

Unit conversion (1 unit equals)

Unit	bar	psi
1 bar	1	14.504
1 psi	0.068948	1
1 kPa	0.01	0.14504
1 kg/cm ²	0.98067	14.223
1 atm	1.01325	14.696
1 mmHg (torr)	0.0013332	0.019337
1 mmH ₂ O (4 °C)	0.00098064	0.0014223
1 inH ₂ O (4 °C)	0.0024909	0.036127
1 MPa	10	145.04

Gauge, absolute, differential

Absolute	$P_{abs} = P_{gauge} + P_{atm}$
Standard atmosphere	1.01325 bar a = 14.696 psi a
Vacuum	below atmospheric, often shown as negative gauge
Differential	$\Delta P = P_{HP} - P_{LP}$

Hydrostatic pressure

Head	$P = \rho \times g \times h$
Water	1 m $\approx$ 98.07 mbar $\approx$ 1.422 psi
100	$\approx$ 0.981 bar
1 water	9.80665 m/s² (standard)

Force and area

Force	$F = P \times A$
Example	10 bar on 100 cm² = 10,000 N

Gauge selection rules

- Normal pressure in the middle third of the scale (about 25 to 75 % of full scale)
- Full scale about 1.5 to 2 times the normal operating pressure
- Pulsating service: liquid filled gauge or snubber
- Steam: siphon (pigtail) to protect the element
- Corrosive or viscous media: diaphragm seal

Transmitter selection rules

- Calibrated span within the sensor range, within the allowed turndown
- Check the over pressure and static pressure limits
- Accuracy of the total installed loop = $\sqrt{(\text{sum of squares of errors})}$
- Absolute transmitters for vacuum and vapour pressure

Atmospheric pressure with altitude

Approximation	$P \approx 1013.25 \times (1 - 2.25577 \times 10^{-5} \times h)^{5.25588}$ hPa
Rule of thumb	about -12 hPa per 100 m near sea level

Accuracy class (EN 837-1 gauges)

Class	Error
0.1 to 0.6	Test gauges
1.0	± 1 % of span
1.6	± 1.6 % of span
2.5	± 2.5 % of span