# 2.28 Propane

Equations for thermodynamic properties have been cited from Buehner et al.[1] and one for surface tension from Miller et al.[2].

## 2.28.1 Temperature Scale

International practical temperature scale 1968 (IPTS-1968)

## 2.28.2 The Names of Substance, Library File and Single Shot Program

| | |
|---|---|
| Name of Substance: | Propane |
| Library File for UNIX: | libjc3h8.a |
| Library File for DOS,Windows95/NT: | JC3H8.LIB |
| Single Shot Program for UNIX: | c3h8-ss |
| Single Shot Program for DOS,Windows95/NT: | C3H8–SS.EXE |

## 2.28.3 Important Constants and Others

| | |
|---|---|
| Molecular Formula: | $C_3H_8$ |
| Relative Molecular Mass: | 44.097 |
| Gas Constant: | 188.546 J/(kg·K) |

Critical Constants:

| | |
|---|---|
| Critical Pressure: | $4.2597\times10^{6}$Pa (42.597 bar) |
| Critical Temperature: | 369.9 K (96.75°C) |
| Critical Specific Volume: | $4.5455\times10^{-3}$m$^3$/kg |

Reference State:

At 1.01325 bar (1 atm) and 25°C(298.15 K), 0 J/(kg·K) is assigned to the specific entropy of the ideal gas. At 25°C(298.15 K), 0 J/kg is assigned to the specific enthalpy of the ideal gas.

## 2.28.4 Formula

Equation of State:

Equation (1) in a function form of $P = P(\rho, T)$ in reference [1]. Here $P$= pressure, $\rho$= density and $T$= temperature. However,

$$P = \rho T[R + B\rho + C\rho^2 + D\rho^3 + F\rho^4 + E\rho^5 \cdots$$

in equation (1) has been corrected to

$$P = \rho T[R + B\rho + C\rho^2 + D\rho^3 + E\rho^4 + F\rho^5 \cdots$$

Vapor Pressure:

Equation (1) [equation of state] in reference [1] and the Gibbs condition for phase equilibrium.

Properties at Vapor-Liquid Equilibrium:

Equation (1) in reference [1] and the Gibbs condition for phase equlibrium for specific volume. Equations as functions of density and temperature, which have been derived from equation (1) in reference [1] for specific entropy, specific enthalpy and isobaric specific heat, respectively.

The Other Properties:

Surface tension from reference [2].

## References

[1] K.Buehner, G.Maurer and E.Bender, Cryogenics, March (1981), pp.157–164.
[2] J.W.Miller Jr. and C.L.Yaws, Chem. Eng., 83–23,(1976), p.127–129.

Table II–2.28–1 Propane Function

| No. | Name of Function | Function and Argument(s) | Range of Argument(s) |
|---|---|---|---|
| 1 | AIPPT(P,T) | | |
| 94 | AJTPT(P,T) | AJTPT: Joule-Thomson Coefficient [K/Pa]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 8A | AKPD(P) | | |
| 8B | AKPDD(P) | | |
| 82 | AKPT(P,T) | AKPT: Isentropic Exponent [–]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 8C | AKTD(T) | | |
| 8D | AKTDD(T) | | |
| 2 | ALAPP(P) | ALAPP: Laplace Coefficient [m]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 3 | ALAPT(T) | ALAPT: Laplace Coefficient [m]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 4 | ALHP(P) | ALHP: Latent Heat of Vaporization [J/kg]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 5 | ALHT(T) | ALHT: Latent Heat of Vaporization [J/kg]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 6 | ALMPD(P) | | |
| 7 | ALMPDD(P) | | |
| 8 | ALMPT(P,T) | | |
| 9 | ALMTD(T) | | |
| 10 | ALMTDD(T) | | |
| 11 | AMUPD(P) | | |
| 12 | AMUPDD(P) | | |
| 13 | AMUPT(P,T) | | |
| 14 | AMUTD(T) | | |
| 15 | AMUTDD(T) | | |
| 92 | BPPT(P,T) | BPPT: Volumetric Coefficient of Expansion [1/K]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 90 | BSPT(P,T) | BSPT: Isentropic Compressibility [1/Pa]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 91 | BTPT(P,T) | BTPT: Isothermal Compressibility [1/Pa]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 93 | BVPT(P,T) | BVPT: Pressure Coefficient [1/K]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |

