

# SI Units and Conversion Factors

To Convert From	To	Multiply By
<b>ACCELERATION</b>		
feet per second per second	centimeters per second per second	30.480
	meters per second per second	0.30480
free fall (standard)	meters per second per second	9.8067
kilometers per hour per second	centimeters per second per second	27.778
	feet per second per second	0.9113
	meters per second squared	0.27778
<b>ANGULAR</b>		
circumferences	radians	6.283
degrees	grade	1.111
	radians	0.017453
degrees per second	radians per second	0.017453
	revolutions per minute	0.16667
	revolutions per second	0.0027778
minutes	radians	0.002909
radians	degrees (angular)	57.296
radians per second	degrees per second (angular)	57.296
	revolutions per minute	9.549
revolutions per minute	degrees per second	6
	radians per second	0.01472
<b>AREA</b>		
acres	square feet	43560
	square meters	4046.9
	hectares	0.40469
circular mils	square inches	0.000007854
hectares	acres	2.4710
	square feet	107639
	square meters	10000
square centimeters	square inches	0.1550
square feet	acres	0.000022956
	square meters	0.092903
square inches	square centimeters	6.4516
square kilometers	acres	247.10

To Convert From	To	Multiply By
	square miles	0.38610
square meters	acres	0.00024710
	square feet	10.764
square miles	acres	640
	square kilometers	2.590
square yards	acres	0.00020661
	square meters	0.83613
<b>CANDLEPOWER</b>		
foot candles	lumens per square meter	10.764
<b>CAPACITY, DISPLACEMENT</b>		
cubic inches per revolution	liters per revolution	0.01639
	milliliters per revolution	16.39
<b>DENSITY, MASS/VOLUME</b>		
grams per cubic centimeter	kilograms per cubic meter	0.001
	pounds per cubic inch	0.03613
	pounds per cubic foot	62.427
pounds-mass per cubic foot	kilograms per cubic meter	16.018
pounds per cubic foot	grams per cubic centimeter	0.016018
	kilograms per cubic meter	16.018
	pounds per cubic inch	0.0005787
pounds per cubic inch	grams per cubic centimeter	27.68
	kilograms per cubic meter	27.680
	newtons per meter	1728
<b>ENERGY AND WORK</b>		
British thermal units	joules	1055
British thermal units per second	watts	1.055
British thermal units per minute	horsepower	0.02358
	watts	17.58
British thermal units per hour	watts	0.2931
calories	British thermal units	0.0039683
	foot-pounds	3.088
	joules	4.1868
	kilogram-meters	0.4265
	watt-hours	0.001163
ergs	joules	0.0000001
foot-pounds-force		0.001285
	British thermal units	

To Convert From	To	Multiply By
	calories	0.3238
	horsepower hours	0.0000005050
	joules	1.3558
	kilocalories	0.0003238
	kilogram-force meters	0.13825
	kilowatt hours	0.0000003766
horsepower	British thermal units per minute	42.43
	foot-pounds-force per minute	33000
	foot-pounds-force per second	550
	kilocalories per minute	10.69
	kilowatts	0.7457
	horsepower (metric)	1.0139
	watts	745.7
horsepower-boiler	British thermal units per horse	33479
	kilowatts	9.8095
	pounds of water evaporated per hour at 212°F	34.5
horsepower hours	British thermal units	2.545
	foot-pounds-force	1980000
	joules	2684500
	kilocalories	641.5
	kilogram-force meters	273200
	kilowatt hours	0.7457
joules	British thermal units	0.0009484
	calories	0.2390
	foot-pounds-force	0.73756
	watt-hours	0.00027778
kilowatts	British thermal units per minute	56.92
	foot-pounds-force per minute	44254
	foot-pounds-force per second	737.6
	horsepower	1.3410
	kilocalories per minute	14.34
kilowatt hours	British thermal units	3413
	foot-pounds-force	2655000
	horsepower hours	1.3410
	joules	3.600000
	kilocalories	860
	kilograms-force meters	367100
pounds-force	kilograms-force	0.45359
	newtons	4.4482
tons of refrigeration	British thermal units per hour	12000
	British thermal units per 24 hours	288000

To Convert From	To	Multiply By
watts	British thermal units per minute	0.05691
	foot-pounds-force per second	0.73756
	foot-pounds-force per minute	44.254
	horsepower	0.0013410
	joules per second	1.0
	kilocalories per minute	0.014340
watt-hours	British thermal units	3.413
	foot-pounds-force	2665
	horsepower hours	0.0013410
	joules	3600
	kilocalories	0.8604
	kilograms-force-meters	367.10

There are several definitions of the Btu, and the values of applicable and/or equivalent factors may vary slightly depending on the definition used. For this reason, three or four significant figures are given on this page, and in most cases provide a value near to most definitions of the Btu. However, as always in making calculations of high accuracy, one should reference the appropriate lists and handbooks of standards.

