INSTITUT FÜR SOLARTECHNIK

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# Type977 fitting for heat pump SIN-8TU

# Parametric Heat Pump calculation

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*2019/03/12 at: 16:07:43 h*

Table 1: Fitted coefficients for the heat pump.

| Coefficient | Description | |
|---|---|---|
| | | $[kW]$ |
| $P_{Q_1}$ | $1^{st}$ *condenser polynomial coefficient* | 7.4629e+00 |
| $P_{Q_2}$ | $2^{st}$ *condenser polynomial coefficient* | 8.1802e+01 |
| $P_{Q_3}$ | $3^{st}$ *condenser polynomial coefficient* | 2.4943e+01 |
| $P_{Q_4}$ | $4^{st}$ *condenser polynomial coefficient* | -1.0992e+02 |
| $P_{Q_5}$ | $5^{st}$ *condenser polynomial coefficient* | -1.8134e+01 |
| $P_{Q_6}$ | $6^{st}$ *condenser polynomial coefficient* | -1.2741e+02 |
| $P_{COP_1}$ | $1^{st}$ *COP polynomial coefficient* | 7.3526e+00 |
| $P_{COP_2}$ | $2^{st}$ *COP polynomial coefficient* | 8.2053e+01 |
| $P_{COP_3}$ | $3^{st}$ *COP polynomial coefficient* | -1.0997e+01 |
| $P_{COP_4}$ | $4^{st}$ *COP polynomial coefficient* | -3.3950e+02 |
| $P_{COP_5}$ | $5^{st}$ *COP polynomial coefficient* | -2.6884e+00 |
| $P_{COP_6}$ | $6^{st}$ *COP polynomial coefficient* | -6.2924e+01 |
| $\dot{m}_{cond}$ | 1400.00 $[kg/h]$ | |
| $\dot{m}_{evap}$ | 1400.00 $[kg/h]$ | |
| $COP_{nom}$ (A0W35) | 4.77 | |
| $Q_{cond,nom}$ (A0W35) | 8.00 $[kW]$ | |
| $Q_{evap,nom}$ (A0W35) | 6.32 $[kW]$ | |
| $W_{comp,nom}$ (A0W35) | 1.68 $[kW]$ | |
| $RMS_{COP}$ | $5.23e-02$ | |
| $RMS_{Q_{cond}}$ | $1.67e-02$ | |
| $RMS_{W_{comp}}$ | $2.65e-02$ | |
| Fit model | Average Temperature | |

Table 2: Differences between experiments and fitted data for the heat pump. $error = 100 \cdot |\frac{Q_{exp}-Q_{num}}{Q_{exp}}|$ and $RMS = \sqrt{\sum \frac{(Q_{exp}-Q_{num})^2}{n_p}}$ where $n_p$ is the number of data points.

| $T_{cond,out}$ $^oC$ | $T_{evap,in}$ $^oC$ | $COP$ [–] | $COP_{exp}$ [–] | error [%] | $Q_{cond}$ $[kW]$ | $Q_{cond,exp}$ $[kW]$ | error [%] | $W_{comp}$ $[kW]$ | $W_{comp,exp}$ $[kW]$ | error [%] |
|---|---|---|---|---|---|---|---|---|---|---|
| 35.00 | -5.00 | 4.10 | 4.11 | 0.3 | 6.91 | 6.90 | 0.2 | 1.69 | 1.68 | 0.44 |
| 35.00 | 0.00 | 4.82 | 4.79 | 0.6 | 8.08 | 8.10 | 0.2 | 1.68 | 1.69 | 0.84 |
| 35.00 | 5.00 | 5.56 | 5.54 | 0.4 | 9.25 | 9.25 | 0.0 | 1.66 | 1.67 | 0.43 |
| 50.00 | -5.00 | 2.95 | 2.91 | 1.3 | 6.43 | 6.43 | 0.1 | 2.18 | 2.21 | 1.39 |
| 50.00 | 0.00 | 3.36 | 3.29 | 2.1 | 7.52 | 7.50 | 0.3 | 2.24 | 2.28 | 1.78 |
| 50.00 | 5.00 | 3.80 | 3.73 | 1.7 | 8.61 | 8.58 | 0.3 | 2.27 | 2.30 | 1.34 |
| 45.00 | -5.00 | 3.37 | 3.42 | 1.4 | 6.67 | 6.67 | 0.0 | 1.98 | 1.95 | 1.50 |
| 45.00 | 0.00 | 3.90 | 3.93 | 0.9 | 7.79 | 7.80 | 0.1 | 2.00 | 1.98 | 0.77 |
| 45.00 | 5.00 | 4.43 | 4.49 | 1.3 | 8.91 | 8.92 | 0.1 | 2.01 | 1.99 | 1.18 |
| 55.00 | 0.00 | 2.78 | 2.80 | 0.6 | 7.18 | 7.20 | 0.3 | 2.58 | 2.57 | 0.35 |
| 55.00 | 5.00 | 3.11 | 3.15 | 1.4 | 8.24 | 8.25 | 0.1 | 2.65 | 2.62 | 1.34 |
| 35.00 | 10.00 | 6.31 | 6.30 | 0.2 | 10.41 | 10.40 | 0.1 | 1.65 | 1.65 | 0.09 |
| 35.00 | 15.00 | 7.08 | 7.09 | 0.1 | 11.56 | 11.55 | 0.1 | 1.63 | 1.63 | 0.21 |
| 50.00 | 10.00 | 4.24 | 4.16 | 1.9 | 9.69 | 9.67 | 0.3 | 2.29 | 2.32 | 1.55 |
| 50.00 | 15.00 | 4.69 | 4.58 | 2.5 | 10.77 | 10.75 | 0.2 | 2.29 | 2.35 | 2.26 |
| 45.00 | 10.00 | 4.98 | 5.05 | 1.3 | 10.01 | 10.03 | 0.2 | 2.01 | 1.99 | 1.14 |
| 45.00 | 15.00 | 5.54 | 5.61 | 1.2 | 11.12 | 11.15 | 0.3 | 2.00 | 1.99 | 0.85 |
| 55.00 | 10.00 | 3.45 | 3.50 | 1.4 | 9.30 | 9.30 | 0.0 | 2.70 | 2.66 | 1.35 |
| 55.00 | 15.00 | 3.80 | 3.83 | 0.7 | 10.35 | 10.35 | 0.0 | 2.72 | 2.71 | 0.68 |
| Sum | | | | 21.3 | | | 3.0 | | | 19.50 |
| $RMS_{COP}$ | $5.23e-02$ | | | | | | | | | |
| $RMS_{Q_{cond}}$ | $1.67e-02$ | | | | | | | | | |
| $RMS_{W_{comp}}$ | $2.65e-02$ | | | | | | | | | |

