

Which Unit Is Commonly Used for Measuring Pressure

A practical guide to which unit is commonly used for measuring pressure, covering the reader intent, the relationship to which unit is commonly used for measuring pressure, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



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<https://www.level-meters.com/>

In the realm of industrial automation and process control, pressure measurement serves as a cornerstone for monitoring system health, safety, and efficiency. For engineers and technicians tasked with liquid level monitoring, understanding the nuances of pressure units is not merely a theoretical exercise but a practical necessity. When determining which unit is commonly used for measuring pressure, the answer often depends on the geographic region, the specific industry, and the physical principles of the measurement technology being employed.

At Welk, we specialize in manufacturing high-precision industrial level measurement instruments, including hydrostatic level transmitters that rely directly on pressure data to calculate liquid depth. This guide provides a comprehensive overview of pressure units, their applications in level measurement, and how to select the appropriate parameters for your industrial environment.

| Measurement Principles: From Pressure to Level

Before exploring specific units, it is essential to understand the physical relationship between pressure and liquid level. Hydrostatic level measurement is based on the principle that the pressure at a specific point within a static liquid is proportional to the height of the liquid column above that point.

The fundamental formula used is:

$$P = \rho \times g \times h$$

Where:

P is the hydrostatic pressure.

ρ (rho) is the density of the liquid (kg/m³).

g is the acceleration due to gravity (approximately 9.81 m/s²).

h is the height of the liquid column (m).

Because gravity and density (assuming a constant temperature) remain relatively stable, the pressure measured by a sensor at the bottom of a tank can be converted directly into a level reading. Consequently, the choice of pressure unit significantly impacts how this data is integrated into PLC (Programmable Logic Controller) systems and HMI (Human-Machine Interface) displays.

| Common Units for Measuring Pressure

Global industrial standards have led to the adoption of several key units. While the International System of Units (SI) promotes the Pascal, practical engineering often favors units that provide more manageable numerical values for everyday applications.

| 1. The Pascal (Pa) and Kilopascal (kPa)

The Pascal is the official SI unit for pressure, defined as one Newton per square meter (1 N/m^2). In most industrial level applications, a single Pascal is an extremely small value. Therefore, the Kilopascal ($1 \text{ kPa} = 1,000 \text{ Pa}$) or Megapascal ($1 \text{ MPa} = 1,000,000 \text{ Pa}$) is more frequently encountered.

Usage: Common in scientific research, high-precision laboratory equipment, and regions following strict SI protocols (such as parts of Europe and Asia).

| 2. The Bar and Millibar (mbar)

Although not an official SI unit, the Bar is widely accepted in global engineering. One Bar is equal to 100,000 Pascals, which is approximately the atmospheric pressure at sea level.

Usage: The Bar is the standard for most hydraulic and pneumatic systems in Europe. In level measurement, the millibar (mbar) is frequently used for shallow tanks or low-pressure gas monitoring.

| 3. Pounds per Square Inch (PSI)

PSI is the primary unit used in the United States and other regions following the Imperial system. It measures the force of one pound-force applied to an area of one square inch.

Usage: Widely used in the oil and gas industry, as well as general manufacturing in North America. For level measurement, PSI is often converted to "inches of water" for better resolution.

| 4. Water Column Units (mH₂O and inH₂O)

Perhaps the most intuitive units for level measurement are those that describe the height of a water column. These units represent the pressure exerted by a column of water at a specific height.

mH₂O (Meters of Water): 1 mH₂O is the pressure exerted by a one-meter-high column of water (approx. 9.81 kPa).

inH₂O (Inches of Water): 1 PSI is approximately equal to 27.7 inches of water.

Usage: These are the preferred units for calibrating hydrostatic level transmitters because they provide a 1:1 conceptual relationship between the pressure reading and the physical level.

| Pressure Unit Conversion Table

When configuring sensors or integrating equipment from different manufacturers, engineers must often convert between these units. The following table provides the conversion factors for the most common units used in level measurement.

