Type977 fitting for heat pump SIN-11TU

Parametric Heat Pump calculation

Dani Carbonell

dani.carbonell@spf.ch

2019/03/12 at: 16:07:47 h

Table 1: Fitted coefficients for the heat pump.

Coefficient	Description	[kW]
P_{Q_1}	1st condenser polynomial coefficient	1.0347e+01
P_{Q_2}	2st condenser polynomial coefficient	1.1794e+02
P_{Q_3}	3st condenser polynomial coefficient	2.9112e+01
P_{Q_4}	4st condenser polynomial coefficient	-2.0540e+02
P_{Q_5}	5st condenser polynomial coefficient	6.8104e+01
P_{Q_6}	6st condenser polynomial coefficient	-1.4845e+02
P_{COP_1}	1st COP polynomial coefficient	7.3541e+00
P_{COP_2}	2st COP polynomial coefficient	7.4987e+01
P_{COP_3}	3st COP polynomial coefficient	-1.0135e+01
P_{COP_4}	4st COP polynomial coefficient	-2.9177e+02
P_{COP_5}	5st COP polynomial coefficient	-3.3744e+01
P_{COP_6}	6st COP polynomial coefficient	-6.5273e+01
$\dot{m}_{cond}$	1900.00 $[kg/h]$	
$\dot{m}_{evap}$	1900.00 $[kg/h]$	
COP_{nom} (A0W35)	4.85	
$Q_{cond,nom}$ (A0W35)	10.86 $[kW]$	
$Q_{evap,nom}$ (A0W35)	8.62 $[kW]$	
$W_{comp,nom}$ (A0W35)	2.24 $[kW]$	
RMS_{COP}	$5.14e-02$	
$RMS_{Q_{cond}}$	$4.08e-02$	
$RMS_{W_{comp}}$	$3.44e-02$	
Fit model	Average Temperature	

HSR
HOCHSCHULE FÜR TECHNIK
RAPPERSWIL

FHO Fachhochschule Ostschweiz

INSTITUT FÜR
SPF SOLARTECHNIK

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	4.18	4.20	0.5	9.43	9.50	0.8	2.26	2.26	0.22
35.00	0.00	4.90	4.87	0.7	10.97	10.90	0.6	2.24	2.24	0.01
35.00	5.00	5.62	5.59	0.5	12.56	12.55	0.1	2.24	2.25	0.38
50.00	-5.00	2.98	2.92	2.1	8.98	8.97	0.1	3.01	3.07	1.92
50.00	0.00	3.43	3.38	1.6	10.36	10.30	0.6	3.02	3.05	0.97
50.00	5.00	3.89	3.82	1.7	11.79	11.78	0.1	3.03	3.08	1.64
45.00	-5.00	3.42	3.46	1.1	9.22	9.23	0.1	2.69	2.67	0.94
45.00	0.00	3.97	4.01	1.0	10.66	10.60	0.5	2.69	2.64	1.59
45.00	5.00	4.51	4.57	1.2	12.14	12.17	0.2	2.69	2.67	0.97
55.00	0.00	2.85	2.90	1.5	9.98	10.00	0.2	3.50	3.45	1.33
55.00	5.00	3.21	3.25	1.2	11.36	11.40	0.4	3.53	3.50	0.78
35.00	10.00	6.32	6.31	0.2	14.19	14.20	0.1	2.24	2.25	0.28
35.00	15.00	7.03	7.03	0.0	15.87	15.85	0.1	2.26	2.25	0.15
50.00	10.00	4.33	4.25	1.9	13.27	13.27	0.0	3.06	3.12	1.86
50.00	15.00	4.76	4.66	2.1	14.79	14.75	0.3	3.10	3.16	1.80
45.00	10.00	5.05	5.11	1.2	13.67	13.73	0.4	2.71	2.69	0.81
45.00	15.00	5.57	5.65	1.3	15.25	15.30	0.3	2.74	2.71	1.01
55.00	10.00	3.57	3.60	0.8	12.78	12.80	0.2	3.58	3.56	0.67
55.00	15.00	3.91	3.93	0.6	14.25	14.20	0.3	3.65	3.62	0.90
Sum				21.3			5.5			18.24
RMS_{COP}	$5.14e-02$									
$RMS_{Q_{cond}}$	$4.08e-02$									
$RMS_{W_{comp}}$	$3.44e-02$									

