

# TEST REPORT

Report no.:  
300-KLAB-22-033



**DANISH  
TECHNOLOGICAL  
INSTITUTE**

Teknologiparken  
Kongsvang Allé 29  
DK-8000 Aarhus C  
+45 72 20 20 00  
Info@teknologisk.dk  
www.teknologisk.dk

Page 1 of 57  
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**Customer:** Company: Panasonic Marketing Europe GmbH  
Address: Hagenauer Str. 43  
City: 65203 Wiesbaden  
Tel.: +49 611 2350

**Component:** Brand: Panasonic  
Type: Air to water heat pump  
Model: Outdoor unit: WH-UXZ12KE5  
Indoor unit: WH-ADC0912K6E5  
Series no.: Outdoor unit: 5624500001  
Indoor unit: 5707000016  
Prod. year: 2022.12

**Dates:** Component tested: January – August 2023

**Procedure:** See objective (page 2) for list of standards.

**Remarks:** The unit was delivered by the customer. The installation and test settings were done according to the manufacturer's instructions. All tests were done with enabled defrost mode.  
The outdoor unit was delivered as model no. WH-UXZ09KE5, cf. the rating plates of the units.  
By changing the software, the unit was changed to model no. WH-UXZ12KE5.

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**Division/Centre:** Danish Technological Institute  
Energy and Climate  
Heat Pump Laboratory, Aarhus

**Date:** 2023.08.21

**Signature:**  
Kamalathasan Arumugam  
B.Sc. Engineer

**Co-reader:**  
Rasmus Thisgaard  
B.TecMan & MarEng



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## Objective

The objective of this report is to document the following:

The Seasonal Coefficient of Performance (SCOP) at low and medium temperature application

In order to calculate the SCOP, tests were carried out at the part load conditions stated in the tables on page 5 and 6.

COP test conditions (heating mode) according to EN 14511:2018, chosen by the manufacturer.

The Seasonal Energy Efficiency Ratio (SEER) at fan cooling application for space cooling according to EN 14825:2018.

Operating requirements according to EN 14511-4:2018

- 4.2.1 Starting and operating tests
- 4.5 Shutting of the heat transfer medium flows
- 4.6 Complete power supply failure

Power consumption of liquid pump for COP and SCOP test points.

Sound power measurements according to EN 12102-1:2017 at rating conditions (A7/W35, A7/W55, A-7/W35, and A-7/W55), quiet mode level 3 (A7/W35, A7/W55, A2/W35, A-7/W35, and A-7/W55), and ErP energy label (A7/W55).





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## Test conditions

### SCOP test conditions for low temperature - EN 14825

Part test conditions for reference SCOP and reference SCOP<sub>net</sub> calculation of air to water units for low temperature application for the reference heating season.

'A' = average, 'W' = warmer, and 'C' = colder.

	Part load ratio p (%)				Reference test exchange		Variable test exchange			
					Water side (cool/heating) temperature (°C)		Flow ratio (%)	Variable water (°C)		
	Variable	A	W	C	Reference air	Reference water	Reference water	A	W	C
A	2/10-90/2 (Flow=100)	90	90	90	-15/45	20/55	1/100	1/100	90	1/100
B	2/10-90/2 (Flow=100)	90	90	90	5/55	20/55	1/100	1/100	1/100	1/100
C	2/10-90/2 (Flow=100)	90	90	90	15/55	20/55	1/100	1/100	1/100	1/100
D	2/10-90/2 (Flow=100)	90	90	90	25/55	20/55	1/100	1/100	1/100	1/100
E	2/10-90/2 (Flow=100)	90	90	90	35/55	20/55	1/100	1/100	1/100	1/100
F	2/10-90/2 (Flow=100)	90	90	90	45/55	20/55	1/100	1/100	1/100	1/100
G	2/10-90/2 (Flow=100)	90	90	90	55/55	20/55	1/100	1/100	1/100	1/100
H	2/10-90/2 (Flow=100)	90	90	90	65/55	20/55	1/100	1/100	1/100	1/100
I	2/10-90/2 (Flow=100)	90	90	90	75/55	20/55	1/100	1/100	1/100	1/100
J	2/10-90/2 (Flow=100)	90	90	90	85/55	20/55	1/100	1/100	1/100	1/100
K	2/10-90/2 (Flow=100)	90	90	90	95/55	20/55	1/100	1/100	1/100	1/100
L	2/10-90/2 (Flow=100)	90	90	90	105/55	20/55	1/100	1/100	1/100	1/100
M	2/10-90/2 (Flow=100)	90	90	90	115/55	20/55	1/100	1/100	1/100	1/100
N	2/10-90/2 (Flow=100)	90	90	90	125/55	20/55	1/100	1/100	1/100	1/100
O	2/10-90/2 (Flow=100)	90	90	90	135/55	20/55	1/100	1/100	1/100	1/100
P	2/10-90/2 (Flow=100)	90	90	90	145/55	20/55	1/100	1/100	1/100	1/100
Q	2/10-90/2 (Flow=100)	90	90	90	155/55	20/55	1/100	1/100	1/100	1/100
R	2/10-90/2 (Flow=100)	90	90	90	165/55	20/55	1/100	1/100	1/100	1/100
S	2/10-90/2 (Flow=100)	90	90	90	175/55	20/55	1/100	1/100	1/100	1/100
T	2/10-90/2 (Flow=100)	90	90	90	185/55	20/55	1/100	1/100	1/100	1/100
U	2/10-90/2 (Flow=100)	90	90	90	195/55	20/55	1/100	1/100	1/100	1/100
V	2/10-90/2 (Flow=100)	90	90	90	205/55	20/55	1/100	1/100	1/100	1/100
W	2/10-90/2 (Flow=100)	90	90	90	215/55	20/55	1/100	1/100	1/100	1/100
X	2/10-90/2 (Flow=100)	90	90	90	225/55	20/55	1/100	1/100	1/100	1/100
Y	2/10-90/2 (Flow=100)	90	90	90	235/55	20/55	1/100	1/100	1/100	1/100
Z	2/10-90/2 (Flow=100)	90	90	90	245/55	20/55	1/100	1/100	1/100	1/100

With the water flow rate as determined in the standard rating conditions given in EN 14825-2 at 50/55 conditions for water with a fixed water flow rate and with a fixed delta T of 10 K for water with a variable flow rate. If the resulting flow rate is below the minimum flow rate then the minimum flow rate is used with the water temperature.

