

Analog 600 Series Selection Guide

Absolute Baratron® Capacitance Manometers



The MKS 600 Series absolute analog Baratron® capacitance manometers are designed for accurate, repeatable pressure and vacuum measurements in demanding production or research process environments. The proven sensor, electronics, and packaging designs combine to provide the most stable and reliable low-pressure measurement instrument available.

The MKS 600 Series Baratron capacitance manometers are analog capacitance-based pressure and vacuum gauges that require $\pm 15\text{VDC}$ input power and provide a high-level 0-10VDC output signal linear with pressure. This analog output can be interfaced with an MKS pressure controller, an MKS power supply/display instrument, or any instrument that meets these requirements. Changes in pressure/vacuum are determined

by measuring the change in capacitance between the sensor's diaphragm and an adjacent electrode disk. This capacitance change is converted to a useable output by patented signal-conditioning electronic circuits. The radially-tensioned Inconel diaphragm in the sensor provides very fast response (<20 msec in many cases), low hysteresis, excellent repeatability, very high resolution (to 0.001% of Full Scale), exceptionally high corrosion resistance, and double-walled welded construction for operator safety.

The sensor itself can withstand repeated exposures to 45 psia (3.1 bar) without permanent degradation or shifting, allowing it to operate in virtually any process system.

Product Features

- Full Scale pressure/vacuum ranges as low as 0.02 Torr (mm Hg) allow for accurate measurement of vacuum as low as 2×10^{-4} Torr (1.5×10^{-4} mbar)
- Complete line of absolute manometers including products operating at internal temperatures of up to 200°C . Widest product range and applications experience available anywhere
- Direct measurement of chamber total pressure independent of gas type or composition, eliminating need for lookup tables and conversion factors
- Best-available long-term output stability ensures state-of-the-art process repeatability in nearly any application
- Inconel® and Incoloy® nickel alloy construction of basic sensor operates without damage in virtually any chemical environment, including halogens, deionized water and steam, and ozone



Key Benefits

- All products are specified in percent of reading for best accuracy and improved process yield
- High overpressure limit ensures reliability from occasional system mishaps

MKS offers many products within the 600 Series family with different attributes, capabilities, and performance.

by individual descriptions of each product and its major applications.

A quick summary of these models is below, followed

Product Family	Sensor	Output	Operating Temperature	Primary Full Scale Ranges - Torr*	Secondary Full Scale Range - Torr*	Electrical Connector	Relay Switches
622D	Standard	0-10VDC analog	Unheated	1 to 1,000	Not available	Terminal Block	No
623H	Standard	0-10VDC analog	Unheated	10 to 1,000	Not available	Terminal Block	Yes
624H	Standard	0-10VDC analog	45°C	1 to 20,000	Not available	15-pin D-subminiature	Yes
625H	Standard	0-10VDC analog	100°C	1 to 20,000	Not available	15-pin D-subminiature	Yes
626D	Standard	0-10VDC analog	Unheated	0.1 to 1000	Not available	15-pin D-subminiature	No
627H	Standard	0-10VDC analog	45°C	0.02 to 20,000	Not available	15-pin D-subminiature	No
628H	Standard	0-10VDC analog	100°C	0.05 to 20,000	Not available	15-pin D-subminiature	No
629H	Standard	0-10VDC analog	45°C or 100°C	0.02 to 1,000**	Not available	9-pin D-subminiature	No
631F	Standard	0-10VDC analog	150°C or 200°C	1 to 1,000	Not available	15-pin D-subminiature	Optional
D24H	Standard	0-10VDC analog	45°C	10 to 1,000	2x, 5x, or 10x lower than primary range	15-pin D-subminiature	Yes
D25H	Standard	0-10VDC analog	100°C	10 to 1,000	2x, 5x, or 10x lower than primary range	15-pin D-subminiature	Yes
D27H	Standard	0-10VDC analog	45°C	10 to 1,000	2x, 5x, or 10x lower than primary range	15-pin D-subminiature	No
D28H	Standard	0-10VDC analog	100°C	10 to 1,000	2x, 5x, or 10x lower than primary range	15-pin D-subminiature	No
E27H	Etch Baffle	0-10VDC analog	45°C	0.02 to 100	Not available	15-pin D-subminiature	No
E28H	Etch Baffle	0-10VDC analog	100°C	0.05 to 100	Not available	15-pin D-subminiature	No
E29H	Etch Baffle	0-10VDC analog	45°C or 100°C	0.02 to 100**	Not available	9-pin D-subminiature	No

Notes: *Other units of measurement available; contact factory.

**0.02 Torr range available only on 45°C models.

A very partial list of applications for the 600 series of products include:

- All semiconductor thin-film processes such as etching and ashing, chemical vapor deposition, physical vapor deposition, oxidation, diffusion, and implantation.
- Production of electronic displays such as LCDs, plasma displays, and CRTs.
- Manufacturing of advanced ceramics and metals for aerospace and transportation.
- Automated leak test systems for industrial and scientific use.
- Sterilization and freeze-drying of biopharmaceuticals, foods, medical implants, and surgical instruments.
- Analytical and metrology instruments such as mass spectrometers, high-precision balances, calibration standards, and other analytical tools.
- Production of data storage components such as laser diodes, magnetic read/write heads, and storage platters.

Capacitance Manometers

622D, 623H and 626D Unheated Absolute Baratron® Capacitance Manometers

The 622D, 623H and 626D Baratron capacitance manometers are unheated, and thus are the most economical of all of the 600 series family of products. They are available in Full Scale pressure/vacuum ranges from 0.1 to 1000 Torr (and metric equivalents) and are suited for many industrial, electronic, and research applications. The 622D has a terminal block electrical connector without relays, the 626D uses a 15-pin D-subminiature electrical connector without relays, and the 623H product adds two (2) independently-adjustable trip relays to control external equipment.



