Heat Conversion Chart

Heating and cooling capacity, heat energy and temperature scales

For: HVAC engineers, installers, energy auditors and students

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EXACT DEFINITION	FORMULA	REVERSE	WORKED EXAMPLE
1 BTU/h = 0.293 071 W; 1 RT = 12,000 BTU/h; 1 therm = 100,000 BTU	kW = BTU/h × 0.000 293 071	BTU/h = kW × 3,412.14	A 24,000 BTU/h heat pump = 7.03 kW = 2 RT

Capacities are rounded as shown. Rankine = (°C + 273.15) × 1.8.

Factor matrix — 1 unit in every other unit

1 unit =	J	kJ	kcal	Wh	kWh	BTU	thm
1 J	1	0.001	2.39006×10^{-4}	2.77778×10^{-4}	2.77778×10^{-7}	9.47817×10^{-4}	9.47817×10^{-9}
1 kJ	1,000	1	0.239006	0.277778	2.77778×10^{-4}	0.947817	9.47817×10^{-6}
1 kcal	4,184	4.184	1	1.16222	0.00116222	3.96567	3.96567×10^{-5}
1 Wh	3,600	3.6	0.860421	1	0.001	3.41214	3.41214×10^{-5}
1 kWh	3.6×10^{6}	3,600	860.421	1,000	1	3,412.14	0.0341214
1 BTU	1,055.06	1.05506	0.252164	0.293071	2.93071×10^{-4}	1	1×10^{-5}
1 thm	1.05506×10^{8}	105,506	25,216.4	29,307.1	29.3071	100,000	1

Air-conditioner and heat-pump sizes: BTU/h to kW

BTU per hour (BTU/h)	Kilowatts (kW)	Tons of refrigeration (RT)
5,000	1.47	0.42
6,000	1.76	0.50
7,000	2.05	0.58
8,000	2.34	0.67
9,000	2.64	0.75
10,000	2.93	0.83
12,000	3.52	1.00
14,000	4.10	1.17
15,000	4.40	1.25
18,000	5.28	1.50
21,000	6.15	1.75
24,000	7.03	2.00
30,000	8.79	2.50
36,000	10.55	3.00
42,000	12.31	3.50
48,000	14.07	4.00
60,000	17.58	5.00

Kilowatts to BTU/h (boilers, heaters)

Kilowatts (kW)	BTU per hour (BTU/h)
1	3,412
2	6,824
3	10,236
4	13,649
5	17,061
6	20,473
7	23,885
8	27,297
9	30,709
10	34,121
11	37,534
12	40,946
13	44,358
14	47,770
15	51,182
16	54,594
17	58,006
18	61,419
19	64,831
20	68,243
21	71,655
22	75,067
23	78,479
24	81,891
25	85,304
26	88,716
27	92,128
28	95,540
29	98,952
30	102,364
35	119,425
40	136,486
50	170,607

Temperature scales including Rankine

Celsius (°C)	Fahrenheit (°F)	Kelvin (K)	Rankine (°R)
−273.15	−459.67	0	0
−40	−40	233.15	419.67
0	32	273.15	491.67
20	68	293.15	527.67
37	98.6	310.15	558.27
100	212	373.15	671.67
200	392	473.15	851.67
300	572	573.15	1,031.67
500	932	773.15	1,391.67
1,000	1,832	1,273.15	2,291.67

Sources and method

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

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/heat-conversion-chart**