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Pipe and Plant Engineering Reference Pack

Pipe schedules, steam tables in SI and US units, pressure, flow and temperature in one printable PDF

For: Process, piping and plant engineers, pipefitters, boiler operators and students

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By Miguel Coelho · Edition 2.0
9 November 2026

Six sheets for the control room, the site office or the classroom: ASME B36.10M and B36.19M pipe dimensions by schedule, saturated and superheated steam tables (IAPWS-IF97) in SI and US customary units, pressure units, liquid volume and flow rates, and temperature in °C, °F and K. Each sheet is also available on its own.

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Conversion values in this pack are generated by the AllUnitConversions conversion library and automatically checked against exact definitions (NIST SP 811, BIPM SI Brochure, 1959 International Yard and Pound Agreement) before the PDF is produced. Reference data taken from standards and regulations is cited to its source on each sheet. Free to print, copy and share with attribution (CC BY 4.0).

Printing tip: print double-sided and staple at the top left, or print single sheets from each chart's own page.

Pipe Schedule Chart

NPS ⅛ to 24 inch and DN: outside diameter, wall thickness by schedule, inside diameter and mass per length

For: Pipe fitters, piping and process engineers, welders, plumbers and estimators

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KEY RELATIONSHIP	FORMULA	REVERSE	WORKED EXAMPLE
From NPS 14 up, NPS = outside diameter in inches. Below that, OD is fixed for each NPS and the schedule sets the wall	ID = OD − 2 × wall; mass (lb/ft) = 10.69 × (OD − wall) × wall	Wall = (OD − ID) ÷ 2	NPS 2 Sch 40: 2.375 − 2 × 0.154 = 2.067 in ID, 3.66 lb/ft

Inches as published (3 decimals); millimetres are inches × 25.4. Mass is plain-end carbon steel; stainless is about 2% heavier.

Wall thickness by schedule (inches)

STD = Sch 40 up to NPS 10, then 0.375 in. XS = Sch 80 up to NPS 8, then 0.500 in.

NPS	DN	OD (in)	Sch 5	Sch 10	Sch 40	STD	Sch 80	XS	Sch 160	XXS
1/8	6	0.405	0.035	0.049	0.068	0.068	0.095	0.095	—	—
1/4	8	0.540	0.049	0.065	0.088	0.088	0.119	0.119	—	—
3/8	10	0.675	0.049	0.065	0.091	0.091	0.126	0.126	—	—
1/2	15	0.840	0.065	0.083	0.109	0.109	0.147	0.147	0.188	0.294
3/4	20	1.050	0.065	0.083	0.113	0.113	0.154	0.154	0.219	0.308
1	25	1.315	0.065	0.109	0.133	0.133	0.179	0.179	0.250	0.358
1 1/4	32	1.660	0.065	0.109	0.140	0.140	0.191	0.191	0.250	0.382
1 1/2	40	1.900	0.065	0.109	0.145	0.145	0.200	0.200	0.281	0.400
2	50	2.375	0.065	0.109	0.154	0.154	0.218	0.218	0.344	0.436
2 1/2	65	2.875	0.083	0.120	0.203	0.203	0.276	0.276	0.375	0.552
3	80	3.500	0.083	0.120	0.216	0.216	0.300	0.300	0.438	0.600
3 1/2	90	4.000	0.083	0.120	0.226	0.226	0.318	0.318	—	0.636
4	100	4.500	0.083	0.120	0.237	0.237	0.337	0.337	0.531	0.674
5	125	5.563	0.109	0.134	0.258	0.258	0.375	0.375	0.625	0.750
6	150	6.625	0.109	0.134	0.280	0.280	0.432	0.432	0.719	0.864
8	200	8.625	0.109	0.148	0.322	0.322	0.500	0.500	0.906	0.875
10	250	10.750	0.134	0.165	0.365	0.365	0.594	0.500	1.125	—
12	300	12.750	0.156	0.180	0.406	0.375	0.688	0.500	1.312	—
14	350	14.000	0.156	0.250	0.438	0.375	0.750	0.500	1.406	—
16	400	16.000	0.165	0.250	0.500	0.375	0.844	0.500	1.594	—
18	450	18.000	0.165	0.250	0.562	0.375	0.938	0.500	1.781	—
20	500	20.000	0.188	0.250	0.594	0.375	1.031	0.500	1.969	—
24	600	24.000	0.218	0.250	0.688	0.375	1.219	0.500	2.344	—

Wall thickness by schedule (millimetres)

NPS	DN	OD (mm)	Sch 5	Sch 10	Sch 40	Sch 80	Sch 160	XXS
1/8	6	10.3	0.89	1.24	1.73	2.41	—	—
1/4	8	13.7	1.24	1.65	2.24	3.02	—	—
3/8	10	17.1	1.24	1.65	2.31	3.20	—	—
1/2	15	21.3	1.65	2.11	2.77	3.73	4.78	7.47
3/4	20	26.7	1.65	2.11	2.87	3.91	5.56	7.82
1	25	33.4	1.65	2.77	3.38	4.55	6.35	9.09

NPS	DN	OD (mm)	Sch 5	Sch 10	Sch 40	Sch 80	Sch 160	XXS
1 1/4	32	42.2	1.65	2.77	3.56	4.85	6.35	9.70
1 1/2	40	48.3	1.65	2.77	3.68	5.08	7.14	10.16
2	50	60.3	1.65	2.77	3.91	5.54	8.74	11.07
2 1/2	65	73.0	2.11	3.05	5.16	7.01	9.52	14.02
3	80	88.9	2.11	3.05	5.49	7.62	11.13	15.24
3 1/2	90	101.6	2.11	3.05	5.74	8.08	—	16.15
4	100	114.3	2.11	3.05	6.02	8.56	13.49	17.12
5	125	141.3	2.77	3.40	6.55	9.52	15.88	19.05
6	150	168.3	2.77	3.40	7.11	10.97	18.26	21.95
8	200	219.1	2.77	3.76	8.18	12.70	23.01	22.22
10	250	273.1	3.40	4.19	9.27	15.09	28.58	—
12	300	323.8	3.96	4.57	10.31	17.48	33.32	—
14	350	355.6	3.96	6.35	11.13	19.05	35.71	—
16	400	406.4	4.19	6.35	12.70	21.44	40.49	—
18	450	457.2	4.19	6.35	14.27	23.83	45.24	—
20	500	508.0	4.78	6.35	15.09	26.19	50.01	—
24	600	609.6	5.54	6.35	17.48	30.96	59.54	—