627H, 628H, and 629H Heated Absolute Baratron® Capacitance Manometers

The 627H, 628H, and 629H are heated capacitance manometers that are much less affected by ambient temperature changes than unheated Baratron capacitance manometers. Heating the sensor also reduces or eliminates the possibility of process byproducts depositing inside the manometer to cause drift, which can have a significant effect on system availability and repeatability. They are available in lower Full Scale pressure ranges than unheated products, which permits their use in more demanding processes. All of the models are internally regulated to their specified operating temperature; no external controllers, cables, or sensors are needed. The 627H and 628H operate at 45°C and 100°C respectively, and have a 15-pin D-subminiature electrical connector. They also have an option for “Heater



Status” and “At Temperature” LED indicators and relay contact. The 629H can be configured to operate at either temperature, and uses a 9-pin D-subminiature electrical connector for “drop-in” compatibility with many competitive products. The 629H also offers an optional external zero set capability, allowing its zero to be set remotely – a major advantage in many process tools that do not permit easy access to the capacitance manometer. The 45°C 627H offers Full Scale pressure/vacuum ranges from 0.02 to 20,000 Torr (0.026 mbar to 26.3 bar), and the 100°C 628H has pressure/vacuum ranges from 0.05 to 20,000 Torr (0.066 mbar to 26.3 bar).

624H and 625H Heated Absolute Baratron® Capacitance Manometers with Integral Process Control Relays

These heated capacitance manometers are identical to the 627H and 628H Baratron capacitance manometers except that they add two (2) internally-mounted, independently-adjusted electromechanical relays that can be set to open or close at any pressure from 0.1% to 100% of the product’s Full Scale measurement range. These relays can be used to control external equipment, such as isolation valves, other high vacuum gauges (such as hot-filament ionization gauges), drive motors, etc. They are available in Full Scale measurement ranges from 10 to 1000 Torr (13 to 1333 mbar).



Capacitance Manometers

631F Heated (150°C or 200°C) Absolute Baratron® Capacitance Manometer

The 631F is a heated capacitance manometer, operating at either 150°C or 200°C. It was specifically designed for the most difficult semiconductor and biopharmaceutical applications known today, such as nitride CVD and DI-steam sterilization. It is completely self-contained, requiring only $\pm 15\text{VDC}$ input power and providing a 0-10VDC analog output signal that is linear with pressure. It is about 40% smaller in its physical size and draws 40% less electrical power than earlier products, making it an ideal choice to upgrade existing systems with 100°C or higher temperature capacitance manometers. In standard form, it includes LED indicators for “At Temperature” and “Heater Failure”. The product is also offers the option of two (2) internally-mounted, independently-adjustable electromechanical trip relays that can be set to open or close at any pressure between 0.1% and 100% of the manometer’s measurement range. Full Scale measurement ranges from 1 to 1000 Torr (1.33 to 1333 mbar) are available.



E27H, E28H, and E29H Heated Absolute Baratron® Capacitance Manometers with Etch Sensor

For certain semiconductor and industrial manufacturing processes, heating the Baratron capacitance manometer to 100°C is sometimes not enough to prevent deposition of process byproducts that cause drift in the manometer’s output and undesirable process excursions.

For these difficult processes, MKS offers a heated capacitance manometer with a patented etch baffle in its sensor, which forces condensable process byproducts to deposit on a baffle before reaching



the sensor’s diaphragm measurement element. This greatly reduces the amount of zero drift in the Baratron capacitance manometer, which in turn improves the overall Cost of Ownership and process accuracy. These products are available in Full Scale measurement ranges as low as 0.02 Torr (0.27 mbar), and with either 15-pin D-subminiature (E27H and E28H) or 9-pin D-subminiature (E29H) electrical connectors.

D24H, D25H, D27H, and D28H Heated Dual-Range Absolute Baratron® Capacitance Manometers

These products are designed for processes where the customer wishes to measure and control the process over a very wide pressure range. Standard single-range Baratron capacitance manometers can be used in pressure control systems down to at least 0.1% of their Full Scale range, but at pressures below 0.05% of Full Scale, the analog output of the manometer is low enough that some pressure controllers may not be able to resolve the signal correctly. The dual-range Baratron capacitance manometers solve that problem by adding a second output signal that is 2x, 5x, or 10x higher in gain than the primary range, which increases the analog output signal by that same amount. These Baratron capacitance manometers are heated to either 45°C or 100°C, are available with or without internally-mounted process relays, and have a single 15-pin D-subminiature electrical connector. Primary pressure ranges from 10 to 1000 Torr (13 to 1333 mbar) are available, and the secondary pressure range is 2x, 5x, or 10x less than the primary range.



Displays, Power Supplies, and Isolation Systems

PR4000 Display/Power Supply

The PR4000 display can operate one or two of any current 600-series Baratron capacitance manometers, including the high-temperature 631F. Its LCD display screen is easy to read, and it also offers two (2) independently-adjustable trip relays for external device control. Its standard outputs are high-resolution (16-bit) analog output and RS232C digital, and it can be equipped with RS485 digital communications. It can also remotely zero the 629H manometer equipped with that option.



PDR2000 Dual-Channel Power Supply/Display

The PDR2000 is a low-cost two-channel power supply/display capable of supporting most 600-series Baratron capacitance manometers. It offers a very compact size (1/8 DIN package), two (2) independently-adjustable relay trip points for external device operation, and selectable engineering units. It also can be ordered with an optional RS232C digital interface, and has the ability to scale to non-standard pressure ranges.



CV7600 Isolation Systems

The MKS CV7600 Isolation System is designed to auto-matically maintain a heated 600 series Baratron capacitance manometer at vacuum throughout a process cycle. The Isolation System consists of either a 627H or 628H heated process Baratron capacitance manometer, an MKS Pneumatic Isolation Valve, and an R750D mini-Baratron capacitance manometer and Relay Module. The R750D Relay Module monitors the process pressure, and provides a contact closure that is used to open or close a (customer-supplied) isolation valve in the pneumatic line to the MKS Pneumatic Isolation Valve. This solenoid closes the MKS valve whenever the process pressure exceeds the Full Scale range of the 600 series Baratron capacitance manometer, maintaining it in its optimum working range. Many different Baratron capacitance manometer configurations and trip point options are available; please contact the MKS Applications group or your MKS Account Manager for more information.



