



## Type 228A

### BARATRON DIFFERENTIAL CAPACITANCE MANOMETER WITH TRIP POINTS

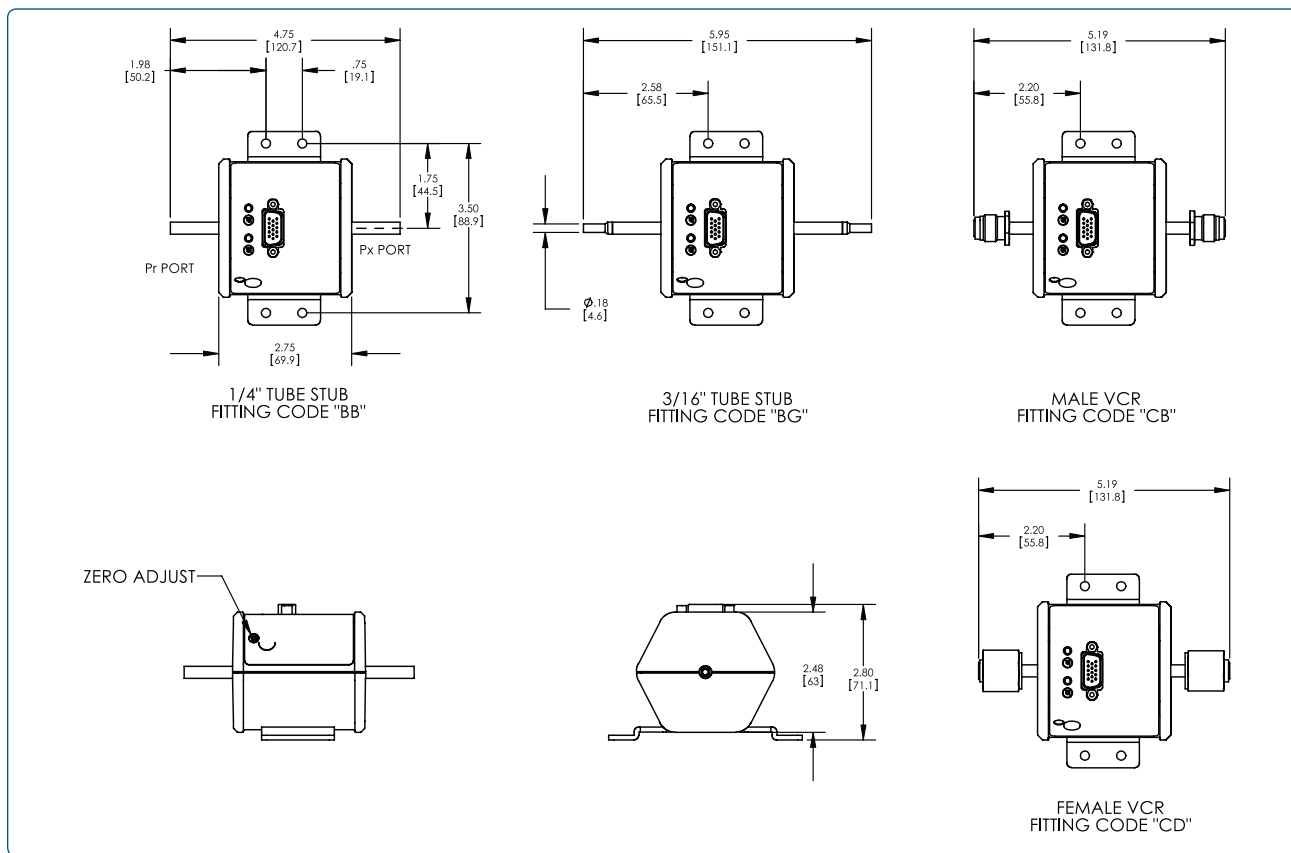
The Type 228A is a differential version of the industry-standard MKS Baratron capacitance manometer. It is designed to accurately measure differential pressures and vacuum from 1000 to 0.2 Torr (133 to 0.027 kPa) and provides two (2) independently-adjustable trip relays for control of external equipment and components. The patented capacitance sensor is built entirely from Inconel® nickel alloys on its measurement side, which offers superior corrosion resistance over long periods of time. Because the sensor operates by measuring the capacitance shift between a diaphragm exposed to the process and an electrode disk (rather than measuring the property of the gas), it is not sensitive to gas composition, and thus eliminates the need for gas-specific correction factors. The product can be used to measure either the true differential pressure or vacuum between two locations, or the reference side of the product can be left open to provide a true reference to local atmospheric pressure. Applications include air and gas flow measurements for filters and analytical systems, downstream pressure control in thin film processing systems, and automated leak testing systems.

