

## GENERAL INFORMATION ABOUT PRESSURE GAUGES



### INTRODUCTION

PCI's gauges are tested and manufactured under ISO 9001 quality standards and comply with the following.

#### Testing

EN 837-1 (part 1) Bourdon tube pressure gauge  
EN 837-2 (part 2) selection, installation and recommendations  
EN 837-3 (part 3) diaphragm and capsule pressure gauge

#### Connection threads

All PCI gauges have threads according to :  
EN 837-1/7.3.1 – 7.3.2 – 7.3.3 and 7.3.4. Parallel pipe thread (symbol G) according ISO 228-1.  
Tapered pipe thread (symbol NPT) according ANSI/ASME B1.20.1.

#### Full safety pattern gauges

Safety pattern solid front type with baffle wall to EN 837-1/9.7.2/S2-S3 (old DIN design 16006/UNI8541/BS1780).

#### Weatherproof standard for gauges

IP54, IP55, IP65 (IEC529).

#### Oxygen and acetylene version

Wetted parts materials comply with EN 29539 and EN 837-1/9.7.2/S1.  
Free of oil and grease.

#### Certified material specification

All stainless steel and other exotic materials used in PCI production for connections, flanges, bourdon tubes, diaphragms (wetted gauge process parts) etc. are traceable, all materials are according to DIN EN 10204 – 2.2 or 3.1 (b).

#### PED directive

All the PCI pressure gauges are manufactured according to PED directive with release of relative certification for ranges starting from 200bar.

#### ATEX directive

All the PCI pressure gauges, on request may be manufactured with ATEX certification and are supplied complete with mark as required.

#### Quality control

PCI's instruments are produced under the rigid codes of the instrumentation industry and QA standards EN-ISO9001:2008. Our company ISO procedures are continuously controlled and monitored by NQA.

**GAUGE SELECTION GUIDE**

The following requirements must be considered when selecting a pressure gauge:

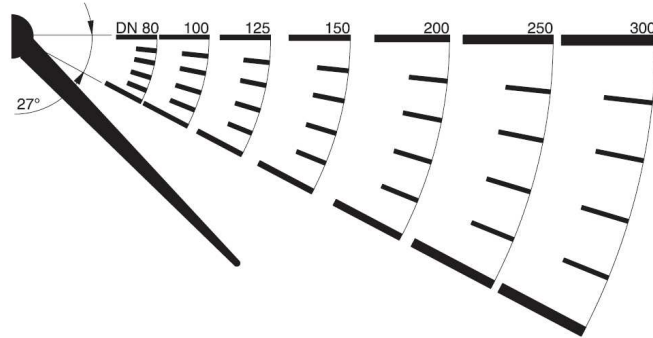
1. Position
2. Working conditions
3. Accuracy

These will be analyzed with the possible options for each requirement

**1. POSITION**

Instrument diameter must be chosen in relation to distance between installation point and reading position to ensure the operator can see the graduated scale reading.

On the right is a representation of legibility of scale subdivision in relation to instrument diameter.



27° = 1/10 scale angular extension

EN 837-1 outlines a number of approved connection positions for pressure gauges.

|                        | Direct Mounting | Surface Mounting               | Flush Mounting<br>3-hole fixing | Flush Mounting<br>Clamp Fixing |
|------------------------|-----------------|--------------------------------|---------------------------------|--------------------------------|
| Radial Connection      | <br>Type 10     | <br>Type 11                    | <br>Type 12<br>(not preferred)  |                                |
| Centre Back Connection | <br>Type 20     | <br>Type 21<br>(not preferred) | <br>Type 22                     | <br>Type 23                    |
| Offset Back Connection | <br>Type 30     | <br>Type 31<br>(not preferred) | <br>Type 32                     | <br>Type 33                    |

## 2. WORKING CONDITIONS

It is important to know the working conditions the gauge will be operating in. Things to consider are:

- **Fluid Nature**
- **Fluid Temperature**
- **Working Pressure**
- **Pulsating Pressure**
- **Vibrations**