Variable water shall be calculated by integration from  $T_{water}$  and the temperature which is shown in the table.

Variable water shall be calculated by integration between the upper and lower temperatures which are shown in the standard integration.

If the variable water temperature is below the minimum of the operation range of the unit, the minimum should be assumed.

### Additional information

Climate	Range (°C)	Range (°C)	TRV (°C)	Water temperature	Flow rate
Average	-15	-15	-15	variable	variable



## SCOP test conditions for medium temperature - EN 14825

Test test conditions for reference SCOP and reference SCOP<sub>net</sub> calculation of air to water units for medium temperature application for the reference testing season.

'W' = average, 'W' = warmer, and 'C' = colder.

Climate	Part load factor p <sub>h</sub> (%)				Outdoor test conditions		Indoor test conditions			
					Indoor test conditions temperature (°C)		Flow rate m³/s	Variable indoor °C		
	Average	W	W	C	Heating 20	Heating 25		W	W	C
A	$\frac{20-25}{25-20}$ (Flow=10)	60	40	40	-15/45	20/25	1/10	1/10	40	1/10
B	$\frac{20-25}{25-20}$ (Flow=10)	50	40	30	5/15	20/25	1/10	1/10	1/10	1/10
C	$\frac{20-25}{25-20}$ (Flow=10)	50	40	30	15/25	20/25	1/10	1/10	1/10	1/10
D	$\frac{20-25}{25-20}$ (Flow=10)	50	30	30	15/15	20/25	1/10	1/10	1/10	1/10
E	20% - 10% (Flow=10)				15/15	20/25	1/10	1/10	1/10	1/10
F	Flow=10 (Flow=10)				Flow=10	20/25	1/10	1/10	1/10	1/10
G	$\frac{10-15}{15-10}$ (Flow=10)	40	40	40	-15	20/25	1/10	40	40	1/10

NOTE: The water flow rate is determined at the standard rating conditions given in EN 14825-2 at 50°C conditions for units with a fixed water flow rate, and with a fixed ratio 1 or 1/10 for units with a variable flow rate. If the resulting flow rate is below the minimum flow rate then the minimum flow rate is used with the water temperature.

Variable indoor shall be calculated by interpolation  $T_{room}$  and the temperature shall be closest to the TDB.

Variable indoor shall be calculated by interpolation between the upper and lower temperatures which are closest to the standard temperature.

If the variable indoor temperature is below the minimum of the operation range of the unit, the minimum should be considered.

### Additional information

Climate	T <sub>space</sub> (°C)	T <sub>room</sub> (°C)	TDB (°C)	Water temperature	Flow rate
Average	-15	-15	-15	variable	variable



### EDP test conditions - low temperature - EN 14511

W	Heat source		Heat sink		Heat pump settings
	Heat sink temperature (°C)	Heat source temperature (°C)	Heat sink temperature (°C)	Heat sink temperature (°C)	
2°	2	6	20	20	
2°	2	1	20	20	
2°	-2	6	20	20	
2°	2	1	20	20	Quick mode 1

2° Standard rating condition

1° Refrigeration rating condition

### EDP test conditions - medium temperature - EN 14511

W	Heat source		Heat sink		Heat pump settings
	Heat sink temperature (°C)	Heat source temperature (°C)	Heat sink temperature (°C)	Heat sink temperature (°C)	
2°	2	6	47	20	
2°	2	1	47	20	
2°	-2	6	47	20	

2° Standard rating condition

1° Refrigeration rating condition



**Test conditions for SEER test points at fan cooling application for space cooling - EN 14825**

W	Heat source		Heat sink		Test point
	Evaporator temperature (°C)	Condenser temperature (°C)	Evaporator temperature (°C)	Condenser temperature (°C)	
1	20	-	20	7	A
2	20	-	22.5	8.5	B
3	20	-	25	10	C
4	20	-	28.5	11.5	D

**Test conditions for operating requirements - EN 14813-4**

W	Heat source		Heat sink	Water flow rate at indoor heat exchanger	Test
	Evaporator temperature (°C)	Condenser temperature (°C)	Evaporator temperature (°C)		
1	20	-	20	Minimum	Starting
2	20	-	27	Minimum	Operating



**Test conditions for shutting off the heat transfer medium - EN 14511-4**

W	Heat source		Heat sink		Heat exchanger
	Test oil bulk temperature (°C)	Test water bulk temperature (°C)	Test temperature (°C)	Outlet temperature (°C)	
1	7	6	20	20	Indoor
2	7	6	20	20	Outdoor

**Test conditions for complete power supply failure - EN 14511-4**

W	Heat source		Heat sink	
	Test oil bulk temperature (°C)	Test water bulk temperature (°C)	Test temperature (°C)	Outlet temperature (°C)
1	7	6	20	20



### Test conditions for sound power measurements - EN 12102-1

RT	Test condition		Test room setting			
	Reverberation time (s) at 125 Hz (T <sub>125</sub> )	Reverberation time (s) at 500 Hz (T <sub>500</sub> )	Background noise (dB)	Test object size (m <sup>2</sup> ) (S <sub>obj</sub> )	Reverberation time (s) at 500 Hz (T <sub>500</sub> )	Reverberation time (s) at 125 Hz (T <sub>125</sub> )
1 <sup>st</sup>	1.0	0.5	40	400/100	12.0	2.0
2 <sup>nd</sup>	1.0	0.5	30	100/100	7.0	1.0
3 <sup>rd</sup>	1.0	0.5	30	100/100	12.0	2.0
4 <sup>th</sup>	1.0	0.5	30	100/100	7.0	2.0
5 <sup>th</sup>	2.0	0.5	40	400/100	9.0	2.0
6 <sup>th</sup>	1.0	0.5	30	100/100	12.0	4.0
7 <sup>th</sup>	1.0	0.5	30	400/100	9.0	2.7
8 <sup>th</sup>	1.0	0.5	30	100/100	12.0	9.0
9 <sup>th</sup>	1.0	0.5	30	400/100	7.0	2.7
10 <sup>th</sup>	1.0	0.5	30	100/100	4.0	1.0

