

Ideal Gas Law - Equation of State

The relation between pressure P , volume V , absolute temperature T , total mass M and the gas constant R for an ideal gas is

$$PV = MRT$$

The units of the product PV are joules, therefore the units of the gas constant:

$$R = \frac{PV}{MT}$$

are $J/kg \cdot K$. This equation of state predicts the behavior of gases quite accurately within certain ranges of pressure and temperature.

Values of Gas Constant

Some values of the gas constant are

<i>Substance</i>	<i>R, kJ/kg · K</i>
<i>Air</i>	0.2870
<i>Argon</i>	0.2081
<i>Helium</i>	2.0770
<i>Oxygen</i>	0.2598
<i>Nitrogen</i>	0.2968
<i>Water Vapor</i>	0.4615

Alternate Forms

Alternate forms are obtained by the introduction of the specific volume v and the specific mass density ρ :

$$Pv = RT \quad \text{or} \quad P = \rho RT$$

where

$$v = \frac{1}{\rho} = \frac{V}{M}$$