

2.47 Halon 1301(R13B1)

All equations for halon 1301(R13B1) are based on the Table from Japanese Association of Refrigeration [1].

2.47.1 Temperature Scale

International practical temperature scale 1968 (ITS-1968)

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

Name of Substance:	Halon 1301, R13B1, Refrigerant 13B1, Freon 13B1, Bromotrifluoromethane
Library File for UNIX:	libjr13b.a
Library File for DOS,Windows95/NT:	JR13B.LIB
Single Shot Program for UNIX:	r13b1-ss
Single Shot Program for DOS,Windows95/NT:	R13B1-SS.EXE

2.47.3 Important Constants and Others

Molecular Formula:	CBrF ₃
Relative Molecular Mass:	148.91
Gas Constant:	55.8346 J/(kg·K)

Critical Constants:

Critical Pressure:	3.9628×10^6 Pa (39.628 bar)
Critical Temperature:	340.08 K (66.93°C)
Critical Specific Volume:	1.3089×10^{-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.

2.47.4 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-2-20) in reference [1].

Properties at Vapor-Liquid Equilibrium:

saturated liquid: Equations (II-2-3), (II-2-9), (II-2-17) and (II-2-21) for specific volume, specific enthalpy, specific entropy and isobaric specific heat, respectively.

saturated vapor: Equations (II-2-20) 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]. However, the coefficients of A_{13} and A_{16} in the equation (II-2-14) have been corrected to $5T_r^{-6}$ from T_r^{-6} .

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-3-7) and (II-3-3) in reference [1] for thermal conductivity of vapor and dynamic

viscosity at the atmospheric pressure, respectively. Also equation (II·3·3) for dynamic viscosity of superheated vapor.

The Other Properties:

Equation (II·2·40) in reference [1] for surface tension.

References

- [1] Japanese Association of Refrigeration, Thermophysical Properties of Refrigerants (R13B1, Bromotrifluoromethane), (1989).

Table II-2.47-1 Halon 1301 (R13B1) 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]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $TSP(P) \leq T \leq 460$ [K] $0.074 \leq P \leq 150$ [bar] $TSP(P) \leq T \leq 186.85$ [°C] see Fig.II-2.47-1
8C	AKTD(T)		
8D	AKTDD(T)		
2	ALAPP(P)	ALAPP: Laplace Coefficient [m] P*: Pressure [Pa], [bar]	$5.858 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.05858 \leq P \leq 39.628$ [bar]
3	ALAPT(T)	ALAPT: Laplace Coefficient [m] T*: Temperature [K], [°C]	$170 \leq T \leq 340.08$ [K] $-103.15 \leq T \leq 66.93$ [°C]
4	ALHP(P)	ALHP: Latent Heat of Vaporization [J/kg] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
5	ALHT(T)	ALHT: Latent Heat of Vaporization [J/kg] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
6	ALMPD(P)	ALMPD: Thermal Conductivity of Saturated Liquid [W/(m·K)] P*: Pressure [Pa], [bar]	$PST(160K) \leq P \leq 2.635 \times 10^6$ [Pa] $PST(113.15^\circ C) \leq P \leq 26.35$ [bar]
7	ALMPDD(P)	ALMPDD: Thermal Conductivity of Saturated Vapor [W/(m·K)] T*: Temperature [K], [°C]	$77.91 \times 10^3 \leq P \leq 3.51 \times 10^6$ [Pa] $0.779 \leq P \leq 35.1$ [bar]
8	ALMPT(P,T)	ALMPT: Thermal Conductivity at Ordinary Pressure [W/(m·K)] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	P=Dummy $270 \leq T \leq 434$ [K] $-3.15 \leq T \leq 160.85$ [°C]
9	ALMTD(T)	ALMTD: Thermal Conductivity of Saturated Liquid [W/(m·K)] T*: Temperature [K], [°C]	$100 \leq T \leq 320$ [K] $-173.15 \leq T \leq 46.85$ [°C]
10	ALMTDD(T)	ALMTDD: Thermal Conductivity of Saturated Vapor [W/(m·K)] T*: Temperature [K], [°C]	$210 \leq T \leq 334$ [K] $-63.15 \leq T \leq 60.85$ [°C]
11	AMUPD(P)	AMUPD: Coefficient of Viscosity of Saturated Liquid [Pa·s] P*: Pressure [Pa], [bar]	$PST(190K) \leq P \leq PST(332K)$ [Pa] ($\sim 25 \times 10^3$) ($\sim 3.37 \times 10^6$) $PST(-83.15^\circ C) \leq P \leq PST(58.85^\circ C)$ (~ 0.25) (~ 33.7) [bar]
12	AMUPDD(P)	AMUPDD: Coefficient of Viscosity of Saturated Vapor [Pa·s] P*: Pressure [Pa], [bar]	$0.8419 \times 10^6 \leq P \leq 3.9628 \times 10^6$ [Pa] $8.419 \leq P \leq 39.628$ [bar]
13	AMUPT(P,T)	AMUPT: Coefficient of Viscosity [Pa·s] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$0.1 \times 10^6 \leq P \leq 10 \times 10^6$ [Pa] $273.15 \leq T \leq 448.15$ [K] $1.6667 \times 10^{-3} \leq V(P,T) \leq$ [m ³ /kg] $1.0 \leq P \leq 100$ [bar] $0 \leq T \leq 175$ [°C]
14	AMUTD(T)	AMUTD: Coefficient of Viscosity of Saturated Liquid [Pa·s] T*: Temperature [K], [°C]	$190 \leq T \leq 332$ [K] $-83.15 \leq T \leq 58.85$ [°C]

