

Steamtables for Mathcad, v0.3
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Installation instructions

Installation is very simple, just put the 2 .dll files in the UserEFI folder in the mathcad program folder (ex. C:\Program Files\MathSoft\Mathcad 2001i Professional\UserEFI). Mathcad automatically looks for plugins and loads them on startup.

I have tested this on Mathcad 2001i and Mathcad 14, so it should probably work in any other version of mathcad, too.

This mathcad plugin makes use of XSteam, a Freeware Steam and water properties library on the "International Association for Properties of Water and Steam Industrial Formulation 1997 (IAPWS IF-97)". A full implementation of the IF-97 standard that provides very accurate steam and water properties in ranges from 0-1000 bar and 0-2000°C for use in process Engineering Industry.

Provided thermodynamic properties are:

- Temperature
- Pressure
- Enthalpy
- Specific volume
- Density
- Specific entropy

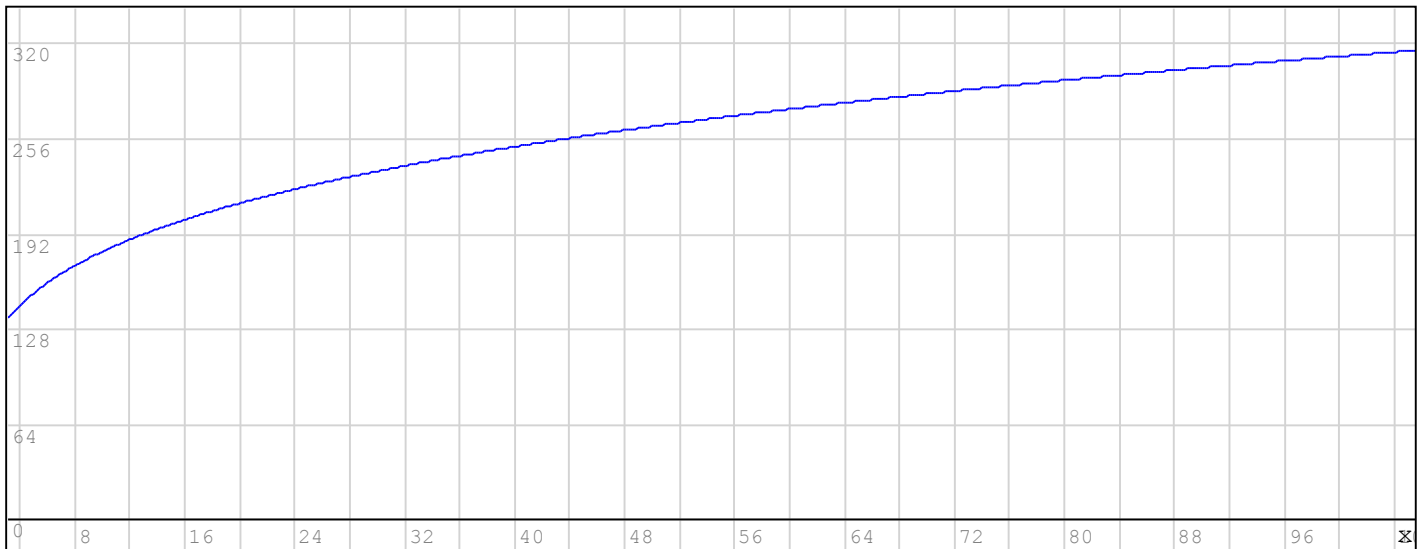
- Specific internal energy
- Specific isobaric heat capacity
- Specific isochoric heat capacity
- Speed of sound
- Viscosity
- Vapour fraction

All properties can be calculated with the inputs, p and T known, p and h known, h and s known and some with pressure and density known.

An examples.mcd file is provided with the functions available (or look on http://www.x-eng.com/XSteam_Information.htm for a extended list of functions available from the xsteam library, although I haven't implemented all of them, just the ones I required (I'm lazy, I know).

Just email me if you need any other functions from the xsteam library I haven't implemented. Or just implement them yourself, the source code is provided (written in Visual C++ 2005, I don't know if it will work with any other compiler). I'll probably implement the rest of the functions in future releases.

Saturation temperature at every pressure



$T_{sat_p}(x)$

All available functions in the XSteam DLL

1. Saturation temperature: $T_{sat_p}(1) = 99,61$
2. Temperature as a function of pressure and enthalpy:
 $T_{ph}(1; 100) = 23,84$
3. Temperature as a function of pressure and entropy:
 $T_{ps}(1; 1) = 73,71$
4. Temperature as a function of enthalpy and entropy:
 $T_{hs}(100; 0,2) = 13,85$
5. Saturation pressure: $psat_T(100) = 1,01$
6. Pressure as a function of h and s: $p_{hs}(84; 0,296) = 2,3$
7. Pressure as a function of enthalpy and density:
 $p_{hrho}(2000; 5) = 6,05$
8. Saturated vapour enthalpy: $hV_p(1) = 2674,95$
9. Saturated liquid enthalpy: $hL_p(1) = 417,44$
10. Saturated vapour enthalpy: $hV_T(100) = 2725,47$
11. Saturated liquid enthalpy: $hL_T(100) = 419,1$
12. Entalpy as a function of pressure and temperature:
 $h_{pT}(1; 20) = 84,01$
13. Entalpy as a function of pressure and entropy:
 $h_{ps}(1; 1) = 308,61$

14. Enthalpy as a function of pressure and vapour fraction:

$$h_{px}(1; 0,5) = 1546,19$$

15. Enthalpy as a function of temperature and vapour fraction:

$$h_{Tx}(100; 0,5) = 1547,34$$

16. Enthalpy as a function of pressure and density.

Observe for low temperatures (liquid) this equation has 2 solutions.
(Not valid!!)

$$h_{prho}(1; 2) = 1082,77$$

17. Saturated vapour volume: $v_{V_p}(1) = 1,69$

18. Saturated liquid volume: $v_{L_p}(1) = 0$

19. Saturated vapour volume: $v_{V_T}(100) = 1,67$

20. Saturated liquid volume: $v_{L_T}(1) = 0$

21. Specific volume as a function of pressure and temperature:

$$v_{pT}(1; 100) = 1,7$$

22. Specific volume as a function of pressure and enthalpy:

$$v_{ph}(1; 1) = 0$$

23. Specific volume as a function of pressure and entropy:

$$v_{ps}(1; 1) = 0$$

24. Saturated vapour density: $\rho_{V_p}(1) = 0,59$

25. Saturated liquid density: $\rho_{L_p}(1) = 958,64$

26. Saturated vapour density: $\rho_{V_T}(100) = 0,6$

27. Saturated liquid density: $\rho_{L_T}(100) = 958,35$

28. Density as a function of pressure and temperature:

$$\rho_{pT}(1; 100) = 0,59$$

29. Density as a function of pressure and enthalpy:

$$\rho_{ph}(1; 1) = 999,86$$

30. Density as a function of pressure and entropy:

$$\rho_{ps}(1; 1) = 975,62$$

31. Saturated vapour entropy: $s_{V_p}(1) = 7,36$

32. Saturated liquid entropy: $s_{L_p}(1) = 1,3$

33. Saturated vapour entropy: $s_{V_T}(100) = 7,35$

34. Saturated liquid entropy: $s_{L,T}(100) = 1,31$

35. Specific entropy as a function of pressure and temperature
(Returns saturated vapour enthalpy if mixture:

$s_{pT}(1; 100) = 7,36$

36. Specific entropy as a function of pressure and enthalpy:

$s_{ph}(1; 1) = 0$