INSTITUT FÜR
SOLARTECHNIK
SPF

HSR
HOCHSCHULE FÜR TECHNIK
RAPPERSWIL
FHO Fachhochschule Ostschweiz

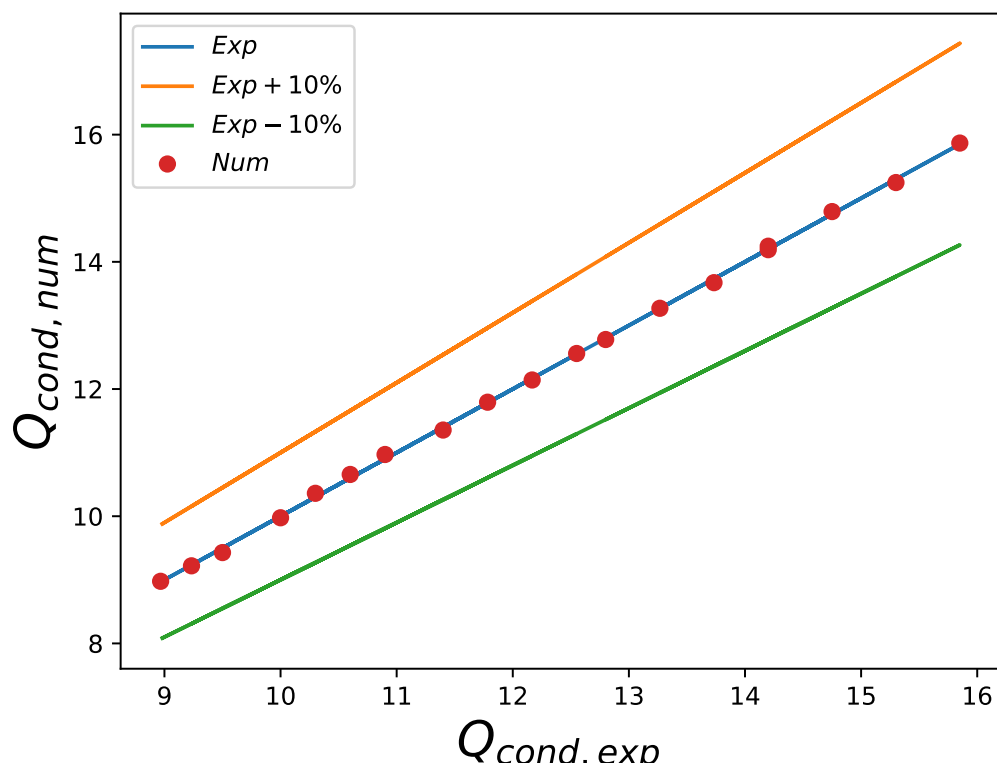Meier/SIN-11TU/SIN-11TU-Qcond.pdf

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

Meier/SIN-11TU/SIN-11TU-Qcomp.pdf

