

# TEST REPORT

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**Customer:** Company: Panasonic Marketing Europe GmbH  
Address: Hagenauer Str. 43  
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**Component:** Brand: Panasonic  
Type: Air to water heat pump (mono bloc)  
Model: Outdoor unit: WH-WDG07LE5 Indoor unit: WH-ADC0509L3E5  
Series no.: Outdoor unit: 5624600003 Indoor unit: 5707200003  
Prod. year: Outdoor unit: 2023.01 Indoor unit: N/A

**Dates:** Component tested: August 2023 – September 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 are done with enabled defrost mode.  
The unit was delivered as model no. WH-WDG05LE5, cf. the rating plate of the outdoor unit.  
By changing the software, the unit was changed to model no. WH-WDG07LE5.

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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 for average climate according to EN 14825:2018.

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.

SEER test conditions at fan cooling application for space cooling according to EN 14825:2018, chosen by the manufacturer.

SEER test conditions at floor cooling application for space cooling according to EN 14825:2018, chosen by the manufacturer.

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.

Pre-running and post-running time of liquid pump when the heat pump starts and stops.

Sound power measurements according to EN 12102-1:2017, chosen by manufacturer.





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## Test conditions

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

Part load conditions for reference SCOP and reference SCOPon calculation of air to water units for low temperature application for the reference heating season;

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

Condition <sup>a</sup>	Part Load Ratio in %				Outdoor heat exchanger		Indoor heat exchanger			
					Inlet dry (wet) bulb temperature °C		Fixed outlet °C	Variable outlet <sup>d</sup> °C		
	Formula	A	W	C	Outdoor air	Exhaust air	All climates	A	W	C
A	$\frac{(-7 - 16)}{(T_{\text{designh}} - 16)}$	88	n/a	61	-7(-8)	20(12)	<sup>a</sup> / 35	<sup>a</sup> / 34	n/a	<sup>a</sup> / 30
B	$\frac{(+2 - 16)}{(T_{\text{designh}} - 16)}$	54	100	37	2(1)	20(12)	<sup>a</sup> / 35	<sup>a</sup> / 30	<sup>a</sup> / 35	<sup>a</sup> / 27
C	$\frac{(+7 - 16)}{(T_{\text{designh}} - 16)}$	35	64	24	7(6)	20(12)	<sup>a</sup> / 35	<sup>a</sup> / 27	<sup>a</sup> / 31	<sup>a</sup> / 25
D	$\frac{(+12 - 16)}{(T_{\text{designh}} - 16)}$	15	29	11	12(11)	20(12)	<sup>a</sup> / 35	<sup>a</sup> / 24	<sup>a</sup> / 26	<sup>a</sup> / 24
E	$(\text{TOL} - 16) / (T_{\text{designh}} - 16)$				TOL	20(12)	<sup>a</sup> / 35	<sup>a</sup> / b	<sup>a</sup> / b	<sup>a</sup> / b
F	$(T_{\text{bivalent}} - 16) / (T_{\text{designh}} - 16)$				T <sub>bivalent</sub>	20(12)	<sup>a</sup> / 35	<sup>a</sup> / c	<sup>a</sup> / c	<sup>a</sup> / c
G	$\frac{(-15 - 16)}{(T_{\text{designh}} - 16)}$	n/a	n/a	82	-15	20(12)	<sup>a</sup> / 35	n/a	n/a	<sup>a</sup> / 32

<sup>a</sup> With the water flow rate as determined at the standard rating conditions given in EN 14511-2 at 30/35 conditions for units with a fixed water flow rate, and with a fixed delta T of 5 K for units with a variable flow rate. If the resulting flow rate is below the minimum flow rate then this minimum flow rate is used with the outlet temperature.

<sup>b</sup> Variable outlet shall be calculated by interpolation from T<sub>designh</sub> and the temperature which is closest to the TOL.

<sup>c</sup> Variable outlet shall be calculated by interpolation between the upper and lower temperatures which are closest to the bivalent temperature.

<sup>d</sup> If the variable outlet temperature is below the minimum of the operation range of the unit, this minimum should be considered.

#### Additional information

Climate	T <sub>designh</sub> [°C]	T <sub>bivalent</sub> [°C]	TOL [°C]	Outlet temperature	Flow rate
Average	-10	-10	-10	Variable	Variable





## SCOP test conditions for medium temperature – EN 14825

Part load conditions for reference SCOP and reference SCOPon calculation of air to water units for medium temperature application for the reference heating season;

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

Condition	Part Load Ratio				Outdoor heat exchanger		Indoor heat exchanger			
					Inlet dry (wet) bulb temperature °C		Fixed outlet °C	Variable outlet <sup>d</sup> °C		
	Formula	A	W	C	Outdoor air	Exhaust air	All climates	A	W	C
A	$\frac{(-7 - 16)}{(T_{\text{designh}} - 16)}$	88	n/a	61	-7(-8)	20(12)	<sup>a</sup> / 55	<sup>a</sup> / 52	n/a	<sup>a</sup> / 44
B	$\frac{(+2 - 16)}{(T_{\text{designh}} - 16)}$	54	100	37	2(1)	20(12)	<sup>a</sup> / 55	<sup>a</sup> / 42	<sup>a</sup> / 55	<sup>a</sup> / 37
C	$\frac{(+7 - 16)}{(T_{\text{designh}} - 16)}$	35	64	24	7(6)	20(12)	<sup>a</sup> / 55	<sup>a</sup> / 36	<sup>a</sup> / 46	<sup>a</sup> / 32
D	$\frac{(+12 - 16)}{(T_{\text{designh}} - 16)}$	15	29	11	12(11)	20(12)	<sup>a</sup> / 55	<sup>a</sup> / 30	<sup>a</sup> / 34	<sup>a</sup> / 28
E	$(T_{\text{TOL}} - 16) / (T_{\text{designh}} - 16)$				TOL	20(12)	<sup>a</sup> / 55	<sup>a</sup> / <sup>b</sup>	<sup>a</sup> / <sup>b</sup>	<sup>a</sup> / <sup>b</sup>
F	$(T_{\text{bivalent}} - 16) / (T_{\text{designh}} - 16)$				T <sub>bivalent</sub>	20(12)	<sup>a</sup> / 55	<sup>a</sup> / <sup>c</sup>	<sup>a</sup> / <sup>c</sup>	<sup>a</sup> / <sup>c</sup>
G	$\frac{(-15 - 16)}{(T_{\text{designh}} - 16)}$	n/a	n/a	82	-15	20(12)	<sup>a</sup> / 55	n/a	n/a	<sup>a</sup> / 49

<sup>a</sup> With the water flow rate as determined at the standard rating conditions given in EN 14511-2 at 47/55 conditions for units with a fixed water flow rate, and with a fixed delta T of 8 K for units with a variable flow rate. If the resulting flow rate is below the minimum flow rate then this minimum flow rate is used with the outlet temperature.

