*Beregning af Phi ud fra målte temperaturer i systemet.*

*Dette bestemmes ud fra energibalancerne for kølemidlet og luften, over fordamperen:*

$q_{mR} \cdot (h_{R;4} - h_{R;1}) + \Phi_{0;R} = 0$ *Energibalance for kølemidlet over fordamper*

$q_{mL} \cdot (h_{L;1} - h_{L;2}) - \Phi_{0;L} = 0$ *Energibalance for luften over fordamper*

*---------------------------- Måledata indtastes her: --------------------------*

$p_{R;f} = (1{,}78 + 1) \cdot 1$ [bar] *tryk i kølemiddel på fordampersiden*

$p_{R;k} = (9{,}46 + 1) \cdot 1$ [bar] *tryk i kølemiddel på kondensatorsiden*

$t_{R;3} = 34$ [C] *temperatur i kølemiddel efter kondensator*

$t_{R;1} = 4{,}27$ [C] *temperatur i kølemiddel efter fordamper*

$p_L = 1$ [bar] *luftens tryk*

$t_{L;1} = 9{,}63$ [C] *luftens temperatur før fordamper*

$t_{L;2} = 5{,}58$ [C] *luftens temperatur efter fordamper*

$rpm = 4000 \cdot \left| 0{,}016666667 \cdot \frac{1/s}{1/min} \right|$ *kompressors rpm*

$c_L = 3$ [m/s] *strømningshastighed af luft over fordamper*

$A_f = \left[\frac{0{,}21}{2}\right]^2 \cdot \pi - 0{,}083^2$ *Tværsnitsareal af luftens vej over fordamper*

*--------------------------- Alt herunder beregnes ----------------------------*

*-------------------------Entalpier:--------------------------------*

*Kølemiddel*

*der antages at entalpien er konstant over ekspansionventilen*

$h_{R;4} = \mathbf{h}(R134a ; T = t_{R;3}; P = p_{R;k})$ *Entalpi af kølemidlet før fordamper beregnet ud fra tryk og temp efter kondensator.*
*$h_{R,4} = h_{R,3}$*

$h_{R;1} = \mathbf{h}(R134a ; T = t_{R;1}; P = p_{R;f})$ *Entalpi af kølemidlet efter fordamper*

*Luft*

$h_{L;1} = \mathbf{h}(Air_{ha} ; T = t_{L;1}; P = p_L)$ *Entalpi af luft før fordamper*

$h_{L;2} = \mathbf{h}(Air_{ha} ; T = t_{L;2}; P = p_L)$ *Entalpi af luft efter fordamper*

*------------------------------- massestrømme: -----------------------------*

*Luft*

$t_{L;m} = \frac{t_{L;1} + t_{L;2}}{2}$ *luftens middeltemperatur*

$\rho_L = \rho(Air_{ha} ; T = t_{L;m}; P = p_L)$ *luftens densitet*

$q_{VL} = c_L \cdot A_f$ *luftens volumenstrøm*

$q_{mL} = q_{VL} \cdot \rho_L$ *luftens massestrøm*

$disp = 5{,}08 \cdot \left| 0{,}000001 \cdot \frac{m3}{cm3} \right|$

*kølemiddel*

$q_{mR} = q_{vr} \cdot \rho_{r1}$ *massestrøm af kølemiddel*

$q_{vr} = q_{vs} \cdot \eta_v$ *volumenstrøm af kølemiddel*

$q_{vs} = disp \cdot rpm$ *slagvolumenstrøm af kølemiddel*

$\eta_v = -0{,}01696 \cdot \frac{p_{R;k}}{p_{R;f}} + 0{,}79144$ *volumetrisk virkningsgrad*

$\rho_{r1} = \rho\left(R134a\ ;\ T = t_{R;1};\ P = p_{R;f}\right)$ *densitet af kølemiddel før kompressor*

$t_{fordamp} = \mathbf{T}_{sat}\left(R134a\ ;\ P = p_{R;f}\right)$ *fordampningstemperatur*

$t_{kondens} = \mathbf{T}_{sat}\left(R134a\ ;\ P = p_{R;k}\right)$ *kondenseringstemperatur*

$overhedning = t_{R;1} - t_{fordamp}$ *overhedning gennem fordamper*

$underkøl = t_{kondens} - t_{R;3}$ *underkøling gennem kondensator*

*usikkerheder*

$U_t = 1{,}397505$ [K]

$U_p = 0{,}065765$ [bar]