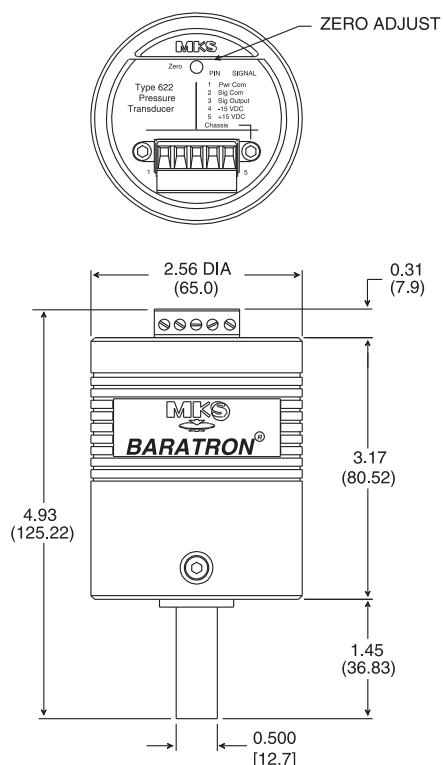
Baratron® 600 Series Capacitance Manometers	622D	623H	626D	627H	628H	629H	624H
	Unheated, Terminal Block Connector	Unheated, Terminal Block Connector, Relays	Unheated, 15-pin D-connector	Heated to 45°C, 15-pin D-connector	Heated to 100°C, 15-pin D-connector	Heated to 45°C or 100°C, 9-pin D-connector	Heated to 45°C, 15-pin D-connector, Relays
Full Scale Pressure Ranges - Torr (mbar)	1, 2, 10, 20, 100, 500 and 1000 (1.33 to 1333)	10, 20, 100, 500 and 1000 (13.3 to 1333)	0.1, 0.25, 1, 2, 10, 20, 100, 500 and 1000 (0.13 to 1333)	0.02, 0.05, 0.1, 0.25, 1, 2, 10, 20, 100, 1000, 2000, 5000, 10000, 15000, and 20000 (0.026 to 26315)	0.05, 0.1, 0.25, 1, 2, 10, 20, 100, 1000, 2000, 5000, 10000, 15000, and 20000 (0.066 to 26315)	0.02, 0.05, 0.1, 0.25, 1, 2, 10, 20, 100, 1000, 2000, 5000, 10000, 15000, and 20000 (0.026 to 26315)	1, 10, 20, 100, 500, 1000, 2000, 5000, 10000, 15000, and 20000 (1.33 to 26315)
Accuracy - % of Reading	0.25%	0.25%	0.25%	0.12% for 1 Torr and above; 0.15% for 0.25, 0.1, and 0.05 Torr; 0.25% for 0.02 Torr	0.25% for 1 Torr and above; 0.50% for below 1 Torr	For 45°C models: 0.12% for 1 Torr and above; 0.15% for 0.25, 0.1, and 0.05 Torr. For 100°C models: 0.25% for 1 Torr and above; 0.50% for below 1 Torr.	0.12%
Resolution - % of Full Scale	0.001%	0.001%	0.001%	0.001% for 0.10 Torr and higher; 0.002% for <0.10 Torr.	0.001% for 0.10 Torr and higher; 0.002% for <0.10 Torr.	0.001% for 0.10 Torr and higher; 0.002% for <0.10 Torr.	0.001%
Zero Temperature Coefficient - % Full Scale/°C	0.005% for 10 Torr and higher; 0.010% for 2 Torr; and 0.015% for 1 Torr	0.005%	0.005% for 10 Torr and higher; 0.010% for 2 Torr; and 0.015% for 1 Torr	0.002% for 1 Torr and higher; 0.005% for 0.1 and 0.25 Torr; 0.015% for 0.05 Torr; 0.030% for 0.02 Torr	0.002% for 1 Torr and higher; 0.010% for 0.1 and 0.25 Torr; 0.015% for 0.05 Torr	Same as 627H and 628H specifications for 45°C and 100°C temperatures	0.002%
Span Temperature Coefficient - % Reading/°C	0.04%	0.04%	0.04%	0.02%	0.02%	0.02%	0.02%
Ambient Operating Temperature	0 to 50°C	0 to 50°C	0 to 50°C	15 to 40°C	15 to 50°C	45°C models: 15 to 40°C 100°C models: 15 to 50°C.	15 to 40°C
Warmup Time	30 minutes	30 minutes	30 minutes	2 hours for 1 Torr and higher; 4 hours for <1 Torr	2 hours for 1 Torr and higher; 4 hours for <1 Torr	2 hours for 1 Torr and higher; 4 hours for <1 Torr	2 hours for 1 Torr and higher; 4 hours for <1 Torr
Overpressure Limit	45 psia	45 psia	45 psia	45 psia	45 psia	45 psia	45 psia
Materials Exposed to Process Gases (excluding optional fittings)	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys
Exposed Volume - cm³	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Input Power Requirements*	±15VDC (±5%) @ 35 mA	±15VDC (±5%)@ 75 mA	±15VDC (±5%) @ 35 mA	±15VDC (±5%)@ 250 mA max	±15VDC (±5%) @ 500 mA max	Same as 627H and 628H specifications for 45°C and 100°C temperatures	±15VDC (± 5%) @ 400 mA max
Output Signal	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms
Trip Relay Specifications	Not Applicable	(2) independent relays, SPDT contacts rated at 1 amp @ 30VDC or 0.5 amp @ 30 VAC resistive. Each relay adjustable from 0.1% to 100% of FS range. 12.5 k ohm max source impedance.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	(2) independent relays, SPDT contacts rated at 1 amp @ 30VDC or 0.5 amp @ 30 VAC resistive. Each relay adjustable from 0.1% to 100% of FS range. 12.5 k ohm max source impedance.
Electrical Connector(s)	5-post terminal strip	(2) terminal strips, (1) 5-post and (1) 8-post	15-pin D-subminia- ture with thread locks	15-pin D-subminia- ture with thread locks	15-pin D-subminia- ture with thread locks	9-pin D-subminiature with thread locks	15-pin D-subminiature with thread locks, 15-pin D-subminiature with slide locks, ter- minal block adapter, 15-pin D-subminia- ture, filtered
Connection Fitting - Standard	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation
Connection Fittings - Optional**	8 Female VCR, 1.33" OD Conflat, NW16-KF, 8 Female VCO, 2.75" OD Conflat, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16- KF, 8 Female VCO, 2.75" OD Conflat, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF, 8 Female VCO, 2.75" OD Conflat, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF, 8 Female VCO, 2.75" OD Conflat, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF, 8 Female VCO, 2.75" OD Conflat, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF, 8 Female VCO, 2.75" OD Conflat, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF
Compliance	CE	CE	CE	CE	CE	CE	CE
Catalog Options	None	None	None	Temperature/Heater Status LEDs; 15-pin D-connector with slide locks	Temperature/Heater Status LEDs; 15-pin D-connector with slide locks	Heater Status Indica- tion; External Zero Adjust (not available on 0.02 Torr/45°C or 0.05 Torr/100°C configurations)	15-pin D-connector with slide locks; Terminal Block Adapter

