2.25 Ethylene

Equations for thermodynamic properties have been cited from Jahangiri et al. [1], one for viscosity from Makita et al.[2] and one for surface tension from Miller et al.[3].

2.25.1 Temperature Scale

International practical temperature scale 1968 (IPTS-1968)

2.25.2 The Names of Substance, Library File and Single Shot Program

Name of Substance:	Ethylene
Library File for UNIX:	libjc2h4.a
Library File for DOS,Windows95/NT:	JC2H4.LIB
Single Shot Program for UNIX:	c2h4-ss
Single Shot Program for DOS,Windows95/NT:	C2H4–SS.EXE

2.25.3 Important Constants and Others

Molecular Formula:	C_2H_4
Relative Molecular Mass:	28.054
Gas Constant:	296.37 J/(kg·K)

Critical Constants:

Critical Pressure:	5.0401×10^{6}Pa (50.401 bar)
Critical Temperature:	282.3452 K (9.1952°C)
Critical Specific Volume:	4.8405×10^{-3}m^3/kg

Triple Point:

Pressure:	122.5 Pa (1.225×10^{-3}bar)
Temperature:	103.986 K (−169.164°C)

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.

2.25.4 Formula

Equation of State:

Equation (5.1) in a function form of $A = A(\rho, T)$ in reference [1]. Here A=specific helmholtz energy, ρ=density and T=temperature.

Vapor Pressure:

Equation (3.1) in reference [1].

Properties at Vapor-Liquid Equilibrium:

Equation (5.1) in reference [1] for specific volume. Equations (5.13) and (5.14) in reference [1] for specific entropy and specific enthalpy, respectively. Equations (5.16) and (5.17) in reference [1] for isochoric specific heat and isobaric specific heat, respectively.

Transport Properties:

Viscosity from equation (4) in reference [2].

The Other Properties:

Surface tension from reference [3].

References

[1] M.Jahangiri, R.T.Jacobsen, R.B.Stewart and R.D.McCarty, J. Phys. Chem. Ref. Data, 15-2,(1986), pp.593-734.
[2] T.Makita, Y.Tanaka and A.Nagashima, Rev. Phys. Chem. Japan, 44-2,(1974), pp.98–111; 46–1, (1976), pp.54-55.
[3] J.W.Miller,Jr. and C.L.Yaws, Chem. Eng., 83–23, (1976), pp.127–129.

Table II–2.25–1 Ethylene 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] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \leq 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
8A	AKPD(P)		
8B	AKPDD(P)		
82	AKPT(P,T)	AKPT: Isentropic Exponent [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \leq 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
8C	AKTD(T)		
8D	AKTDD(T)		
2	ALAPP(P)	ALAPP: Laplace Coefficient [m] P∗: Pressure [Pa], [bar]	$122.5 \leq P < 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \leq P < 50.401$ [bar]
3	ALAPT(T)	ALAPT: Laplace Coefficient [m] T∗: Temperature [K], [°C]	103.986≤T<282.3452 [K] −169.164≤T<9.1952 [°C]
4	ALHP(P)	ALHP: Latent Heat of Vaporization [J/kg] P∗: Pressure [Pa], [bar]	$122.5 \leq P \leq 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \leq P \leq 50.401$ [bar]
5	ALHT(T)	ALHT: Latent Heat of Vaporization [J/kg] T∗: Temperature [K], [°C]	103.986≤T≤282.3452 [K] −169.164≤T≤9.1952 [°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)	AMUPT: Coefficient of Viscosity [Pa·s] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0 \leq P \leq 80\times10^6$ [Pa] 297.15≤T≤373.15 [K] 0≤P≤800 [bar] 24≤T≤100 [°C]
14	AMUTD(T)		
15	AMUTDD(T)		
92	BPPT(P,T)	BPPT: Volumetric Coefficient of Expansion [1/K] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \leq 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]

