@AIR - PSYCHROMETRIC AIR PROPERTIES

@Air is a member of Techware's family of software packages bringing accurate thermodynamic properties of fluids to many popular **Windows®** programs. **@Air** provides thermodynamic properties (sometimes called psychrometric properties) and transport properties of moist air. The **@Air** package includes: DeskTop Air, an advanced interactive air properties calculator; a dynamic link library (DLL) of air property functions; and various add-ins which link the functions to **Windows®** applications. The add-ins allow you to use the functions as if they were built-in to **Microsoft Excel®, Lotus 1-2-3 for Windows** and **MathSoft Mathcad®**. Programmers can call the functions in the dynamic link library directly from many **Windows®** programming languages such as **Microsoft Visual BASIC®**, **Microsoft Visual C++ for Windows®** and **Microsoft Access.**

@Air is going to change the way you solve many problems involving moist air! Your calculations will be greatly simplified and their accuracy will improve by using the **@Air** functions. The functions in **@Air** will help you calculate the performance of HVAC equipment, evaporative coolers, air compressors and air turbines. You can conveniently design equipment right on your favorite spreadsheet and your results will be more accurate because you won't have to interpolate data from tables, read from psychrometric charts or construct graphical solutions. You won't have to make perfect gas assumptions either.

Summary of @Air Features

- Seamlessly extends your spreadsheet program's set of built-in functions

- Accurate properties consistent with ASHRAE tables

- Equations based on virial equation of state using second and third order mixing coefficients. No perfect gas assumptions

- Accuracy fully documented.

- Supports many combinations of input data

- Use English, English Gage, SI Common, SI Formal, SI kPa and Metric unit sets.

- Includes easy to follow examples

- Allows pressures up to 50 bar (725 psia) and temperatures from 180 °K (-135.7 °F) to 2000 °K (3140.3 °F)

- Calculates specific volume, enthalpy, entropy, specific heat, viscosity or thermal conductivity

- Uses or calculates humidity ratio, relative humidity, degree of saturation, wet bulb or dew point temperatures.

- Express moisture as humidity ratio, mole fraction or mass fraction

- Express results on wet or dry basis

- Free phone support

@Air gives you fast, accurate functions that return specific volume, enthalpy, entropy, specific heat, thermal conductivity and viscosity. Reverse functions calculate the dry bulb temperature when specific volume, enthalpy or entropy is known. **@Air** also includes a number of functions that allow you to express moisture content in various ways including humidity ratio, relative humidity, degree of saturation, wet bulb temperature and dew point temperature.

No programming is required to use the **@Air** functions with Excel, 1-2-3 or Mathcad. Just follow a few simple steps to load the ready-made add-ins. The **@Air** functions can be used in formulas just like any of the other built-in functions.

The **@Air** package also includes **DeskTop Air**, a powerful interactive air property calculator which runs in its own window. The calculator features very flexible unit selection, an intuitive Windows user interface and special tools to facilitate calculations involving compression, expansion, heating and cooling of air.

Programmers should note that all of the air property functions are contained in a Windows Dynamic Link Library (DLL). Any Windows application which allows users to call functions in a DLL should be able to access the **@Air** functions. The 32-bit DLL works with Windows 98, Windows NT, Windows 2000, Windows XP and Vista. The 64-bit DLL works with Windows 7. Function protocols and .LIB files are included to support programming activities.

The functions use formulations for the thermodynamic properties of moist air based on a third order virial equation of state using data developed by the National Bureau of Standards (now NIST).

TECHWARE

ENGINEERING APPLICATIONS, INC.

@Air

Version 4.0

MOIST AIR THERMODYNAMIC
AND TRANSPORT PROPERTIES
FOR WINDOWS APPLICATIONS

Function	Input(s)	Output
AirPTWV()	Press, Temp, Abs Hum	Specific Volume
AirPVWT()	Press, Vol, Moisture	Dry Bulb Temp.
AirTVWP()	Temp, Vol, Moisture	Pressure
AirPTW()	Press, Temp	Sat Hum Ratio
AirPWD()	Press, Moisture	Dew Point Temp
AirPTF	Press, Temp	Enhancement Factor
AirPTRW()	Press, Temp, Rel Hum	Moisture
AirPTWR()	Press, Temp, Moisture	Relative Humidity
AirPTWB()	Press, Temp, Moisture	Wet Bulb Temp
AirPTBW()	Press, Temp, Wet Bulb	Moisture
AirPBWT()	Press, Wet Bulb, Moisture	Dry Bulb Temp
AirPBRT()	Press, Wet Bulb, Rel Hum	Dry Bulb Temp
AirPTWU()	Press, Temp, Moisture	Degree of Sat
AirPTUW()	Press, Temp, Deg of Sat	Moisture
AirPTWH()	Press, Temp, Moisture	Specific Enthalpy
AirPTHs()	Press, Temp	Sat Enthalpy
AirPWHT()	Press, Moisture, Enthalpy	Dry Bulb Temp
AirPHWT()	Press, Enthalpy, Moisture	Dry Bulb Temp
AirPHTs()	Press, Enthalpy	Sat Dry Bulb Temp
AirPTWS()	Press, Temp, Moisture	Specific Entropy
AirPWST()	Press, Moisture, Entropy	Dry Bulb Temp
AirPSWT()	Press, Entropy, Moisture	Dry Bulb Temp
AirPTWC()	Press, Temp, Moisture	Specific Heat
AirPTWM()	Press, Temp, Moisture	Dynamic Viscosity
AirPTWK()	Press, Temp, Moisture	Conductivity
AirVapTP()	Sat.Water Vapor Temp	Sat Pressure
AirVapPT()	Sat.Water Vapor Press	Sat Temperature
AirCondPTH()	Press, Temp	Specific Enthalpy of Condensed Water
AirCondPTS()	Press, Temp	Specific Entropy of Condensed Water
AirWX()	Humidity Ratio	Mole or mass fract
AirXW()	Mole or mass fraction	Humidity Ratio
AirVer()	None	Version/serial no.

Technical Specifications	
Applications Supported	Microsoft Excel Versions XP, 2003, 2007 and 2010 (32-bit and 64-bit). Lotus 1-2-3 97 and Millennium Mathcad Plus 6, 7 and 8 Visual Basic (32 bit and 64-bit) Visual C++ (32 bit and 64-bit)
Measurement Units	English, English Gauge, SI Common, SI Formal , SI kPa and Metric and Metric Formal Units
Valid Range	Pressure: Up to 50 bar (725 psia) Temperature: 180 °K to 2000 °K -135.7 °F to 3140.3 °F
Typical calling syntax	Excel: =AirPTWH(P, T, W, US) 1-2-3: @AirPTWH(P, T, W, US)

Moisture parameter defaults to humidity ratio but can be mole fraction or mass fraction by adding "C" or "M" to unit set respectively.

Computer Requirements

Operating System: Windows NT, 2000, XP, Vista and Windows 7
Disk Space Used: up to 3.0 MB