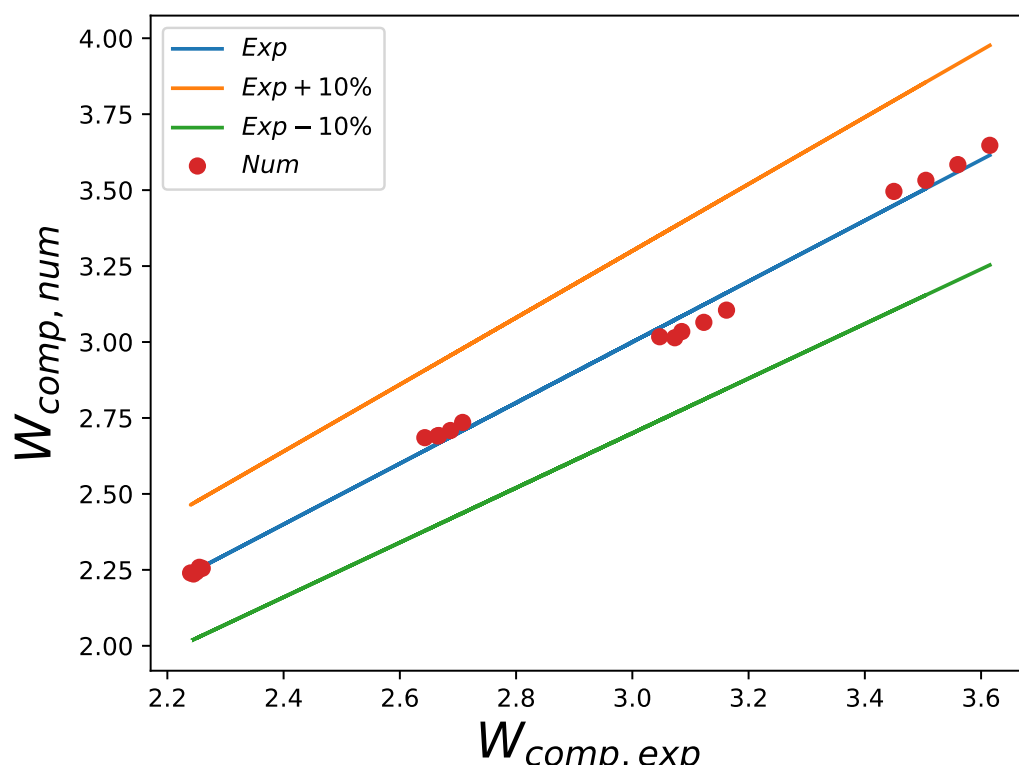Figure 2: W_{comp} differences between experiments and fitted data

HSR
HOCHSCHULE FÜR TECHNIK
RAPPERSWIL

FHO Fachhochschule Ostschweiz
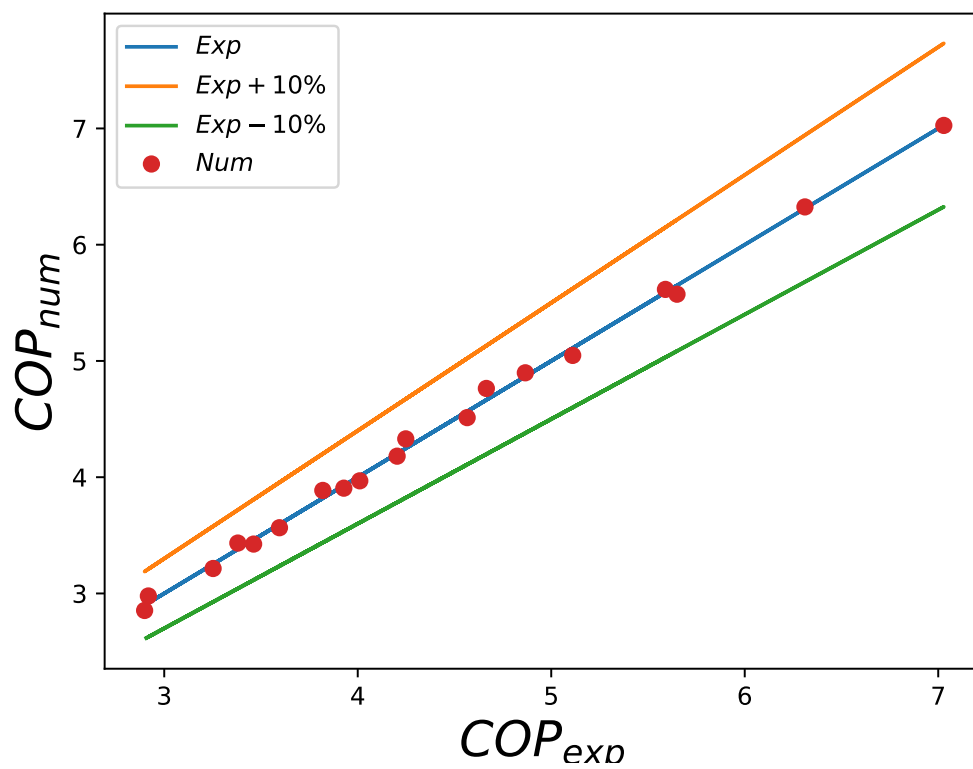
INSTITUT FÜR
SOLARTECHNIK

SPF

Meier/SIN-11TU/SIN-11TU-COP.pdf

Figure 3: COP differences between experiments and fitted data