US Customary Steam Tables

Saturated and superheated steam in °F, psia, BTU/lb and ft³/lb (IAPWS-IF97)

For: US mechanical and process engineers, boiler and steam-plant operators, HVAC engineers and students

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BASIS
IAPWS-IF97, converted exactly: 1 BTU/lb = 2.326 kJ/kg; 1 BTU/(lb·°R) = 4.1868 kJ/(kg·K)

KEY RELATIONSHIP
hfg = hg − hf; wet steam h = hf + x × hfg

READING THE TABLE
psig = psia − 14.696; dryness x = (h − hf) ÷ hfg

WORKED EXAMPLE
At 14.696 psia: Tsat = 211.95 °F, hfg = 970.1 BTU/lb

Pressures are absolute (psia). Same reference state as the SI tables (hf ≈ 0 at 32.018 °F). Critical point 705.10 °F, 3,200.1 psia.

Saturated steam by temperature (°F)

T (°F)	p (psia)	vf (ft³/lb)	vg (ft³/lb)	hf (BTU/lb)	hfg (BTU/lb)	hg (BTU/lb)	sf (BTU/lb·°R)	sg (BTU/lb·°R)
32.018	0.088713	0.01602	3,299.8	0.00	1,075.20	1,075.20	0.0000	2.1868
35	0.099981	0.01602	2,945.5	3.00	1,073.50	1,076.51	0.0061	2.1762
40	0.12173	0.01602	2,443.4	8.03	1,070.67	1,078.70	0.0162	2.1590
45	0.14757	0.01602	2,035.6	13.05	1,067.84	1,080.89	0.0262	2.1421
50	0.17813	0.01602	1,702.9	18.07	1,065.01	1,083.07	0.0361	2.1257
60	0.25639	0.01603	1,206.1	28.08	1,059.36	1,087.44	0.0555	2.0941
70	0.36334	0.01605	867.19	38.08	1,053.71	1,091.78	0.0746	2.0640
80	0.50744	0.01607	632.44	48.07	1,048.04	1,096.11	0.0933	2.0353
90	0.69899	0.01610	467.45	58.05	1,042.37	1,100.43	0.1116	2.0080
100	0.95044	0.01613	349.87	68.04	1,036.68	1,104.71	0.1296	1.9819
110	1.2766	0.01617	264.99	78.02	1,030.96	1,108.98	0.1473	1.9570
120	1.6949	0.01620	202.96	88.00	1,025.22	1,113.22	0.1647	1.9333
130	2.2258	0.01625	157.10	97.99	1,019.44	1,117.43	0.1817	1.9106
140	2.8929	0.01629	122.82	107.98	1,013.62	1,121.60	0.1985	1.8888
150	3.7231	0.01634	96.934	117.97	1,007.77	1,125.74	0.2151	1.8680
160	4.7472	0.01639	77.186	127.98	1,001.86	1,129.83	0.2313	1.8481
170	5.9998	0.01645	61.982	137.99	995.90	1,133.89	0.2474	1.8290
180	7.5196	0.01651	50.171	148.01	989.87	1,137.89	0.2631	1.8106
190	9.3497	0.01657	40.918	158.05	983.78	1,141.83	0.2787	1.7930
200	11.538	0.01663	33.611	168.10	977.62	1,145.71	0.2940	1.7760
212	14.709	0.01671	26.781	180.18	970.11	1,150.29	0.3122	1.7565
220	17.201	0.01677	23.135	188.25	965.03	1,153.28	0.3241	1.7440
230	20.795	0.01684	19.373	198.35	958.60	1,156.95	0.3388	1.7288
240	24.985	0.01692	16.316	208.47	952.06	1,160.54	0.3534	1.7141
250	29.843	0.01700	13.816	218.62	945.41	1,164.03	0.3678	1.7000
260	35.445	0.01708	11.760	228.79	938.65	1,167.44	0.3820	1.6862
270	41.874	0.01717	10.059	238.99	931.75	1,170.73	0.3960	1.6730
280	49.218	0.01726	8.6442	249.21	924.71	1,173.92	0.4099	1.6601
290	57.567	0.01735	7.4610	259.47	917.53	1,177.00	0.4236	1.6476
300	67.021	0.01745	6.4666	269.76	910.20	1,179.96	0.4372	1.6354
320	89.654	0.01765	4.9148	290.44	895.04	1,185.48	0.4640	1.6120
340	118.00	0.01787	3.7888	311.30	879.15	1,190.45	0.4903	1.5897
360	153.00	0.01811	2.9582	332.34	862.47	1,194.81	0.5162	1.5684
380	195.71	0.01836	2.3363	353.59	844.91	1,198.50	0.5416	1.5478
400	247.22	0.01864	1.8640	375.10	826.37	1,201.46	0.5667	1.5280
420	308.71	0.01894	1.5007	396.89	806.73	1,203.62	0.5915	1.5086
440	381.44	0.01926	1.2179	419.01	785.88	1,204.88	0.6161	1.4896
460	466.71	0.01962	0.99515	441.50	763.66	1,205.17	0.6405	1.4709