Schedule 40 pipe: inside diameter, flow area and mass

NPS	DN	OD (in)	Wall (in)	ID (in)	ID (mm)	Flow area (in²)	lb/ft	kg/m
1/8	6	0.405	0.068	0.269	6.8	0.057	0.24	0.36
1/4	8	0.540	0.088	0.364	9.2	0.104	0.43	0.63
3/8	10	0.675	0.091	0.493	12.5	0.191	0.57	0.85
1/2	15	0.840	0.109	0.622	15.8	0.304	0.85	1.27
3/4	20	1.050	0.113	0.824	20.9	0.533	1.13	1.68
1	25	1.315	0.133	1.049	26.6	0.864	1.68	2.50
1 1/4	32	1.660	0.140	1.380	35.1	1.496	2.27	3.39
1 1/2	40	1.900	0.145	1.610	40.9	2.036	2.72	4.05
2	50	2.375	0.154	2.067	52.5	3.356	3.66	5.44
2 1/2	65	2.875	0.203	2.469	62.7	4.788	5.80	8.63
3	80	3.500	0.216	3.068	77.9	7.393	7.58	11.29
3 1/2	90	4.000	0.226	3.548	90.1	9.887	9.12	13.57
4	100	4.500	0.237	4.026	102.3	12.730	10.80	16.07
5	125	5.563	0.258	5.047	128.2	20.006	14.63	21.78
6	150	6.625	0.280	6.065	154.1	28.890	18.99	28.27
8	200	8.625	0.322	7.981	202.7	50.027	28.58	42.54
10	250	10.750	0.365	10.020	254.5	78.854	40.52	60.31
12	300	12.750	0.406	11.938	303.2	111.932	53.57	79.74
14	350	14.000	0.438	13.124	333.3	135.276	63.50	94.51
16	400	16.000	0.500	15.000	381.0	176.715	82.85	123.31
18	450	18.000	0.562	16.876	428.7	223.681	104.76	155.93
20	500	20.000	0.594	18.812	477.8	277.946	123.23	183.40
24	600	24.000	0.688	22.624	574.6	402.002	171.45	255.18

Schedule 80 pipe: inside diameter, flow area and mass

NPS	DN	OD (in)	Wall (in)	ID (in)	ID (mm)	Flow area (in²)	lb/ft	kg/m
1/8	6	0.405	0.095	0.215	5.5	0.036	0.31	0.47
1/4	8	0.540	0.119	0.302	7.7	0.072	0.54	0.80

NPS	DN	OD (in)	Wall (in)	ID (in)	ID (mm)	Flow area (in²)	lb/ft	kg/m
3/8	10	0.675	0.126	0.423	10.7	0.141	0.74	1.10
1/2	15	0.840	0.147	0.546	13.9	0.234	1.09	1.62
3/4	20	1.050	0.154	0.742	18.8	0.432	1.48	2.20
1	25	1.315	0.179	0.957	24.3	0.719	2.17	3.24
1 1/4	32	1.660	0.191	1.278	32.5	1.283	3.00	4.46
1 1/2	40	1.900	0.200	1.500	38.1	1.767	3.63	5.41
2	50	2.375	0.218	1.939	49.3	2.953	5.03	7.48
2 1/2	65	2.875	0.276	2.323	59.0	4.238	7.67	11.41
3	80	3.500	0.300	2.900	73.7	6.605	10.26	15.27
3 1/2	90	4.000	0.318	3.364	85.4	8.888	12.52	18.63
4	100	4.500	0.337	3.826	97.2	11.497	15.00	22.32
5	125	5.563	0.375	4.813	122.3	18.194	20.80	30.95
6	150	6.625	0.432	5.761	146.3	26.067	28.60	42.57
8	200	8.625	0.500	7.625	193.7	45.664	43.43	64.64
10	250	10.750	0.594	9.562	242.9	71.810	64.49	95.98
12	300	12.750	0.688	11.374	288.9	101.605	88.71	132.04
14	350	14.000	0.750	12.500	317.5	122.718	106.23	158.11
16	400	16.000	0.844	14.312	363.5	160.876	136.74	203.52
18	450	18.000	0.938	16.124	409.5	204.190	171.08	254.64
20	500	20.000	1.031	17.938	455.6	252.719	209.06	311.16
24	600	24.000	1.219	21.562	547.7	365.147	296.86	441.84

Large-bore schedules 20 to 140 (inches)

NPS	DN	OD (in)	Sch 20	Sch 30	Sch 60	Sch 100	Sch 120	Sch 140
4	100	4.500	—	—	—	—	0.438	—
5	125	5.563	—	—	—	—	0.500	—
6	150	6.625	—	—	—	—	0.562	—
8	200	8.625	0.250	0.277	0.406	0.594	0.719	0.812
10	250	10.750	0.250	0.307	0.500	0.719	0.844	1.000
12	300	12.750	0.250	0.330	0.562	0.844	1.000	1.125
14	350	14.000	0.312	0.375	0.594	0.938	1.094	1.250
16	400	16.000	0.312	0.375	0.656	1.031	1.219	1.438
18	450	18.000	0.312	0.438	0.750	1.156	1.375	1.562
20	500	20.000	0.375	0.500	0.812	1.281	1.500	1.750
24	600	24.000	0.375	0.562	0.969	1.531	1.812	2.062

Stainless steel schedules 5S to 80S (ASME B36.19M, inches)