From / To	Pascal (Pa)	Bar	PSI	mH2O
1 Pascal	1	10 ⁻⁵	0.000145	0.000102
1 Bar	100,000	1	14.5038	10.197
1 PSI	6,894.76	0.0689	1	0.703
1 mH2O	9,806.65	0.0981	1.422	1

Selecting the Right Unit for Your Application

Deciding which unit is commonly used for measuring pressure in your specific facility depends on several operational factors:

1. **Industry Standards:** The oil and gas sector typically defaults to PSI or Bar, while water treatment plants often prefer mH2O or kPa.
2. **Control System Compatibility:** Ensure the unit selected is supported by your PLC's analog input scaling. Most modern transmitters can be toggled between units via software or HART communication.
3. **Required Precision:** For very shallow tanks (e.g., chemical dosing), using inches of water (inH2O) or millibars (mbar) provides higher resolution than using Bar or PSI.
4. **Geographic Location:** Projects in the United States generally require Imperial units, whereas international projects in the EMEA or APAC regions lean toward SI-derived units.

For a detailed look at how these units are applied across various sensor technologies, you can review product options and application support on our [Main Page](#).

| Installation Considerations for Pressure-Based Sensors

Choosing the correct unit is only half the battle; the physical installation of the pressure-sensing element is critical for accuracy. Hydrostatic transmitters, which are the primary tools for pressure-based level measurement, require specific environmental conditions.

| Atmospheric Venting

Most level measurement applications require "Gauge Pressure" measurement. This means the sensor must account for changes in atmospheric pressure to avoid errors. This is usually achieved through a vented cable that allows the internal side of the sensor diaphragm to "breathe" and stay balanced with the ambient air.

| Media Density and Temperature

Because pressure is a function of density, any change in the liquid's temperature or concentration will change the pressure reading, even if the actual level remains constant. In applications with fluctuating temperatures, sensors with integrated temperature compensation are required to maintain accuracy.

| Mounting Position

Submersible pressure transducers must be mounted in a location where they are not subject to high-velocity flows or turbulence, which can create dynamic pressure errors (the Bernoulli effect). Stilling wells are often used in agitated tanks to provide a stable environment for the sensor.

| Limitations of Pressure-Based Level Measurement

While pressure is a reliable proxy for level, it is not suitable for every application. Engineers should be aware of the following limitations:

Variable Density: If a tank is used for different liquids with varying specific gravities, the system must be recalibrated for each liquid, or a secondary measurement must be used to calculate density.

Pressurized Tanks: In a sealed, pressurized vessel, a standard hydrostatic sensor cannot distinguish between the liquid head and the gas blanket pressure. In these cases, a Differential Pressure (DP) transmitter is required.

Clogging and Viscosity: High-viscosity liquids or those with suspended solids can clog the sensor diaphragm or the small pressure ports, leading to drifted or frozen readings.

In scenarios where pressure measurement is impractical, Welk offers alternative technologies such as radar level meters and ultrasonic sensors, which measure level based on Time-of-Flight (ToF) rather than physical force.

| Frequently Asked Questions (FAQs)

| Why is Bar more common than Pascal in industrial settings?

The Pascal is an extremely small unit (1 Pa is roughly the weight of a single sheet of paper spread over a square meter). Using the Bar allows engineers to work with smaller, more manageable numbers that align closely with atmospheric pressure.

| What is the difference between barg and bara?

barg (Bar Gauge): Pressure relative to the current atmospheric pressure. This is the most common unit for level measurement.

bara (Bar Absolute): Pressure relative to a perfect vacuum. This is used in vacuum systems or specialized scientific processes.

Can I use a pressure sensor to measure the level of a boiling liquid?

Measuring boiling liquids with pressure sensors is challenging because the density of the liquid decreases as bubbles form, and the vapor pressure in the headspace can interfere with the reading. Radar level meters are generally preferred for such applications.

How often should I recalibrate my pressure-based level transmitter?

Calibration frequency depends on the criticality of the process and the stability of the environment. For most industrial applications, an annual calibration check is recommended to account for potential sensor drift.

Conclusion

Identifying which unit is commonly used for measuring pressure is a vital step in designing a reliable level monitoring system. Whether your facility standardizes on the Bar, PSI, or mH₂O, the goal remains the same: achieving an accurate, repeatable measurement that ensures process safety and efficiency. By understanding the underlying physics of hydrostatic pressure and the specific needs of your application, you can select the right instrumentation to meet your goals.

Welk continues to provide robust solutions for global industries, ensuring that whether you are measuring water in a deep well or chemicals in a processing plant, your data is precise and actionable. For more technical specifications and to explore our full range of measurement technologies, visit our [Main Page](#).