Table II-2.47-1 Halon 1301 (R13B1) 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]	$273.15 \leq T \leq 340.08$ [K] $0 \leq T \leq 66.93$ [°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]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
17	CPPDD(P)	CPPDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
18	CPPT(P,T)	CPPT: Isobaric Specific Heat [J/(kg·K)] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $TSP(P) \leq T \leq 460$ [K] $0.074 \leq P \leq 150$ [bar] $TSP(P) \leq T \leq 186.85$ [°C] see Fig.II-2.47-1
19	CPTD(T)	CPTD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
20	CPTDD(T)	CPTDD: Isobaric Specific Heat of Saturated Vapor [J/(kg·K)] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
21	CRP('A')	CRP: Critical Constants H: 'A'='H': 0.2778×10^6 [J/kg] Specific Enthalpy P*: 'A'='P': 3.9628×10^6 [Pa], 39.628 [bar] Pressure S: 'A'='S': 1.241×10^3 [J/(kg·K)] Specific Entropy T*: 'A'='T': 340.08 [K], 66.93 [°C] Temperature V: 'A'='V': 1.3089×10^{-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]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
77	CVPT(P,T)	CVPT: Isochoric Specific Heat [J/(kg·K)] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $TSP(P) \leq T \leq 460$ [K] $0.074 \leq P \leq 150$ [bar] $TSP(P) \leq T \leq 186.85$ [°C] see Fig.II-2.47-1
7B	CVTD(T)		
78	CVTDD(T)	CVTDD: Isochoric Specific Heat of Saturated Vapor [J/(kg·K)] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°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': 148.91 Relative Molecular Mass R: 'A'='R': 55.8346 [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)		