Table II–2.28–1 Propane Function (cont'd)

| No. | Name of Function | Function and Argument(s) | Range of Argument(s) |
|---|---|---|---|
| 16 | CPPD(P) | CPPD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 17 | CPPDD(P) | CPPDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 18 | CPPT(P,T) | CPPT: Isobaric Specific Heat [J/(kg·K)]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 19 | CPTD(T) | CPTD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 20 | CPTDD(T) | CPTDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 21 | CRP('A') | CRP: Critical Constants<br>H: 'A'='H': $-491.10\times10^{3}$ [J/kg] Specific Enthalpy<br>P∗: 'A'='P': $4.2597\times10^{6}$ [Pa], 42.597 [bar] Pressure<br>S: 'A'='S': $-4.0931\times10^{3}$ [J/(kg·K)] Specific Entropy<br>T∗: 'A'='T': 369.9 [K], 96.75 [°C] Temperature<br>V: 'A'='V': $4.5455\times10^{-3}$ [$m^3$/kg] Specific Volume | one of 'H', 'P', 'S', 'T' and 'V' |
| 7A | CVPD(P) | | |
| 76 | CVPDD(P) | CVPDD: Isochoric Specific Heat of Saturated Vapor [J/(kg·K)]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 77 | CVPT(P,T) | CVPT: Isochoric Specific Heat [J/(kg·K)]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 7B | CVTD(T) | | |
| 78 | CVTDD(T) | CVTDD: Isochoric Specific Heat of Saturated Vapor [J/(kg·K)]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 2A | EPSPD(P) | | |
| 2B | EPSPDD(P) | | |
| 22 | EPSPT(P,T) | | |
| 2C | EPSTD(T) | | |
| 2D | EPSTDD(T) | | |
| 89 | FC('A') | FC: Fundamental Constants<br>M: 'A'='M': 44.097 Relative Molecular Mass<br>R: 'A'='R': 188.546 [J/(kg·K)] Gas Constant | one of 'M' and 'R' |
| 9A | GAMPD(P) | | |
| 96 | GAMPDD(P) | GAMPDD: Ratio of Specific Heats of Saturated Vapor [–]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 95 | GAMPT(P,T) | GAMPT: Ratio of Heats [–]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 9B | GAMTD(T) | | |
| 97 | GAMTDD(T) | GAMTDD: Ratio of Specific Heats of Saturated Vapor [–]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |

Table II–2.28–1 Propane Function (cont'd)

