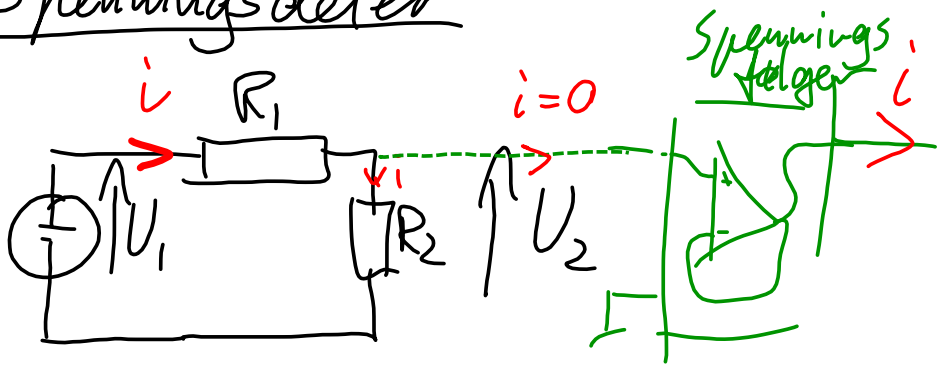
Spenningsdeler



$$i = \frac{U_1}{R_1 + R_2} \qquad U_2 = i \cdot R_2$$

$$U_2 = \frac{U_1}{R_1 + R_2} \cdot R_2$$

$$\frac{U_2}{U_1} = \frac{R_2}{R_1 + R_2}$$

Eks

$$\frac{U_2}{U_1} = 0{,}2 = \frac{R_2}{R_1 + R_2}$$

$$0{,}2 \cdot R_1 + 0{,}2 \cdot R_2 = R_2$$

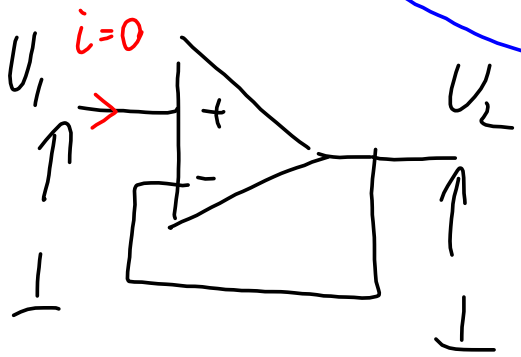
$$0{,}2 \cdot R_1 = R_2 - 0{,}2 R_2 = 0{,}8 R_2$$

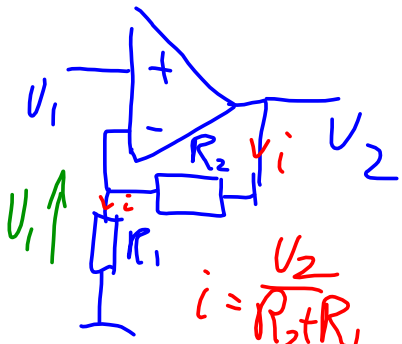
$$R_1 = \frac{0{,}8 R_2}{0{,}2} = 4{,}0 \cdot R_2$$

