STEAM TABLES

and

Mollier Diagram

(S.I. Units)

CONTENTS

SYMBOLS AND UNITS USED IN THE TABLES

t = Temperature, °C

t_s = Saturation temperature, °C

p = Pressure, bar

h_f = Specific enthalpy of saturated liquid, kJ/kg

h_{fg} = Specific enthalpy of evaporation (latent heat), kJ/kg

h_g = Specific enthalpy of saturated vapour, kJ/kg

s_f = Specific entropy of saturated liquid, kJ/kg K

s_{fg} = Specific entropy of evaporation, kJ/kg K

s_g = Specific entropy of saturated vapour, kJ/kg K

v_f = Specific volume of saturated liquid, m^3/kg

v_g = Specific volume of saturated steam, m^3/kg

TABLE I

Saturated Water and Steam (Temperature) Tables

Temp. (°C)	*Absolute pressure* (bar)	*Specific enthalpy* (kJ/kg)			*Specific entropy* (kJ/kg K)			*Specific volume* (m^3/kg)	
t	p	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	v_f	v_g
0	0.0061	−0.02	2501.4	2501.3	−0.0001	9.1566	9.1565	0.0010002	206.3
0.01	0.0061	0.01	2501.3	2501.4	0.000	9.156	9.156	0.0010002	206.2
1	0.0065	4.2	2499.0	2503.2	0.015	9.115	9.130	0.0010002	192.6
2	0.0070	8.4	2496.7	2505.0	0.031	9.073	9.104	0.0010001	179.9
3	0.0076	12.6	2494.3	2506.9	0.046	9.032	9.077	0.0010001	168.1
4	0.0081	16.8	2491.9	2508.7	0.061	8.990	9.051	0.0010001	157.2
5	0.0087	21.0	2489.6	2510.6	0.076	8.950	9.026	0.0010001	147.1
6	0.0093	25.2	2487.2	2512.4	0.091	8.909	9.000	0.0010001	137.7
7	0.0100	29.4	2484.8	2514.2	0.106	8.869	8.975	0.0010002	129.0
8	0.0107	33.6	2482.5	2516.1	0.121	8.829	8.950	0.0010002	120.9
9	0.0115	37.8	2480.1	2517.9	0.136	8.789	8.925	0.0010003	113.4
10	0.0123	42.0	2477.7	2519.7	0.151	8.750	8.901	0.0010004	106.4
11	0.0131	46.2	2475.4	2521.6	0.166	8.711	8.877	0.0010004	99.86
12	0.0140	50.4	2473.0	2523.4	0.181	8.672	8.852	0.0010005	93.78
13	0.0150	54.6	2470.7	2525.3	0.195	8.632	8.828	0.0010007	88.12
14	0.0160	58.8	2468.3	2527.1	0.210	8.595	8.805	0.0010008	82.85
15	0.0170	63.0	2465.9	2528.9	0.224	8.557	8.781	0.0010009	77.93
16	0.0182	67.2	2463.6	2530.8	0.239	8.519	8.758	0.001001	73.33
17	0.0194	71.4	2461.2	2532.6	0.253	8.482	8.735	0.001001	69.04
18	0.0206	75.6	2458.8	2534.4	0.268	8.444	8.712	0.001001	65.04
19	0.0220	79.8	2456.5	2536.3	0.282	8.407	8.690	0.001002	61.29
20	0.0234	84.0	2454.1	2538.1	0.297	8.371	8.667	0.001002	57.79
21	0.0249	88.1	2451.8	2539.9	0.311	8.334	8.645	0.001002	54.51
22	0.0264	92.3	2449.4	2541.7	0.325	8.298	8.623	0.001002	51.45
23	0.0281	96.5	2447.0	2543.5	0.339	8.262	8.601	0.001002	48.57
24	0.0298	100.7	2444.7	2545.4	0.353	8.226	8.579	0.001003	45.88
25	0.0317	104.9	2442.3	2547.2	0.367	8.191	8.558	0.001003	43.36
26	0.0336	109.1	2439.9	2549.0	0.382	8.155	8.537	0.001003	40.99
27	0.0357	113.2	2437.6	2550.8	0.396	8.120	8.516	0.001004	38.77
28	0.0378	117.4	2435.2	2552.6	0.409	8.086	8.495	0.001004	36.69
29	0.0401	121.6	2432.8	2554.5	0.423	8.051	8.474	0.001004	34.73
30	0.0425	125.8	2430.5	2556.3	0.437	8.016	8.453	0.001004	32.89

Temp. (°C)	*Absolute pressure* (bar)	*Specific enthalpy* (kJ/kg)			*Specific entropy* (kJ/kg K)			*Specific volume* (m^3/kg)	
t	p	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	v_f	v_g
31	0.0450	130.0	2428.1	2558.1	0.451	7.982	8.433	0.001005	31.17
32	0.0476	134.2	2425.7	2559.9	0.464	7.948	8.413	0.001005	29.54
33	0.0503	138.3	2423.4	2561.7	0.478	7.915	8.393	0.001005	28.01
34	0.0532	142.5	2421.0	2563.5	0.492	7.881	8.373	0.001006	26.57
35	0.0563	146.7	2418.6	2565.3	0.505	7.848	8.353	0.001006	25.22
36	0.0595	150.9	2416.2	2567.1	0.519	7.815	8.334	0.001006	23.94
37	0.0628	155.0	2413.9	2568.9	0.532	7.782	8.314	0.001007	22.74
38	0.0663	159.2	2411.5	2570.7	0.546	7.749	8.295	0.001007	21.60
39	0.0700	163.4	2409.1	2572.5	0.559	7.717	8.276	0.001007	20.53
40	0.0738	167.6	2406.7	2574.3	0.573	7.685	8.257	0.001008	19.52
41	0.0779	171.7	2404.3	2576.0	0.586	7.652	8.238	0.001008	18.57
42	0.0821	175.9	2401.9	2577.8	0.599	7.621	8.220	0.001009	17.67
43	0.0865	180.1	2399.5	2579.6	0.612	7.589	8.201	0.001009	16.82
44	0.0911	184.3	2397.2	2581.5	0.626	7.557	8.183	0.001010	16.02
45	0.0959	188.4	2394.8	2583.2	0.639	7.526	8.165	0.001010	15.26
46	0.1010	192.6	2392.4	2585.0	0.652	7.495	8.147	0.001010	14.54
47	0.1062	196.8	2390.0	2586.8	0.665	7.464	8.129	0.001011	13.86
48	0.1118	201.0	2387.6	2588.6	0.678	7.433	8.111	0.001011	13.22
49	0.1175	205.1	2385.2	2590.3	0.691	7.403	8.094	0.001012	12.61
50	0.1235	209.3	2382.7	2592.1	0.704	7.372	8.076	0.001012	12.03
52	0.1363	217.7	2377.9	2595.6	0.730	7.312	8.042	0.001013	10.97
54	0.1502	226.0	2373.1	2599.1	0.755	7.253	8.008	0.001014	10.01
56	0.1653	234.4	2368.2	2602.6	0.781	7.194	7.975	0.001015	9.149
58	0.1817	242.8	2363.4	2606.2	0.806	7.136	7.942	0.001016	8.372
60	0.1994	251.1	2358.5	2609.6	0.831	7.078	7.909	0.001017	7.671
62	0.2186	259.5	2353.6	2613.1	0.856	7.022	7.878	0.001018	7.037
64	0.2393	267.9	2348.7	2616.5	0.881	6.965	7.846	0.001019	6.463
66	0.2617	276.2	2343.7	2619.9	0.906	6.910	7.816	0.001020	5.943
68	0.2859	284.6	2338.8	2623.4	0.930	6.855	7.785	0.001022	5.471
70	0.3119	293.0	2333.8	2626.8	0.955	6.800	7.755	0.001023	5.042
75	0.3858	313.9	2321.4	2635.3	1.015	6.667	7.682	0.001026	4.131
80	0.4739	334.9	2308.8	2643.7	1.075	6.537	7.612	0.001029	3.407
85	0.5783	355.9	2296.0	2651.9	1.134	6.410	7.544	0.001033	2.828
90	0.7014	376.9	2283.2	2660.1	1.192	6.287	7.479	0.001036	2.361
95	0.8455	397.9	2270.2	2668.1	1.250	6.166	7.416	0.001040	1.982
100	1.0135	419.0	2257.0	2676.0	1.307	6.048	7.355	0.001044	1.673

