2.49 Refrigerant 502

All equations for R502 are based on the Table from Japanese Association of Refrigeration [1].

2.49.1 Temperature Scale

International practical temperature scale 1968 (IPTS-1968)

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

Name of Substance:	R502, Refrigerant 502, Freon 502, Azeotrope of R22 and R115, Azeotrope of HCFC-22 and CFC-115
Library File for UNIX:	libjr502.a
Library File for DOS,Windows95/NT:	JR502.LIB
Single Shot Program for UNIX:	r502-ss
Single Shot Program for DOS,Windows95/NT:	R502–SS.EXE

2.49.3 Important Constants and Others

Molecular Formula:	$CHC\ell F_{2(48.8\text{mass}\%)} + C_2C\ell F_{5(51.2\text{mass}\%)}$
Relative Molecular Mass:	111.6
Gas Constant:	74.577 J/(kg·K)

Critical Constants:

Critical Pressure:	4.065×10^6Pa (40.65 bar)
Critical Temperature:	355.37 K (82.22 °C)
Critical Specific Volume:	1.764×10^{-3}m^3/kg

Reference State:

At 0°C, 1.0000 kJ/(kg·K) and 200.00 kJ/kg are assigned to the specific entropy and the specific enthalpy of saturated liquid, respectively.

2.49.4 Formula

Equation of State:

Equation (II·2·1) in a function from of $Z = Z(\rho, T)$ in reference [1]. Here Z=compressibility, ρ=density and T= temperature.

Vapor Pressure:

Equation (II·2·15) in reference [1].

Properties at Vapor-Liquid Equilibrium:

saturated liquid: Equations (II·2·10), (II·2·12), (II·2·14) and (II·2·5) with (II·2·15) for specific volume, specific enthalpy, specific entropy and isobaric specific heat, respectively.

saturated vapor: Equations (II·2·15) and (II·2·1) for specific volume, (II·2·15) and (II·2·11) for specific enthalpy and (II·2·5) with (II·2·15) for isobaric specific heat. Equation (II·2·4) with (II·2·15) for isochoric specific heat.

All of these equations have been cited from reference [1].

Transport Properties:

Equations (II·3·5) and (II·3·1) in reference [1] for thermal conductivity and dynamic viscosity of saturated liquid, respectively. Equations (II·3·9) and (II·3·2) in reference [1] for thermal conductivity of vapor and dynamic viscosity at the atmospheric pressure, respectively. Equations (II·3·3) in reference[1] for dynamic viscosity of superheated vapor.

The Other Properties:

Equation (II·2·25) in reference [1] for surface tension.

References

[1] Japanese Association of Refrigeration, Thermophysical Properties of Refrigerants (R502, Azeotrope of R22 and R115), (1986).

