Thermocouple Circuit V01

The thermocouple here is Type-E, Chromel-Constantan.

Seeback coefficient of Chromel is 21.7 µV/°C
Seeback coefficient of Constantan is -35 µV/°C

Minimum temperature of Type-E, Chromel-Constantan is -200 °C
Maximum temperature of Type-E, Chromel-Constantan is +900 °C

Let blue be Chromel
Let red be Constantan

$$V_a - V_{T1} = S_{RED}(25°C - T_1), \qquad V_b - V_{T1} = S_{BLUE}(25°C - T_1)$$

$$V_b - V_{T1} - V_a + V_{T1} = -S_{RED}(25°C - T_1) + S_{BLUE}(25°C - T_1)$$

$$V_b - V_a = (S_{BLUE} - S_{RED})(25°C - T_1)$$

$$V_b - V_a = (S_{RED} - S_{BLUE})(T_1 - 25°C)$$

$$V_b - V_a = (-35 - (21.7))\frac{\mu V}{°C}(T_1 - 25°C)$$

$$V_b - V_a = -56.7\frac{\mu V}{°C}(T_1 - 25°C)$$

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2nd Approach

Let

$$V_{ref} = 700mV$$

$$V_{ref}\frac{R_g}{R_1} = 700mV\frac{R_g}{R_1} = 1024mV$$

$$\frac{R_g}{R_1} = \frac{1024mV}{700mV} \cong \frac{500}{330}$$

$$V_{ref} \cong (12.757mV)\left(\frac{2R_b}{R_i} + 1\right)\left(\frac{R_4}{R_3}\right)$$