Table II–2.25–1 Ethylene Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
90	BSPT(P,T)	BSPT: Isentropic Compressibility [1/Pa] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \leq 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
91	BTPT(P,T)	BTPT: Isothermal Compressibility [1/Pa] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \leq 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
93	BVPT(P,T)	BVPT: Pressure Coefficient [1/K] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \leq 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
16	CPPD(P)	CPPD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] P∗: Pressure [Pa], [bar]	$122.5 \leq P < 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \leq P < 50.401$ [bar]
17	CPPDD(P)	CPPDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	$122.5 \leq P < 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \leq P < 50.401$ [bar]
18	CPPT(P,T)	CPPT: Isobaric Specific Heat [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \leq 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
19	CPTD(T)	CPTD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] T∗: Temperature [K], [°C]	$103.986 \leq T < 282.3452$ [K] $-169.164 \leq T < 9.1952$ [°C]
20	CPTDD(T)	CPTDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] T∗ : Temperature [K], [°C]	$103.986 \leq T < 282.3452$ [K] $-169.164 \leq T < 9.1952$ [°C]
21	CRP('A')	CRP: Critical Constants H: 'A'='H': 0.79537×10^6 [J/kg] Specific Enthalpy P∗: 'A'='P': 5.0401×10^6 [Pa], 50.401 [bar] Pressure S: 'A'='S': 5.8587×10^3 [J/(kg·K)] Specific Entropy T∗: 'A'='T': 282.3452 [K], 9.1952 [°C] Temperature V: 'A'='V': 4.8405×10^{-3} [m^3/kg] Specific Volume	one of 'H', 'P', 'S', 'T' and 'V'

Table II–2.25–1 Ethylene Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
7A	CVPD(P)		
76	CVPDD(P)	CVPDD: Isochoric Specific Heat of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	$122.5 \leq P < 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P < 50.401$ [bar]
77	CVPT(P,T)	CVPT: Isochoric Specific Heat [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40 \times 10^6$ [Pa] TMLP(P)≤T≤450 [K] $40 \times 10^6 < P \leq 260 \times 10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
7B	CVTD(T)		
78	CVTDD(T)	CVTDD: Isochoric Specific Heat of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	103.986≤T<282.3452 [K] −169.164≤T<9.1952 [°C]
2A	EPSPD(P)		
2B	EPSPDD(P)		
22	EPSPT(P,T)		
2C	EPSTD(T)		
2D	EPSTDD(T)		
89	FC('A')	FC: Fundamental Constants M: 'A'='M': 28.054 Relative Molecular Mass R: 'A'='R': 296.37 [J/(kg·K)] Gas Constant	one of 'M' and 'R'
9A	GAMPD(P)		
96	GAMPDD(P)	GAMPDD: Ratio of Specific Heats of Saturated Vapor [–] P∗: Pressure [Pa], [bar]	$122.5 \leq P \leq 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P \leq 50.401$ [bar]
95	GAMPT(P,T)	GAMPT: Ratio of Specific Heats [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40 \times 10^6$ [Pa] TMLP(P)≤T≤450 [K] $40 \times 10^6 < P \leq 260 \times 10^6$ [Pa] TMLP(P)≤T≤350 [K] 0.1≤P≤400 [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
9B	GAMTD(T)		
97	GAMTDD(T)	GAMTDD: Ratio of Specific Heats of Saturated Vapor [–] T∗: Temperature [K], [°C]	103.986≤T≤282.3452 [K] −169.164≤T≤9.1952 [°C]
23	HPD(P)	HPD: Specific Enthalpy of Saturated Liquid [J/kg] P∗: Pressure [Pa], [bar]	$122.5 \leq P \leq 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P \leq 50.401$ [bar]
24	HPDD(P)	HPDD: Specific Enthalpy of Saturated Vapor [J/kg] P∗: Pressure [Pa], [bar]	$122.5 \leq P \leq 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P \leq 50.401$ [bar]
71	HPS(P,S)	HPS: Specific Enthalpy [J/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$10000 \leq P \leq 40 \times 10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,450K) [J/(kg·K)] $40 \times 10^6 < P \leq 260 \times 10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,350K) [J/(kg·K)] 0.1≤P≤400 [bar] SPT(P,TMLP(P))≤S≤ SPT(P,176.85°C) [J/(kg·K)] 400<P≤2600 [bar] SPT(P,TMLP(P))≤S≤ SPT(P,76.85°C) [J/(kg·K)]

