

Engineer's Notebook

Mechanical pressure gauges, which require no external power, provide an affordable and are a reliable source of accurate pressure measurement. When selected using the criteria described below, maximum gauge life can be expected.

To properly select a pressure gauge, consider the gauge process, range, environment, accuracy, dial size, connection and mounting requirements. When selected using these 7 Steps, the gauge performance and reliability will greatly be enhanced.

Step 1: Gauge Process

The wetted parts of the pressure gauge, the bourdon tube and socket must be compatible with the process media. If not compatible with the wetted parts of the gauge, corrosion will occur. Corrosion of gauge wetted parts will eventually cause gauge failure and possibly safety issues.

Bourdon tubes are most often manufactured from phosphor bronze, 316 stainless steel, or Monel. Less frequently, they are produced from 304 stainless steel, Inconel, or steel. If the process media is not compatible with the wetted parts of the gauge, a diaphragm seal/gauge isolator can be used to prevent the process media from contacting the Bourdon tube. The diaphragm seal when supplied with wetted parts compatible with the process not only protects the gauge from corrosion attack, but also serves to prevent viscous or extremely dirty media from clogging the Bourdon tube. When attached to a gauge, a diaphragm seal will add an additional minimum error of 0.5% to the gauge/seal assembly.



Both pulsation and vibration will decrease the life of the gauge if not properly dampened. Gauges subject to pulsation and vibration should be liquid filled or internally dampened. Ashcroft gauges offer a unique patented method of gauge dampening that provides the performance of a liquid filled gauge without any of the complications associated with liquid fills.

Available accessories that minimize stresses on the bourdon tube/movement and extend the life of the gauge include pulsation dampers, pressure snubbers, gauge savers, and diaphragm seals.



Step 2: Pressure Gauge Range

ASME B40.1-1998 recommends that normal operating pressure be confined to 25%-75% of the scale. If pulsation is present in the process, maximum operating gauge pressure should not exceed 50% of the full-scale range.

Step 3: The Environment

Environmental considerations include ambient temperature, air-borne particulate, condensation, humidity, water and chemicals, all of which can affect gauge performance.

Ambient temperature may affect the accuracy and integrity of the gauge. Gauges are available either temperature compensated or non-temperature compensated. Ambient conditions may require that the gauge be isolated from temperature extremes. When required, the gauge should be isolated from temperature extremes with flexible capillary.

When ambient conditions are corrosive, contain a large number of particulate or if the gauge will be exposed to a wet or humid environment like humidity, wash-downs or rain, specify a gauge that is weatherproof/hermetically sealed or liquid filled.

Step 4: Accuracy

For a mechanical pressure gauge, accuracy is defined as a percentage of the full-scale range.

While requirements differ from one industry to another, the following are general guidelines:

- Test Gauges and Standards: 0.25% through 0.10% full scale
- Critical Processes: 0.5% full scale
- General Industrial Processes: 1.0% Less Critical Commercial Uses: 2.0%

Refer to ASME B40.1-1998 or the DIN specifications for more information on accuracy.

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Step 5: Dial Size

Pressure gauge dial sizes range from 1½" to 16" diameters. Generally, readability requirements, space limitations and required gauge accuracy determine dial size. Accuracy's of 0.25% or 0.10% generally have dial sizes of 4½" or larger since more dial graduations are required.

Step 6: Gauge Connection

Gauges are available with a variety of connections including NPT, DIN, JIS, BSP & SAE. Process pressure gauges with 4½" dial sizes or larger are most often supplied with a ½" NPT connection to best support the gauge.

Factors to consider when selecting a pressure gauge connection include process pressures, gauge size and weight, space limitations, leak integrity, and past experience.

Step 7: Mounting Requirements

Consider the following mounting options when selecting a pressure gauge:

- Direct stem mount lower connect,
- Remote wall/surface mount lower connect,
- Panel surface mount back connect,
- Panel hole U-clamp flush mount back connect,
- Panel hole front flange flush mount back connect

Glossary Of Terms

Gauge Pressure -

Indicates pressure from a single source and uses ambient pressure as zero.

Absolute Pressure -

The pressure measured above a perfect vacuum. It's the pressure indicated by an ordinary gauge added to the atmospheric pressure.

Differential Pressure -

The difference between two independent, but related pressures.

Compound Pressure Gauges -

Indicate pressures above & below ambient pressure or positive & negative pressure.

Duplex Gauges -

Utilizes two independent sensing elements each connected to different but related pressure sources

This material was provided by Dresser Measurement – ASHCROFT GAUGES and INSTRUMENTS.



Pressure Gauge Selection