$V_{ref} := 4.096V \qquad R_{pot} := 100k\Omega$

We'll choose the XTR116 which has a V_ref of 4.096V, and we'll also select a 0-100kΩ potentiometer.

$I_{inmin} := \frac{4mA}{100} \qquad I_{inmin} = 40 \times 10^{-6} A$

$I_{inmax} := \frac{20mA}{100} \qquad I_{inmax} = 200 \times 10^{-6} A$

The XTR116 has a current gain of 100A/A. Therefore, in order to achieve I_out of 4-20mA, we must provide I_in of 40-200μA.

$I_{inspan} := \frac{16mA}{100} \qquad I_{inspan} = 160 \times 10^{-6} A$

$$I_{inspan} = \left(\frac{V_{ref}}{R_z} - \frac{V_{ref}}{R_z + R_{pot}} \right)$$

We use a known value (I_inspan) to calculate our first unknown value (R_z).

$$R_z := \frac{\frac{\sqrt{I_{inspan} \cdot R_{pot} \cdot \left(4 \cdot V_{ref} + I_{inspan} \cdot R_{pot}\right)}}{2} - \frac{I_{inspan} \cdot R_{pot}}{2}}{I_{inspan}}$$

Solve the I_inspan equation for R_z.

$R_z = 21.134 \times 10^{3} \Omega$

$$I_{inmin} = \left(\frac{V_{ref}}{R_z + R_{pot}} + \frac{V_{ref}}{R_{sh}} \right)$$

Since we started the calculations with the value of R_pot already chosen, we add a shunt resistor to better control the current in.

$$R_{sh} := \frac{V_{ref}}{I_{inmin} - \frac{V_{ref}}{R_z + R_{pot}}} = 662.128 \times 10^{3} \Omega$$

$$I_{outmin} := \left(\frac{V_{ref}}{R_z + R_{pot}} + \frac{V_{ref}}{R_{sh}} \right) \cdot 100 = 4 \times 10^{-3} A$$

Correct current values are achieved with our calculated resistors.

$$I_{outmax} := \left(\frac{V_{ref}}{R_z + 0} + \frac{V_{ref}}{R_{sh}} \right) \cdot 100 = 20 \times 10^{-3} A$$