

Name of Pressure Measuring Devices

A practical guide to name of pressure measuring devices, covering the reader intent, the relationship to name of pressure measuring devices, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



Main topic: Main Page
<https://www.level-meters.com/>

In the landscape of industrial process control, the accurate quantification of force exerted by fluids is fundamental to safety, efficiency, and quality. Identifying the correct name of pressure measuring devices is the first step for engineers and technicians tasked with designing or maintaining systems in water treatment, chemical processing, and oil and gas industries. While the term "pressure gauge" is often used as a catch-all, the specific technology required—whether mechanical, electronic, or hydrostatic—depends heavily on the application environment and the required data output.

Understanding these devices requires a firm grasp of how pressure is defined: the force applied perpendicular to the surface of an object per unit area. In industrial contexts, this is typically measured in bar, kilopascals (kPa), or pounds per square inch (psi).

Understanding Industrial Pressure Measurement Principles

Before selecting a specific name of pressure measuring devices, it is essential to understand the physical principles that govern their operation. Most industrial instruments function by converting the physical displacement of a sensing element into a readable value or an electrical signal.

Elastic Deformation

Mechanical devices often rely on elastic elements like Bourdon tubes, bellows, or diaphragms. When fluid enters the sensing chamber, the pressure causes these components to deform. This movement is then mechanically amplified to drive a pointer on a dial. For example, a Bourdon tube—a C-shaped or helical metal tube—tends to straighten when pressurized, a movement directly proportional to the internal pressure.

| Piezoresistive and Capacitive Sensing

Modern electronic transmitters often utilize piezoresistive or capacitive sensors. Piezoresistive sensors contain a silicon diaphragm with integrated strain gauges. When pressure is applied, the resistance of the strain gauges changes, which is then converted into a 4-20mA or digital signal. Capacitive sensors measure the change in electrical capacitance between a sensing diaphragm and a fixed plate as the distance between them fluctuates under pressure.

| Hydrostatic Pressure for Level Measurement

In the context of liquid level measurement, pressure devices are used to calculate the height of a liquid column. The principle follows the formula $P = \rho \cdot g \cdot h$, where P is pressure, ρ (ρ) is the fluid density, g is gravity, and h is the height of the liquid. By measuring the pressure at the bottom of a tank, a hydrostatic transmitter can accurately determine the level of the contents, provided the density remains constant.

| Common Names of Pressure Measuring Devices in Process Control

Depending on the complexity of the task, different instruments are employed. Below are the primary names of pressure measuring devices used in modern engineering.

| 1. Pressure Gauges

These are the most common mechanical instruments used for local visualization. They do not require external power and are ideal for quick manual checks.

Bourdon Tube Gauges: Suitable for clean, non-clogging liquids and gases.

Diaphragm Gauges: Preferred for low-pressure applications or when the media is corrosive or viscous, as the diaphragm provides a larger surface area for sensing.

| 2. Pressure Transmitters

Transmitters are electronic devices that convert pressure into a standardized electrical signal (typically 4-20mA, 0-10V, or digital protocols like HART). They are essential for automated systems where data must be sent to a PLC or DCS. For a comprehensive look at how these integrate into broader measurement systems, you can visit the Main Page of industrial instrumentation providers.

| 3. Differential Pressure (DP) Transmitters

As the name suggests, these devices measure the difference between two pressure points. They are versatile tools used for:

Flow Measurement: Measuring the pressure drop across an orifice plate.

Filter Monitoring: Detecting when a filter is clogged by measuring the pressure before and after the element.

Pressurized Tank Level: Measuring the pressure at the top and bottom of a sealed vessel to calculate liquid level regardless of the headspace pressure.

| 4. Manometers

A manometer is one of the oldest names of pressure measuring devices. It uses a column of liquid (water or mercury) in a U-shaped tube to measure pressure differences. While less common in heavy industrial automation today, they remain vital in laboratory settings and for calibrating other instruments.

| 5. Hydrostatic Level Transmitters

Specifically designed for the water and wastewater industry, these are often submersible sensors that measure the head pressure of a liquid to determine its depth. They are highly reliable for open reservoirs, wells, and tanks.

Technical Selection Criteria for Pressure Instruments

Choosing the right device requires more than just knowing the name of pressure measuring devices; it requires a detailed analysis of the process conditions.