RT: Reverberation time, T<sub>125</sub>: Reverberation time at 125 Hz, T<sub>500</sub>: Reverberation time at 500 Hz





## Test results

### Test results of SCOP test at low temperature - heating season average – EN 14825

<b>Model (Outdoor)</b>	WH-UXZ12KE5
<b>Air-to-water heat pump mono bloc</b>	N
<b>Low-temperature heat pump</b>	N
<b>Equipped with supplementary heater</b>	Y
<b>Heat pump combination heater</b>	Y

<b>Rated heat output<sup>1)</sup></b>	$P_{rated}$	<b>9 [kW]</b>
<b>Seasonal space heating energy efficiency</b>	$\eta_s$	<b>214.2 [%]</b>
	SCOP	<b>5.43 [-]</b>

<b>Measured capacity for heating for part load at outdoor temperature <math>T_j</math></b>	Average Climate - Low temperature application	$T_j = -15\text{ °C}$	$P_{dh}$	- [kW]
		$T_j = -7\text{ °C}$	$P_{dh}$	8.70 [kW]
		$T_j = 2\text{ °C}$	$P_{dh}$	4.83 [kW]
		$T_j = 7\text{ °C}$	$P_{dh}$	5.32 [kW]
		$T_j = 12\text{ °C}$	$P_{dh}$	6.13 [kW]
		$T_j = \text{bivalent temperature}$	$P_{dh}$	8.77 [kW]
		$T_j = \text{operation limit}$	$P_{dh}$	8.77 [kW]

K  
K

<b>Measured coefficient of performance at outdoor temperature <math>T_j</math></b>	Average Climate - Low temperature application	$T_j = -15\text{ °C}$	COPd	- [-]
		$T_j = -7\text{ °C}$	COPd	3.42 [-]
		$T_j = 2\text{ °C}$	COPd	5.34 [-]
		$T_j = 7\text{ °C}$	COPd	6.89 [-]
		$T_j = 12\text{ °C}$	COPd	8.75 [-]
		$T_j = \text{bivalent temperature}$	COPd	3.04 [-]
		$T_j = \text{operation limit}$	COPd	3.04 [-]

<b>Bivalent temperature</b>	$T_{bivalent}$	-10 [°C]
<b>Operation limit</b>	TOL	-10 [°C]
<b>temperatures</b>	WTOL	- [°C]
<b>Degradation coefficient</b>	$C_{dh}$	0.99 [-]

<b>Power consumption in modes other than active mode</b>	Off mode	$P_{OFF}$	0.007 [kW]
	Thermostat-off mode	$P_{TO}$	0.007 [kW]
	Standby mode	$P_{SB}$	0.007 [kW]
	Crankcase heater mode	$P_{CK}$	0.007 [kW]
<b>Supplementary heater<sup>1)</sup></b>	Rated heat output	$P_{SUP}$	0.00 [kW]
	Type of energy input		Electrical

<b>Other items</b>	Capacity control		Variable
	Water flow control		Variable
	Water flow rate		-
	Annual energy consumption	$Q_{HE}$	3424 [kWh]

<sup>1)</sup>For heat pump space heaters and heat pump combination heaters, the rated heat output,  $P_{rated}$ , is equal to the design load for heating,  $P_{design,h}$ , and the rated heat output of a supplementary heater,  $P_{sup}$ , is equal to the supplementary capacity for heating,  $sup(T_j)$ .

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## Test results of SCOP test at medium temperature - heating season average – EN 14825

<b>Model (Outdoor)</b>	WH-UXZ12KE5
<b>Air-to-water heat pump mono bloc</b>	N
<b>Low-temperature heat pump</b>	N
<b>Equipped with supplementary heater</b>	Y
<b>Heat pump combination heater</b>	Y

<b>Rated heat output<sup>1)</sup></b>	$P_{rated}$	<b>9 [kW]</b>
<b>Seasonal space heating energy efficiency</b>	$\eta_s$	<b>153.9 [%]</b>
	SCOP	<b>3.92 [-]</b>

<b>Measured capacity for heating for part load at outdoor temperature <math>T_j</math></b>	Average Climate - Medium temperature application	$T_j = -15\text{ °C}$	$P_{dh}$	- [kW]	
		$T_j = -7\text{ °C}$	$P_{dh}$	7.58 [kW]	
		$T_j = 2\text{ °C}$	$P_{dh}$	4.98 [kW]	
		$T_j = 7\text{ °C}$	$P_{dh}$	5.05 [kW]	K
		$T_j = 12\text{ °C}$	$P_{dh}$	5.92 [kW]	
		$T_j = \text{bivalent temperature}$	$P_{dh}$	8.55 [kW]	K
		$T_j = \text{operation limit}$	$P_{dh}$	8.55 [kW]	

<b>Measured coefficient of performance at outdoor temperature <math>T_j</math></b>	Average Climate - Medium temperature application	$T_j = -15\text{ °C}$	COPd	- [-]	
		$T_j = -7\text{ °C}$	COPd	2.42 [-]	
		$T_j = 2\text{ °C}$	COPd	3.86 [-]	
		$T_j = 7\text{ °C}$	COPd	4.95 [-]	
		$T_j = 12\text{ °C}$	COPd	6.79 [-]	
		$T_j = \text{bivalent temperature}$	COPd	2.08 [-]	
		$T_j = \text{operation limit}$	COPd	2.08 [-]	

<b>Bivalent temperature</b>	$T_{bivalent}$	-10 [°C]
<b>Operation limit temperatures</b>	TOL	-10 [°C]
<b>Degradation coefficient</b>	WTOL	- [°C]
	$C_{dh}$	0.99 [-]