T (°F)	p (psia)	vf (ft³/lb)	vg (ft³/lb)	hf (BTU/lb)	hfg (BTU/lb)	hg (BTU/lb)	sf (BTU/lb·°R)	sg (BTU/lb·°R)
480	565.92	0.02001	0.81796	464.44	739.92	1,204.36	0.6648	1.4522
500	680.53	0.02044	0.67559	487.89	714.45	1,202.34	0.6890	1.4335
520	812.08	0.02092	0.56010	511.93	687.01	1,198.94	0.7133	1.4145
540	962.23	0.02146	0.46555	536.69	657.29	1,193.98	0.7377	1.3952
560	1,132.7	0.02208	0.38745	562.29	624.90	1,187.19	0.7624	1.3752
580	1,325.4	0.02279	0.32233	588.95	589.28	1,178.23	0.7875	1.3543
600	1,542.5	0.02363	0.26747	616.93	549.69	1,166.62	0.8133	1.3320
620	1,786.1	0.02465	0.22071	646.62	504.99	1,151.61	0.8400	1.3077
640	2,059.2	0.02593	0.18023	678.69	453.26	1,131.95	0.8683	1.2804
660	2,364.8	0.02766	0.14437	714.47	390.86	1,105.33	0.8991	1.2482
680	2,707.3	0.03035	0.11125	757.31	309.33	1,066.63	0.9354	1.2068
700	3,092.9	0.03684	0.074668	823.71	166.94	990.65	0.9911	1.1350

Saturated steam by pressure (psia)