Velger $\rightarrow R_2 = 1{,}5\,K\Omega$

$$R_1 = 4{,}0 \cdot 1{,}5\,K\Omega = 6{,}0\,K\Omega$$

Spenningsfølger $\Rightarrow \frac{U_2}{U_1} = 1 \quad U_2 = U_1$





$i = \frac{U_2}{R_2 + R_1} \quad U_1 = i \cdot R_1$

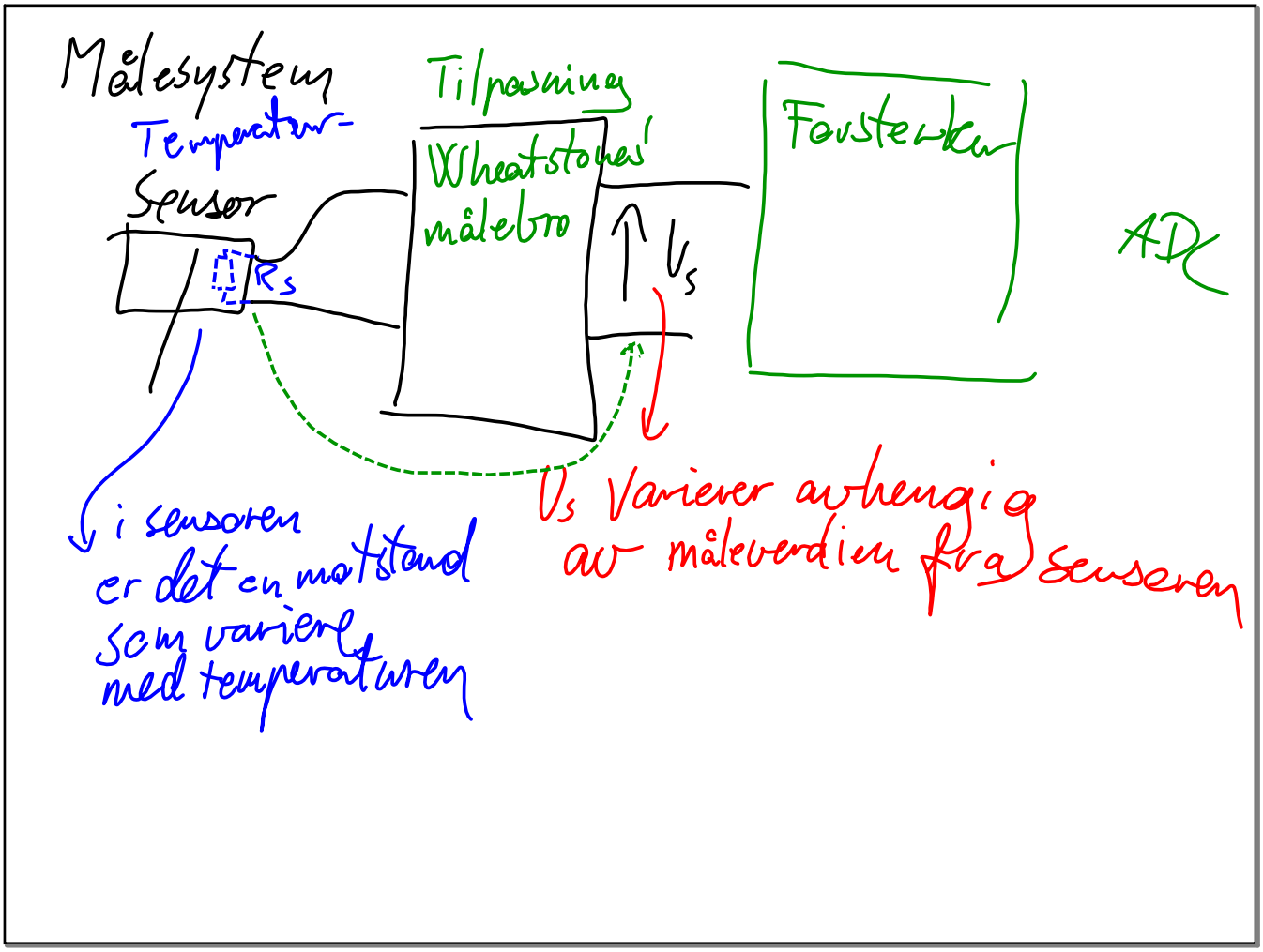
$U_1 = \frac{U_2}{R_2 + R_1} \cdot R_1$

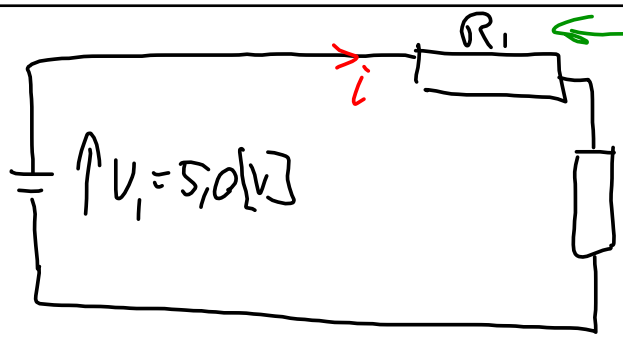
$\frac{U_2}{U_1} = \frac{R_2 + R_1}{R_1} = 1 + \frac{R_2}{R_1}$

