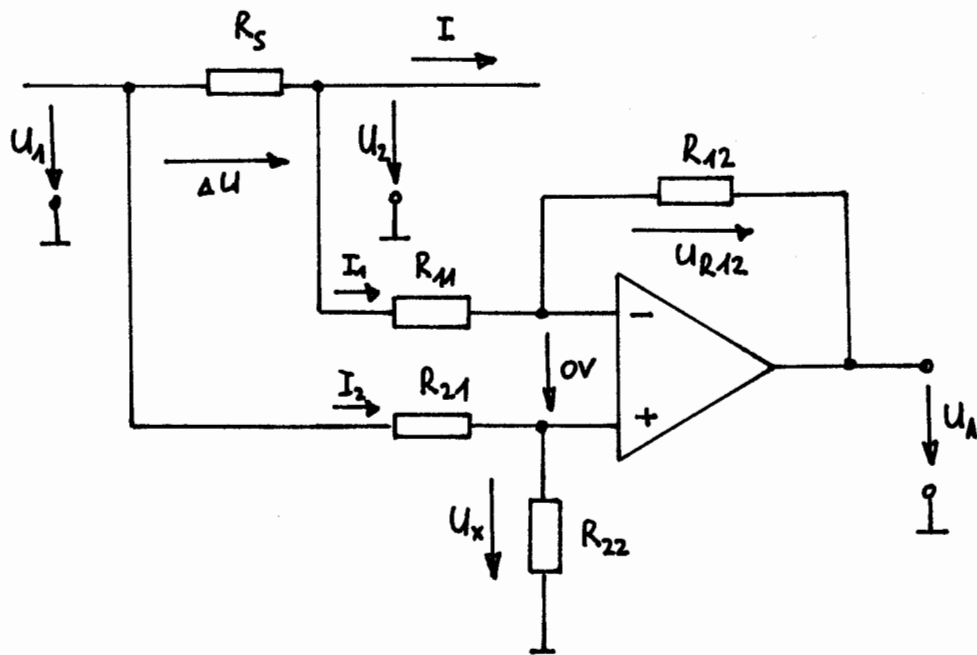


Differenzverstärker

1/2



$$U_x = U_{R_{22}} = U_1 \frac{R_{22}}{R_{21} + R_{22}}$$

$$U_A - U_x - 0V + U_{R_{12}} = 0 \Rightarrow U_A = U_x - U_{R_{12}}$$

$$U_2 = U_1 - \Delta U$$

$$I_1 = \frac{U_2 - U_x}{R_{11}}, \quad U_{R_{12}} = I_1 \cdot R_{12} = (U_2 - U_x) \frac{R_{12}}{R_{11}}$$

$$U_{R_{12}} = (U_1 - \Delta U - U_x) \frac{R_{12}}{R_{11}} = \frac{R_{12}}{R_{11}} \left(U_1 - \Delta U - U_1 \frac{R_{22}}{R_{21} + R_{22}} \right)$$

$$U_A = U_1 \left(\frac{R_{22}}{R_{21} + R_{22}} \right) - U_1 \left(\frac{R_{21}}{R_{11}} \right) + \Delta U \left(\frac{R_{12}}{R_{11}} \right) + U_1 \left(\frac{R_{22}}{R_{21} + R_{22}} \right) \left(\frac{R_{12}}{R_{11}} \right)$$

$$\left(\frac{R_{22}}{R_{21} + R_{22}} \right) = K \quad \left(\frac{R_{12}}{R_{11}} \right) = Z$$

$$U_A = U_1 (K - Z + KZ) + \Delta U \cdot Z$$

⏟

wenn = 0 dann von U_1 unabhängig

$$K - Z + KZ = 0$$

alle R gleich $K = \frac{1}{2}, Z = 1$

$$\Rightarrow \frac{1}{2} - 1 + \frac{1}{2} \cdot 1 = 0 \quad \checkmark$$

$$\Rightarrow U_A = \Delta U$$

für $\frac{R_{12}}{R_{11}} = 10 = Z, (U_A = 10 \Delta U)$

$$K(1+Z) = Z \quad \Rightarrow \quad K = \frac{Z}{1+Z}$$

$$K(1+Z) = Z \quad \Rightarrow \quad K = \frac{Z}{1+Z}$$

$$K = \frac{10}{11} = 0,909 = \frac{R_{22}}{R_{21} + R_{22}} = \frac{10}{11}$$

$$\Rightarrow R_{22} = 10 R_{21}$$

allgemein:

$$R_{22} = Z \cdot R_{21} \quad \text{für } Z = \frac{R_{12}}{R_{11}}$$