2.22 Sulfur Hexafluoride

Equations for thermodynamic properties have been cited from Oda et al.[1], that for transport properties from Tanaka et al.[2], Tauscher[3], Dawe et al.[4] and Harris[5] , and that for surface tension from Rathjen et al.[6].

2.22.1 Temperature Scale

International practical temperature scale 1968 (IPTS-1968)

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

Name of Substance:	Sulfur Hexafloride
Library File for UNIX:	libjsf6.a
Library File for DOS,Windows95/NT:	JSF6.LIB
Single Shot Program for UNIX:	sf6-ss
Single Shot Program for DOS,Windows95/NT:	SF6–SS.EXE

2.22.3 Important Constants and Others

Molecular Formula:	SF_6
Relative Molecular Mass:	146.05
Gas Constant:	56.928 J/(kg·K)

Critical Constants:

Critical Pressure:	3.7461×10^{6}Pa (37.641 bar)
Critical Temperature:	318.748 K (−45.598°C)
Critical Specific Volume:	1.37266×10^{-3}m^3/kg

Triple Point:

Pressure:	0.22502×10^{6}Pa (2.22502 bar)
Temperature:	222.35 K (−50.8°C)

Reference State:
At 25°C(298.15 K), 0 J/kg is assigned to the specific enthalpy of the ideal gas. 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.

2.22.4 Formula

Equation of State:
Equation (6) in a function form of $P = P(\rho, T)$ in reference [1]. Here P=pressure, ρ=density and T=temperature.

Vapor Pressure:
Equation (6) in reference [1] and equation for the Gibbs condition for phase equilibrium.

Properties at Vapor-Liquid Equilibrium:
Equation (6) in reference [1] and equation for the Gibbs condition for phase equilibrium for specific volume. Equations as functions of density and temperature, which have been derived directly by partial differentiation of the equation of state (6) in reference [1] for specific entropy, specific enthalpy, isochoric specific heat and isobaric specific heat, respectively.

Transport property:

Equation (7) in reference [2] for thermal conductivity of superheated vapor and equation(5) in reference [3] for thermal conductivity of saturated liquid. Equation (1) in reference [4] and equation (1) in reference [5] for viscosity at room pressure.

The other Properties:
Equation (25) in reference [6] for surface tension.

References

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[4] R.A.Dawe, G.C.Maitland, M.Rigby and E.B.Smith, Trans. Faraday Soc., 66(1970),pp.1955-1965.
[5] E.J.Harris, G.C.Hope, D.W.Gough and E.B.Smith, J. Chem. Soc.; Faraday I, 75(1979),pp.892-897.
[6] W.Rathjen and J.Straub, Waerme- und Stoeffuebertraegung,14 (1980),pp.59-73.

Table II–2.22–1 Sulfur Hexafluoride 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]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
8A	AKPD(P)		
8B	AKPDD(P)		
82	AKPT(P,T)	AKPT: Isentropic Exponent [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
8C	AKTD(T)		
8D	AKTDD(T)		
2	ALAPP(P)	ALAPP: Laplace Coefficient [m] P∗: Pressure [Pa], [bar]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [bar]
3	ALAPT(T)	ALAPT: Laplace Coefficient [m] T∗: Temperature [K], [°C]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°C]
4	ALHP(P)	ALHP: Latent Heat of Vaporization [J/kg] P∗: Pressure [Pa], [bar]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [bar]
5	ALHT(T)	ALHT: Latent Heat of Vaporization [J/kg] T∗: Temperature [K], [°C]	$222.35 \leq T \leq 318.748$ [K] $-50.8 \leq T \leq 45.598$ [°C]
6	ALMPD(P)	ALMPD: Thermal Conductivity of Saturated Liquid [W/(m·K)] P∗: Pressure [Pa], [bar]	$0.28505 \times 10^6 \leq P \leq 1.2590 \times 10^6$ [Pa] $2.8505 \leq P \leq 12.59$ [bar]
7	ALMPDD(P)		
8	ALMPT(P,T)	ALMPT: Thermal Conductivity [W/(m·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$10000 \leq P \leq (0.653 \times$ (T[K]-273.15)+4.3)$\times 10^5$ [Pa] $298.15 \leq T \leq 373.15$ [K] $0.1 \leq P \leq 0.653 \times$T[°C]+4.3 [bar] $25 \leq T \leq 100$ [°C]
9	ALMTD(T)	ALMTD: Thermal Conductivity of Saturated Liquid [W/(m·K)] T∗: Temperature [K], [°C]	$228.15 \leq T \leq 273.15$ [K] $-45 \leq T \leq 0$ [°C]
10	ALMTDD(T)		
11	AMUPD(P)		
12	AMUPDD(P)		
13	AMUPT(P,T)	AMUPT: Coefficient of Viscosity at Ordinary Pressure [Pa·s] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	P=Dummy $298.15 \leq T \leq 373.15$ [K] $25 \leq T \leq 100$ [°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]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
90	BSPT(P,T)	BSPT: Isentropic Compressibility [1/Pa] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]