Table II–2.49–1 Refrigerant 502 Function

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
1	AIPPT(P,T)		
94	AJTPT(P,T)		
8A	AKPD(P)		
8B	AKPDD(P)		
82	AKPT(P,T)	AKPT: Isentropic Exponent [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$2.0\times10^3 \le P \le 1.2078\times10^6$ [Pa] TSP(P)≤T≤500 [K] $1.2078\times10^6 < P \le 10.0\times10^6$ [Pa] 330≤T≤500 [K] 0.02≤P≤12.078 [bar] TSP(P)≤T≤226.85 [°C] 12.078<P≤100 [bar] 56.85≤T≤226.85 [°C]
8C	AKTD(T)		
8D	AKTDD(T)		
2	ALAPP(P)	ALAPP: Laplace Coefficient [m] P∗: Pressure [Pa], [bar]	$22.845\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.22845≤P≤40.65 [bar]
3	ALAPT(T)	ALAPT: Laplace Coefficient [m] T∗: Temperature [K], [°C]	200≤T≤355.37 [K] −73.15≤T≤82.22 [°C]
4	ALHP(P)	ALHP: Latent Heat of Vaporization [J/kg] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.02≤P≤40.65 [bar]
5	ALHT(T)	ALHT: Latent Heat of Vaporization [J/kg] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
6	ALMPD(P)	ALMPD: Thermal Conductivity of Saturated Liquid [W/(m·K)] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \le P \le 1.147\times10^6$ [Pa] 0.02≤P≤11.47 [bar]
7	ALMPDD(P)	ALMPDD: Thermal Conductivity of Saturated Vapor [W/(m·K)] T∗: Temperature [K], [°C]	$127.9\times10^3 \le P \le 3.5187\times10^6$ [Pa] 1.279≤P≤35.187 [bar]
8	ALMPT(P,T)	ALMPT: Thermal Conductivity at Ordinary Pressure [W/(m·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	P=Dummy 230≤T≤434 [K] −43.15≤T≤160.85 [°C]
9	ALMTD(T)	ALMTD: Thermal Conductivity of Saturated Liquid [W/(m·K)] T∗: Temperature [K], [°C]	140≤T≤298 [K] −133.15≤T≤24.85 [°C]
10	ALMTDD(T)	ALMTDD: Thermal Conductivity of Saturated Vapor [W/(m·K)] T∗: Temperature [K], [°C]	233≤T≤348 [K] −40.15≤T≤74.85 [°C]
11	AMUPD(P)	AMUPD: Coefficient of Viscosity of Saturated Liquid [Pa·s] P∗: Pressure [Pa], [bar]	PST(201K)≤P≤PST(285K) [Pa] ($\sim24.2\times10^3$) ($\sim0.806\times10^6$) PST(−72.15°C)≤P≤PST(11.85°C) (∼0.242) (∼8.06) [bar]
12	AMUPDD(P)	AMUPDD: Coefficient of Viscosity of Saturated Vapor [Pa·s] P∗: Pressure [Pa], [bar]	$0.56626\times10^6 \le P \le 4.065\times10^6$ [Pa] 5.6626≤P≤40.65 [bar]
13	AMUPT(P,T)	AMUPT: Coefficient of Viscosity [Pa·s] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$0.1\times10^6 \le P \le 7.2\times10^6$ [Pa] 273.15≤T≤398.15 [K] $3.3333\times10^{-3} \le V(P,T)$ [m^3/kg] 1.0≤P≤72 [bar] 0≤T≤125 [°C]
14	AMUTD(T)	AMUTD: Coefficient of Viscosity of Saturated Liquid [Pa·s] T∗: Temperature [K], [°C]	201≤T≤285 [K] −72.15≤T≤11.75 [°C]

Table II–2.49–1 Refrigerant 502 Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
15	AMUTDD(T)	AMUTDD: Coefficient of Viscosity of Saturated Vapor [Pa·s] T∗: Temperature [K], [°C]	273.15≤T≤355.37 [K] 0≤T≤82.22 [°C]
92	BPPT(P,T)		
90	BSPT(P,T)		
91	BTPT(P,T)		
93	BVPT(P,T)		
16	CPPD(P)	CPPD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] P∗: Pressure [Pa], [bar]	2.0×10^3≤P≤4.065×10^6 [Pa] 0.02≤P≤40.65 [bar]
17	CPPDD(P)	CPPDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	2.0×10^3≤P≤4.065×10^6 [Pa] 0.02≤P≤40.65 [bar]
18	CPPT(P,T)	CPPT: Isobaric Specific Heat [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	2.0×10^3≤P≤1.2078×10^6 [Pa] TSP(P)≤T≤500 [K] 1.2078×10^6<P≤10.0×10^6 [Pa] 330≤T≤500 [K] 0.02≤P≤12.078 [bar] TSP(P)≤T≤226.85 [°C] 12.078<P≤100 [bar] 56.85≤T≤226.85 [°C]
19	CPTD(T)	CPTD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
20	CPTDD(T)	CPTDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
21	CRP('A')	CRP: Critical Constants H: 'A'='H': 0.3259×10^6 [J/kg] Specific Enthalpy P∗: 'A'='P': 4.065×10^6 [Pa], 40.65 [bar] Pressure S: 'A'='S': 1.383×10^3 [J/(kg·K)] Specific Entropy T∗: 'A'='T': 355.37 [K], 82.22 [°C] Temperature V: 'A'='V': 1.764×10^{-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]	2.0×10^3≤P≤4.065×10^6 [Pa] 0.02≤P≤40.65 [bar]
77	CVPT(P,T)	CVPT: Isochoric Specific Heat [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	2.0×10^3≤P≤1.2078×10^6 [Pa] TSP(P)≤T≤500 [K] 1.2078×10^6<P≤10.0×10^6 [Pa] 330≤T≤500 [K] 0.02≤P≤12.078 [bar] TSP(P)≤T≤226.85 [°C] 12.078<P≤100 [bar] 56.85≤T≤226.85 [°C]
7B	CVTD(T)		
78	CVTDD(T)	CVTDD: Isochoric Specific Heat of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
2A	EPSPD(P)		
2B	EPSPDD(P)		
22	EPSPT(P,T)		
2C	EPSTD(T)		
2D	EPSTDD(T)		

