2.8 Fluorine

Equations for thermodynamic properties have been cited from the IUPAC Table [1].

2.8.1 Temperature Scale

International practical temperature scale 1968 (IPTS-1968)

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

Name of Substance:	Fluorine
Library File for UNIX:	libjf2.a
Library File for DOS,Windows95/NT:	JF2.LIB
Single Shot Program for UNIX:	f2-ss
Single Shot Program for DOS,Windows95/NT:	F2–SS.EXE

2.8.3 Important Constants and Others

Molecular Formula:	F_2
Relative Molecular Mass:	37.99681
Gas Constant:	218.8205 J/(kg·K)

Critical Constants:

Critical Pressure:	5.23952×10^{6}Pa (52.3952 bar)
Critical Temperature:	144.414 K (−128.736°C)
Critical Specific Volume:	1.686727×10^{-3}m^3/kg

Triple Point:

Pressure:	239 Pa (2.39×10^{-3} bar)
Temperature:	53.481 K (−219.669°C)

Reference State:

At 1 bar 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.

2.8.4 Formula

Equation of State:

Equation (4.1) in a function form of $A = A(\rho, T)$ in reference [1]. Here A=specific Helmholtz free energy, ρ=density and T=temperature.

Vapor Pressure:

Equation (4.1) [equation of state] and equation (4.25) [the Gibbs condition for phase equilibrium] in reference [1].

Properties at Vapor-Liquid Equilibrium:

Equation (4.1) [equation of state] and equation (4.25) [the Gibbs condition for phase equilibrium] for specific volume of both saturated liquid and saturated vapor. Equations (4.7) and (4.10) using these specific volumes for specific entropy and specific enthalpy, respectively. Equations (4.13) and (4.11) using these specific volumes for isobaric specific heat and isochoric specific heat, respectively. All of these equations have been cited from reference [1].

Pressure and Temperature on Melting Line:

Equations (4.26) in reference [1].

References

[1] K.M.de Reuck, International Thermodynamic Table of the Fluid State-11, Fluorine, IUPAC, vol.11, (1990).

Table II–2.8–1 Fluorine 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]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
8A	AKPD(P)		
8B	AKPDD(P)		
82	AKPT(P,T)	AKPT: Isentropic Exponent [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
8C	AKTD(T)		
8D	AKTDD(T)		
2	ALAPP(P)		
3	ALAPT(T)		
4	ALHP(P)	ALHP: Latent Heat of Vaporization [J/kg] P∗: Pressure [Pa], [bar]	$0.239\times10^{3}\leq P\leq5.23952\times10^{6}$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
5	ALHT(T)	ALHT: Latent Heat of Vaporization [J/kg] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°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] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
90	BSPT(P,T)	BSPT: Isentropic Compressibility [1/Pa] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
91	BTPT(P,T)	BTPT: Isothermal Compressibility [1/Pa] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
93	BVPT(P,T)	BVPT: Pressure Coefficient [1/K] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
16	CPPD(P)	CPPD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] P∗: Pressure [Pa], [bar]	$0.239\times10^{3}\leq P\leq5.23952\times10^{6}$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
17	CPPDD(P)	CPPDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	$0.239\times10^{3}\leq P\leq5.23952\times10^{6}$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]

Table II–2.8–1 Fluorine Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
18	CPPT(P,T)	CPPT: Isobaric Specific Heat [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
19	CPTD(T)	CPTD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
20	CPTDD(T)	CPTDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
21	CRP('A')	CRP: Critical Constants H: 'A'='H': -0.210537×10^{6} [J/kg] Specific Enthalpy P∗: 'A'='P': 5.23952×10^{6} [Pa], 52.3952 [bar] Pressure S: 'A'='S': -1.96455×10^{3} [J/(kg·K)] Specific Entropy T∗: 'A'='T': 144.414 [K], −128.736 [°C] Temperature V: 'A'='V': 1.68673×10^{-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)] P∗: Pressure [Pa], [bar]	$0.239\times10^{3}\leq P\leq5.23952\times10^{6}$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
77	CVPT(P,T)	CVPT: Isochoric Specific Heat [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
7B	CVTD(T)		
78	CVTDD(T)	CVTDD: Isochoric Specific Heat of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°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': 37.99681 Relative Molecular Mass R: 'A'='R': 218.8205 [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]	$0.239\times10^{3}\leq P\leq5.23952\times10^{6}$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
95	GAMPT(P,T)	GAMPT: Ratio of Specific Heats [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^{3}\leq P\leq20\times10^{6}$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
9B	GAMTD(T)		
97	GAMTDD(T)	GAMTDD: Ratio of Specific Heats of Saturated Vapor [–] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
23	HPD(P)	HPD: Specific Enthalpy of Saturated Liquid [J/kg] P∗: Pressure [Pa], [bar]	$0.239\times10^{3}\leq P\leq5.23952\times10^{6}$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]