Table II-2.47-1 Halon 1301 (R13B1) 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] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
24	HPDD(P)	HPDD: Specific Enthalpy of Saturated Vapor [J/kg] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
71	HPS(P,S)	HPS: Specific Enthalpy [J/kg] P*: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $0.074 \leq P \leq 150$ [bar] see Fig.II-2.47-3 for S
25	HPT(P,T)	HPT: Specific Enthalpy [J/kg] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $TSP(P) \leq T \leq 460$ [K] $0.074 \leq P \leq 150$ [bar] $TSP(P) \leq T \leq 186.85$ [°C] see Fig.II-2.47-1
26	HPX(P,X)	HPX: Specific Enthalpy of Mixture [J/kg] P*: Pressure [Pa], [bar] X: Dryness Fraction [-]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar] $0 \leq X \leq 1.0$ [-]
27	HTD(T)	HTD: Specific Enthalpy of Saturated Liquid [J/kg] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
28	HTDD(T)	HTDD: Specific Enthalpy of Saturated Vapor [J/kg] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
29	HTX(T,X)	HTX: Specific Enthalpy of Mixture [J/kg] T*: Temperature [K], [°C] X: Dryness Fraction [-]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C] $0 \leq X \leq 1.0$ [-]
84	IDENTF('A')	IDENTF: CHARACTER TYPE FUNCTION for Package Identification (Length 20) C: 'A'='C': 'CBRF3' Molecular Formula S: 'A'='S': 'HALON 1301(R13B1)' 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]	$25 \times 10^3 \leq P \leq 2.635 \times 10^6$ [Pa] $0.25 \leq P \leq 26.35$ [bar]
86	PRPDD(P)	PRPDD: Prandtl Number of Saturated Vapor [-] P*: Pressure [Pa], [bar]	$0.8419 \times 10^6 \leq P \leq 3.51 \times 10^6$ [Pa] $8.419 \leq P \leq 35.1$ [bar]
81	PRPT(P,T)	PRPT: Prandtl Number at Ordinary Pressure [-] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	P=Dummy $270 \leq T \leq 434$ [K] $-3.15 \leq T \leq 160.85$ [°C]
87	PRTD(T)	PRTD: Prandtl Number of Saturated Liquid [-] T*: Temperature [K], [°C]	$190 \leq T \leq 320$ [K] $-83.15 \leq T \leq 46.85$ [°C]
88	PRTDD(T)	PRTDD: Prandtl Number of Saturated Vapor [-] T*: Temperature [K], [°C]	$273.15 \leq T \leq 334$ [K] $0 \leq T \leq 60.85$ [°C]
99	PSBT(T)		
30	PST(T)	PST*: Saturation Pressure [Pa], [bar] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
72	PSTD(T)		
73	PSTDD(T)		
31	SIGP(P)	SIGP: Surface Tension [N/m] P*: Pressure [Pa], [bar]	$PST(160K) \leq P \leq 3.9628 \times 10^6$ [Pa] ($\sim 20 \times 10^3$) $PST(-113.15 \text{ } ^\circ\text{C}) \leq P \leq 39.628$ (~ 0.2) [bar]
32	SIGT(T)	SIGT: Surface Tension [N/m] T*: Temperature [K], [°C]	$160 \leq T \leq 340.08$ [K] $-113.15 \leq T \leq 66.93$ [°C]

