

# Reference Data

## Equivalents & Conversions

### Temperature Equivalents (°F and °C)

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-50	-58	95	203	240	464	385	725	530	986	675	1247	820	1508	965	1769
-45	-49	100	212	245	473	390	734	535	995	680	1256	825	1517	970	1778
-40	-40	105	221	250	482	395	743	540	1004	685	1265	830	1526	975	1787
-35	-31	110	230	255	491	400	752	545	1013	690	1274	835	1535	980	1796
-30	-22	115	239	260	500	405	761	550	1022	695	1283	840	1544	985	1805
-25	-13	120	248	265	509	410	770	555	1031	700	1292	845	1553	990	1814
-20	-4	125	257	270	518	415	779	560	1040	705	1301	850	1562	995	1823
-15	-5	130	266	275	527	420	788	565	1049	710	1310	855	1571	1000	1832
-10	14	135	275	280	536	425	797	570	1058	715	1319	860	1580	1005	1841
-5	23	140	284	285	545	430	806	575	1067	720	1328	865	1589	1010	1850
0	32	145	293	290	554	435	815	580	1076	725	1337	870	1598	1015	1859
5	41	150	302	295	563	440	824	585	1085	730	1346	875	1607	1020	1868
10	50	155	311	300	572	445	833	590	1094	735	1355	880	1616	1025	1877
15	59	160	320	305	581	450	842	595	1103	740	1364	885	1625	1030	1886
20	68	165	329	310	590	455	851	600	1112	745	1373	890	1634	1035	1895
25	77	170	338	315	599	460	860	605	1121	750	1382	895	1643	1040	1904
30	86	175	347	320	608	465	869	610	1130	755	1391	900	1652	1045	1913
35	95	180	356	325	617	470	878	615	1139	760	1400	905	1661	1050	1922
40	104	185	365	330	626	475	887	620	1148	765	1409	910	1670	1055	1931
45	113	190	374	335	635	480	896	625	1157	770	1418	915	1679	1060	1940
50	122	195	383	340	644	485	905	630	1166	775	1427	920	1688	1065	1949
55	131	200	392	345	653	490	914	635	1175	780	1436	925	1697	1070	1958
60	140	205	401	350	662	495	923	640	1184	785	1445	930	1706	1075	1967
65	149	210	410	355	671	500	932	645	1193	790	1454	935	1715	1080	1976
70	158	215	419	360	680	505	941	650	1202	795	1463	940	1724	1085	1985
75	167	220	428	365	689	510	950	655	1211	800	1472	945	1733	1090	1994
80	176	225	437	370	698	515	959	660	1220	805	1481	950	1742	1095	2003
85	185	230	446	375	707	520	968	665	1229	810	1490	955	1751	1100	2012
90	194	235	455	380	716	525	977	670	1238	815	1499	960	1760	1105	2021

### Values for Interpolation in Above Table

1°C = 1.8°F	6°C = 10.8°F	1°F = 0.55°C	6°F = 3.33°C
2°C = 3.6°F	7°C = 12.6°F	2°F = 1.11°C	7°F = 3.88°C
3°C = 5.4°F	8°C = 14.4°F	3°F = 1.66°C	8°F = 4.44°C
4°C = 7.2°F	9°C = 16.2°F	4°F = 2.22°C	9°F = 5°C
5°C = 9°F		5°F = 2.77°C	

### Formula for Converting Temperature Scales

Fahrenheit to Celsius	°F = 1.8°C + 32
Celsius to Fahrenheit	°C = 5/9 x (°F - 32)
Fahrenheit to Rankine (absolute)	°R = °F + 460
Celsius to Kelvin (absolute)	°K = °C + 273