<sup>b</sup> Variable outlet shall be calculated by interpolation T<sub>designh</sub> and the temperature which is closest to the TOL.

<sup>c</sup> Variable outlet shall be calculated by interpolation between the upper and lower temperatures which are closest to the bivalent temperature.

<sup>d</sup> If the variable outlet temperature is below the minimum of the operation range of the unit, this minimum should be considered.

### Additional information

Climate	T <sub>designh</sub> [°C]	T <sub>bivalent</sub> [°C]	TOL [°C]	Outlet temperature	Flow rate
Average	-10	-7	-10	Variable	Variable



## COP test conditions - low temperature – EN 14511

N#	Heat source		Heat sink		Heat pump settings
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1 <sup>S</sup>	7	6	30	35	
2 <sup>A</sup>	2	1	30	35	
3 <sup>A</sup>	-7	-8	30	35	
4 <sup>A</sup>	2	1	30	35	Quiet mode 3

S: Standard rating condition  
A: Application rating condition

## COP test conditions - medium temperature – EN 14511

N#	Heat source		Heat sink		Heat pump settings
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1 <sup>S</sup>	7	6	47	55	
2 <sup>A</sup>	2	1	47	55	
3 <sup>A</sup>	-7	-8	47	55	

S: Standard rating condition  
A: Application rating condition



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## COP test conditions - high temperature – EN 14511

N <sup>#</sup>	Heat source		Heat sink		Heat pump settings
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1 <sup>S</sup>	7	6	55	65	
2	7	6	50	60	
3 <sup>A</sup>	2	1	55	65	
4	2	1	50	60	
5 <sup>A</sup>	-7	-8	55	65	
6	-7	-8	50	60	

S: Standard rating condition

A: Application rating condition

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

N <sup>#</sup>	Heat source		Heat sink		Test point
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	35	-	12	7	A
2	25	-	15	10	C





### Test conditions for SEER test points at floor cooling application for space cooling - EN 14825

N#	Heat source		Heat sink		Test point
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	35	-	23	18	A
2	25	-	23	18	C

### Test conditions for operating requirements – EN 14511-4

N#	Heat source		Heat sink	Water flow rate at indoor heat exchanger	Test
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)		
1	-25	-	15	Minimum	Starting
2	-25	-	47	Minimum	Operating

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

N#	Heat source		Heat sink		Heat exchanger
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	7	6	47	55	Indoor
2	7	6	47	55	Outdoor



## Test conditions for complete power supply failure – EN 14511-4

N <sup>#</sup>	Heat source		Heat sink	
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)
1 <sup>K</sup>	7	6	47	55

K) Keymark





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

N <sup>#</sup>	Test condition		Heat pump setting			
	Outdoor heat exchanger (dry bulb/ wet bulb) (°C)	Indoor heat exchanger (inlet/ outlet) (°C)	Compressor speed (Hz)	Fan speed Outdoor (rpm)	Heating capacity (kW)	Power input (kW)
1 <sup>R</sup>	7/6	47/55	55	430	7.20	2.23
2 <sup>E</sup>	7/6	47/55	23	360	2.75	0.92
3 <sup>Q</sup>	7/6	47/55	24	340	2.80	0.96
4 <sup>R</sup>	7/6	30/35	49	480	7.12	1.40
5 <sup>Q</sup>	7/6	30/35	21	330	3.10	0.58
6 <sup>R</sup>	-7/-8	47/55	67	660	5.97	2.61
7 <sup>Q</sup>	-7/-8	47/55	28	460	1.83	1.14
8 <sup>R</sup>	-7/-8	30/35	62	640	6.15	1.90
9 <sup>Q</sup>	-7/-8	30/35	26	450	2.46	0.73
10 <sup>Q</sup>	2/1	30/35	29	580	3.75	0.85

R) Rating capacity, Q) Quiet mode 3, E) ErP labelling





## Test results

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

<b>Model (Outdoor)</b>		WH-WDG07LE5	
<b>Air-to-water heat pump mono bloc</b>		Y	
<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>7 [kW]</b>	
<b>Seasonal space heating energy efficiency</b>	$\eta_s$	<b>206.2 [%]</b>	
	SCOP	<b>5.23 [-]</b>	
<b>Measured capacity for heating for part load at outdoor temperature <math>T_j</math></b>	Average Climate	$T_j = -15\text{ °C}$	$P_{dh}$ - [kW]
	-	$T_j = -7\text{ °C}$	$P_{dh}$ 6.14 [kW]
	Low temperature application	$T_j = 2\text{ °C}$	$P_{dh}$ 3.95 [kW]
		$T_j = 7\text{ °C}$	$P_{dh}$ 2.98 [kW]
		$T_j = 12\text{ °C}$	$P_{dh}$ 3.47 [kW]
		$T_j = \text{bivalent temperature}$	$P_{dh}$ 7.16 [kW]
		$T_j = \text{operation limit}$	$P_{dh}$ 7.16 [kW]
<b>Measured coefficient of performance at outdoor temperature <math>T_j</math></b>	Average Climate	$T_j = -15\text{ °C}$	COPd - [-]
	-	$T_j = -7\text{ °C}$	COPd 3.28 [-]
	Low temperature application	$T_j = 2\text{ °C}$	COPd 5.08 [-]
		$T_j = 7\text{ °C}$	COPd 6.80 [-]
		$T_j = 12\text{ °C}$	COPd 8.66 [-]
		$T_j = \text{bivalent temperature}$	COPd 2.91 [-]
		$T_j = \text{operation limit}$	COPd 2.91 [-]
<b>Bivalent temperature</b>	$T_{bivalent}$	<b>-10 [°C]</b>	
<b>Operation limit temperatures</b>	TOL	<b>-10 [°C]</b>	
<b>Degradation coefficient</b>	$C_{dh}$	<b>0.98 [-]</b>	
<b>Power consumption in modes other than active mode</b>	Off mode	$P_{OFF}$	0.005 [kW]
	Thermostat-off mode	$P_{TO}$	0.008 [kW]
	Standby mode	$P_{SB}$	0.005 [kW]
	Crankcase heater mode	$P_{CK}$	0.005 [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	$Q_{HE}$	2765 [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,  $sup(T_j)$ .



