (not available with EtherCAT) | 3 |
| Enclosure | | |
| Standard/Viton Sealing IP54/Viton Standard/Viton Sealing/Display | 0 2 4 (not available with EtherCAT) | 4 |
| Accessories | | |
| PDR900 Single Channel Controller, RS232/485, US Power Cord Cable, PDR900 to 970B, 10 ft (3M), RS232 Cable, PDR900 to 970B, 10 ft (3M), RS485 Replacement Cold Cathode Anode Module NW25KF Centering Ring with 4µm Filter and Viton O-ring* NW40KF Centering Ring with 4µm Filter and Viton O-ring* | PDR900-12-US 100013620 100013671 970BNT-KIT 100014515 100014520 | |

* Recommended on inlet flange of 972B/974B to protect sensors from particulates when used in harsh environments. Other filter sizes available upon request.

RS232/RS485 Version

| Flange | A |
|-----------|------------|
| NW 25 KF | 3.70 (94) |
| NW 40 KF | 3.86 (98) |
| 2 3/4" CF | 4.49 (114) |

EtherCAT Version

| Flange | A |
|-----------|------------|
| NW 25 KF | 4.90 (124) |
| NW 40 KF | 4.77 (121) |
| 2 3/4" CF | 5.40 (137) |

Dimensional Drawings

Note: Unless specified, dimensions are nominal values in inches (mm referenced).



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