

2.13 Carbon Monoxide

Equations for thermodynamic properties have been cited from reference [1].

2.13.1 Temperature Scale

International practical temperature scale 1968 (IPTS-1968)

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

Name of Substance:	Carbon Monoxide
Library File for UNIX:	libjco.a
Library File for DOS,Windows95/NT:	JCO.LIB
Single Shot Program for UNIX:	co-ss
Single Shot Program for DOS,Windows95/NT:	CO-SS.EXE

2.13.3 Important Constants and Others

Molecular Formula:	CO
Relative Molecular Mass:	28.01
Gas Constant:	296.84 J/(kg·K)

Critical Constants:

Critical Pressure:	3.4935×10 ⁶ Pa (34.935 bar)
Critical Temperature:	132.85 K (−140.30°C)
Critical Specific Volume:	3.29×10 ^{−3} m ³ /kg

Triple Point:

Pressure:	0.01540×10 ⁶ Pa (0.1540 bar)
Temperature:	68.127 K (−205.023°C)

Reference State:

Zero is assigned to the specific internal energy of saturated liquid at the triple point.

2.13.4 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 (2) in reference [1].

Properties at Vapor-Liquid Equilibrium:

Equations (3) for specific volume of saturated liquid and equation (4) for specific volume of saturated vapor, equations (10) and (19) for specific entropy, equations (9) and (19) for specific enthalpy, and equation (16) for isobaric specific heat, respectively. All of these have been cited from reference [1].

Pressure and Temperature on Melting Line:

Equation (1) in reference [1].

References

- [1] R.D.Goodwin, Carbon Monoxide Thermophysical Properties from 68 to 1000K at Pressures to 100MPa, J. Phys. & Chem. Ref. Data, vol.14, No.4, (1985), p.849.

Table II-2.13-1 Carbon Monoxide 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)		
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]	$15.4 \times 10^3 \leq P \leq 3.4935 \times 10^6$ [Pa] $0.154 \leq P \leq 34.935$ [bar]
5	ALHT(T)	ALHT: Latent Heat of Vaporization [J/kg] T*: Temperature [K], [°C]	$68.127 \leq T \leq 132.85$ [K] $-205.023 \leq T \leq -140.3$ [°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)		
90	BSPT(P,T)		
91	BTPPT(P,T)		
93	BVPT(P,T)		
16	CPPD(P)	CPPD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] P*: Pressure [Pa], [bar]	$15.4 \times 10^3 \leq P \leq 3.4935 \times 10^6$ [Pa] $0.154 \leq P \leq 34.935$ [bar]
17	CPPDD(P)		
18	CPPT(P,T)		
19	CPTD(T)	CPTD: Isobaric Specific Heat of Saturated Liquid [J/(kg·K)] T*: Temperature [K], [°C]	$68.127 \leq T \leq 132.85$ [K] $-205.023 \leq T \leq -140.3$ [°C]
20	CPTDD(T)		
21	CRP('A')	CRP: Critical Constants H: 'A'='H': 188.2×10^3 [J/kg] Specific Enthalpy P*: 'A'='P': 3.4935×10^6 [Pa], 34.935 [bar] Pressure S: 'A'='S': 4.435×10^3 [J/(kg·K)] Specific Entropy T*: 'A'='T': 132.85 [K], -140.3 [°C] Temperature V: 'A'='V': 3.29×10^{-3} [m ³ /kg] Specific Volume	one of 'H', 'P', 'S', 'T' and 'V'
7A	CVPD(P)		
76	CVPDD(P)		
77	CVPT(P,T)		
7B	CVTD(T)		
78	CVTDD(T)		
2A	EPSPD(P)		
2B	EPSPDD(P)		
22	EPSPT(P,T)		
2C	EPSTD(T)		
2D	EPSTDD(T)		

Table II-2.13-1 Carbon Monoxide Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
89	FC('A')	FC: Fundamental Constants M: 'A'='M': 28.01 Relative Molecular Mass R: 'A'='R': 296.84 [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]	$15.4 \times 10^3 \leq P \leq 3.4935 \times 10^6$ [Pa] $0.154 \leq P \leq 34.935$ [bar]
24	HPDD(P)	HPDD: Specific Enthalpy of Saturated Vapor [J/kg] P*: Pressure [Pa], [bar]	$15.4 \times 10^3 \leq P \leq 3.4935 \times 10^6$ [Pa] $0.154 \leq P \leq 34.935$ [bar]
71	HPS(P,S)		
25	HPT(P,T)		
26	HPX(P,X)		
27	HTD(T)	HTD: Specific Enthalpy of Saturated Liquid [J/kg] T*: Temperature [K], [°C]	$68.127 \leq T \leq 132.85$ [K] $-205.023 \leq T \leq -140.3$ [°C]
28	HTDD(T)	HTDD: Specific Enthalpy of Saturated Vapor [J/kg] T*: Temperature [K], [°C]	$68.127 \leq T \leq 132.85$ [K] $-205.023 \leq T \leq -140.3$ [°C]
29	HTX(T,X)		
84	IDENTF('A')	IDENTF: CHARACTER TYPE FUNCTION for Package Identification (Length 20) C: 'A'='C': 'CO' Molecular Formula S: 'A'='S': 'CARBON MONOXIDE' 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]	$68.127 \leq T \leq 88.317$ [K] $-205.023 \leq T \leq -184.833$ [°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]	$68.127 \leq T \leq 132.85$ [K] $-205.023 \leq T \leq -140.3$ [°C]
72	PSTD(T)		
73	PSTDD(T)		
31	SIGP(P)		
32	SIGT(P)		
33	SPD(P)	SPD: Specific Entropy of Saturated Liquid [J/(kg·K)] P*: Pressure [Pa], [bar]	$15.4 \times 10^3 \leq P \leq 3.4935 \times 10^6$ [Pa] $0.154 \leq P \leq 34.935$ [bar]
34	SPDD(P)	SPDD: Specific Entropy of Saturated Vapor [J/(kg·K)] P*: Pressure [Pa], [bar]	$15.4 \times 10^3 \leq P \leq 3.4935 \times 10^6$ [Pa] $0.154 \leq P \leq 34.935$ [bar]
35	SPT(P,T)		
36	SPX(P,X)		