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

Model (Outdoor)	WH-WDG07LE5	
Air-to-water heat pump mono bloc	Y	
Low-temperature heat pump	N	
Equipped with supplementary heater	Y	
Heat pump combination heater	Y	

Rated heat output <sup>1)</sup>	P <sub>rated</sub>	7 [kW]
Seasonal space heating energy efficiency	η <sub>ls</sub>	153.3 [%]
	SCOP	3.91 [-]

Measured capacity for heating for part load at outdoor temperature T <sub>j</sub>	Average Climate - Medium temperature application	T <sub>j</sub> = -15 °C	P <sub>dh</sub>	- [kW]
		T <sub>j</sub> = -7 °C	P <sub>dh</sub>	6.08 [kW]
		T <sub>j</sub> = 2 °C	P <sub>dh</sub>	3.88 [kW]
		T <sub>j</sub> = 7 °C	P <sub>dh</sub>	2.69 [kW]
		T <sub>j</sub> = 12 °C	P <sub>dh</sub>	3.39 [kW]
		T <sub>j</sub> = bivalent temperature	P <sub>dh</sub>	6.08 [kW]
		T <sub>j</sub> = operation limit	P <sub>dh</sub>	6.23 [kW]

Measured coefficient of performance at outdoor temperature T <sub>j</sub>	Average Climate - Medium temperature application	T <sub>j</sub> = -15 °C	COP <sub>d</sub>	- [-]
		T <sub>j</sub> = -7 °C	COP <sub>d</sub>	2.42 [-]
		T <sub>j</sub> = 2 °C	COP <sub>d</sub>	3.75 [-]
		T <sub>j</sub> = 7 °C	COP <sub>d</sub>	5.25 [-]
		T <sub>j</sub> = 12 °C	COP <sub>d</sub>	6.95 [-]
		T <sub>j</sub> = bivalent temperature	COP <sub>d</sub>	2.42 [-]
		T <sub>j</sub> = operation limit	COP <sub>d</sub>	2.13 [-]

Bivalent temperature	T <sub>bivalent</sub>	-7 [°C]
Operation limit temperatures	TOL	-10 [°C]
	WTOL	- [°C]
Degradation coefficient	C <sub>dh</sub>	0.98 [-]

Power consumption in modes other than active mode	Off mode	P <sub>OFF</sub>	0.005 [kW]
	Thermostat-off mode	P <sub>TO</sub>	0.008 [kW]
	Standby mode	P <sub>SB</sub>	0.005 [kW]
	Crankcase heater mode	P <sub>CK</sub>	0.005 [kW]
Supplementary heater <sup>1)</sup>	Rated heat output	P <sub>SUP</sub>	0.77 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Variable
	Water flow rate		-
	Annual energy consumption	Q <sub>HE</sub>	3701 [kWh]

<sup>1)</sup>For heat pump space heaters and heat pump combination heaters, the rated heat output, P<sub>rated</sub>, is equal to the design load for heating, P<sub>design,h</sub>, and the rated heat output of a supplementary heater, P<sub>sup</sub>, is equal to the supplementary capacity for heating, sup(T<sub>j</sub>).





### **COP test results - low temperature – EN 14511**

<b>N#</b>	<b>Test conditions</b>	<b>Heating capacity [kW]</b>	<b>COP</b>
1	A7/W35	7.147	5.184
2	A2/W35	7.367	3.727
3	A-7/W35	6.152	3.262
4 <sup>Q</sup>	A2/W35	3.737	4.588

Q) Quiet mode 3

### **COP test results - medium temperature – EN 14511**

<b>N#</b>	<b>Test conditions</b>	<b>Heating capacity [kW]</b>	<b>COP</b>
1	A7/W55	7.189	3.231
2	A2/W55	6.625	2.616
3	A-7/W55	5.970	2.286



### **COP test results - high temperature – EN 14511**

<b>N#</b>	<b>Test conditions</b>	<b>Heating capacity [kW]</b>	<b>COP</b>
1	A7/W65	6.733	2.481
2	A7/W60	7.012	2.912
3	A2/W65	6.231	2.250
4	A2/W60	6.416	2.445
5	A-7/W65	6.008	1.919
6	A-7/W60	6.082	2.118

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

<b>N°</b>	<b>Test conditions</b>	<b>Heating capacity [kW]</b>	<b>COP</b>
1	A35/W7	6.734	3.113
2	A25/W10	3.317	6.039



### Test results for SEER test points at floor cooling application for space cooling - EN 14825

N°	Test conditions	Heating capacity [kW]	COP
1	A35/W18	6.747	4.834
2	A25/W18	3.537	8.734

### Test results for starting and operating test - EN 14511-4:2018

N#	Test conditions air/water inlet [°C]	Test validation
Starting	A-25/W15	Passed
Operating	A-25/W47	Passed

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

N#	Heat exchanger	Test validation
1	Indoor	Passed
2	Outdoor	Passed

### Test results for complete power supply failure – EN 14511-4

N#	Test validation
1	Passed



### **Power consumption of liquid pump for SCOP test points – low temperature application - Average climate**

<b>N#</b>	<b>Test condition</b>	<b>Measured power consumption (W)</b>	<b>Test mode n°</b>
A	A-7/W34	53 W	6
B	A2/W30	45 W	5
C	A7/W27	42 W	4
D	A12/W24	44 W	3
E&F	A-10/W35	56 W	7

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

### **Power consumption of liquid pump for SCOP test points – medium temperature application - Average climate**

<b>N#</b>	<b>Test condition</b>	<b>Measured power consumption (W)</b>	<b>Test mode n°</b>
A&F	A-7/W52	45 W	11
B	A2/W42	42 W	10
C	A7/W36	42 W	9
D	A12/W30	42 W	8
E	A-10/W55	45 W	12

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





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

N#	Test condition	Measured power consumption (W)	Test mode n°
1	A7/W35	55 W	1
2	A2/W35	55 W	1
3	A-7/W35	51 W	1

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

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

N#	Test condition	Measured power consumption (W)	Test mode n°
1	A7/W55	46 W	1
2	A2/W55	44 W	1
3	A-7/W55	44 W	1

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

## Pre-run and post-run time for liquid pump

N#	Time (sec)
Pre-run	180
Post-run	15





## Test results of sound power measurements – EN 12102

<b>N#</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/W55	<b>61.8</b>	1.0
2 <sup>E-K</sup>	A7/W55	<b>51.3</b>	0.5
3 <sup>Q</sup>	A7/W55	<b>52.6</b>	0.5
4 <sup>R</sup>	A7/W35	<b>58.4</b>	0.5
5 <sup>Q</sup>	A7/W35	<b>46.6</b>	0.5
6 <sup>R</sup>	A-7/W55	<b>65.8</b>	0.5
7 <sup>Q</sup>	A-7/W55	<b>55.1</b>	0.5
8 <sup>R</sup>	A-7/W35	<b>66.8</b>	1.0
9 <sup>Q</sup>	A-7/W35	<b>54.5</b>	0.5
10 <sup>Q</sup>	A2/W35	<b>60.1</b>	0.5

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 Kamalathan Arumugam (KAMA) and co-read by Birger Bech Jessen (BBJN), Danish Technological Institute.



Test Rep. nr.



