

AME 20213 Lab Exercise #1 Procedure
Topic: Sensors/Measurement Systems/Calibration

Calibration Curve for the Thermistor

The calibration curve for the thermistor is

$$T(R_{therm}) = \left(A + B \ln \left(\frac{R_{therm}}{R_{ref}} \right) + C \ln^2 \left(\frac{R_{therm}}{R_{ref}} \right) + D \ln^3 \left(\frac{R_{therm}}{R_{ref}} \right) \right)^{-1} \quad [^{\circ}K]$$

where R_{therm} is the resistance of the thermistor at temperature and $R_{ref} = 10 \text{ k}\Omega$ is the resistance of the thermistor at 25°C . The constants are

$$A = 3.354016 \times 10^{-3}$$

$$B = 2.56985 \times 10^{-4}$$

$$C = 2.620131 \times 10^{-6}$$

$$D = 6.383091 \times 10^{-8}$$

The resistance of the thermistor R_{therm} is given by the voltage divider circuit as

$$R_{therm} = R_{fix} \left(\frac{V_{in}}{V_{out}} - 1 \right)$$

where R_{fix} is the resistance of the fixed resistor in the voltage divider circuit ($10 \text{ k}\Omega$) and V_{in} is the supply voltage (5 V) into the voltage divider circuit.

Calibration Curve for RTD

The calibration curve for the RTD is

$$T(R_{RTD}) = 0.2597[R_{RTD}] - 259.92 \quad [^{\circ}\text{C}]$$

where R_{RTD} is the resistance of the RTD given by the voltage divider circuit as

$$R_{RTD} = R_{fix} \left(\frac{V_{in}}{V_{out}/G} - 1 \right)$$

where R_{fix} is the resistance of the fixed resistor in the voltage divider circuit (300Ω) and V_{in} is the supply voltage (5 V) into the voltage divider circuit. Notice in this case V_{out} is divided by a gain G , since the V_{out} goes through an amplifier with a gain G . G is the value measured in the lab i.e. RTD amplified voltage divided by the raw sensor voltage.