| No. | Name of Function | Function and Argument(s) | Range of Argument(s) |
|---|---|---|---|
| 23 | HPD(P) | HPD: Specific Enthalpy of Saturated Liquid [J/kg]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 24 | HPDD(P) | HPDD: Specific Enthalpy of Saturated Vapor [J/kg]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 71 | HPS(P,S) | HPS: Specific Enthalpy [J/kg]<br>P∗: Pressure [Pa], [bar]<br>S: Specific Entropy [J/(kg·K)] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>SPT(P,188.15K)≤S≤<br>SPT(P,573.15K) [J/(kg·K)]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>SPT(P,−85°C)≤S≤<br>SPT(P,300°C) [J/(kg·K)] |
| 25 | HPT(P,T) | HPT: Specific Enthalpy [J/kg]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |
| 26 | HPX(P,X) | HPX: Specific Enthalpy of Mixture [J/kg]<br>P∗: Pressure [Pa], [bar]<br>X: Dryness Fraction [–] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar]<br>$0\leq X\leq1.0$ [–] |
| 27 | HTD(T) | HTD: Specific Enthalpy of Saturated Liquid [J/kg]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 28 | HTDD(T) | HTDD: Specific Enthalpy of Saturated Vapor [J/kg]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 29 | HTX(T,X) | HTX: Specific Enthalpy of Mixture [J/kg]<br>T∗: Temperature [K], [°C]<br>X: Dryness Fraction [–] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C]<br>$0\leq X\leq1.0$ [–] |
| 84 | IDENTF('A') | IDENTF: CHARACTER TYPE FUNCTION<br>for Package Identification (Length 20)<br>C: 'A'='C': 'C3H8' Molecular Formula<br>S: 'A'='S': 'PROPANE' Name of Substance<br>V: 'A'='V': '10.1' Version Number | one of 'C', 'S' and 'V' |
| 66 | PLDT(T) | | |
| 68 | PMLT(T) | | |
| 85 | PRPD(P) | | |
| 86 | PRPDD(P) | | |
| 81 | PRPT(P,T) | | |
| 87 | PRTD(T) | | |
| 88 | PRTDD(T) | | |
| 99 | PSBT(T) | | |
| 30 | PST(T) | PST∗: Saturation Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 72 | PSTD(T) | | |
| 73 | PSTDD(T) | | |
| 31 | SIGP(P) | SIGP: Surface Tension [N/m]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 32 | SIGT(T) | SIGT: Surface Tension [N/m]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 33 | SPD(P) | SPD: Specific Entropy of Saturated Liquid [J/(kg·K)]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 34 | SPDD(P) | SPDD: Specific Entropy of Saturated Vapor [J/(kg·K)]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 35 | SPT(P,T) | SPT: Specific Entropy [J/(kg·K)]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>$188.15\leq T\leq573.15$ [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>$-85\leq T\leq300$ [°C] |

Table II–2.28–1 Propane Function (cont'd)

| No. | Name of Function | Function and Argument(s) | Range of Argument(s) |
|---|---|---|---|
| 36 | SPX(P,X) | SPX: Specific Entropy of Mixture [J/(kg·K)]<br>P∗: Pressure [Pa], [bar]<br>X: Dryness Fraction [–] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar]<br>$0\leq X\leq1.0$ [–] |
| 37 | STD(T) | STD: Specific Entropy of Saturated Liquid [J/(kg·K)]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 38 | STDD(T) | STDD: Specific Entropy of Saturated Vapor [J/(kg·K)]<br>T∗: Temperature [K], [°C] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C] |
| 39 | STX(T,X) | STX: Specific Entropy of Mixture [J/(kg·K)]<br>T∗: Temperature [K], [°C]<br>X: Dryness Fraction [–] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C]<br>$0\leq X\leq1.0$ [–] |
| 67 | TLDP(P) | | |
| 69 | TMLP(P) | | |
| 64 | TPH(P,H) | TPH∗: Temperature [K], [°C]<br>P∗: Pressure [Pa], [bar]<br>H: Specific Enthalpy [J/kg] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>HPT(P,188.15K)≤H≤<br>HPT(P,573.15K) [J/kg]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>HPT(P,−85°C)≤H≤<br>HPT(P,300°C) [J/kg] |
| 6H | TPH2(P,H) | | |
| 65 | TPS(P,S) | TPS∗: Temperature [K], [°C]<br>P∗: Pressure [Pa], [bar]<br>S: Specific Entropy [J/(kg·K)] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>SPT(P,188.15K)≤S≤<br>SPT(P,573.15K) [J/(kg·K)]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>SPT(P,−85°C)≤S≤<br>SPT(P,300°C) [J/(kg·K)] |
| 6S | TPS2(P,S) | | |
| 98 | TPSEUP(P) | TPSEUP: Pseudo Boiling Point [K], [°C]<br>P∗: Pressure [Pa], [bar] | $4.2597\times10^{6}<P\leq20\times10^{6}$ [Pa]<br>$42.597<P\leq200$ [bar] |
| 70 | TPV(P,V) | TPV∗: Temperature [K], [°C]<br>P∗: Pressure [Pa], [bar]<br>V: Specific Volume [$m^3$/kg] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>VPT(P,188.15K)≤V≤<br>VPT(P,573.15K) [$m^3$/kg]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>VPT(P,−85°C)≤V≤<br>VPT(P,300°C) [$m^3$/kg] |
| 41 | TRPL('A') | | |
| 100 | TSBP(P) | | |
| 40 | TSP(P) | TSP∗: Saturation Temperature [K], [°C]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 74 | TSPD(P) | | |
| 75 | TSPDD(P) | | |
| 42 | UPD(P) | UPD: Specific Internal Energy of Saturated Liquid [J/kg]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 43 | UPDD(P) | UPDD: Specific Internal Energy of Saturated Vapor [J/kg]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |

