



Kreisprozessarbeit  $W_k$

$$Q_{12} + W_{V12} = U_2 - U_1$$

$$Q_{21} + W_{V21} = U_1 - U_2$$

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$$Q_{12} + Q_{21} + W_{V12} + W_{V21} = 0$$

$$\rightarrow W_k := W_{V12} + W_{V21} = -(Q_{12} + Q_{21})$$

allgemein

$$W_k = \sum W_{V,i} = -\sum Q_i = -(Q_{21} + Q_{ab})$$

thermischer Wirkungsgrad  $\eta_{th}$

$$\eta_{th} = \frac{\text{Nutzen}}{\text{Aufwand}} = \frac{-W_k}{Q_{21}}$$

$$\left( = \frac{Q_{21} + Q_{ab}}{Q_{21}} \right)$$

$$0 \leq \eta_{th} \leq 1$$