LR-Cal

DRUCK & TEMPERATUR LEITENBERGER

User guide

BOURDON TUBE PRESSURE GAUGE

001-DS160 / 010-DS100
018 / 183 / 020 / 203

1. General information

The instrument described in this manual has been designed and produced in compliance with the following standards:
EN 837-1-2 and ASME B40.1. All components are submitted to severe quality and traceability controls. The quality management system is certified according to the ISO 9001 standard. This manual contains important information about the use and the installation of the gauge in safe conditions. Therefore, reading the following instructions carefully before use is highly recommended.

This instrument works in safe conditions when selected and installed correctly in the system and when the instructions concerning it as well as the maintenance procedures established by the manufacturer are respected.
The staff charged with the selection, installation and maintenance of the instrument must be able to recognize the conditions that may negatively affect the instrument ability to work and which may lead to premature breakage. The staff must be, therefore, technically qualified and properly trained, to carry out the procedures established by the plant regulations.

Standards
Directive P.E.D. **2014/68/EU**
LEITENBERGER instruments are designed and manufactured according to the safety rules included in the safety international standards in force. According to the **2014/68/EU** standard the LEITENBERGER pressure gauges are classified within 2 categories:
PS ≤200 bar these instruments may not satisfy completely the essential safety standards but they have to be designed and manufactured according to a SEP-Sound Engineering Practice. No CE marking is required on them.
PS >200 bar these instruments should satisfy the essential safety standards established by the PED, they are classified as category I and they are certified according to Form A. They should bring the CE marking as the one shown below.

CE

1.1 Intended use
These instruments are designed to be used in food, processing, pharmaceutical, petrochemical industries and for conventional and nuclear power plants. They are built to resist to the most severe conditions created by the process medium and by the environment. They are designed to work with non-crystalizing highly viscous fluids.

2. Installation

Attention	**Before installation ensure that the instrument has been selected correctly according to the working conditions and in particular to the range, the working temperature and the compatibility between the material and the process fluid.**
Attention	**This manual does not concern the instruments as per standard 2014/34/EU (ATEX).**
Attention	**The product warranty is no longer valid in case of non-authorized modifications and improper use of the product.**
Warning	**The manufacturer disclaims all responsibility in case of damages caused by the improper use of the product and by the non-respect of the instructions reported in this manual.**
Warning	**Follow the specific safety rules carefully when oxygen pressure, acetylene, inflammable or toxic gas or liquids are involved.**
Attention	**The user is totally responsible for the instrument installation and maintenance.**
Warning	**Disconnect the instruments only after depressurization of the system.**
Warning	**The process fluids remaining in the disassembled gauges may affect people, the environment and the system. Proper precautions are highly recommended.**

In order to verify the working and manufacturing features of LEITENBERGER instruments, read the catalogue sheets in their most up-dated edition available on-line on **www.druck-temperatur.de**

The instrument installation should be carried out according to standard EN 837-2 (Recommendations for pressure gauges installation and selection)

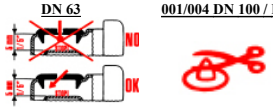
- The gauge should be connected to the process system forcing through a special wrench on the process connection point without forcing on the case by the hands. As for process connections provided with cylindric threading, a head gasket compatible with the fluid to measure should be used. In case the connection threading is conic, additional sealing materials should be applied on the thread (PTFE tape).
This procedure is not suitable for cylindric threading.

- Installation must be performed according to **EN 837- 1**, Chapter 8. The user is responsible for any other combination which is not described in the above- mentioned regulation.
- The torching procedure, which is necessary to ensure a suitable tightness, depends on the measuring range, on the threading type and on the gasket type.

Instrument with marking ⚠3
Instruments with the DIN 11851 connection must be installed using special gaskets type SKS.
Instruments with process connection conformed to ISO 2853 (IDS/ISS) must be installed using gaskets with supporting ring as described in the above-mentioned directive.

- When a low scale range pressure gauge is installed it is necessary to ventilate the case following the instructions shown on tags applied on the gauge. This procedure allows to bring the internal pressure of the case back to the atmospheric pressure value.