The Type 228A provides both a high-level analog output signal that is linear with pressure and two (2) trip relays. It can operate on either  $\pm 15\text{VDC}$  or  $+24\text{VDC}$  input voltage, and it offers three (3) different analog output signals for use in nearly any control or data acquisition system. The product can be equipped with any of twelve (12) industrial fittings on either the measurement or reference sides, including common industrial and semiconductor-industry standards like VCR®, NW-KF, VCO®, and NPT. The sensor and electronics are mounted in a rugged industrial-grade housing that has high immunity and isolation from RF and EM interference. The Type 228A Baratron is CE marked, and meets current RoHS (Restriction of Hazardous Substances) regulations.

### Features & Benefits

- Fully-welded Inconel diaphragm sensor offers high resistance to corrosion for use in many difficult applications – no mercury, silicone, or hydrocarbon-based fluids are used
- Direct pressure measurement is not affected by gas composition
- Differential measurement ranges from 1000 to 0.2 Torr (133 to 0.027 kPa) allows accurate, repeatable characterization of very small pressure drops and flow rates
- Two (2) UL-approved trip relays independently adjustable from -100% to +100% of full-scale measurement range
- Input voltage of either  $\pm 15\text{VDC}$  or  $+24\text{VDC}$  for use in a wide variety of processing systems
- Three different analog output signals (0-1V, 0-5V, and 0-10V) in either unidirectional or bidirectional calibrations
- Rugged, industrial-grade design suitable for use in applications with high levels of RF/EM interference
- CE marked, RoHS compliant and SEMI S2 compliant





### Dimensional Drawings —

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



# Specifications

<b>Full Scale Ranges</b>	0.2, 1, 2, 5, 10, 20, 50, 100, 200, and 1000 Torr and equivalents in kPa, mbar, inches H <sub>2</sub> O, and cm H <sub>2</sub> O
<b>Resolution</b>	0.01% of Full Scale (F.S.)
<b>Accuracy</b>	0.50% of Full Scale unidirectional or bidirectional standard; 0.30% of F.S. unidirectional or bidirectional, and 0.30% of Reading (unidirectional only) optional
<b>Temperature Coefficients</b>	
Zero	0.1% Full Scale/°C for standard accuracy specification
Span	0.04% of Reading/°C
<b>Ambient Operating Temperature</b>	0° to 50°C
<b>Maximum Overpressure</b>	
Measurement Side	120% of Full Scale or 20 psi (140 kPa), whichever is higher
Reference Side	120% of Full Scale
<b>Maximum Line Pressure</b>	40 psig (275 kPa)
<b>Materials Exposed to Process</b>	
Measurement Side	Inconel
Reference Side	Inconel, ceramic, palladium, stainless steel, glass
<b>Sensor Internal Volume</b>	
Measurement Side	1.4 cm <sup>3</sup>
Reference Side	9.0 cm <sup>3</sup>
<b>Warmup Time</b>	30 minutes
<b>Input Power</b>	±15VDC (±5%) or +16 to +30VDC @ 75 mA, ripple less than 20 mV
<b>Output Signal</b>	0 - 1VDC, 0 - 5VDC, or 0 - 10VDC <sup>1</sup> > 10 k $\Omega$ load
<b>Trip Relays</b>	Two (2) process pressure trip relays, independently adjustable from -100% to +100% of F.S. DPDT contacts rated at 1.0 amps at 30VDC or 0.3 amps at 120VAC. Relays conform to UL-1950 Basic Insulation at 125V. Internally mounted, externally adjustable by customer.
<b>Electrical Connector</b>	15-pin high-density D-subminiature
<b>Certifications and Approvals</b>	Fully compliant to EMC Directive 2004/108/EC, SEMI S2-0706 compliant
<b>Restriction of Hazardous Substances</b>	RoHS compliant to Directive 2002-95-EC
<b>Fittings</b>	
Standard	¼" OD (6.4 mm) tubes
Optional	3/16" OD (4.8 mm) tubes, 4 male VCR®, 4 female VCR, 4 male VCO®, 4 female VCO, NW16-KF, 1.33" OD (33.8 mm) Conflat®, 1/8" male and female NPT, 1/4" male and female NPT

## Notes:

<sup>1</sup> 0-10VDC bidirectional output signal not available with +24VDC input voltage.