Table II–2.28–1 Propane Function (cont'd)

| No. | Name of Function | Function and Argument(s) | Range of Argument(s) |
|---|---|---|---|
| 79 | UPS(P,S) | UPS: Specific Internal Energy [J/kg]<br>P∗: Pressure [Pa], [bar]<br>S: Specific Entropy [J/(kg·K)] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>SPT(P,188.15K)≤S≤<br>SPT(P,573.15K) [J/(kg·K)]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>SPT(P,−85°C)≤S≤<br>SPT(P,300°C) [J/(kg·K)] |
| 44 | UPT(P,T) | UPT: Specific Internal Energy [J/kg]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>188.15≤T≤573.15 [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>−85≤T≤300 [°C] |
| 45 | UPX(P,X) | UPX: Specific Internal Energy of Mixture [J/kg]<br>P∗: Pressure [Pa], [bar]<br>X: Dryness Fraction [–] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar]<br>0≤X≤1.0 [–] |
| 46 | UTD(T) | UTD: Specific Internal Energy of Saturated Liquid [J/kg]<br>T∗: Temperature [K], [°C] | 188.15≤T≤369.6 [K]<br>−85≤T≤96.45 [°C] |
| 47 | UTDD(T) | UTDD: Specific Internal Energy of Saturated Vapor [J/kg]<br>T∗: Temperature [K], [°C] | 188.15≤T≤369.6 [K]<br>−85≤T≤96.45 [°C] |
| 48 | UTX(T,X) | UTX: Specific Internal Energy of Mixture [J/kg]<br>T∗: Temperature [K], [°C]<br>X: Dryness Fraction [–] | 188.15≤T≤369.6 [K]<br>−85≤T≤96.45 [°C]<br>0≤X≤1.0 [–] |
| 49 | VPD(P) | VPD: Specific Volume of Saturated Liquid [$m^3$/kg]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 50 | VPDD(P) | VPDD: Specific Volume of Saturated Vapor [$m^3$/kg]<br>P∗: Pressure [Pa], [bar] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar] |
| 80 | VPS(P,S) | VPS: Specific Volume [$m^3$/kg]<br>P∗: Pressure [Pa], [bar]<br>S: Specific Entropy [J/(kg·K)] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>SPT(P,188.15K)≤S≤<br>SPT(P,573.15K) [J/(kg·K)]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>SPT(P,−85°C)≤S≤<br>SPT(P,300°C) [J/(kg·K)] |
| 51 | VPT(P,T) | VPT: Specific Volume [$m^3$/kg]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>188.15≤T≤573.15 [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>−85≤T≤300 [°C] |
| 52 | VPX(P,X) | VPX: Specific Volume of Mixture [$m^3$/kg]<br>P∗: Pressure [Pa], [bar]<br>X: Dryness Fraction [–] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar]<br>0≤X≤1.0 [–] |
| 53 | VTD(T) | VTD: Specific Volume of Saturated Liquid [$m^3$/kg]<br>T∗: Temperature [K], [°C] | 188.15≤T≤369.6 [K]<br>−85≤T≤96.45 [°C] |
| 54 | VTDD(T) | VTDD: Specific Volume of Saturated Vapor [$m^3$/kg]<br>T∗: Temperature [K], [°C] | 188.15≤T≤369.6 [K]<br>−85≤T≤96.45 [°C] |
| 55 | VTX(T,X) | VTX: Specific Volume of Mixture [$m^3$/kg]<br>T∗: Temperature [K], [°C]<br>X: Dryness Fraction [–] | 188.15≤T≤369.6 [K]<br>−85≤T≤96.45 [°C]<br>0≤X≤1.0 [–] |
| 8E | WPD(P) | | |
| 8F | WPDD(P) | | |
| 83 | WPT(P,T) | WPT: Velocity of Sound [m/s]<br>P∗: Pressure [Pa], [bar]<br>T∗: Temperature [K], [°C] | $7.671\times10^{3}\leq P\leq100\times10^{6}$ [Pa]<br>188.15≤T≤573.15 [K]<br><br>$76.71\times10^{-3}\leq P\leq1000$ [bar]<br>−85≤T≤300 [°C] |
| 8G | WTD(T) | | |
| 8H | WTDD(T) | | |

