REFERENCE

EN 837-1
ANSI B 40.100
IS 3624

CERTIFICATE

ISO 9001 : 2008
ISO 14001 : 2004
BS OHSAS 18001 : 2007
CE - PED
ATEX

1 The recommendations are taken from the text of the EN837-1/2/3 and ANSI B40.1 standards, which the user must put the instruments into service. Safety results from the careful selection and installation of instruments in the pressurized system as well as from compliance with the maintenance procedures set out by the manufacturer, the user is entirely responsible for ensuring correct installation and maintenance. The persons charged with selection and installation of the instruments must be able to recognize the conditions that may negatively impact on the instrument's ability to perform its function and which may lead to premature failure. In order to correctly specify the functional and constructive characteristics of the instruments it is recommended to consult the most up to date version of the catalogue / data sheets.

2 SELECTION CRITERIA

Operating Pressure Range- The instruments selected should have a full scale pressure ranges such that the operating pressure occurs in the middle half (Between 25% & 75% of FS) of the scale. The full scale pressure of the gauge should be the approximately two times the intended operating pressure. A black triangle symbol on the scale end of the dial indicates that the operating pressure may reach 90% for pulsating pressures and 100 % for static pressures.

3 The following application must be considered potentially dangerous and carefully specified.

Application	Paragraph
Systems containing compressed gas	4
Systems containing oxygen	5
Systems containing corrosive fluids in a liquid or gaseous state	6
Systems containing pressurized steam	7
Systems subject to dynamic or cyclical Pressures	8 & 9
Systems in which over pressures may accidentally be applied or in which low pressure gauges may be installed on high pressure couplings	10 & 11

4 In system containing compressed gas , its advisable to select an instruments equipped with an adequate safety device. In the event of unexpected failure of the measuring element, the safety device allows the compressed gas to escape outside the case, thereby preventing the instrument from fracturing. The safety patterns employed on Itec instruments are designed type on S1 when the consist of the a release valve which open when the pressure inside the sealed case exceeds an established safety limit putting it in communication with the outside, and are designated type S3 when the safety consist of on entire blow out back and there is an added baffle wall separating the measuring element from the clear solid front , providing further protection to the operator. Select an instruments an adequate level of protection, consulting the following tables (Table 1 & 2).

TABLE 1

Pressurized Fluid	Liquid							
Case Filling	None				Liquid Filled			
DN	< 100		= 100		< 100		=100	
Range (Bar)	=25	>25	=25	>25	=25	>25	=25	>25
Safety Code	0	0	0	0	S1	S1	S1	S1

TABLE 2

Pressurized Fluid	Gas or Steam							
Case Filling	None				Liquid Filled			
DN	< 100		= 100		< 100		=100	
Range (Bar)	=25	>25	=25	>25	=25	>25	=25	>25
Safety Code	0	S2	S1	S3	S1	S2	S1	S3

Explosive Failure

This occurs as a result of the violent release of thermal energy due to a chemical reaction, such as adiabatic compression of oxygen in the presence of Hydrocarbons. It is generally accepted that the effects of this type of failure cannot be anticipated. Even the use of solid front instruments does not exclude against the projection of fragment towards the front of the instrument. Pressure gauges suitable for use with oxygen are marked “OXYGEN -Use No Oil" and / or with a "crossed out oil can" symbol on the dial. The instruments are supplied already washed and degreased using appropriate products and packed in polyethylene bags. The user must take the necessary precautions to ensure that the pressure gauges have been unpacked.

Corrosion Failure

This occur when the material of the measuring element is weakened through at the corrosive chemicals present either in the media inside or the environment around it. Failure may occur as a pinhole leakage or early fatigue failure due to stress cracking brought out by the chemicals detrition of the material. In such a case the use of a fluid separator may influence the sensitivity or accuracy or both. As an alternative to a fluid separator , it is possible to consider choosing a measuring element made from AISI316 or Monel400, rather than the phosphor Bronze. The measuring element is generally characterized by its thickness and therefore works under considerable mechanical stress. Chemical compatibility with the pressure fluid must therefore be taken in to account. Non of the commonly used materials can be considered immune to chemical attack and various factors can influence its extent. Concentration, Temperature and the type of mixture of the various Chemicals Substances. Chemical attack can rapidly lead to corrosion failure.