Table II–2.25–1 Ethylene Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
25	HPT(P,T)	HPT: Specific Enthalpy [J/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40 \times 10^6$ [Pa] TMLP(P)≤T≤450 [K] $40 \times 10^6 < P \leq 260 \times 10^6$ [Pa] TMLP(P)≤T≤350 [K] $0.1 \leq P \leq 400$ [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]
26	HPX(P,X)	HPX: Specific Enthalpy of Mixture [J/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$122.5 \leq P \leq 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P \leq 50.401$ [bar] 0≤X≤1.0 [–]
27	HTD(T)	HTD: Specific Enthalpy of Saturated Liquid [J/kg] T∗: Temperature [K], [°C]	103.986≤T≤282.3452 [K] −169.164≤T≤9.1952 [°C]
28	HTDD(T)	HTDD: Specific Enthalpy of Saturated Vapor [J/kg] T∗: Temperature [K], [°C]	103.986≤T≤282.3452 [K] −169.164≤T≤9.1952 [°C]
29	HTX(T,X)	HTX: Specific Enthalpy of Mixture [J/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	103.986≤T≤282.3452 [K] −169.164≤T≤9.1952 [°C] 0≤X≤1.0 [–]
84	IDENTF('A')	IDENTF: CHARACTER TYPE FUNCTION for Package Identification (Length 20) C: 'A'='C': 'C2H4' Molecular Formula S: 'A'='S': 'ETHYLENE' Name of Substance V: 'A'='V': '10.1' Version Number	one of 'C', 'S' and 'V'
66	PLDT(T)		
68	PMLT(T)	PMLT∗: Pressure on Melting Curve [Pa], [bar] T∗: Temperature [K], [°C]	103.986≤T≤135.2 [K] −169.164≤T≤−137.95 [°C]
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] T∗: Temperature [K], [°C]	103.986≤T≤282.3452 [K] −169.164≤T≤9.1952 [°C]
72	PSTD(T)		
73	PSTDD(T)		
31	SIGP(P)	SIGP: Surface Tension [N/m] P∗: Pressure [Pa], [bar]	$122.5 \leq P \leq 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P \leq 50.401$ [bar]
32	SIGT(T)	SIGT: Surface Tension [N/m] T∗: Temperature [K], [°C]	103.986≤T≤282.3452 [K] −169.164≤T≤9.1952 [°C]
33	SPD(P)	SPD: Specific Entropy of Saturated Liquid [J/(kg·K)] P∗: Pressure [Pa], [bar]	$122.5 \leq P \leq 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P \leq 50.401$ [bar]
34	SPDD(P)	SPDD: Specific Entropy of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	$122.5 \leq P \leq 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P \leq 50.401$ [bar]
35	SPT(P,T)	SPT: Specific Entropy [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq 40 \times 10^6$ [Pa] TMLP(P)≤T≤450 [K] $40 \times 10^6 < P \leq 260 \times 10^6$ [Pa] TMLP(P)≤T≤350 [K] $0.1 \leq P \leq 400$ [bar] TMLP(P)≤T≤176.85 [°C] 400<P≤2600 [bar] TMLP(P)≤T≤76.85 [°C]