Table II–2.8–1 Fluorine Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
24	HPDD(P)	HPDD: Specific Enthalpy of Saturated Vapor [J/kg] P∗: Pressure [Pa], [bar]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
71	HPS(P,S)	HPS: Specific Enthalpy [J/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$0.239\times10^3\leq P\leq20\times10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,300K) [J/(kg·K)] $2.39\times10^{-3}\leq P\leq200$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,26.85°C) [J/(kg·K)]
25	HPT(P,T)	HPT: Specific Enthalpy [J/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^3\leq P\leq20\times10^6$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
26	HPX(P,X)	HPX: Specific Enthalpy of Mixture [J/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar] 0≤X≤1.0 [–]
27	HTD(T)	HTD: Specific Enthalpy of Saturated Liquid [J/kg] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
28	HTDD(T)	HTDD: Specific Enthalpy of Saturated Vapor [J/kg] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
29	HTX(T,X)	HTX: Specific Enthalpy of Mixture [J/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C] 0≤X≤1.0 [–]
84	IDENTF('A')	IDENTF: CHARACTER TYPE FUNCTION for Package Identification (Length 20) C: 'A'='C': 'F2' Molecular Formula S: 'A'='S': 'FLUORINE' 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]	53.481≤T≤55.399 [K] −219.669≤T≤−217.751 [°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]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
72	PSTD(T)		
73	PSTDD(T)		
31	SIGP(P)		
32	SIGT(T)		
33	SPD(P)	SPD: Specific Entropy of Saturated Liquid [J/(kg·K)] P∗: Pressure [Pa], [bar]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
34	SPDD(P)	SPDD: Specific Entropy of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
35	SPT(P,T)	SPT: Specific Entropy [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^3\leq P\leq20\times10^6$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
36	SPX(P,X)	SPX: Specific Entropy of Mixture [J/(kg·K)] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar] 0≤X≤1.0 [–]

Table II–2.8–1 Fluorine Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
37	STD(T)	STD: Specific Entropy of Saturated Liquid [J/(kg·K)] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
38	STDD(T)	STDD: Specific Entropy of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
39	STX(T,X)	STX: Specific Entropy of Mixture [J/(kg·K)] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C] 0≤X≤1.0 [–]
67	TLDP(P)		
69	TMLP(P)	TMLP∗: Temperature on Melting Curve [K], [°C] P∗: Pressure [Pa], [bar]	0.239×10^3≤P≤20×10^6 [Pa] 2.39×10^{-3}≤P≤200 [bar]
64	TPH(P,H)	TPH∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] H: Specific Enthalpy [J/kg]	0.239×10^3≤P≤20×10^6 [Pa] HPT(P,TMLP(P))≤H≤ HPT(P,300K) [J/kg] 2.39×10^{-3}≤P≤200 [bar] HPT(P,TMLP(P))≤H≤ HPT(P,26.85°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)]	0.239×10^3≤P≤20×10^6 [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,300K) [J/(kg·K)] 2.39×10^{-3}≤P≤200 [bar] SPT(P,TMLP(P))≤S≤ SPT(P,26.85°C) [J/(kg·K)]
6S	TPS2(P,S)		
98	TPSEUP(P)	TPSEUP: Pseudo Boiling Point [K], [°C] T∗: Temperature [K], [°C]	5.23952×10^6<P≤20×10^6 [Pa] 52.3952<P≤200 [bar]
70	TPV(P,V)	TPV∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] V: Specific Volume [m^3/kg]	0.239×10^3≤P≤20×10^6 [Pa] VPT(P,TMLP(P))≤V≤ VPT(P,300K) [m^3/kg] 2.39×10^{-3}≤P≤200 [bar] VPT(P,TMLP(P))≤V≤ VPT(P,26.85°C) [m^3/kg]
41	TRPL('A')	TRPL∗: Properties at Triple Point P∗: 'A'='P': 0.239×10^3 [Pa], 2.39×10^{-3} [bar] Pressure T∗: 'A'='T': 53.481 [K], −219.669 [°C] Temperature	one of 'P' and 'T'
100	TSBP(P)		
40	TSP(P)	TSP∗: Saturation Temperature [K], [°C] P∗: Pressure [Pa], [bar]	0.239×10^3≤P≤5.23952×10^6 [Pa] 2.39×10^{-3}≤P≤52.3952 [bar]
74	TSPD(P)		
75	TSPDD(P)		
42	UPD(P)	UPD: Specific Internal Energy of Saturated Liquid [J/kg] P∗: Pressure [Pa], [bar]	0.239×10^3≤P≤5.23952×10^6 [Pa] 2.39×10^{-3}≤P≤52.3952 [bar]
43	UPDD(P)	UPDD: Specific Internal Energy of Saturated Vapor [J/kg] P∗: Pressure [Pa], [bar]	0.239×10^3≤P≤5.23952×10^6 [Pa] 2.39×10^{-3}≤P≤52.3952 [bar]