TABLE II

Saturated Water and Steam (Pressure) Tables

Absolute pressure (bar) p	*Temp. (°C)* t_s	*Specific enthalpy (kJ/kg)* h_f	h_{fg}	h_g	*Specific entropy (kJ/kg K)* s_f	s_{fg}	s_g	*Specific volume (m^3/kg)* v_f	v_g
0.006113	0.01	0.01	2 501.3	2 501.4	0.000	9.156	9.156	0.0010002	206.14
0.010	7.0	29.3	2 484.9	2 514.2	0.106	8.870	8.976	0.0010000	129.21
0.015	13.0	54.7	2 470.6	2 525.3	0.196	8.632	8.828	0.0010007	87.98
0.020	17.0	73.5	2 460.0	2 533.5	0.261	8.463	8.724	0.001001	67.00
0.025	21.1	88.5	2 451.6	2 540.1	0.312	8.331	8.643	0.001002	54.25
0.030	24.1	101.0	2 444.5	2 545.5	0.355	8.223	8.578	0.001003	45.67
0.035	26.7	111.9	2 438.4	2 550.3	0.391	8.132	8.523	0.001003	39.50
0.040	29.0	121.5	2 432.9	2 554.4	0.423	8.052	8.475	0.001004	34.80
0.045	31.0	130.0	2 428.2	2 558.2	0.451	7.982	8.433	0.001005	31.13
0.050	32.9	137.8	2 423.7	2 561.5	0.476	7.919	8.395	0.001005	28.19
0.055	34.6	144.9	2 419.6	2 565.5	0.500	7.861	8.361	0.001006	25.77
0.060	36.2	151.5	2 415.9	2 567.4	0.521	7.809	8.330	0.001006	23.74
0.065	37.6	157.7	2 412.4	2 570.1	0.541	7.761	8.302	0.001007	22.01
0.070	39.0	163.4	2 409.1	2 572.5	0.559	7.717	8.276	0.001007	20.53
0.075	40.3	168.8	2 406.0	2 574.8	0.576	7.675	8.251	0.001008	19.24
0.080	41.5	173.9	2 403.1	2 577.0	0.593	7.636	8.229	0.001008	18.10
0.085	42.7	178.7	2 400.3	2 579.0	0.608	7.599	8.207	0.001009	17.10
0.090	43.8	183.3	2 397.7	2 581.0	0.622	7.565	8.187	0.001009	16.20
0.095	44.8	187.7	2 395.2	2 582.9	0.636	7.532	8.168	0.001010	15.40
0.10	45.8	191.8	2 392.8	2 584.7	0.649	7.501	8.150	0.001010	14.67
0.11	47.7	199.7	2 388.3	2 588.0	0.674	7.453	8.117	0.001011	13.42
0.12	49.4	206.9	2 384.2	2 591.1	0.696	7.390	8.086	0.001012	12.36
0.13	51.0	213.7	2 380.2	2 593.9	0.717	7.341	8.058	0.001013	11.47
0.14	52.6	220.0	2 376.6	2 596.6	0.737	7.296	8.033	0.001013	10.69
0.15	54.0	226.0	2 373.2	2 599.2	0.754 9	7.254 4	8.009 3	0.001014	10.022
0.16	55.3	231.6	2 370.0	2 601.6	0.772 1	7.214 8	7.986 9	0.001015	9.433
0.17	56.6	236.9	2 366.9	2 603.8	0.788 3	7.177 5	7.965 8	0.001015	8.911
0.18	57.8	242.0	2 363.9	2 605.9	0.803 6	7.142 4	7.945 9	0.001016	8.445
0.19	59.0	246.8	2 361.1	2 607.9	0.818 2	7.109 0	7.927 2	0.001017	8.027
0.20	60.1	251.5	2 358.4	2 609.9	0.832 1	7.077 3	7.909 4	0.001017	7.650
0.21	61.1	255.9	2 355.8	2 611.7	0.845 3	7.047 2	7.892 5	0.001018	7.307
0.22	62.2	260.1	2 353.3	2 613.5	0.858 1	7.018 4	7.876 4	0.001018	6.995
0.23	63.1	264.2	2 350.9	2 615.2	0.870 2	6.990 8	7.861 1	0.001019	6.709
0.24	64.1	268.2	2 348.6	2 616.8	0.882 0	6.964 4	7.846 4	0.001019	6.447

Absolute pressure (bar) p	*Temp. (°C)* t_s	*Specific enthalpy (kJ/kg)* h_f	h_{fg}	h_g	*Specific entropy (kJ/kg K)* s_f	s_{fg}	s_g	*Specific volume (m^3/kg)* v_f	v_g
0.25	65.0	272.0	2 346.4	2 618.3	0.893 2	6.939 1	7.832 3	0.001020	6.205
0.26	65.9	275.7	2 344.2	2 619.9	0.904 1	6.914 7	7.818 8	0.001020	5.980
0.27	66.7	279.2	2 342.1	2 621.3	0.914 6	6.891 2	7.805 8	0.001021	5.772
0.28	67.5	282.7	2 340.0	2 622.7	0.924 8	6.868 5	7.793 3	0.001021	5.579
0.29	68.3	286.0	2 338.1	2 624.1	0.934 6	6.846 6	7.781 2	0.001022	5.398
0.30	69.1	289.3	2 336.1	2 625.4	0.944 1	6.825 4	7.769 5	0.001022	5.229
0.32	70.6	295.5	2 332.4	2 628.0	0.962 3	6.785 0	7.747 4	0.001023	4.922
0.34	72.0	301.5	2 328.9	2 630.4	0.979 5	6.747 0	7.726 5	0.001024	4.650
0.36	73.4	307.1	2 325.5	2 632.6	0.995 8	6.711 1	7.707 0	0.001025	4.408
0.38	74.7	312.5	2 322.3	2 634.8	1.011 3	6.677 1	7.688 4	0.001026	4.190
0.40	75.9	317.7	2 319.2	2 636.9	1.026 1	6.644 8	7.670 9	0.001026	3.993
0.42	77.1	322.6	2 316.3	2 638.9	1.040 2	6.614 0	7.654 2	0.001027	3.815
0.44	78.2	327.3	2 313.4	2 640.7	1.053 7	6.584 6	7.638 3	0.001028	3.652
0.46	79.3	331.9	2 310.7	2 642.6	1.066 7	6.556 4	7.623 1	0.001029	3.503
0.48	80.3	336.3	2 308.0	2 644.3	1.079 2	6.529 4	7.608 6	0.001029	3.367
0.50	81.3	340.6	2 305.4	2 646.0	1.091 2	6.503 5	7.594 7	0.001030	3.240
0.55	83.7	350.6	2 299.3	2 649.9	1.119 4	6.442 8	7.562 3	0.001032	2.964
0.60	86.0	359.9	2 293.6	2 653.6	1.145 4	6.387 3	7.532 7	0.001033	2.732
0.65	88.0	368.6	2 288.3	2 656.9	1.169 6	6.336 0	7.505 5	0.001035	2.535
0.70	90.0	376.8	2 283.3	2 660.1	1.192 1	6.288 3	7.480 4	0.001036	2.369
0.75	92.0	384.5	2 278.6	2 663.0	1.213 1	6.243 9	7.457 0	0.001037	2.217
0.80	93.5	391.7	2 274.0	2 665.8	1.233 0	6.202 2	7.435 2	0.001039	2.087
0.85	95.1	398.6	2 269.8	2 668.4	1.251 8	3.162 9	7.414 7	0.001040	1.972
0.90	96.7	405.2	2 265.6	2 670.9	1.269 6	6.125 8	7.395 4	0.001041	1.869
0.95	98.2	411.5	2 261.7	2 673.2	1.286 5	6.090 6	7.377 1	0.001042	1.777
1.0	99.6	417.5	2 257.9	2 675.4	1.302 7	6.057 1	7.359 8	0.001043	1.694
1.1	102.3	428.8	2 250.8	2 679.6	1.333 0	5.994 7	7.327 7	0.001046	1.549
1.2	104.8	439.4	2 244.1	2 683.4	1.360 9	5.937 5	7.298 4	0.001048	1.428
1.3	107.1	449.2	2 237.8	2 687.0	1.386 8	5.884 7	7.271 5	0.001050	1.325
1.4	109.3	458.4	2 231.9	2 690.3	1.410 9	5.835 6	7.246 5	0.001051	1.236
1.5	111.3	467.1	2 226.2	2 693.4	1.433 6	5.789 8	7.233 4	0.001053	1.159
1.6	113.3	475.4	2 220.9	2 696.2	1.455 0	5.746 7	7.201 7	0.001055	1.091
1.7	115.2	483.2	2 215.7	2 699.0	1.475 2	5.706 1	7.181 3	0.001056	1.031
1.8	116.9	490.7	2 210.8	2 701.5	1.494 4	5.667 8	7.162 2	0.001058	0.977
1.9	118.6	497.8	2 206.1	2 704.0	1.512 7	5.631 4	7.144 0	0.001060	0.929