Table II–2.22–1 Sulfur Hexafluoride Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
91	BTPT(P,T)	BTPT: Isothermal Comperssibility [1/Pa] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
93	BVPT(P,T)	BVPT: Pressure Coefficient [1/K] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
16	CPPD(P)	CPPD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] P∗: Pressure [Pa], [bar]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [bar]
17	CPPDD(P)	CPPDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	$0{,}22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [bar]
18	CPPT(P,T)	CPPT: Isobaric Specific Heat [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
19	CPTD(T)	CPTD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] T∗: Temperature [K], [°C]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°C]
20	CPTDD(T)	CPTDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°C]
21	CRP('A')	CRP: Critical Constants H: 'A'='H': -40.9178×10^3 [J/kg] Specific Enthalpy P∗: 'A'='P': 3.7641×10^6 [Pa], 37.641 [bar] Pressure S: 'A'='S': -0.309422×10^3 [J/(kg·K)] Specific Entropy T∗: 'A'='T': 318.748 [K], 45.598 [°C] Temperature V: 'A'='V': 1.37266×10^{-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]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [bar]
77	CVPT(P,T)	CVPT: Isochoric Specific Heat [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
7B	CVTD(T)		
78	CVTDD(T)	CVTDD: Isochoric Specific Heat of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°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': 146.05 Relative Molecular Mass R: 'A'='R': 56.928 [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]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [bar]

Table II–2.22–1 Sulfur Hexafluoride Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
95	GAMPT(P,T)	GAMPT: Ratio of Specific Heats [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
9B	GAMTD(T)		
97	GAMTDD(T)	GAMTDD: Ratio of Specific Heats of Saturated Vapor [–] T∗: Temperature [K], [°C]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°C]
23	HPD(P)	HPD: Specific Enthalpy of Saturated Liquid [J/kg] P∗: Pressure [Pa], [bar]	$0.22502 \times 10^6 \leq P \leq 3.7641 \times 10^6$ [Pa] $2.2502 \leq P \leq 37.641$ [bar]
24	HPDD(P)	HPDD: Specific Enthalpy of Saturated Vapor [J/kg] P∗: Pressure [Pa], [bar]	$0.22502 \times 10^6 \leq P \leq 3.7641 \times 10^6$ [Pa] $2.2502 \leq P \leq 37.641$ [bar]
71	HPS(P,S)	HPS: Specific Enthalpy [J/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $SPT(P,222.35) \leq S \leq$ SPT(P,500K) [J/(kg·K)] $0.01 \leq P \leq 500$ [bar] $SPT(P,-50.8°C) \leq S \leq$ SPT(P,226.85°C) [J/(kg·K)]
25	HPT(P,T)	HPT: Specific Enthalpy [J/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
26	HPX(P,X)	HPX: Specific Enthalpy of Mixture [J/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$0.22502 \times 10^6 \leq P \leq 3.7641 \times 10^6$ [Pa] $2.2502 \leq P \leq 37.641$ [bar] $0 \leq X \leq 1.0$ [–]
27	HTD(T)	HTD: Specific Enthalpy of Saturated Liquid [J/kg] T∗: Temperature [K], [°C]	$222.35 \leq T \leq 318.748$ [K] $-50.8 \leq T \leq 45.598$ [°C]
28	HTDD(T)	HTDD: Specific Enthalpy of Saturated Vapor [J/kg] T∗: Temperature [K], [°C]	$222.35 \leq T \leq 318.748$ [K] $-50.8 \leq T \leq 45.598$ [°C]
29	HTX(T,X)	HTX: Specific Enthalpy of Mixture [J/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	$222.35 \leq T \leq 318.748$ [K] $-50.8 \leq T \leq 45.598$ [°C] $0 \leq X \leq 1.0$ [–]
84	IDENTF('A')	IDENTF: CHARACTER TYPE FUNCTION for Package Identification (Length 20) C: 'A'='C': 'SF6' Molecular Formula S: 'A'='S': 'SULFUR HEXAFLUORIDE' Name of Substance 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)	PRPT: Prandtl Number [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	P=Dummy $298.15 \leq T \leq 373.15$ [K] $25 \leq T \leq 100$ [°C]
87	PRTD(T)		
88	PRTDD(T)		
99	PSBT(T)		
30	PST(T)	PST∗: Saturation Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$222.35 \leq T \leq 318.748$ [K] $-50.8 \leq T \leq 45.598$ [°C]
72	PSTD(T)		
73	PSTDD(T)		

