calculatoratoz.com

unitsconverters.com

Conduction, Convection and Radiation 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 13 Conduction, Convection and Radiation Formulas

Conduction, Convection and Radiation

1) Black Bodies Heat Exchange by Radiation

Open Calculator

$$q = \varepsilon \cdot [\text{Stefan-BoltZ}] \cdot A_{cs} \cdot \left(T_1^4 - T_2^4\right)$$

$$77.70409\,\text{W/m}^2 = 0.95 \cdot [\text{Stefan-BoltZ}] \cdot 41\,\text{m}^2 \cdot \left((101.01\,\text{K})^4 - (91.114\,\text{K})^4\right)$$

2) Convective Processes Heat Transfer Coefficient

Open Calculator

$$q = h_t \cdot (T_w - T_{aw})$$

$$77.70048\,\text{W/m}^2 = 13.2\,\text{W/m}^2\text{*K} \cdot (305\,\text{K} - 299.1136\,\text{K})$$

3) Critical Thickness of Insulation for Cylinder

Open Calculator

$$r_c = \frac{k_o}{h_t}$$

$$0.771212\,\text{m} = \frac{10.18\,\text{W/(m*K)}}{13.2\,\text{W/m}^2\text{*K}}$$

4) Heat Exchange by Radiation due to Geometric Arrangement

Open Calculator

$$q = \varepsilon \cdot A_{cs} \cdot [\text{Stefan-BoltZ}] \cdot SF \cdot \left(T_1^4 - T_2^4\right)$$

$$77.70417\,\text{W/m}^2 = 0.95 \cdot 41\,\text{m}^2 \cdot [\text{Stefan-BoltZ}] \cdot 1.000001 \cdot \left((101.01\,\text{K})^4 - (91.114\,\text{K})^4\right)$$

5) Heat Transfer

Open Calculator

$$Q_c = \frac{T_{vd}}{R_{th}}$$

$$48.1005\text{W} = \frac{0.3367035\text{K}}{0.007\text{K/W}}$$

6) Heat Transfer According to Fourier's Law

Open Calculator

$$Q_c = -\left(k_o \cdot A_s \cdot \frac{\Delta T}{L}\right)$$

$$48.1005\text{W} = -\left(10.18\text{W/(m*K)} \cdot 0.1314747\text{m}^2 \cdot \frac{-105\text{K}}{2.92166\text{m}}\right)$$

7) Heat Transfer by Conduction at Base

Open Calculator

$$Q_{fin} = \left(k_o \cdot A_{cs} \cdot P_f \cdot h\right)^{0.5} \cdot \left(t_o - t_a\right)$$

$$6498.246\text{W} = \left(10.18\text{W/(m*K)} \cdot 41\text{m}^2 \cdot 0.046\text{m} \cdot 30.17\text{W/m}^2\text{*K}\right)^{0.5} \cdot \left(573\text{K} - 303\text{K}\right)$$

8) Newton's Law of Cooling

Open Calculator

$$q = h_t \cdot \left(T_w - T_f\right)$$

$$77.7\text{W/m}^2 = 13.2\text{W/m}^2\text{*K} \cdot \left(305\text{K} - 299.113636\text{K}\right)$$

9) Non Ideal Body Surface Emittance

Open Calculator

$$e = \varepsilon \cdot [\text{Stefan-BoltZ}] \cdot T_w^4$$

$$466.1591\text{W/m}^2 = 0.95 \cdot [\text{Stefan-BoltZ}] \cdot \left(305\text{K}\right)^4$$

10) One Dimensional Heat Flux

Open Calculator

fx $$q = -\frac{k_o}{t} \cdot (T_{w2} - T_{w1})$$

ex $$77.70992\text{W/m}^2 = -\frac{10.18\text{W/(m*K)}}{0.131\text{m}} \cdot (299\text{K} - 300\text{K})$$

11) Thermal Conductivity given Critical Thickness of Insulation for Cylinder

Open Calculator

fx $$k_o = r_c \cdot h_o$$

ex $$10.18\text{W/(m*K)} = 0.771212\text{m} \cdot 13.2000021\text{W/m}^2\text{*K}$$