Table II-2.47-1 Halon 1301 (R13B1) Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
33	SPD(P)	SPD: Specific Entropy of Saturated Liquid [J/(kg·K)] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
34	SPDD(P)	SPDD: Specific Entropy of Saturated Vapor [J/(kg·K)] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
35	SPT(P,T)	SPT: Specific Entropy [J/(kg·K)] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $TSP(P) \leq T \leq 460$ [K] $0.074 \leq P \leq 150$ [bar] $TSP(P) \leq T \leq 186.85$ [°C] see Fig.II-2.47-1
36	SPX(P,X)	SPX: Specific Entropy of Mixture [J/(kg·K)] P*: Pressure [Pa], [bar] X: Dryness Fraction [-]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar] $0 \leq X \leq 1.0$ [-]
37	STD(T)	STD: Specific Entropy of Saturated Liquid [J/(kg·K)] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
38	STDD(T)	STDD: Specific Entropy of Saturated Vapor [J/(kg·K)] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
39	STX(T,X)	STX: Specific Entropy of Mixture [J/(kg·K)] T*: Temperature [K], [°C] X: Dryness Fraction [-]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C] $0 \leq X \leq 1.0$ [-]
67	TLDP(P)		
69	TMLP(P)		
64	TPH(P,H)	TPH*: Temperature [K], [°C] P*: Pressure [Pa], [bar] H: Specific Enthalpy [J/kg]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $0.074 \leq P \leq 150$ [bar] see Fig.II-2.47-2 for H
6H	TPH2(P,H)		
65	TPS(P,S)	TPS*: Temperature [K], [°C] P*: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $0.074 \leq P \leq 150$ [bar] see Fig.II-2.47-3 for S
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]	$7.4 \times 10^3 \leq P \leq PST(333K)$ [Pa] $VPD(P) \leq V \leq$ $VPT(P,460K)$ [m ³ /kg] $PST(333K) < P \leq 15 \times 10^6$ [Pa] $VPT(P,333K) \leq V \leq$ $VPT(P,460K)$ [m ³ /kg] $0.074 \leq P \leq PST(59.85^\circ C)$ [bar] $VPD(P) \leq V \leq$ $VPT(P,186.85^\circ C)$ [m ³ /kg] $PST(59.85^\circ C) < P \leq 150$ [bar] $VPT(P,59.85^\circ C) \leq V \leq$ $VPT(P,186.85^\circ C)$ [m ³ /kg] see Fig.II-2.47-1 for V
41	TRPL('A')		
100	TSBP(P)		
40	TSP(P)	TSP*: Saturation Temperature [K], [°C] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
74	TSPD(P)		
75	TSPDD(P)		

Table II-2.47-1 Halon 1301 (R13B1) Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
42	UPD(P)	UPD: Specific Internal Energy of Saturated Liquid [J/kg] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
43	UPDD(P)	UPDD: Specific Internal Energy of Saturated Vapor [J/kg] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
79	UPS(P,S)	UPS: Specific Internal Energy [J/kg] P*: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $0.074 \leq P \leq 150$ [bar] see Fig.II-2.47-3 for S
44	UPT(P,T)	UPT: Specific Internal Energy [J/kg] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $\text{TSP}(P) \leq T \leq 460$ [K] $0.074 \leq P \leq 150$ [bar] $\text{TSP}(P) \leq T \leq 186.85$ [°C] see Fig.II-2.47-1
45	UPX(P,X)	UPX: Specific Internal Energy of Mixture [J/kg] P*: Pressure [Pa], [bar] X: Dryness Fraction [-]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar] $0 \leq X \leq 1.0$ [-]
46	UTD(T)	UTD: Specific Internal Energy 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]
47	UTDD(T)	UTDD: Specific Internal Energy 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]
48	UTX(T,X)	UTX: Specific Internal Energy 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] $0 \leq X \leq 1.0$ [-]
49	VPD(P)	VPD: Specific Volume of Saturated Liquid [m ³ /kg] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
50	VPDD(P)	VPDD: Specific Volume of Saturated Vapor [m ³ /kg] P*: Pressure [Pa], [bar]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar]
80	VPS(P,S)	VPS: Specific Volume [m ³ /kg] P*: Pressure [Pa], [bar] S: Specific Entropy [J/(kg·K)]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $0.074 \leq P \leq 150$ [bar] see Fig.II-2.47-3 for S
51	VPT(P,T)	VPT: Specific Volume [m ³ /kg] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $\text{TSP}(P) \leq T \leq 460$ [K] $0.074 \leq P \leq 150$ [bar] $\text{TSP}(P) \leq T \leq 186.85$ [°C] see Fig.II-2.47-1
52	VPX(P,X)	VPX: Specific Volume of Mixture [m ³ /kg] P*: Pressure [Pa], [bar] X: Dryness Fraction [-]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar] $0 \leq X \leq 1.0$ [-]
53	VTD(T)	VTD: Specific Volume of Saturated Liquid [m ³ /kg] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
54	VTDD(T)	VTDD: Specific Volume of Saturated Vapor [m ³ /kg] T*: Temperature [K], [°C]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C]
55	VTX(T,X)	VTX: Specific Volume of Mixture [m ³ /kg] T*: Temperature [K], [°C] X: Dryness Fraction [-]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C] $0 \leq X \leq 1.0$ [-]
8E	WPD(P)		
8F	WPDD(P)		