NPS	DN	OD (in)	5S	10S	40S	80S
1/8	6	0.405	0.035	0.049	0.068	0.095
1/4	8	0.540	0.049	0.065	0.088	0.119
3/8	10	0.675	0.049	0.065	0.091	0.126
1/2	15	0.840	0.065	0.083	0.109	0.147
3/4	20	1.050	0.065	0.083	0.113	0.154
1	25	1.315	0.065	0.109	0.133	0.179
1 1/4	32	1.660	0.065	0.109	0.140	0.191
1 1/2	40	1.900	0.065	0.109	0.145	0.200
2	50	2.375	0.065	0.109	0.154	0.218
2 1/2	65	2.875	0.083	0.120	0.203	0.276

NPS	DN	OD (in)	5S	10S	40S	80S
3	80	3.500	0.083	0.120	0.216	0.300
3 1/2	90	4.000	0.083	0.120	0.226	0.318
4	100	4.500	0.083	0.120	0.237	0.337
5	125	5.563	0.109	0.134	0.258	0.375
6	150	6.625	0.109	0.134	0.280	0.432
8	200	8.625	0.109	0.148	0.322	0.500
10	250	10.750	0.134	0.165	0.365	0.500
12	300	12.750	0.156	0.180	0.375	0.500

Sources and method

- **ASME B36.10M** — Welded and seamless wrought steel pipe: outside diameters, wall thicknesses and the plain-end mass formula
- **ASME B36.19M** — Stainless steel pipe: schedules 5S, 10S, 40S and 80S
- **ISO 6708** — Pipework components: definition and selection of DN (nominal size)
- **International Yard and Pound Agreement (1959)** — 1 in = 25.4 mm exactly

Outside diameters and wall thicknesses are transcribed from ASME B36.10M and B36.19M and cross-checked against a second published table; inside diameter, flow area and mass are calculated with the B36.10M formula. Interactive version, corrections and more charts: **allunitconversions.com/pipe-schedule-chart**

Steam Tables

Saturated steam by temperature and by pressure, and superheated steam, in SI units (IAPWS-IF97)

For: Mechanical, process and power engineers, boiler operators and thermodynamics students

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BASIS
IAPWS-IF97; u = 0 and s = 0 for saturated liquid at the triple point (0.01 °C, 0.611657 kPa)

KEY RELATIONSHIP
hfg = hg − hf; wet steam h = hf + x × hfg (x = dryness fraction)

READING THE TABLE
Dryness x = (h − hf) ÷ hfg

WORKED EXAMPLE
At 100 kPa: Tsat = 99.61 °C, hfg = 2,257.5 kJ/kg

Pressures are absolute. Enthalpy to 0.01 kJ/kg and entropy to 0.0001 kJ/(kg·K), well within IF97 accuracy. Critical point 373.946 °C, 22.064 MPa.

Saturated steam by temperature

T (°C)	p (kPa)	vf (m³/kg)	vg (m³/kg)	hf (kJ/kg)	hfg (kJ/kg)	hg (kJ/kg)	sf (kJ/kg·K)	sg (kJ/kg·K)
0.01	0.61166	0.001000	206.00	0.00	2,500.91	2,500.91	0.0000	9.1555
5	0.87257	0.001000	147.02	21.02	2,489.05	2,510.07	0.0763	9.0249
10	1.2282	0.001000	106.31	42.02	2,477.21	2,519.23	0.1511	8.8998
15	1.7057	0.001001	77.881	62.98	2,465.38	2,528.36	0.2245	8.7804
20	2.3392	0.001002	57.761	83.92	2,453.55	2,537.47	0.2965	8.6661
25	3.1697	0.001003	43.341	104.84	2,441.71	2,546.54	0.3673	8.5568
30	4.2467	0.001004	32.882	125.75	2,429.84	2,555.58	0.4368	8.4521
35	5.6286	0.001006	25.208	146.64	2,417.94	2,564.59	0.5052	8.3518
40	7.3844	0.001008	19.517	167.54	2,406.00	2,573.54	0.5724	8.2557
45	9.5944	0.001010	15.253	188.44	2,394.02	2,582.45	0.6386	8.1634
50	12.351	0.001012	12.028	209.34	2,381.97	2,591.31	0.7038	8.0749
55	15.761	0.001015	9.5649	230.24	2,369.87	2,600.11	0.7680	7.9899
60	19.946	0.001017	7.6677	251.15	2,357.69	2,608.85	0.8312	7.9082
65	25.041	0.001020	6.1938	272.08	2,345.43	2,617.51	0.8935	7.8296
70	31.201	0.001023	5.0397	293.02	2,333.08	2,626.10	0.9550	7.7540
75	38.595	0.001026	4.1291	313.97	2,320.63	2,634.60	1.0156	7.6812
80	47.415	0.001029	3.4053	334.95	2,308.07	2,643.01	1.0754	7.6110
85	57.867	0.001032	2.8259	355.95	2,295.38	2,651.33	1.1344	7.5434
90	70.182	0.001036	2.3591	376.97	2,282.56	2,659.53	1.1927	7.4781
95	84.609	0.001040	1.9806	398.02	2,269.60	2,667.61	1.2502	7.4150
100	101.42	0.001043	1.6719	419.10	2,256.47	2,675.57	1.3070	7.3541
110	143.38	0.001052	1.2094	461.36	2,229.70	2,691.07	1.4187	7.2380
120	198.67	0.001060	0.89130	503.78	2,202.15	2,705.93	1.5278	7.1291
130	270.26	0.001070	0.66808	546.39	2,173.70	2,720.09	1.6346	7.0264
140	361.50	0.001080	0.50852	589.20	2,144.24	2,733.44	1.7393	6.9293
150	476.10	0.001091	0.39250	632.25	2,113.67	2,745.92	1.8420	6.8370
160	618.14	0.001102	0.30682	675.57	2,081.86	2,757.43	1.9428	6.7491
170	792.05	0.001114	0.24262	719.21	2,048.69	2,767.89	2.0419	6.6649
180	1,002.6	0.001127	0.19386	763.19	2,014.03	2,777.22	2.1395	6.5841
190	1,255.0	0.001141	0.15638	807.57	1,977.75	2,785.31	2.2358	6.5060
200	1,554.7	0.001157	0.12722	852.39	1,939.67	2,792.06	2.3308	6.4303
210	1,907.4	0.001173	0.10430	897.73	1,899.62	2,797.35	2.4248	6.3565
220	2,319.3	0.001190	0.086101	943.64	1,857.41	2,801.05	2.5178	6.2842
230	2,796.8	0.001209	0.071510	990.21	1,812.80	2,803.01	2.6102	6.2131