<sup>2</sup> When used with an overall metal braided shielded cable, properly grounded at both ends.

<sup>3</sup> When equipped with standard 1/4-inch (6.4 mm) O.D. inlet and reference tubes



# Ordering Information

Ordering Code Example: 228AXXXYYZZQSSTVRR					Code	Configuration
Type 228A Baratron Differential Capacitance Manometer					228A	228A
Ranges (XXX)						
	Torr	mbar	kPa	inH <sub>2</sub> O	cm H <sub>2</sub> O	
0.02	-	-	U2K	-	-	11T
0.1	-	-	.1K	.1W	-	
0.2	.2T	.2M	.2K	-	.2R	
0.5	-	-	.5K	.5W	-	
1	01T	01M	01K	01W	01R	
2	02T	02M	02K	02W	02R	
5	05T	05M	05K	05W	05R	
10	11T	11M	11K	11W	11R	
20	21T	21M	21K	21W	21R	
50	51T	51M	-	51W	51R	
100	12T	12M	12K	12W	12R	
200	22T	22M	-	-	22R	
500	-	-	-	52W	-	
1000	13T	13M	-	-	13R	
Reference Side Fitting (YY)						
1/4" OD tube					BB	CD
3/16" OD tube					BG	
4 male VCR					CB	
4 female VCR					CD	
4 male VCO					DC	
4 female VCO					DD	
1/4" female NPT					FA	
1/4" male NPT					FB	
1/8" male NPT					FE	
1/8" female NPT					FF	
NW16-KF					GA	
1.33" OD Conflat					HA	
Measurement Side Fitting (ZZ)						
1/4" OD tube					BB	CD
3/16" OD tube					BG	
4 male VCR					CB	
4 female VCR					CD	
4 male VCO					DC	
4 female VCO					DD	
1/4" female NPT					FA	
1/4" male NPT					FB	
1/8" male NPT					FE	
1/8" female NPT					FF	
NW16-KF					GA	
1.33" OD Conflat					HA	
Accuracy (Q)						
0.50% Full Scale (standard)					F	F
0.30% Full Scale					K	
0.30% Reading					S	
Input/Output and Calibration (SS)						
±15 VDC input/0 - 1 VDC bidirectional output					B1	B2
±15 VDC input/0 - 10 VDC bidirectional output					B2	
±15 VDC input/0 - 5 VDC bidirectional output					B3	
+24 VDC input/0 - 1 VDC bidirectional output					B5	
+24 VDC input/0 - 5 VDC bidirectional output					B7	
±15 VDC input/0 - 1 VDC unidirectional output					U1	
±15 VDC input/0 - 10 VDC unidirectional output					U2	
±15 VDC input/0 - 5 VDC unidirectional output					U3	
+24 VDC input/0 - 1 VDC unidirectional output					U5	
+24 VDC input/0 - 5 VDC unidirectional output					U7	
Electrical Connector (T)						
15-pin high-density D-subminiature					C	C
Mounting (V)						
No bracket (standard)					0	1
Mounting bracket, standard 1					1	
Mounting bracket, slotted					2	
Trip Relay Settings (RR)						
Trip A above 50% FS, Trip B above 50% FS* (default setting)					AA	BB
Trip A above 50% FS, Trip B below 50% FS*					AB	
Trip A below 50% FS, Trip B below 50% FS*					BB	
Trip A below 50% FS, Trip B above 50% FS*					BA	

\*Contact factory for alternate trip relay settings



## MKS Instruments, Inc. Global Headquarters

2 Tech Drive, Suite 201  
Andover, MA 01810  
Tel: 978.645.5500  
Tel: 800.227.8766 (in U.S.A.)  
Web: www.mksinst.com

## MKS Instruments, Inc. Pressure & Vacuum Measurement Solutions

Six Shattuck Road  
Andover, MA 01810  
Tel: 978.975.2350