Regardless of the material with which the unit has been made or welded (Connection to the process, Bourdon tube, terminal) it is not advisable to use the pressure gauges at temperature exceeding ambient 65 °C (150°F). It is recommended to use a trap in cases where the pressure gauges is used with steam or liquid media at high temperature. A trap or similar device (syphon) should always be fitted near the instrument and filled with condensed fluid before pressurizing the system, so as to prevent the hot fluid from reaching the instrument during the initial pressurize. The fluid should not be allowed to freeze or crystallize inside the measuring element. However, if the instrument is used for measuring points at high temperature , it is recommended to use a hose with inside diameter of at least 6mm to connect it to the pressure coupling, A hose about 1.5-2 meters long reduces the effective operating temperature to approximately ambient level. If the type of fluid does not permit the use of a small section hose, it is often necessary to insert a separator (snubber) between the process fluid and the instrument, provided that the transmission fluid is suitable for temperature of the process fluid.

Dynamic or Cyclical Pressure

These are generally encountered when the instruments are installed on pumps , and result in a significant reduction in the lifeline of the measuring element and the amplifying mechanism of the pressure gauge. Such pressure are generally indicated by broad fluctuations of the pointer. It is necessary to minimize this type of pulsating pressure by fitting a snubber between the source of the harmful effect of pulsation on the moving parts of the pressure gauges. Incorrect selection of the instrument may result in fatigue failure.

Fatigue Failure

This is caused by mechanical stress resulting from the pressure and takes the from of a small crack from the inside to the outside. Generally along an edge . Such failure are more dangerous when the measured medium is a compressed gas rather than a liquid. Fatigue failures release the fluid gradually, and therefore the case pressure build - up is indicated by the opening of the relief valve. when measuring high pressures , the process operating is close to the maximum permissible stress limit, and can therefore result in an explosive failure. In this case a choke(Snubber/ Dampening Screw) should be fitted on the instrument's coupling in order to limit the flow of liquid.

Over-pressure

Any over-pressure subject the measuring element to stress, with a consequent reduction in its life span and accuracy, It is therefore always advisable to choose an instrument whose full scale pressure is greater than the maximum operating pressure so that it is better able to withstand over-pressures and pressure surges. Pressure surges can be handled in the same way as pulsating pressure. Over - pressure of longer duration can be handled by installing a pressure reducing valve (Gauge Saver) on the pressure gauge line. The occurrence of even a single over-pressure event can result in an over-pressure failure.

11 **Over-pressure Failure**

This is caused by application of internal pressure greater than the rated limits of the measuring element and can occur when a low pressure gauges is installed on a high pressure system. The effects of this type of failure, generally more serious in compressed gas applications, are unpredictable and may result in instrument fragments being projected in all directions. The opening of the safety device on the case does not always guarantee containment of the fragment. It is generally accepted that using an instrument with a solid front and Blow -Out back reduces the possibility of fragments being projected toward the front of the instrument, where the operator stop to take readings. The clear front alone does not provide adequate projection, and in fact is the most dangerous component in such a case. Over-pressure pulses of short duration (Spikes) can occur in pneumatic or hydraulic systems. especially when valves are opened or closed. The amplitude of such can be many times the operating pressure, and the great speed at which they occur prevents them from being read out on the instrument, making them invisible to the operator. They can result in definitive breakage of the instrument or a permanent zero error. A choke (Snubber / Dampening Screw) reduces the amplitude of the over-pressure spike that reaches the measuring element. The use of pressure limiting valve protects (Gauge Saver) the instrument from all pressures which exceed the calibration limit of the valve. thereby protecting the instrument from over-pressures

12 **Vibration Failure**

The most common mode of vibration failure is that where the movement parts wear because of high cyclic loading caused by vibration resulting in a gradual loss of accuracy and ultimately, failure of the pointer to indicate a pressure change.

13 **Vibration-Induced Failure**

Large amplitude vibrations may in some instances cause fatigue cracks in the measuring element. In this case the pressure build-up may be slow or fast, or even explosive.

14 **Vibrations**

When the pressure gauge support is subject to vibrations, various solutions may be considered, such as: a) The use of liquid -filled gauges; b) if the vibration are strong or irregular, the instruments must be mounted at a distance and connected using a flexible hose or tubing. The presence of vibrations is indicated by continuous, often irregular fluctuations of the pointer.

15 **Liquid Filled Cases**

Liquid Filling is generally used to dampen the vibrations of moving parts due to vibrations and / or pulsations. Great care must be taken in choosing the damping liquid for instruments that will be used with oxidizing media such as oxygen, chlorine, nitric acid hydrogen peroxide, est.,. In the presence of oxidizing agents, there is possible risk of chemical reaction, ignition and explosive of the instrument. In this case it is necessary to use fluorine or chlorine based filling liquids /Jellyfilled Movement to use .In order to contain the damping liquid inside the case, the pressure gauges are built and supplied in a sealed construction. In some cases, during installation it is necessary to ventilate the case following the instructions on the label affixed to the instrument itself. Special care must be taken with the type of filling liquid used and its usage limitations as a function of ambient used (Table.3)

TABLE 3

Filling Liquids	Ambient Temperature
Glycerin 98%	+15…… 65 °C (+60….+150°F)
Silicon Oil	- 45…… 65 °C (+60….+150°F)
Fluoridated Liquid	-45…… 65 °C (+60….+150°F)

16 In case of radial mounting , especially if the case is filled with damping liquid and the vibrations are extensive , the possibility of failure resulting from considerable vibrating mass of the pressure gauges must be taken into account .In such cases a threaded 1/2" coupling to the process line is an essential minimum requirement.