Table II–2.28–1 Propane Function (cont'd)

| No. | Name of Function | Function and Argument(s) | Range of Argument(s) |
|---|---|---|---|
| 56 | XPH(P,H) | XPH: Dryness Fraction [–]<br>P∗: Pressure [Pa], [bar]<br>H: Specific Enthalpy of Mixture [J/kg] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar]<br>HPD(P)≤H≤HPDD(P) [J/kg] |
| 57 | XPS(P,S) | XPS: Dryness Fraction [–]<br>P∗: Pressure [Pa], [bar]<br>S: Specific Entropy of Mixture [J/(kg·K)] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar]<br>SPD(P)≤S≤SPDD(P) [J/(kg·K)] |
| 58 | XPU(P,U) | XPU: Dryness Fraction [–]<br>P∗: Pressure [Pa], [bar]<br>U: Specific Internal Energy of Mixture [J/kg] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar]<br>UPD(P)≤U≤UPDD(P) [J/kg] |
| 59 | XPV(P,V) | XPV: Dryness Fraction [–]<br>P∗: Pressure [Pa], [bar]<br>V: Specific Volume of Mixture [$m^3$/kg] | $7.671\times10^{3}\leq P\leq4.251\times10^{6}$ [Pa]<br>$76.71\times10^{-3}\leq P\leq42.51$ [bar]<br>VPD(P)≤V≤VPDD(P) [$m^3$/kg] |
| 60 | XTH(T,H) | XTH: Dryness Fraction [–]<br>T∗: Temperature [K], [°C]<br>H: Specific Enthalpy of Mixture [J/kg] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C]<br>HTD(T)≤H≤HTDD(T) [J/kg] |
| 61 | XTS(T,S) | XTS: Dryness Fraction [–]<br>T∗: Temperature [K], [°C]<br>S: Specific Entropy of Mixture [J/(kg·K)] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C]<br>STD(T)≤S≤STDD(T) [J/(kg·K)] |
| 62 | XTU(T,U) | XTU: Dryness Fraction [–]<br>T∗: Temperature [K], [°C]<br>U: Specific Internal Energy of Mixture [J/kg] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C]<br>UTD(T)≤U≤UTDD(T) [J/kg] |
| 63 | XTV(T,V) | XTV: Dryness Fraction [–]<br>T∗: Temperature [K], [°C]<br>V: Specific Volume of Mixture [$m^3$/kg] | $188.15\leq T\leq369.6$ [K]<br>$-85\leq T\leq96.45$ [°C]<br>VTD(T)≤V≤VTDD(T) [$m^3$/kg] |