The gauge's efficiency and life depend on knowing the above conditions.

|                           |   |
|---------------------------|---|
| <b>Fluid Nature</b>       | <b>Clean and inert</b> : the whole range of a standard instruments may be used.<br><b>Sedimentary</b> : only instruments with diaphragm seal or Schaeffer type gauge may be used.<br><b>Corrosive</b> : the whole range of instruments may be used but manufactured with materials suitable to resist the corrosive action of the fluid or with a chemical seal.  |
| <b>Fluid Temperature</b>  | <b>Up to 100°C</b> : no special feature is required .<br><b>Between 100°C and 150°C</b> : it is suggested the use of a syphon or a cooling tower to remove the gauge from the hot point to reduce the temperature to the sensing element.<br><b>Over 150°C</b> : instruments must be made with materials suitable to resist the high temperatures. It is suggested the use of a cooling tower and/or a chemical seal are used at such temperatures, it is essential to specify such high temperatures in order to compensate the negative effect on the accuracy. |
| <b>Working Pressure</b>   | Select a gauge with a full scale pressure range of approximately twice the normal operating pressure. The maximum operating pressure should not exceed 75% of the full scale range for more than 12 hours. Selecting a gauge outside these criteria may ultimately result in fatigue failure of the bourdon tube.   |
| <b>Pulsating Pressure</b> | In the presence of pulsating pressure (presses, pumps, hydraulic power packs, compressors, etc.) generating rapid and continuous variations, we suggest using AISI316 "C" type Bourdon springs for pressure lower or equal to 60bar max scale, and "flat spiral" type for higher pressures. Moreover we suggest using reinforced movements and external pulsation dampeners and filling the case with dampening fluid (glycerine, silicon oil...).  |
| <b>Vibrations</b>         | If possible, it is better to avoid mechanical vibrations.<br><br>If it is necessary to mount the instrument on a rigid wall and connect the pressure via capillary. We suggest to put between the wall and instrument an anti-vibration rubber element.<br><br>In vibrating installations such as turbines, pumps, motor compressors, control stations, vibrations, dampers it is necessary to use instruments with reinforced movements and filled with dampening fluid such as glycerine.   |

## 3. ACCURACY

All PCI gauge accuracy classes are standard according to EN837-1/6.

The classes within EN837 are defined as 0,1% - 0,25% - 0,6% - 1% - 1,6% - 2,4% - 4%.

PCI gauges comply also with American Standards ASME B40.1 Grade B, Class 3/2/3% and 1,5%, ASME B40.1 Grade 1A, Class 1%, ASME B40.1 Grade 2A, Class 0,5%, ASME B40.1 Grade 3A, Class 0,25%, ASME B40.1 Grade 4A, Class 0,1%

## SAFETY PATTERN TYPES

Under EN 837 there are 3 acceptable case designs for pressure gauges.

Type 1: standard gauge without blow-out device. (S1)

Type 2: standard gauge fitted with blow-out disc but without baffle wall.(S2)

Type 3: safety pattern gauge with baffle wall. (S3)

## PRESSRE SENSING ELEMENT

The main types of pressure elements are :

- Bourdon tube type
- Schaeffer
- Capsule or bellow

**Bourdon tube pressure gauge:** the sensing element is a metal tube drawn in elliptical section and shaped in form a “C” , or spiral. One end is closed while the other is joined to a socket from which the process connection is manufactured. The tube is linked to a movement where the pressure or depression can be measured. Movement is than transferred to the pointer. The application range of these instruments starts from –1 to 2500bar.

**Schaeffer type pressure gauge:** The sensing element is a corrugated horizontal diaphragm deformed by the action of the pressure. Movement is than transmitted to the pointer. The application range of these instruments starts from –1 to 25 bar.

**Capsule or bellow type pressure gauge:** The sensing element is a capsule or a bellows deforming under the action of the pressure and to which a spring situated inside the sensing element is opposed. Movement of the bottom of the capsule or of the bellows is than transmitted to the pointer. The application range of these instruments starts from –6000 to +6000 mmH<sub>2</sub>O.