Table II-2.47-1 Halon 1301 (R13B1) Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
83	WPT(P,T)	WPT: Velocity of Sound [m/s] P*: Pressure [Pa], [bar] T*: Temperature [K], [°C]	$7.4 \times 10^3 \leq P \leq 15 \times 10^6$ [Pa] $TSP(P) \leq T \leq 460$ [K] $0.074 \leq P \leq 150$ [bar] $TSP(P) \leq T \leq 186.85$ [°C] see Fig.II-2.47-1
8G	WTD(T)		
8H	WTDD(T)		
56	XPH(P,H)	XPH: Dryness Fraction [-] P*: Pressure [Pa], [bar] H: Specific Enthalpy of Mixture [J/kg]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar] $HPD(P) \leq H \leq HPDD(P)$ [J/kg]
57	XPS(P,S)	XPS: Dryness Fraction [-] P*: Pressure [Pa], [bar] S: Specific Entropy of Mixture [J/(kg·K)]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar] $SPD(P) \leq S \leq SPDD(P)$ [J/(kg·K)]
58	XPU(P,U)	XPU: Dryness Fraction [-] P*: Pressure [Pa], [bar] U: Specific Internal Energy of Mixture [J/kg]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar] $UPD(P) \leq U \leq UPDD(P)$ [J/kg]
59	XPV(P,V)	XPV: Dryness Fraction [-] P*: Pressure [Pa], [bar] V: Specific Volume of Mixture [m ³ /kg]	$7.4 \times 10^3 \leq P \leq 3.9628 \times 10^6$ [Pa] $0.074 \leq P \leq 39.628$ [bar] $VPD(P) \leq V \leq VPDD(P)$ [m ³ /kg]
60	XTH(T,H)	XTH: Dryness Fraction [-] T*: Temperature [K], [°C] H: Specific Enthalpy of Mixture [J/kg]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C] $HTD(T) \leq H \leq HTDD(T)$ [J/kg]
61	XTS(T,S)	XTS: Dryness Fraction [-] T*: Temperature [K], [°C] S: Specific Entropy of Mixture [J/(kg·K)]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C] $STD(T) \leq S \leq STDD(T)$ [J/(kg·K)]
62	XTU(T,U)	XTU: Dryness Fraction [-] T*: Temperature [K], [°C] U: Specific Internal Energy of Mixture [J/kg]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C] $UTD(T) \leq U \leq UTDD(T)$ [J/kg]
63	XTV(T,V)	XTV: Dryness Fraction [-] T*: Temperature [K], [°C] V: Specific Volume of Mixture [m ³ /kg]	$173 \leq T \leq 340.08$ [K] $-100.15 \leq T \leq 66.93$ [°C] $VTD(T) \leq V \leq VTDD(T)$ [m ³ /kg]