$R_2 = 0$

$R_1 = \infty$

$\frac{U_2}{U_1} = 1 + \frac{0}{\infty} = 1$


Målesystem
Temperatur-
Sensor
R_s
Tilpasning
Wheatstones
målebro
U_s
Forsterker
ADC
i sensoren er det en motstand som varierer med temperaturen
U_s Varierer avhengig av måleverdien fra sensoren



R_S er en Pt1000 temperatur sensor

$-10\,^\circ C \Rightarrow +20\,^\circ C$

$R_S = 960{,}9\,\Omega \quad R_S = 1077{,}9$

$$i = \frac{V_1}{R_1 + R_S} \qquad U_S = i \cdot R_S$$

$$U_S = \frac{V_1}{R_1 + R_S} \cdot R_S \qquad \frac{U_S}{V_1} = \frac{R_S}{R_1 + R_S}$$

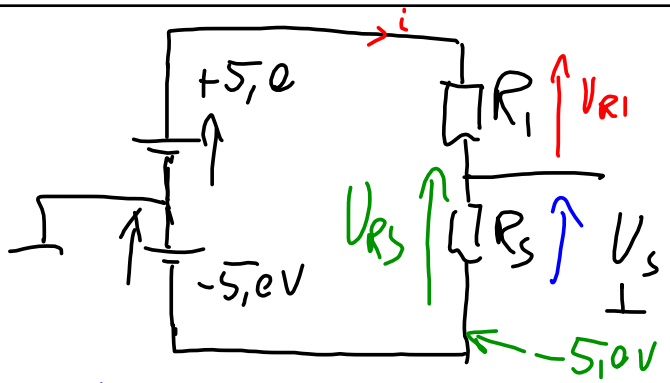
$$U_S = \frac{R_S}{R_1 + R_S} \cdot V_1$$

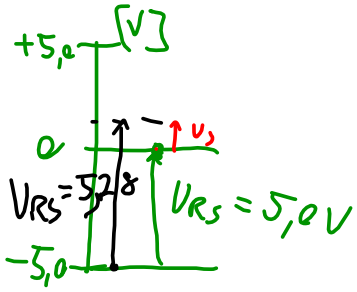
Hva er U_S ved $t = -10{,}0\,^\circ C$

$$U_S = \frac{960{,}9}{1000 + 960{,}9} \cdot 5{,}0[V] = 2{,}45V$$

Hva er U_S ved $t = +20{,}0\,^\circ C$

$$U_S = \frac{1077{,}9}{1000 + 1077{,}9} \cdot 5{,}0[V] = 2{,}59[V]$$





Vi ønsker at $V_S = 0{,}0\,V$ ved $-20{,}0\,^\circ C$

Da må $R_1 = R_S = 960{,}9\,\Omega$

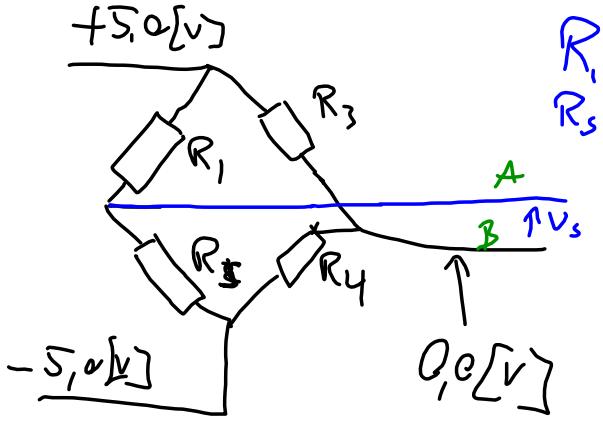
ved $-10\,^\circ C$

$$V_{RS} = \frac{10\,V}{R_1 + R_S} \cdot R_S = 10[V] \cdot \frac{960{,}9}{2 \cdot 960{,}9} = \frac{10}{2} = 5{,}0\,V$$