<b>Power consumption in modes other than active mode</b>	Off mode	$P_{OFF}$	0.007 [kW]
	Thermostat-off mode	$P_{TO}$	0.007 [kW]
	Standby mode	$P_{SB}$	0.007 [kW]
	Crankcase heater mode	$P_{CK}$	0.007 [kW]
<b>Supplementary heater<sup>1)</sup></b>	Rated heat output	$P_{SUP}$	0.00 [kW]
	Type of energy input		Electrical

<b>Other items</b>	Capacity control		Variable
	Water flow control		Variable
	Water flow rate		-
	Annual energy consumption	$Q_{HE}$	4741 [kWh]

<sup>1)</sup>For heat pump space heaters and heat pump combination heaters, the rated heat output,  $P_{rated}$ , is equal to the design load for heating,  $P_{designh}$ , and the rated heat output of a supplementary heater,  $P_{sup}$ , is equal to the supplementary capacity for heating,  $sup(T_j)$ .

K) Keymark



## COP test results - low temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1 <sup>K</sup>	A7/W35	12.144	4.912
2	A2/W35	12.165	3.439
3	A-7/W35	13.414	2.960
4 <sup>Q</sup>	A2/W35	8.720	3.837

K) Keymark  
Q) Quiet mode

## COP test results - medium temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1 <sup>K</sup>	A7/W55	11.940	3.070
2	A2/W55	12.911	2.434
3	A-7/W55	12.313	2.095

K) Keymark





**Test results for SEER test points at fan coil cooling application for space cooling - EN 14825**

Rated cooling output		2.00	2.00
SEER		5.00	5.00
	Air to air heat exchanger	Rated cooling output	2.00
		SEER	5.00
		Rated cooling output	2.00
		SEER	5.00
		Rated cooling output	2.00
		SEER	5.00
		Rated cooling output	2.00
		SEER	5.00
		Rated cooling output	2.00
		SEER	5.00
Regulation coefficient		1.00	1.00
Power consumption in steady state when cooling mode	At rated	1.00	1.00
	Power factor at rated	1.00	1.00
	Rated power	1.00	1.00
	Rated power factor	1.00	1.00
	Rated power	1.00	1.00
	Rated power factor	1.00	1.00
Regulation factor		1.00	1.00
Other tests	Rated cooling output	2.00	2.00
	Rated power	1.00	1.00
	Rated power factor	1.00	1.00
	Rated power	1.00	1.00

10. Summary

**Test results for operating requirements - EN 14813-4**

ST	Test conditions	Test validation
1	Starting	Passed
2	Operating	Passed

10. Summary



**Test results for shutting off the heat transfer medium - EN 14511-4**

Ref	Test exchange	Test validation
1	Index	Passed
2	Index	Passed

10/10/2020

**Test results for complete power supply failure - EN 14511-4**

Ref	Test validation
1	Passed

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**Starting and operating test - EN 14511-4:2018**

Ref	Test conditions air supply inlet (°C)	Test validation
Starting	4-20/10/15	Passed
Operating	4-20/10/17	Passed



**Power consumption of liquid pump for SCCP test points - low  
temperature application - Average climate**

SP	Test condition	Measured power consumption (W)	Test mode no.
A	A-118034	10 W	5
B	A218035	10 W	5
C	A318037	10 W	6
D	A4218038	10 W	5
SCCP	A-1218035	10 W	7

The power consumption of the liquid pump have been measured separately.

**Power consumption of liquid pump for SCCP test points - medium  
temperature application - Average climate**

SP	Test condition	Measured power consumption (W)	Test mode no.
A	A-118032	10 W	11
B	A218032	10 W	10
C	A318036	10 W	9
D	A4218033	10 W	8
SCCP	A-1218033	10 W	12

The power consumption of the liquid pump have been measured separately.



### Power consumption of liquid pump for EN14511 - low temperature application

ST	Test condition	Measured power consumption (W)	Test result (s)
1	AC100%	50 W	1
2	AC100%	50 W	1
3	A-1100%	50 W	1

The power consumption of the liquid pump have been measured separately.

### Power consumption of liquid pump for EN14511 - medium temperature application

ST	Test condition	Measured power consumption (W)	Test result (s)
1	AC100%	50 W	1
2	AC100%	50 W	1
3	A-1100%	50 W	1

The power consumption of the liquid pump have been measured separately.

### Pre and post run time for liquid pump

ST	Time (sec)
Pre-run	100
Post-run	10





## Test results of sound power measurements – EN 12102

<b>N<sup>#</sup></b>	<b>Test conditions</b>	<b>Sound power level LW(A) [dB re 1pW]</b>	<b>Uncertainty (dB) (weighted value)</b>
1 <sup>R</sup>	A7/W35	<b>65.8</b>	0.5
2 <sup>Q</sup>	A7/W35	<b>56.7</b>	1.0
3 <sup>R</sup>	A7/W55	<b>66.4</b>	1.0
4 <sup>Q</sup>	A7/W55	<b>60.0</b>	1.0
5 <sup>Q</sup>	A2/W35	<b>61.7</b>	1.0
6 <sup>R</sup>	A-7/W35	<b>67.1</b>	0.5
7 <sup>Q</sup>	A-7/W35	<b>64.7</b>	1.0
8 <sup>R</sup>	A-7/W55	<b>68.5</b>	1.0
9 <sup>Q</sup>	A-7/W55	<b>66.2</b>	1.0
10 <sup>E-K</sup>	A7/W55	<b>57.9</b>	1.0

R) Rating capacity, Q) Quiet mode 3, E) ERP labelling K) Keymark

The uncertainty value is a weighted value using the level and frequency dependant influence for each 1/1-octave level on the final A-weighted sound power level.

The A-weighted total sound power level is determined for the measured frequency range from 100 Hz to 10 kHz.

The sound power measurements are carried out by Kamalathasan Arumugam (KAMA) and co-read by Birger Bech Jessen (BBJN).





