Changing The Range of the P55 – What to Expect

Introduction:

The P55 pressure sensor can be disassembled and the sensing diaphragm replaced by the user. This is not part of the design of the P55 but it can be done in order to replace an over-pressured diaphragm, replace a corroded diaphragm or change the pressure range of the sensor.

Changing the diaphragm does not require any special tools or skills but does have certain implications about subsequent performance of the P55:

- **The P55 must be re-calibrated after the diaphragm has been replaced.**
- **The output signal may not be adjustable to exactly 0 and +/-5 Vdc, or 4-20 mA**
- **The temperature compensation of the P55 may be compromised**

Sensor Dis-assembly:

Only the differential versions of the P55 transducers (models P55D) may be disassembled.

The sensor is attached to the P55 housing by two Phillips head screws on the underside of the mounting plate. Remove these first but take care that as the sensor moves it does not put undue strain on the wires going into the electronics assembly. The wires are very short so be careful not to move the sensor too far away from the electronics.

There are 4 body bolts holding the sensor together. These are Torx T27 type bolts. A Torx adapter for 3/8 drive socket wrenches can be purchased at most auto parts stores and this is the best way to remove the bolts.

Note: The sensor must be held in a vise in order to remove the bolts properly.

The torque on the body bolts is very high, some 125 in-lb, so it may take some effort to break them out of the sensor body.

When the body bolts are removed the sensor will easily separate into two halves with the sensing diaphragm and two o-rings between.

Examining the Sensor:

Check the sensor for signs of corrosion on its internal surfaces. There is a small, dime-sized inconel foil lid welded to the inside center of each of the two sensor halves. Using a magnifying glass inspect the weld around the circumference of the lid for evidence of corrosion. Also check the old diaphragm for pitting or holes.

If corrosion is suspected, measure the DC resistance between the metal body of the sensor and any of the four coil terminals that exit the sensor. The resistance should be 200 M Ohms – essentially open circuit. If the isolation resistance is 200 K or less the sensor may not function correctly.

Installing the New Diaphragm:

Installing the diaphragm is simple – just the reverse of dis-assembly. There is no preferred orientation for the diaphragm when assembled into the sensor body.

Take care that the o-rings are seated correctly in the grooves and won't be pinched as the sensor is bolted together.

Be sure the wires are also clear of the sensor so they do not get caught between the two body halves as they are bolted together.

A light coating of assembly lubricant should be applied to the body bolt threads and also to the underside of the heads. The idea is to reduce friction in the threaded parts so that the full effect of the torque will go towards clamping the diaphragm in place.

When tightening the bolts – use a vise and go in two or three stages. Do not tighten the bolts all the way one at a time but rather alternate as you would to mount a tire to your car.

Note: The final torque for the body bolts is 125 In-Lbs

Insufficient torque will cause non-linearity and excessive hysteresis.

When the sensor is assembled, re-attach it to the housing using the Phillips head screws.

Re-calibration:

Once the sensor is assembled apply power and read the output signal. Ideally the output will be 0.000 Vdc (for voltage versions) or 4.000 mA for current output versions. (or 2.500 Vdc or 12.000 mA for offset output options).

The output signal will likely not be correct, but turn the Z adjustment until the signal is as close as possible to correct.

Apply full scale pressure to the + port of the sensor and observe the output signal. Adjust the S control until the full-scale output signal is as close as possible to correct.

If you can calibrate to the normal endpoints (o and +5 Vdc, 4 and 20 mA) then check intermediate pressures to verify accuracy. A calibration application note is available explaining how to do this.

If the usual endpoints cannot be achieved, then verify that the signal is linear between the signals that could be obtained.

For example, it may be that a P55 calibrates to, say, 0.5 Vdc at zero pressure and 4.75 Vdc at full scale pressure. You can check the intermediate pressures and the output should be linear to with 0.25% FS.

A spreadsheet is available to do these calculations for 5-point unidirectional and 9-point bidirectional calibrations respectively.

Even though the unit may not be adjustable to the normal end point signals, the output should be linear and therefore useful. With a little algebra you can determine the relationship between output signal and pressure.