**Unit Settings: SI C bar J mass deg**

| Variable±Uncertainty | Partial derivative | % of uncertainty |
|---|---|---|
| overhedning = 5,712±1,539 [C] | | |
| $p_{R,f}$ = 2,78±0,06577 [bar] | $\partial overhedning / \partial p_{R,f}$ = -9,809 | 17,56 % |
| $p_{R,k}$ = 10,46±0,06577 [bar] | $\partial overhedning / \partial p_{R,k}$ = 0 | 0,00 % |
| $t_{L,1}$ = 9,63±1,398 [C] | $\partial overhedning / \partial t_{L,1}$ = 0 | 0,00 % |
| $t_{L,2}$ = 5,58±1,398 [C] | $\partial overhedning / \partial t_{L,2}$ = 0 | 0,00 % |
| $t_{R,1}$ = 4,27±1,398 [C] | $\partial overhedning / \partial t_{R,1}$ = 1 | 82,44 % |
| $t_{R,3}$ = 34±1,398 [C] | $\partial overhedning / \partial t_{R,3}$ = 0 | 0,00 % |
| $\Phi_{0,L}$ = 421±205,4 [W] | | |
| $p_{R,f}$ = 2,78±0,06577 [bar] | $\partial\Phi_{0,L}/\partial p_{R,f}$ = 0 | 0,00 % |
| $p_{R,k}$ = 10,46±0,06577 [bar] | $\partial\Phi_{0,L}/\partial p_{R,k}$ = 0 | 0,00 % |
| $t_{L,1}$ = 9,63±1,398 [C] | $\partial\Phi_{0,L}/\partial t_{L,1}$ = 103,2 | 49,28 % |
| $t_{L,2}$ = 5,58±1,398 [C] | $\partial\Phi_{0,L}/\partial t_{L,2}$ = -104,7 | 50,72 % |
| $t_{R,1}$ = 4,27±1,398 [C] | $\partial\Phi_{0,L}/\partial t_{R,1}$ = 0 | 0,00 % |
| $t_{R,3}$ = 34±1,398 [C] | $\partial\Phi_{0,L}/\partial t_{R,3}$ = 0 | 0,00 % |
| $\Phi_{0,R}$ = 510,4±15,25 [W] | | |
| $p_{R,f}$ = 2,78±0,06577 [bar] | $\partial\Phi_{0,R} / \partial p_{R,f}$ = 207,9 | 80,41 % |
| $p_{R,k}$ = 10,46±0,06577 [bar] | $\partial\Phi_{0,R} / \partial p_{R,k}$ = -4,253 | 0,03 % |
| $t_{L,1}$ = 9,63±1,398 [C] | $\partial\Phi_{0,R} / \partial t_{L,1}$ = 0 | 0,00 % |
| $t_{L,2}$ = 5,58±1,398 [C] | $\partial\Phi_{0,R} / \partial t_{L,2}$ = 0 | 0,00 % |
| $t_{R,1}$ = 4,27±1,398 [C] | $\partial\Phi_{0,R} / \partial t_{R,1}$ = 0,408 | 0,14 % |

| | | |
|---|---|---|
| $t_{R,3}$ = 34±1,398 [C] | $\partial\Phi_{0,R} / \partial t_{R,3}$ = -4,808 | 19,42 % |

No unit problems were detected.

| | | |
|---|---|---|
| $A_f$ = 0,02775 [$m^2$] | $c_L$ = 3 [m/s] | disp = 0,00000508 [$m^3$] |
| $\eta_v$ = 0,7276 | $h_{L,1}$ = 282915 [J/kg] | $h_{L,2}$ = 278841 [J/kg] |
| $h_{R,1}$ = 402818 [J/kg] | $h_{R,4}$ = 247525 [J/kg] | overhedning = 5,712 [C] |
| $\Phi_{0,L}$ = 421 [W] | $\Phi_{0,R}$ = 510,4 [W] | $p_L$ = 1 [bar] |
| $p_{R,f}$ = 2,78 [bar] | $p_{R,k}$ = 10,46 [bar] | $q_{mL}$ = 0,1033 [kg/s] |
| $q_{mR}$ = 0,003287 [kg/s] | $q_{VL}$ = 0,08324 [m3/s] | $q_{vr}$ = 0,0002464 [m3/s] |
| $q_{vs}$ = 0,0003387 [m3/s] | $\rho_L$ = 1,241 [$kg/m^3$] | $\rho_{r1}$ = 13,34 [$kg/m^3$] |
| rpm = 66,67 [1/s] | $t_{fordamp}$ = -1,442 [C] | $t_{kondens}$ = 41,05 [C] |
| $t_{L,1}$ = 9,63 [C] | $t_{L,2}$ = 5,58 [C] | $t_{L,m}$ = 7,605 [C] |
| $t_{R,1}$ = 4,27 [C] | $t_{R,3}$ = 34 [C] | underkøl = 7,047 [C] |
| $U_p$ = 0,06577 [bar] | $U_t$ = 1,398 [K] | |

No unit problems were detected.

KEY VARIABLES

| | |
|---|---|
| $\Phi_{0,L}$ = 421 [W] | *kuldeydelse fra luft* |
| overhedning = 5,712 [C] | |
| $\Phi_{0,R}$ = 510,4 [W] | *kuldeydelse fra kølemiddel* |