## Photo

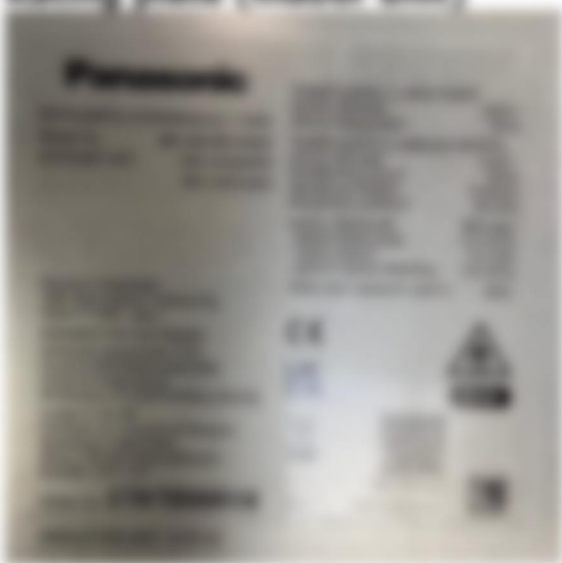
Rating plate (outdoor unit)



Outdoor unit



Rating plate (indoor unit)



### SCOP - detailed calculation

## Detailed SCOP calculation of low temperature and average climate conditions - EN 14825

Year	1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2100	
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Number of hours for which the unit is considered to peak is determined at each month, steadily state, continuous steady state and off state, i.e., respectively.

Electricity consumption during formation of roads, monthly roads, concrete roads, roads out of roads, etc., respectively.

[illegible]

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
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long enough to become ill with a cold, or even worse, with

	1990	1991	1992	1993
1990	1990	1991	1992	1993
1991	1991	1992	1993	1994
1992	1992	1993	1994	1995
1993	1993	1994	1995	1996





## Detailed SCOP calculation of medium temperature and average climate conditions - EN 14825

### Calculation of reference SCOP

$$SCOP_{ref} = \frac{\sum_{i=1}^n \frac{Q_{h,i}}{T_{h,i}}}{\sum_{i=1}^n \frac{Q_{h,i}}{T_{h,i}} + \sum_{i=1}^n \frac{Q_{c,i}}{T_{c,i}}}$$

Where

$Q_{h,i}$  =

Heating load of the building at design temperature, kWh

$T_{h,i}$  =

Number of equivalent heating hours, 2000 h

$Q_{c,i}$ ,  $Q_{c,off}$ ,  $Q_{c,mod}$ ,  $Q_{c,off+mod}$  =

Number of hours for which the unit is considered to work in thermostat off mode, standby mode, continuous heater mode and off mode, h, respectively

$Q_{c,i}$ ,  $Q_{c,off}$ ,  $Q_{c,mod}$ ,  $Q_{c,off+mod}$  =

Electricity consumption during thermostat off mode, standby mode, continuous heater mode and off mode, kWh, respectively

Table 1000

	Heating load Q <sub>h,i</sub> kWh	Thermostat off Q <sub>c,off</sub> kWh	Standby Q <sub>c,mod</sub> kWh	Continuous heater Q <sub>c,i</sub> kWh	Off mode Q <sub>c,off+mod</sub> kWh	h <sub>off</sub> h	h <sub>mod</sub> h	h <sub>i</sub> h
1	1000	100	100	100	100	1000	1000	1000
2	1000	100	100	100	100	1000	1000	1000
3	1000	100	100	100	100	1000	1000	1000
4	1000	100	100	100	100	1000	1000	1000
5	1000	100	100	100	100	1000	1000	1000
6	1000	100	100	100	100	1000	1000	1000
7	1000	100	100	100	100	1000	1000	1000
8	1000	100	100	100	100	1000	1000	1000
9	1000	100	100	100	100	1000	1000	1000
10	1000	100	100	100	100	1000	1000	1000

### Energy consumption in thermostat off mode, off mode, continuous heater mode

	h <sub>off</sub> h	h <sub>mod</sub> h	h <sub>i</sub> h	h <sub>off+mod</sub> h
Off mode	1000	0	0	1000
Thermostat off	0	1000	0	1000
Standby	0	0	1000	1000
Continuous heater	0	0	0	1000



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[illegible]

## Detailed SEM calculation = 5N 14825

January 1998

[illegible]

Strong arguments to decrease all levels of risk without these tools

[illegible]

Number of hours for which the unit is considered to work is determined off work, standby work, overtime, regular work and off work. i.e. respectively.

Electricity consumption during harvesting of male, sterile male, combined male and sterile male, and separately