Table II–2.22–1 Sulfur Hexafluoride Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
31	SIGP(P)	SIGP: Surface Tension [N/m] P∗: Pressure [Pa], [bar]	$0.22502\times10^6\leq P\leq3.7641\times10^6$ [Pa] $2.2502\leq P\leq37.641$ [bar]
32	SIGT(T)	SIGT: Surface Tension [N/m] T∗: Temperature [K], [°C]	$222.35\leq T\leq318.748$ [K] $-50.8\leq T\leq45.598$ [°C]
33	SPD(P)	SPD: Specific Entropy of Saturated Liquid [J/(kg·K)] P∗: Pressure [Pa], [bar]	$0.22502\times10^6\leq P\leq3.7641\times10^6$ [Pa] $2.2502\leq P\leq37.641$ [bar]
34	SPDD(P)	SPDD: Specific Entropy of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	$0.22502\times10^6\leq P\leq3.7641\times10^6$ [Pa] $2.2502\leq P\leq37.641$ [bar]
35	SPT(P,T)	SPT: Specific Entropy [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000\leq P\leq50\times10^6$ [Pa] $222.35\leq T\leq500$ [K] $0.01\leq P\leq500$ [bar] $-50.8\leq T\leq226.85$ [°C]
36	SPX(P,X)	SPX: Specific Entropy of Mixture [J/(kg·K)] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$0.22502\times10^6\leq P\leq3.7641\times10^6$ [Pa] $2.2502\leq P\leq37.641$ [bar] $0\leq X\leq1.0$ [–]
37	STD(T)	STD: Specific Entropy of Saturated Liquid [J/(kg·K)] T∗: Temperature [K], [°C]	$222.35\leq T\leq318.748$ [K] $-50.8\leq T\leq45.598$ [°C]
38	STDD(T)	STDD: Specific Entropy of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	$222.35\leq T\leq318.748$ [K] $-50.8\leq T\leq45.598$ [°C]
39	STX(T,X)	STX: Specific Entropy of Mixture [J/(kg·K)] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	$222.35\leq T\leq318.748$ [K] $-50.8\leq T\leq45.598$ [°C] $0\leq X\leq1.0$ [–]
67	TLDP(P)		
69	TMLP(P)		
64	TPH(P,H)	TPH∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] H: Specific Enthalpy [J/kg]	$1000\leq P\leq50\times10^6$ [Pa] HPT(P,222.35K)≤H≤ HPT(P,500K) [J/kg] $0.01\leq P\leq500$ [bar] HPT(P,−50.8°C)≤H≤ HPT(P,226.85°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)]	$1000\leq P\leq50\times10^6$ [Pa] SPT(P,222.35K)≤S≤ SPT(P,500K) [J/(kg·K)] $0.01\leq P\leq500$ [bar] SPT(P,−50.8°C)≤S≤ SPT(P,226.85°C) [J/(kg·K)]
6S	TPS2(P,S)		
98	TPSEUP(P)	TPSEUP: Pseudo Boiling Point [K], [°C] T∗: Temperature [K], [°C]	$3.7641\times10^6<P\leq20\times10^6$ [Pa] $37.641<P\leq200$ [bar]
70	TPV(P,V)	TPV∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] V: Specific Volume [m^3/kg]	$1000\leq P\leq50\times10^6$ [Pa] VPT(P,222.35K)≤V≤ VPT(P,500K) [m^3/kg] $0.01\leq P\leq500$ [bar] VPT(P,−50.8°C)≤V≤ VPT(P,226.85°C) [m^3/kg]

