KCE
ThermoFluidProperties

# Property Library for Propane

# LibPropan

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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_PROP | APTXPROP(P,T,X) | Thermal diffusivity | $m^2/s$ |
| $c_p = f(p,t,x)$ | cp_ptx_PROP | CPPTXPROP(P,T,X) | Specific isobaric heat capacity | kJ/(kg K) |
| $\eta = f(p,t,x)$ | eta_ptx_PROP | ETAPTXPROP(P,T,X) | Dynamic viscosity | Pa s |
| $h = f(p,t,x)$ | h_ptx_PROP | HPTXPROP(P,T,X) | Specific enthalpy | kJ/kg |
| $\kappa = f(p,t,x)$ | kappa_ptx_PROP | KAPTXPROP(P,T,X) | Isentropic exponent | - |
| $\lambda = f(p,t,x)$ | lambda_ptx_PROP | LAMPTXPROP(P,T,X) | Thermal conductivity | W/(m K) |
| $\nu = f(p,t,x)$ | ny_ptx_PROP | NYPTXPROP(P,T,X) | Kinematic viscosity | $m^2/s$ |
| $p_{mel} = f(t)$ | pmel_t_PROP | PMELPROP(T) | Melting pressure from temperature | bar |
| $p_s = f(t)$ | ps_t_PROP | PSTPROP(T) | Vapor pressure from temperature | bar |
| $Pr = f(p,t,x)$ | Pr_ptx_PROP | PRPTXPROP(P,T,X) | *Prandtl*-Number | - |
| $\rho = f(p,t,x)$ | rho_ptx_PROP | ROPTXPROP(P,T,X) | Density | $kg/m^3$ |
| $s = f(p,t,x)$ | s_ptx_PROP | SPTXPROP(P,T,X) | Specific entropy | kJ/(kg K) |
| $t = f(p,h)$ | t_ph_PROP | TPHPROP(P,H) | Backward function: Temperature from pressure and enthalpy | °C |
| $t = f(p,s)$ | t_ps_PROP | TPSPROP(P,S) | Backward function: Temperature from pressure and entropy | °C |
| $t_{mel} = f(p)$ | tmel_p_PROP | TMELPROP(P) | Melting temperature from pressure | °C |
| $t_s = f(p)$ | ts_p_PROP | TSPPROP(P) | Saturation temperature from pressure | °C |
| $u = f(p,t,x)$ | u_ptx_PROP | UPTXPROP(P,T,X) | Specific internal energy | kJ/kg |
| $v = f(p,t,x)$ | v_ptx_PROP | VPTXPROP(P,T,X) | Specific volume | $m^3/kg$ |
| $w = f(p,t,x)$ | w_ptx_PROP | WPTXPROP(P,T,X) | Isentropic speed of sound | m/s |
| $x = f(p,h)$ | x_ph_PROP | XPHPROP(P,H) | Backward function: Vapor fraction from pressure and enthalpy | kg/kg |
| $x = f(p,s)$ | x_ps_PROP | XPSPROP(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 $t_{mel}(p)$ to 326.85 °C

Pressure range: from $p_s(t_t)$ = 1.7517 x $10^{-9}$ bar to 1000 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*

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 –1000.

Wet steam region: Temperature range from $t_t$ = –187.625 °C to $t_c$ = 96.74 °C

Pressure range from $p_s(t_t)$ = 1.7517 x $10^{-9}$ bar to $p_c$ = 42.512 bar

**Note.**

*If the calculation results in –1000, the values entered represent a state point beyond the range of validity of LibPropan. 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.*