



PRESSURE SOLUTIONS

P401: Pressure Transmitters/Transducers

Be wary of nomenclature. Some people use the terms transmitter and transducer interchangeably.

By definition, a transducer is a device, usually electrical, for converting energy from one form to another.

By definition, a transmitter is a device for sending a signal across an intervening space.

Sensors:

The sensor is the heart of the device. Most pressure sensors are analogue in format, and are designed to monitor the displacement of a sensing diaphragm, as we learnt in P101. Most common are bridge type strain-gauges, and capacitive sensors. Bridge types are ratiometric, ie the voltage out is a function of the voltage in (excitation). Capacitive sensors utilise the variation in system capacitance caused by the deflection of the diaphragm, to measure pressure. We now are beginning to see resonant sensors, whose resonant frequency is determined by applied pressure. These are digital sensors, since the frequency can be measured digitally without intervening analogue measurements.

Signals:

In our business, we consider a pressure transducer to be a device to convert pressure into some form of electrical signal for local use. The signal is usually voltage, which may be raw or conditioned. Raw voltage output is usually ratiometric, and is 4 wire. Conditioning the signal provides a standardised output, for example 0 – 5V. Transducers with standardised outputs are usually 3 wire, ie a voltage supply positive and common, and a signal output, relative to common.

Transmission:

Pressure transmitters, by definition, have to have a conditioned output, usually standardised to communicate with various receivers. As soon as we plan on sending this voltage signal over a distance, we have problems associated with voltage drop, which can introduce significant errors. The well-known 4 – 20 mA current loop eliminates these problems. By converting the signal into a regulated current, there are two significant advantages. First, the voltage drop in the lines does not affect the measurement of the current. Secondly, the signal only needs 2 wires, not 3, thus making significant savings on cabling. See P402 for more details.

Digital Systems:

The first open attempt at digital communication with transmitters was the HART protocol, which superimposed a digital signal over the current loop, enabling configuration and diagnostics to be performed remotely.

Some people realised that a wholly digital system could reduce cabling costs further, by running a single cable to a series of addressable transmitters, much like computer network. Events are moving in this direction, but there is a lack of standardisation. The competing systems are Foundation Fieldbus (USA) and Profibus (Europe). Choosing any one of these systems automatically excludes some major players. As a result of this impasse, smaller players are not getting involved.

P.O.Box 3357, Benoni 1500. 169, Elston Ave, Benoni, 1501, Gauteng, South Africa
Phone 422-1749/1840 Fax 421-5379 Dial code international +2711 local 011
E-mail: rod@pressuresolutions.co.za Web: www.pressuresolutions.co.za

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