Table II-2.13-1 Carbon Monoxide 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]	68.127 ≤ T ≤ 132.85 [K] -205.023 ≤ T ≤ -140.3 [°C]
38	STDD(T)	STDD: Specific Entropy of Saturated Vapor [J/(kg·K)] T*: Temperature [K], [°C]	68.127 ≤ T ≤ 132.85 [K] -205.023 ≤ T ≤ -140.3 [°C]
39	STX(T,X)		
67	TLDP(P)		
69	TMLP(P)	TMLP*: Temperature on Melting Curve [K], [°C] P*: Pressure [Pa], [bar]	15.4 × 10 ³ ≤ P ≤ 100 × 10 ⁶ [Pa] 0.154 ≤ P ≤ 1000 [bar]
64	TPH(P,H)		
6H	TPH2(P,H)		
65	TPS(P,S)		
6S	TPS2(P,S)		
98	TPSEUP(P)		
70	TPV(P,V)		
41	TRPL('A')	TRPL*: Properties at Triple Point P*: 'A'='P': 15.4 × 10 ³ [Pa], 0.154 [bar] Pressure T*: 'A'='T': 68.127 [K], -205.023 [°C] Temperature	one of 'P' and 'T'
100	TSBP(P)		
40	TSP(P)	TSP*: Saturation Temperature [K], [°C] P*: Pressure [Pa], [bar]	15.4 × 10 ³ ≤ P ≤ 3.4935 × 10 ⁶ [Pa] 0.154 ≤ P ≤ 34.935 [bar]
74	TSPD(P)		
75	TSPDD(P)		
42	UPD(P)	UPD: Specific Internal Energy of Saturated Liquid [J/kg] P*: Pressure [Pa], [bar]	15.4 × 10 ³ ≤ P ≤ 3.4935 × 10 ⁶ [Pa] 0.154 ≤ P ≤ 34.935 [bar]
43	UPDD(P)	UPDD: Specific Internal Energy of Saturated Vapor [J/kg] P*: Pressure [Pa], [bar]	15.4 × 10 ³ ≤ P ≤ 3.4935 × 10 ⁶ [Pa] 0.154 ≤ P ≤ 34.935 [bar]
79	UPS(P,S)		
44	UPT(P,T)		
45	UPX(P,X)		
46	UTD(T)	UTD: Specific Internal Energy of Saturated Liquid [J/kg] T*: Temperature [K], [°C]	68.127 ≤ T ≤ 132.85 [K] -205.023 ≤ T ≤ -140.3 [°C]
47	UTDD(T)	UTDD: Specific Internal Energy of Saturated Vapor [J/kg] T*: Temperature [K], [°C]	68.127 ≤ T ≤ 132.85 [K] -205.023 ≤ T ≤ -140.3 [°C]
48	UTX(T,X)		
49	VPD(P)	VPD: Specific Volume of Saturated Liquid [m ³ /kg] P*: Pressure [Pa], [bar]	15.4 × 10 ³ ≤ P ≤ 3.4935 × 10 ⁶ [Pa] 0.154 ≤ P ≤ 34.935 [bar]
50	VPDD(P)	VPDD: Specific Volume of Saturated Vapor [m ³ /kg] P*: Pressure [Pa], [bar]	15.4 × 10 ³ ≤ P ≤ 3.4935 × 10 ⁶ [Pa] 0.154 ≤ P ≤ 34.935 [bar]
80	VPS(P,S)		
51	VPT(P,T)		
52	VPX(P,X)		

Table II-2.13-1 Carbon Monoxide Function (cont'd)

No.	Name of Function	Function and Argument(s)	Range of Argument(s)
53	VTD(T)	VTD: Specific Volume of Saturated Liquid [m ³ /kg] T*: Temperature [K], [°C]	68.127 ≤ T ≤ 132.85 [K] -205.023 ≤ T ≤ -140.3 [°C]
54	VTDD(T)	VTDD: Specific Volume of Saturated Vapor [m ³ /kg] T*: Temperature [K], [°C]	68.127 ≤ T ≤ 132.85 [K] -205.023 ≤ T ≤ -140.3 [°C]
55	VTX(T,X)		
8E	WPD(P)		
8F	WPDD(P)		
83	WPT(P,T)		
8G	WTD(T)		
8H	WTDD(T)		
56	XPH(P,H)		
57	XPS(P,S)		
58	XPU(P,U)		
59	XPV(P,V)		
60	XTH(T,H)		
61	XTS(T,S)		
62	XTU(T,U)		
63	XTV(T,V)		