Absolute pressure (bar)	*Temp. (°C)*	*Specific enthalpy (kJ/kg)*			*Specific entropy (kJ/kg K)*			*Specific volume (m^3/kg)*	
p	t_s	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	v_f	v_g
2.0	120.2	504.7	2 201.6	2 706.3	1.530 1	5.596 7	7.126 8	0.001061	0.885
2.1	121.8	511.3	2 197.2	2 708.5	1.546 8	5.563 7	7.110 5	0.001062	0.846
2.2	123.3	517.6	2 193.0	2 710.6	1.562 7	5.532 1	7.094 9	0.001064	0.810
2.3	124.7	523.7	2 188.9	2 712.6	1.578 1	5.501 9	7.080 0	0.001065	0.777
2.4	126.1	529.6	2 184.9	2 714.5	1.592 9	5.472 8	7.065 7	0.001066	0.746
2.5	127.4	535.3	2 181.0	2 716.4	1.607 1	5.444 9	7.052 0	0.001068	0.718
2.6	128.7	540.9	2 177.3	2 718.2	1.620 9	5.418 0	7.038 9	0.001069	0.693
2.7	129.9	546.2	2 173.6	2 719.9	1.634 2	5.392 0	7.026 2	0.001070	0.668
2.8	131.2	551.4	2 170.1	2 721.5	1.647 1	5.367 0	7.014 0	0.001071	0.646
2.9	132.4	556.5	2 166.6	2 723.1	1.659 5	5.342 7	7.002 3	0.001072	0.625
3.0	133.5	561.4	2 163.2	2 724.7	1.671 6	5.319 3	6.990 9	0.001074	0.606
3.1	134.6	566.2	2 159.9	2 726.1	1.683 4	5.296 5	6.979 9	0.001075	0.587
3.2	135.7	570.9	2 156.7	2 727.6	1.694 8	5.274 4	6.969 2	0.001076	0.570
3.3	136.8	575.5	2 153.5	2 729.0	1.705 9	5.253 0	6.958 9	0.001077	0.554
3.4	137.8	579.9	2 150.4	2 730.3	1.716 8	5.232 2	6.948 9	0.001078	0.538
3.5	138.8	584.3	2 147.4	2 731.6	1.727 3	5.211 9	6.939 2	0.001079	0.524
3.6	139.8	588.5	2 144.4	2 732.9	1.737 6	5.192 1	6.929 7	0.001080	0.510
3.7	140.8	592.7	2 141.4	2 734.1	1.747 6	5.172 9	6.920 5	0.001081	0.497
3.8	141.8	596.8	2 138.6	2 735.3	1.757 4	5.154 1	6.911 6	0.001082	0.486
3.9	142.7	600.8	2 135.7	2 736.5	1.767 0	5.135 8	6.902 8	0.001083	0.473
4.0	143.6	604.7	2 133.0	2 737.6	1.776 4	5.117 9	6.894 3	0.001084	0.462
4.2	145.4	612.3	2 127.5	2 739.8	1.794 5	5.083 4	6.877 9	0.001086	0.441
4.4	147.1	619.6	2 122.3	2 741.9	1.812 0	5.050 3	6.862 3	0.001088	0.423
4.6	148.7	626.7	2 117.2	2 743.9	1.828 7	5.018 6	6.847 3	0.001089	0.405
4.8	150.3	633.5	2 112.2	2 745.7	1.844 8	4.988 1	6.832 9	0.001091	0.390
5.0	151.8	640.1	2 107.4	2 747.5	1.860 4	4.958 8	6.819 2	0.001093	0.375
5.2	153.3	646.5	2 102.7	2 749.3	1.875 4	4.930 6	6.805 9	0.001094	0.361
5.4	154.7	652.8	2 098.1	2 750.9	1.889 9	4.903 3	6.793 2	0.001096	0.348
5.6	156.2	658.8	2 093.7	2 752.5	1.904 0	4.876 9	6.780 9	0.001098	0.337
5.8	157.5	664.7	2 089.3	2 754.0	1.917 6	4.851 4	6.769 0	0.001099	0.326
6.0	158.8	670.4	2 085.0	2 755.5	1.930 8	4.826 7	6.757 5	0.001101	0.315
6.2	160.1	676.0	2 080.9	2 756.9	1.943 7	4.802 7	6.746 4	0.001102	0.306
6.4	161.4	681.5	2 076.8	2 758.2	1.956 2	4.779 4	6.735 6	0.001104	0.297
6.6	162.6	686.8	2 072.7	2 759.5	1.968 4	4.756 8	6.725 2	0.001105	0.288
6.8	163.8	692.0	2 068.8	2 760.8	1.980 2	4.734 8	6.715 0	0.001107	0.280

Absolute pressure (bar) p	*Temp. (°C)* t_s	*Specific enthalpy (kJ/kg)* h_f	h_{fg}	h_g	*Specific entropy (kJ/kg K)* s_f	s_{fg}	s_g	*Specific volume (m^3/kg)* v_f	v_g
7.0	165.0	697.1	2064.9	2762.0	1.9918	4.7134	6.7052	0.001108	0.273
7.2	166.1	702.0	2061.1	2763.2	2.0031	4.6925	6.6956	0.001110	0.265
7.4	167.2	706.9	2057.4	2764.3	2.0141	4.6721	6.6862	0.001111	0.258
7.6	168.3	711.7	2053.7	2765.4	2.0249	4.6522	6.6771	0.001112	0.252
7.8	169.4	716.3	2050.1	2766.4	2.0354	4.6328	6.6683	0.001114	0.246
8.0	170.4	720.9	2046.5	2767.5	2.0457	4.6139	6.6596	0.001115	0.240
8.2	171.4	725.4	2043.0	2768.5	2.0558	4.5953	6.6511	0.001116	0.235
8.4	172.4	729.9	2039.6	2769.4	2.0657	4.5772	6.6429	0.001118	0.229
8.6	173.4	734.2	2036.2	2770.4	2.0753	4.5594	6.6348	0.001119	0.224
8.8	174.4	738.5	2032.8	2771.3	2.0848	4.5421	6.6269	0.001120	0.219
9.0	175.4	742.6	2029.5	2772.1	2.0941	4.5250	6.6192	0.001121	0.215
9.2	176.3	746.8	2026.2	2773.0	2.1033	4.5083	6.6116	0.001123	0.210
9.4	177.2	750.8	2023.0	2773.8	2.1122	4.4920	6.6042	0.001124	0.206
9.6	178.1	754.8	2019.8	2774.6	2.1210	4.4759	6.5969	0.001125	0.202
9.8	179.0	758.7	2016.7	2775.4	2.1297	4.4601	6.5898	0.001126	0.198
10.0	179.9	762.6	2013.6	2776.2	2.1382	4.4446	6.5828	0.001127	0.194
10.5	182.0	772.0	2005.9	2778.0	2.1588	4.4071	6.5659	0.001130	0.185
11.0	184.1	781.1	1998.5	2779.7	2.1786	4.3711	6.5497	0.001133	0.177
11.5	186.0	789.9	1991.3	2781.3	2.1977	4.3366	6.5342	0.001136	0.170
12.0	188.0	798.4	1984.3	2782.7	2.2161	4.3033	6.5194	0.001139	0.163
12.5	189.8	806.7	1977.4	2784.1	2.2338	4.2712	6.5050	0.001141	0.157
13.0	191.6	814.7	1970.7	2785.4	2.2510	4.2403	6.4913	0.001144	0.151
13.5	193.3	822.5	1964.2	2786.6	2.2676	4.2104	6.4779	0.001146	0.146
14.0	195.0	830.1	1957.7	2787.8	2.2837	4.1814	6.4651	0.001149	0.141
14.5	196.7	837.5	1951.4	2788.9	2.2993	4.1533	6.4526	0.001151	0.136
15.0	198.3	844.7	1945.2	2789.9	2.3145	4.1261	6.4406	0.001154	0.132
15.5	199.8	851.7	1939.2	2790.8	2.3292	4.0996	6.4289	0.001156	0.128
16.0	201.4	858.6	1933.2	2791.7	2.3436	4.0739	6.4175	0.001159	0.124
16.5	202.8	865.3	1927.3	2792.6	2.3576	4.0489	6.4065	0.001161	0.120
17.0	204.3	871.8	1921.5	2793.4	2.3713	4.0245	6.3957	0.001163	0.117
17.5	205.7	878.3	1915.9	2794.1	2.3846	4.0007	6.3853	0.001166	0.113
18.0	207.1	884.6	1910.3	2794.8	2.3976	3.9775	6.3751	0.001168	0.110
18.5	208.4	890.7	1904.7	2795.5	2.4103	3.9548	6.3651	0.001170	0.107
19.0	209.8	896.8	1899.3	2796.1	2.4228	3.9326	6.3554	0.001172	0.105
19.5	211.1	902.8	1893.9	2796.7	2.4349	3.9110	6.3459	0.001174	0.102