Table II–2.25–1 Ethylene 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)] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$122.5 \leq P \leq 5.0401 \times 10^6$ [Pa] $1.225 \times 10^{-3} \leq P \leq 50.401$ [bar] $0 \leq X \leq 1.0$ [–]
37	STD(T)	STD: Specific Entropy of Saturated Liquid [J/(kg·K)] T∗: Temperature [K], [°C]	$103.986 \leq T \leq 282.3452$ [K] $-169.164 \leq T \leq 9.1952$ [°C]
38	STDD(T)	STDD: Specific Entropy of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	$103.986 \leq T \leq 282.3452$ [K] $-169.164 \leq T \leq 9.1952$ [°C]
39	STX(T,X)	STX: Specific Entropy of Mixture [J/(kg·K)] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	$103.986 \leq T \leq 282.3452$ [K] $-169.164 \leq T \leq 9.1952$ [°C] $0 \leq X \leq 1.0$ [–]
67	TLDP(P)		
69	TMLP(P)	TMLP∗: Temperature on Melting Curve [K], [°C] P∗: Pressure [Pa], [bar]	$10000 \leq P \leq 260 \times 10^6$ [Pa] $0.1 \leq P \leq 2600$ [bar]
64	TPH(P,H)	TPH∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] H: Specific Enthalpy [J/kg]	$10000 \leq P \leq 40 \times 10^6$ [Pa] HPT(P,TMLP(P))≤H≤ HPT(P,450K) [J/kg] $40 \times 10^6 < P \leq 260 \times 10^6$ [Pa] HPT(P,TMLP(P))≤H≤ HPT(P,350K) [J/kg] $0.1 \leq P \leq 400$ [bar] HPT(P,TMLP(P))≤H≤ HPT(P,176.85°C) [J/kg] $400 < P \leq 2600$ [bar] HPT(P,TMLP(P))≤H≤ HPT(P,76.85°C) [J/kg]
6H	TPH2(P,H)		
65	TPS(P,S)	TPS∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$10000 \leq P \leq 40 \times 10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,450K) [J/(kg·K)] $40 \times 10^6 < P \leq 260 \times 10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,350K) [J/(kg·K)] $0.1 \leq P \leq 400$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,176.85°C) [J/(kg·K)] $400 < P \leq 2600$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,76.85°C) [J/(kg·K)]
6S	TPS2(P,S)		
98	TPSEUP(P)	TPSEUP: Pseudo Boiling Point [K], [°C] P∗: Pressure [Pa], [bar]	$5.0401 \times 10^6 < P \leq 40 \times 10^6$ [Pa] $50.401 < P \leq 400$ [bar]
70	TPV(P,V)	TPV∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] V: Specific Volume [m^3/kg]	$10000 \leq P \leq 40 \times 10^6$ [Pa] VPT(P,TMLP(P))≤V≤ VPT(P,450K) [m^3/kg] $40 \times 10^6 < P \leq 260 \times 10^6$ [Pa] VPT(P,TMLP(P))≤V≤ VPT(P,350K) [m^3/kg] $0.1 \leq P \leq 400$ [bar] VPT(P,TMLP(P))≤V≤ VPT(P,176.85°C) [m^3/kg] $400 < P \leq 2600$ [bar] VPT(P,TMLP(P))≤V≤ VPT(P,76.85°C) [m^3/kg]