T (°C)	p (kPa)	vf (m³/kg)	vg (m³/kg)	hf (kJ/kg)	hfg (kJ/kg)	hg (kJ/kg)	sf (kJ/kg·K)	sg (kJ/kg·K)
240	3,346.7	0.001229	0.059710	1,037.52	1,765.54	2,803.06	2.7019	6.1425
250	3,975.9	0.001252	0.050087	1,085.69	1,715.33	2,801.01	2.7934	6.0722
260	4,692.1	0.001276	0.042175	1,134.83	1,661.82	2,796.64	2.8847	6.0017
270	5,502.8	0.001303	0.035622	1,185.09	1,604.60	2,789.69	2.9762	5.9304
280	6,416.5	0.001333	0.030154	1,236.67	1,543.15	2,779.82	3.0681	5.8578
290	7,441.6	0.001366	0.025557	1,289.80	1,476.84	2,766.63	3.1608	5.7832
300	8,587.7	0.001404	0.021663	1,344.77	1,404.80	2,749.57	3.2547	5.7058
310	9,864.7	0.001448	0.018339	1,402.00	1,325.92	2,727.92	3.3506	5.6243
320	11,284	0.001499	0.015476	1,462.05	1,238.62	2,700.67	3.4491	5.5373
330	12,858	0.001561	0.012984	1,525.74	1,140.51	2,666.25	3.5516	5.4425
340	14,600	0.001638	0.010784	1,594.45	1,027.62	2,622.07	3.6599	5.3359
350	16,529	0.001740	0.0088009	1,670.86	892.73	2,563.59	3.7783	5.2109
360	18,666	0.001895	0.0069450	1,761.49	719.50	2,480.99	3.9164	5.0527
370	21,043	0.002222	0.0049462	1,892.64	440.86	2,333.50	4.1142	4.7996

Saturated steam by pressure

p (kPa)	p (bar)	T (°C)	vf (m³/kg)	vg (m³/kg)	hf (kJ/kg)	hfg (kJ/kg)	hg (kJ/kg)	sf (kJ/kg·K)	sg (kJ/kg·K)
1	0.01	6.97	0.001000	129.18	29.30	2,484.38	2,513.68	0.1059	8.9749
1.5	0.015	13.02	0.001001	87.962	54.69	2,470.06	2,524.75	0.1956	8.8271
2	0.02	17.50	0.001001	66.990	73.43	2,459.48	2,532.91	0.2606	8.7227
2.5	0.025	21.08	0.001002	54.242	88.43	2,451.00	2,539.43	0.3119	8.6422
3	0.03	24.08	0.001003	45.655	100.99	2,443.89	2,544.88	0.3543	8.5766
4	0.04	28.96	0.001004	34.792	121.40	2,432.31	2,553.71	0.4224	8.4735
5	0.05	32.88	0.001005	28.186	137.77	2,423.00	2,560.77	0.4763	8.3939
7.5	0.075	40.29	0.001008	19.234	168.76	2,405.30	2,574.06	0.5763	8.2502
10	0.1	45.81	0.001010	14.671	191.81	2,392.07	2,583.89	0.6492	8.1489
15	0.15	53.97	0.001014	10.020	225.94	2,372.37	2,598.30	0.7548	8.0071
20	0.2	60.06	0.001017	7.6482	251.40	2,357.55	2,608.95	0.8320	7.9072
25	0.25	64.96	0.001020	6.2034	271.93	2,345.52	2,617.45	0.8931	7.8302
30	0.3	69.10	0.001022	5.2286	289.23	2,335.32	2,624.55	0.9439	7.7675
40	0.4	75.86	0.001026	3.9931	317.57	2,318.48	2,636.05	1.0259	7.6690
50	0.5	81.32	0.001030	3.2401	340.48	2,304.74	2,645.21	1.0910	7.5930
75	0.75	91.76	0.001037	2.2171	384.37	2,278.02	2,662.39	1.2130	7.4557
100	1	99.61	0.001043	1.6940	417.44	2,257.51	2,674.95	1.3026	7.3588
101.325	1.01325	99.97	0.001043	1.6733	418.99	2,256.54	2,675.53	1.3067	7.3544
125	1.25	105.97	0.001048	1.3749	444.30	2,240.59	2,684.89	1.3739	7.2840
150	1.5	111.35	0.001053	1.1594	467.08	2,226.03	2,693.11	1.4335	7.2229
175	1.75	116.04	0.001057	1.0036	486.97	2,213.16	2,700.13	1.4849	7.1714
200	2	120.21	0.001061	0.88574	504.68	2,201.56	2,706.24	1.5301	7.1269
250	2.5	127.41	0.001067	0.71870	535.35	2,181.15	2,716.50	1.6072	7.0524
300	3	133.53	0.001073	0.60579	561.46	2,163.44	2,724.89	1.6718	6.9916
350	3.5	138.86	0.001079	0.52420	584.31	2,147.65	2,731.97	1.7275	6.9401
400	4	143.61	0.001084	0.46239	604.72	2,133.33	2,738.06	1.7766	6.8954
450	4.5	147.91	0.001088	0.41390	623.22	2,120.16	2,743.39	1.8206	6.8560
500	5	151.84	0.001093	0.37480	640.19	2,107.92	2,748.11	1.8606	6.8206
600	6	158.83	0.001101	0.31558	670.50	2,085.64	2,756.14	1.9311	6.7592
700	7	164.95	0.001108	0.27276	697.14	2,065.61	2,762.75	1.9921	6.7070
800	8	170.41	0.001115	0.24033	721.02	2,047.28	2,768.30	2.0460	6.6615
900	9	175.36	0.001121	0.21487	742.72	2,030.31	2,773.04	2.0944	6.6212