Table II–2.49–1 Refrigerant 502 Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
89	FC('A')	FC: Fundamental Constants M: 'A'='M': 111.6 Relative Molecular Mass R: 'A'='R': 74.577 [J/(kg·K)] Gas Constant	one of 'M' and 'R'
9A	GAMPD(P)		
96	GAMPDD(P)		
95	GAMPT(P,T)		
9B	GAMTD(T)		
97	GAMTDD(T)		
23	HPD(P)	HPD: Specific Enthalpy of Saturated Liquid [J/kg] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \leq P \leq 4.065\times10^6$ [Pa] $0.02 \leq P \leq 40.65$ [bar]
24	HPDD(P)	HPDD: Specific Enthalpy of Saturated Vapor [J/kg] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \leq P \leq 4.065\times10^6$ [Pa] $0.02 \leq P \leq 40.65$ [bar]
71	HPS(P,S)	HPS: Specific Enthalpy [J/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$2.0\times10^3 \leq P \leq 1.2078\times10^6$ [Pa] SPD(P)≤S≤SPT(P,500K) [J/(kg·K)] $1.2078\times10^6 < P \leq 10.0\times10^6$ [Pa] SPT(P,330K)≤S≤ SPT(P,500K) [J/(kg·K)] $0.02 \leq P \leq 12.078$ [bar] SPD(P)≤S≤ SPT(P,226.85°C) [J/(kg·K)] $12.078 < H \leq 100$ [bar] SPT(P,56.85°C)≤S≤ 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]	$2.0\times10^3 \leq P \leq 1.2078\times10^6$ [Pa] TSP(P)≤T≤500 [K] $1.2078\times10^6 < P \leq 10.0\times10^6$ [Pa] $330 \leq T \leq 500$ [K] $0.02 \leq P \leq 12.078$ [bar] TSP(P)≤T≤226.85 [°C] $12.078 < P \leq 100$ [bar] $56.85 \leq T \leq 226.85$ [°C]
26	HPX(P,X)	HPX: Specific Enthalpy of Mixture [J/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$2.0\times10^3 \leq P \leq 4.065\times10^6$ [Pa] $0.02 \leq P \leq 40.65$ [bar] $0 \leq X \leq 1.0$ [–]
27	HTD(T)	HTD: Specific Enthalpy of Saturated Liquid [J/kg] T∗: Temperature [K], [°C]	$167.5 \leq T \leq 355.37$ [K] $-105.65 \leq T \leq 82.22$ [°C]
28	HTDD(T)	HTDD: Specific Enthalpy of Saturated Vapor [J/kg] T∗: Temperature [K], [°C]	$167.5 \leq T \leq 355.37$ [K] $-105.65 \leq T \leq 82.22$ [°C]
29	HTX(T,X)	HTX: Specific Enthalpy of Mixture [J/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	$167.5 \leq T \leq 355.37$ [K] $-105.65 \leq T \leq 82.22$ [°C] $0 \leq X \leq 1.0$ [–]
84	IDENTF('A')	IDENTF: CHARACTER TYPE FUNCTION for Package Identification (Length 20) C: 'A'='C': 'CHCLF2+C2CLF5' Molecular Formula S: 'A'='S': 'REFRIGERANT 502' 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)	PRPD: Prandtl Number of Saturated Liquid [–] P∗: Pressure [Pa], [bar]	$24.2\times10^3 \leq P \leq 0.806\times10^6$ [Pa] $0.242 \leq P \leq 8.06$ [bar]
86	PRPDD(P)	PRPDD: Prandtl Number of Saturated Vapor [–] P∗: Pressure [Pa], [bar]	$0.56626\times10^6 \leq P \leq 3.5187\times10^6$ [Pa] $5.6626 \leq P \leq 35.187$ [bar]