Absolute pressure (bar)	*Temp. (°C)*	*Specific enthalpy (kJ/kg)*			*Specific entropy (kJ/kg K)*			*Specific volume (m^3/kg)*	
p	t_s	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	v_f	v_g
20.0	212.4	908.6	1888.6	2797.2	2.4469	3.8898	6.3366	0.001177	0.0995
20.5	213.6	914.3	1883.4	2797.7	2.4585	3.8690	6.3276	0.001179	0.0971
21.0	214.8	920.0	1878.2	2798.2	2.4700	3.8487	6.3187	0.001181	0.0949
21.5	216.1	925.5	1873.1	2798.6	2.4812	3.8288	6.3100	0.001183	0.0927
22.0	217.2	931.0	1868.1	2799.1	2.4922	3.8093	6.3015	0.001185	0.0907
22.5	218.4	936.3	1863.1	2799.4	2.5030	3.7901	6.2931	0.001187	0.0887
23.0	219.5	941.6	1858.2	2799.8	2.5136	3.7713	6.2849	0.001189	0.0868
23.5	220.7	946.8	1853.3	2800.1	2.5241	3.7528	6.2769	0.001191	0.0849
24.0	221.8	951.9	1848.5	2800.4	2.5343	3.7347	6.2690	0.001193	0.0832
24.5	222.9	957.0	1843.7	2800.7	2.5444	3.7168	6.2612	0.001195	0.0815
25.0	223.9	962.0	1839.0	2800.9	2.5543	3.6993	6.2536	0.001197	0.0799
25.5	225.0	966.9	1834.3	2801.2	2.5640	3.6821	6.2461	0.001199	0.0783
26.0	226.0	971.7	1829.6	2801.4	2.5736	3.6651	6.2387	0.001201	0.0769
26.5	227.1	976.5	1825.1	2801.6	2.5831	3.6484	6.2315	0.001203	0.0754
27.0	228.1	981.2	1820.5	2801.7	2.5924	3.6320	6.2244	0.001205	0.0740
27.5	229.1	985.9	1816.0	2801.9	2.6016	3.6158	6.2173	0.001207	0.0727
28.0	230.0	990.5	1811.5	2802.0	2.6106	3.5998	6.2104	0.001209	0.0714
28.5	231.0	995.0	1807.1	2802.1	2.6195	3.5841	6.2036	0.001211	0.0701
29.0	232.0	999.5	1802.6	2802.2	2.6283	3.5686	6.1969	0.001213	0.0689
29.5	233.0	1004.0	1798.3	2802.2	2.6370	3.5533	6.1902	0.001214	0.0677
30.0	233.8	1008.4	1793.9	2802.3	2.6455	3.5382	6.1837	0.001216	0.0666
30.5	234.7	1012.7	1789.6	2802.3	2.6539	3.5233	6.1772	0.001218	0.0655
31.0	235.6	1017.0	1785.4	2802.3	2.6623	3.5087	6.1709	0.001220	0.0645
31.5	236.5	1021.2	1781.1	2802.3	2.6705	3.4942	6.1647	0.001222	0.0634
32.0	237.4	1025.4	1776.9	2802.3	2.6786	3.4799	6.1585	0.001224	0.0624
32.5	238.3	1029.6	1772.7	2802.3	2.6866	3.4657	6.1523	0.001225	0.0615
33.0	239.2	1033.7	1768.6	2802.3	2.6945	3.4518	6.1463	0.001227	0.0605
33.5	240.0	1037.8	1764.4	2802.2	2.7023	3.4380	6.1403	0.001229	0.0596
34.0	240.9	1041.8	1760.3	2802.1	2.7101	3.4244	6.1344	0.001231	0.0587
34.5	241.7	1045.8	1756.3	2802.1	2.7177	3.4109	6.1286	0.001233	0.0579
35.0	242.5	1049.8	1752.2	2802.0	2.7253	3.3976	6.1228	0.001234	0.0570
35.5	243.3	1053.7	1748.2	2801.8	2.7327	3.3844	6.1171	0.001236	0.0562
36.0	244.2	1057.6	1744.2	2801.7	2.7401	3.3714	6.1115	0.001238	0.0554
36.5	245.0	1061.4	1740.2	2801.6	2.7474	3.3585	6.1059	0.001239	0.0546
37.0	245.7	1065.2	1736.2	2801.4	2.7547	3.3458	6.1004	0.001242	0.0539

Absolute pressure (bar)	*Temp. (°C)*	*Specific enthalpy (kJ/kg)*			*Specific entropy (kJ/kg K)*			*Specific volume (m^3/kg)*	
p	t_s	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	v_f	v_g
37.5	246.5	1069.0	1732.3	2801.3	2.7618	3.3332	6.0950	0.001243	0.0531
38.0	247.3	1072.7	1728.4	2801.1	2.7689	3.3207	6.0896	0.001245	0.0524
38.5	248.1	1076.4	1724.5	2800.9	2.7759	3.3083	6.0842	0.001247	0.0517
39.0	248.8	1080.1	1720.6	2800.8	2.7829	3.2961	6.0789	0.001249	0.0511
39.5	249.6	1083.8	1716.8	2800.5	2.7897	3.2840	6.0737	0.001250	0.0504
40.0	250.3	1087.4	1712.9	2800.3	2.7965	3.2720	6.0685	0.001252	0.0497
41.0	251.8	1094.6	1705.3	2799.9	2.8099	3.2483	6.0582	0.001255	0.0485
42.0	253.2	1101.6	1697.8	2799.4	2.8231	3.2251	6.0482	0.001259	0.0473
43.0	254.6	1108.5	1690.3	2798.8	2.8360	3.2023	6.0383	0.001262	0.0461
44.0	256.0	1115.4	1682.9	2798.3	2.8487	3.1799	6.0286	0.001266	0.0451
45.0	257.4	1122.1	1675.6	2797.7	2.8612	3.1579	6.0191	0.001269	0.0440
46.0	258.7	1128.8	1668.3	2797.0	2.8735	3.1362	6.0097	0.001272	0.0430
47.0	260.1	1135.3	1661.1	2796.4	2.8855	3.1149	6.0004	0.001276	0.0421
48.0	261.4	1141.8	1653.9	2795.7	2.8974	3.0939	5.9913	0.001279	0.0412
49.0	262.6	1148.2	1646.8	2794.9	2.9091	3.0733	5.9823	0.001282	0.0403
50.0	263.9	1154.5	1639.7	2794.2	2.9206	3.0529	5.9735	0.001286	0.0394
51.0	265.1	1160.7	1632.7	2793.4	2.9319	3.0328	5.9648	0.001289	0.0386
52.0	266.4	1166.8	1625.7	2792.6	2.9431	3.0130	5.9561	0.001292	0.0378
53.0	267.6	1172.9	1618.8	2791.7	2.9541	2.9935	5.9476	0.001296	0.0371
54.0	268.7	1178.9	1611.9	2790.8	2.9650	2.9742	5.9392	0.001299	0.0363
55.0	269.9	1184.9	1605.0	2789.9	2.9757	2.9552	5.9309	0.001302	0.0356
56.0	271.1	1190.8	1598.2	2789.0	2.9863	2.9364	5.9227	0.001306	0.0349
57.0	272.2	1196.6	1591.4	2788.0	2.9967	2.9179	5.9146	0.001309	0.0343
58.0	273.3	1202.3	1584.7	2787.0	3.0071	2.8995	5.9066	0.001312	0.0336
59.0	274.4	1208.0	1578.0	2786.0	3.0172	2.8814	5.8986	0.001315	0.0330
60.0	275.5	1213.7	1571.3	2785.0	3.0273	2.8635	5.8908	0.001318	0.0324
61.0	276.6	1219.3	1564.7	2784.0	3.0372	2.8458	5.8830	0.001322	0.0319
62.0	277.7	1224.8	1558.0	2782.9	3.0471	2.8283	5.8753	0.001325	0.0313
63.0	278.7	1230.3	1551.5	2781.8	3.0568	2.8109	5.8677	0.001328	0.0308
64.0	279.8	1235.7	1544.9	2780.6	3.0664	2.7938	5.8601	0.001332	0.0302
65.0	280.8	1241.1	1538.4	2779.5	3.0759	2.7768	5.8527	0.001335	0.0297
66.0	281.8	1246.5	1531.9	2778.3	3.0853	2.7600	5.8452	0.001338	0.0292
67.0	282.8	1251.8	1525.4	2777.1	3.0946	2.7433	5.8379	0.001341	0.0287
68.0	283.8	1257.0	1518.9	2775.9	3.1038	2.7268	5.8306	0.001345	0.0283
69.0	284.8	1262.2	1512.5	2774.7	3.1129	2.7105	5.8233	0.001348	0.0278

