

# task\_ezrkjzifcegttcpc\_with\_calculation

## Student Group

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### Exercise E27 Multiphase systems

(written test, approx. 4 % of a 120-minute written test, SS2021)

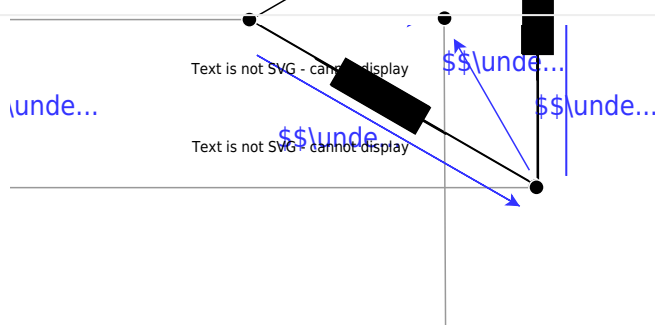
a) Specify the RMS value of the phase voltage  $U_{\text{RMS}}$  and the winding voltage  $U_{\text{L}}$ .  
Result:

A voltage with the RMS value  $U_{\text{RMS}} = 110 \text{ V}$  is applied between the terminals of each winding.

Through each of the windings, there is a current with an RMS value  $I_{\text{RMS}} = 5 \text{ A}$  and a phase shift  $\varphi = \pm 25^\circ$  compared to the voltage.

Since  $U_{\text{RMS}} = 110 \text{ V}$  and  $I_{\text{RMS}} = 5 \text{ A}$  is applied between each winding, the active power  $P$  is given by  $P = 3 \cdot U_{\text{RMS}} \cdot I_{\text{RMS}} \cdot \cos(\varphi)$ . For a phase shift of  $\varphi = 25^\circ$ , the active power  $P$  is  $P = 3 \cdot 110 \text{ V} \cdot 5 \text{ A} \cdot \cos(25^\circ) = 1410.888 \text{ W}$ . The total active power  $P_{\text{total}}$  must be zero:  $\sum P_i = 0$ .

By this (and showing in the example in the image below), One can see, that  $I_{\text{L}} = \sqrt{3} \cdot I_{\text{RMS}} = \sqrt{3} \cdot 5 \text{ A}$



one single phase as an example



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