Table II–2.49–1 Refrigerant 502 Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
81	PRPT(P,T)	PRPT: Prandtl Number at Ordinary Pressure [–] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	P=Dummy 230≤T≤434 [K] −43.15≤T≤160.85 [°C]
87	PRTD(T)	PRTD: Prandtl Number of Saturated Liquid [–] T∗: Temperature [K], [°C]	201≤T≤285 [K] −72.15≤T≤11.85 [°C]
88	PRTDD(T)	PRTDD: Prandtl Number of Saturated Vapor [–] T∗: Temperature [K], [°C]	273.15≤T≤348 [K] 0≤T≤74.85 [°C]
99	PSBT(T)		
30	PST(T)	PST∗: Saturation Pressure [Pa], [bar] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
72	PSTD(T)		
73	PSTDD(T)		
31	SIGP(P)	SIGP: Surface Tension [N/m] P∗: Pressure [Pa], [bar]	PST(200K)≤P≤4.065×10^6 [Pa] (∼20×10^3) PST(−73.15 °C)≤P≤40.65 [bar] (∼0.2)
32	SIGT(T)	SIGT: Surface Tension [N/m] T∗: Temperature [K], [°C]	200≤T≤355.37 [K] −73.15≤T≤82.22 [°C]
33	SPD(P)	SPD: Specific Entropy of Saturated Liquid [J/(kg·K)] P∗: Pressure [Pa], [bar]	2.0×10^3≤P≤4.065×10^6 [Pa] 0.02≤P≤40.65 [bar]
34	SPDD(P)	SPDD: Specific Entropy of Saturated Vapor [J/(kg·K)] P∗: Pressure [Pa], [bar]	2.0×10^3≤P≤4.065×10^6 [Pa] 0.02≤P≤40.65 [bar]
35	SPT(P,T)	SPT: Specific Entropy [J/(kg·K)] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	2.0×10^3≤P≤1.2078×10^6 [Pa] TSP(P)≤T≤500 [K] 1.2078×10^6<P≤10.0×10^6 [Pa] 330≤T≤500 [K] 0.02≤P≤12.078 [bar] TSP(P)≤T≤226.85 [°C] 12.078<P≤100 [bar] 56.85≤T≤226.85 [°C]
36	SPX(P,X)	SPX: Specific Entropy of Mixture [J/(kg·K)] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	2.0×10^3≤P≤4.065×10^6 [Pa] 0.02≤P≤40.65 [bar] 0≤X≤1.0 [–]
37	STD(T)	STD: Specific Entropy of Saturated Liquid [J/(kg·K)] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
38	STDD(T)	STDD: Specific Entropy of Saturated Vapor [J/(kg·K)] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
39	STX(T,X)	STX: Specific Entropy of Mixture [J/(kg·K)] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C] 0≤X≤1.0 [–]
67	TLDP(P)		
69	TMLP(P)		
64	TPH(P,H)	TPH∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] H: Specific Enthalpy [J/kg]	2.0×10^3≤P≤1.2078×10^6 [Pa] HPD(P)≤H≤HPT(P,500K) [J/kg] 1.2078×10^6<P≤10.0×10^6 [Pa] HPT(P,330K)≤H≤ HPT(P,500K) [J/kg] 0.02≤P≤12.078 [bar] HPD(P)≤H≤HPT(P,226.85°C) [J/kg] 12.078<H≤100 [bar] HPT(P,56.85°C)≤H≤ HPT(P,226.85°C) [J/kg]

