

Elastic Element Pressure Gauges

Technical Information

Indicating pressure gauges with elastic measuring element are used very extensively to measure pressures in technical applications because they are both robust and easy to handle. These gauges incorporate measuring elements which deform elastically under the influence of pressure. Mechanical pressure gauges are produced with bourdon tube, diaphragm and bellows and spring elements and are accordingly different. The measuring elements are made of copper alloys, alloyed steels or produced in special materials for specific measuring applications.

Pressures are only measurable in conjunction with a reference pressure. The atmospheric pressure alone serves as reference pressure and the pressure gauge shows how much the measured pressure is higher or lower in relation to the given atmospheric pressure (i.e. an overpressure measuring instrument).

The pressure is shown in standard measuring ranges over 270 angle degrees on the dial. Liquid-filled pressure gauges offer optimal protection against destruction by high dynamic pressure loads or vibrations as a result of their cushioning. Switching operations can be carried out when combined with alarm contacts and electrical output signals (for example 4 ... 20 mA) can be used for industrial process automation in combination with transmitters.

1. Pressure gauges with bourdon tube

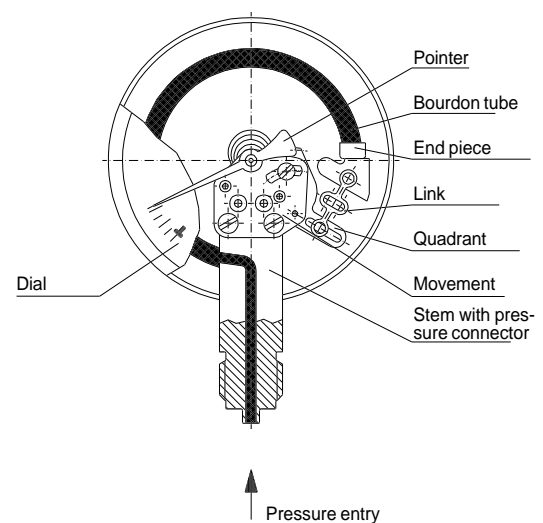
Bourdon tubes are circular-shaped tubes with an oval cross-section. The pressure of the media acts on the inside of this tube which results in the oval cross section becomes almost round. Because of the curvature of the tube ring tension occurs which bends the bourdon tube. The end of the tube, which is not fixed, moves, this movement being a measurement for the pressure.

This movement is indicated by a pointer. The bourdon tubes bent at an angle of approx. 250° are used for pressures up to approx. 60 bar.

Used for higher pressures are bourdon tubes with a number of superimposed coils of the same diameter (i.e. helical coils) or helical-shaped coils (i.e. helical springs) at one level.

Bourdon tubes can only be protected against overload to a limited extent. For particularly difficult measuring operations the pressure gauge can be provided upstream with a chemical seal as separation or protection system.

The pressure ranges are between 0 ... 0.6 and 0 ... 4000 bar with a reading accuracy (or class) from 0.1 to 4.0 %.



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2. Pressure gauges with diaphragm elements

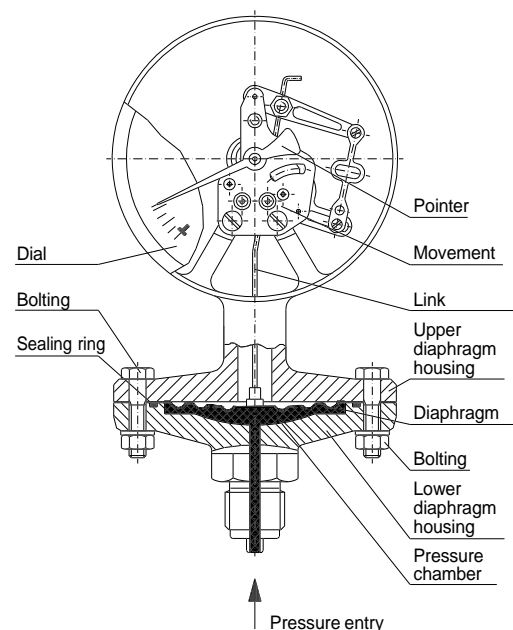
Diaphragm elements are circular-shaped, convoluted membranes. They are either clamped around the rim between two flanges or welded and subject to the pressure of the media acting on one side. The deflection caused in this way is used as a measurement for the pressure and is indicated by a pointer.

Compared with bourdon tubes these diaphragm elements have a relatively high activating force and because of the annular clamping of the element they are insensitive to vibration.

The diaphragm element can be subject to higher overload through load take-up points (by bringing the diaphragm element up against the upper flange). Moreover, the measuring instrument can also be protected against extremely corrosive media by coating with special material or covering with foil.

Wide connection ports, open connection flanges and purging plugs can be integrated for measuring highly viscous, impure or crystallizing media.

Pressure ranges are between 0 ... 16 mbar and 0 ... 40 bar in accuracy class from 0.6 to 2.5 %.