#### ENERGY/AREA TIME

Btu/cubic feet second	watts per square meter	11348
Btu/cubic feet hour	watts per square meter	3.1525

#### FLOW RATE MASS

pounds per minute	kilograms per minute	0.4536
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#### FLOW RATE VOLUME

cubic feet per minute	cubic centimeters per second	471.9
	cubic meters per second	0.0004719
	cubic meters per hour	1.699
	liters per second	0.4719
	gallons (US) per second	0.2247
	pounds of water per minute (at 68°F)	62.32
cubic feet per second	cubic meters per second	0.028317
	cubic meters per minute	1.699
	cubic meters per hour	101.9
	gallons (US) per minute	448.8
	gallons (imp) per hour	646315
	liters	28.32
cubic meters per hour	cubic meters per minute	0.016667
	cubic meters per second	0.00027778
	gallons (US) per minute	4.4033
	liters per second	0.27778
cubic meters per second	cubic meters per hour	3600

To Convert From	To	Multiply By
	gallons (US) per minute	15850
gallons (US) per minute	cubic meters per second	0.000063090
	cubic meters per minute	0.0037854
	cubic meters per hour	0.2771
	cubic feet per second	0.002228
	cubic feet per hour	8.021
	liters per second	0.06309
	liters per minute	cubic feet per second
liters per second		0.01667
gallons (US) per second		0.004403
gallons (US) per minute		0.26418
gallons (imp) per minute		0.003666
liters per second	cubic meters per second	0.001
	cubic meters per minute	0.06
	cubic meters per hour	3.600
	liters per minute	60
	gallons (US) per minute	15.85
	gallons (imp) per minute	13.20
pounds of water per minute at 60°F	cubic centimeters per second	7.5667
	cubic feet per second	0.0002675
	cubic meters per minute	0.00045398
	kilograms per second	0.0075599
standard cubic feet per minute	cubic meters per hour at STP	1.6957
	liters per second at STP	0.47103
stokes	square feet per second	0.001076
	square meters per second	0.0001
tons (short) of water per 24 hours at 60°	cubic feet per hour	1.338
	cubic meters per hour	0.03789
	gallons (US) per minute	0.1668
	pounds of water per hour	83.333
<b>FORCE</b>		
dynes	newtons	0.00001
grams-force	newtons	0.0098066
kilograms-force	newtons	9.8066
	pounds-force	2.2046
kiloponds	newtons	9.807
	kilograms-force	1
	pounds-force	2.2046
	poundals	70.932
	kips	0.002205

To Convert From	To	Multiply By
grams-force per centimeter	newtons per meter	98.07
	pounds-force per inch	0.005600
kilograms-force per meter	newtons	9.8066
	pounds-force per foot	0.6721
newtons	dynes	100000
	kilograms-force	0.10197
	poundals	7.2330
	pounds-force	0.2248
poundals	newtons	0.13826
pounds-force	newtons	4.448

### LENGTH

centimeters	inches	0.3937
fathoms	feet	6
	meters	1.8288
feet	centimeters	30.480
	inches	12
	meters	0.30480
	yards	0.3333
inches	centimeters	2.540
	meters	0.02540
	millimeters	25.40
	micrometers	25.4
kilometers	feet	3280.8
	miles	0.62137
meters	feet	3.2808
	inches	39.370
	yards	1.0936
micrometers	meters	0.000001
millimeters	inches	0.039370
mills	millimeters	0.0254
miles	feet	5280
	kilometers	1.6093
	meters	1609.3
	yards	1760
statute miles	kilometers	1.609
yards	meters	0.91440

### MASS/WEIGHT

To Convert From	To	Multiply By
drams (avoir)	grains	27.344
	grams	1.7718
	ounces	0.0625
grains	grams	0.0648
	ounces (avoir)	0.0022857
grams	grains	15.432
	ounces (avoir)	0.035274
	pounds (avoir)	0.0022046
kilograms	pounds	2.2046
	tons (short)	0.0011023
metric tons (tonnes)	kilograms	1000
	pounds	2204.6
ounces (avoir)	drams (avoir)	16
	grains	437.5
	grams	28.3495
	kilograms	0.028350
	pounds-avoir	0.06250
	tons (long)	0.00002790
	metric tons	0.000028350
pounds (avoir)	drams (avoir)	256
	grains	7000
	grams	453.59
	kilograms	0.45359
	ounces (avoir)	16
	metric tons	0.00045359
	tons (long)	0.00044643
	tons (short)	0.0005
tons (long)	kilograms	1016.0
	metric tons	1.0160
	pounds-avoir	2240
	tons (short)	1.120
tons (short)	kilograms	907.18
	pounds-avoir	2000
	tons (long)	0.89286
	metric tons	0.9072
short ton	metric ton/tonne	0.9072

