

How to Choose a Digital Pressure Gauge

By Tom Halaczkiwicz

Sensor

Is it an all-welded sensor? This can be difficult to determine – you cannot tell by looking at the gauge. Non-welded sensors use o-rings or even thread tape inside the gauge, and these designs sometimes may say "not for use with oxygen". O-rings can degrade, and both o-rings and thread tape have the potential for leaks, especially if anything other than air or nitrogen is used.

Is the sensor mounting robust? One design we have seen uses epoxy to retain the sensor!

Are you warned to use clean, dry air? These sensors are not suitable because moisture, let alone liquid water, will cause eventual sensor failure.

Can you insert objects, like screwdrivers or cotton swabs into the sensor? The diaphragm of the sensor can be easily damaged with tools – there should be something that prevents common tools from being inserted. This happens when someone wants to see a response from the gauge, or when trying to remove debris from the diaphragm. Small screwdrivers or cotton swabs are the usual culprits. Good designs include a filter or other mechanical way of keeping these items away from the sensor.

What is the sensor technology? Currently, piezoresistive sensors with oil isolation provide the best combination of performance and value. They are highly repeatable and robust and can handle overpressure conditions well. On the other hand, sensors employing bonded strain gauges or thin film strain gauges rely on the deformation of a metal diaphragm. This makes them similar to mechanical pressure gauges, in that overpressure can cause a permanent shift in calibration. Also, some designs, found especially in low cost digital gauges, should only be used with liquids. Rapid changes in pressure in these gauges cause readings to be unstable until the strain gauges reach thermal equilibrium, which can take up to a minute or more. To test for this, zero the gauge, apply full scale pressure using air or nitrogen, then vent the gauge and see if it returns to zero.

Batteries:

Does it use standard batteries or something exotic? Lithium batteries are a great technology, but a 9V lithium is really expensive, if you can even find one.

How long is the battery life? This varies between products, more than you might think.

Does it have a separate battery compartment? Many gauges require a degree of disassembly to change the batteries and are surprisingly difficult to reassemble. Also, in some designs, you have to be very careful to not damage the sensor and/or the cable that connects the sensor to the circuit board when replacing batteries.

Performance

Is the gauge properly temperature compensated? Any specification that says something like: "From 18 to 28°C" as part of the specification does not have adequate temperature compensation. What looks like a small adder to the uncertainty rapidly expands and overwhelms the basic specification of the gauge at ordinary temperatures you are likely to experience.

Does the specification include time? Shorter calibration intervals allow manufacturers to improve the basic accuracy specifications, and they can become pretty fantastic if the calibration interval is 90 days or less.

Is the resolution adequate? In some gauges, the least significant digit does not change in increments of 1 like you would expect – it may increment by 2s, 3s, or even 5s. This is due to inadequate

resolution of the analog to digital converter, and is especially noticeable on ranges such as millimeters of mercury or in some cases on metric scales like kPa.

Calibration

Does the gauge come with a calibration certificate or do you have to pay extra for this? This should be free, because modern instruments are manufactured using traceable, automated calibration equipment.

Can you recalibrate it (if you have the appropriate equipment) or do you have to send it back to the factory? If you can't calibrate, neither can your favorite provider of calibration services.

If you can recalibrate it, what do you have to do? Are the instructions included or do you have to contact the factory for the procedure or authorization code? Once you have the procedure, take a look at what it entails (you might be in for a surprise). For example some gauges require that you apply precisely "25% of full scale", or precisely "37.5%" (!) of full scale, and many more similar points to adjust the gauge. If you're a user of deadweight testers, you know that this is probably not easy to do (e.g., 37.5% of a 30 PSI gauge is 11.25 PSI).

Ease of Use

Does the gauge use a menu system or offer multi-language operation? We're discussing pressure gauges, not multifunction calibrators. Any pressure gauge with multi-language operation is probably inherently difficult to use.

Enclosure

Are the components of the enclosure compatible with hydraulic or other fluids you use? Polycarbonates can be attacked by many solvents and hydraulic fluids.

Is the display protected from impact? Most, if not all gauges use liquid crystal displays. If the gauge does not have a hard plastic or glass window, dropping a tool onto the display will destroy the LCD.

What happens when you drop the gauge? You won't find this in the brochure, and probably not even in the operator's manual, but chances are that the gauge will get dropped.

Final Advice

The final advice is to actually test and use a gauge. Spec sheets and brochures only tell part of the story. Is it easy to use? How good is the zero stability? How repeatable is it? Does it drift? What happens when you drop it? Actually trying the gauge can answer all of these questions, and should be part of your evaluation, **before** you buy it.

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