DN 63 **001/004 DN 100 / DN 150**



- In case of fluid leakage during mounting, a careful cleaning is highly recommended.
- As for gauges with security device, a free space on the back side measuring at least 20mm, should be maintained during installation.
- As for gauges with full painting, which is necessary to protect it from corrosive atmospheres, it is essential that the safety device operates properly.
- As for gauges with surface mounting and back connection ensure that the pipe containing the fluid under pressure is connected to the instrument connection without tensions.
- In order to guarantee an accurate measuring procedure, it is necessary to respect the working limits described in the catalogue sheets.
- These instruments should be installed where vibrations are taking place. If the mounting point is not stable because of vibrations, the instrument should be supported using a clamp or a flange or a flexible capillary when possible.
- If vibrations cannot be prevented during installation, we suggest choosing liquid filled instruments.
- According to standard EN 837-1 /9.6.7, the instrument mounting has to be vertical. Different calibration and mounting (when requested) are shown on the dial.
- Instruments must be protected from significant ambient temperature variations.
- Instruments must be protected from sun radiations during operation in order to prevent overheating.
- Liquid filled instruments working within temperatures under 20°C, may have higher response times because of the filling liquid increased viscosity.
- During installation, ensure that the fluid and the ambient temperatures are not affected by heating radiations which may affect the real values. The temperature influence on the accuracy value has to be taken into account.
- During the first operating procedure, pressure spikes should be prevented. The interception valves should be opened slowly.
- The use of instruments measuring zero values is not recommended especially in gauges in which the first section of the scale has been suppressed.
-these instruments should not be reused on plants operating with other process fluids in order to prevent chemical reactions during which explosions may engage owing to the instrument wetted parts are contamination.
- If the pressure indication remains steady for a long time, the pipe, conveying pressure to the sensing element, might be clogged. When the pressure level is zero, the gauge must be insulated through an interception valve before disassembling.

3. Use limits

3.1 Process and ambient temperature
This standard type instrument is designed to be used in safety conditions i.e. in an ambient temperature between –40C° and +65°C. As for the filled model, please see the paragraph "DAMPENING LIQUID FILLING"
As for instruments provided with stainless-steal measuring systems, it is necessary to cool the process fluid in case of process temperatures from 150 °C up. Moreover, the use of siphons, temperature dissipators or capillaries is recommended. In case of temperatures below 0°C, the use of liquid filled gauges is recommended in order to prevent some components from freezing. The fluid inside the sensing element must neither freeze nor crystalize.

3.2 Working pressure
The choice of an instrument supporting a working pressure ranging between 25% and 75% of the full-scale range is recommended. The full-scale range should be approximately twice the working pressure value. If the instrument is provided with a small black triangle placed on the dial scale range, it means that the working pressure could reach 90% when operating with pulsating pressures and 100% when operating with static pressures.

3.3 Dynamic and cyclic pressures
When dynamic or cyclic pressures take place, the pointer starts to oscillate. The sensing element's and the amplifying movement's life might be reduced by them. Therefore, it is necessary to reduce the pulsating pressures placing a dampener or a reducing valve between the pressure source and the instrument. The harmful effect of pulsations could also be reduced by filling the case with a dampening liquid. An incorrect choice of the instrument may bring to a stress breakage.

3.4 Overpressure
Overpressure stresses the sensing element reducing its life and accuracy. Therefore, it is always better to use an instrument whose scale range is bigger than the maximum working pressure and which is able to absorb overpressures and pressure shocks. Pressure shocks can be treated in the same way as pulsating pressures. Overpressure could break the elastic element instantly.

3.5 Vibration
Vibrations can be detected by continuous and often irregular oscillations of the case and the pointer. When the instrument is affected by vibrations, the use of liquid filled pressure gauges is recommended.

3.6 Safety device
In systems working with compressed gas, the use of an instrument with a proper safety device complying to standard EN 837-2 is recommended. In case of unexpected breaking of the sensing element, the compressed gas is able to expand outside the case through the safety device.

3.7 Dampening liquid filling
The dampening liquid is generally used to protect the moving parts from vibrations. It reduces the usage of the rotating parts considerably and increases either the instrument resistance to stress and the instrument readability, preventing pressure from falling suddenly. In case oxidant fluids such as oxygen, chlorine, nitric acid, hydrogen peroxide, the dampening liquid must be chosen extremely carefully.
Oxidant agents may develop a dangerous chemical reaction involving the instrument explosion as a consequence. In this case a proper filling liquid must be used.
The dampening liquid type should also be chosen considering the working temperature, the liquid viscosity degree and the expected damping level.
As for working temperatures of liquid filled instruments please see the instrument catalogue sheet.

3.8 Protection within an explosive environment
If pressure gauges are used in a potentially explosive atmosphere, special procedures must be followed. The directive regarding ATEX products 94/9/CE concerns pressure gauges with electrical devices and mechanical pressure gauges.
In order to choose the right product, please see the concerning catalogue sheet and manual.