### POWER

Btu/hour	watt	0.2931
Btu/second	watt	1055

To Convert From	To	Multiply By
Horsepower	kilowatt	0.746

### PRESSURE AND STRESS

atmosphere	bars	1.01325
	centimeters of mercury at 32F	76.0
	feet of water at 68F	33.96
	inches of mercury at 32F	29.921
	kilograms-force per square centimeter	1.0332
	kilograms-force per square meter	103322
	kilopascals	101.325
	pounds-force per square inch	14.696
	tons-force (short) per square foot	1.0581
	torr	760
bars	kilopascals	100
centimeters of mercury	atmospheres	0.013158
	bars	0.01333
	feet of water at 68°F	0.4468
	inches of water at 68°F	5.362
	kilograms-force per square centimeter	0.19337
	pounds-force per square inch	27.85
	torr	10
feet of water (at 68°F)	atmospheres	0.02945
	bars	0.02984
	inches of mercury (at 0°C)	0.8811
	kilograms-force per square centimeter	0.03042
	kilopascals	2.984
	pounds-force per square inch	0.4328
	pounds-force per square foot	62.32
inches of mercury at 0°C	atmospheres (standard)	0.00342
	bars	0.033864
	feet of water at 68°F	1.135
	inches of water at 68°F	13.62
	kilograms-force per square centimeter	0.034532
	kilograms-force per square meter	345.32
	kilopascals	3.3864
	millimeters of mercury	25.40
	pounds-force per square foot	70.73
	pounds-force per square inch	0.4912
inches of water at 68°F	atmosphere	0.002454
	bars	0.002487
	inches of mercury	0.07342
	kilograms-force per square centimeter	0.002535
	kilopascals	0.2487

To Convert From	To	Multiply By
	ounces-force per square inch	0.5770
	pounds-force per square foot	5.193
	pounds-force per square inch	0.03606
kilograms-force per square centimeter	atmospheres	0.9678
	bars	0.98066
	feet of water at 68°F	32.87
	inches of mercury at 0°C	28.96
	kilopascals	98.066
	pounds-force per square foot	2048
	pounds-force per square inch	14.223
kilograms-force per square millimeter	kilograms-force per square meter	1000000
	megapascals	9.8066
kilograms per square meter	pascals	9.807
kilopascals	dynes per square centimeter	10000
	feet of water at 68°F	0.3351
	inches of mercury at 32°F	0.2953
	inches of water at 68°F	4.021
	kilograms-force per square centimeter	0.010197
	pascals	1000
	pounds-force per square inch	0.1450
kips per square inch	kilopascals	6894.8
	kilograms-force per square centimeter	70.307
	bars	68.94
	pounds per square inch	1000
megapascals	kilograms-force per square millimeter	0.10197
	kilograms-force per square centimeter	10.197
	kilopascals	1000
	pascals	1000000
	pounds-force per square inch	145.0
millibars	pascals	100
millimeters of mercury at 0°C	bars	0.0013332
	feet of water at 68°F	0.004680
	inches of mercury	0.03937
	inches of water at 68°F	0.53616
	kilograms per square centimeter	0.0013595
	pascals	133.32
	pounds per square inch	0.0193368
ounces-force per square inch	grams-force per square centimeter	4.395
	pascals	43.1
	pounds-force per square inch	0.06250

To Convert From	To	Multiply By
pascals	bars	0.00001
	dynes per square centimeter	10.0
	grams-force per square centimeter	0.010197
	kilograms-force per square centimeter	0.000010197
	kilopascals	0.001
	newtons per square meter	1.0
	pounds-force per square inch	0.0001450
poise	centipoises	100
	pascal-seconds	0.1000
	pound-force-seconds per square foot	0.0020886
	pounds per foot-second	0.06721
	pounds-force per square foot	feet of water at 68°F
kilograms-force per square centimeter		0.0004882
kilopascals		0.0047880
pascals		47.880
pounds-force per square inch		0.0069444
pounds-force per square inch		atmospheres
	feet of water at 68°F	2.311
	inches of water at 68°F	27.73
	inches of mercury at 0°F	2.036
	kilograms force per square centimeter	0.07031
	kilopascals	6.8948
	pounds per square foot	4.8824
pounds per square inch	pascals	6895
	kilopascals	6.895
	megapascals	0.006895

### THERMAL CONDUCTIVITY

Btu · inch · hour · feet <sup>2</sup> · °F	watt per meter <sup>2</sup> · °K	0.1442
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### TORQUE: BENDING MOMENT

pound feet	newton meters	1.356
kilogram meters	newton meters	9.807

### VELOCITY

centimeters per second	feet per second	0.03281
	feet per minute	1.9685
	miles per hour	0.02237
	kilometers per hour	0.03600
	meters per minute	0.60000
feet per minute	centimeters per second	0.5080
	kilometers per hour	0.01829