No	Outdoor Temperature	Hours	Heating Load	Heating	Actual Heating Demand	Actual Energy Input
°C	°F	h	kWh	°C	kWh	kWh
1		175	2000	0.000	0.000	100.000
2		180	2075	0.000	0.000	200.000
3		185	2150	0.000	0.000	300.000
4		190	2225	0.000	0.000	400.000
5		205	2700	0.000	0.000	1100.000
6		210	2775	0.000	0.000	1400.000
7		215	2850	0.000	0.000	1700.000
8		220	2925	0.000	0.000	2000.000
9		235	3400	0.000	0.000	2700.000
10		240	3475	0.000	0.000	3000.000
11		245	3550	0.000	0.000	3300.000
12		250	3625	0.000	0.000	3600.000
13		255	3700	0.000	0.000	3900.000
14		260	3775	0.000	0.000	4200.000
15		275	4250	0.000	0.000	4900.000
16		280	4325	0.000	0.000	5200.000
17		285	4400	0.000	0.000	5500.000
18		290	4475	0.000	0.000	5800.000
19		305	4950	0.000	0.000	6500.000
20		310	5025	0.000	0.000	6800.000
21		315	5100	0.000	0.000	7100.000
22		320	5175	0.000	0.000	7400.000
23		335	5650	0.000	0.000	8100.000
24		340	5725	0.000	0.000	8400.000
25		345	5800	0.000	0.000	8700.000
26		350	5875	0.000	0.000	9000.000
27		365	6350	0.000	0.000	9700.000
28		370	6425	0.000	0.000	10000.000
29		375	6500	0.000	0.000	10300.000
30		380	6575	0.000	0.000	10600.000
31		395	7050	0.000	0.000	11300.000
32		400	7125	0.000	0.000	11600.000
33		405	7200	0.000	0.000	11900.000
34		410	7275	0.000	0.000	12200.000
35		425	7750	0.000	0.000	12900.000
36		430	7825	0.000	0.000	13200.000
37		435	7900	0.000	0.000	13500.000
38		440	7975	0.000	0.000	13800.000
39		455	8450	0.000	0.000	14500.000
40		460	8525	0.000	0.000	14800.000
41		465	8600	0.000	0.000	15100.000
42		470	8675	0.000	0.000	15400.000
43		485	9150	0.000	0.000	16100.000
44		490	9225	0.000	0.000	16400.000
45		495	9300	0.000	0.000	16700.000
46		500	9375	0.000	0.000	17000.000
47		515	9850	0.000	0.000	17700.000
48		520	9925	0.000	0.000	18000.000
49		525	10000	0.000	0.000	18300.000
50		530	10075	0.000	0.000	18600.000
51		545	10550	0.000	0.000	19300.000
52		550	10625	0.000	0.000	19600.000
53		555	10700	0.000	0.000	19900.000
54		560	10775	0.000	0.000	20200.000
55		575	11250	0.000	0.000	20900.000
56		580	11325	0.000	0.000	21200.000
57		585	11400	0.000	0.000	21500.000
58		590	11475	0.000	0.000	21800.000
59		605	11950	0.000	0.000	22500.000
60		610	12025	0.000	0.000	



### Detailed test results

#### Detailed SCOP test results - low temperature application

## - average climate = 89° 148.25

Detailed result for 2019-2020 Average Low 26, 4, 7 2020		
	Heating 2019 and Heating 2020	Average
Heating according to		
Heating curve		Average
Temperature application		12.0
Condition curve		1.0
Condition temperature	12	12.0
Heat load	10	10.0
Power demand	10	10.0
Energy	10	10.0
Energy	10	10.0
Heating demand	10	10.0
Q <sub>h</sub>	1	1.0
Minimum flow coefficient	1	1.0
Measurement type		Flow
Integrated condition curve		1.0
Adjusted condition curve result		
Heating curve to	10	10.0
Q <sub>h</sub>	1	1.0
Power consumption	10	10.0
Measured		
Heating curve to	10	10.0
Q <sub>h</sub>	1	1.0
Power consumption	10	10.0
Heating heating		
Q <sub>h</sub> temperature in the building	12	12.0
Q <sub>h</sub> temperature in the building	12	12.0
Q <sub>h</sub> temperature in the building	12	12.0
Water temperature	12	12.0
Water temperature	12	12.0
Water temperature (flow averaged)	12	12.0
Condition curve		
Measured data differential pressure (approximate)	10	10.0
Adjusted hydraulic curve	10	10.0
Adjusted power efficiency	1	1.0
Adjusted power to the system	10	10.0
Adjusted power consumption	10	10.0
Q <sub>h</sub> Q <sub>h</sub>	10	10.0





Detailed result for: 2019-02-20 Average Load: 4.2 MW		
	Heating Demand	Heating Power
Climate zone		Average
Temperature application		15°C
Condition name		15°C
Condition temperature	15	15
Part load	100	100
Power Demand	15	15
Energy	15	15
Energy	15	15
Heating demand	15	15
15	1	1
Minimum flow method	1	1
Measurement type		Heating Power
Integrated simulation period		15
Detailed simulation (Heat result)		
Heating capacity	15	15
15	1	1
Power consumption	15	15
Detailed		
Heating capacity	15	15
15	1	1
Power consumption	15	15
Energy heating		
15 - temperature 15°C	15	15
15 - temperature 15°C	15	15
15 - temperature 15°C	15	15
15 - temperature	15	15
15 - temperature	15	15
15 - temperature (Flow averaged)	15	15
Detailed energy		
Measured: 15°C differential pressure, 15°C	15	15
Calculated hydraulic power	15	15
Calculated global efficiency	1	1
Calculated capacity correction	15	15
Calculated power correction	15	15
15 - 15	15	15





Detailed result for EN14025 2012 Average Low (L) A 7 902		
	December 2012 and December 2013	Average
Tested according to		
Climate zone		Average
Temperature application		Low
Condition name		Low
Condition temperature	15	15
Part load	50	50
Power demand	15	15
Energy	15	15
Energy	50	50
Heating demand	50	50
Uk	-	50
Minimum flow method	-	50
Measurement type		Steady State
Integrated simulation profile		50
Detailed simulation (Heat result)		
Heating capacity	50	50
Uk	-	50
Power consumption	50	50
Measured		
Heating capacity	50	50
Uk	-	50
Power consumption	50	50
During heating		
Air temperature dry bulb	15	15
Air temperature wet bulb	15	15
Air temperature dry bulb	15	15
Water temperature	15	15
Water temperature	15	15
Water temperature (Flow averaged)	15	15
Condition pump		
Measured static differential pressure (pump only)	50	50
Calculated hydraulic power	50	50
Calculated global efficiency	1	1
Calculated capacity correction	50	50
Calculated Power correction	50	50
Water flow	50	50





Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Tested according to:	EN60335-1:2012 and EN60335-2-1:2012	
Climate zone		Average
Temperature application		15 °C
Condition name		EN 60335-2-1:2012
Condition temperature	15 °C	15 °C
Test load	20 A	20 A
Power threshold	15 W	15 W
Energy	15 W	15 W
Energy	15 W	15 W
Heating demand	15 W	15 W
OK	1	1
Minimum flow method	1	1
Measurement type		Flow
Integrated insulation point		0
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for STRAIGHT 2018 Average Load 20 A 12 MW		
Heating capacity	15 W	15 W
OK	1	1
Power consumption	15 W	15 W
Detailed result for		













Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Tested according to	EN 12831:2003 and EN 12831:2017	
Climate zone		Average
Temperature application		Medium
Condition name		
Condition temperature	15	
Part load	0.00	0.00
Power demand	0.00	0.00
Energy	0.00	0.00
Energy	0.00	0.00
Heating demand	0.00	0.00
Q <sub>h</sub>	1	0.00
Minimum flow coefficient	1	0.00
Measurement type		Static
Integrated circulation point		0
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00
Power consumption	0.00	0.00
<hr/>		
Detailed result for 2019-02-25 2019 Average Medium (L) A 7 000		
Heating capacity	0.00	0.00
Q <sub>h</sub>	1	0.00



Detailed result for 2019-02-20 Average Medium (2) A 12 000		
Tested according to		EN15459 and EN15458-2014
Climate zone		Average
Temperature application		Steady
Condition name		
Condition temperature	15	15-15-15
Part load	100	100-100-100
Power demand	100	100-100-100
Energy	100	100-100-100
Energy	100	100-100-100
Heating demand	100	100-100-100
U <sub>0</sub>	1	1-1-1
Minimum flow coefficient	1	1-1-1
Measurement type		Steady
Integrated simulation period		10
Detailed simulation (Final result)		
Heating capacity	100	100-100-100
U <sub>0</sub>	1	1-1-1
Power consumption	100	100-100-100
Detailed		
Heating capacity	100	100-100-100
U <sub>0</sub>	1	1-1-1
Power consumption	100	100-100-100
During heating		
W <sub>0</sub> temperature dry bulb	15	15-15-15
W <sub>0</sub> temperature wet bulb	15	15-15-15
W <sub>0</sub> temperature wet/dry	15	15-15-15
Water temperature	15	15-15-15
Heating temperature	15	15-15-15
Heating temperature (Flow averaged)	15	15-15-15
Simulation pump		
Maximum static differential pressure, hydraulic	10	10-10-10
Estimated hydraulic power	10	10-10-10
Estimated global efficiency	1	1-1-1
Estimated capacity correction	10	10-10-10
Estimated flow correction	10	10-10-10
Water type	10	10-10-10





### Detailed COP test results - low temperature - EN 14813

Detailed result for: 300-KLAB-22-033		
Tested according to		EN 14813
Minimum flow method		Yes
Measurement type		Steady state
Integrated correction factor		Yes
Heating correction factor result		
Heating capacity	100	100.000
COP	-	0.000
Power consumption	100	0.000
Cooling		
Heating capacity	100	100.000
COP	-	0.000
Power consumption	100	0.000
Heating/cooling		
Air temperature dry bulb	15	15.000
Air temperature wet bulb	15	15.000
Air temperature dry bulb outdoor	15	15.000
Water temperature	15	15.000
Water temperature	15	15.000
Correction factor		
Measured static differential pressure (Pa)	10	10.000
Corrected heating capacity	100	100.000
Corrected power efficiency	100	100.000
Corrected capacity correction	100	100.000
Corrected power correction	100	100.000
Static loss	100	100.000



Detailed result for: 300-KLAB-22-033			
Tested according to			EN 12556-2
Minimum flow method			Yes
Measurement type			Flow
Integrated correction factor			1.00
Included corrections (final result)			
Flowing capacity	100	100	100
Loss	1	1	1
Flow consumption	100	100	100
Method			
Flowing capacity	100	100	100
Loss	1	1	1
Flow consumption	100	100	100
Flowing testing			
Air temperature dry bulb	15	15	15
Air temperature wet bulb	15	15	15
Air temperature dry bulb wet bulb	15	15	15
Water temperature	15	15	15
Water temperature	15	15	15
Stability testing			
Measured static differential pressure, liquid piping	10	10	10
Estimated hydraulic power	10	10	10
Estimated gasket efficiency	10	10	10
Estimated leakage correction	10	10	10
Estimated flow correction	10	10	10
Static loss	10	10	10



Detailed result for: 300-KLAB-22-033 A 1000		
Tested according to		EN 12550-2
Minimum flow method		Yes
Measurement type		Steady flow
Flow rate correction factor		1
Included correction (flow result)		
Testing capacity	100	100.00
Loss	-	0.00
Power consumption	100	0.00
Method		
Testing capacity	100	100.00
Loss	-	0.00
Power consumption	100	0.00
Testing facility		
Air temperature dry bulb	15	15.00
Air temperature wet bulb	15	15.00
Air temperature dry bulb wet bulb	15	15.00
Test temperature	15	15.00
Test temperature	15	15.00
Provisional result		
Measured static differential pressure (approximate)	10	10.00
Estimated hydraulic power	10	10.00
Estimated gross efficiency	10	10.00
Estimated input to the machine	10	10.00
Estimated power correction	10	10.00
Result type	10	10.00



Detailed result for 300-KLAB-22-033			
Tested according to			EN 12556-2
Minimum flow method			Yes
Measurement type			Flow
Integrated correction factor			1.00
Included corrections (final result)			
Flowing capacity	100		100
Loss	1		1
Flow consumption	100		100
Minimum			
Flowing capacity	100		100
Loss	1		1
Flow consumption	100		100
Flowing testing			
Air temperature dry bulb	15		15
Air temperature wet bulb	15		15
Air temperature dry bulb wet bulb	15		15
Water temperature	15		15
Water temperature	15		15
Correction factor			
Measured static differential pressure, liquid piping	10		10
Estimated hydraulic power	10		10
Estimated gross efficiency	10		10
Estimated specific consumption	10		10
Estimated Power consumption	10		10
Water flow	10		10





