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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 $2x10^{-4}$ to $1x10^{-3}$ 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 1x10^{-8} Torr to 5x10^{-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 1x10^{-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 1x10^{-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.

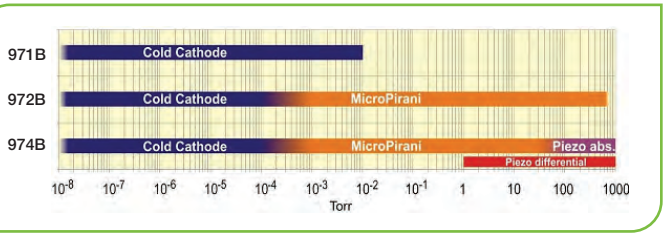
The transducers are available with an optional IP54 (NEMA 3) rated enclosure. The user changeable cold cathode anode module and screen offers easy serviceability without disassembling of transducer electronics. The Series 970B has RS232, RS485, and EtherCAT digital communications interface for setup of transducer parameters and to provide real time pressuremeasurement.

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 relayswhich can be used for process control, examples are interlocking valves or pumps.

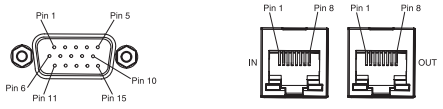
The Series 970B have standard 15 pin HD SUBD connector and an analog output voltage pressure signal of 0.5 VDC/decade. It can also emulate analog voltage outputs from a variety of other vacuum transducers. The emulation feature can be used to upgrade and replace other vendors' gauges in OEM applications 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.



Sensor and transducer measurement ranges



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

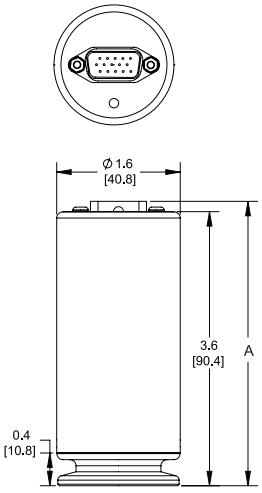
Specifications	Series 971B	Series 972B	Series 974B
Sensor Type	Cold Cathode	Cold Cathode / MicroPirani (MEMS Thermal Conductivity)	Cold Cathode / MicroPirani (MEMS Thermal Conductivity) / Piezo Differential (MEMS Diaphragm)
Measuring Range Absolute	1 x 10^{-8} Torr to 5 x 10^{-3} Torr	1 x 10^{-8} Torr 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 Code Example: 972B-21034	Code	Configuration
Model		
971B UniMag 972B DualMag 974B QuadMag	971B- 972B- 974B-	972B
Flange		
NW25 KF 2 ¾" 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	2 3 (not available with EtherCAT)	3
Enclosure		
Standard/Viton Sealing Standard/Viton Sealing/Display	0 4 (not available with EtherCAT)	4
Accessories		
PDR900 Single Channel Controller, RS232/485, US Power Cord	PDR900-12-US	
Cable, PDR900 to 970B, 10 ft (3M), RS232	100013620	
Cable, PDR900 to 970B, 10 ft (3M), RS485	100013671	
Replacement Cold Cathode Anode Module	970BNT-KIT	
NW25KF Centering Ring with 4µm Filter and Viton O-ring*	100014515	
NW40KF Centering Ring with 4µm Filter and Viton O-ring*	100014520	

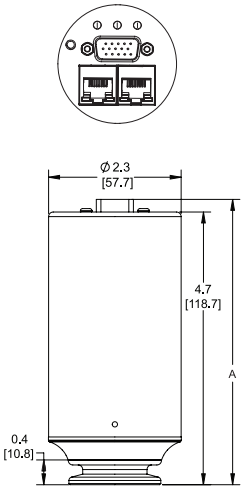
** Recommended on inlet flange of 972B/974B to protect sensors from particulates when used in harsh environments. Other filter sizes available upon request.*

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

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