

R740D and R750D

General Purpose Baratron® Capacitance Manometers with Trip Relay



Today's industrial manufacturing processes require stability, repeatability, and accuracy in measuring pressure and vacuum. MKS has applied its expertise in capacitance sensor design in the new R740D and R750D compact Baratron® capacitance manometers that are designed for use in industrial, analytical, and electronic measurement applications. The products' flexible design allow it to be used either for new processing systems, or for retrofits into existing processing systems.

The R740D and R750D Baratrons are rugged, industrial-grade pressure and vacuum transducers that use MKS proprietary sensor and electronics designs for superior accuracy, repeatability, and long-term signal stability. All exposed sensor surfaces are made from Inconel® or Incoloy® nickel alloys for exceptional resistance to corrosion from a wide variety of aggressive chemicals. The sensor is also fully welded, guaranteeing safety to equipment operators

from accidental exposure to dangerous chemicals. This advanced sensor and its electronics are mounted in a rugged stainless steel enclosure that can withstand harsh environments, the two (2) independently-adjusted electro-mechanical trip relays allow the product to be used to directly control external components such as pumps, valves, and other equipment.

The R740D product is referenced to atmospheric pressure, and thus offers Full Scale measurement ranges from 20 to 3000 PSIG (1.4 to 204 bar). The R750D is an absolute transducer (referenced to high vacuum), and thus offers Full Scale measurement ranges from 10 Torr (13 mbar) to 3000 PSIA (204 bar). The products have a standard linear 0-10 VDC analog output signal in addition to the trip relays.

Product Features

- Proven MKS capacitance technology yields a measurement resolution of 1 part in 10,000
- Linear 0-10 VDC analog output plus two (2) independently-adjusted trip relays
- Overpressure limit of two times Full Scale or 45 psia (whichever is greater) with no degradation in performance
- Available with absolute (referenced to vacuum) or gage (referenced to atmosphere) calibrations



Key Benefits

- Self-contained sensor and signal conditioner in a compact and rugged enclosure
- All-welded Inconel sensor construction allows for use with most corrosive media
- MKS proprietary sensor and electronics designs for superior accuracy, repeatability, and long-term signal stability

Theory of Operation

MKS transducers are based on capacitance manometer technology and contain a sensor and signal conditioner. The sensor is made up of a tensioned metal diaphragm, one side of which is exposed to the media whose pressure is to be measured.

The other (reference) side contains an electrode assembly placed in a reference cavity (Figure 1). Absolute transducers have the reference side factory-sealed to a high vacuum (10^{-7} mmHg). For gage units, the reference side is open to atmosphere. The diaphragm deflects with changing pressure — force per unit area — causing a capacitance change between the diaphragm and the adjacent electrode assembly. The high level output signal, current, or DC voltage is linear with pressure, amplified, and self-compensated for thermal stability with ambient temperature changes. Capacitance manometers should be zeroed on installation. This zero adjustment has no effect on the actual calibration; it is similar to adjusting a dial gage to zero psig at the prevailing barometric pressure.



R740D, R750D with external slide switches

Accuracy

The accuracy of the 740/750 Series is specified as percent of Reading, and includes hysteresis and non-linearity. Since many processes operate at pressures somewhere below Full Scale, the percent of Reading specification provides greater accuracy at the operating pressure. (Figure 2)

Unlike strain gages, whose accuracy and reliability are a function of the precision of the gage itself and how well it is bonded to the surface, MKS pressure transducers are not subject to the additional uncertainties caused by the bonding. MKS capacitance-based pressure transducers have proven their accuracy and repeatability in application after application. The capacitance design is also much less susceptible to temperature changes.

Repeatability

In order to maintain repeatable manufacturing processes, day to day, month after month, a pressure measurement source that will provide reliable and repeatable outputs on a continuous basis with the lowest possible error is needed. The 740/750 Series General Purpose Pressure Transducers have a repeatability specification of $\pm 0.1\%$ of Reading. It is this percentage of Reading

specification that gives end-users tighter process control (smaller deviations) over percent of Full Scale error — especially useful in applications requiring higher accuracy at the lower ends of the pressure measurement range.