12) Thermal Resistance in Conduction

Open Calculator

fx $$R_{th} = \frac{L}{k_o \cdot A_{cs}}$$

ex $$0.007\text{K/W} = \frac{2.92166\text{m}}{10.18\text{W/(m*K)} \cdot 41\text{m}^2}$$

13) Thermal Resistance in Convection Heat Transfer

Open Calculator

fx $$R_{th} = \frac{1}{A_e \cdot h_{co}}$$

ex $$0.007\text{K/W} = \frac{1}{11.1\text{m}^2 \cdot 12.870012\text{W/m}^2\text{*K}}$$

Variables Used

- A_{cs} Cross Sectional Area *(Square Meter)*
- A_e Exposed Surface Area *(Square Meter)*
- A_s Surface Area of Heat Flow *(Square Meter)*
- **e** Real Surface Radiant Surface Emittance *(Watt per Square Meter)*
- **h** Convective Heat Transfer Coefficient *(Watt per Square Meter per Kelvin)*
- h_{co} Coefficient of Convective Heat Transfer *(Watt per Square Meter per Kelvin)*
- h_o Heat Transfer Coefficient at Outer Surface *(Watt per Square Meter per Kelvin)*
- h_t Heat Transfer Coefficient *(Watt per Square Meter per Kelvin)*
- k_o Thermal Conductivity of Fin *(Watt per Meter per K)*
- **L** Thickness of The Body *(Meter)*
- P_f Perimeter of the Fin *(Meter)*
- **q** Heat Flux *(Watt per Square Meter)*
- Q_c Heat Flow Through a Body *(Watt)*
- Q_{fin} Rate of Conductive Heat Transfer *(Watt)*
- r_c Critical Thickness of Insulation *(Meter)*
- R_{th} Thermal Resistance *(Kelvin per Watt)*
- **SF** Shape Factor
- **t** Wall Thickness *(Meter)*
- T_1 Temperature of Surface 1 *(Kelvin)*
- T_2 Temperature of Surface 2 *(Kelvin)*
- t_a Ambient Temperature *(Kelvin)*
- T_{aw} Recovery Temperature *(Kelvin)*
- T_f Temperature of Characteristic Fluid *(Kelvin)*
- t_o Base Temperature *(Kelvin)*
- T_{vd} Thermal Potential Difference *(Kelvin)*
- T_w Surface Temperature *(Kelvin)*

- T_{w1} Temperature of Wall 1 *(Kelvin)*
- T_{w2} Temperature of Wall 2 *(Kelvin)*
- ΔT Temperature Difference *(Kelvin)*
- ε Emissivity

Constants, Functions, Measurements used

- Constant: **[Stefan-BoltZ]**, 5.670367E-8
  Stefan-Boltzmann Constant
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Power** in Watt (W)
  Power Unit Conversion
- Measurement: **Temperature Difference** in Kelvin (K)
  Temperature Difference Unit Conversion
- Measurement: **Thermal Resistance** in Kelvin per Watt (K/W)
  Thermal Resistance Unit Conversion
- Measurement: **Thermal Conductivity** in Watt per Meter per K (W/(m*K))
  Thermal Conductivity Unit Conversion
- Measurement: **Heat Flux Density** in Watt per Square Meter (W/m²)
  Heat Flux Density Unit Conversion
- Measurement: **Heat Transfer Coefficient** in Watt per Square Meter per Kelvin (W/m²*K)
  Heat Transfer Coefficient Unit Conversion

Check other formula lists

- Entropy Generation Formulas
- Factors of Thermodynamics Formulas
- Heat Engine and Heat Pump Formulas
- Ideal Gas Formulas
- Isentropic Process Formulas
- Pressure Relations Formulas
- Refrigeration Parameters Formulas
- Thermal Efficiency Formulas

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

11/25/2024 | 4:30:48 PM UTC

Please leave your feedback here...