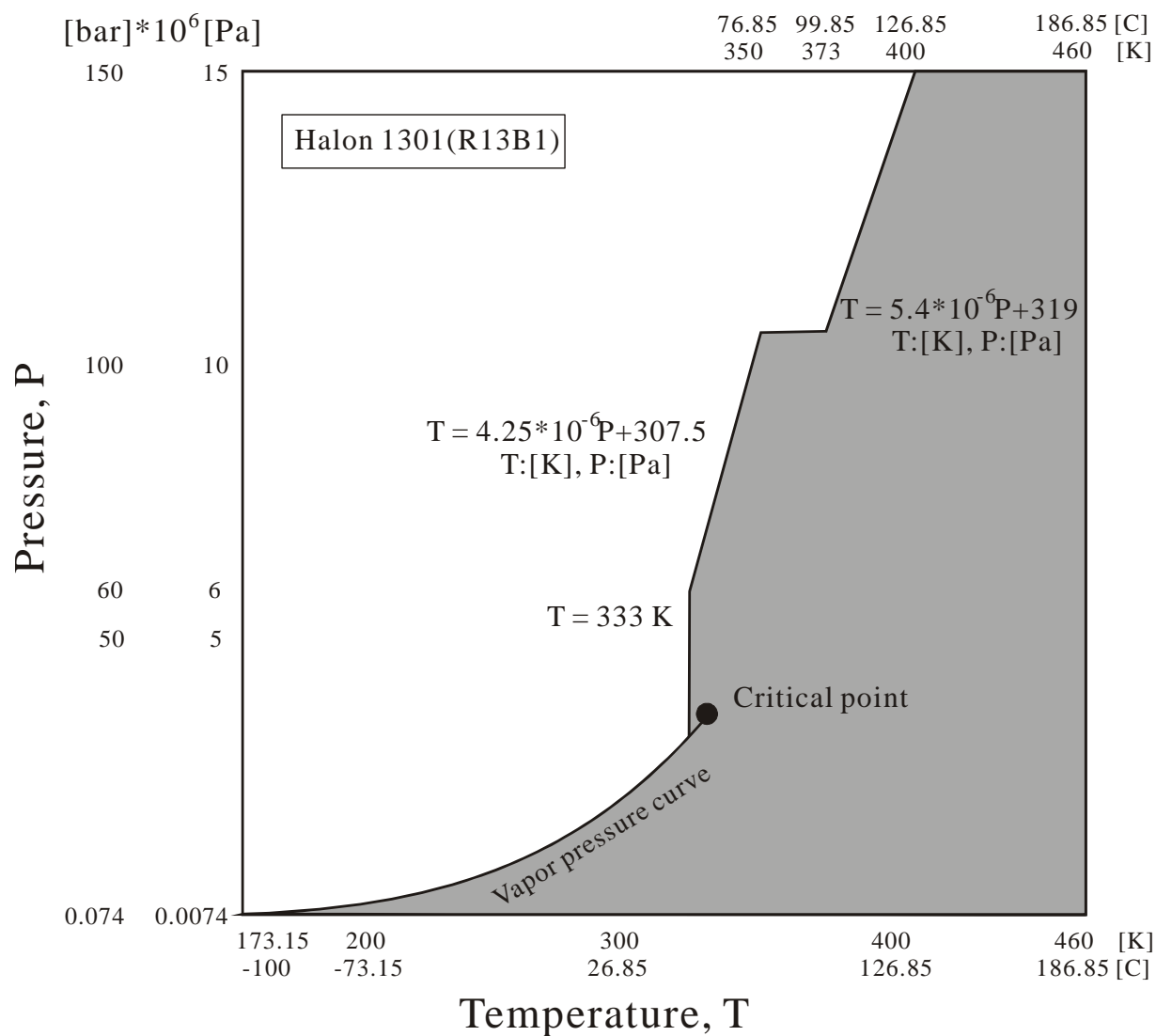


Fig.II-2.47-1 Range of Arguments(P,T) for AKPT(P,T),CPPT(P,T),CVPT(P,T),HPT(P,T), SPT(P,T),UPT(P,T),VPT(P,T) and WPT(P,T).