Compound Calibration

MKS offers compound calibration on 740 Series gage pressure units (Figure 3). Compound calibration utilizes a single transducer to measure a composite of pressure and vacuum. More simply defined, this is the ability to measure pressure above and below barometric pressure. Compound calibration allows the user to evacuate a container or chamber to a vacuum and then backfill to a specified pressure.

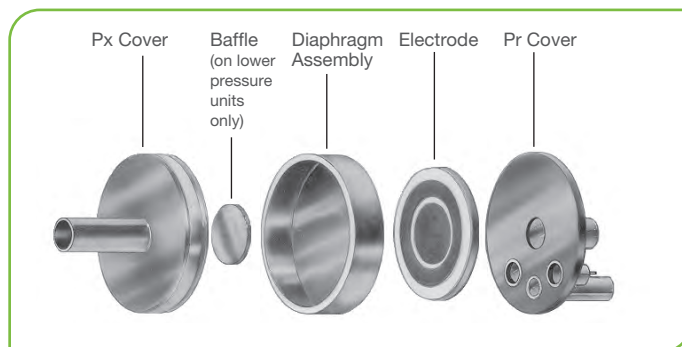


Figure 1. An exploded diagram of an MKS pressure sensor

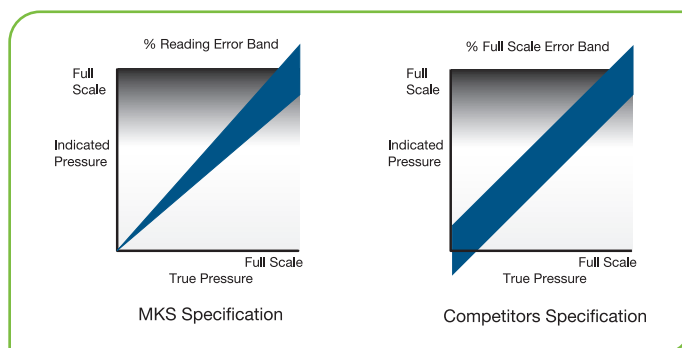


Figure 2. Comparison of MKS accuracy expressed as percent of Reading versus competitors accuracy as percent of Full Scale

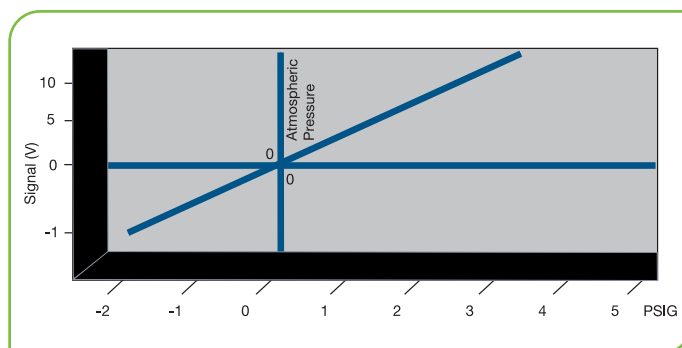
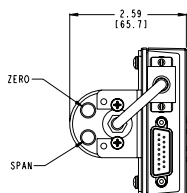
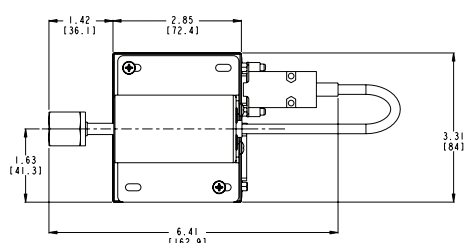


