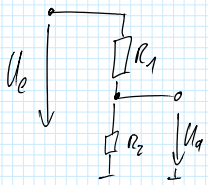
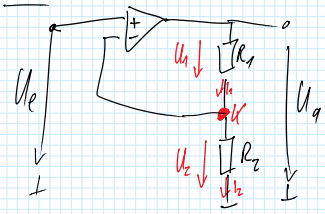
C1.1



$$U_a = \frac{R_2}{R_1 + R_2}$$

C1.2

Verstärker



K: $I_1 = I_2 \Rightarrow \frac{U_1}{R_1} = \frac{U_2}{R_2}$ $\quad | U_2 = U_e$

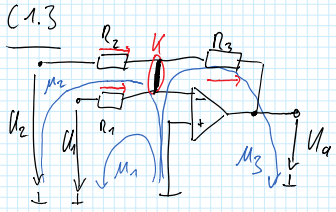
$\frac{U_1}{R_1} = \frac{U_e}{R_2}$ $\quad | U_1 = U_a - U_e$

$\frac{U_a - U_e}{R_1} = \frac{U_e}{R_2} \Rightarrow U_a = \frac{U_e \cdot R_1}{R_2} + U_e$

$U_a = \frac{R_1 + R_2}{R_2} U_e = \left(\frac{R_1}{R_2} + 1\right) U_e$

C1.3

ADDIEREN



K: $I_{R2} + I_{R1} = I_{R3}$ $\quad | = \frac{U}{R}$

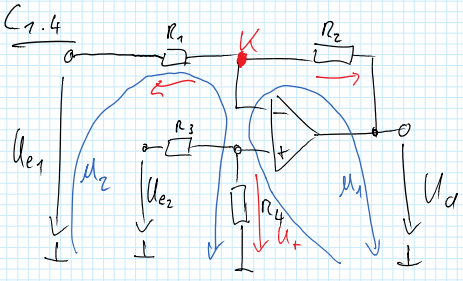
$\Rightarrow \frac{U_{R2}}{R_2} + \frac{U_{R1}}{R_1} = \frac{U_{R3}}{R_3}$ $\quad | U_1: U_1 = U_{R1}$ $\quad | U_2: U_2 = U_{R2}$ $\quad | U_3: U_3 = -U_a$

$\frac{U_2}{R_2} + \frac{U_1}{R_1} = -\frac{U_a}{R_3}$

$U_a = -R_3 \left(\frac{U_1}{R_1} + \frac{U_2}{R_2}\right)$

C1.4

Subtrahierer



$U_+ = \frac{R_4}{R_3 + R_4} U_{e2}$

$U_1: -U_+ + U_{R2} + U_a = 0$

$U_2: -U_{e1} - U_{R_1} + U_+ = 0$

K: $-I_{R_1} = I_{R_2} \Rightarrow \frac{U_{R1}}{R_1} = \frac{U_{R_2}}{R_2}$ $\quad | U_1, U_2$

$U_+ - U_{e1}$ $\quad R_1 - R_1$

$\frac{1}{R_1} = \frac{1}{R_2} \Rightarrow R_1 = R_2$ | $\forall R_1, R_2$

$$-\frac{U_+ - U_{e1}}{R_1} = \frac{U_+ - U_a}{R_2}$$

$$\left(-U_+ + U_{e1}\right)\frac{R_2}{R_1} = U_+ - U_a$$

$$-\left(-U_+ + U_{e1}\right)\frac{R_2}{R_1} + U_+ = + U_a$$

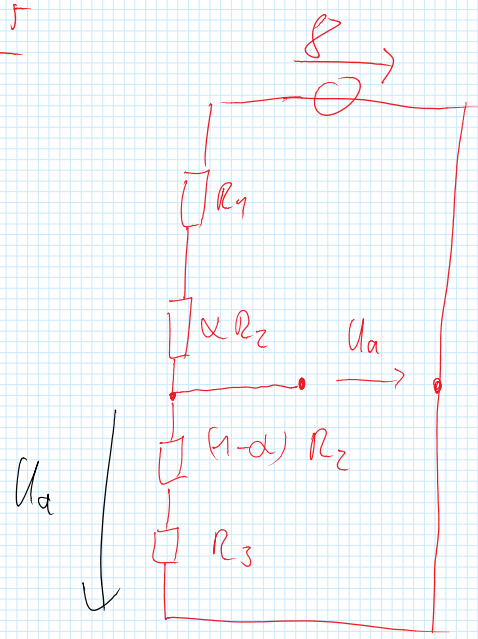
$$U_+ \frac{R_2}{R_1} - U_{e1}\frac{R_2}{R_1} + U_+ = U_a \Rightarrow$$

