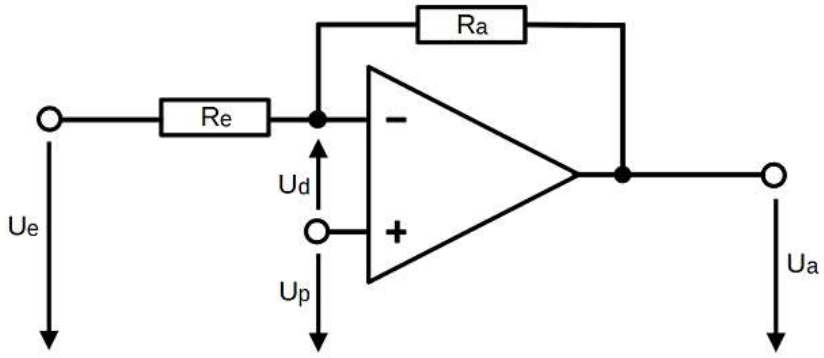
Operational Amplifier - Inverter mit Offset

Gegeben



Bekannt: R_e, R_a, U_e, U_p

Bedingung: $U_d = 0$

Gesucht: U_a

Die Ausgangsspannung U_a ergibt sich zu:

$$\boxed{U_a = (1 + \frac{R_a}{R_e})U_p - \frac{R_a}{R_e}U_e}$$

Rechenweg

$$I_e = \frac{U_e - (U_p - U_d)}{R_e}$$

$$\boxed{I_e = \frac{U_e - U_p + U_d}{R_e}}$$

$$I_a = \frac{(U_p - U_d) - U_a}{R_a}$$

$$\boxed{I_a = \frac{U_p - U_d - U_a}{R_a}}$$

$I_e = I_a$: Innenwiderstand OPA gegen unendlich

$$\frac{U_e - U_p + U_d}{R_e} = \frac{U_p - U_d - U_a}{R_a}$$

$U_d = 0$: Eingangs-Differenzspannung OPA identisch null

$$\frac{U_e - U_p}{R_e} = \frac{U_p - U_a}{R_a}$$

$$R_a U_e - R_a U_p = R_e U_p - R_e U_a$$

$$R_e U_a = R_e U_p - R_a U_e + R_a U_p$$

$$R_e U_a = (R_e + R_a) U_p - R_a U_e$$

$$U_a = \frac{(R_e + R_a)}{R_e} U_p - \frac{R_a}{R_e} U_e$$

$$\boxed{U_a = (1 + \frac{R_a}{R_e}) U_p - \frac{R_a}{R_e} U_e}$$