*24VDC input power available for some models; contact MKS Applications for assistance. **Not all fittings available for all pressure ranges; contact MKS Applications for assistance.

625H	631F	E27H	E28H	E29H	D24H	D25H	D27H	D28H
Heated to 100°C, 15-pin D-connector, Relays	Heated to 150°C or 200°C, 15-pin D-connector, Relays Optional	Etch Sensor, Heated to 45°C, 15-pin D-connector	Etch Sensor, Heated to 100°C, 15-pin D-connector	Etch Sensor, Heated to 45°C or 100°C, 9-pin D-connector	Dual Range, Heated to 45°C, 15-pin D-connector, Relays	Dual Range, Heated to 100°C, 15-pin D-connector, Relays	Dual Range, Heated to 45°C, 15-pin D-connector	Dual Range, Heated to 100°C, 15-pin D-connector
1, 10, 20, 100, 500, 1000, 2000, 5000, 10000, 15000, and 20000 (1.33 to 26315)	1, 2, 10, 100, and 1000 (1.33 to 1333)	0.02, 0.05, 0.1, 0.25, 1, 2, 10, 20, and 100 (0.026 to 133)	0.05, 0.1, 0.25, 1, 2, 10, 20, and 100 (0.026 to 133)	0.02, 0.05, 0.1, 0.25, 1, 2, 10, 20, and 100 (0.026 to 133)	10, 100, and 1000 (13.3 to 1333)	10, 100, and 1000 (13.3 to 1333)	1, 10, 100, and 1000 (1.33 to 1333)	1, 10, 100, and 1000 (1.33 to 1333)
0.25%	0.50%	0.12% for 1 Torr and above; 0.15% for 0.25, 0.1, and 0.05 Torr; 0.25% for 0.02 Torr	0.25% for 1 Torr and above; 0.50% for below 1 Torr	45°C models: 0.12% for 1 Torr and above; 0.15% for 0.25, 0.1, and 0.05 Torr. 100°C models: 0.25% for 1 Torr and above; 0.50% for below 1 Torr.	0.12%	0.25%	0.12%	0.25%
0.001%	0.001%	0.001% for 0.10 Torr and higher; 0.002% for <0.10 Torr.	0.001% for 0.10 Torr and higher; 0.002% for <0.10 Torr.	0.001% for 0.10 Torr and higher; 0.002% for <0.10 Torr.	0.001%	0.001%	0.001%	0.001%
0.002%	150°C models: 0.004% for 10 Torr and higher; 0.006% for 1 and 2 Torr. 200°C models: 0.008% for 10 Torr and higher; 0.016% for 1 and 2 Torr.	0.002% for 1 Torr and higher; 0.005% for 0.1 and 0.25 Torr; 0.015% for 0.05 Torr; 0.030% for 0.02 Torr	0.002% for 1 Torr and higher; 0.010% for 0.1 and 0.25 Torr; 0.015% for 0.05 Torr	Same as E27H and E28H specifications for 45°C and 100°C temperatures.	0.002%	0.002%	0.002%	0.002%
0.02%	0.10%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
15 to 50°C	15 to 50°C	15 to 40°C	15 to 50°C	45°C models: 15 to 40°C. 100°C models: 15 to 50°C.	15 to 40°C	15 to 50°C	15 to 40°C	15 to 50°C
2 hours for 1 Torr and higher; 4 hours for <1 Torr	4 hours	2 hours for 1 Torr and higher; 4 hours for <1 Torr	2 hours for 1 Torr and higher; 4 hours for <1 Torr	2 hours for 1 Torr and higher; 4 hours for <1 Torr	2 hours	2 hours	2 hours	2 hours
45 psia	45 psia	45 psia	45 psia	45 psia	45 psia	45 psia	45 psia	45 psia
Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys	Inconel and Incoloy alloys
6.3	6.2	6.3	6.3	6.3	6.3	6.3	6.3	6.3
±15VDC (±5%) @ 600 mA max	±15VDC (± 5%) @ 1.0 A max	±15VDC (±5%) @ 250 mA max	±15VDC (±5%) @ 500 mA max	Same as E27H and E28H specifications for 45°C and 100°C temperatures.	±15VDC (±5%) @ 400 mA max	±15VDC (±5%) @ 600 mA max	±15VDC (±5%) @ 250 mA max	±15VDC (±5%) @ 500 mA max
0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms	0-10VDC into > 10 k-ohms
(2) independent relays, SPDT contacts rated at 1 amp @ 30VDC or 0.5 amp @ 30 VAC resistive. Each relay adjustable from 0.1% to 100% of Full Scale range. 12.5 k ohm max source impedance.	(2) process pressure & (1) heater failure trip relay mounted internally. Pressure relays independently adjustable from 0-100% Full Scale. DPDT contacts rated at 1 amp @ 30VDC or 0.5 amps @ 30VAC. Relays conform to UL-1950 Basic Insulation at 125V.	Not Applicable	Not Applicable	Not Applicable	(2) independent relays, SPDT contacts rated at 1 amp @ 30VDC or 0.5 amp @ 30 VAC resistive. Each relay adjustable from 0.1% to 100% of FS range. 12.5 k ohm max source impedance.	(2) independent relays, SPDT contacts rated at 1 amp @ 30VDC or 0.5 amp @ 30 VAC resistive. Each relay adjustable from 0.1% to 100% of FS range. 12.5 k ohm max source impedance.	Not Applicable	Not Applicable
15-pin D-subminiature with thread locks, 15-pin D-subminiature with slide locks, terminal block adapter, 15-pin -subminiature, filtered	15-pin D-subminiature with thread locks	15-pin D-subminiature with thread locks	15-pin D-subminiature with thread locks	9-pin D-subminiature with thread locks	15-pin D-subminiature with thread locks	15-pin D-subminiature with thread locks	15-pin D-subminiature with thread locks	15-pin D-subminiature with thread locks
1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation	1/2" OD (12.7 mm) tubulation
8 Female VCR, 1.33" OD Conflat, NW16-KF, NW 16 KF (right angle), NW25-KF	8 Female VCR, NW16-KF, 1.5" OD TriClover, 2" OD TriClover	8 Female VCR, 1.33" OD Conflat, NW16-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF, NW25-KF	8 Female VCR, 1.33" OD Conflat, NW16-KF, NW25-KF
CE	CE	CE	CE	CE	CE	CE	CE	CE
15-pin D-connector with slide locks; Terminal Block Adaptor	Relay Settings	Heater Status Indication; Horizontal Calibration	Heater Status Indication; Horizontal Calibration	Heater Status Indication; External Zero Adjust (not available on 0.02 Torr/45°C or 0.05 Torr/100°C configurations; Horizontal calibration	15-pin D-subminiature with slide locks	15-pin D-subminiature with slide locks	15-pin D-subminiature with slide locks	15-pin D-subminiature with slide locks