Absolute pressure (bar)	*Temp. (°C)*	*Specific enthalpy (kJ/kg)*			*Specific entropy (kJ/kg K)*			*Specific volume (m^3/kg)*	
p	t_s	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	v_f	v_g
70.0	285.8	1267.4	1506.0	2773.5	3.1219	2.6943	5.8162	0.001351	0.0274
71.0	286.7	1272.5	1499.6	2772.2	3.1308	2.6782	5.8090	0.001355	0.0269
72.0	287.7	1277.6	1493.3	2770.9	3.1397	2.6623	5.8020	0.001358	0.0265
73.0	288.6	1282.7	1486.9	2769.6	3.1484	2.6465	5.7949	0.001361	0.0261
74.0	289.6	1287.7	1480.5	2768.3	3.1571	2.6309	5.7880	0.001364	0.0257
75.0	290.5	1292.7	1474.2	2766.9	3.1657	2.6153	5.7810	0.001368	0.0253
76.0	291.4	1297.6	1467.9	2765.5	3.1742	2.5999	5.7742	0.001371	0.0249
77.0	292.3	1302.5	1461.6	2764.2	3.1827	2.5846	5.7673	0.001374	0.0246
78.0	293.2	1307.4	1455.3	2762.8	3.1911	2.5695	5.7605	0.001378	0.0242
79.0	294.1	1312.3	1449.1	2761.3	3.1994	2.5544	5.7538	0.001381	0.0239
80.0	294.9	1317.1	1442.8	2759.9	3.2076	2.5395	5.7471	0.001384	0.0235
81.0	295.8	1321.9	1436.6	2758.4	3.2158	2.5246	5.7404	0.001387	0.0232
82.0	296.7	1326.6	1430.3	2757.0	3.2239	2.5099	5.7338	0.001391	0.0229
83.0	297.5	1331.4	1424.1	2755.5	3.2320	2.4952	5.7272	0.001394	0.0225
84.0	298.4	1336.1	1417.9	2754.0	3.2399	2.4807	5.7206	0.001397	0.0222
85.0	299.2	1340.7	1411.7	2752.5	3.2479	2.4663	5.7141	0.001401	0.0219
86.0	300.1	1345.4	1405.5	2750.9	3.2557	2.4519	5.7076	0.001404	0.0216
87.0	300.9	1350.0	1399.3	2749.4	3.2636	2.4376	5.7012	0.001408	0.0213
88.0	301.7	1354.6	1393.2	2747.8	3.2713	2.4235	5.6948	0.001411	0.0211
89.0	302.5	1359.2	1387.0	2746.2	3.2790	2.4094	5.6884	0.001414	0.0208
90.0	303.3	1363.7	1380.9	2744.6	3.2867	2.3953	5.6820	0.001418	0.0205
91.0	304.1	1368.3	1374.7	2743.0	3.2943	2.3814	5.6757	0.001421	0.0202
92.0	304.9	1372.8	1368.6	2741.4	3.3018	2.3676	5.6694	0.001425	0.0199
93.0	305.7	1377.2	1362.5	2739.7	3.3093	2.3538	5.6631	0.001428	0.0197
94.0	306.4	1381.7	1356.3	2738.0	3.3168	2.3401	5.6568	0.001432	0.0194
95.0	307.2	1386.1	1350.2	2736.4	3.3242	2.3264	5.6506	0.001435	0.0192
96.0	308.0	1390.6	1344.1	2734.7	3.3315	2.3129	5.6444	0.001438	0.0189
97.0	308.7	1395.0	1338.0	2733.0	3.3388	2.2994	5.6382	0.001442	0.0187
98.0	309.4	1399.3	1331.9	2731.2	3.3461	2.2859	5.6321	0.001445	0.0185
99.0	310.2	1403.7	1325.8	2729.5	3.3534	2.2726	5.6259	0.001449	0.0183
100.0	311.1	1408.0	1319.7	2727.7	3.3605	2.2593	5.6198	0.001452	0.0181
102.0	312.4	1416.7	1307.5	2724.2	3.3748	2.2328	5.6076	0.001459	0.0176
104.0	313.8	1425.2	1295.3	2720.5	3.3889	2.2066	5.5955	0.001467	0.0172
106.0	315.3	1433.7	1283.1	2716.8	3.4029	2.1806	5.5835	0.001474	0.0168
108.0	316.6	1442.2	1270.9	2713.1	3.4167	2.1548	5.5715	0.001481	0.0164

Absolute pressure (bar)	*Temp. (°C)*	*Specific enthalpy (kJ/kg)*			*Specific entropy (kJ/kg K)*			*Specific volume (m^3/kg)*	
p	t_s	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	v_f	v_g
110.0	318.0	1450.6	1258.7	2709.3	3.4304	2.1291	5.5595	0.001488	0.0160
112.0	319.4	1458.9	1246.5	2705.4	3.4440	2.1036	5.5476	0.001496	0.0157
114.0	320.7	1467.2	1234.3	2701.5	3.4574	2.0783	5.5357	0.001504	0.0153
116.0	322.1	1475.4	1222.0	2697.4	3.4708	2.0531	5.5239	0.001511	0.0149
118.0	323.4	1483.6	1209.7	2693.3	3.4840	2.0280	5.5121	0.001519	0.0146
120.0	324.6	1491.8	1197.4	2689.2	3.4972	2.0030	5.5002	0.001527	0.0143
122.0	325.9	1499.9	1185.0	2684.9	3.5102	1.9782	5.4884	0.001535	0.0139
124.0	327.1	1508.0	1172.6	2680.6	3.5232	1.9533	5.4765	0.001543	0.0137
126.0	328.4	1516.0	1160.1	2676.1	3.5360	1.9286	5.4646	0.001551	0.0134
128.0	329.6	1524.0	1147.6	2671.6	3.5488	1.9039	5.4527	0.001559	0.0131
130.0	330.8	1532.0	1135.0	2667.0	3.5616	1.8792	5.4408	0.001567	0.0128
132.0	332.0	1540.0	1122.3	2662.3	3.5742	1.8546	5.4288	0.001576	0.0125
134.0	333.2	1547.9	1109.5	2657.4	3.5868	1.8300	5.4168	0.001584	0.0123
136.0	334.3	1555.8	1096.7	2652.5	3.5993	1.8053	5.4047	0.001593	0.0120
138.0	335.5	1563.7	1083.8	2647.5	3.6118	1.7807	5.3925	0.001602	0.0117
140.0	336.6	1571.6	1070.7	2642.4	3.6242	1.7560	5.3803	0.001611	0.0115
142.0	337.7	1579.5	1057.6	2637.1	3.6366	1.7313	5.3679	0.001619	0.0112
144.0	338.8	1587.4	1044.4	2631.8	3.6490	1.7066	5.3555	0.001629	0.0110
146.0	339.9	1595.3	1031.0	2626.3	3.6613	1.6818	5.3431	0.001638	0.0108
148.0	341.1	1603.1	1017.6	2620.7	3.6736	1.6569	5.3305	0.001648	0.0106
150.0	342.1	1611.0	1004.0	2615.0	3.6859	1.6320	5.3179	0.001658	0.0103
152.0	343.2	1618.9	990.3	2609.2	3.6981	1.6070	5.3051	0.001668	0.0101
154.0	344.2	1626.8	976.5	2603.3	3.7103	1.5819	5.2922	0.001678	0.00991
156.0	345.3	1634.7	962.6	2597.3	3.7226	1.5567	5.2793	0.001689	0.00971
158.0	346.3	1642.6	948.5	2591.1	3.7348	1.5314	5.2663	0.001699	0.00951
160.0	347.3	1650.5	934.3	2584.9	3.7471	1.5060	5.2531	0.001710	0.00931
162.0	348.3	1658.5	920.0	2578.5	3.7594	1.4806	5.2399	0.001721	0.00911
164.0	349.3	1666.5	905.6	2572.1	3.7717	1.4550	5.2267	0.001733	0.00893
166.0	350.3	1674.5	891.0	2565.5	3.7842	1.4290	5.2132	0.001745	0.00874
168.0	351.3	1683.0	875.6	2558.6	3.7974	1.4021	5.1994	0.001757	0.00855
170.0	352.3	1691.7	859.9	2551.6	3.8107	1.3748	5.1855	0.001769	0.00837
172.0	353.2	1700.4	844.0	2544.4	3.8240	1.3473	5.1713	0.001783	0.00819
174.0	354.2	1709.0	828.1	2537.1	3.8372	1.3198	5.1570	0.001796	0.00801
176.0	355.1	1717.6	811.9	2529.5	3.8504	1.2922	5.1425	0.001810	0.00784
178.0	356.0	1726.2	795.6	2521.8	3.8635	1.2643	5.1278	0.001825	0.00767

