isting variables, a *standard* or *normal atmosphere* having a pressure of 1,013,250 dyn/cm^2 has been established. This is equal to the pressure exerted by a column of mercury 760 mm high, at a temperature of 0°C, or 29.921 in. Hg, or 14.696 psi.

Absolute pressure is the pressure measured from zero pressure. But pressure gages frequently read in *gage pressure*, or *vacuum pressure* (see Vacuum technique). Gage pressure is equal to the absolute pressure minus the atmospheric pressure; this is convenient when a vessel is under a moderate pressure in excess of the ambient atmospheric pressure. It is often reported in lb/in.^{2} *gage*, psig. The expression psia is often used when it is desired to emphasize that the measurement is absolute. A gage reading vacuum pressure reports the amount by which the pressure on it is less than atmospheric. A compound gage can register either gage or vacuum pressure.

Torr. This International Standard unit is now used for reporting less-than-atmospheric pressures on an absolute basis. It is equal to $\frac{1}{760}$ of a standard atmosphere, or 1 mm Hg.

Expressions such as "low," "medium," or "high," applied to pressure or vacuum, have come to designate ranges approximately as follows:

Pressure	*Gage pressure, psig*	*Vacuum*	*Vacuum pressure, Torr*
very high	over 5,000 (can be up to 100,000 or even higher)	low	25–760
		medium	10^{-3}–25
		high	10^{-6}–10^{-3}
high	500–5,000	very high	10^{-9}–10^{-6}
medium	50–500	ultra high	0–10^{-9}
low	0–50		

Elements for Pressure Measurement

Pressures and/or vacuums are generally measured by means of mechanical direct actuated elements. When measurement of very high pressures or vacuums between absolute zero and 25 Torr (25 mm Hg) are required, specialized elements are necessary. Most of the elements in use are described and many of them are illustrated in the subsequent sections.

The mechanical direct actuated pressure elements are the diaphragm, inverted bell, diaphragm capsule, bourdon tube including spirals and helixes, spring and bellows, and absolute pressure gage. The specialized units are the strain gage, electromagnetic, piezoelectric, thermoelectric, and ionization sensors.

Diaphragm Pressure Elements. A diaphragm is a pressure element which moves in a direction perpendicular to its flexible surface. Diaphragms may be fabricated from natural materials or from various synthetic materials including metals. They may be substantially flat or have one or many convolutions in their surfaces. The thinner the diaphragm material and the larger its effective area (pressure area) the lower the pressure range it can measure. In the design of this type of element, and in fact of all pressure elements, it is essential that the movement of the element always be less than the movement which would exceed the elastic limit of the diaphragm material. Exceeding the elastic limit would result in a permanent set or stretch of the diaphragm with resulting shift and error in the pressure measurement.

Figure 1 illustrates a typical arrangement for a direct-deflection type of diaphragm-actuated pressure gage. The process pressure produces a force which moves