### Detailed COP test results - medium temperature - EN 14515

Detailed result for EN14515 2014 A1W05		
Tested according to		EN14515:2014
Minimum flow method		Yes
Measurement type		Steady state
Integrated correction factor		Yes
Heating as well as cooling results		
Heating capacity	100	10.000
Q <sub>HP</sub>	-	0.000
Power consumption	100	0.000
Cooling		
Heating capacity	100	10.000
Q <sub>HP</sub>	-	0.000
Power consumption	100	0.000
Energy efficiency		
η <sub>HP</sub> temperature 10°C	10	1.000
η <sub>HP</sub> temperature 15°C	10	1.000
η <sub>HP</sub> temperature 20°C	10	1.000
η <sub>HP</sub> temperature 25°C	10	1.000
η <sub>HP</sub> temperature	10	1.000
η <sub>HP</sub> temperature	10	1.000
Cooling capacity		
Measured static differential pressure, liquid supply	10	0.000
Accumulated hydraulic power	10	0.000
Accumulated gross efficiency	10	0.000
Accumulated capacity correction	10	0.000
Accumulated power correction	10	0.000
Test Date	2022	2022-03-03



Detailed result for EN14907:2016 A2PWS			Result
Tested according to			EN14907:2016
Minimum flow method			Yes
Measurement type			Flow
Integrated circulation pump			Yes
Initial condition (Test result)			
Testing capacity	100		100.000
Cost	-		0.000
Power consumption	100		0.000
Revised			
Testing capacity	100		100.000
Cost	-		0.000
Power consumption	100		0.000
During testing			
Air temperature dry bulb	15		1.000
Air temperature wet bulb	15		0.000
Air temperature dry bulb wetted	15		0.000
Room temperature	15		0.000
Water temperature	15		0.000
Circulation pump			
Measured static differential pressure (pump/pump)	10		0.000
Calculated hydraulic power	10		0.000
Calculated global efficiency	10		0.000
Calculated capacity correction	10		0.000
Calculated Power correction	10		0.000
Result Type	10		0.000



Detailed result for EN14907 2012 A 7000		
Tested according to		EN14907 2012
Minimum flow coefficient		10
Measurement type		Steady State
Integrated insulation pump		Yes
Included correction (final result)		
Testing capacity	100	10.000
Loss	-	0.000
Power consumption	100	0.070
Revised		
Testing capacity	100	10.000
Loss	-	0.070
Power consumption	100	0.000
During testing		
Air temperature dry bulb	15	15.00
Air temperature wet bulb	15	15.00
Air temperature dry bulb surface	15	15.00
Room temperature	15	15.00
Water temperature	15	15.00
Insulation pump		
Measured static differential pressure (pump/pump)	10	0.00
Calculated hydraulic power	10	0.00
Calculated global efficiency	10	0.00
Calculated capacity correction	10	0.00
Calculated Power correction	10	0.00
State, Class	10/10	0.000000



## Detailed SEER test results, fan cooling application for space cooling - EN 14825

Detailed result for ENECEN 2018 Cooling for Jul JA A2018			
	Simulation start end	Simulation start	Simulation end
Simulated according to:			
Climate zone			ETC
Temperature application			Cooling for Jul
Condition name			
Condition temperature	25		25
Part load	0.5		0.5
Power demand	0.5		0.5
Energy	0.5		0.5
Energy	0.5		0.5
Cooling demand	0.5		0.5
PA	-		0.5
Minimum flow coefficient	-		0.5
Measurement type		Power	0.5
Integration simulation period			0.5
Selected variables (that result)			
Cooling capacity	0.5		0.5
PA	-		0.5
Power consumption	0.5		0.5
Refrigerant			
Cooling capacity	0.5		0.5
PA	-		0.5
Power consumption	0.5		0.5
Cooling heating			
PA temperature (in bulk)	25		25
PA temperature (in wall)	25		25
PA temperature	25		25
PA temperature	25		25
PA temperature (Flow averaged)	25		25
Cooling pump			
Measured static differential pressure (pump/loop)	0.5		0.5
Simulated hydraulic power	0.5		0.5
Simulated gross efficiency	0.5		0.5
Simulated capacity correction	0.5		0.5
Simulated Power correction	0.5		0.5
PA	0.5		0.5





Detailed result for Struktelt 2018 Cooling for J6 A10000.2		
Tested according to	Standard 2018 and	Standard 2017
Product name		
Temperature application		Cooling
Condition name		
Condition temperature	15	15
Test load	100	100
Power to product	100	100
Test log		
Test log		
Test log		
Test log		
Test log		
Minimum flow method	1	1
Measurement type		
Long-term condition points		
Added condition that results		
Setting name to	100	100
Test	1	1
Power consumption	100	100
Test log		
Setting name to	100	100
Test	1	1
Power consumption	100	100
Setting cooling		
Test temperature in bulk	15	15
Test temperature in outlet	15	15
Test temperature	15	15
Test temperature	15	15
Test temperature / Flow averaged	15	15
Condition name		
Measured static differential pressure, input power	100	100
Measured static pressure	100	100
Measured static efficiency	100	100
Measured static flow rate	100	100
Measured static pressure	100	100
Test log		



















## Detailed test results of sound power measurement - Test N°7





## Detailed test results of sound power measurement - Test N°9





[illegible]







## Appendix E: Test Procedure

The measurements of the emitted sound power level from the test pump are carried out according to the following:

- ISO 9614-1:2018
- EN 12502-1:2017
- ISO 9614-2:2018

The basic acoustic measurement standard ISO 9614-1 is a comparison method using a calibrated reference sound source. Two series of sound pressure measurements are made under exactly the same acoustic conditions, e.g., the same microphone positions, temperature and air humidity. The calibrated sound power levels are known for the reference sound source at each frequency band, and they are used in the estimation of the acoustical correction factor for the calculation of the sound power emitted from the tested test pump. The background noise levels are measured and used for relevant corrections.

The final total A-weighted sound power level is based on measurements and calculations in 1/3 octave levels, which then are summed into 1/3 octave levels. The uncertainty is estimated on the weighted standard deviations in 1/3 octave levels.

The actual microphone positions and correction values are saved in data files linked to the complete project documentation according to the DIBAH accreditation.

The complete measurement system is documented and regularly calibrated according to DIBAH.

The detailed description of the measurement method is given in Danish in the quality database system "Q8-Net" at Danish Technological Institute, which is accessible to DIBAH.