



calculatoratoz.com



unitsconverters.com

Heat Input in Welding Formulas

Calculators!

Examples!

Conversions!

Bookmark calculatoratoz.com, unitsconverters.com

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

[Please leave your feedback here...](#)



List of 11 Heat Input in Welding Formulas

Heat Input in Welding

1) Heat required to Melt Joint

$$fx \quad H_{req} = M_{fp} \cdot ((C_p \cdot \Delta T_{rise}) + L_f)$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$ex \quad 8.0475KJ = 0.5kg \cdot ((1.005kJ/kg \cdot K \cdot 16K) + 15J/kg)$$

2) Heat Transfer Efficiency

$$fx \quad \alpha = \frac{h_{net}}{H}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$ex \quad 0.950119 = \frac{20KJ}{21.05KJ}$$

3) Melting Efficiency

$$fx \quad \beta = \frac{H_{req}}{h_{net}}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$ex \quad 0.402375 = \frac{8.0475KJ}{20KJ}$$



4) Net Heat per Unit Volume available for Arc Welding

$$fx \quad h_v = \frac{P_{in}}{v \cdot A}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 167.2727J/m^3 = \frac{46W}{5.5mm/s \cdot 50m^2}$$

5) Net Heat Supplied to Joint

$$fx \quad h_v = \alpha \cdot EP \cdot \frac{I}{\beta \cdot v \cdot A}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 167.2405J/m^3 = 0.95 \cdot 20.22V \cdot \frac{.9577A}{0.4 \cdot 5.5mm/s \cdot 50m^2}$$

6) Power given Electric Current and Resistance

$$fx \quad P = I^2 \cdot R$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 17.23857W = (.9577A)^2 \cdot 18.7950\Omega$$


7) Power given Electric Potential Difference and Electric Current

$$fx \quad P = \Delta V \cdot I$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 17W = 17.75086V \cdot .9577A$$



8) Power given Electric Potential Difference and Resistance 

$$fx \quad P = \frac{\Delta V^2}{R}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 16.76473W = \frac{(17.75086V)^2}{18.7950\Omega}$$

9) Rated Duty Cycle given Actual Duty Cycle 

$$fx \quad D_{rated} = D_{req} \cdot \left(\frac{I_{max}}{I_r} \right)^2$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)


$$ex \quad 1.016296 = 0.42 \cdot \left(\frac{7A}{4.5A} \right)^2$$

10) Required Duty cycle for arc welding 

$$fx \quad D_{req} = D_{rated} \cdot \left(\frac{I_r}{I_{max}} \right)^2$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 0.417398 = 1.01 \cdot \left(\frac{4.5A}{7A} \right)^2$$

11) Total heat generated in resistance welding 

$$fx \quad H = k \cdot i_o^2 \cdot R \cdot t$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 21.05013KJ = 0.84655 \cdot (0.7A)^2 \cdot 18.7950\Omega \cdot 0.75h$$



Variables Used













- **A** Area (Square Meter)
- **C_p** Specific Heat Capacity at Constant Pressure (Kilojoule per Kilogram per K)
- **D_{rated}** Rated Duty Cycle
- **D_{req}** Required Duty Cycle
- **EP** Electrode Potential (Volt)
- **H** Heat Generated (Kilojoule)
- **h_{net}** Net Heat Supplied (Kilojoule)
- **H_{req}** Heat Required (Kilojoule)
- **h_v** Heat Required Per Unit Volume (Joule per Cubic Meter)
- **I** Electric Current (Ampere)
- **I_{max}** Maximum Current New Add (Ampere)
- **i_o** Input Current (Ampere)
- **I_r** Rated Current (Ampere)
- **k** Constant to Account for Heat Losses
- **L_f** Latent Heat of Fusion (Joule per Kilogram)
- **M_{fp}** Mass in Flight Path (Kilogram)
- **P** Power (Watt)
- **P_{in}** Input Power (Watt)
- **R** Resistance (Ohm)
- **β** Melting Efficiency
- **t** Time (Hour)




- **v** Travel Speed of Electrode (Millimeter per Second)
- **α** Heat Transfer Efficiency
- **ΔT_{rise}** Rise in Temperature (Kelvin)
- **ΔV** Electric Potential Difference (Volt)



Constants, Functions, Measurements used

- **Measurement: Weight** in Kilogram (kg)
Weight Unit Conversion 
- **Measurement: Time** in Hour (h)
Time Unit Conversion 
- **Measurement: Electric Current** in Ampere (A)
Electric Current Unit Conversion 
- **Measurement: Temperature** in Kelvin (K)
Temperature Unit Conversion 
- **Measurement: Area** in Square Meter (m²)
Area Unit Conversion 
- **Measurement: Speed** in Millimeter per Second (mm/s)
Speed Unit Conversion 
- **Measurement: Energy** in Kilojoule (KJ)
Energy Unit Conversion 
- **Measurement: Power** in Watt (W)
Power Unit Conversion 
- **Measurement: Electric Resistance** in Ohm (Ω)
Electric Resistance Unit Conversion 
- **Measurement: Electric Potential** in Volt (V)
Electric Potential Unit Conversion 
- **Measurement: Specific Heat Capacity** in Kilojoule per Kilogram per K (kJ/kg*K)
Specific Heat Capacity Unit Conversion 
- **Measurement: Latent Heat** in Joule per Kilogram (J/kg)
Latent Heat Unit Conversion 



- **Measurement: Energy Density** in Joule per Cubic Meter (J/m^3)
Energy Density Unit Conversion 



Check other formula lists

- [Distortion in Weldments Formulas](#) 
- [Heat Flow in Welded Joints Formulas](#) 
- [Heat Input in Welding Formulas](#) 

Feel free to SHARE this document with your friends!

PDF Available in

[English](#) [Spanish](#) [French](#) [German](#) [Russian](#) [Italian](#) [Portuguese](#) [Polish](#) [Dutch](#)

6/19/2024 | 9:48:04 AM UTC

[Please leave your feedback here...](#)