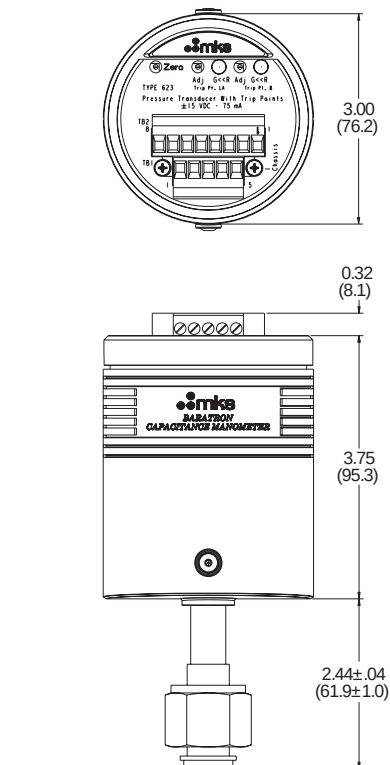
Power Supplies Digital Readout	PR4000	PDR2000
	One or two channels, multiple relays, high power	Economical single/dual channel readout
Display Type	Digital, 4½-place LCD	Digital, 4-place Red LED
Number of Channels	• 1 4000B • 2 4000B	2
Input Power Required	115/230 VAC, 50/60 Hz	Universal input; 110-240 VAC; 47-63 Hz, 40 VA, IEC 320 instrument power input receptacle
Input Signal	• 0 to ±10 VDC • 0 to ±5 VDC • Other, scalable	0 to +10 VDC
Power Supply Output	• ±15 VDC @ 0.8 Amps • ±15 VDC @ 1.5 Amps • 24 VDC @ 1 Amp	±15 VDC @ 750 mA
Signal Output (analog)	1 analog output per channel with 16 bit resolution	Linear, 4 VDC for F.S. output, (0.5 VDC per decade), 0-10 VDC each transducer
Signal Output (digital)	Optional RS-232, RS-485	Linear, 4 VDC for F.S. output, (0.5 VDC per decade), 0-10 VDC each transducer
Trip Points	2, fully programmable	Two relays, contacts rated at 2 Amps @ 30 VDC
Trip Point Relay Ratings	2 5PDT, 2 Amps @ 30 VDC, 1 Amp @ 230 VAC	Two relays, contacts rated at 2 Amps @ 30 VDC
Operating Temperature Range	15° - 40°C	2° - 50°C
Compatible Instruments	• 622, 623, 624, 625, 626, 627, 628* • Other MKS products: 120*, 220, 223, 230*, 430, 619*, 621*, 631*, 722, 740, 750, 850, 852, 870, 872 capacitance manometers; 640 pressure controller; 358, 558, 179 mass flow meters, 1179,	• 628 (one only) • Other MKS products: 622, 623, 624, 627, 722, 750, 850, 852, 870, 872, 223 (unidirectional only)
Mounting	Half 19-inch rack mount	1/8" DIN enclosure; 94 mm x 47 mm x 165 mm
Channel Selection	Dual display	User selected by front panel push button
Compliance	CE	CE
Additional Information	• Wide array of standard features. • Options for digital communicators and high power output for temperature-controlled manometers	• RS-232 (9600 baud, 8 data bits, no parity, 1 stop bit) • Low cost, compact enclosure for two manometers

*Subject to total power consumption of connected instrument(s) and PR4000 options



