KCE

ThermoFluidProperties

Property Library for Carbon Monoxide

LibCO

Prof. Hans-Joachim Kretzschmar
Dr. Sebastian Herrmann
Dr. Matthias Kunick

Property Functions

Functional Dependence	Function Name	Call from Fortran Program	Property or Function	Unit of the Result
$a = f(p,t,x)$	a_ptx_CO	A_PTX_CO(P,T,X)	Thermal diffusivity	m²/s
$c_p = f(p,t,x)$	cp_ptx_CO	CP_PTX_CO(P,T,X)	Specific isobaric heat capacity	kJ/(kg K)
$c_v = f(p,t,x)$	cv_ptx_CO	CV_PTX_CO(P,T,X)	Specific isochoric heat capacity	kJ/(kg K)
$\eta = f(p,t,x)$	eta_ptx_CO	ETA_PTX_CO(P,T,X)	Dynamic viscosity	Pa . s
$h = f(p,t,x)$	h_ptx_CO	H_PTX_CO(P,T,X)	Specific enthalpy	kJ/kg
$\kappa = f(p,t,x)$	ka_ptx_CO	KA_PTX_CO(P,T,X)	Isentropic exponent	-
$\lambda = f(p,t,x)$	lam_ptx_CO	LAM_PTX_CO(P,T,X)	Thermal conductivity	W/(m . K)
$\nu = f(p,t,x)$	ny_ptx_CO	NY_PTX_CO(P,T,X)	Kinematic viscosity	m²/s
$p_{mel} = f(t)$	pmel_t_CO	PMEL_T_CO (T)	Melting pressure from temperature	bar
$Pr = f(p,t,x)$	pr_ptx_CO	PR_PTX_CO(P,T,X)	*Prandtl*-number	-
$p_s = f(t)$	ps_t_CO	PS_T_CO(T)	Vapor pressure from temperature	bar
$\rho = f(p,t,x)$	rho_ptx_CO	RHO_PTX_CO(P,T,X)	Density	kg/m^3
$s = f(p,t,x)$	s_ptx_CO	S_PTX_CO(P,T,X)	Specific entropy	kJ/(kg K)
$\sigma = f(t)$	sigma_t_CO	SIGMA_T_CO(T)	Surface tension from temperature	N/m
$t = f(p,h)$	t_ph_CO	T_PH_CO(P,H)	Backward function: Temperature from pressure and enthalpy	°C
$t = f(p,s)$	t_ps_CO	T_PS_CO(P,S)	Backward function: Temperature from pressure and entropy	°C
$t_{mel} = f(p)$	tmel_p_CO	TMEL_P_CO (P)	Melting Temperature from pressure	°C
$t_s = f(p)$	ts_p_CO	TS_P_CO(P)	Saturation temperature from pressure	°C
$u = f(p,t,x)$	u_ptx_CO	U_PTX_CO(P,T,X)	Specific internal energy	kJ/kg

Functional Dependence	Function Name	Call from Fortran Program	Property or Function	Unit of the Result
$v = f(p,t,x)$	v_ptx_CO	V_PTX_CO(P,T,X)	Specific volume	m³/kg
$w = f(p,t,x)$	w_ptx_CO	W_PTX_CO(P,T,X)	Isentropic speed of sound	m/s
$x = f(p,h)$	x_ph_CO	X_PH_CO(P,H)	Backward function: Vapor fraction from pressure and enthalpy	kg/kg
$x = f(p,s)$	x_ps_CO	X_PS_CO(P,S)	Backward function: Vapor fraction from pressure and entropy	kg/kg

Units: *t* in °C
p in bar
x in (kg saturated steam)/(kg wet steam)

Range of validity

Temperature range: from - 204.99 °C to 226.85 °C
Pressure range: from 0.15537 bar to 1000 bar

Reference state

h = 0 kJ/kg and *s* = 0 kJ/(kg K) at *p* = 1,01325 bar 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:

Single-phase region

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.

Wet-steam region

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* 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 this is not the case the calculation for the property of the chosen function results in –1.

Wet steam region: Temperature ranges from t_{min} = - 204.99 °C to t_c = 140.29 °C

Pressure ranges from p_{min} = 0.15537 bar to p_c = 34.9821 bar

Note:

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