Absolute pressure (bar) p	*Temp. (°C)* t_s	*Specific enthalpy (kJ/kg)* h_f	h_{fg}	h_g	*Specific entropy (kJ/kg K)* s_f	s_{fg}	s_g	*Specific volume (m^3/kg)* v_f	v_g
180.0	356.9	1734.8	779.1	2513.9	3.8765	1.2362	5.1128	0.001840	0.00750
182.0	357.8	1743.4	762.3	2505.8	3.8896	1.2079	5.0975	0.001856	0.00733
184.0	358.7	1752.1	745.3	2497.4	3.9028	1.1792	5.0820	0.001872	0.00717
186.0	359.6	1760.9	727.9	2488.8	3.9160	1.1501	5.0661	0.001889	0.00701
188.0	360.5	1769.7	710.1	2479.8	3.9294	1.1205	5.0498	0.001907	0.00684
190.0	361.4	1778.7	692.0	2470.6	3.9429	1.0903	5.0332	0.001926	0.00668
192.0	362.3	1787.8	673.3	2461.1	3.9566	1.0594	5.0160	0.001946	0.00652
194.0	363.2	1797.0	654.1	2451.1	3.9706	1.0278	4.9983	0.001967	0.00636
196.0	364.0	1806.6	634.2	2440.7	3.9849	0.9951	4.9800	0.001989	0.00620
198.0	364.8	1816.3	613.5	2429.8	3.9996	0.9614	4.9611	0.002012	0.00604
200.0	365.7	1826.5	591.9	2418.4	4.0149	0.9263	4.9412	0.002037	0.00588
202.0	366.5	1837.0	569.2	2406.2	4.0308	0.8897	4.9204	0.002064	0.00571
204.0	367.3	1848.1	545.1	2393.3	4.0474	0.8510	4.8984	0.002093	0.00555
206.0	368.2	1859.9	519.5	2379.4	4.0651	0.8099	4.8750	0.002125	0.00538
208.0	368.9	1872.5	491.7	2364.2	4.0841	0.7657	4.8498	0.002161	0.00521
210.0	369.8	1886.3	461.3	2347.6	4.1048	0.7175	4.8223	0.002201	0.00502
212.0	370.6	1901.5	427.4	2328.9	4.1279	0.6639	4.7917	0.002249	0.00483
214.0	371.3	1919.0	388.4	2307.4	4.1543	0.6026	4.7569	0.002306	0.00462
216.0	372.1	1939.9	341.6	2281.6	4.1861	0.5293	4.7154	0.002379	0.00439
218.0	372.9	1967.2	280.8	2248.0	4.2276	0.4346	4.6622	0.002483	0.00412
220.0	373.7	2011.1	184.5	2195.6	4.2947	0.2852	4.5799	0.002671	0.00373
221.2	374.1	2107.4	0.0	2107.4	4.4429	0.0	4.4429	0.003170	0.00317

TABLE III

Superheated Steam at Various Pressures and Temperatures

↓p (bar) (t_s)	t (°C) →	50	100	150	200	250	300	400	500
	v	149.1	172.2	195.3	218.4	241.5	264.5	310.7	356.8
0.01	u	2445.4	2516.4	2588.4	2661.6	2736.9	2812.2	2969.0	3132.4
(7.0)	h	2594.5	2688.6	2783.6	2880.0	2978.4	3076.8	3279.7	3489.2
	s	9.242	9.513	9.752	9.967	10.163	10.344	10.671	10.960
	v	29.78	34.42	39.04	48.66	48.28	52.9	62.13	71.36
0.05	u	2444.8	2516.2	2588.4	2661.9	2736.6	2812.6	2969.6	3133.0
(32.9)	h	2593.7	2688.1	2783.4	2879.9	2977.6	3076.7	3279.7	3489.2
	s	8.498	8.770	9.009	9.225	9.421	9.602	9.928	10.218
	v	14.57	17.19	19.51	21.82	24.14	26.44	31.06	35.68
0.1	u	2443.9	2515.5	2587.9	2661.3	2736.0	2812.1	2968.9	3132.3
(45.8)	h	2592.6	2687.5	2783.0	2879.5	2977.3	3076.5	3279.6	3489.1
	s	8.175	8.448	8.688	8.904	9.100	9.281	9.608	9.898
	v		34.18	3.889	43.56	4.821	5.284	6.209	7.134
0.5	u		2511.6	2585.6	2659.9	2735.0	2811.3	2968.5	3132.0
(81.3)	h		2682.5	2780.1	2877.7	2976.0	3075.5	3278.9	3488.7
	s		7.695	7.940	8.158	8.356	8.537	8.864	9.155
	v		2.27	2.587	2.900	3.211	3.520	4.138	4.755
0.75	u		2509.2	2584.2	2659.0	2734.4	2810.9	2968.2	3131.8
(92.0)	h		2679.4	2778.2	2876.5	2975.2	3074.9	3278.5	3488.4
	s		7.501	7.749	7.969	8.167	8.349	8.677	8.967
	v		1.696	1.936	2.172	2.406	2.639	3.103	3.565
1.0	u		2506.2	2582.8	2658.1	2733.7	2810.4	2967.9	3131.6
(99.6)	h		2676.2	2776.4	2875.3	2974.3	3074.3	3278.2	3488.1
	s		7.361	7.613	7.834	8.033	8.216	8.544	8.834
	v			1.912	2.146	2.375	2.603	3.062	3.519
1.01325	u			2582.6	2658.0	2733.6	2810.3	2967.8	3131.5
(100)	h			2776.3	2875.2	2974.2	3074.2	3278.1	3488.0
	s			7.828	7.827	8.027	8.209	8.538	8.828
	v			1.285	1.143	1.601	1.757	2.067	2.376
1.5	u			2579.8	2656.2	2732.5	2809.5	2967.3	3131.2
(111.4)	h			2772.6	2872.9	2972.7	3073.1	3277.4	3487.6
	s			7.419	7.643	7.844	8.027	8.356	8.647

↓p (bar) (t_s)	t (°C) →	50	100	150	200	250	300	400	500
	v			0.960	1.080	1.199	1.316	1.549	1.781
2.0	u			2576.9	2654.4	2731.2	2808.6	2966.7	3130.8
(120.2)	h			2768.8	2870.5	2971.0	3071.8	3276.6	3487.1
	s			7.279	7.507	7.709	7.893	8.222	8.513
	v			0.764	0.862	0.957	1.052	1.238	1.424
2.5	u			2574.7	2655.7	2734.9	2813.8	2973.9	3139.6
(127.4)	h			2764.5	2868.0	2969.6	3070.9	3275.9	3486.5
	s			7.169	7.401	7.604	7.789	8.119	8.410
	v			0.634	0.716	0.796	0.875	1.031	1.187
3.0	u			2570.8	2650.7	2728.7	2806.7	2965.6	3130.0
(133.5)	h			2761.0	2865.6	2967.6	3069.3	3275.0	3486.1
	s			7.078	7.311	7.517	7.702	8.033	8.325
	v			0.471	0.534	0.595	0.655	0.773	0.889
4.0	u			2564.5	2646.8	2726.1	2804.8	2964.4	3129.2
(143.6)	h			2752.8	2860.5	2964.2	3066.8	3273.4	3484.9
	s			6.930	7.171	7.379	7.566	7.899	8.191