Table II–2.25–1 Ethylene Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
41	TRPL('A')	TRPL∗: Properties at Triple Point P∗: 'A'='P': 0.1225×10^{3} [Pa], 1.225×10^{-3} [bar] Pressure T∗: 'A'='T': 103.986 [K], −169.164 [°C] Temperature	one of 'P' and 'T'
100	TSBP(P)		
40	TSP(P)	TSP∗: Saturation Temperature [K], [°C] P∗: Pressure [Pa], [bar]	$122.5\leq P\leq5.0401\times10^{6}$ [Pa] $1.225\times10^{-3}\leq P\leq50.401$ [bar]
74	TSPD(P)		
75	TSPDD(P)		
42	UPD(P)	UPD: Specific Internal Energy of Saturated Liquid [J/kg] P∗: Pressure [Pa], [bar]	$122.5\leq P\leq5.0401\times10^{6}$ [Pa] $1.225\times10^{-3}\leq P\leq50.401$ [bar]
43	UPDD(P)	UPDD: Specific Internal Energy of Saturated Vapor [J/kg] P∗: Pressure [Pa], [bar]	$122.5\leq P\leq5.0401\times10^{6}$ [Pa] $1.225\times10^{-3}\leq P\leq50.401$ [bar]
79	UPS(P,S)	UPS: Specific Internal Energy [J/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$10000\leq P\leq40\times10^{6}$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,450K) [J/(kg·K)] $40\times10^{6}<P\leq260\times10^{6}$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,350K) [J/(kg·K)] $0.1\leq P\leq400$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,176.85°C) [J/(kg·K)] $400<P\leq2600$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,76.85°C) [J/(kg·K)]
44	UPT(P,T)	UPT: Specific Internal Energy [J/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000\leq P\leq40\times10^{6}$ [Pa] $TMLP(P)\leq T\leq450$ [K] $40\times10^{6}<P\leq260\times10^{6}$ [Pa] $TMLP(P)\leq T\leq350$ [K] $0.1\leq P\leq400$ [bar] $TMLP(P)\leq T\leq176.85$ [°C] $400<P\leq2600$ [bar] $TMLP(P)\leq T\leq76.85$ [°C]
45	UPX(P,X)	UPX: Specific Internal Energy of Mixture [J/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$122.5\leq P\leq5.0401\times10^{6}$ [Pa] $1.225\times10^{-3}\leq P\leq50.401$ [bar] $0\leq X\leq1.0$ [–]
46	UTD(T)	UTD: Specific Internal Energy of Saturated Liquid [J/kg] T∗: Temperature [K], [°C]	$103.986\leq T\leq282.3452$ [K] $-169.164\leq T\leq9.1952$ [°C]
47	UTDD(T)	UTDD: Specific Internal Energy of Saturated Vapor [J/kg] T∗: Temperature [K], [°C]	$103.986\leq T\leq282.3452$ [K] $-169.164\leq T\leq9.1952$ [°C]
48	UTX(T,X)	UTX: Specific Internal Energy of Mixture [J/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	$103.986\leq T\leq282.3452$ [K] $-169.164\leq T\leq9.1952$ [°C] $0\leq X\leq1.0$ [–]
49	VPD(P)	VPD: Specific Volume of Saturated Liquid [m^3/kg] P∗: Pressure [Pa], [bar]	$122.5\leq P\leq5.0401\times10^{6}$ [Pa] $1.225\times10^{-3}\leq P\leq50.401$ [bar]
50	VPDD(P)	VPDD: Specific Volume of Saturated Vapor [m^3/kg] P∗: Pressure [Pa], [bar]	$122.5\leq P\leq5.0401\times10^{6}$ [Pa] $1.225\times10^{-3}\leq P\leq50.401$ [bar]