p (psia)	p (psig)	T (°F)	vf (ft³/lb)	vg (ft³/lb)	hf (BTU/lb)	hfg (BTU/lb)	hg (BTU/lb)	sf (BTU/lb·°R)	sg (BTU/lb·°R)
0.5	—	79.55	0.01607	641.32	47.62	1,048.30	1,095.92	0.0925	2.0366
1	—	101.69	0.01614	333.51	69.73	1,035.71	1,105.44	0.1326	1.9776
1.5	—	115.64	0.01619	227.68	83.65	1,027.72	1,111.37	0.1571	1.9435
2	—	126.03	0.01623	173.72	94.02	1,021.74	1,115.76	0.1750	1.9195
3	—	141.42	0.01630	118.70	109.39	1,012.80	1,122.19	0.2009	1.8858
4	—	152.91	0.01636	90.628	120.89	1,006.05	1,126.94	0.2198	1.8621
5	—	162.18	0.01641	73.523	130.16	1,000.56	1,130.72	0.2349	1.8438
6	—	170.00	0.01645	61.979	137.99	995.90	1,133.89	0.2474	1.8290
8	—	182.81	0.01652	47.345	150.83	988.17	1,139.00	0.2675	1.8056
10	—	193.16	0.01659	38.423	161.22	981.84	1,143.06	0.2836	1.7875
14.696	0	211.95	0.01671	26.804	180.13	970.14	1,150.27	0.3121	1.7566
15	0.304	212.99	0.01672	26.295	181.18	969.48	1,150.66	0.3137	1.7549
20	5.304	227.92	0.01683	20.092	196.25	959.95	1,156.19	0.3358	1.7319
25	10.304	240.03	0.01692	16.306	208.51	952.04	1,160.55	0.3534	1.7141
30	15.304	250.30	0.01700	13.748	218.93	945.21	1,164.14	0.3682	1.6995
35	20.304	259.25	0.01708	11.900	228.03	939.15	1,167.19	0.3809	1.6873
40	25.304	267.22	0.01715	10.500	236.15	933.68	1,169.83	0.3921	1.6766
45	30.304	274.42	0.01721	9.4023	243.50	928.66	1,172.16	0.4022	1.6672
50	35.304	280.99	0.01727	8.5171	250.23	924.01	1,174.24	0.4113	1.6588
60	45.304	292.69	0.01738	7.1762	262.24	915.57	1,177.81	0.4273	1.6443
70	55.304	302.92	0.01748	6.2071	272.76	908.03	1,180.79	0.4412	1.6319
80	65.304	312.03	0.01757	5.4730	282.18	901.16	1,183.34	0.4534	1.6212
90	75.304	320.27	0.01766	4.8969	290.73	894.82	1,185.55	0.4644	1.6117
100	85.304	327.82	0.01774	4.4324	298.57	888.92	1,187.49	0.4744	1.6032
110	95.304	334.78	0.01781	4.0496	305.84	883.37	1,189.21	0.4835	1.5954
120	105.304	341.26	0.01789	3.7286	312.62	878.12	1,190.74	0.4920	1.5883
130	115.304	347.33	0.01796	3.4554	318.98	873.14	1,192.12	0.4998	1.5818
140	125.304	353.04	0.01802	3.2199	324.99	868.37	1,193.37	0.5072	1.5757
150	135.304	358.44	0.01809	3.0148	330.68	863.81	1,194.49	0.5141	1.5700
160	145.304	363.55	0.01815	2.8345	336.10	859.42	1,195.52	0.5207	1.5647
180	165.304	373.08	0.01827	2.5320	346.21	851.09	1,197.30	0.5328	1.5549
200	185.304	381.81	0.01839	2.2880	355.53	843.27	1,198.80	0.5439	1.5460
225	210.304	391.81	0.01852	2.0422	366.26	834.08	1,200.34	0.5565	1.5360
250	235.304	400.98	0.01865	1.8439	376.16	825.43	1,201.59	0.5679	1.5270
275	260.304	409.46	0.01878	1.6805	385.37	817.22	1,202.59	0.5785	1.5187
300	285.304	417.37	0.01890	1.5434	394.00	809.38	1,203.38	0.5883	1.5111
350	335.304	431.75	0.01913	1.3262	409.84	794.63	1,204.47	0.6060	1.4974