**Note** — All decimals are exact. All decimals are repeating decimals.

### Pressure Equivalents

Unit	Lbs/In <sup>2</sup>	Kg/cm <sup>2</sup>	Atm	Bar	Pascals	mm Hg. (0°C)	In. Hg (32°F)	Ft H <sub>2</sub> O (60°F)
1 lbs/in <sup>2</sup>	1	0.0703	0.06804	0.06895	6,895	51.715	2.036	2.3086
1 kg/cm. <sup>2</sup>	14.22	1	0.9678	0.98066	98,066	735.56	28.96	32.843
1 Atmosphere (atm)	14.696	1.0333	1	1.01325	101,326	760	29.921	33.925
1 Bar	14.504	1.019716	0.9869	1	1 x 10 <sup>5</sup>	750.06	29.53	33.49
1 Pascal (N/m <sup>2</sup> )	14.5 x 10 <sup>-5</sup>	1.03 x 10 <sup>-5</sup>	1 x 10 <sup>-5</sup>	1 x 10 <sup>-5</sup>	1	7.5 x 10 <sup>5</sup>	0.000295	0.000335
1 mm Hg. (0°C)	0.01934	1.35951	0.1316	0.1333	13,330	1	0.03937	0.04465
1 in. Hg. (32°F)	0.4912	0.034532	0.03342	0.03386	3,386	25.4	1	1.1342
1 ft. H <sub>2</sub> O (60°F)	0.4331	0.03045	0.02947	0.02986	2,987	22.396	0.88175	1
100 ft H <sub>2</sub> O (60°F)	43.31	3.0448	2.9469	2.9859	298,700	2239.6	88.175	100

#### Notes —

- 1 inch of Hg (Mercury) = 13.6 inches of water.
- 1 pound per square inch (psi) = 2.31 feet of water.
- 1 foot of water = 0.4331 pounds per square inch (psi).

# Reference Data

## Engineering Constants & Conversions

### Common Conversion Factors

To Convert	Units	Multiply By	To Obtain	Units
Atmospheres	atm	1.0133	Bar	
Atmospheres	atm	29.92	Inches Mercury	in. Hg
Bar		0.9869	Atmospheres	atm
Bar		14.504	Pounds/square inch	psi
British thermal unit	Btu	1,055	Joules	J
British thermal unit	Btu	0.0002931	Kilowatts	kW
British thermal unit	Btu	0.2931	Watts	Wh
British thermal unit	Btu	0.252	Kilocalories	kcal
Brit. ther. units/hr	Btuh	0.2931	Joules/second	J/s
Brit. ther. units/hr	Btuh	0.2931	Watt/hours	Wh
Brit. ther. units/hr	Btuh	0.0002931	Kilowatt/hours	kWh
Brit. ther. units/ inch/hour/sqft°F	Btu/in/h/ft²°F	0.1442	Watts/meter°C	W/m°C
Brit. ther. units/hr	Btuh	0.252	Kilocalories/hour	kcal/h
Calories	cal	4.187	Joules	J
Centimeter	cm	0.03281	Feet	ft
Centimeter	cm	0.3937	Inches	in.
Centimeters/second	cm/s	1.969	Feet/minute	fpm
Cubic centimeter	cm³	0.061	Cubic inches	in³
Cubic feet	ft³	62.43	Pounds of water	lb
Cubic feet	ft³	28.32	Cubic centimeters	cm³
Cubic feet	ft³	0.02832	Cubic meters	m³
Cubic feet	ft³	7.481	Gallons, U.S.	gal
Cubic feet	ft³	28.32	Liters	l
Cubic feet/minute	cfm	1.699	Cubic meters/hour	m³/h
Cubic feet/minute	term	0.000472	Cubic meters/sec	m³/s
Cubic feet/minute	cfm	0.4719	Liters/second	l/s
Cubic inch	in³	16.39	Cubic centimeters	cm³
Cubic meter	m³	35.32	Cubic feet	ft³
Cubic meter	m³	264.2	Gallons, U.S.	gal
Cubic meter	m³	1,000	Liters	l
Cubic meters/hr	m³/h	0.5885	Cubic feet/min.	cfm
Cubic meters/hr	m³/h	4.403	Gallons/min.	gpm
Cubic meters/sec	m³/s	2,119	Cubic feet/min.	cfm
Feet	ft	30.48	Centimeters	cm
Feet	ft	0.3048	Meters	m
Feet/minute	fpm	0.508	Centimeters/sec.	cm/s
Feet/minute	fpm	0.00508	Meters/sec.	m/s
Gallon, Imperial		1.201	Gallons, U.S.	gal
Gallon, U.S.	gal	231	Cubic inches	in³
Gallon, U.S.	gal	0.1337	Cubic feet	ft³
Gallon, U.S.	gal	8.337	Pounds of water	lb
Gallon, U.S.	gal	0.8327	Gallon Imperial	
Gallon, U.S.	gal	3.785	Liters	l
Gallon, U.S.	gal	0.003785	Cubic meters	m³
Gallons/minute	gpm	0.2271	Cubic meters/hr	m³/h
Gallons/minute	gpm	0.06309	Liters/sec.	l/s
Grams	g	0.035274	Ounces	oz
Grams	g	0.002205	Pounds	lb
Grams/cu centimeter	g/cm³	1,000	Kilograms/cu meter	kg/m³
Grams/cu centimeter	g/cm³	62.43	Pounds/cubic foot	lb/ft³
Grams/cu centimeter	g/cm³	0.03613	Pounds/cubic inch	lb/in³
Horsepower	hp	0.7457	Kilowatts	kW
Horsepower	hp	2,545	British thermal units	Btu
Horsepower	hp	33,000	Foot-lbs/min	ft-lb/min
Horsepower, boiler	bhp	9.803	Kilowatts	kW
Horsepower, boiler	bhp	3,352	British ther. units/hr	Btuh
Inches	in.	2.54	Centimeters	cm
Inches	in.	25.4	Millimeters	mm
Inches Mercury	in. Hg	0.03342	Atmospheres	atm
Inches Mercury	in. Hg	0.03937	Torr	