Table II–2.49–1 Refrigerant 502 Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
6H	TPH2(P,H)		
65	TPS(P,S)	TPS∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$2.0\times10^3 \le P \le 1.2078\times10^6$ [Pa] SPD(P)≤S≤SPT(P,500K) [J/(kg·K)] $1.2078\times10^6 < P \le 10.0\times10^6$ [Pa] SPT(P,330K)≤S≤ SPT(P,500K) [J/(kg·K)] 0.02≤P≤12.078 [bar] SPD(P)≤S≤ SPT(P,226.85°C) [J/(kg·K)] 12.078<H≤100 [bar] SPT(P,56.85°C)≤S≤ SPT(P,226.85°C) [J/(kg·K)]
6S	TPS2(P,S)		
98	TPSEUP(P)		
70	TPV(P,V)	TPV∗: Temperature [K], [°C] P∗: Pressure [Pa], [bar] V: Specific Volume [m^3/kg]	$2.0\times10^3 \le P \le 1.2078\times10^6$ [Pa] VPD(P)≤V≤VPT(P,500K) [m^3/kg] $1.2078\times10^6 < P \le 10.0\times10^6$ [Pa] VPT(P,330K)≤V≤ VPT(P,500K) [m^3/kg] 0.02≤P≤12.078 [bar] VPD(P)≤V≤VPT(P,226.85°C) [m^3/kg] 12.078<H≤100 [bar] VPT(P,56.85°C)≤V≤ VPT(P,226.85°C) [m^3/kg]
41	TRPL('A')		
100	TSBP(P)		
40	TSP(P)	TSP∗: Saturation Temperature [K], [°C] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.02≤P≤40.65 [bar]
74	TSPD(P)		
75	TSPDD(P)		
42	UPD(P)	UPD: Specific Internal Energy of Saturated Liquid [J/kg] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.02≤P≤40.65 [bar]
43	UPDD(P)	UPDD: Specific Internal Energy of Saturated Vapor [J/kg] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.02≤P≤40.65 [bar]
79	UPS(P,S)	UPS: Specific Internal Energy [J/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$2.0\times10^3 \le P \le 1.2078\times10^6$ [Pa] SPD(P)≤S≤SPT(P,500K) [J/(kg·K)] $1.2078\times10^6 < P \le 10.0\times10^6$ [Pa] SPT(P,330K)≤S≤ SPT(P,500K) [J/(kg·K)] 0.02≤P≤12.078 [bar] SPD(P)≤S≤ SPT(P,226.85°C) [J/(kg·K)] 12.078<H≤100 [bar] SPT(P,56.85°C)≤S≤ SPT(P,226.85°C) [J/(kg·K)]

