Airgas
an Air Liquide company

Conversion Factors
Volume of Compressed Gas in a Cylinder

To find the volume of gas available from a compressed gas cylinder, we apply the Ideal Gas Law (PV = nRT). In a high-pressure cylinder, the volume will be affected by the content's compressibility factor Z (PV = ZnRT). For example, an Airgas 49 liter cylinder of pure helium may contain 291 CF of gas while the same cylinder of pure nitrogen may contain 304 CF under the same conditions. For these practical calculations, however, we assume ideal gas behavior for simplicity.
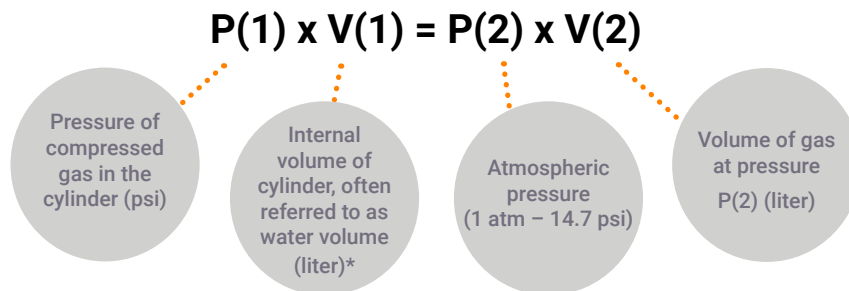
The Ideal Gas Law PV = nRT

Where:
P is pressure   R is the gas constant
V is volume   T is the absolute temperature
n is the number of moles

When the temperature is kept constant, we can derive the equation:

$$P(1) \times V(1) = P(2) \times V(2)$$

Pressure of compressed gas in the cylinder (psi)	Internal volume of cylinder, often referred to as water volume (liter)*	Atmospheric pressure (1 atm – 14.7 psi)	Volume of gas at pressure P(2) (liter)

For example, a 300-size cylinder is filled at 2600 psi. What is the gas volume from the cylinder?
P(1) is 2600 psi
V(1) is the internal volume of an Airgas cylinder or 49 liters
P(2) is 14.7 psi
V(2) is the unknown volume of gas

Solving the equation above for V(2):

$$V(2) = [p(1) \times V(1)]/P(2) \text{ or } (2600 \text{ psi} \times 49 \text{ liters})/14.7 \text{ psi} = 8667 \text{ liters}$$

To further convert V(2) to cubic feet (based on 1 CF = 0.02832 m³), then:

$$V(2) = 8667/1000 = 8.667 \text{ m}^3; \text{ therefore } V(2) = 8.667/0.02832 = 306 \text{ CF}$$

* The water volume of the high-pressure cylinders can be found on Airgas.com.

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