Meier/SIN-8TU/SIN-8TU-Qcond.pdf

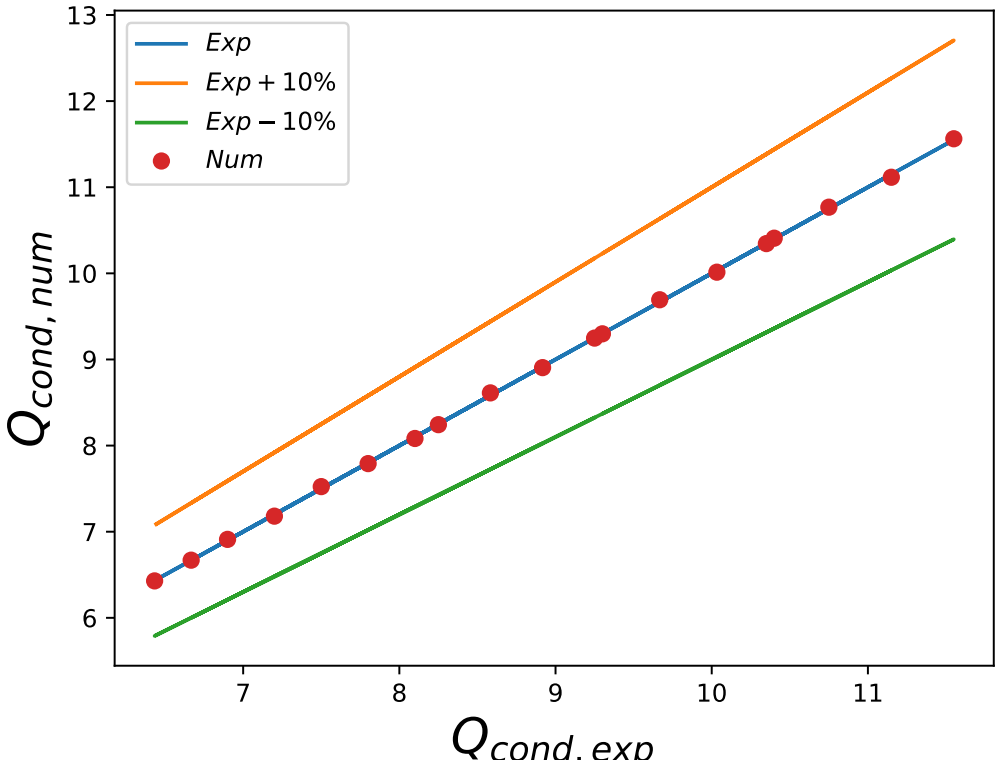


Figure 1: $Q_{cond}$ differences between experiments and fitted data

Meier/SIN-8TU/SIN-8TU-Qcomp.pdf

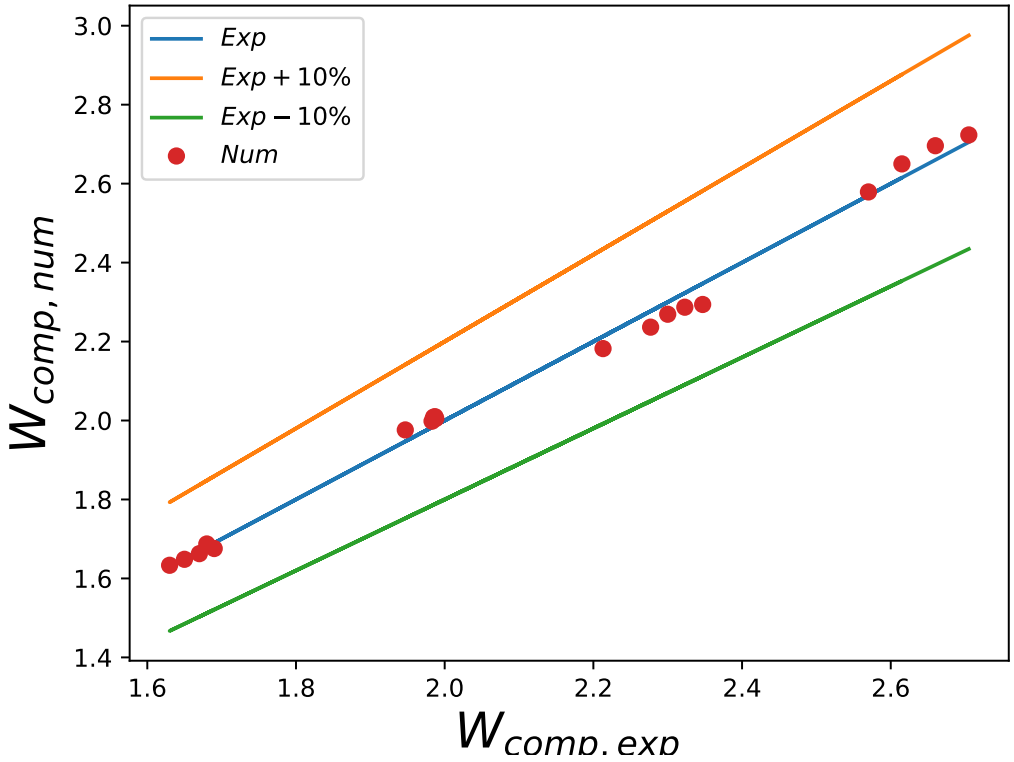