Table II–2.49–1 Refrigerant 502 Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
44	UPT(P,T)	UPT: Specific Internal Energy [J/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$2.0\times10^3 \le P \le 1.2078\times10^6$ [Pa] TSP(P)≤T≤500 [K] $1.2078\times10^6 < P \le 10.0\times10^6$ [Pa] 330≤T≤500 [K] 0.02≤P≤12.078 [bar] TSP(P)≤T≤226.85 [°C] 12.078<P≤100 [bar] 56.85≤T≤226.85 [°C]
45	UPX(P,X)	UPX: Specific Internal Energy of Mixture [J/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$2.0\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.02≤P≤40.65 [bar] 0≤X≤1.0 [–]
46	UTD(T)	UTD: Specific Internal Energy of Saturated Liquid [J/kg] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
47	UTDD(T)	UTDD: Specific Internal Energy of Saturated Vapor [J/kg] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
48	UTX(T,X)	UTX: Specific Internal Energy of Mixture [J/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C] 0≤X≤1.0 [–]
49	VPD(P)	VPD: Specific Volume of Saturated Liquid [m^3/kg] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.02≤P≤40.65 [bar]
50	VPDD(P)	VPDD: Specific Volume of Saturated Vapor [m^3/kg] P∗: Pressure [Pa], [bar]	$2.0\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.02≤P≤40.65 [bar]
80	VPS(P,S)	VPS: Specific Volume [m^3/kg] P∗: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$2.0\times10^3 \le P \le 1.2078\times10^6$ [Pa] SPD(P)≤S≤SPT(P,500K) [J/(kg·K)] $1.2078\times10^6 < P \le 10.0\times10^6$ [Pa] SPT(P,330K)≤S≤ SPT(P,500K) [J/(kg·K)] 0.02≤P≤12.078 [bar] SPD(P)≤S≤ SPT(P,226.85°C) [J/(kg·K)] 12.078<H≤100 [bar] SPT(P,56.85°C)≤S≤ SPT(P,226.85°C) [J/(kg·K)]
51	VPT(P,T)	VPT: Specific Volume [m^3/kg] P∗: Pressure [Pa], [bar] T∗: Temperature [K], [°C]	$2.0\times10^3 \le P \le 1.2078\times10^6$ [Pa] TSP(P)≤T≤500 [K] $1.2078\times10^6 < P \le 10.0\times10^6$ [Pa] 330≤T≤500 [K] 0.02≤P≤12.078 [bar] TSP(P)≤T≤226.85 [°C] 12.078<P≤100 [bar] 56.85≤T≤226.85 [°C]
52	VPX(P,X)	VPX: Specific Volume of Mixture [m^3/kg] P∗: Pressure [Pa], [bar] X: Dryness Fraction [–]	$2.0\times10^3 \le P \le 4.065\times10^6$ [Pa] 0.02≤P≤40.65 [bar] 0≤X≤1.0 [–]
53	VTD(T)	VTD: Specific Volume of Saturated Liquid [m^3/kg] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
54	VTDD(T)	VTDD: Specific Volume of Saturated Vapor [m^3/kg] T∗: Temperature [K], [°C]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C]
55	VTX(T,X)	VTX: Specific Volume of Mixture [m^3/kg] T∗: Temperature [K], [°C] X: Dryness Fraction [–]	167.5≤T≤355.37 [K] −105.65≤T≤82.22 [°C] 0≤X≤1.0 [–]

Table II–2.49–1 Refrigerant 502 Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
8E	WPD(P)		
8F	WPDD(P)		
83	WPT(P,T)	WPT: Velocity of Sound [m/s] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$2.0\times10^3\leq P\leq1.2078\times10^6$ [Pa] TSP(P)≤T≤500 [K] $1.2078\times10^6<P\leq10.0\times10^6$ [Pa] 330≤T≤500 [K] 0.02≤P≤12.078 [bar] TSP(P)≤T≤226.85 [°C] 12.078<P≤100 [bar] 56.85≤T≤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]	$2.0\times10^3\leq P<4.065\times10^6$ [Pa] 0.02≤P<40.65 [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)]	$2.0\times10^3\leq P<4.065\times10^6$ [Pa] 0.02≤P<40.65 [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]	$2.0\times10^3\leq P<4.065\times10^6$ [Pa] 0.02≤P<40.65 [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]	$2.0\times10^3\leq P<4.065\times10^6$ [Pa] 0.02≤P<40.65 [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]	167.5≤T<355.37 [K] −105.65≤T<82.22 [°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)]	167.5≤T<355.37 [K] −105.65≤T<82.22 [°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]	167.5 ≤T<355.37 [K] −105.65≤T<82.22 [°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]	167.5 ≤T<355.37 [K] −105.65≤T<82.22 [°C] VTD(T)≤V≤VTDD(T) [m^3/kg]