Since 1972

Percent of Rated Wattage for Various Applied Voltages

Applied Voltage	Rated Voltage														Applied Voltage
	110	115	120	208	220	230	240	277	380	415	440	460	480	550	
110	100%	91%	84%	28%	25%	23%	21%	16%	8.4%	7%	6.3%	5.7%	5.3%	4%	110
115	109%	100%	92%	31%	27%	25%	23%	17%	9.2%	7.7%	6.8%	6.3%	5.7%	4.4%	115
120	119%	109%	100%	33%	30%	27%	25%	19%	10%	8.4%	7.4%	6.8%	6.3%	4.8%	120
208			300%	100%	89%	82%	75%	56%	30%	25%	22%	20%	19%	14%	208
220				112%	100%	91%	84%	63%	34%	28%	25%	23%	21%	16%	220
230				122%	109%	100%	92%	69%	37%	31%	27%	25%	23%	17%	230
240				133%	119%	109%	100%	75%	40%	33%	30%	27%	25%	19%	240
277						133%		100%	53%	45%	40%	36%	33%	25%	277
380								188%	100%	84%	75%	68%	63%	48%	380
415									119%	100%	89%	81%	75%	57%	415
440										112%	100%	91%	84%	64%	440
460										123%	109%	100%	92%	70%	460
480											119%	109%	100%	76%	480
550											156%	143%	131%	100%	550

To determine the resultant wattage on a voltage not shown in the chart above, use the following formula:

$$\text{Actual Wattage} = \frac{\text{Rated Wattage} \times (\text{Applied Voltage})^2}{(\text{Rated Voltage})^2}$$

CAUTION Applying higher than the actual rated voltage to heating elements will increase the watt density (watts/in.sq.), which can lead to premature heater failure and/or damage the material being heated.

Watt Density Calculations

Band Heaters

$$\text{Watts/In}^2 = \frac{\text{Wattage}}{(\text{Diameter} \times 3.1416 \times \text{Width}) - (\text{Cold Area})}$$

Cartridge and Tubular Heaters

$$\text{Watts/In}^2 = \frac{\text{Wattage}}{\text{Diameter} \times 3.1416 \times \text{Heated Length}}$$

Mica Strip Heaters

$$\text{Watts/In}^2 = \frac{\text{Wattage}}{\text{Heated Length} \times \text{Width}}$$

Channel Strip Heaters

$$\text{Watts/In}^2 = \frac{\text{Wattage}}{\text{Heated Length} \times 3.625}$$

Ohm's Law

Volts

$$\text{Volts} = \sqrt{\text{Watts} \times \text{Ohms}}$$

$$\text{Volts} = \frac{\text{Watts}}{\text{Amperes}}$$

$$\text{Volts} = \text{Amperes} \times \text{Ohms}$$

Ohms

$$\text{Ohms} = \frac{\text{Volts}}{\text{Amperes}}$$

$$\text{Ohms} = \frac{\text{Watts}}{\text{Amperes}^2}$$

$$\text{Ohms} = \frac{\text{Volts}^2}{\text{Watts}}$$

Ohm's Law wheel: $\sqrt{WR}$, $\frac{W}{I}$, IR, $\frac{E}{I}$, $\frac{W}{I^2}$, $\frac{E^2}{W}$, $\frac{E^2}{R}$, I^2R, EI, $\frac{W}{E}$, $\sqrt{\frac{W}{R}}$, $\frac{E}{R}$ — E (Volts), I (Amps), R (Ohms), W (Watts)

Amperes

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

$$\text{Amperes} = \sqrt{\frac{\text{Watts}}{\text{Ohms}}}$$

$$\text{Amperes} = \frac{\text{Watts}}{\text{Volts}}$$

Watts

$$\text{Watts} = \text{Volts} \times \text{Amperes}$$

$$\text{Watts} = \text{Amps}^2 \times \text{Ohms}$$

$$\text{Watts} = \frac{\text{Volts}^2}{\text{Ohms}}$$