p (kPa)	p (bar)	T (°C)	vf (m³/kg)	vg (m³/kg)	hf (kJ/kg)	hfg (kJ/kg)	hg (kJ/kg)	sf (kJ/kg·K)	sg (kJ/kg·K)
1,000	10	179.89	0.001127	0.19435	762.68	2,014.44	2,777.12	2.1384	6.5850
1,200	12	187.96	0.001139	0.16325	798.50	1,985.27	2,783.77	2.2163	6.5217
1,400	14	195.05	0.001149	0.14077	830.13	1,958.76	2,788.89	2.2839	6.4675
1,600	16	201.38	0.001159	0.12373	858.61	1,934.27	2,792.88	2.3438	6.4200
1,800	18	207.12	0.001168	0.11036	884.61	1,911.37	2,795.99	2.3978	6.3776
2,000	20	212.38	0.001177	0.099581	908.62	1,889.76	2,798.38	2.4470	6.3392
2,500	25	223.96	0.001197	0.079947	961.98	1,840.06	2,802.04	2.5544	6.2560
3,000	30	233.86	0.001217	0.066664	1,008.37	1,794.89	2,803.27	2.6456	6.1858
3,500	35	242.56	0.001235	0.057058	1,049.78	1,752.97	2,802.74	2.7254	6.1245
4,000	40	250.36	0.001253	0.049777	1,087.43	1,713.47	2,800.90	2.7967	6.0697
5,000	50	263.94	0.001286	0.039446	1,154.50	1,639.73	2,794.23	2.9207	5.9737
6,000	60	275.59	0.001319	0.032449	1,213.73	1,570.83	2,784.56	3.0274	5.8901
7,000	70	285.83	0.001352	0.027380	1,267.44	1,505.13	2,772.57	3.1220	5.8146
8,000	80	295.01	0.001385	0.023528	1,317.08	1,441.53	2,758.61	3.2077	5.7448
9,000	90	303.35	0.001418	0.020493	1,363.65	1,379.23	2,742.88	3.2866	5.6790
10,000	100	311.00	0.001453	0.018034	1,407.87	1,317.61	2,725.47	3.3603	5.6159
12,000	120	324.68	0.001526	0.014269	1,491.33	1,194.26	2,685.58	3.4965	5.4941
14,000	140	336.67	0.001610	0.011489	1,570.88	1,067.22	2,638.09	3.6230	5.3730
16,000	160	347.36	0.001710	0.0093081	1,649.67	931.13	2,580.80	3.7457	5.2463
18,000	180	356.99	0.001839	0.0074987	1,732.02	777.51	2,509.53	3.8717	5.1055
20,000	200	365.75	0.002039	0.0058583	1,827.10	584.29	2,411.39	4.0154	4.9299
22,000	220	373.71	0.002706	0.0035705	2,013.36	149.86	2,163.21	4.2976	4.5293

Superheated steam: specific enthalpy h (kJ/kg)

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

T	1 bar	2 bar	5 bar	10 bar	20 bar	40 bar	60 bar	100 bar	150 bar	200 bar
Tsat	99.61	120.21	151.84	179.89	212.38	250.36	275.59	311.00	342.16	365.75
100	2,675.8	—	—	—	—	—	—	—	—	—
150	2,776.6	2,769.1	—	—	—	—	—	—	—	—
200	2,875.5	2,870.8	2,855.9	2,828.3	—	—	—	—	—	—
250	2,974.5	2,971.3	2,961.1	2,943.2	2,903.2	—	—	—	—	—
300	3,074.5	3,072.1	3,064.6	3,051.7	3,024.3	2,961.7	2,885.5	—	—	—
350	3,175.8	3,173.9	3,168.1	3,158.2	3,137.6	3,093.3	3,043.9	2,924.0	2,693.0	—
400	3,278.5	3,277.0	3,272.3	3,264.4	3,248.2	3,214.4	3,178.2	3,097.4	2,975.5	2,816.8
450	3,382.8	3,381.5	3,377.7	3,371.2	3,358.1	3,331.0	3,302.8	3,242.3	3,157.8	3,061.5
500	3,488.7	3,487.6	3,484.4	3,479.0	3,468.1	3,445.8	3,422.9	3,375.1	3,310.8	3,241.2
550	3,596.3	3,595.4	3,592.6	3,588.1	3,578.9	3,560.2	3,541.2	3,501.9	3,450.5	3,396.2
600	3,705.6	3,704.8	3,702.5	3,698.6	3,690.7	3,674.8	3,658.8	3,625.8	3,583.3	3,539.2
650	3,816.6	3,815.9	3,813.9	3,810.5	3,803.8	3,790.2	3,776.4	3,748.3	3,712.4	3,675.6
700	3,929.4	3,928.8	3,927.0	3,924.1	3,918.2	3,906.4	3,894.5	3,870.3	3,839.5	3,808.2
750	4,043.9	4,043.4	4,041.9	4,039.3	4,034.2	4,023.8	4,013.4	3,992.3	3,965.6	3,938.5
800	4,160.2	4,159.8	4,158.4	4,156.1	4,151.6	4,142.5	4,133.3	4,114.7	4,091.3	4,067.7

Superheated steam: specific entropy s (kJ/kg·K)

T	1 bar	2 bar	5 bar	10 bar	20 bar	40 bar	60 bar	100 bar	150 bar	200 bar
Tsat	99.61	120.21	151.84	179.89	212.38	250.36	275.59	311.00	342.16	365.75
100	7.3610	—	—	—	—	—	—	—	—	—
150	7.6147	7.2809	—	—	—	—	—	—	—	—