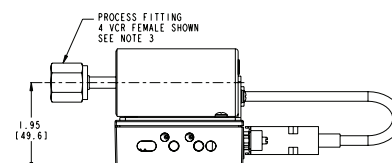
Figure 3. Compound Calibration

Specifications

Pressure Ranges	R740D R750D	20 to 3000 PSI (1.4 to 204 bar) gauge 10 Torr (13 mbar) to 3000 PSI (204 bar) absolute
Accuracy (includes non-linearity, hysteresis and non-repeatability)		±1% Reading
Repeatability		±0.1% of Reading
Resolution (output)		0.01% of Full Scale
Ambient Operating Temperature		0° to 50°C
Temperature Effect	Zero Span	0.02% of Full Scale/°C 0.04% of Reading/°C
Response Time		20 msec
Maximum Overpressure		45 PSI or 2x Full Scale (whichever is greater)
Burst Pressure	FS ranges of 1000 PSI or less FS ranges of more than 1000 PSI	100 PSI or 10x Full Scale (whichever is greater) 5x Full Scale
Internal Volume		4.7 cm ³
Exposed Materials		Inconel®, Incoloy®, and 316L stainless steel
Input Voltage		±15 VDC (± 5%) @ 35 mA (max)
Analog Output Signal		0-10 VDC into > 10 k Ω load
Electrical Connector		15-pin D-subminiature
Relay Specifications		(2) independently-adjusted DPDT contacts adjustable between 0.5% and 100% of FS. Relays are UL listed and rated at 1.0 amps @ 30 VDC or 0.3 amps @ 30VAC. Relay setpoints and operating directions can be adjusted by customers from exterior of product.
Factory Default Trip Relay Settings		Trip Relay A energizes below 55% of Full Scale range, and Trip Relay B energizes above 55% of Full Scale range. Custom relay settings available on special order; contact MKS Applications for details and pricing.
Weight		1.0 lbs (0.4 kg)
Available Fittings		1/4" (6.3 mm) OD tube, 4 VCR® male and female, 8 VCR female, 8 VCO® female, NPT*, NW16-KF**, and 1.33" (33.8 mm) OD CF***
Compliance		CE



J3	SIGNAL
1	RELAY CONTACT A, N.O.
2	PRESSURE OUTPUT
3	RESERVED
4	RESERVED
5	POWER RETURN
6	-15VDC
7	+15VDC
8	RELAY CONTACT A, N.C.
9	RELAY CONTACT B, N.C.
10	TRIP PT A, SETTING
11	TRIP PT B, SETTING
12	PRESSURE RETURN
13	RELAY CONTACT B, N.O.
14	RELAY CONTACT B, COMMON
15	RELAY CONTACT A, COMMON



Dimensional Drawings

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

Ordering Code Example: R750D13TCE2GG R740D/R750D Baratron® Pressure Transducers		Code	Configuration
Model			
Gage Single-ended Transducer Absolute Single-ended Transducer		R740D R750D	R750D
Pressure Ranges			
Gage (R740D models only) 20 psig 50 psig 100 psig 200 psig 250 psig 500 psig 1000 psig 2000 psig 3000 psig Absolute (R750D models only) 10 mmHg 20 mmHg 50 mmHg 100 mmHg 500 mmHg 1000 mmHg 50 psia 100 psia 3000 psia		21P 51P 12P 22P RDP 52P 13P 23P 33P 11T 21T 51T 12T 52T 13T 51P 12P 33P	13T
Fittings			
½" OD Tube* ¼" OD Weld Stub 4 VCR® Male 4 VCR Female 8 VCR Female 8 VCO® Female ¼" NPT Female** ¼" NPT Male** 1/8" NPT Female** 1/8" NPT Male** NW-16KF* 1.33" OD Conflat****		BA BB CB CD CE DA FA FB FE FF GA HA	CE
Input/Output			
±15 VDC (±5%) input/0-10 VDC output		2	2
Accuracy			
1.0% of Reading		G	G
Trip Point Settings			
Standard Setting (relays activate above trip points) Optional Setting (relays activate below trip points)		G S	G

*Available only on Full Scale ranges of 1000 Torr or less

**Not available for 10 or 50 Torr Full Scale ranges

***Available only for Full Scale ranges of 1000 psi or less