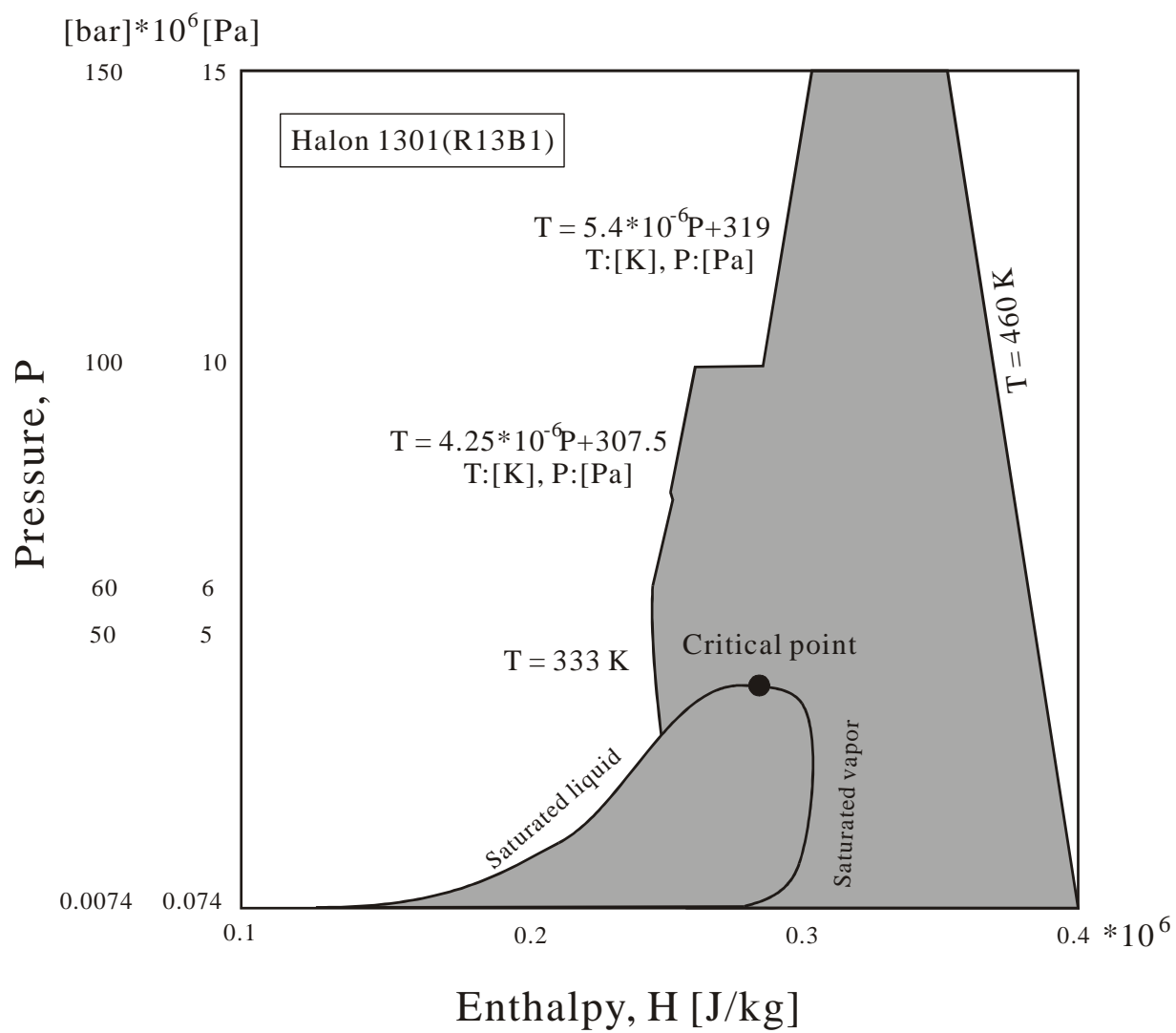


Fig.II-2.47-2 Range of Arguments(P,H) for TPH(P,H).