T	1 bar	2 bar	5 bar	10 bar	20 bar	40 bar	60 bar	100 bar	150 bar	200 bar
200	7.8356	7.5081	7.0611	6.6955	—	—	—	—	—	—
250	8.0346	7.7100	7.2726	6.9266	6.5474	—	—	—	—	—
300	8.2171	7.8940	7.4614	7.1247	6.7685	6.3638	6.0702	—	—	—
350	8.3865	8.0643	7.6345	7.3028	6.9582	6.5843	6.3356	5.9458	5.4435	—
400	8.5451	8.2235	7.7954	7.4668	7.1290	6.7712	6.5431	6.2139	5.8817	5.5525
450	8.6945	8.3733	7.9464	7.6198	7.2863	6.9383	6.7216	6.4217	6.1433	5.9041
500	8.8361	8.5151	8.0891	7.7640	7.4335	7.0919	6.8824	6.5993	6.3479	6.1445
550	8.9709	8.6501	8.2247	7.9007	7.5723	7.2353	7.0306	6.7584	6.5230	6.3390
600	9.0998	8.7792	8.3543	8.0309	7.7042	7.3704	7.1692	6.9045	6.6797	6.5077
650	9.2234	8.9029	8.4784	8.1557	7.8301	7.4989	7.3002	7.0409	6.8235	6.6596
700	9.3424	9.0220	8.5977	8.2755	7.9509	7.6215	7.4248	7.1696	6.9576	6.7994
750	9.4571	9.1368	8.7128	8.3909	8.0670	7.7391	7.5439	7.2918	7.0839	6.9301
800	9.5681	9.2479	8.8240	8.5024	8.1791	7.8523	7.6583	7.4087	7.2039	7.0534

Superheated steam: specific volume v (m^3/kg)

T	1 bar	2 bar	5 bar	10 bar	20 bar	40 bar	60 bar	100 bar	150 bar	200 bar
Tsat	99.61	120.21	151.84	179.89	212.38	250.36	275.59	311.00	342.16	365.75
100	1.696	—	—	—	—	—	—	—	—	—
150	1.937	0.9599	—	—	—	—	—	—	—	—
200	2.172	1.081	0.4250	0.2060	—	—	—	—	—	—
250	2.406	1.199	0.4744	0.2327	0.1115	—	—	—	—	—
300	2.639	1.316	0.5226	0.2580	0.1255	0.05887	0.03619	—	—	—
350	2.871	1.433	0.5701	0.2825	0.1386	0.06647	0.04225	0.02244	0.01148	—
400	3.103	1.549	0.6173	0.3066	0.1512	0.07343	0.04742	0.02644	0.01567	0.009950
450	3.334	1.665	0.6642	0.3304	0.1635	0.08004	0.05217	0.02978	0.01848	0.01272
500	3.566	1.781	0.7109	0.3541	0.1757	0.08644	0.05667	0.03281	0.02083	0.01479
550	3.797	1.897	0.7576	0.3777	0.1877	0.09270	0.06102	0.03566	0.02295	0.01657
600	4.028	2.013	0.8041	0.4011	0.1996	0.09886	0.06526	0.03838	0.02492	0.01818
650	4.259	2.129	0.8506	0.4245	0.2115	0.1049	0.06943	0.04102	0.02680	0.01969
700	4.490	2.244	0.8970	0.4478	0.2233	0.1110	0.07354	0.04359	0.02862	0.02113
750	4.721	2.360	0.9433	0.4711	0.2350	0.1170	0.07761	0.04613	0.03039	0.02252
800	4.952	2.476	0.9897	0.4944	0.2467	0.1229	0.08164	0.04862	0.03212	0.02387

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/m^3
- **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/)

Every property is calculated with IAPWS-IF97; the calculation reproduces the IF97 verification values exactly, and that check runs in the site tests. Interactive version, corrections and more charts: **allunitconversions.com/steam-tables**

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

allunitconversions.com/steam-tables-us
By Miguel Coelho · Edition 2.0
9 November 2026

BASIS	KEY RELATIONSHIP	READING THE TABLE	WORKED EXAMPLE
IAPWS-IF97, converted exactly: 1 BTU/lb = 2.326 kJ/kg; 1 BTU/(lb·°R) = 4.1868 kJ/(kg·K)	hfg = hg − hf; wet steam h = hf + x × hfg	psig = psia − 14.696; dryness x = (h − hf) ÷ hfg	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

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)
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
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

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)
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
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	—

T	1 psia	14.696 psia	50 psia	100 psia	150 psia	200 psia	300 psia	500 psia	1,000 psia	2,000 psia
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 (ft^3/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/m^3
- **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**

Pressure Conversion Chart

psi, kPa, bar, atm, Pa, MPa, mbar and Torr

For: Engineers, HVAC technicians, mechanics and cyclists

allunitconversions.com/pressure-conversion-chart
By Miguel Coelho · Edition 2.0
9 November 2026

EXACT DEFINITION	FORMULA	REVERSE	WORKED EXAMPLE
1 bar = 100 kPa; 1 atm = 101.325 kPa; 1 psi = 6.894 757 kPa	kPa = psi × 6.894 757	psi = kPa ÷ 6.894 757; psi = bar × 14.503 77	32 psi × 6.894757 = 220.6 kPa = 2.206 bar

Matrix values use 6 significant figures; tables are rounded as shown.

Factor matrix — 1 unit in every other unit

1 unit =	Pa	kPa	MPa	bar	mbar	atm	psi	Torr
1 Pa	1	0.001	1×10^{-6}	1×10^{-5}	0.01	9.86923×10^{-6}	1.45038×10^{-4}	0.00750062
1 kPa	1,000	1	0.001	0.01	10	0.00986923	0.145038	7.50062
1 MPa	1×10^{6}	1,000	1	10	10,000	9.86923	145.038	7,500.62
1 bar	100,000	100	0.1	1	1,000	0.986923	14.5038	750.062
1 mbar	100	0.1	1×10^{-4}	0.001	1	9.86923×10^{-4}	0.0145038	0.750062
1 atm	101,325	101.325	0.101325	1.01325	1,013.25	1	14.6959	760
1 psi	6,894.76	6.89476	0.00689476	0.0689476	68.9476	0.068046	1	51.7149
1 Torr	133.322	0.133322	1.33322×10^{-4}	0.00133322	1.33322	0.00131579	0.0193368	1

