Pressure Gauge Selection, Installation, Operation and Maintenance Information Document



Gauges are supplied and, depending on model, are applicable to standards

- EN 837-1 Bourdon Tube pressure gauges, metrology, dimensions, requirements and testing
- EN 837-2 Selection and Installation recommendations for pressure gauges
- EN 837-3 Diaphragm and Capsule Gauges, metrology, dimensions, requirements and testing

WARNING:

Before installation, commissioning and operation, ensure that the appropriate pressure gauge has been selected in terms of design, measuring range and corrosion for the specific measuring conditions. In order to guarantee the measurement accuracy and long-term stability specified, the corresponding load limits must be observed. Pressure gauges should be selected considering media and ambient operating conditions. Improper application can be detrimental to the gauge, causing failure and possible personal injury, property damage or death. This information is offered as a guide in making the proper selection of a pressure gauge. Only qualified persons are permitted to install, maintain and service the pressure gauges. For hazardous media such as oxygen, acetylene, flammable or toxic gases or liquids, and refrigeration plants, compressors, etc., in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.

Non-observance of the respective regulations can cause serious injuries and/or damage to the equipment.

Important Considerations when selecting gauges:

<u>Range</u> – The range of the instrument should be approximately twice the maximum operating pressure. Too low a range may result in low fatigue life of the elastic element due to high operating stress and susceptibility to overpressure set due to pressure transients that exceed the normal operating pressure. Too high a range may yield insufficient resolution for the application.

<u>Media</u> – The material of the process sensing element must be compatible with the process media. Use of a diaphragm seal with the gauge is recommended for process media that is corrosive to the process sensing element, contain heavy particulates or are very viscous (including those that harden at room temperature).

<u>Oxidising Media</u> – For further information about gauges to be used with oxidising media please contact Trent Instruments with your requirement.

<u>Pulsation/Vibration</u> – For further information about gauges to be used in a pulsating or vibrating environment please contact Trent Instruments with your requirement.

<u>Gauge Fills</u> – Once it has been determined if a liquid filled gauge is required the type of fill is required.

- Glycerine satisfies most applications. While being the least expensive fill, its usable temperature range is -6°C to 82°C.
- Silicone filled gauges have a broader service range 4°C to 120°C.



Temperature considerations:

- <u>Ambient Temperature</u> To ensure long life and accuracy, pressure gauges should preferably be used at an ambient temperature, between -30°C to 65°C. At very low temperatures, standard gauges may exhibit slow pointer response. Above 65°C, the accuracy will be affected by approximately 1.5% per 35°C.
- <u>Accuracy</u> Heat and cold affect accuracy of indication. A general rule of thumb for dry gauges is 0.5% of full scale change for every 72°C change from 24°C. Double that allowance for gauges with hermetically sealed or liquid filled cases. Above 120°C there may exist very significant errors in indication.
- <u>Steam Service</u> In order to prevent live steam from entering the Bourdon tube, a syphon filled with water should be installed between the gauge and the process line. Syphons can be supplied with ratings up to 275 Bar (4,000 psi). If freezing of the condensate in the loop of the syphon is a possibility, a diaphragm seal should be used to isolate the gauge from the process steam. Siphons should also be used whenever condensing, hot vapours (not just steam) are present.
- <u>Diaphragm Seals</u> A diaphragm seal should be used to protect gauges from corrosive media, or media that will plug the instrument. Diaphragm seals are offered in a wide variety of designs and corrosion resistant materials to accommodate almost any application and most connections.

Installation:

<u>Location</u> – Gauges should be located to minimize the effects of vibration, extreme ambient temperatures and moisture. Dry locations away from very high thermal sources (ovens, boilers etc.) are preferred. If the mechanical vibration level is extreme, the gauge should be remotely located (usually on a wall) and connected to the pressure source via flexible tubing.

