

## Electrical Conversion Chart

### Power Conversions

Common conversions between different units of electrical power.

Power Unit	Equivalent in Watts (W)	Equivalent in Kilowatts (kW)	Equivalent in Horsepower (hp)
1 Watt (W)	1 W	0.001 kW	0.00134 hp
1 Kilowatt (kW)	1,000 W	1 kW	1.34 hp
1 Horsepower (hp)	746 W	0.746 kW	1 hp
1 Megawatt (MW)	1,000,000 W	1,000 kW	1,340 hp
1 BTU/hour	0.293 W	0.000293 kW	0.000393 hp

### Energy Conversions

Common conversions between different units of electrical energy.

Energy Unit	Equivalent in Joules (J)	Equivalent in Watt-hours (Wh)	Equivalent in Kilowatt-hours (kWh)
1 Joule (J)	1 J	0.00028 Wh	$2.78 \times 10^{-7}$ kWh

1 Watt-hour (Wh)	3,600 J	1 Wh	0.001 kWh
1 Kilowatt-hour (kWh)	3,600,000 J	1,000 Wh	1 kWh
1 Megajoule (MJ)	1,000,000 J	277.78 Wh	0.278 kWh
1 BTU	1,055 J	0.293 Wh	0.000293 kWh

## Voltage, Current, and Resistance Relationships

Common relationships based on Ohm's Law ( $V = IR$ ) and Power ( $P = VI$ ).

$$V = I \times R$$

$$I = V \div R$$

$$R = V \div I$$

$$P = V \times I$$

$$P = I^2 \times R$$

$$P = V^2 \div R$$

Voltage (V)	Current (A)	Resistance ( $\Omega$ )	Power (W)
120 V	10 A	12 $\Omega$	1,200 W
230 V	5 A	46 $\Omega$	1,150 W
12 V	2 A	6 $\Omega$	24 W
5 V	1 A	5 $\Omega$	5 W
48 V	20 A	2.4 $\Omega$	960 W

## Common Appliance Power Ratings

Appliance	Typical Power (W)	Typical Power (kW)	Energy per Hour (kWh)
LED Light Bulb	10 W	0.01 kW	0.01 kWh
Laptop Computer	50 W	0.05 kW	0.05 kWh
Refrigerator	150 W	0.15 kW	0.15 kWh
Microwave Oven	1,200 W	1.2 kW	1.2 kWh
Electric Kettle	1,500 W	1.5 kW	1.5 kWh
Air Conditioner (Window)	1,200 W	1.2 kW	1.2 kWh
Electric Water Heater	4,000 W	4 kW	4 kWh

## Conversion Formulas

### Power Conversions:

- Watts to Kilowatts:  $\text{kW} = \text{W} \div 1,000$
- Kilowatts to Watts:  $\text{W} = \text{kW} \times 1,000$
- Watts to Horsepower:  $\text{hp} = \text{W} \div 746$
- Horsepower to Watts:  $\text{W} = \text{hp} \times 746$
- Kilowatts to Horsepower:  $\text{hp} = \text{kW} \times 1.34$
- Horsepower to Kilowatts:  $\text{kW} = \text{hp} \times 0.746$

### Energy Conversions:

- Joules to Watt-hours:  $\text{Wh} = \text{J} \div 3,600$
- Watt-hours to Joules:  $\text{J} = \text{Wh} \times 3,600$
- Watt-hours to Kilowatt-hours:  $\text{kWh} = \text{Wh} \div 1,000$

- Kilowatt-hours to Watt-hours:  $Wh = kWh \times 1,000$
- Energy (kWh) = Power (kW)  $\times$  Time (hours)
- Energy (Wh) = Power (W)  $\times$  Time (hours)

## International Voltage Standards

Region	Residential Voltage	Frequency
North America	120 V	60 Hz
Europe, Asia, Africa, Australia	230 V	50 Hz
United Kingdom	230 V	50 Hz
Japan	100 V	50/60 Hz

*Note: For AC circuits, apparent power (VA) and real power (W) differ by the power factor (PF), where  $W = VA \times PF$ .*

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This chart is for reference only. For precise calculations, consider factors like efficiency, power factor, and tolerance.