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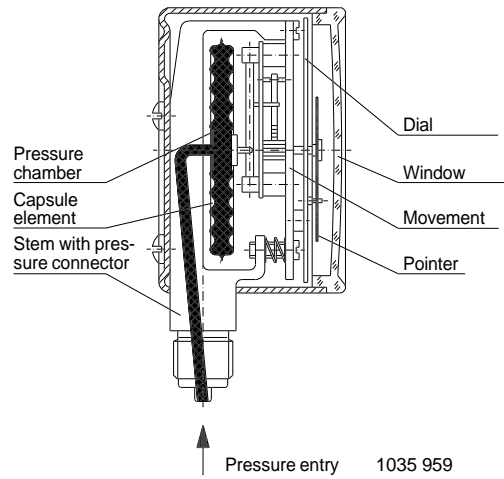
3. Pressure gauges with capsule elements

The capsule element comprises two circular-shaped, convoluted membranes sealed tight around their circumference. The pressure acts on the inside of this capsule and the generated stroke movement is shown by a pointer as measurement of pressure.

Pressure gauges with capsule elements are more especially suitable for gaseous media and relatively low pressures. Overload protection is possible within certain limits.

The activating force is increased if a number of capsule elements are connected mechanically in series (a so-called capsule element "package").

Pressure ranges are between 0 ... 2.5 mbar and 0 ... 0.6 bar in the accuracy class 0.1 to 2.5.



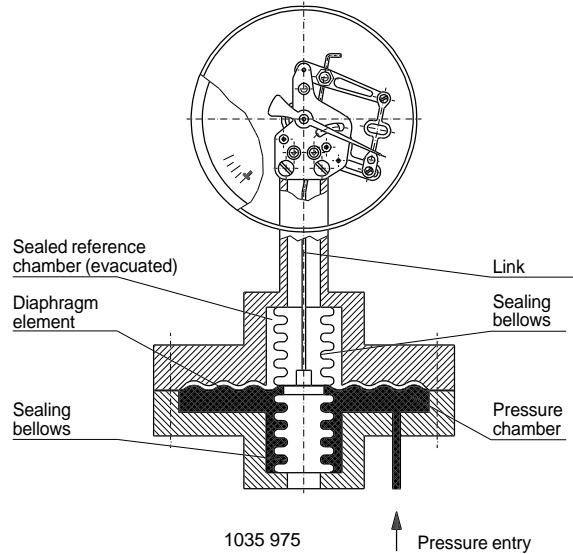
4. Absolute pressure gauges

These instruments are used where pressures are to be measured independent of the natural fluctuations in atmospheric pressure. As a general rule all the known types of element and measuring principles can be applied.

The pressure of the media to be measured is compared against a reference pressure which, at the same time, is absolute zero. For this purpose an absolute vacuum is given as reference pressure in a reference chamber on the side of the measuring element not subject to pressure. This function is achieved by sealing off the appropriate measuring chamber or surrounding case.

Measuring element movement transmission and pressure indication follow in the same way as with the already described overpressure gauges.

Pressure ranges are between 0 ... 16 mbar and 0 ... 25 bar in the accuracy class 0.6 to 2.5.



5. Differential pressure gauges

The difference between two pressures is determined directly and shown on the differential pressure gauge. Here again all of the measuring elements known from overpressure gauges and the measuring principles can be applied.

Two sealed medium chambers are separated by the measuring element or measurement elements, respectively. If both operating pressures are the same the measuring element cannot make any movement and no pressure will be indicated.

A differential pressure reading is only given when one of the pressures is either higher or lower. Low differential pressures can be measured directly in the case of high static pressures. Very high overload capability is achieved with diaphragm elements.

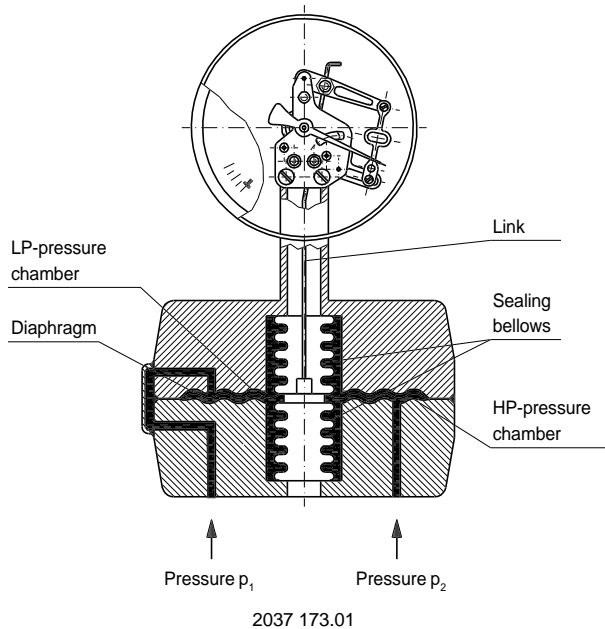
The permissible static pressure and the overload capability on the ⊕ and ⊖ -side must be observed.

Transmission of the measuring element movement and pressure indication is the same as with the already described overpressure gauges in the majority of cases.

Pressure ranges are between 0 ... 16 mbar and 0 ... 25 bar in the accuracy class 0.6 to 2.5.

Areas of application

- Filter technology (monitoring filter pollution)
- Filling level measurement (in enclosed containers)
- Flow measurement (pressure drop)



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