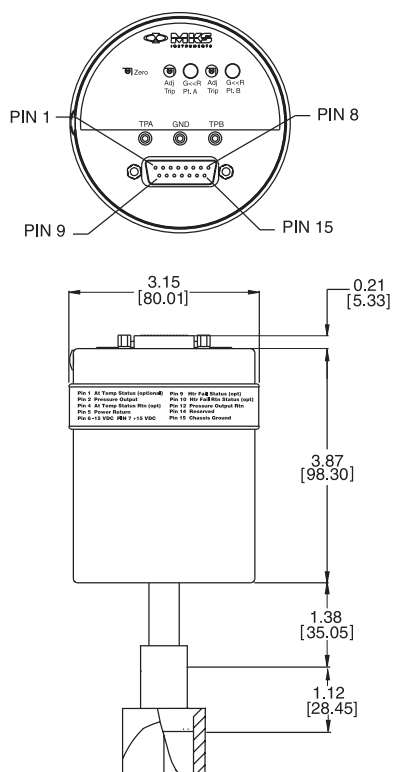
622D Dimensional Drawing

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



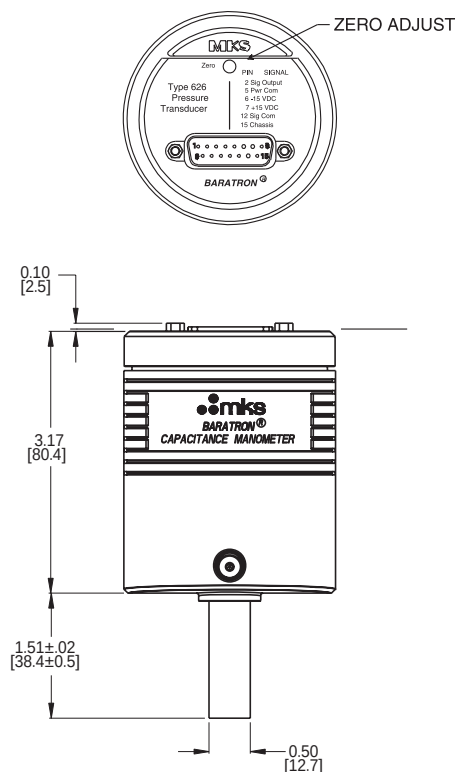
623H Dimensional Drawing

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



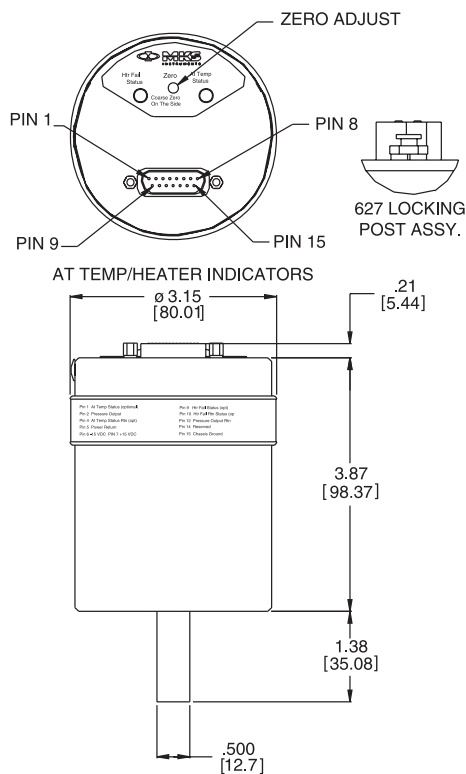
624H/625H/D24H/D25H Dimensional Drawing

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

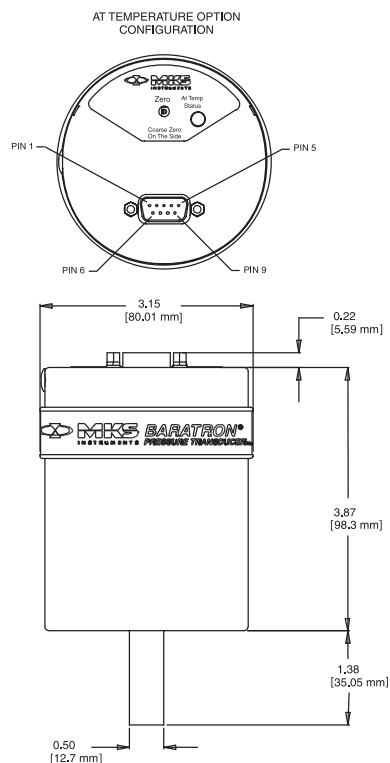


626D Dimensional Drawing

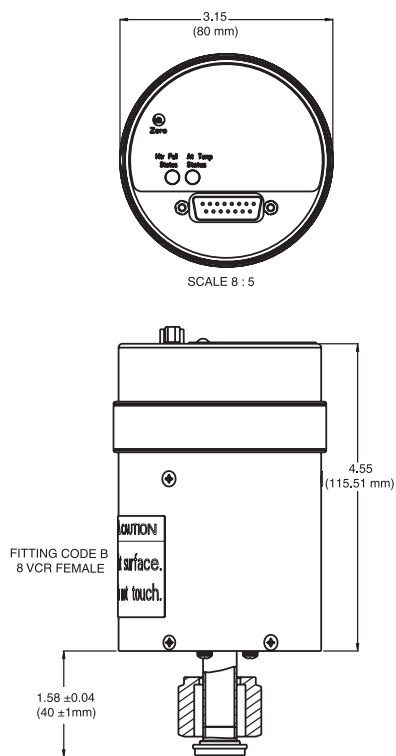
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).



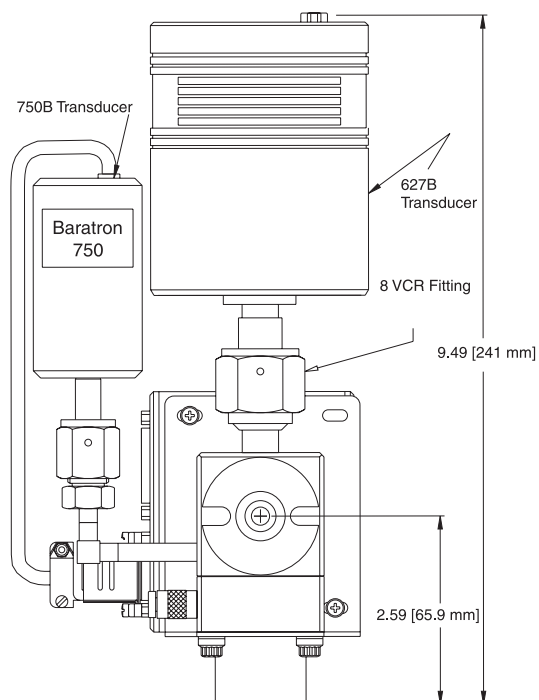
627H/628H/E27H/E28H/D27H/D28H Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).