## Photo

### Rating plate (outdoor unit)

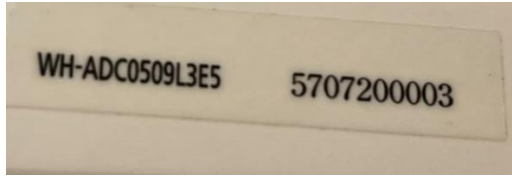


### Outdoor unit

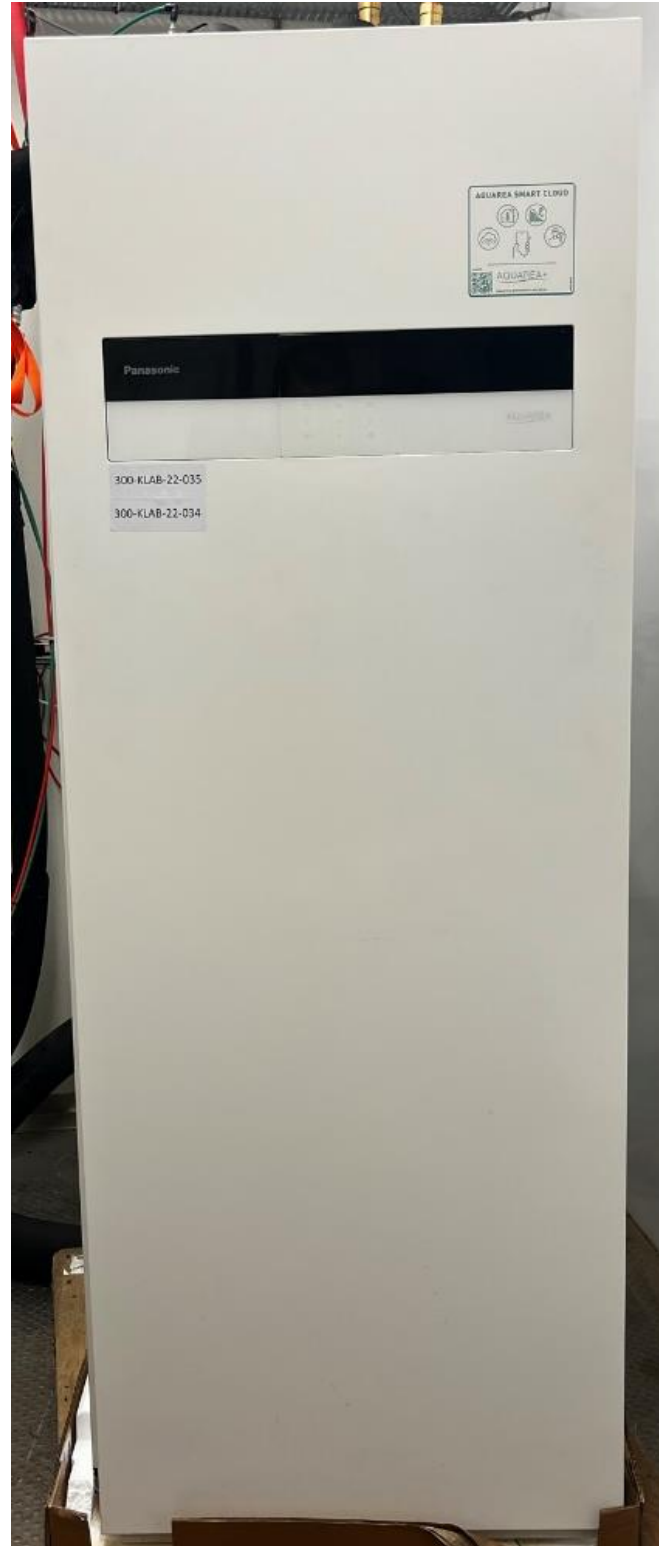




### Rating plate (indoor unit)



### Indoor unit





## SCOP - detailed calculation

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

#### Calculation of reference SCOP

$$SCOP = \frac{P_{design} \times H_{he}}{\frac{P_{design} \times H_{he}}{SCOP_{on}} + H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{CK} \times P_{CK} + H_{OFF} \times P_{OFF}}$$

Where

$P_{design}$ =	Heating load of the building at design temperature, kW
$H_{he}$ =	Number of equivalent heating hours, 2066 h
$H_{TO}, H_{SB}, H_{CK}, H_{OFF}$ =	Number of hours for which the unit is considered to work in thermostat off mode, standby mode, crankcase heater mode and off mode, h, respectively
$P_{TO}, P_{SB}, P_{CK}, P_{OFF}$ =	Electricity consumption during thermostat off mode, standby mode, crankcase heater mode and off mode, kW, respectively

#### Data for SCOP

	Outdoor temperature [°C]	Part load ratio [%]	Part load [kW]	Declared capacity [kW]	Declared COP [-]	cdh [-]	CR [-]	COPbin [-]
A	-7	88	6.19	6.14	3.28	1.00	1.00	3.28
B	2	54	3.77	3.95	5.08	0.99	1.00	5.08
C	7	35	2.42	2.98	6.80	0.98	0.81	6.77
D	12	15	1.08	3.47	8.66	0.98	0.31	8.28
E	-10	100	7.00	7.16	2.91	1.00	1.00	2.91
F - BIV	-10	100	7.00	7.16	2.91	1.00	1.00	2.91

#### Energy consumption for thermostat off, standby, off mode, crankcase heater mode

	Hours [h]	Power input [kW]	Applied to SCOP calculation [kW]	Energy consumption [kWh]
Off mode	0	0.0054	0.0054	0
Thermostat off	178	0.0083	0.0083	1.4774
Standby	0	0.0054	0.0054	0
Crankcase heater	178	0.0054	0	0