$$\frac{R_2}{R_1}\frac{R_4}{(R_3+R_4)}U_{e2} - \frac{R_2}{R_1}U_{e1} + \frac{R_4}{R_3+R_4}U_{e2} = U_a$$

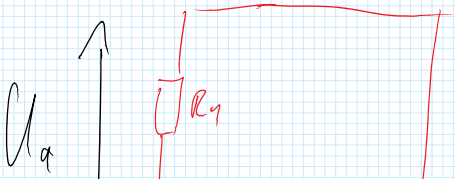
$$\Rightarrow \frac{R_2 R_4}{R_1(R_3+R_4)} + \frac{R_1 R_4}{R_1(R_3+R_4)}U_{e2} - \frac{R_2}{R_1}U_{e1} = U_a$$

$$\boxed{\frac{R_4}{R_1}\left(\frac{R_2+R_1}{R_3+R_4}\right)U_{e2} - \frac{R_2}{R_1}U_{e1} = U_a}$$

C1.5

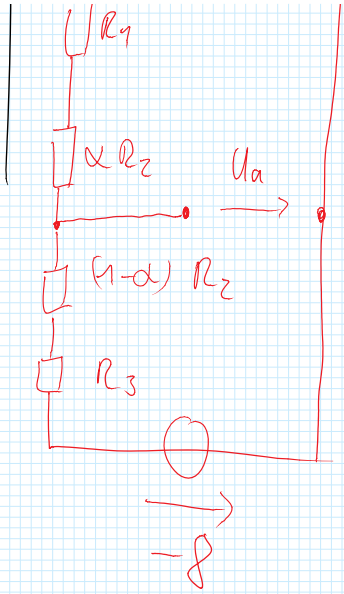


$$U_{a1} = \frac{(1-\alpha)R_2 + R_3}{R_1 + R_2 + R_3} \cdot + 8\,V$$



$$U_{a2} = \frac{R_1 + \alpha R_2}{R_1 + R_2 + R_3}(+ 8\,V$$

U_a



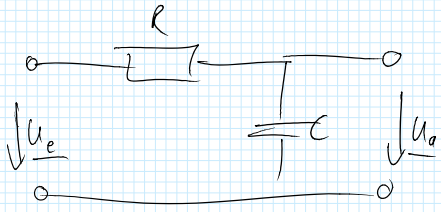
$U_{a2} =$ $\qquad$ 8 V
$R_1 + R_2 + R_3$

$$U_a = \left(\frac{(1-\alpha) R_2 + R_3}{R_1 + R_2 + R_3} + \frac{\alpha R_2 + R_1}{R_1 + R_2 + R_3} \right) \cdot 8\,V$$

$$U_a = \frac{R_2 + \alpha R_2 + R_3 + \alpha R_2 + R_1}{R_1 + R_2 + R_3} \cdot 8\,V$$

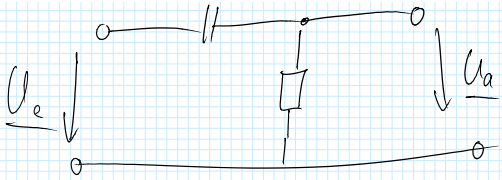
$$U_a = \frac{-R_3 - R_2 + 2\alpha R_2 + R_1}{R_1 + R_2 + R_3} \cdot 8\,V$$

C 1.6



$$U_a = \frac{\frac{1}{j\omega C}}{R + \frac{1}{j\omega C}} U_e = \frac{1}{j\omega RC - 1}$$

C 1.7



$$U_a = \frac{R}{R + \frac{1}{j\omega C}} U_e = \frac{j\omega RC}{j\omega RC + 1} U_e$$