Table II–2.8–1 Fluorine 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] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$0.239\times10^3\leq P\leq20\times10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,300K) [J/(kg·K)] $2.39\times10^{-3}\leq P\leq200$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,26.85°C) [J/(kg·K)]
44	UPT(P,T)	UPT: Specific Internal Energy [J/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^3\leq P\leq20\times10^6$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
45	UPX(P,X)	UPX: Specific Internal Energy of Mixture [J/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar] 0≤X≤1.0 [–]
46	UTD(T)	UTD: Specific Internal Energy of Saturated Liquid [J/kg] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
47	UTDD(T)	UTDD: Specific Internal Energy of Saturated Vapor [J/kg] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
48	UTX(T,X)	UTX: Specific Internal Energy of Mixture [J/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C] 0≤X≤1.0 [–]
49	VPD(P)	VPD: Specific Volume of Saturated Liquid [m^3/kg] P∗: Pressure [Pa], [bar]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
50	VPDD(P)	VPDD: Specific Volume of Saturated Vapor [m^3/kg] P∗: Pressure [Pa], [bar]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar]
80	VPS(P,S)	VPS: Specific Volume [m^3/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy[J/(kg·K)]	$0.239\times10^3\leq P\leq20\times10^6$ [Pa] SPT(P,TMLP(P))≤S≤ SPT(P,300K) [J/(kg·K)] $2.39\times10^{-3}\leq P\leq200$ [bar] SPT(P,TMLP(P))≤S≤ SPT(P,26.85°C) [J/(kg·K)]
51	VPT(P,T)	VPT: Specific Volume [m^3/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.239\times10^3\leq P\leq20\times10^6$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
52	VPX(P,X)	VPX: Specific Volume of Mixture [m^3/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$0.239\times10^3\leq P\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq P\leq52.3952$ [bar] 0≤X≤1.0 [–]
53	VTD(T)	VTD: Specific Volume of Saturated Liquid [m^3/kg] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
54	VTDD(T)	VTDD: Specific Volume of Saturated Vapor [m^3/kg] T∗: Temperature [K], [°C]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C]
55	VTX(T,X)	VTX: Specific Volume of Mixture [m^3/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	53.481≤T≤144.414 [K] −219.669≤T≤−128.736 [°C] 0≤X≤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]	$0.239\times10^3\leq P\leq20\times10^6$ [Pa] TMLP(P)≤T≤300 [K] $2.39\times10^{-3}\leq P\leq200$ [bar] TMLP(P)≤T≤26.85 [°C]
8G	WTD(T)		
8H	WTDD(T)		

Table II–2.8–1 Fluorine Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
56	XPH(P,H)	XPH: Dryness Fraction [–] P∗: Pressure [Pa], [bar] H: Specific Enthalpy of Mixture [J/kg]	$0.239\times10^3\leq$P$\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq$P≤52.3952 [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)]	$0.239\times10^3\leq$P$\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq$P≤52.3952 [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]	$0.239\times10^3\leq$P$\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq$P≤52.3952 [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]	$0.239\times10^3\leq$P$\leq5.23952\times10^6$ [Pa] $2.39\times10^{-3}\leq$P≤52.3952 [bar] VPD(P)≤V≤VPDD(P) [m^3/kg]
60	XTH(T,H)	XTH: Dryness Fraction [–] T∗: Temperature [K], [°C] H: Specific Enthalpy of Mixture [J/kg]	$53.481\leq$T≤144.414 [K] $-219.669\leq$T≤-128.736 [°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)]	$53.481\leq$T≤144.414 [K] $-219.669\leq$T≤-128.736 [°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]	$53.481\leq$T≤144.414 [K] $-219.669\leq$T≤-128.736 [°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]	$53.481\leq$T≤144.414 [K] $-219.669\leq$T≤-128.736 [°C] VTD(T)≤V≤VTDD(T) [m^3/kg]