psi to kPa and bar (tyres, HVAC, hydraulics)

psi (psi)	Kilopascals (kPa)	Bar (bar)	psi (psi)	Kilopascals (kPa)	Bar (bar)	psi (psi)	Kilopascals (kPa)	Bar (bar)
1	6.9	0.069	**19**	131.0	1.310	**65**	448.2	4.482
2	13.8	0.138	**20**	137.9	1.379	**70**	482.6	4.826
3	20.7	0.207	**21**	144.8	1.448	**75**	517.1	5.171
4	27.6	0.276	**22**	151.7	1.517	**80**	551.6	5.516
5	34.5	0.345	**23**	158.6	1.586	**85**	586.1	5.861
6	41.4	0.414	**24**	165.5	1.655	**90**	620.5	6.205
7	48.3	0.483	**25**	172.4	1.724	**95**	655.0	6.550
8	55.2	0.552	**26**	179.3	1.793	**100**	689.5	6.895
9	62.1	0.621	**27**	186.2	1.862	**105**	723.9	7.239
10	68.9	0.689	**28**	193.1	1.931	**110**	758.4	7.584
11	75.8	0.758	**29**	199.9	1.999	**115**	792.9	7.929
12	82.7	0.827	**30**	206.8	2.068	**120**	827.4	8.274
13	89.6	0.896	**35**	241.3	2.413	**125**	861.8	8.618
14	96.5	0.965	**40**	275.8	2.758	**130**	896.3	8.963
15	103.4	1.034	**45**	310.3	3.103	**135**	930.8	9.308
16	110.3	1.103	**50**	344.7	3.447	**140**	965.3	9.653
17	117.2	1.172	**55**	379.2	3.792	**145**	999.7	9.997
18	124.1	1.241	**60**	413.7	4.137	**150**	1,034.2	10.342

bar to psi and kPa

Bar (bar)	psi (psi)	Kilopascals (kPa)	Bar (bar)	psi (psi)	Kilopascals (kPa)
0.5	7.25	50	**10.5**	152.29	1,050
1.0	14.50	100	**11.0**	159.54	1,100

Bar (bar)	psi (psi)	Kilopascals (kPa)
1.5	21.76	150
2.0	29.01	200
2.5	36.26	250
3.0	43.51	300
3.5	50.76	350
4.0	58.02	400
4.5	65.27	450
5.0	72.52	500
5.5	79.77	550
6.0	87.02	600
6.5	94.27	650
7.0	101.53	700
7.5	108.78	750
8.0	116.03	800
8.5	123.28	850
9.0	130.53	900
9.5	137.79	950
10.0	145.04	1,000

Bar (bar)	psi (psi)	Kilopascals (kPa)
11.5	166.79	1,150
12.0	174.05	1,200
12.5	181.30	1,250
13.0	188.55	1,300
13.5	195.80	1,350
14.0	203.05	1,400
14.5	210.30	1,450
15.0	217.56	1,500
15.5	224.81	1,550
16.0	232.06	1,600
16.5	239.31	1,650
17.0	246.56	1,700
17.5	253.82	1,750
18.0	261.07	1,800
18.5	268.32	1,850
19.0	275.57	1,900
19.5	282.82	1,950
20.0	290.08	2,000

Sources and method

- **BIPM SI Brochure, 9th edition** — Definitions of the SI units, including the kelvin (www.bipm.org/en/publications/si-brochure)
- **NIST Special Publication 811** — Guide for the Use of the International System of Units (www.nist.gov/pml/special-publication-811)

Conversion values on this sheet are generated by the AllUnitConversions conversion library and automatically checked against the exact definitions above before the PDF is produced; reference tables are taken from the sources listed. Interactive version, corrections and more charts: **allunitconversions.com/pressure-conversion-chart**

Fluid Volume and Flow Chart

US and UK liquid measures, fluid ounces and flow rates

For: Cooks, plumbers, pool and irrigation installers, and engineers

allunitconversions.com/fluid-conversion-chart
By Miguel Coelho · Edition 2.0
9 November 2026

EXACT DEFINITION	FORMULA	REVERSE	WORKED EXAMPLE
1 US gal = 3.785 411 784 L; 1 UK gal = 4.546 09 L; 1 US fl oz = 1/128 US gal	mL = US fl oz × 29.5735; mL = UK fl oz × 28.4131	L/min = US gpm × 3.785 41	A 10 US gpm pump = 37.85 L/min = 2.27 m³/h

Matrix values use 6 significant figures; tables are rounded as shown.

Factor matrix — 1 unit in every other unit

1 unit =	mL	L	US fl oz	US cup	US pt	US qt	US gal	UK gal
1 mL	1	0.001	0.033814	0.00422675	0.00211338	0.00105669	2.64172×10^{-4}	2.19969×10^{-4}
1 L	1,000	1	33.814	4.22675	2.11338	1.05669	0.264172	0.219969
1 US fl oz	29.5735	0.0295735	1	0.125	0.0625	0.03125	0.0078125	0.00650527
1 US cup	236.588	0.236588	8	1	0.5	0.25	0.0625	0.0520421
1 US pt	473.176	0.473176	16	2	1	0.5	0.125	0.104084
1 US qt	946.353	0.946353	32	4	2	1	0.25	0.208169
1 US gal	3,785.41	3.78541	128	16	8	4	1	0.832674
1 UK gal	4,546.09	4.54609	153.722	19.2152	9.6076	4.8038	1.20095	1

Fluid ounces to millilitres (US and UK)

Fluid ounces	mL (US fl oz)	mL (UK fl oz)
1	29.6	28.4
2	59.1	56.8
3	88.7	85.2
4	118.3	113.7
5	147.9	142.1
6	177.4	170.5
7	207.0	198.9
8	236.6	227.3
9	266.2	255.7
10	295.7	284.1
11	325.3	312.5
12	354.9	341.0
13	384.5	369.4
14	414.0	397.8
15	443.6	426.2
16	473.2	454.6

