

Pressure transmitters - Functional principle and application

Difference between absolute, gauge (relative) and differential pressure

Pressure transmitters measure the current pressure in comparison to a reference pressure. They can be divided into three different kinds:

- Absolute pressure transmitters
- Gauge (relative) pressure transmitters
- Differential pressure transmitters

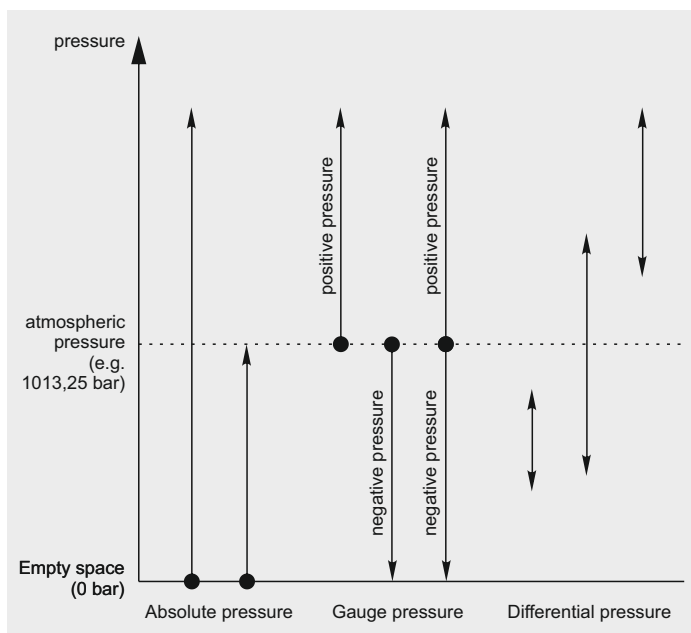


Fig. 1: Comparison absolute, gauge and differential pressure

Absolute pressure transmitters

Absolute pressure is the pressure referred to the empty space / vacuum (0 bar). Absolute pressure transmitters measure the the pressure in comparison to a vacuum enclosed in the sensor element. The reference vacuum should be so small, that it is negligible compared to the measured pressure.

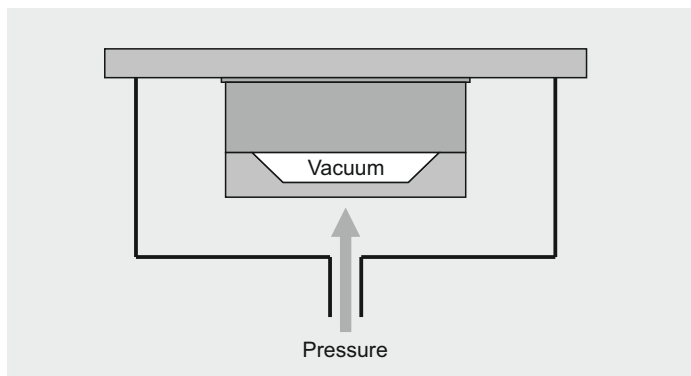


Fig. 2: Construction of an absolute pressure sensor

Application example

Absolute pressure sensors are used to measure the atmospheric pressure in barometers and altimeters.

Furthermore absolute pressure sensors are used in vacuum packaging machines in the food industry. They ensure that a fixed negative pressure is used, regardless of the current local air pressure.

Gauge (relative) pressure transmitters

Gauge pressure transmitters measure the pressure compared to the ambient atmospheric pressure. The average atmospheric pressure at sea level is 1013.25 mbar. The atmospheric pressure can change due to weather conditions or altitude. These changes influence the measured value.

A measured gauge pressure higher than the atmospheric pressure is called positive pressure. If the measured gauge pressure is below the atmospheric pressure it is referred to as negative pressure.

Gauge pressure sensor have one pressure port. The ambient atmospheric pressure is directed through a vent hole or hose at the back of the sensor element and therefore compensated.

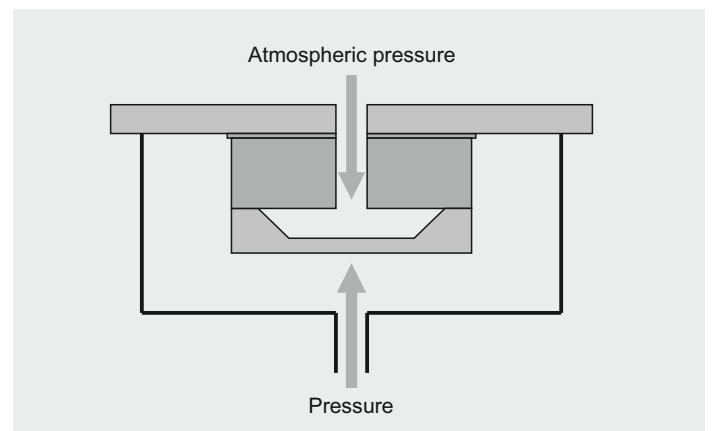


Fig. 3: Construction of an gauge pressure sensor

Application examples

A typical use of gauge pressure transmitters is to control the pressure of (car) tires.

Medical aspirators are used in the emergency medicine, operations or by dentists. They produce a negative pressure to aspirate secretion and mucus.

Differential pressure transmitters

Differential pressure is the difference between two freely chosen pressures (e.g. two process pressures). Therefore they have two separate pressure ports with tube or thread process connection.

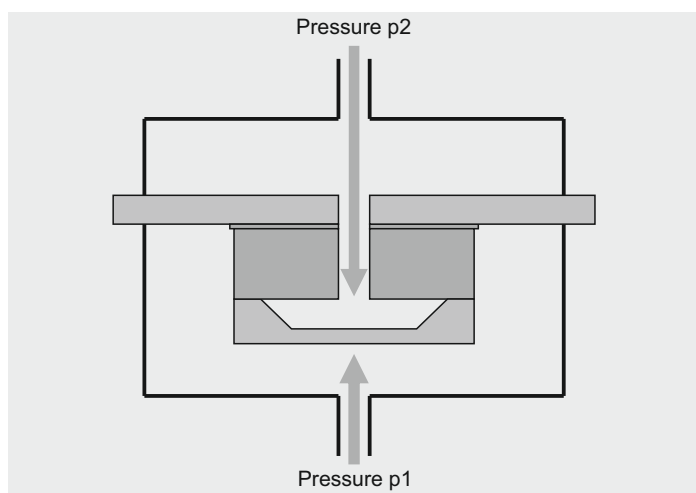


Fig. 4: Construction of a differential pressure sensor

Application examples

Differential pressure sensors are used in the building automation to measure air flows. A constriction in the flow channel, made with a diaphragm or laminar flow element, generates a pressure drop, which can be measured to determine the flow volume. The differential pressure sensors measure this pressure drop by measuring the pressure in front and behind the flow channel.

The same functional principles applies in medical machines to determine respiratory or gas flows.

Also differential pressure sensors are used for filter monitoring. When the filter clogs, the flow resistance will increase and change the pressure drop.