Property Library for R134a

LibR134a

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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_R134a	A_PTX_R134A(P,T,X)	Thermal diffusivity	m^2/s
$c_p = f(p,t,x)$	cp_ptx_R134a	CP_PTX_R134A(P,T,X)	Specific isobaric heat capacity	kJ/(kg K)
$c_v = f(p,t,x)$	cv_ptx_R134a	CV_PTX_R134A(P,T,X)	Specific isochoric heat capacity	kJ/(kg K)
$\eta = f(p,t,x)$	eta_ptx_R134a	ETA_PTX_R134A(P,T,X)	Dynamic viscosity	Pa s
$h = f(p,t,x)$	h_ptx_R134a	H_PTX_R134A(P,T,X)	Specific enthalpy	kJ/kg
$\kappa = f(p,t,x)$	kappa_ptx_R134a	KAP_PTX_R134A(P,T,X)	Isentropic exponent	-
$\lambda = f(p,t,x)$	lambda_ptx_R134a	LAM_PTX_R134A(P,T,X)	Thermal conductivity	W/m K
$\nu = f(p,t,x)$	ny_ptx_R134a	NY_PTX_R134A(P,T,X)	Kinematic viscosity	m^2/s
$p_s = f(t)$	ps_t_R134a	PS_T_R134A(T)	Vapor pressure from temperature	Bar
$Pr = f(p,t,x)$	Pr_ptx_R134a	PR_PTX_R134A(P,T,X)	*Prandtl*-Number	-
$\rho = f(p,t,x)$	rho_ptx_R134a	RHO_PTX_R134A(P,T,X)	Density	kg/m³
$s = f(p,t,x)$	s_ptx_R134a	S_PTX_R134A(P,T,X)	Specific entropy	kJ/(kg K)
$\sigma = f(t)$	sigma_t_R134a	SIGMA_T_R134A(T)	Surface tension	N/m
$t = f(p,h)$	t_ph_R134a	T_PH_R134A(P,H)	Backward function: Temperature from pressure and enthalpy	°C
$t = f(p,s)$	t_ps_R134a	T_PS_R134A(P,S)	Backward function: Temperature from pressure and entropy	°C
$t_s = f(p)$	ts_p_R134a	TS_P_R134A(P)	Saturation temperature from pressure	°C
$u = f(p,t,x)$	u_ptx_R134a	U_PTX_R134A(P,T,X)	Specific internal energy	kJ/kg
$v = f(p,t,x)$	v_ptx_R134a	V_PTX_R134A(P,T,X)	Specific volume	m³/kg
$w = f(p,t,x)$	w_ptx_R134a	W_PTX_R134A(P,T,X)	Isentropic speed of sound	m/s²
$x = f(p,h)$	x_ph_R134a	X_PH_R134A(P,H)	Backward function: Vapor fraction from pressure and enthalpy	kg/kg
$x = f(p,s)$	x_ps_R134a	X_PS_R134A(P,S)	Backward function: Vapor fraction from pressure and entropy	kg/kg

Units: t in °C

                      p in bar

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

Range of validity

Temperature range: from $t(p, \rho_{max})$ to 181.85 °C

Pressure range: from p_t = 0.000389564 bar to 700 bar

Reference state

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

Details on the vapor fraction *x*

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:

<u>Single-phase region</u>

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.

<u>Wet-steam region</u>

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. In this case, the backward functions result in the appropriate value between 0 and 1 for *x*. When calculating wet steam either the given value for *t* <u>and</u> p = -1000 or the given value for *p* <u>and</u> t = -1000 and in both cases the value for *x* between 0 and 1 must be entered.

If *p* <u>and</u> *t* <u>and</u> *x* are entered as given values, the program considers *p* and *t* to be appropriate to represent the vapor pressure curve. If this is not the case the calculation for the property of the chosen function results in –1000.

Wet steam region: Temperature ranges from t_t = –103.30 °C to t_c = 101.03 °C

                           Pressure ranges from p_t = 0. 000389564 bar to p_c = 40.566 bar

Hint:

If the calculation results in –1000, the values entered represent a state point beyond the range of validity of LibR134a. For further information on each function and its range of validity see Chapter 3. The same information may also be accessed via the online help pages.