To Convert From	To	Multiply By
	meters per minute	0.30480
	meters per second	0.00508
	miles per hour	0.01136
feet per second	centimeters per second	30.480
	kilometers per hour	1.097
	meters per minute	18.29
	meters per second	0.30480
	miles per hour	0.6818
international knots	meters per second	0.5144
	miles per hour	1.1516
kilometers per hour	centimeters per second	27.778
	feet per second	0.9113
	feet per minute	54.68
	international knots	0.53996
	meters per minute	16.667
	meters per second	0.27778
	miles per hour	0.6214
kilometers per second	miles per minute	37.28
meters per minute	centimeters per second	1.6667
	feet per minute	3.2808
	feet per second	0.05468
	kilometers per hour	0.0600
	miles per hour	0.03728
meters per second	feet per minute	196.8
	feet per second	3.281
	kilometers per hour	3.600
	kilometers per minute	0.0600
	miles per hour	2.237
	miles per minute	0.03728
miles per hour	centimeters per second	44.70
	feet per minute	88
	feet per second	1.4667
	international knots	0.8690
	kilometers per hour	1.6093
	meters per minute	26.82
<b>VOLUME</b>		
acre-feet	cubic feet	43.560
	gallons (US)	325851
	cubic meters	1233.5
barrels (US liquid)	gallons (US)	31.5

To Convert From	To	Multiply By
barrels (oil)	cubic meters	0.11924
	gallons of oil	42
	cubic meters	0.15899
cubic centimeters	cubic inches	0.06102
	cubic feet	0.000035315
	cubic yards	0.000001308
	gallons (US)	0.0002642
	gallons (imp)	0.00022
	liters	0.001
	cubic feet	cubic centimeters
cubic meters		0.028317
cubic inches		1728
cubic yards		0.03704
gallons (US)		7.4805
gallons (imp)		6.229
liters		28.32
cubic inches	cubic centimeters	16.387
	cubic feet	0.0005787
	cubic meters	0.000016387
	cubic yards	0.00002143
	gallons (US)	0.004329
	gallons (imp)	0.03605
	liters	0.016387
cubic meters	cubic inches	61024
	cubic feet	35.315
	cubic yards	1.3080
	gallons (US)	264.17
	gallons (imp)	219.97
	liters	1000
cubic yards	cubic centimeters	764550
	cubic feet	27
	cubic inches	46.656
	cubic meters	0.76455
	gallons (US)	201.97
	gallons (imp)	168.17
	liters	764.55
fluid ounces (US)	cubic inches	1.8046
	liters	0.02957
gallons (imp)	cubic centimeters	4546.1
	cubic meters	0.0045461
	cubic feet	0.16054
	cubic yards	0.005946

To Convert From	To	Multiply By
gallons (US)	gallons (US)	1.20094
	liters	4.5461
	pounds of water at 62°F	10.000
	cubic centimeters	3785.4
	cubic meters	0.0037854
	cubic inches	231
	cubic feet	0.13368
	cubic yards	0.0049515
	pints (liquid)	8
	quarts (liquid)	4
	gallons (imp)	0.8327
	liters	3.7854
	pounds of water at 60°F	8.338
	liters	cubic centimeters
cubic feet		0.035315
cubic inches		61.024
cubic meters		0.001
cubic yards		0.001308
gallons (US)		0.26418
gallons (imp)		0.2200
pounds-mass of water at 60°F		cubic centimeters
	cubic feet	0.01603
	cubic inches	27.70
	gallons (US)	0.11993
	liters	0.45398
	quarts (dry)	cubic centimeters
cubic inches		67.20
cubic meters		0.0011012
quarts (liquid)	cubic centimeters	946.35
	cubic inches	57.75
	liters	0.94635
<b>WATER HARDNESS</b>		
grains per gallon (imp)	grams per cubic meter	14.25
	kilograms per cubic meter	0.01425
	parts per million by weight in water	14.25
grains per gallon (US)	grams per cubic meter	17.118
	kilograms per cubic meter	0.017118
	parts per million by weight in water	17.118
	pounds per million gallons	142.9
grains per liter	grains per US gallon	58.417
	parts per million by mass weight in water	1000

To Convert From

To

Multiply By

pounds per cubic foot

0.0622427

pounds per 1000 gallons (US)

8.3544

milligrams per liter

parts per million

1.0

parts per million by mass

grains per gallon (US) at 60°F

0.0583

grains per gallon (imp) at 62°F

0.0700

grams per cubic meter at 15°C

0.9991

milligrams per liter

1.0

pounds per million gallons (US) at 60°F

8.328