

Property Library for Hydrogen Sulfide

LibH2S

Prof. Hans-Joachim Kretzschmar
Dr. Sebastian Herrmann
Dr. Matthias Kunick
Ines Jaehne
Tobias Goepfert

Property Functions

Functional Dependence	Function Name	Call from Fortran Program	Property or Function	Unit of the Result
$a = f(p, t, x)$	a_ptx_H2S	A_PTX_H2S(P,T,X)	Thermal diffusivity	m ² /s
$c_p = f(p, t, x)$	cp_ptx_H2S	CP_PTX_H2S(P,T,X)	Specific isobaric heat capacity	kJ/(kg K)
$c_v = f(p, t, x)$	cv_ptx_H2S	CV_PTX_H2S(P,T,X)	Specific isochoric heat capacity	kJ/(kg K)
$\eta = f(p, t, x)$	eta_ptx_H2S	ETA_PTX_H2S(P,T,X)	Dynamic viscosity	Pa . s
$h = f(p, t, x)$	h_ptx_H2S	H_PTX_H2S(P,T,X)	Specific enthalpy	kJ/kg
$\kappa = f(p, t, x)$	ka_ptx_H2S	KA_PTX_H2S(P,T,X)	Isentropic exponent	-
$\lambda = f(p, t, x)$	lam_ptx_H2S	LAM_PTX_H2S(P,T,X)	Thermal conductivity	W/(m . K)
$\nu = f(p, t, x)$	ny_ptx_H2S	NY_PTX_H2S(P,T,X)	Kinematic viscosity	m ² /s
$Pr = f(p, t, x)$	pr_ptx_H2S	PR_PTX_H2S(P,T,X)	<i>Prandtl</i> -number	-
$p_s = f(t)$	ps_t_H2S	PS_T_H2S(T)	Vapor pressure from temperature	bar
$\rho = f(p, t, x)$	rho_ptx_H2S	RHO_PTX_H2S(P,T,X)	Density	kg/m ³
$s = f(p, t, x)$	s_ptx_H2S	S_PTX_H2S(P,T,X)	Specific entropy	kJ/(kg K)
$\sigma = f(t)$	sigma_t_H2S	SIGMA_T_H2S(T)	Surface tension from temperature	N/m
$t = f(p, h)$	t_ph_H2S	T_PH_H2S(P,H)	Backward function: Temperature from pressure and enthalpy	°C
$t = f(p, s)$	t_ps_H2S	T_PS_H2S(P,S)	Backward function: Temperature from pressure and entropy	°C
$t_s = f(p)$	ts_p_H2S	TS_P_H2S(P)	Saturation temperature from pressure	°C
$u = f(p, t, x)$	u_ptx_H2S	U_PTX_H2S(P,T,X)	Specific internal energy	kJ/kg
$v = f(p, t, x)$	v_ptx_H2S	V_PTX_H2S(P,T,X)	Specific volume	m ³ /kg
$w = f(p, t, x)$	w_ptx_H2S	W_PTX_H2S(P,T,X)	Isentropic speed of sound	m/s

Functional Dependence	Function Name	Call from Fortran Program	Property or Function	Unit of the Result
$x = f(p, h)$	x_ph_H2S	X_PH_H2S(P,H)	Backward function: Vapor fraction from pressure and enthalpy	kg/kg
$x = f(p, s)$	x_ps_H2S	X_PS_H2S(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 - 85.45 °C to 486.85 °C

Pressure range: from 0.23259 bar to 1700 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 $t_{\min} = -85.45\text{ °C}$ to $t_c = 99.95\text{ °C}$
Pressure ranges from $p_{\min} = 0.23259\text{ bar}$ to $p_c = 89.987\text{ bar}$

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 program documentation in Chapter 3.