p (psia)	p (psig)	T (°F)	vf (ft³/lb)	vg (ft³/lb)	hf (BTU/lb)	hfg (BTU/lb)	hg (BTU/lb)	sf (BTU/lb·°R)	sg (BTU/lb·°R)
400	385.304	444.63	0.01934	1.1616	424.18	780.87	1,205.04	0.6217	1.4853
450	435.304	456.32	0.01955	1.0324	437.33	767.87	1,205.19	0.6360	1.4743
500	485.304	467.05	0.01975	0.92815	449.53	755.48	1,205.02	0.6490	1.4643
600	585.304	486.25	0.02014	0.77016	471.71	732.16	1,203.87	0.6723	1.4464
700	685.304	503.14	0.02051	0.65587	491.62	710.29	1,201.90	0.6928	1.4305
800	785.304	518.27	0.02088	0.56918	509.83	689.47	1,199.30	0.7112	1.4162
900	885.304	532.02	0.02124	0.50107	526.72	669.44	1,196.16	0.7279	1.4030
1,000	985.304	544.65	0.02160	0.44606	542.56	650.01	1,192.57	0.7434	1.3906
1,200	1,185.304	567.26	0.02233	0.36247	571.84	612.37	1,184.21	0.7714	1.3677
1,400	1,385.304	587.14	0.02307	0.30169	598.77	575.65	1,174.42	0.7966	1.3465
1,600	1,585.304	604.93	0.02386	0.25525	624.07	539.20	1,163.27	0.8197	1.3262
1,800	1,785.304	621.07	0.02471	0.21840	648.27	502.42	1,150.69	0.8415	1.3063
2,000	1,985.304	635.85	0.02563	0.18819	671.80	464.70	1,136.50	0.8622	1.2864
2,500	2,485.304	668.17	0.02859	0.13067	730.78	360.75	1,091.53	0.9130	1.2329
3,000	2,985.304	695.41	0.03438	0.084525	802.90	213.56	1,016.46	0.9736	1.1585

Superheated steam: enthalpy h (BTU/lb)

Rows: temperature (°F). Columns: absolute pressure; the first row is the saturation temperature (°F). — = liquid at that pressure.

T	1 psia	14.696 psia	50 psia	100 psia	150 psia	200 psia	300 psia	500 psia	1,000 psia	2,000 psia
Tsat	101.7	212.0	281.0	327.8	358.4	381.8	417.4	467.0	544.7	635.9
200	1,150.1	—	—	—	—	—	—	—	—	—
300	1,195.7	1,192.7	1,184.5	—	—	—	—	—	—	—
400	1,241.8	1,240.0	1,235.1	1,227.8	1,219.7	1,210.9	—	—	—	—
500	1,288.6	1,287.4	1,284.1	1,279.3	1,274.3	1,269.1	1,257.9	1,231.9	—	—
600	1,336.2	1,335.3	1,332.9	1,329.5	1,325.9	1,322.3	1,314.8	1,298.6	1,249.3	—
700	1,384.6	1,383.9	1,382.1	1,379.4	1,376.8	1,374.1	1,368.5	1,357.0	1,324.9	1,239.7
800	1,433.9	1,433.3	1,431.9	1,429.8	1,427.7	1,425.5	1,421.2	1,412.4	1,389.0	1,334.3
900	1,484.1	1,483.6	1,482.4	1,480.7	1,479.0	1,477.3	1,473.8	1,466.8	1,448.5	1,408.5
1000	1,535.1	1,534.7	1,533.8	1,532.3	1,530.9	1,529.5	1,526.7	1,520.9	1,506.2	1,474.9
1100	1,587.1	1,586.8	1,586.0	1,584.8	1,583.6	1,582.4	1,580.0	1,575.3	1,563.0	1,537.6
1200	1,640.0	1,639.8	1,639.1	1,638.1	1,637.1	1,636.1	1,634.0	1,630.0	1,619.7	1,598.6
1300	1,693.9	1,693.7	1,693.1	1,692.2	1,691.4	1,690.5	1,688.8	1,685.3	1,676.6	1,658.7
1400	1,748.7	1,748.5	1,748.0	1,747.2	1,746.5	1,745.8	1,744.3	1,741.3	1,733.7	1,718.4

Superheated steam: entropy s (BTU/lb·°R)

