

Please do not change any of the values in this sheet

Atmospheric air pressure - (As recorded from engine data)

980 [mBar]  
 98000 [Pa]  
 6 [C]  
 279 [K]  
 80 [%]

$$\rho_{\text{humid air}} = \frac{p_d}{R_d T} + \frac{p_v}{R_v T} = \frac{p_d M_d + p_v M_v}{R T}$$

where:

Density of the humid air (kg/m<sup>3</sup>)

$$\rho_{\text{humid air}} = 1.220156 \text{ Kg/m}^3$$

Partial pressure of dry air (Pa)

Specific gas constant for dry air, 287.058 J/(kg·K)

Temperature (K)

0.285162196

Pressure of water vapor (Pa)

Specific gas constant for water vapor, 461.495 J/(kg·K)

Molar mass of dry air, 0.028964 (kg/mol)

Molar mass of water vapor, 0.018016 (kg/mol)

[Universal gas constant, 8.314 J/\(K·mol\)](#)

The vapor pressure of water may be calculated from the [saturation vapor pressure](#) and [relative humidity](#). It is found by:

$$p_v = \phi p_{\text{sat}}$$

$$P_u = 748.0517 \text{ [Pa]}$$

Where:

Vapor pressure of water

Relative humidity

Saturation vapor pressure

The saturation [vapor pressure of water](#) at any given temperature is the vapor pressure when relative humidity is 100%. One formula <sup>[1]</sup> used to find the saturation vapor pressure is:

$$p_{\text{sat}} = 6.1078 \times 10^{\frac{7.5T}{237.3}}$$

$$P_{\text{sat}} = 9.350647 \text{ hPa}$$

$$P_{\text{sat}} = 935.0647 \text{ [Pa]}$$

where T is in degrees C. Note:

This will give a result in hPa (100 Pa, equivalent to the older unit millibar, 1 mbar = 0.001 bar = 0.1 kPa)

[is found considering partial pressure, resulting in:](#)

$$P_d = 97251.95 \text{ [Pa]}$$

[Where p simply denotes the observed absolute pressure.](#)

$$\rho = \frac{p}{R_{\text{specific}} T} \quad 1.22364 \text{ [kg/m}^3]$$

R = 287.058 J/Kg K

T = Temperature in degrees Kelvin

P = Absolute Pressure in Pa