Differenzverstärker/
Subtrahierer

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Nichtinvertierender
Verstärker

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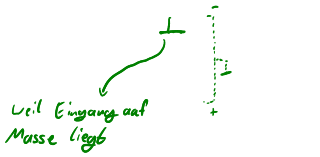
Summierer



d) $V_{op2} = 1 + \frac{R_4}{R_6} = 5 \Leftrightarrow R_4 = 4R_5 \Leftrightarrow R_4 = 4 \cdot 10k\Omega = 40k\Omega$

$V_{op2} = \frac{U_{op2}}{U_{r2}} = \frac{I_{Q4,5} \cdot (R_4 + R_5)}{U_{r2}} \Rightarrow U_{op2} = \frac{I_{Q4,5} \cdot 5R_5}{U_{r2}} \Leftrightarrow U_{op2} \cdot U_{r2} = I_{Q4,5} \cdot 5R_5 \Leftrightarrow \frac{U_{op2} \cdot U_{r2}}{5 I_{Q4,5}} = R_5 = \frac{5 \cdot 1V}{5 \cdot 100mA} = 10k\Omega$

$U_{op2} = I_{Q4,5} \cdot (R_4 + R_5)$

e) $T_1 = 100°C$: $0 = -U_{R3} + U_{R2} = -R3 \cdot I_{r11} + U_{R2} - U_{OP11} \Leftrightarrow R3 \cdot I_{r11} = U_{R2} - U_{OP11} \Leftrightarrow R_3 = \frac{1}{I_{r11}}(U_{R2} - U_{OP11})$

$T_1 = 0°C$: $0 = -U_{R3} + U_{R2} - U_{OP12} = -R3 \cdot I_{r12} + U_{R2} - U_{OP12} \Leftrightarrow R3 = \frac{1}{I_{r12}}(U_{R2} - U_{OP12}) = \frac{1}{6mA}(0,625V - 0V) = 156,25\Omega$

$\frac{1}{I_{r12}}(U_{R2} - U_{OP12}) = \frac{1}{I_{r11}}(U_{R2} - U_{OP12}) \Leftrightarrow I_{r11}(U_{R2} - U_{OP11}) = I_{r12}(U_{R2} - U_{OP11}) \Leftrightarrow U_{R2}(I_{r11} - I_{r12}) = -I_{r12}U_{OP11} - I_{r11}U_{OP12} \Leftrightarrow U_{R2} = \frac{1}{I_{r11} - I_{r2}}(-I_{r12}U_{OP11} - I_{r11}U_{OP12}) = 0,625V$

$R2 = \frac{U_{R2}}{I_{D1,2}} = \frac{0{,}625\,V}{50\,\mu A} = 12{,}5\,k\Omega$

$R1 = \frac{U_S - U_{R2}}{I_{D1,2}} = \frac{5\,V - 0{,}625\,V}{50\,\mu A} = 87{,}5\,k\Omega$