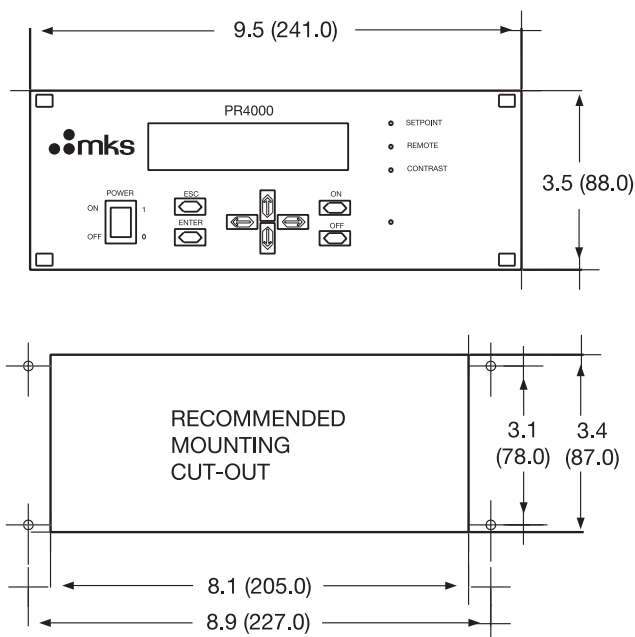
629H/E29H Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).



631F Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

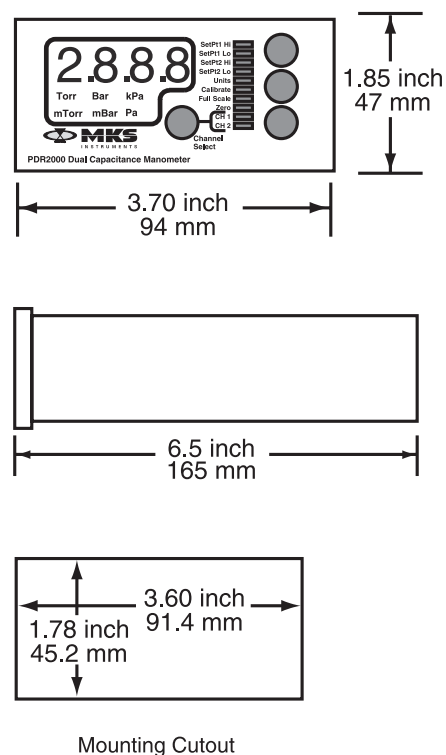


CV7627 Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).



PR4000 Dimensional Drawing

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



PDR2000 Dimensional Drawing

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

622D, 623H, 626D, 627H, 628H, E27H, and E28H Ordering Code Example: 627H11TBC1B	Code	Configuration
Absolute Capacitance Manometers		
Unheated; terminal block connector; standard sensor Unheated; relays; terminal block; standard sensor Unheated; 15-pin D-connector; standard sensor 45°C sensor temp; 15-pin D-connector; standard sensor 100°C sensor temp; 15-pin D-connector; standard sensor 45°C sensor temp; 15-pin D-connector; etch sensor 100°C sensor temp; 15-pin D-connector; etch sensor	622D 623H 626D 627H 628H E27H E28H	627H
Pressure Ranges Full Scale (Torr)		
0.02 (available on 627H and E27H) 0.05 (available on 627H, E27H, 628H, E28H) 0.1 (not available on 622D, 623H) 0.25 (not available on 622D, 623H) 1 (not available on 623H) 2 (not available on 623H) 10 20 100 200 (available on 623H, 627H, 628H) 500 (not available on E27H, E28H) 1000 (not available on E27H, E28H) 2000 (available on 627H, 628H) 5000 (available on 627H, 628H) 10000 (available on 627H, 628H) 15000 (available on 627H, 628H) 20000 (available on 627H, 628H) 25000 (available on 627H, 628H)	U2T U5T .1T RET 01T 02T 11T 21T 12T 22T 52T 13T 23T 53T 14T RBT 24T RCT	11T
Fittings		
1/2" (12.7 mm) tubulation Swagelok 8 VCR, female 1.33" OD ConFlat, rotatable ¹ NW16 KF ² NW25 KF ² Swagelok 8 VCO, female 2.75" OD ConFlat, rotatable ¹	A B C D Q E L	B
Accuracy (% of Reading)		
0.12% (627H and E27H 1 Torr range and higher) 0.15% (627H and E27H in 0.25, 0.10, 0.05 Torr ranges) 0.25% (622D, 623H, 626D, 628H, E28H, and 0.02 Torr 627H and E27H) 0.50% (628H and E28H in 0.25, 0.10, 0.05 Torr ranges)	C D E F	C
Options (not available on 622D, 623H, 626D)		
Standard configuration, vertical calibration (627H, E27H, 628H, E28H only; 1 Torr and higher) Temperature/Heater status, vertical calibration (627H, E27H, 628H, E28H only; 1 Torr and higher) Standard configuration, horizontal calibration (E27H, E28H only; < 1 Torr) Temperature/Heater status, horizontal calibration (E27H, E28H only; < 1 Torr)	1 2 5 6	1
Connector (not available on 622D, 623H, 626D)		
15-pin D-connector, thread locks (627H, E27H, 628H, E28H only) 15-pin D-connector, slide locks (627H, E27H, 628H, E28H only)	B P	B

¹ Available only on ranges of 1000 Torr and less.

² Available only on ranges of 5000 Torr and less, and 2000 and 5000 Torr ranges require use of an MKS overpressure ring.