Calculation Bin for SCOP<sub>on</sub>

	Bin	Outdoor temperature [°C]	Hours [h]	Heat load [kW]	Heat load covered by heat pump [kW]	Electrical back up heater [kW]	backup heater energy input [kWh]	COP <sub>bin</sub> [-]	Annual heating demand [kWh]	Annual energy input [kWh]	Net annual heating capacity [kWh]	Net annual power input [kWh]
	[-]											
<b>E / F - BIV</b>	21	-10	1	7.00	7.00	0.00	0.00	2.91	7.00	2.41	7.00	2.41
	22	-9	25	6.73	6.71	0.00	0.00	3.03	168.27	55.45	168.27	55.45
	23	-8	23	6.46	6.43	0.00	0.00	3.16	148.62	47.03	148.62	47.03
<b>A</b>	24	-7	24	6.19	6.14	0.00	0.00	3.28	148.62	45.24	148.62	45.24
	25	-6	27	5.92	5.88	0.00	0.00	3.48	159.92	45.90	159.92	45.90
	26	-5	68	5.65	5.61	0.00	0.00	3.68	384.46	104.37	384.46	104.37
	27	-4	91	5.38	5.35	0.00	0.00	3.88	490.00	126.18	490.00	126.18
	28	-3	89	5.12	5.09	0.00	0.00	4.08	455.27	111.51	455.27	111.51
	29	-2	165	4.85	4.82	0.00	0.00	4.28	799.62	186.73	799.62	186.73
	30	-1	173	4.58	4.56	0.00	0.00	4.48	791.81	176.68	791.81	176.68
	31	0	240	4.31	4.30	0.00	0.00	4.68	1033.85	220.85	1033.85	220.85
	32	1	280	4.04	4.03	0.00	0.00	4.88	1130.77	231.69	1130.77	231.69
	33	2	320	3.77	3.77	0.00	0.00	5.08	1206.15	237.43	1206.15	237.43
<b>B</b>	34	3	357	3.50	3.50	0.00	0.00	5.42	1249.50	230.59	1249.50	230.59
	35	4	356	3.23	3.23	0.00	0.00	5.76	1150.15	199.78	1150.15	199.78
	36	5	303	2.96	2.96	0.00	0.00	6.10	897.35	147.21	897.35	147.21
	37	6	330	2.69	2.69	0.00	0.00	6.43	888.46	138.09	888.46	138.09
	38	7	326	2.42	2.42	0.00	0.00	6.77	789.92	116.64	789.92	116.64
<b>C</b>	39	8	348	2.15	2.15	0.00	0.00	7.07	749.54	105.96	749.54	105.96
	40	9	335	1.88	1.88	0.00	0.00	7.37	631.35	85.61	631.35	85.61
	41	10	315	1.62	1.62	0.00	0.00	7.68	508.85	66.29	508.85	66.29
	42	11	215	1.35	1.35	0.00	0.00	7.98	289.42	36.28	289.42	36.28
	43	12	169	1.08	1.08	0.00	0.00	8.28	182.00	21.99	182.00	21.99
<b>D</b>	44	13	151	0.81	0.81	0.00	0.00	8.58	121.96	14.22	121.96	14.22
	45	14	105	0.54	0.54	0.00	0.00	8.88	56.54	6.37	56.54	6.37
	46	15	74	0.27	0.27	0.00	0.00	9.18	19.92	2.17	19.92	2.17
<b>SUM</b>									14459.31	2762.66	14459.31	2762.66
<b>SCOP<sub>on</sub></b>										5.23	<b>SCOP<sub>net</sub></b>	5.23





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

### Calculation of reference SCOP

$$SCOP = \frac{P_{designh} \times H_{he}}{\frac{P_{designh} \times H_{he}}{SCOP_{on}} + H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{CK} \times P_{CK} + H_{OFF} \times P_{OFF}}$$

Where

$P_{design}$  =

Heating load of the building at design temperature, kW

$H_{he}$  =

Number of equivalent heating hours, 2066 h

$H_{TO}$ ,  $H_{SB}$ ,  $H_{CK}$ ,  $H_{OFF}$  =

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

$P_{TO}$ ,  $P_{SB}$ ,  $P_{CK}$ ,  $P_{OFF}$  =

Electricity consumption during thermostat off mode, standby mode, crankcase heater mode and off mode, kW, respectively

### Data for SCOP

	Outdoor temperature [°C]	Part load ratio [%]	Part load [kW]	Declared capacity [kW]	Declared COP [-]	cdh [-]	CR [-]	COPbin [-]
A	-7	88	6.19	6.08	2.42	1.00	1.00	2.42
B	2	54	3.77	3.88	3.75	0.99	1.00	3.75
C	7	35	2.42	2.69	5.25	0.98	0.90	5.24
D	12	15	1.08	3.39	6.95	0.98	0.32	6.71
E	-10	100	7.00	6.23	2.13	1.00	1.00	2.13
F - BIV	-7	88	6.19	6.08	2.42	1.00	1.00	2.42

### Energy consumption for thermostat off, standby, off mode, crankcase heater mode

	Hours [h]	Power input [kW]	Applied to SCOP calculation [kW]	Energy consumption [kWh]
Off mode	0	0.0054	0.0054	0
Thermostat off	178	0.0083	0.0083	1.4774
Standby	0	0.0054	0.0054	0
Crankcase heater	178	0.0054	0	0



Calculation Bin for SCOP<sub>on</sub>

	Bin [-]	Outdoor temperature [°C]	Hours [h]	Heat load [kW]	Heat load covered by heat pump [kW]	Electrical back up heater [kW]	backup heater energy input [kWh]	COP <sub>bin</sub> [-]	Annual heating demand [kWh]	Annual energy input [kWh]	Net annual heating capacity [kWh]	Net annual power input [kWh]
<b>E</b>	21	-10	1	7.00	6.23	0.77	0.77	2.13	7.00	3.69	6.23	2.93
	22	-9	25	6.73	6.18	0.55	13.73	2.22	168.27	83.19	154.54	69.47
	23	-8	23	6.46	6.13	0.33	7.59	2.32	148.62	68.38	141.03	60.79
<b>A / F - BIV</b>	24	-7	24	6.19	6.08	0.00	0.00	2.42	148.62	61.53	148.62	61.53
	25	-6	27	5.92	5.82	0.00	0.00	2.56	159.92	62.40	159.92	62.40
	26	-5	68	5.65	5.57	0.00	0.00	2.71	384.46	141.83	384.46	141.83
	27	-4	91	5.38	5.31	0.00	0.00	2.86	490.00	171.42	490.00	171.42
	28	-3	89	5.12	5.05	0.00	0.00	3.01	455.27	151.44	455.27	151.44
	29	-2	165	4.85	4.80	0.00	0.00	3.15	799.62	253.51	799.62	253.51
	30	-1	173	4.58	4.54	0.00	0.00	3.30	791.81	239.80	791.81	239.80
	31	0	240	4.31	4.28	0.00	0.00	3.45	1033.85	299.69	1033.85	299.69
	32	1	280	4.04	4.03	0.00	0.00	3.60	1130.77	314.32	1130.77	314.32
<b>B</b>	33	2	320	3.77	3.77	0.00	0.00	3.75	1206.15	322.05	1206.15	322.05
	34	3	357	3.50	3.50	0.00	0.00	4.04	1249.50	309.00	1249.50	309.00
	35	4	356	3.23	3.23	0.00	0.00	4.34	1150.15	264.89	1150.15	264.89
	36	5	303	2.96	2.96	0.00	0.00	4.64	897.35	193.38	897.35	193.38
	37	6	330	2.69	2.69	0.00	0.00	4.94	888.46	179.90	888.46	179.90
<b>C</b>	38	7	326	2.42	2.42	0.00	0.00	5.24	789.92	150.83	789.92	150.83
	39	8	348	2.15	2.15	0.00	0.00	5.53	749.54	135.52	749.54	135.52
	40	9	335	1.88	1.88	0.00	0.00	5.82	631.35	108.39	631.35	108.39
	41	10	315	1.62	1.62	0.00	0.00	6.12	508.85	83.17	508.85	83.17
	42	11	215	1.35	1.35	0.00	0.00	6.41	289.42	45.14	289.42	45.14
<b>D</b>	43	12	169	1.08	1.08	0.00	0.00	6.71	182.00	27.14	182.00	27.14
	44	13	151	0.81	0.81	0.00	0.00	7.00	121.96	17.42	121.96	17.42
	45	14	105	0.54	0.54	0.00	0.00	7.29	56.54	7.75	56.54	7.75
	46	15	74	0.27	0.27	0.00	0.00	7.59	19.92	2.63	19.92	2.63