Criteria	Considerations
Pressure Type	Gauge (relative to atmosphere), Absolute (relative to vacuum), or Differential.
Measurement Range	The operating pressure should ideally fall within the middle 50% to 75% of the device's full-scale range.
Media Compatibility	Wetted parts (SS316, Monel, Hastelloy) must be chemically compatible with the process fluid.
Temperature	High-temperature steam or cryogenic fluids require cooling elements or specialized seals.
Output Signal	Analog (4-20mA), Digital (Modbus, Profibus), or purely mechanical (Dial).
Accuracy	Industrial standards typically range from 0.1% to 1.0% of the full scale.

Installation Best Practices and Considerations

Correct installation is as critical as device selection. Even the most accurate pressure transmitter will provide false data if installed incorrectly.

1. Mounting Position: For liquid applications, the device should be mounted below the tapping point to prevent gas bubbles from being trapped in the impulse line. For gas applications, mount the device above the tapping point so condensate can drain back into the process.
2. Siphon Tubes and Pigtails: When measuring steam, a siphon tube must be used. This tube traps condensed water, which acts as a thermal barrier, protecting the internal sensing element from high-temperature damage.

3. Isolation Valves: Always install a block-and-bleed valve or a manifold. This allows the instrument to be removed for calibration or maintenance without shutting down the entire process line.

4. Diaphragm Seals: For highly viscous, corrosive, or hygienic (food/pharma) applications, a diaphragm seal is used. This seal separates the process media from the instrument's sensing element using a flexible membrane and a fill fluid (like silicone oil).

| Limitations and Troubleshooting Common Issues

No single device is perfect for every scenario. Understanding the limitations of the chosen name of pressure measuring devices prevents premature failure.

Overpressure: Exceeding the maximum pressure rating of a sensor can cause permanent deformation of the diaphragm or Bourdon tube, leading to zero-shift or total failure.

Vibration: In environments with heavy machinery, mechanical gauges may suffer from excessive wear. Liquid-filled gauges (using glycerin or silicone oil) are used to dampen the movement and lubricate the internal gears.

Pulsation: Rapid pressure fluctuations, common near pump discharges, can destroy a sensor. Installing a snubber (a small flow restrictor) can smooth out these pulses.

Chemical Attack: If the process fluid is incompatible with the wetted materials, the sensor may corrode, leading to leaks or loss of accuracy. Always verify the material of construction (MOC) against a chemical resistance chart.

| Comparison Table of Pressure Measuring Devices

Device Name	Principle	Typical Range	Best Use Case
Bourdon Gauge	Mechanical Expansion	0.6 bar to 7000 bar	Local pressure monitoring in non-clogging fluids.
Diaphragm Gauge	Mechanical Deflection	10 mbar to 40 bar	Low-pressure gas or corrosive media.
Piezoresistive Transmitter	Electrical Resistance	0.1 bar to 1000 bar	General industrial automation and remote monitoring.
DP Transmitter	Differential Sensing	1 mbar to 400 bar	Level in pressurized tanks and flow measurement.
Hydrostatic Probe	Submersible Pressure	0.1 bar to 20 bar	Deep well and wastewater tank level sensing.

Frequently Asked Questions (FAQs)

Q: What is the difference between gauge pressure and absolute pressure?

A: Gauge pressure is measured relative to the ambient atmospheric pressure (approx. 1.013 bar at sea level). Absolute pressure is measured relative to a perfect vacuum. Most industrial processes use gauge pressure, while vacuum processes or meteorological studies use absolute pressure.

Q: When should I use a digital pressure gauge instead of an analog one?

A: Digital gauges are preferred when high precision is required, or when the user needs additional features like data logging, backlight, or the ability to switch between units (e.g., bar to psi). However, analog gauges are superior for seeing rapid trends and do not require batteries.

Q: Can a pressure transmitter be used for level measurement?

A: Yes, this is known as hydrostatic level measurement. By installing a pressure transmitter at the bottom of a tank, the weight of the liquid column is converted into a level reading. This is a very common application for the products found on the Welk Main Page.

Q: What is a "smart" pressure transmitter?

A: A smart transmitter includes a microprocessor that allows for remote calibration, self-diagnostics, and digital communication (like HART). This reduces maintenance time and improves the reliability of the process data.

| Conclusion

Selecting the appropriate name of pressure measuring devices involves a balance of mechanical understanding and process requirements. From the simple reliability of a Bourdon tube gauge to the sophisticated data integration of a digital DP transmitter, each instrument serves a specific niche in the industrial ecosystem. By adhering to strict installation guidelines and considering the chemical and physical properties of the process media, engineers can ensure long-term accuracy and safety in their operations.