

Measurements & Error in measure tools.

$d := 25 \text{ mm}$	$L := 250 \text{ mm}$	$T_\infty := 100 \text{ }^\circ\text{C}$	$R := 100 \text{ } \Omega$	i	T_s	E
$\Delta d := 1 \text{ mm}$	$\Delta L := 2 \text{ mm}$	$\Delta T_\infty := 1 \text{ }^\circ\text{C}$	$\Delta R := 2 \text{ } \Omega$		($^\circ\text{C}$)	(V)
				1	10	30
				2	20	50
				3	30	70
$i := 1, 2, 3$			$\Delta T_s := 2 \text{ }^\circ\text{C}$	$\Delta E := 2 \text{ V}$		

Formula to calculate results... Need to find total error for each calculation.

$$h(d, L, T_s, T_\infty, E, R) := \frac{1}{(d \cdot \pi \cdot L) \cdot (T_s - T_\infty)} \cdot \frac{E^2}{R} \quad h(d, L, T_{s_i}, T_\infty, E_i, R) = \begin{bmatrix} -5.09 \\ -15.92 \\ -35.65 \end{bmatrix} \frac{\text{W}}{\text{m}^2 \cdot \text{K}}$$

$$dd_i := \frac{d}{dd} h(d, L, T_{s_i}, T_\infty, E_i, R) = \begin{bmatrix} 203.718 \\ 636.62 \\ 1.426 \cdot 10^3 \end{bmatrix} \frac{\text{W}}{\text{m}^3 \cdot \text{K}}$$

Total Error by d.

$$\sigma d := dd \cdot \Delta d = \begin{bmatrix} 0.204 \\ 0.637 \\ 1.426 \end{bmatrix} \frac{\text{W}}{\text{m}^2 \cdot \text{K}}$$

$$dL_i := \frac{d}{dL} h(d, L, T_{s_i}, T_\infty, E_i, R) = \begin{bmatrix} 20.372 \\ 63.662 \\ 142.603 \end{bmatrix} \frac{\text{W}}{\text{m}^3 \cdot \text{K}}$$

Total Error by L.

$$\sigma L := dL \cdot \Delta L = \begin{bmatrix} 0.041 \\ 0.127 \\ 0.285 \end{bmatrix} \frac{\text{W}}{\text{m}^2 \cdot \text{K}}$$

$$dT_{s_i} := \frac{d}{dT_s} h(d, L, T_{s_i}, T_\infty, E_i, R) = ?$$

Total Error by Ts.

$$\sigma T_s := dT_s \cdot \Delta T_s = ? \frac{\text{W}}{\text{m}^2 \cdot \text{K}}$$

$$dT_s(d, L, T_s, T_\infty, E, R) := \frac{d}{dT_s} h(d, L, T_s, T_\infty, E, R)$$

$$dT_s(d, L, T_{s_i}, T_\infty, E_i, R) = \begin{bmatrix} -0.057 \\ -0.199 \\ -0.509 \end{bmatrix} \frac{\text{kg}}{\text{s}^3 \cdot \text{K}^2}$$