### Common Conversion Factors

To Convert	Units	Multiply By	To Obtain	Units
Joules	J	0.000948	British thermal unit	Btu
Joules	J	0.2388	Calories	cal
Joules	J	0.0002778	Watt/hrs	Wh
Joules/second	J/s	1	Watts	W
Kilocalories/hour	kcal/h	3.969	British ther. units/hr	Btuh
Kilograms	kg	2.205	Pounds	lb
Kilo./cubic meter	kg/m³	0.001	Grams/cu centimeter	g/cm³
Kilo./cubic meter	kg/m³	0.06243	Pounds/cubic foot	lb/ft³
Kilograms/sq cm	kg/cm²	14.22	Pounds/square inch	psi
Kilojoule	kJ	0.2778	Watt/hrs	Wh
Kilometers/hour	km/h	0.6315	Miles/hr	mph
Kilopascal	kPa	0.145	Pounds/square inch	psi
Kilowatt/hours	kWh	3,412	British ther. units/hr	Btuh
Kilowatt	kW	3,412	British thermal units	Btu
Liter	l	0.03532	Cubic feet	ft³
Liter	l	0.001	Cubic meters	m³
Liter	l	0.2642	Gallon, U.S.	gal
Liters/second	l/s	2.119	Cubic feet/min.	cfm
Liters/second	l/s	15.85	Gallons/min.	gpm
Meter	m	3.281	Feet	ft
Meter	m	39.37	Inches	in.
Meters/second	m/s	196.9	Feet/min.	fpm
Miles/hour	mph	1.609	Kilometers/hr	km/h
Milliliter	ml	1	Cubic centimeters	cm³
Millimeter	mm	0.03937	Inches	in.
Newtons/sq meter	N/m²	0.000145	Pounds/square inch	psi
Ounce	oz	28.35	Grams	g
Pound	lb	453.6	Grams	g
Pound	lb	0.4536	Kilograms	kg
Pounds/cubic foot	lb/ft³	0.01602	Grams/cu centimeter	g/cm³
Pounds/cubic foot	lb/ft³	16.02	Kilograms/cu meter	kg/m³
Pounds/cubic inch	lb/in³	27.68	Grams/cu centimeter	g/cm³
Pounds/square inch	psi	0.06805	Atmospheres	atm
Pounds/square inch	psi	0.06895	Bar	
Pounds/square inch	psi	0.07031	Kilograms/sq cm	kg/cm²
Pounds/square inch	psi	6.895	Kilopascals	kPa
Pounds/square inch	psi	6.895	Newtons/sq meter	N/m²
Pounds/square inch	psi	51.71	Torr	
Square centimeters	cm²	0.001076	Square feet	ft²
Square centimeters	cm²	0.155	Square inches	in²
Square feet	ft²	929	Square centimeters	cm²
Square feet	ft²	0.0929	Square meters	m²
Square inches	in²	6.452	Square centimeters	cm²
Square meters	m²	10.76	Square feet	ft²
Torr		0.001316	Atmospheres	atm
Torr		25.4	Inches Mercury	in. Hg
Watt-hours	Wh	3,600	Joules	J
Watt-hours	Wh	3.412	British ther. units/hr	Btuh
Watt-hours	Wh	3.6	Kilojoules	kJ
Watt-hours	Wh	0.001	Kilowatt-hours	kWh
Watts	W	1	Joules/second	J/s
Watts	W	3.412	British thermal units	Btu
Watts	W	0.001	Kilowatts	kW
Watts/meter°C	W/m°C	6.934	British ther. units/ inch/hour/sqft°F	ft²°F
Watts/sq centimeter	W/cm²	6.452	Watts/square inch	W/in²
Watts/square inch	W/in²	0.155	Watts/sq centimeter	W/cm²
Yards	yd	0.944	Meters	m