Hva er V_S ved $+20\,^\circ C$

$$V_{RS} = \frac{10{,}0[V]}{R_1 + R_S} \cdot R_S = 10{,}0[V] \cdot \frac{1077{,}9}{960{,}9 + 1077{,}9} = 5{,}28[V]$$

$$V_S = V_{RS} - 5{,}0[V] = 5{,}28[V] - 5{,}0[V] = \underline{0{,}28\,V}$$



Balansert system

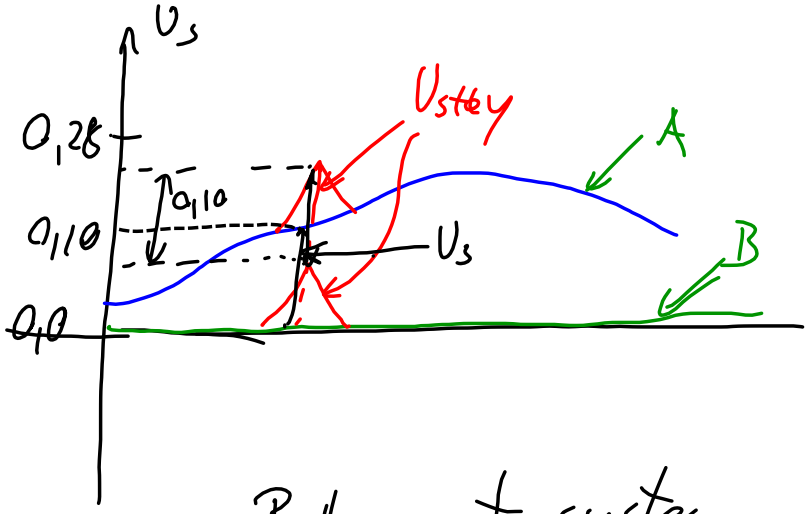
$R_1 = 960,9$

R_s : Pt1000 sensor

$\rightarrow U_s = 0,0$ [V] ved $-10\,^\circ C$

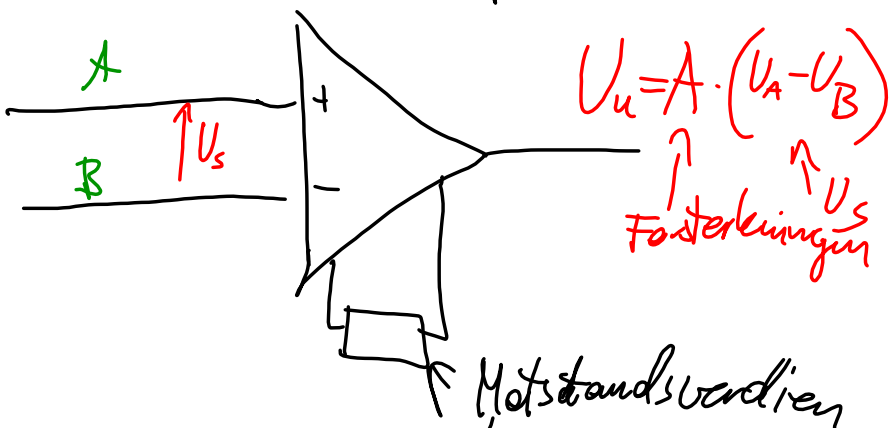
$U_s = 0,28$ [V] ved $+20\,^\circ C$

$R_3 = R_4 = 1000\,\Omega$



Balansert system

Balansert forsterker



Målestandsverdien bestemmer forsterkningen