INSTALLATION

17

To facilitate removal for maintenance purposes, a shut - off valve can be installed between the pressure gauges and plant . The pressure connection must be watertight . If the pressure connection has a cylindrical thread , the seal is achieved using an O-Ring clamped between the two flat sealing surfaces, one on the pressure connection and the other on the instrument's process connection. If the pressure connection has a tapered thread, the seal is achieved by simply screwing the connection onto the coupling through the mating of the threads . It is common practice to wrap PTFE tape around the male thread before coupling. In both cases the torque must be applied using two hexagonal spanners , one on the flat faces of the instruments / process coupling and the other on the pressure connection. Do not use the case as a means of tightening as this may cause damage to the instrument. When Pressurizing the system for the first time , check the tightness of the connection seal . All instruments must be mounted in such a way that the dial is vertical, unless otherwise indicated on the dial itself. When the instrument includes a safety device, this must be at least 20 mm from any other object. For wall or panel mount instruments make sure that the pipe conveying the pressurized fluid is connected to the instrument coupling without exerting torsion or force.

INTENDED USE

18

It is not advisable to use the instruments for measuring pressures near zero, as in that range the accuracy tolerance can represent a significant percentage of the applied pressure. For this reason , these instrument should not be used for measuring residual pressures inside large volume containers tanks, surge tank and the like . In fact, such containers may retain pressures that are dangerous for the operator, even when the instrument indicates a zero pressure. It is recommended to install a ventilation device on tanks in order to achieve zero pressure before removing covers are connections, or performing similar tasks. ambient Temperature -It is difficult to insulate the instrument from ambient temperature that are too high or too Low. One solution is to position it further away form the source of cold or heat , when this is possible. If an instrument of accuracy class 0.6 or higher is used at an ambient temperature different from the reference value (20°C ± 2°C), It is necessary to make a correction it is not advisable to successively install instrument on systems with different operating media, to avoid initiating chemical reactions that may cause explosions resulting from contamination of the wetted parts. If the instrument dial indicates a fixed pressure for a prolonged time, make sure that is not due to an obstruction of the pressure elements supply pipe. Especially in the cause of a zero o pressure reading, make sure that there is effectively zero pressure inside the instrument before removing it, by isolating is using the shut off valve.

MAINTENANCE

19

The general safety of an installation often depends on the operating condition of the instruments which it contains. It is essential that the instruments indicated by these instruments are reliable. Therefore, any instruments which appears to give an abnormal readout if necessary. Maintenance of accuracy should be confirmed by routine checks & must be carried out by competent personnel using suitable testing equipment. Every 3/6 months after installation, check the accuracy and the wear on moving parts and the state of corrosion on the measuring element. For instrument used on plant subject to demanding conditions(Vibrations, Pulsating pressures, corrosive media, sediments est.) replace them after the time intervals indicated in the plant procedures. The calibration and testing must be compatible with the measured media in the pressurized system. **Fluids containing hydrocarbons must not be used when the measured medium is oxygen or any other oxidizing substance.** Instrument kept in their original standard packing (cardboard box) must be stored in a closed area and protected from moisture: in this case no special attention is required .If the instruments are packed in special materials (Wooden crates lined with tar paper or barrier bags) it is preferable to store them in a closed room if possible, or in any cause in an area protected from the elements, the condition of packed materials should be checked every 3-4 months, especially if the crates are exposed to the elements. The temperature of the storage area should be between -20 and +65°C, except where otherwise specified on the catalogue data sheet. Mechanical stress -Pressure gauges must not be subjected to mechanical stress. If the installation points are subject to mechanical stresses , the instrument must be installed at a distance and connected using flexible hoses . The instruments selected must be of the surface, wall or panel mount type. The characteristic of the instruments may be must effected during transport, despite adequate packing, and must be checked before use. Correct calibration can be checked by excluding the instrument from the process by means of the shut off valve and checking that the pointer returns to the zero mark (Unless the temperature varies greatly from 20°C) Failure of the pointer to return to zero indicates serious damage to the instrument.