<u>Gauge reuse</u> – BSEN 837 recommends that gauges not be moved indiscriminately from one application to another. The cumulative number of pressure cycles on an in-service or previously used gauge is generally unknown, so it is generally safer to install a new gauge whenever and wherever possible. This will also minimize the possibility of a reaction with previous media.

<u>Tightening of gauge</u> – This should be done in accordance with the general technical regulations for pressure gauges (EN 837-2). When screwing the instruments in, the force required to do this must not be applied through the case, but only through the spanner flats provided for this purpose, and using a suitable tool. For parallel threads, use flat gaskets or lens-type sealing rings at the sealing face. With tapered threads (e.g. NPT threads), sealing is made in the threads using additional sealing materials, e.g. PTFE tape (EN 837-2) or Teflon tape and must be tightened very securely to ensure a leak tight seal. The torque depends on the sealing used. In order to orientate the measuring instrument so that it can be read as well as possible, a connection with clamp socket or union nut should be used. When a blow-out device is fitted to a pressure gauge, it must be protected against being blocked by debris and dirt. With safety pressure gauges there must be a free space of > 15 mm behind the blow-out back.

<u>Process isolation</u> – A shut-off valve should be installed between the gauge and the process in order to be able to isolate the gauge for inspection or replacement without shutting down the process.



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F: +44 (0)871 750 2387
E: sales@trentinstruments.co.uk Surface Mounting – Also known as wall mounting. Gauges should be kept free of piping strains. The gauge case mounting feet, if applicable, will ensure clearance between the pressure relieving back and the mounting surface.

Flush Mounting (also known as panel mounting) – Please enquire for further information if required.

Operational Considerations:

<u>Frequency of Inspection</u> – This is quite subjective and depends upon the severity of the service and how critical the accuracy of the indicated pressure is. For example, a monthly inspection frequency may be in order for critical, severe service applications. Annual inspections, or even less frequent schedules, are often employed in non-critical applications.

In-Service Inspection – If the accuracy of the gauge cannot be checked in place, the user can at least look for erratic or random pointer motion or readings that are suspect - especially indications of pressure when the user believes the true pressure is 0 Bar. Any gauge which is obviously not working or indicating erroneously, should be immediately shut-off at the valve or removed from service to avoid a possible pressure boundary failure.

When to check accuracy – Any suspicious behaviour of the gauge pointer warrants that a full accuracy check be performed. Even if the gauge is not showing any symptoms of abnormal performance, the user may want to establish a frequency of bench type inspection.

When to Recalibrate – This depends on the criticality of the application. If the accuracy of a class 2.5% commercial type gauge is only 0.5% beyond specification, the user must decide whether it's worth the time and expense to bring the gauge back into specification. Conversely if the accuracy of a 0.25% test gauge is found to be 0.1% out of specification then the gauge should be recalibrated.

Other Considerations – Including:

- Bent or unattached pointers due to extreme pressure pulsation
- Broken windows which should be replaced to keep dirt out of the internals
- Leakage of gauge fill
- Case damage dents and/or cracks
- Any signs of service media leakage through the gauge including its connection -
- -Discoloration of gauge fill that impedes readability.

Gauge Replacement – If any of the following points are noticed, gauge replacement should be strongly considered:

(A) Gauges that exhibit a span shift greater than 10%. It is possible the Bourdon tube has suffered thinning of its walls by corrosion.

(B) Gauges that exhibit a zero shift greater than 25%. It is likely the Bourdon tube has seen significant overpressure leaving residual stresses that may be detrimental to the application.

(C) Gauges which have accumulated over 1,000,000 pressure cycles with significant pointer excursion.

(D) Gauges showing any signs of corrosion and/or leakage of the pressure system.

(E) Gauges which have been exposed to high temperature or exhibit signs of having been exposed to high temperature – specifically 120°C or greater for soft soldered systems.



<u>Storage</u> – To protect the pressure gauges from mechanical damage keep them in the original packaging until installation. Protect the measuring instruments from humidity and dust. Storage temperature range: -40 to +70 $^{\circ}$ C.

If you have any other questions or queries please contact Trent Instruments:

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