T	1 psia	14.696 psia	50 psia	100 psia	150 psia	200 psia	300 psia	500 psia	1,000 psia	2,000 psia
Tsat	101.7	212.0	281.0	327.8	358.4	381.8	417.4	467.0	544.7	635.9
200	2.0510	—	—	—	—	—	—	—	—	—
300	2.1152	1.8160	1.6724	—	—	—	—	—	—	—
400	2.1723	1.8744	1.7352	1.6521	1.6001	1.5602	—	—	—	—
500	2.2238	1.9266	1.7891	1.7089	1.6602	1.6243	1.5706	1.4928	—	—
600	2.2710	1.9741	1.8374	1.7586	1.7114	1.6771	1.6271	1.5591	1.4457	—
700	2.3146	2.0179	1.8818	1.8037	1.7573	1.7238	1.6756	1.6117	1.5140	1.3783
800	2.3554	2.0588	1.9229	1.8453	1.7994	1.7664	1.7191	1.6576	1.5670	1.4567
900	2.3937	2.0972	1.9615	1.8842	1.8386	1.8059	1.7593	1.6991	1.6125	1.5134
1000	2.4299	2.1335	1.9980	1.9209	1.8754	1.8430	1.7968	1.7375	1.6535	1.5606
1100	2.4644	2.1680	2.0326	1.9556	1.9103	1.8780	1.8322	1.7735	1.6911	1.6022
1200	2.4973	2.2009	2.0656	1.9887	1.9435	1.9114	1.8657	1.8076	1.7264	1.6401
1300	2.5288	2.2324	2.0972	2.0204	1.9753	1.9432	1.8978	1.8399	1.7596	1.6752
1400	2.5591	2.2627	2.1275	2.0508	2.0058	1.9738	1.9284	1.8708	1.7912	1.7083

Superheated steam: specific volume v (ft³/lb)

T	1 psia	14.696 psia	50 psia	100 psia	150 psia	200 psia	300 psia	500 psia	1,000 psia	2,000 psia
Tsat	101.7	212.0	281.0	327.8	358.4	381.8	417.4	467.0	544.7	635.9
200	392.5	—	—	—	—	—	—	—	—	—
300	452.3	30.53	8.774	—	—	—	—	—	—	—
400	511.9	34.67	10.06	4.936	3.222	2.361	—	—	—	—
500	571.5	38.77	11.31	5.588	3.680	2.725	1.767	0.9930	—	—
600	631.1	42.86	12.53	6.216	4.111	3.058	2.005	1.159	0.5143	—
700	690.7	46.93	13.74	6.834	4.531	3.379	2.227	1.304	0.6085	0.2489
800	750.3	51.00	14.95	7.446	4.944	3.693	2.442	1.441	0.6883	0.3076
900	809.9	55.07	16.15	8.053	5.353	4.003	2.653	1.572	0.7614	0.3539
1000	869.5	59.13	17.35	8.658	5.759	4.310	2.861	1.701	0.8308	0.3948
1100	929.1	63.19	18.55	9.260	6.163	4.615	3.066	1.827	0.8978	0.4327
1200	988.6	67.25	19.75	9.862	6.566	4.918	3.270	1.952	0.9632	0.4686
1300	1,048	71.31	20.94	10.46	6.968	5.221	3.473	2.076	1.028	0.5033
1400	1,108	75.36	22.14	11.06	7.369	5.522	3.676	2.199	1.091	0.5370

Sources and method

- **IAPWS-IF97 (IAPWS R7-97, 2012 revision)** — Industrial formulation for the thermodynamic properties of water and steam; reference state u = s = 0 for saturated liquid at the triple point (iapws.org/relguide/IF97-Rev.html)
- **IAPWS R2-83 (2012)** — Critical point of water: 647.096 K (373.946 °C), 22.064 MPa, 322 kg/m³
- **CoolProp 8.0 (Bell et al., Ind. Eng. Chem. Res. 2014)** — Open-source property library used to evaluate IF97 and the refrigerant equations of state (coolprop.org/)
- **NIST Special Publication 811** — Conversion factors; BTU is the International Table BTU (1055.055 852 62 J) (www.nist.gov/pml/special-publication-811)

Every property is calculated with IAPWS-IF97 in SI units and converted with exact factors; the IF97 verification values are checked in the site tests. Interactive version, corrections and more charts: **allunitconversions.com/steam-tables-us**