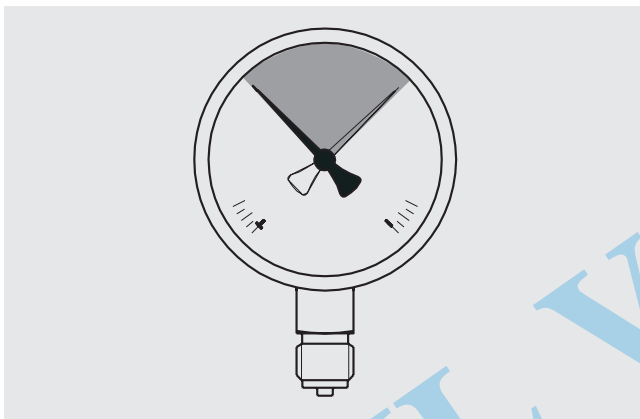


# Selection, Installation, Handling and Operation of Elastic Element Pressure Gauges

WIKA Data Sheet IN 00.05

## General

The user must ensure that the appropriate pressure gauge, with respect to scale range and performance, is selected. The optimal selection of the scale range occurs when the operating pressure lies in the middle third of the scale range.



The pressure gauge should be installed in such a way as to avoid exposure to heat and vibration and to enable the dial indication to be easily read.

The pressure connections must be sealed.

It is common practise to install an isolating device between the pressure tapping point and the pressure gauge, to enable the gauge to be replaced and the zero point to be checked while the Plant is running.

## Isolating devices

The isolating device may be either a pressure gauge cock or a pressure gauge valve, depending on operating conditions and requirements.

## Pressure gauge cocks feature three positions:

- **Gauge vented** The service connection is closed and the pressure element is open to atmosphere. The zero point can be set.
- **On** The service connection is open, the pressure element is pressurised.
- **Purging** The service connection is open; the pressure medium is vented to atmosphere. The pressure element is not in use.

Pressure gauge valves, either with or without a test connection (DIN 16270 or 16271 resp.) are equipped with a vent plug between valve body and pressure connection. Loosening the vent plug enables controlled venting through the thread.

For certain applications (e.g. steam vessels) the isolating valves must have a test connector, so that the pressure gauge can be tested without being disconnected. Pressure gauge valves to DIN 16272 feature discretely isolatable test connections.

## Pressure gauge mounting provisions

If the pipe to the gauge is not rigid enough for a vibration-free installation, the gauge should be mounted by means of a mounting device for surface or pipe mounting, and, if necessary, with a capillary extension.

## Damping of the measuring system

If vibrations cannot be eliminated by appropriate installation, then liquid-filled gauges should be used.

## Effects of temperature

The operating temperature of the pressure gauge, resulting from the effects of pressure medium, ambient temperature and possibly heat radiation must not exceed the temperature span the pressure gauge is intended for. Suitably shaped tailpipes or syphons with water filling may be used to separate the pressure gauge and its isolating device from hot pressure media. The influence of the temperature on the display accuracy should be considered.

## Diaphragm seals / Protection

For pressure media which are aggressive, hot, highly-viscous, crystallising or contain particles, and which must not enter the pressure element, diaphragm seals provide separation. For transmission of the pressure to the pressure element, a neutral pressure transmission fluid is used, which is chosen to match the measuring range, the temperature and the compatibility with the pressure medium. The connection between the pressure gauge and the diaphragm seal must not, under any circumstances, be loosened.

## Overload protection for pressure elements

Should the measuring medium be subject to rapid fluctuations in pressure, or pressure surges have to be taken into account, these must not be allowed to act directly on the pressure element.

The pressure surges must be restricted in their effect, for example, by fitting integral restrictor screws (to reduce the cross-section in the pressure channel) or by using adjustable snubber devices.

In cases where it is necessary to select a range lower than the maximum pressure which could briefly occur in the system, in order to obtain a high reading resolution, the pressure element must be protected against damage. An overload protection device (external protection) should be fitted; with a pressure surge these close immediately, and only gradually with a slow pressure rise. The set closing pressure thus depends on the temporal pressure profile. A further possibility is to use a pressure gauge with a high overpressure safety (internal protection).

## Pressure test connection

The pressure test connection, with a sufficiently large bore ( $\geq 6$  mm diameter), should be arranged, as far as possible, over a shut-off device, in a position where the accuracy of reading will not be affected by the flow of the media being measured. The piping between the pressure test connection and the pressure gauge should have an inner diameter large enough to avoid blockages or delays in pressure transmission. It should also not have any sharp bends. It is recommended that it is laid with a continuous incline of approx. 1:15.

## Piping

The piping should be arranged and fitted so that it can withstand the stresses caused by expansion, vibration and the influence of heat. When the media is gaseous, a water drain point should be provided at the lowest point. For liquid pressure media, an air bleed should be provided at the highest point.