<b>SUM</b>	14459.31	3698.41	14437.23	3676.33
<b>SCOP<sub>on</sub></b>		3.91	<b>SCOP<sub>net</sub></b>	3.93



## Detailed test results

### Detailed SCOP test results - low temperature application - average climate – EN 14825

<b>Detailed result for 'EN14825:2018' Average Low (A) A -7 /W34</b>		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:		Average
Temperature application:		Low
Condition name:		A
Condition temperature:	°C	-7
Part load:	%	88%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	7.00
Heating demand:	kW	6.19
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>6.141</b>
COP	-	<b>3.285</b>
Power consumption	kW	<b>1.870</b>
<b>Measured</b>		
Heating capacity	kW	6.181
COP	-	3.212
Power consumption	kW	1.924
<b>During heating</b>		
Air temperature dry bulb	°C	-6.89
Air temperature wet bulb	°C	-7.89
Air temperature dry bulb outlet	°C	-10.32
Inlet temperature	°C	28.99
Outlet temperature	°C	34.14
Outlet temperature (Time averaged)	°C	<b>34.14</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	51073
Calculated Hydraulic power	W	15
Calculated global efficiency	η	0.27
Calculated Capacity correction	W	40
Calculated Power correction	W	55
Water Flow	m <sup>3</sup> /s	0.000289



Detailed result for 'EN14825:2018' Average Low (B) A 2 /W30		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Low	
Condition name:	B	
Condition temperature:	°C	2
Part load:	%	54%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	7,00
Heating demand:	kW	3,77
CR:	-	1,0
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	3,948
COP	-	5,080
Power consumption	kW	0,777
Measured		
Heating capacity	kW	3,982
COP	-	4,844
Power consumption	kW	0,822
During heating		
Air temperature dry bulb	°C	2,08
Air temperature wet bulb	°C	1,20
Air temperature dry bulb outlet	°C	-0,33
Inlet temperature	°C	24,98
Outlet temperature	°C	30,05
Outlet temperature (Time averaged)	°C	30,05
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	55920
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0,24
Calculated Capacity correction	W	34
Calculated Power correction	W	45
Water Flow	m³/s	0,000189



**Detailed result for 'EN14825:2018' Average Low (C) A 7 /W27**

Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Low	
Condition name:	C	
Condition temperature:	°C	7
Part load:	%	35%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	7.00
Heating demand:	kW	2.42
CR:	-	0.8
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>2.981</b>
COP	-	<b>6.802</b>
Power consumption	kW	<b>0.438</b>
<b>Measured</b>		
Heating capacity	kW	3.011
COP	-	6.311
Power consumption	kW	0.477
<b>During heating</b>		
Air temperature dry bulb	°C	6.99
Air temperature wet bulb	°C	5.94
Air temperature dry bulb outlet	°C	3.83
Inlet temperature	°C	23.00
Outlet temperature	°C	28.01
Outlet temperature (Time averaged)	°C	<b>27.07</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	57508
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	31
Calculated Power correction	W	39
Water Flow	m <sup>3</sup> /s	0.000144





**Detailed result for 'EN14825:2018' Average Low (D) A 12 /W24**

Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Low	
Condition name:	D	
Condition temperature:	°C	12
Part load:	%	15%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	7.00
Heating demand:	kW	1.08
CR:	-	0.3
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>3.471</b>
COP	-	<b>8.659</b>
Power consumption	kW	<b>0.401</b>
<b>Measured</b>		
Heating capacity	kW	3.504
COP	-	7.915
Power consumption	kW	0.443
<b>During heating</b>		
Air temperature dry bulb	°C	12.02
Air temperature wet bulb	°C	11.01
Air temperature dry bulb outlet	°C	8.75
Inlet temperature	°C	22.39
Outlet temperature	°C	27.52
Outlet temperature (Time averaged)	°C	<b>23.98</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	56983
Calculated Hydraulic power	W	9
Calculated global efficiency	η	0.22
Calculated Capacity correction	W	32
Calculated Power correction	W	42
Water Flow	m <sup>3</sup> /s	0.000164



Detailed result for 'EN14825:2018' Average Low (E and F) A -10 /W35		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Low	
Condition name:	E and F	
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	7.00
Heating demand:	kW	7.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
<hr/>		
Included corrections (Final result)		
Heating capacity	kW	7.157
COP	-	2.909
Power consumption	kW	2.460
Measured		
Heating capacity	kW	7.198
COP	-	2.859
Power consumption	kW	2.517
During heating		
Air temperature dry bulb	°C	-9.91
Air temperature wet bulb	°C	-11.05
Air temperature dry bulb outlet	°C	-13.30
Inlet temperature	°C	29.96
Outlet temperature	°C	35.03
Outlet temperature (Time averaged)	°C	35.03
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	46531
Calculated Hydraulic power	W	16
Calculated global efficiency	η	0.28
Calculated Capacity correction	W	42
Calculated Power correction	W	58
Water Flow	m³/s	0.000342



## Detailed SCOP test results - medium temperature application - average climate – EN 14825

<b>Detailed result for 'EN14825:2018' Average Medium (A) A -7 /W52</b>		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:		Average
Temperature application:		Medium
Condition name:		A
Condition temperature:	°C	-7
Part load:	%	88%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	7.00
Heating demand:	kW	6.19
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>6.082</b>
COP	-	<b>2.415</b>
Power consumption	kW	<b>2.518</b>
<b>Measured</b>		
Heating capacity	kW	6.116
COP	-	2.386
Power consumption	kW	2.564
<b>During heating</b>		
Air temperature dry bulb	°C	-6.90
Air temperature wet bulb	°C	-7.91
Air temperature dry bulb outlet	°C	-9.75
Inlet temperature	°C	44.00
Outlet temperature	°C	52.07
Outlet temperature (Time averaged)	°C	<b>52.07</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	58908
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	45
Water Flow	m <sup>3</sup> /s	0.000183