Fluid ounces	mL (US fl oz)	mL (UK fl oz)
17	502.8	483.0
18	532.3	511.4
19	561.9	539.8
20	591.5	568.3
21	621.0	596.7
22	650.6	625.1
23	680.2	653.5
24	709.8	681.9
25	739.3	710.3
26	768.9	738.7
27	798.5	767.2
28	828.1	795.6
29	857.6	824.0
30	887.2	852.4
31	916.8	880.8
32	946.4	909.2

Flow: litres per minute to gallons per minute and m³/h

Litres per minute (L/min)	US gallons per minute (US gpm)	UK gallons per minute (UK gpm)	Cubic metres per hour (m³/h)
1	0.26	0.22	0.06
2	0.53	0.44	0.12
5	1.32	1.10	0.30

Litres per minute (L/min)	US gallons per minute (US gpm)	UK gallons per minute (UK gpm)	Cubic metres per hour (m³/h)
60	15.85	13.20	3.60
75	19.81	16.50	4.50
100	26.42	22.00	6.00

Litres per minute (L/min)	US gallons per minute (US gpm)	UK gallons per minute (UK gpm)	Cubic metres per hour (m^3/h)
10	2.64	2.20	0.60
15	3.96	3.30	0.90
20	5.28	4.40	1.20
25	6.60	5.50	1.50
30	7.93	6.60	1.80
40	10.57	8.80	2.40
50	13.21	11.00	3.00

Litres per minute (L/min)	US gallons per minute (US gpm)	UK gallons per minute (UK gpm)	Cubic metres per hour (m^3/h)
150	39.63	33.00	9.00
200	52.83	43.99	12.00
250	66.04	54.99	15.00
300	79.25	65.99	18.00
400	105.67	87.99	24.00
500	132.09	109.98	30.00
1,000	264.17	219.97	60.00

US and UK measures compared

From	To	Multiply by
US fluid ounces (US fl oz)	UK fluid ounces (UK fl oz)	1.040843
US pints (US pt)	UK pints (UK pt)	0.8326742
US gallons (US gal)	UK gallons (UK gal)	0.8326742
Cubic feet (ft^3)	Litres (L)	28.31685
Cubic inches (in^3)	Cubic centimetres (cm^3)	16.38706
Cubic feet per minute (CFM)	Cubic metres per hour (m^3/h)	1.699011

Sources and method

- **NIST Special Publication 811** — Guide for the Use of the International System of Units (www.nist.gov/pml/special-publication-811)

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Temperature Conversion Chart

Celsius, Fahrenheit and Kelvin side by side

For: Students, scientists, engineers and cooks

allunitconversions.com/temperature-conversion-chart
By Miguel Coelho · Edition 2.0
9 November 2026

EXACT DEFINITION	FORMULA	REVERSE	WORKED EXAMPLE
K = °C + 273.15 and °F = °C × 9/5 + 32 (exact)	°F = (°C × 1.8) + 32; K = °C + 273.15	°C = (°F − 32) ÷ 1.8; °C = K − 273.15	25 °C = 77 °F = 298.15 K

Values are rounded to 2 decimal places.

−50 °C to 300 °C in 5-degree steps

Celsius (°C)	Fahrenheit (°F)	Kelvin (K)	Celsius (°C)	Fahrenheit (°F)	Kelvin (K)
−50	−58.0	223.15	**130**	266.0	403.15
−45	−49.0	228.15	**135**	275.0	408.15
−40	−40.0	233.15	**140**	284.0	413.15
−35	−31.0	238.15	**145**	293.0	418.15
−30	−22.0	243.15	**150**	302.0	423.15
−25	−13.0	248.15	**155**	311.0	428.15
−20	−4.0	253.15	**160**	320.0	433.15
−15	5.0	258.15	**165**	329.0	438.15
−10	14.0	263.15	**170**	338.0	443.15
−5	23.0	268.15	**175**	347.0	448.15
0	32.0	273.15	**180**	356.0	453.15
5	41.0	278.15	**185**	365.0	458.15
10	50.0	283.15	**190**	374.0	463.15
15	59.0	288.15	**195**	383.0	468.15
20	68.0	293.15	**200**	392.0	473.15
25	77.0	298.15	**205**	401.0	478.15
30	86.0	303.15	**210**	410.0	483.15
35	95.0	308.15	**215**	419.0	488.15
40	104.0	313.15	**220**	428.0	493.15
45	113.0	318.15	**225**	437.0	498.15
50	122.0	323.15	**230**	446.0	503.15
55	131.0	328.15	**235**	455.0	508.15
60	140.0	333.15	**240**	464.0	513.15
65	149.0	338.15	**245**	473.0	518.15
70	158.0	343.15	**250**	482.0	523.15
75	167.0	348.15	**255**	491.0	528.15
80	176.0	353.15	**260**	500.0	533.15
85	185.0	358.15	**265**	509.0	538.15
90	194.0	363.15	**270**	518.0	543.15
95	203.0	368.15	**275**	527.0	548.15
100	212.0	373.15	**280**	536.0	553.15
105	221.0	378.15	**285**	545.0	558.15
110	230.0	383.15	**290**	554.0	563.15

Celsius (°C)	Fahrenheit (°F)	Kelvin (K)
115	239.0	388.15
120	248.0	393.15
125	257.0	398.15

Celsius (°C)	Fahrenheit (°F)	Kelvin (K)
295	563.0	568.15
300	572.0	573.15

Reference points

Reference	Celsius (°C)	Fahrenheit (°F)	Kelvin (K)
Absolute zero	−273.15	−459.67	0
Celsius equals Fahrenheit	−40	−40	233.15
Water freezes	0	32	273.15
Room temperature	20	68	293.15
Body temperature	37	98.6	310.15
Water boils (sea level)	100	212	373.15

Sources and method

- **BIPM SI Brochure, 9th edition** — Definitions of the SI units, including the kelvin (www.bipm.org/en/publications/si-brochure)
- **NIST Special Publication 811** — Guide for the Use of the International System of Units (www.nist.gov/pml/special-publication-811)

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