624H and 625H Ordering Code Example: 624H11TCECB	Code	Configuration
Absolute Capacitance Manometers		
45°C sensor temperature, relays 100°C sensor temperature, relays	624H 625H	624H
Pressure Ranges Full Scale (Torr)		
1 2 10 20 100 500 1000 2000 5000 10000 15000 20000	01T 02T 11T 21T 12T 52T 13T 23T 53T 14T RBT 24T	11T
Fittings		
1/2" OD (12.7 mm) tubulation Swagelok 8 VCR, female 1.33" OD ConFlat, rotatable ¹ NW16 KF ² NW16 KF ² , right angle NW25 KF ²	BA CE HA GA GE GC	CE
Accuracy (% of Reading)		
0.12% (624H only) 0.25% (625H only)	C E	C
Connector (not available on 622D, 623H, 626D)		
15-pin D-connector, thread locks 15-pin D-connector, slide locks Terminal block adaptor 15-pin D-connector, filtered	B P U V	B

¹ Available only on ranges of 1000 Torr and less.

² Available only on ranges of 5000 Torr and less, and 2000 and 5000 Torr ranges require use of an MKS overpressure ring.

631F Ordering Code Example: 631F11TBFHBA	Code	Configuration
Absolute Capacitance Manometers		
15-pin D-connector	631F	631F
Pressure Ranges Full Scale (Torr)		
1 2 10 30 100 1000	01T 02T 11T 31T 12T 13T	11T
Fittings		
1/2" OD (12.7 mm) tubulation Swagelok 8 VCR, female NW16 KF 1.5" OD Sanitary 1.5" OD Sanitary	A B D M N	B
Accuracy (% of Reading)		
0.50%	F	F
Sensor Temperature		
150°C 200°C	H P	H
Relay Configuration ³		
No relays TP-A activates above 50% Full Scale; TP-B activates above 50% Full Scale TP-A activates above 50% Full Scale; TP-B activates below 50% Full Scale TP-A activates below 50% Full Scale; TP-B activates below 50% Full Scale TP-A activates below 50% Full Scale; TP-B activates above 50% Full Scale	None AA AB BB BA	BA

³ Other relay settings and logic available; contact MKS Applications for assistance.

629H and E29H Ordering Code Example: 629H11TBCJ4B	Code	Configuration
Absolute Capacitance Manometers		
9-pin D-connector, standard sensor 9-pin D-connector, etch sensor	629H E29H	629H
Pressure Ranges Full Scale (Torr)		
0.02 (available on 45°C models only) 0.05 0.10 0.25 1 2 10 20 100 1000 (available on 629H only)	U2T U5T .1T RET 01T 02T 11T 21T 12T 13T	11T
Fittings		
1/2" (12.7 mm) tubulation Swagelok 8 VCR, female 1.33" OD ConFlat, rotatable ¹ NW16 KF ² Swagelok 8 VCO, female (629H only)	A B C D E	B
Accuracy (% of Reading)		
0.12% (45°C products in 1 Torr range and higher) 0.15% (45°C products in 0.25, 0.10, 0.05 Torr ranges) 0.25% (100°C products 1 Torr range or higher, and 0.02 Torr 45°C products) 0.50% (100°C products in 0.25, 0.10, 0.05 Torr ranges)	C D E F	C
Sensor Temperatures		
45°C 100°C	J L	J
Options		
Standard configuration, vertical calibration Heater status indication, vertical calibration External zero, vertical cal (n/a for 0.02 Torr or 100°C/0.05 Torr products) Heater status, external zero, vertical cal (n/a for 0.02 Torr or 100°C/0.05 Torr products) Standard configuration, horizontal calibration (< 1 Torr only) Heater status indication, horizontal calibration (< 1 Torr only) External zero, horizontal cal (45°C products with 0.05, 0.10, 0.25 Torr ranges; 100°C products with 0.10 and 0.25 Torr ranges) Heater status, external zero, horizontal cal (45°C products with 0.05, 0.10, 0.25 Torr ranges; 100°C products with 0.10 and 0.25 Torr ranges)	1 2 3 4 5 6 7 8	4
Connector		
9-pin D-connector, thread locks 9-pin D-connector, slide locks	B P	B

¹ Available only on ranges of 1000 Torr and less.

² Available only on ranges of 5000 Torr and less, and 2000 and 5000 Torr ranges require use of an MKS overpressure ring.

D24H and D25H Ordering Code Example: D24H11TBCB0	Code	Configuration
Absolute Capacitance Manometers		
Dual range, 45°C sensor temperature, relays Dual range, 100°C sensor temperature, relays	D24H D25H	D24H
Pressure Ranges Full Scale (Torr)		
10 100 1000	11T 12T 13T	11T
Fittings		
1/2" (12.7 mm) tubulation Swagelok 8 VCR, female 1.33" OD ConFlat, rotatable NW16 KF	A B C D	B
Accuracy (% of Reading)		
0.12% (D24H only) 0.25% (D25H only)	C E	C
Connector		
15-pin D-connector, thread locks 15-pin D-connector, slide locks	B P	B
Secondary Range Gain Ratio		
2 to 1 5 to 1 10 to 1	2 5 0	0
D27H and D28H Ordering Code Example: D27H11TCEC1B0	Code	Configuration
Absolute Capacitance Manometers		
Dual range, 45°C sensor temperature Dual range, 100°C sensor temperature	D27H D28H	D27H
Pressure Ranges Full Scale (Torr)		
1 10 100 1000	01T 11T 12T 13T	11T
Fittings		
1/2" (12.7 mm) tubulation Swagelok 8 VCR, female Swagelok 8 VCO, female NW16 KF 1.33" OD ConFlat, rotatable	BA CE DA GA HA	CE
Accuracy (% of Reading)		
0.12% (1 to 1000 Torr only, D27H) 0.25% (1 to 1000 Torr only, D28H)	C E	C
Orientation/Calibration		
Vertical calibration (standard for 1 to 1000 Torr) Horizontal calibration (< 1 Torr only)	1 5	1
Connector		
15-pin D-connector, thread locks 15-pin D-connector, slide locks	B P	B
Secondary Range Gain Ratio		
2 to 1 5 to 1 10 to 1	2 5 0	0