For gases or liquids containing solids separation should be provided which can be separated and emptied while the plant is running. If the pressure gauge has to be mounted higher or lower than the tapping point, if the pressure medium in the lines does not have the same density, this shifts the measuring range. The offset is determined from the difference in density ( $\rho_M - \rho_L$ ) and the height difference  $\Delta h$  according to the equation:

$$\Delta p = (\rho_M - \rho_L) \cdot g \cdot \Delta h \cdot 10^{-5} \text{ (bar)} = \text{Offset of measuring range}$$

where

$$\rho_M = \text{density of pressure medium in (kg/m}^3\text{)}$$

$$\rho_L = \text{density of ambient air in (kg/m}^3\text{)} \\ \text{(standard value 1.205 kg/m}^3\text{ at 20 }^\circ\text{C)}$$

$$\Delta h = \text{Level difference in metres (m)}$$

$$g = \text{Acceleration due to gravity in (m/s}^2\text{)} \\ \text{(standard value = 9.81 m/s}^2\text{)}$$

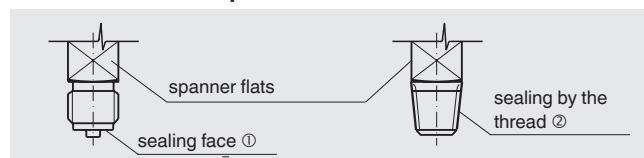
The corresponding indication will be lower by the value of  $\Delta p$  if the gauge is mounted above, but higher by the value of  $\Delta p$  if the gauge is mounted below the pressure tapping point. Pressure gauges will normally be mounted with the dial in the vertical plane. For different positions, the orientation symbol on the dial should be adhered to.

## Installation and commissioning

Correct sealing of pressure gauge connections with parallel threads ① is achieved by means of a suitable sealing ring, sealing washer or WIKA profile seals.

The sealing of tapered threads (e.g. NPT threads) is made by the thread itself ②, with additional sealing material such as, for example, PTFE tape (EN 837-2).

### ① Parallel and ② tapered thread connection



In order to simplify the correct orientation of the gauge, connecting the gauge by means of a union nut or a LH-RH adjusting nut is recommended. When screw-fitting or unscrewing the pressure gauge, the torque must not be applied to the housing, but only to the spanner flats on the stem.

If the pressure gauge is positioned lower than the pressure test connection, the tailpipe should be thoroughly cleaned prior to fitting the gauge. For internal pressure compensation, some pressure gauge models are provided with a resealable pressure vent with the inscription CLOSE and OPEN. This pressure vent is supplied closed (lever in CLOSE position). Prior to inspection and/or after installation and prior to initial operation, the gauges must be vented (lever in OPEN position).

No pressure higher than indicated by the working pressure symbol ▼ (final value) must be applied to the gauge during hydrostatic pressure test of the system (EN 837-1 and EN 837-3). Otherwise the gauge must be isolated or removed during this operation.

In the case of diaphragm gauges, care should be taken not to accidentally loosen the bolts that retain upper and lower diaphragm housing.

No attempts should be made to remove a pressurized gauge. The pressure system must be totally vented if the gauge cannot be otherwise isolated.

Any residual pressure medium contained in the pressure element may be hazardous or toxic. This should be taken into account when handling and storing pressure gauges which have been removed.

Pressure gauges whose pressure elements are filled with water or a water mixture should be protected against freezing.

## Operation

Isolating equipment should only be opened slowly, in order to avoid pressure surges.

Steady working pressure is indicated on the dial by the identifying mark ▼ (EN 837-1 and EN 837-3). For fluctuating working pressure, lower values are applicable.

To check the zero point during operation, the isolating device should be closed and the pressure element relieved. The pointer must fall within the thickened portion of the zero mark +.

If the pointer remains outside of the crossbar, this generally results from a lasting deformation of the pressure element, which would need to be submitted for a closer examination, in order to avoid measuring errors or damage.

On-site testing of the pressure gauge is feasible by means of isolating devices enabling connection of a test gauge together with a suitable pressure source. The permissible error limits are defined in EN 837-1 and EN 837-3.

For hazardous pressure media such as

- oxygen
- acetylene
- flammable gases or liquids
- toxic gases or liquids
- steam
- ammonia and other refrigerants

as well as for refrigeration systems, compressors, etc. require attention beyond that of the standard regulations. In these instances, the appropriate specific safety codes or regulations must be considered.

## Storage

For the storage of the pressure gauge before installation, the following points should be observed in order to prevent damage:

The pressure gauge should remain in its original packing and stored so that it is protected from damage from external influences.

Should the gauge be taken out (e.g. for testing), afterwards reuse the original packaging material.

Storage temperature range from -40 °C to +70 °C.

Variations in these storage temperatures are possible for different instruments. The permissible temperature range is given in the appropriate data sheet.

Gauges should be protected against dust and humidity.

## Reference documents

### Cited DIN standards and other DIN EN standards

#### DIN EN 837-1

Pressure gauges; part 1: Bourdon tube pressure gauges; Dimensions, metrology, requirements and testing

#### DIN EN 837-2

Pressure gauges; part 2: Selection and installation recommendation for pressure gauges

#### DIN EN 837-3

Pressure gauges; part 3: Diaphragm and capsule pressure gauges; Dimensions, metrology, requirements and testing

#### DIN 16270

PN 250 and PN 400 valves without test connection for pressure gauges

#### DIN 16271

PN 250 and PN 400 valves with test connection for pressure gauges

#### DIN 16272

PN 250 and PN 400 valves with blocking test connection for pressure gauges

## Accessories for pressure gauges



Overpressure protector

Adjustable snubber

Pressure gauge cock

Trumpet-form syphon

Adaptor for surface mounting bracket

LH-RH adjusting nut

Pressure gauge valve

U-form syphon

Pressure gauge valve with extra valve for test connector

Surface mounting bracket

## Arrangements for pressure measurement

Proven measuring arrangements for various types of media. Contents of tail pipe Typically

Contents of tail pipe Typically	Liquid media			Gaseous media		
	Liquid	Liquid with vapour	Vapour only	Gas only	Wet gas	Liquid gas condensate
	Condensate	Boiling liquid	Liquefied gas	Dry air	Moist air Flue gas	Steam
Pressure instrument higher than tapping point						
Pressure instrument lower than tapping point						

The specifications given in this document represent the state of engineering at the time of publishing. We reserve the right to make modifications to the specifications and materials.