↓p (bar) (t_s)	t (°C) →	200	250	300	350	400	450	500	600
	v	0.425	0.474	0.523	0.570	0.617	0.664	0.711	0.804
5.0	u	2642.9	2723.5	2802.9	2882.6	2963.2	3045.3	3128.4	3299.6
(151.8)	h	2855.4	2960.7	3064.2	3167.7	3271.9	3377.2	3483.9	3701.7
	s	7.059	7.271	7.460	7.633	7.794	7.945	8.087	8.353
	v	0.352	0.394	0.434	0.474	0.514	0.553	0.592	0.670
6.0	u	2638.9	2720.9	2801.0	2881.2	2962.1	3044.2	3127.6	3299.1
(158.8)	h	2850.1	2957.2	3061.6	3165.7	3270.3	3376.0	3482.8	3700.9
	s	6.967	7.182	7.372	7.546	7.708	7.859	8.002	8.267
	v	0.300	0.336	0.371	0.406	0.440	0.473	0.507	0.574
7.0	u	2634.8	2718.2	2799.1	2879.7	2960.9	3043.2	3126.8	3298.5
(165.0)	h	2844.8	2953.6	3059.1	3163.7	3268.7	3374.7	3481.7	3700.2
	s	6.886	7.105	7.298	7.473	7.635	7.787	7.930	8.196
	v	0.261	0.293	0.324	0.354	0.384	0.414	0.443	0.502
8.0	u	2630.6	2715.5	2797.2	2878.2	2959.7	3042.3	3126.0	3297.8
(170.4)	h	2839.3	2950.1	3056.5	3161.7	3267.1	3373.4	3480.6	3699.4
	s	6.816	7.038	7.233	7.409	7.572	7.724	7.867	8.133

↓p (bar) (t_s)	t (°C) →	200	250	300	350	400	450	500	600
	v	0.230	0.260	0.287	0.314	0.341	0.367	0.394	0.446
9.0	u	2626.3	2712.7	2795.2	2876.7	2958.5	3041.3	3125.2	3297.3
(175.4)	h	2833.6	2946.3	3053.8	3159.7	3265.5	3372.1	3479.6	3698.6
	s	6.752	6.979	7.175	7.352	7.516	7.668	7.812	8.078
	v	0.206	0.233	0.258	0.282	0.307	0.330	0.354	0.401
10.0	u	2621.9	2709.9	2793.2	2875.2	2957.3	3040.3	3124.4	3296.8
(179.9)	h	2827.9	2942.6	3051.2	3157.8	3263.9	3370.7	3478.5	3697.9
	s	6.694	6.925	7.123	7.301	7.465	7.618	7.762	8.029
	v	0.132	0.152	0.169	0.187	0.203	0.219	0.235	0.267
15.0	u	2598.8	2695.3	2783.1	2867.6	2951.3	3035.3	3120.3	3293.9
(198.3)	h	2796.8	2923.3	3037.6	3147.5	3255.8	3364.2	3473.1	3694.0
	s	6.455	6.709	6.918	7.102	7.269	7.424	7.570	7.839
	v		0.111	0.125	0.139	0.151	0.163	0.176	0.200
20.0	u		2679.6	2772.6	2859.8	2945.2	3030.5	3116.2	3290.9
(212.4)	h		2902.5	3023.5	3137.0	3247.6	3357.5	3467.6	3690.1
	s		6.545	6.766	6.956	7.127	7.285	7.432	7.702
	v		0.0870	0.0989	0.109	0.120	0.130	0.140	0.159
25	u		2662.6	2761.6	2851.9	2939.1	3025.5	3112.1	3288.0
(223.9)	h		2880.1	3008.8	3126.3	3239.3	3350.8	3462.1	3686.3
	s		6.408	6.644	6.840	7.015	7.175	7.323	7.596
	v		0.0706	0.0811	0.0905	0.0994	0.108	0.116	0.132
30	u		2644.0	2750.1	2843.7	2932.8	3020.4	3108.0	3285.0
(233.8)	h		2855.8	2993.5	3115.3	3230.9	3344.0	3456.5	3682.3
	s		6.287	6.539	6.743	6.921	7.083	7.234	7.509
	v			0.0588	0.0664	0.0734	0.080	0.0864	0.0989
40	u			2725.3	2826.7	2919.9	3010.2	3099.5	3279.1
(250.4)	h			2960.7	3092.5	3213.6	3330.3	3445.3	3674.4
	s			6.362	6.582	6.769	6.936	7.090	7.369
	v			0.0453	0.0519	0.0578	0.0633	0.0686	0.0787
50	u			2698.0	2808.7	2906.6	2999.7	3091.0	3273.0
(263.9)	h			2924.5	3068.4	3195.7	3316.2	3433.8	3666.5
	s			6.208	6.449	6.646	6.819	6.976	7.259

↓p (bar) (t_s)	t (°C) →	200	250	300	350	400	450	500	600
	v			0.0362	0.0422	0.0474	0.0521	0.0567	0.0653
60	u			2667.2	2789.6	2892.9	2988.9	3082.2	3266.9
(275.5)	h			2884.2	3043.0	3177.2	3301.8	3422.2	3658.4
	s			6.067	6.333	6.541	6.719	6.880	7.168
	v			0.0295	0.0352	0.0399	0.0442	0.0481	0.0557
70	u			2632.2	2769.4	2878.6	2978.0	3073.4	3260.7
(285.8)	h			2838.4	3016.0	3158.1	3287.1	3410.3	3650.3
	s			5.931	6.228	6.448	6.633	6.798	7.089

↓p (bar) (t_s)	t (°C) →	350	375	400	450	500	550	600	700
80	v	0.02995	0.03222	0.03432	0.03817	0.04175	0.04516	0.04845	0.05481
(294.9)	h	2987.3	3066.1	3138.3	3272.0	3398.3	3521.0	3642.0	3882.4
	s	6.130	6.254	6.363	6.555	6.724	6.878	7.021	7.281
90	v	0.0258	0.02796	0.02993	0.03350	0.03677	0.03987	0.04285	0.04857
(303.3)	h	2956.6	3041.3	3117.8	3256.6	3386.1	3511.0	3633.7	3876.5
	s	6.036	6.169	6.285	6.484	6.658	6.814	6.959	7.222
100	v	0.02242	0.02453	0.02641	0.02975	0.03279	0.03564	0.03837	0.04358
(311.0)	h	2923.4	3015.4	3096.5	3240.9	3373.7	3500.9	3625.3	3870.5
	s	5.944	6.089	6.212	6.419	6.597	6.756	6.903	7.169
110	v	0.01961	0.02169	0.02351	0.02668	0.02952	0.03217	0.03470	0.03950
(318.0)	h	2887.3	2988.2	3074.3	3224.7	3361.0	3490.7	3616.9	3864.5
	s	5.853	6.011	6.142	6.358	6.540	6.703	6.851	7.120
120	v	0.01721	0.01931	0.02108	0.02412	0.02680	0.02929	0.03164	0.03610
(324.6)	h	2847.7	2958.9	3051.3	3208.2	3348.2	3480.4	3608.3	3858.4
	s	5.760	5.935	6.075	6.300	6.487	6.653	6.804	7.075
130	v	0.01511	0.01725	0.01900	0.02194	0.0245	0.02684	0.02905	0.03322
(330.8)	h	2803.3	2927.9	3027.2	3191.3	3335.2	3469.9	3599.7	3852.3
	s	5.663	5.859	6.009	6.245	6.437	6.606	6.759	7.033
140	v	0.01322	0.01546	0.01722	0.02007	0.02252	0.02474	0.02683	0.03075
(336.6)	h	2752.6	2894.5	3001.9	3174.0	3322.0	3459.3	3591.1	3846.2
	s	5.559	5.782	5.945	6.192	6.390	6.562	6.712	6.994
150	v	0.01145	0.01388	0.01565	0.01845	0.02080	0.02293	0.02491	0.02861
(342.1)	h	2692.4	2858.4	2975.5	3156.2	3308.6	3448.6	3582.3	3840.1
	s	5.442	5.703	5.881	6.140	6.344	6.520	6.679	6.957

