

Duniway Stockroom Corp. Application Note

Diaphragm Gauge Sensors - Ranges and Accuracy

Diaphragm gauges (Capacitance Diaphragm Gauges and Piezo Diaphragm Gauges) are an excellent choice when accuracy and gas-species-independent vacuum measurements are required. In applying diaphragm gauges, it is important to understand the ranges and accuracies of these gauges. Here are some of the important parameters to understand:

1. Full Scale Range: Specified by the manufacturer, this parameter is the highest measurement pressure of the gauge, where the output voltage is 10.0 VDC (for 0-10.0VDC units). In some cases, pressures of a few percent above this value can be measured.
2. Accuracy: Specified by the manufacturer, this is the percentage accuracy of the reading, taking into account non-linearity, hysteresis and repeatability.
3. Lowest Suggested Reading: This represents the lowest reading at which the accuracy can be assured. Lower readings may be possible under controlled conditions. Usually, the lowest suggested reading is 1/2000th of the Full Scale Range for the gauge.
4. Lowest Suggested Control Pressure: This is the lowest pressure at which process control set points should be used for the gauge, taking into account hysteresis and accuracy of both the gauge and the control circuit. Usually, the lowest suggested control pressure is 1/200th of the Full Scale Range.

Below is a table summarizing this information, and some examples:

Parameter	Units	Factor	Output
Full Scale Range –	Torr	Sensor Spec.	10.0 VDC
Accuracy -	% of Reading	Sensor Spec.	--
Lowest Suggested Reading -	% Full Scale - Torr	0.05	5 mVDC
Lowest Suggested Control Pressure -	% Full Scale - Torr	0.5	50 mVDC

Example 1:

MKS Baratron[®] 722A-1000;
 1000 Torr Full Scale Range;
 Accuracy 0.5% of Reading;
 Lowest Suggested Reading: 0.5 Torr;
 Lowest Suggested Control Pressure: 5 torr

Example 2:

MKS Baratron[®] 627B-1(Heated);
 1 Torr Full Scale Range;
 Accuracy 0.15% of Reading;
 Lowest Suggested Reading: 0.5 mTorr;
 Lowest Suggested Control Pressure: 5 mTorr.

Example 3

Terranova 808-1000:
 1000 Torr Full Scale Range;
 Accuracy: 2% of Reading;
 Lowest Suggested Reading: 0.5 Torr;
 Lowest Suggested Control Pressure: 5 Torr.

Example 4:

MKS Baratron[®] 627B-002(Heated);
 20 mTorr Full Scale Range;
 Accuracy 0.15% of Reading;
 Lowest Suggested Reading: 0.01 mTorr;
 Lowest Suggested Control Pressure: 0.1 mTorr

Terranova 908A with Typical CDG Sensors

The Terranova 908A Dual Diaphragm Gauge Controller operates two diaphragm gauges, displays the pressure for one gauge at a time and provides two process control set point relays which can be independently assigned to either gauge.

When the controller and diaphragm sensors are set up, the zero setting must be confirmed and adjusted, if necessary. The Operators Manual (on our web-site: www.duniway.com) describes the zero calibration process. For 1000 torr Full Scale Range sensors, atmosphere setting is accomplished by determining the local barometric pressure (see procedure, also on our web-site). The following table represents the combined characteristics of the 908A and typical CDG sensors having 0.5% accuracy.

<u>Sensor Range Full-Scale</u>	<u>908A Lowest Scale</u>	<u>908A Highest Scale</u>	<u>Highest Display Resolution</u>	<u>Lowest Recommended Reliable Value</u>	<u>Lowest Set Point</u>	<u>Highest Set Point</u>
10 ktorr	X torr	XXE3 torr	1 torr	5 torr	50 torr	9990 torr
1000 torr	X.X torr	XXXX torr	0.1 torr	0.5 torr	5 torr	999.0 torr
100 torr	X.XX torr	XXX.X torr	0.01 torr	50 mtorr	0.50 torr	99.90 torr
20 torr	X.XXX torr	XX.XX torr	1 mtorr	10 mtorr	100 mtorr	19.98 torr
10 torr	X.XXX torr	XX.XX torr	1 mtorr	5 mtorr	50 mtorr	9.990 torr
2 torr	X.X mtorr	X.XXX torr	0.1 mtorr	1 mtorr	10 mtorr	1.998 torr
1 torr	X.X mtorr	X.XXX torr	0.1 mtorr	0.5 mtorr	5 mtorr	999.0 mtorr
100 mtorr	X.XX mtorr	XX.XX mtorr	0.01 mtorr	0.05 mtorr	0.5 mtorr	99.90 mtorr
50 mtorr	X.XX mtorr	XX.XX mtorr	0.01 mtorr	0.025 mtorr	0.25 mtorr	49.95 mtorr
20 mtorr	X.XX mtorr	XX.XX mtorr	0.01 mtorr	0.01mtorr	0.1 mtorr	19.90 mtorr

Notes:

1. From 100% of full scale to approximately 130% of full scale, the display will flash.
2. Above approximately 130% of full scale, the display will indicate "HI".
3. Prior to proper setting of zero, the display may show a negative value, as low as -1% of full scale. Of course negative readings are meaningless, but only provide span for adjustment. Below approximately -1% of full scale, the display will indicate "LO". Proper adjustment of the 908A zero and sensor zero will move readings out of the negative range.



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