KCE
ThermoFluidProperties

Property Library for Ammonia-Water Mixtures

LibButan_n

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Property Functions

Functional Dependence	Function Name	Call from Fortran program	Property or Function	Unit of the result
$a = f(p,t,x)$	a_ptx_BUTN	APTXBUTN(P,T,X)	Thermal diffusivity	m^2/s
$c_p = f(p,t,x)$	cp_ptx_BUTN	CPPTXBUTN(P,T,X)	Specific isobaric heat capacity	kJ/(kg K)
$c_v = f(p,t,x)$	cv_ptx_BUTN	CVPTXBUTN(P,T,X)	Specific isochoric heat capacity	kJ/(kg K)
$\eta = f(p,t,x)$	eta_ptx_BUTN	ETAPTXBUTN(P,T,X)	Dynamic viscosity	Pa s
$h = f(p,t,x)$	h_ptx_BUTN	HPTXBUTN(P,T,X)	Specific enthalpy	kJ/kg
$\kappa = f(p,t,x)$	kappa_ptx_BUTN	KAPTXBUTN(P,T,X)	Isentropic exponent	-
$\lambda = f(p,t,x)$	lambda_ptx_BUTN	LAMPTXBUTN(P,T,X)	Thermal conductivity	W/(m K)
$\nu = f(p,t,x)$	ny_ptx_BUTN	NYPTXBUTN(P,T,X)	Kinematic viscosity	m^2/s
$p_{mel} = f(t)$	pmel_t_BUTN	PMELBUTN(T)	Melting pressure from temperature	bar
$p_s = f(t)$	ps_t_BUTN	PSTBUTN(T)	Vapor pressure from temperature	bar
$Pr = f(p,t,x)$	Pr_ptx_BUTN	PRPTXBUTN(P,T,X)	*Prandtl*-Number	-
$\rho = f(p,t,x)$	rho_ptx_BUTN	ROPTXBUTN(P,T,X)	Density	kg/m^3
$s = f(p,t,x)$	s_ptx_BUTN	SPTXBUTN(P,T,X)	Specific entropy	kJ/(kg K)
$t = f(p,h)$	t_ph_BUTN	TPHBUTN(P,H)	Backward function: Temperature from pressure and enthalpy	°C
$t = f(p,s)$	t_ps_BUTN	TPSBUTN(P,S)	Backward function: Temperature from pressure and entropy	°C
$t_{mel} = f(p)$	tmel_p_BUTN	TMELBUTN(P)	Melting temperature from pressure	°C
$t_s = f(p)$	ts_p_BUTN	TSPBUTN(P)	Saturation temperature from pressure	°C
$u = f(p,t,x)$	u_ptx_BUTN	UPTXBUTN(P,T,X)	Specific internal energy	kJ/kg
$v = f(p,t,x)$	v_ptx_BUTN	VPTXBUTN(P,T,X)	Specific volume	m^3/kg
$w = f(p,t,x)$	w_ptx_BUTN	WPTXBUTN(P,T,X)	Isentropic speed of sound	m/s
$x = f(p,h)$	x_ph_BUTN	XPHBUTN(P,H)	Backward function: Vapor fraction from pressure and enthalpy	kg/kg
$x = f(p,s)$	x_ps_BUTN	XPSBUTN(P,S)	Backward function: Vapor fraction from pressure and entropy	kg/kg
$z = f(p,t,x)$	z_ptx_BUTN	ZPTXBUTN(P,T,X)	Compression factor	-

Units:

t in °C

p in bar

x in (kg of saturated steam)/(kg wet steam)

Range of validity

Temperature range: from $t_{mel}(p)$ to 301.85 °C

Pressure range: from $p_t = 6.53 \times 10^{-6}$ bar to 690 bar

Reference state

h = 200 kJ/kg and s = 1 kJ/(kg K) at t = 0 °C on the boiling curve (x = 0)

Details on the vapor fraction *x* and on the calculation of wet steam

The wet steam region is calculated automatically by the subprograms. For this purpose the following fixed details on the vapor fraction x are to be considered:

If the state point to be calculated is located in the single-phase region (liquid or superheated steam) x = –1 must be entered as a pro-forma value.

If the state point to be calculated is located in the wet steam region, a value for x between 0 and 1 (x = 0 for saturated liquid, x = 1 for saturated steam) must be entered.

When calculating wet steam either the given value for t and p = -1000 or the given value for p and t = -1000 and in both cases the value for x between 0 and 1 must be entered.

If p and t and x are entered as given values, the program considers p and t to be appropriate to represent the vapor pressure curve.

If it is not true, the calculated result will be –1000.

Wet steam region: Temperature range from t_t = –138.255 °C to t_c = 151.975 °C

Pressure range from $p_t = 6.53 \times 10^{-6}$ bar to 37.96 bar

Hint!

If the input values are located outside the range of validity, the result for the calculated function will always be –1000. Please find more exact details on every function and its corresponding range of validity in the enclosed program documentation in chapter 3.