↓*p* (*bar*) (*t*$_s$)	*t* (°C) →	*350*	*375*	*400*	*450*	*500*	*550*	*600*	*700*
160	*v*	0.00975	0.01245	0.01426	0.01701	0.01930	0.02134	0.02323	0.02674
(347.3)	*h*	2615.7	2818.9	2947.6	3138.0	3294.9	3437.8	3573.5	3833.9
	s	5.302	5.622	5.188	6.091	6.301	6.480	6.640	6.922
170	*v*		0.01117	0.01302	0.01575	0.01797	0.01993	0.02174	0.02509
(352.3)	*h*		2776.8	2918.2	3119.3	3281.1	3426.9	3564.6	3827.7
	s		5.539	5.754	6.042	6.259	6.442	6.604	6.889
180	*v*		0.00996	0.01190	0.01462	0.01678	0.01868	0.02042	0.02362
(356.9)	*h*		2727.9	2887.0	3100.1	3267.0	3415.9	3555.6	3821.5
	s		5.448	5.689	5.995	6.218	6.405	6.570	6.858
190	*v*		0.00881	0.01088	0.01361	0.01572	0.01756	0.01924	0.02231
(361.4)	*h*		2671.3	2853.8	3080.4	3252.7	3404.7	3546.6	3815.3
	s		5.346	5.622	5.948	6.179	6.369	6.537	6.828
200	*v*		0.00767	0.00994	0.01269	0.9477	0.01655	0.01818	0.02113
(365.7)	*h*		2602.5	2818.1	3060.1	3238.2	3393.5	3537.6	3809.0
	s		5.227	5.554	5.902	6.140	6.335	6.505	6.799
210	*v*		0.00645	0.00907	0.01186	0.01390	0.01564	0.01722	0.02006
(369.8)	*h*		2511.0	2779.6	3039.3	3223.5	3382.1	3528.4	3802.8
	s		5.075	5.483	5.856	6.103	6.301	6.474	6.772
220	*v*		0.00482	0.00825	0.01110	0.01312	0.01481	0.01634	0.01909
(373.7)	*h*		2345.1	2737.6	3017.9	3208.6	3370.6	3519.2	3796.5
	s		4.810	5.407	5.811	6.066	6.269	6.444	6.745

TABLE IV

Supercritical Steam

p(bar)	*t (°C)* →	*350*	*375*	*400*	*425*	*450*	*500*	*600*	*700*	*800*
230	*v*	0.00162	0.00221	0.00748	0.00915	0.01040	0.01239	0.01554	0.01821	0.02063
	h	1632.8	1912.2	2691.2	2869.2	2995.8	3193.4	3510.0	3790.2	4056.2
	s	3.137	4.137	5.327	5.587	5.765	6.030	6.415	6.719	6.980
250	*v*	0.00160	0.00197	0.00600	0.00788	0.00916	0.01112	0.01414	0.01665	0.01891
	h	1623.5	1848.0	2580.2	2806.3	2949.7	3162.4	3491.4	3775.5	4047.1
	s	3.680	4.032	5.142	5.472	5.674	5.959	6.360	6.671	6.934
300	*v*	0.00155	0.00179	0.00279	0.00530	0.00673	0.00868	0.01145	0.01366	0.01562
	h	1608.5	1791.5	2151.1	2614.2	2821.4	3081.1	3443.9	3745.6	4024.2
	s	3.643	3.930	4.473	5.150	5.442	5.790	6.233	6.561	6.833
350	*v*	0.00152	0.00110	0.00210	0.00343	0.00496	0.00693	0.00953	0.01153	0.01328
	h	1597.1	1762.4	1987.6	2373.4	2672.4	2994.4	3395.5	3713.5	4001.5
	s	3.612	3.872	4.213	4.775	5.196	5.628	6.118	6.463	6.745
400	*v*	0.00149	0.00164	0.00191	0.00253	0.00369	0.00562	0.00809	0.00994	0.01152
	h	1588.3	1742.8	1930.9	2198.1	2512.8	2903.3	3346.4	3681.2	3978.7
	s	3.586	3.829	4.113	4.503	4.946	5.470	6.011	6.375	6.666
500	*v*	0.00144	0.00156	0.00173	0.00201	0.00249	0.00389	0.00611	0.00773	0.00908
	h	1575.3	1716.6	1874.6	2060.0	2284.0	2720.1	3247.6	3616.8	3933.6
	s	3.542	3.764	4.003	4.273	4.588	5.173	5.818	6.219	6.529
600	*v*	0.00140	0.00150	0.00163	0.00182	0.00209	0.00296	0.00483	0.00627	0.00746
	h	1566.4	1699.5	1843.4	2001.7	2179.0	2567.9	3151.2	3553.5	3889.1
	s	3.505	3.764	3.932	4.163	4.412	4.932	5.645	6.082	6.411
700	*v*	0.00137	0.00146	0.00157	0.00171	0.00189	0.00247	0.00398	0.00526	0.00632
	h	1560.4	1687.7	1822.8	1967.2	2122.7	2463.2	3061.7	3492.4	3845.7
	s	3.473	3.673	3.877	4.088	4.307	4.762	5.492	5.961	6.307
800	*v*	0.00135	0.00142	0.00152	0.00163	0.00177	0.00219	0.00339	0.00452	0.00548
	h	1556.4	1679.4	1808.3	1943.9	2086.9	2394.0	2982.7	3434.6	3803.8
	s	3.444	3.638	3.833	4.031	4.232	4.642	5.360	5.851	6.213
900	*v*	0.00133	0.00139	0.00147	0.00157	0.00169	0.00201	0.00297	0.00397	0.00484
	h	1553.9	1673.4	1797.7	1927.2	2062.0	2346.7	2915.6	3381.1	3763.8
	s	3.419	3.607	3.795	3.984	4.174	4.554	5.247	5.753	6.128
1000	*v*	0.01308	0.00137	0.00144	0.00152	0.00163	0.00189	0.00267	0.00355	0.00434
	h	1552.7	1669.4	1790.0	1914.8	2043.8	2312.8	2859.8	3332.3	3726.1
	s	3.396	3.579	3.762	3.944	4.126	4.485	5.151	5.664	6.050

TABLE V

Conversion Factors

Force

1 newton	=	1 kg-m/sec^2
	=	0.012 kgf
1 kgf	=	9.81 N

Pressure

1 bar	=	750.06 mm Hg
	=	0.9869 atm
	=	10^5 N/m^2
	=	10^3 kg/m-sec^2
1 N/m^2	=	1 pascal
	=	10^{-5} bar
	=	10^{-2} kg/m-sec^2
1 atm	=	760 mm Hg
	=	1.03 kgf/cm^2 = 1.01325 bar
	=	1.01325×10^5 N/m^2

Work, Energy or Heat

1 joule	=	1 newton metre
	=	1 watt-sec
	=	2.7778×10^{-7} kWh
	=	0.239 cal
	=	0.239×10^{-3} kcal
1 cal	=	4.184 joule
	=	1.1622×10^{-6} kWh
1 kcal	=	4.184×10^3 joule
	=	427 kgfm
	=	1.1622×10^{-3} kWh
1 kWh	=	8.6×10^5 cal
	=	860 kcal
	=	3.6×10^6 joule
1 kgfm	=	$\left(\frac{1}{427}\right)$ kcal = 9.81 joules

Power

1 watt	=	1 joule/sec = 0.86 kcal/h
1 h.p.	=	75 mkgf/sec = 0.1757 kcal/sec
	=	735.3 watt
1 kW	=	1000 watts
	=	860 kcal/h

Specific heat

1 kcal/kg - °K = 4.18 kJ/kg-K

Thermal conductivity

1 watt/m-K = 0.8598 kcal/h-m-°C
1 kcal/h-m-°C = 1.16123 watt/m-K
= 1.16123 joules/s-m-K

Heat transfer co-efficient

1 watt/m^2-K = 0.86 kcal/m^2-h-°C
1 kcal/m^2-h-°C = 1.163 watt/m^2-K

IMPORTANT ENGINEERING CONSTANTS AND EXPRESSIONS IN SI UNITS

	Engineering constants and expressions	*M.K.S. system*	*S.I. units*
1.	Value of g_0	9.81 kg-m/kgf-sec^2	1 kg-m/N-sec^2
2.	Universal gas constant	848 kgf-m/kg mole-°K	848 × 9.81 = 8314 J/kg-mole-°K ($\because$ 1 kgf-m = 9.81 joules)
3.	Gas constant (R)	29.27 kgf m/kg-°K for air	$\frac{8314}{29}$ = 287 joules/kg-K for air
4.	Specific heats (for air)	c_v = 0.17 kcal/kg-°K c_p = 0.24 kcal/kg-°K	c_v = 0.17 × 4.184 = 0.71128 kJ/kg-K c_p = 0.24 × 4.184 = 1 kJ/kg-K
5.	Flow through nozzle-exit velocity (C_2)	91.5 $\sqrt{U}$ where U is in kcal	44.7 $\sqrt{U}$ where U is in kJ
6.	Refrigeration 1 ton	= 50 kcal/min	= 210 kJ/min
7.	**Heat transfer** The Stefan Boltzman Law is given by :	$Q = \sigma T^4$ kcal/m^2-h when $\sigma = 4.9 \times 10^{-8}$ kcal/h-m^2-°K^4	$Q = \sigma T^4$ watts/m^2-h when $\sigma = 5.67 \times 10^{-8}$ W/m^2K^4