4. Wrong application

4.1 Failure for Fatigue
If pressure varies very frequently, the elastic element's life may be reduced because of the pointer oscillating movement. Failures, which could be more dangerous when measuring compressed gas instead of liquids, engage a pressure increase inside the case. At this point, the safety device opens. In case of operation engaging high pressure, an explosion may develop. The use of a dampening liquid filled instrument is recommended. Moreover, in order to shrink the pressure entrance conduit, a restrictor screw or an adjustable dampener is recommended as well.

4.2 Failure for Overpressure
Overpressure might damage the product unexpectedly and even more seriously when compressed gas is involved. An explosion of the instrument may develop and debris may be deflected all around. The safety device opening does not always prevent the fragments from spreading out. If the risk of breakage for overpressure is real, we recommend using a solid front blow-out back instrument. This model prevents the operator from being hit by the instrument's fragments. The glass alone does not guarantee a proper protection, on the contrary, it represents the most dangerous component. Short overpressure pulsations could develop in pneumatic or hydraulic systems, especially after the valves opening or closing. The amplitude of these pulsations can often be higher than the working pressure and their high velocity affects the instrument reading so that the operator cannot be aware of them. These pulsations can bring to a complete breakage of the instrument or to a permanent zero error. Also in this case the application of a choking element may reduce the overpressure spike amplitude transmitted to the sensing element. The use of a limiting pressure valve protects the instrument from all pressures higher than those to which the valve itself is calibrated protecting the instrument form overpressures.
The bourdon tube pressure gauges as well can be designed in order to resist to overcharges.
A clamp is mounted inside the gauge so the tube should not be extended furtherly.

4.3 Failure for Corrosion
The compatibility with the process medium is essential in preventing failure for corrosion. The sensing element thickness is reduced, therefore it works in conditions of stress caused by corrosion. None of the most common materials is able to resist to a chemical attack whose intensity depends on many factors such as the medium concentration, temperature and the type of chemical mix.
In this case a suitable diaphragm seal is recommended.
The customer is entirely responsible for the choice of the instrument material which has to be as much compatible as possible with the process medium.

4.4 Failure for Explosion
After a violent release of thermal energy due to some chemical reactions such as the adiabatic compression of oxygen in presence of hydrocarbons, an explosion may occur. Even the use of a solid front gauge cannot prevent the front window of the gauge itself from spreading around.

Pressure gauges suitable for use with oxygen are marked with:

OXYGEN

"Oxygen - No lubrification" and/or they are marked with a crossed-out oil can symbol on the dial

Instruments are properly cleaned and degreased with special products and packed in polyethylene bags. The user must take the necessary precautions to ensure that the connection and the elastic element are clean after unpacking.

4.5 Failure for Vibration and Shocks
Vibrations generally produce an abnormal deterioration of the parts in movement up to a progressive loss of accuracy and then to a complete stop of the pointer.
Vibrations could also produce stress cracks in the sensing element's structure involving a liquid leakage and even an explosion.

5. Maintenance

Instruments original characteristics should be maintained over time according to a special maintenance program which has to be drawn up and managed by qualified technicians.
The maintenance program consists in the cleaning of the external parts of the instrument by means of a humid cloth, checking the pressure indication accuracy, checking of the gaskets tightness state, checking inside the case to prevent the condensate to develop, checking the glass, the case and the general safety device conditions.
Heavy work instruments operating in severe conditions plants (vibrations, pulsating pressures, corrosive or sediment fluids, fuel or inflammable fluids) should be replaced according to the maintenance program. In case the instrument does not work properly it is necessary to proceed to an extra-checking procedure.
Instruments should store instruments in their original packaging and placed indoor and protected from humidity. Temperature in the store area should be between –25 and +65°C unless otherwise indicated.
If instruments are handled without care, the metrological features could be affected even if they are packed properly.
Instruments should be checked before use. As far as the zero-free instruments are concerned, the null-pressure pointer could be inside the zero span.

5.1 Routine check
In order to verify the sensing element conditions, the instrument should be installed on the pressure generator adding an interception valve between them. The maximum pressure value should be applied to the gauge while the valve isolates it from the pressure source. Any possible leakage of the sensing element may be noticed by the slow return of the pointer to zero.

5.2 Recalibration
If after recalibration results are different from the nominal values declared on the catalogue sheet the recalibration procedure should be repeated. For this procedure, instruments have to be returned to **LEITENBERGER.**

LEITENBERGER will not be responsible for all nonauthorized intervention on the instrument. In case of non-authorized modification of the instrument the contract warranty and the CE Conformity Declaration is no longer valid.

6. Disposal

An inappropriate disposal procedure can be dangerous for the environment. The instrument components and packing materials disposal process must follow an eco-compatible procedure and must comply with the national standards. The fluid remaining inside the instrument could be dangerous or toxic to the environment and to people.

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