Figure 2: $W_{comp}$ differences between experiments and fitted data

Meier/SIN-8TU/SIN-8TU-COP.pdf

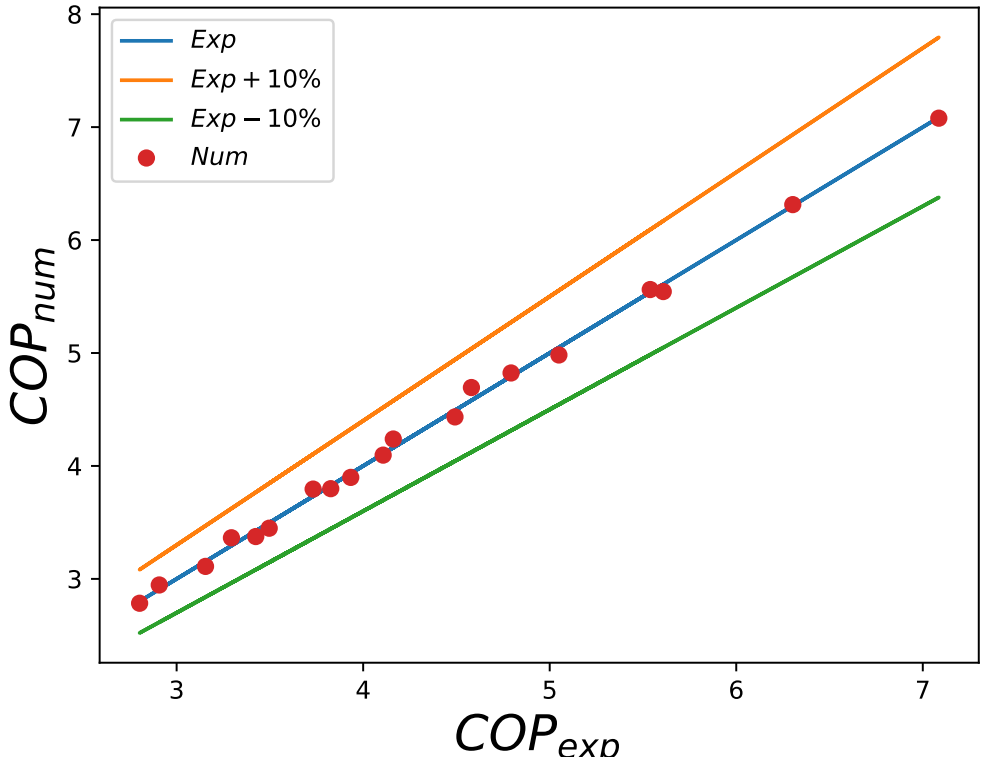


Figure 3: *COP* differences between experiments and fitted data