Table II–2.25–1 Ethylene Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
80	VPS(P,S)	VPS: Specific Volume [m^3/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$10000 \le P \le 40\times10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,450K) [J/(kg·K)] $40\times10^6 < P \le 260\times10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,350K) [J/(kg·K)] $0.1 \le P \le 400$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,176.85°C) [J/(kg·K)] $400 < P \le 2600$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,76.85°C) [J/(kg·K)]
51	VPT(P,T)	VPT: Specific Volume [m^3/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \le P \le 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \le 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] $0.1 \le P \le 400$ [bar] TMLP(P)≤T≤176.85 [°C] $400 < P \le 2600$ [bar] TMLP(P)≤T≤76.85 [°C]
52	VPX(P,X)	VPX: Specific Volume of Mixture [m^3/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$122.5 \le P \le 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \le P \le 50.401$ [bar] $0 \le X \le 1.0$ [–]
53	VTD(T)	VTD: Specific Volume of Saturated Liquid [m^3/kg] T∗: Temperature [K], [°C]	$103.986 \le T \le 282.3452$ [K] $-169.164 \le T \le 9.1952$ [°C]
54	VTDD(T)	VTDD: Specific Volume of Saturated Vapor [m^3/kg] T∗: Temperature [K], [°C]	$103.986 \le T \le 282.3452$ [K] $-169.164 \le T \le 9.1952$ [°C]
55	VTX(T,X)	VTX: Specific Volume of Mixture [m^3/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	$103.986 \le T \le 282.3452$ [K] $-169.164 \le T \le 9.1952$ [°C] $0 \le X \le 1.0$ [–]
8E	WPD(P)		
8F	WPDD(P)		
83	WPT(P,T)	WPT: Velocity of Sound [m/s] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \le P \le 40\times10^6$ [Pa] TMLP(P)≤T≤450 [K] $40\times10^6 < P \le 260\times10^6$ [Pa] TMLP(P)≤T≤350 [K] $0.1 \le P \le 400$ [bar] TMLP(P)≤T≤176.85 [°C] $400 < P \le 2600$ [bar] TMLP(P)≤T≤76.85 [°C]
8G	WTD(T)		
8H	WTDD(T)		
56	XPH(P,H)	XPH: Dryness Fraction [–] P∗: Pressure [Pa], [bar] H: Specific Enthalpy of Mixture [J/kg]	$122.5 \le P < 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \le P < 50.401$ [bar] HPD(P)≤H≤HPDD(P) [J/kg]
57	XPS(P,S)	XPS: Dryness Fraction [–] P∗: Pressure [Pa], [bar] S: Specific Entropy of Mixture [J/(kg·K)]	$122.5 \le P < 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \le P < 50.401$ [bar] SPD(P)≤S≤SPDD(P) [J/(kg·K)]
58	XPU(P,U)	XPU: Dryness Fraction [–] P∗: Pressure [Pa], [bar] U: Specific Internal Energy of Mixture [J/kg]	$122.5 \le P < 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \le P < 50.401$ [bar] UPD(P)≤U≤UPDD(P) [J/kg]
59	XPV(P,V)	XPV: Dryness Fraction [–] P∗: Pressure [Pa], [bar] V: Specific Volume of Mixture [m^3/kg]	$122.5 \le P < 5.0401\times10^6$ [Pa] $1.225\times10^{-3} \le P < 50.401$ [bar] VPD(P)≤V≤VPDD(P) [m^3/kg]

Table II–2.25–1 Ethylene Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
60	XTH(T,H)	XTH: Dryness Fraction [–] T∗: Temperature [K], [°C] H: Specific Enthalpy of Mixture [J/kg]	103.986≤T<282.3452 [K] −169.164≤T<9.1952 [°C] HTD(T)≤H≤HTDD(T) [J/kg]
61	XTS(T,S)	XTS: Dryness Fraction [–] T∗: Temperature [K], [°C] S: Specific Entropy of Mixture [J/(kg·K)]	103.986≤T<282.3452 [K] −169.164≤T<9.1952 [°C] STD(T)≤S≤STDD(T) [J/(kg·K)]
62	XTU(T,U)	XTU: Dryness Fraction [–] T∗: Temperature [K], [°C] U: Specific Internal Energy of Mixture [J/kg]	103.986≤T<282.3452 [K] −169.164≤T<9.1952 [°C] UTD(T)≤U≤UTDD(T) [J/kg]
63	XTV(T,V)	XTV: Dryness Fraction [–] T∗: Temperature [K], [°C] V: Specific Volume of Mixture [m^3/kg]	103.986≤T<282.3452 [K] −169.164≤T<9.1952 [°C] VTD(T)≤V≤VTDD(T) [m^3/kg]