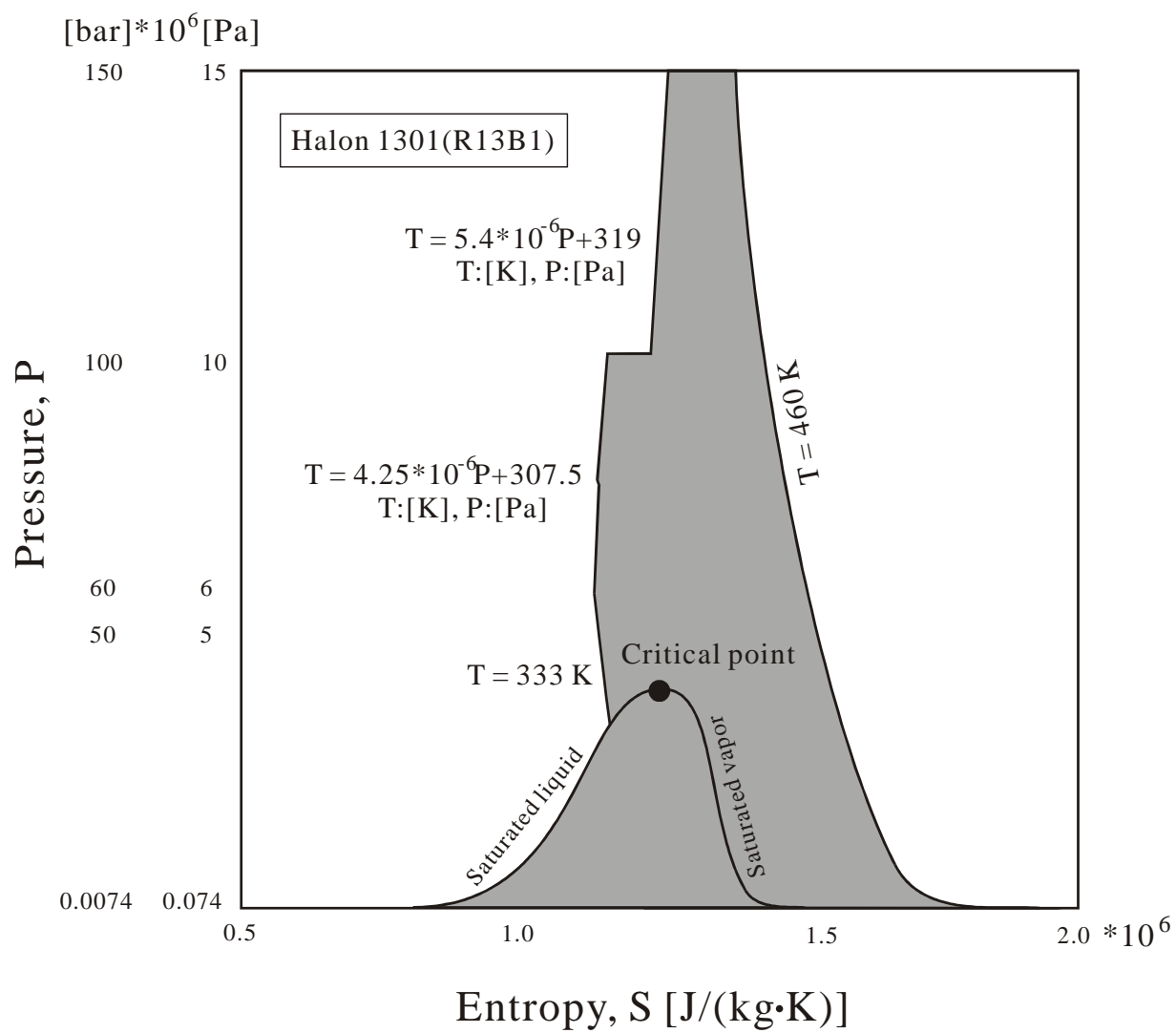


Fig.II-2.47-3 Range of Arguments(P,S) for HPS(P,S),TPS(P,S),UPS(P,S) and VPS(P,S).