

## INTRODUCTION TO PRESSURE AND VACUUM

The term “pressure” is used to describe either negative (below atmospheric) or positive (above atmospheric) pressure. Positive pressure is called “gauge pressure”. The term “vacuum” is used to describe the region of pressure below one atmosphere of pressure, also referred to as negative pressure. When speaking of vacuum, one must remember it as the opposite of pressure; high vacuum means low pressure. A vacuum (“HgV”) reading is similar to gauge pressure (PSIG), in that the gauge reading is referenced to the current atmospheric or barometric pressure (which changes over time and place to place). When the reading is referenced to the theoretical absolute zero for a unit of measure, the reading is called an absolute value (PSIA, “HgA). Standard atmospheric pressure is 29.92 “HgA, 760 torr, or 14.7 PSIA.

When using a vacuum or gauge pressure reading in a calculation, the reading must be converted to an absolute value. This is done by taking the current barometric pressure and subtracting the vacuum reading or adding the gauge pressure reading. If a current barometric pressure is not known, then the standard atmospheric pressure (29.92 “HgA) is assumed.

A vacuum reading of 22” HgV is converted as follows:

$$\begin{aligned} \text{Standard Pressure} - \text{Vacuum Reading} &= \text{Absolute Pressure} \\ 29.92 \text{ “HgA} - 22 \text{” HgV} &= 7.92 \text{ “HgA} \end{aligned}$$

When using a gauge pressure reading in a calculation, the gauge pressure reading must also be converted to an absolute value. With a positive gauge reading, the value is added to the barometric pressure.

A gauge pressure reading of 22 PSIG is converted as follows:

$$\begin{aligned} \text{Standard Pressure} + \text{Pressure Reading} &= \text{Absolute Pressure} \\ 14.7 \text{ PSIA} + 22 \text{ PSIG} &= 36.7 \text{ PSIA} \end{aligned}$$

There are a number of different units of measure used to describe a level of pressure. At standard atmospheric pressure all the values are equal.

$$\begin{aligned} 14.7 \text{ PSIA} &= 29.92 \text{ “HgA} = 760 \text{ mmHgA} = 760 \text{ torr} \\ &= 760,000 \text{ microns} = 1,1013 \text{ millibar (mbar)} \end{aligned}$$

The units of torr, microns, millibar are always used as absolute values. Refer to page 2-002 for a comparison of these units.



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