Table II–2.22–1 Sulfur Hexafluoride 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': 0.22502×10^6 [Pa], 2.2502 [bar] Pressure T∗: 'A'='T': 222.35 [K], −50.8 [°C] Temperature	one of 'P' and 'T'
100	TSBP(P)		
40	TSP(P)	TSP∗: Saturation Temperature [K], [°C] P∗: Pressure [Pa], [bar]	$0.22502\times10^6\leq$P$\leq3.7641\times10^6$ [Pa] 2.2502≤P≤37.641 [bar]
74	TSPD(P)		
75	TSPDD(P)		
42	UPD(P)	UPD: Specific Internal Energy of Saturated Liquid [J/kg] P∗: Pressure [Pa], [bar]	$0.22502\times10^6\leq$P$\leq3.7641\times10^6$ [Pa] 2.2502≤P≤37.641 [bar]
43	UPDD(P)	UPDD: Specific Internal Energy of Saturated Vapor [J/kg] P∗: Pressure [Pa], [bar]	$0.22502\times10^6\leq$P$\leq3.7641\times10^6$ [Pa] 2.2502≤P≤37.641 [bar]
79	UPS(P,S)	UPS: Specific Internal Energy [J/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$1000\leq$P$\leq50\times10^6$ [Pa] SPT(P,222.35K)≤S≤ SPT(P,500K) [J/(kg·K)] 0.01≤P≤500 [bar] SPT(P,−50.8)≤S≤ SPT(P,226.85°C) [J/(kg·K)]
44	UPT(P,T)	UPT: Specific Internal Energy [J/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000\leq$P$\leq50\times10^6$ [Pa] 222.35≤T≤500 [K] 0.01≤P≤500 [bar] −50.8≤T≤226.85 [°C]
45	UPX(P,X)	UPX: Specific Internal Energy of Mixture [J/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$0.22502\times10^6\leq$P$\leq3.7641\times10^6$ [Pa] 2.2502≤P≤37.641 [bar] 0≤X≤1.0 [–]
46	UTD(T)	UTD: Specific Internal Energy of Saturated Liquid [J/kg] T∗: Temperature [K], [°C]	222.35≤T≤318.748 [K] −50.8≤T≤45.598 [°C]
47	UTDD(T)	UTDD: Specific Internal Energy of Saturated Vapor [J/kg] T∗: Temperature [K], [°C]	222.35≤T≤318.748 [K] −50.8≤T≤45.598 [°C]
48	UTX(T,X)	UTX: Specific Internal Energy of Mixture [J/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	222.35≤T≤318.748 [K] −50.8≤T≤45.598 [°C] 0≤X≤1.0 [–]
49	VPD(P)	VPD: Specific Volume of Saturated Liquid [m^3/kg] P∗: Pressure [Pa], [bar]	$0.22502\times10^6\leq$P$\leq3.7641\times10^6$ [Pa] 2.2502≤P≤37.641 [bar]
50	VPDD(P)	VPDD: Specific Volume of Saturated Vapor [m^3/kg] P∗: Pressure [Pa], [bar]	$0.22502\times10^3\leq$P$\leq3.7641\times10^6$ [Pa] 2.2502≤P≤37.641 [bar]
80	VPS(P,S)	VPS: Specific Volume [m^3/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$1000\leq$P$\leq50\times10^6$ [Pa] SPT(P,222.35K)≤S≤ SPT(P,500K) [J/(kg·K)] 0.01≤P≤500 [bar] SPT(P,−50.8°C)≤S≤ SPT(P,226.85°C) [J/(kg·K)]

Table II–2.22–1 Sulfur Hexafluoride Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
51	VPT(P,T)	VPT: Specific Volume [m^3/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°C]
52	VPX(P,X)	VPX: Specific Volume of Mixture [m^3/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$0.22502 \times 10^6 \leq P \leq 3.7641 \times 10^6$ [Pa] $2.2502 \leq P \leq 37.641$ [bar] $0 \leq X \leq 1.0$ [–]
53	VTD(T)	VTD: Specific Volume of Saturated Liquid [m^3/kg] T∗: Temperature [K], [°C]	$222.35 \leq T \leq 318.748$ [K] $-50.8 \leq T \leq 45.598$ [°C]
54	VTDD(T)	VTDD: Specific Volume of Saturated Vapor [m^3/kg] T∗: Temperature [K], [°C]	$222.35 \leq T \leq 318.748$ [K] $-50.8 \leq T \leq 45.598$ [°C]
55	VTX(T,X)	VTX: Specific Volume of Mixture [m^3/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	$222.35 \leq T \leq 318.748$ [K] $-50.8 \leq T \leq 45.598$ [°C] $0 \leq X \leq 1.0$ [–]
8E	WPD(P)		
8F	WPDD(P)		
83	WPT(P,T)	WPT: Velocity of Sound [m/s] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$1000 \leq P \leq 50 \times 10^6$ [Pa] $222.35 \leq T \leq 500$ [K] $0.01 \leq P \leq 500$ [bar] $-50.8 \leq T \leq 226.85$ [°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]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [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)]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [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]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [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]	$0.22502 \times 10^6 \leq P < 3.7641 \times 10^6$ [Pa] $2.2502 \leq P < 37.641$ [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]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°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)]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°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]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°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]	$222.35 \leq T < 318.748$ [K] $-50.8 \leq T < 45.598$ [°C] VTD(T)≤V≤VTDD(T) [m^3/kg]