**Detailed result for 'EN14825:2018' Average Medium (B) A 2 /W42**

Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:		Average
Temperature application:		Medium
Condition name:		B
Condition temperature:	°C	2
Part load:	%	54%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	7.00
Heating demand:	kW	3.77
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>3.884</b>
COP	-	<b>3.745</b>
Power consumption	kW	<b>1.037</b>
<b>Measured</b>		
Heating capacity	kW	3.914
COP	-	3.641
Power consumption	kW	1.075
<b>During heating</b>		
Air temperature dry bulb	°C	2.09
Air temperature wet bulb	°C	1.00
Air temperature dry bulb outlet	°C	-0.18
Inlet temperature	°C	35.01
Outlet temperature	°C	42.08
Outlet temperature (Time averaged)	°C	<b>42.08</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	59295
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	30
Calculated Power correction	W	38
Water Flow	m <sup>3</sup> /s	0.000133



**Detailed result for 'EN14825:2018' Average Medium (C) A 7 /W36**

Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Medium	
Condition name:	C	
Condition temperature:	°C	7
Part load:	%	35%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	7.00
Heating demand:	kW	2.42
CR:	-	0.9
Minimum flow reached:	-	Yes
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>2.693</b>
COP	-	<b>5.247</b>
Power consumption	kW	<b>0.513</b>
<b>Measured</b>		
Heating capacity	kW	2.723
COP	-	4.941
Power consumption	kW	0.551
<b>During heating</b>		
Air temperature dry bulb	°C	7.18
Air temperature wet bulb	°C	6.10
Air temperature dry bulb outlet	°C	4.36
Inlet temperature	°C	31.62
Outlet temperature	°C	36.54
Outlet temperature (Time averaged)	°C	<b>36.04</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	59071
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	30
Calculated Power correction	W	38
Water Flow	m <sup>3</sup> /s	0.000133



**Detailed result for 'EN14825:2018' Average Medium (D) A 12 /W30**

Tested according to:		EN14511:2018 and EN14825:2018	
Climate zone:		Average	
Temperature application:		Medium	
Condition name:		D	
Condition temperature:	°C		12
Part load:	%		15%
Chosen Tbivalent	°C		-7
Tdesign	°C		-10
Pdesign	kW		7.00
Heating demand:	kW		1.08
CR:	-		0.3
Minimum flow reached:	-		Yes
Measurement type:		Steady State	
Integrated circulation pump:		Yes	
<b>Included corrections (Final result)</b>			
Heating capacity	kW		<b>3.387</b>
COP	-		<b>6.951</b>
Power consumption	kW		<b>0.487</b>
<b>Measured</b>			
Heating capacity	kW		3.417
COP	-		6.510
Power consumption	kW		0.525
<b>During heating</b>			
Air temperature dry bulb	°C		12.00
Air temperature wet bulb	°C		11.03
Air temperature dry bulb outlet	°C		8.84
Inlet temperature	°C		28.15
Outlet temperature	°C		34.30
Outlet temperature (Time averaged)	°C		<b>30.10</b>
<b>Circulation pump</b>			
Measured: Static differential pressure, liquid pump	Pa		58580
Calculated Hydraulic power	W		8
Calculated global efficiency	η		0.21
Calculated Capacity correction	W		30
Calculated Power correction	W		38
Water Flow	m <sup>3</sup> /s		0.000133



**Detailed result for 'EN14825:2018' Average Medium (E) A -10 /W55**

Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:		Average
Temperature application:		Medium
Condition name:		E
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	7.00
Heating demand:	kW	7.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>6.232</b>
COP	-	<b>2.130</b>
Power consumption	kW	<b>2.926</b>
<b>Measured</b>		
Heating capacity	kW	6.267
COP	-	2.108
Power consumption	kW	2.972
<b>During heating</b>		
Air temperature dry bulb	°C	-9.91
Air temperature wet bulb	°C	-11.10
Air temperature dry bulb outlet	°C	-12.90
Inlet temperature	°C	47.00
Outlet temperature	°C	55.16
Outlet temperature (Time averaged)	°C	<b>55.16</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	58689
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	46
Water Flow	m³/s	0.000186



## Detailed COP test results - low temperature – EN 14511

<b>Detailed result for 'EN14511:2018' A7/W35</b>		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>7.147</b>
COP	-	<b>5.184</b>
Power consumption	kW	<b>1.379</b>
<b>Measured</b>		
Heating capacity	kW	7.188
COP	-	5.012
Power consumption	kW	1.434
<b>During heating</b>		
Air temperature dry bulb	°C	6.99
Air temperature wet bulb	°C	6.01
Air temperature dry bulb outlet	°C	2.85
Inlet temperature	°C	29.99
Outlet temperature	°C	35.09
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	43982
Calculated Hydraulic power	W	15
Calculated global efficiency	$\eta$	0.27
Calculated Capacity correction	W	40
Calculated Power correction	W	55
Water Flow	m <sup>3</sup> /s	0.000339





### Detailed result for 'EN14511:2018' A2/W35

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Transient	
Integrated circulation pump:	Yes	
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>7.367</b>
COP	-	<b>3.727</b>
Power consumption	kW	<b>1.977</b>
<b>Measured</b>		
Heating capacity	kW	7.405
COP	-	3.650
Power consumption	kW	2.029
<b>During heating</b>		
Air temperature dry bulb	°C	2.11
Air temperature wet bulb	°C	1.05
Air temperature dry bulb outlet	°C	-2.32
Inlet temperature	°C	30.13
Outlet temperature	°C	35.17
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	32729
Calculated Hydraulic power	W	13
Calculated global efficiency	η	0.26
Calculated Capacity correction	W	38
Calculated Power correction	W	52
Water Flow	m <sup>3</sup> /s	0.000412



<b>Detailed result for 'EN14511:2018' A-7/W35</b>			
Tested according to:		EN14511:2018	
Minimum flow reached:		No	
Measurement type:		Steady State	
Integrated circulation pump:		Yes	
<b>Included corrections (Final result)</b>			
Heating capacity	kW	<b>6.152</b>	
COP	-	<b>3.262</b>	
Power consumption	kW	<b>1.886</b>	
<b>Measured</b>			
Heating capacity	kW	6.192	
COP	-	3.191	
Power consumption	kW	1.940	
<b>During heating</b>			
Air temperature dry bulb	°C	-6.91	
Air temperature wet bulb	°C	-7.97	
Air temperature dry bulb outlet	°C	-10.03	
Inlet temperature	°C	29.98	
Outlet temperature	°C	34.94	
<b>Circulation pump</b>			
Measured: Static differential pressure, liquid pump	Pa	48666	
Calculated Hydraulic power	W	15	
Calculated global efficiency	η	0.27	
Calculated Capacity correction	W	40	
Calculated Power correction	W	55	
Water Flow	m <sup>3</sup> /s	0.000300	



Quiet mode 3:

<b>Detailed result for 'EN14511:2018' A2/W35</b>			
Tested according to:			EN14511:2018
Minimum flow reached:			No
Measurement type:			Steady State
Integrated circulation pump:			Yes
<b>Included corrections (Final result)</b>			
Heating capacity	kW		<b>3.737</b>
COP	-		<b>4.588</b>
Power consumption	kW		<b>0.815</b>
<b>Measured</b>			
Heating capacity	kW		3.771
COP	-		4.392
Power consumption	kW		0.859
<b>During heating</b>			
Air temperature dry bulb	°C		2.11
Air temperature wet bulb	°C		1.12
Air temperature dry bulb outlet	°C		-0.22
Inlet temperature	°C		29.98
Outlet temperature	°C		35.08
<b>Circulation pump</b>			
Measured: Static differential pressure, liquid pump	Pa		57604
Calculated Hydraulic power	W	✓	10
Calculated global efficiency	η		0.23
Calculated Capacity correction	W		34
Calculated Power correction	W		44
Water Flow	m <sup>3</sup> /s		0.000178



## Detailed COP test results - medium temperature – EN 14511

<b>Detailed result for 'EN14511:2018' A7/W55</b>		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>7.189</b>
COP	-	<b>3.231</b>
Power consumption	kW	<b>2.225</b>
<b>Measured</b>		
Heating capacity	kW	7.226
COP	-	3.177
Power consumption	kW	2.274
<b>During heating</b>		
Air temperature dry bulb	°C	7.04
Air temperature wet bulb	°C	5.95
Air temperature dry bulb outlet	°C	2.82
Inlet temperature	°C	47.02
Outlet temperature	°C	55.22
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	57374
Calculated Hydraulic power	W	12
Calculated global efficiency	$\eta$	0.25
Calculated Capacity correction	W	37
Calculated Power correction	W	49
Water Flow	m <sup>3</sup> /s	0.000213



### Detailed result for 'EN14511:2018' A2/W55

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Transient	
Integrated circulation pump:	Yes	
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>6.625</b>
COP	-	<b>2.616</b>
Power consumption	kW	<b>2.533</b>
<b>Measured</b>		
Heating capacity	kW	6.663
COP	-	2.579
Power consumption	kW	2.583
<b>During heating</b>		
Air temperature dry bulb	°C	2.13
Air temperature wet bulb	°C	1.00
Air temperature dry bulb outlet	°C	-1.61
Inlet temperature	°C	47.04
Outlet temperature	°C	54.96
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	56257
Calculated Hydraulic power	W	13
Calculated global efficiency	η	0.26
Calculated Capacity correction	W	38
Calculated Power correction	W	51
Water Flow	m <sup>3</sup> /s	0.000231



### Detailed result for 'EN14511:2018' A-7/W55

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>5.970</b>
COP	-	<b>2.286</b>
Power consumption	kW	<b>2.612</b>
<b>Measured</b>		
Heating capacity	kW	6.005
COP	-	2.260
Power consumption	kW	2.658
<b>During heating</b>		
Air temperature dry bulb	°C	-6.90
Air temperature wet bulb	°C	-7.91
Air temperature dry bulb outlet	°C	-9.70
Inlet temperature	°C	46.99
Outlet temperature	°C	54.93
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	59105
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	46
Water Flow	m <sup>3</sup> /s	0.000183



## Detailed COP test results - high temperature – EN 14511

<b>Detailed result for 'EN14511:2018' A7/W65</b>		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>6.733</b>
COP	-	<b>2.481</b>
Power consumption	kW	<b>2.713</b>
<b>Measured</b>		
Heating capacity	kW	6.766
COP	-	2.454
Power consumption	kW	2.757
<b>During heating</b>		
Air temperature dry bulb	°C	7.06
Air temperature wet bulb	°C	6.02
Air temperature dry bulb outlet	°C	3.17
Inlet temperature	°C	55.02
Outlet temperature	°C	65.09
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	60759
Calculated Hydraulic power	W	10
Calculated global efficiency	$\eta$	0.23
Calculated Capacity correction	W	33
Calculated Power correction	W	43
Water Flow	m <sup>3</sup> /s	0.000163



<b>Detailed result for 'EN14511:2018' A7/W60</b>		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>7.012</b>
COP	-	<b>2.912</b>
Power consumption	kW	<b>2.408</b>
<b>Measured</b>		
Heating capacity	kW	7.046
COP	-	2.873
Power consumption	kW	2.452
<b>During heating</b>		
Air temperature dry bulb	°C	6.97
Air temperature wet bulb	°C	5.92
Air temperature dry bulb outlet	°C	2.78
Inlet temperature	°C	50.00
Outlet temperature	°C	59.77
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	59413
Calculated Hydraulic power	W	10
Calculated global efficiency	$\eta$	0.23
Calculated Capacity correction	W	34
Calculated Power correction	W	44
Water Flow	m <sup>3</sup> /s	0.000175





### Detailed result for 'EN14511:2018' A2/W65

Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Transient
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>6.231</b>
COP	-	<b>2.250</b>
Power consumption	kW	<b>2.769</b>
<b>Measured</b>		
Heating capacity	kW	6.264
COP	-	2.228
Power consumption	kW	2.812
<b>During heating</b>		
Air temperature dry bulb	°C	2.21
Air temperature wet bulb	°C	0.93
Air temperature dry bulb outlet	°C	-1.12
Inlet temperature	°C	54.99
Outlet temperature	°C	64.79
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	60443
Calculated Hydraulic power	W	10
Calculated global efficiency	$\eta$	0.23
Calculated Capacity correction	W	33
Calculated Power correction	W	43
Water Flow	m <sup>3</sup> /s	0.000163



<b>Detailed result for 'EN14511:2018' A2/W60</b>			
Tested according to:			EN14511:2018
Minimum flow reached:			No
Measurement type:			Transient
Integrated circulation pump:			Yes
<b>Included corrections (Final result)</b>			
Heating capacity	kW		<b>6.416</b>
COP	-		<b>2.445</b>
Power consumption	kW		<b>2.624</b>
<b>Measured</b>			
Heating capacity	kW		6.450
COP	-		2.418
Power consumption	kW		2.668
<b>During heating</b>			
Air temperature dry bulb	°C		2.14
Air temperature wet bulb	°C		0.99
Air temperature dry bulb outlet	°C		-1.33
Inlet temperature	°C		50.00
Outlet temperature	°C		60.09
<b>Circulation pump</b>			
Measured: Static differential pressure, liquid pump	Pa		59681
Calculated Hydraulic power	W		10
Calculated global efficiency	$\eta$		0.23
Calculated Capacity correction	W		34
Calculated Power correction	W		44
Water Flow	m <sup>3</sup> /s		0.000172



<b>Detailed result for 'EN14511:2018' A-7/W65</b>			
Tested according to:		EN14511:2018	
Minimum flow reached:		No	
Measurement type:		Steady State	
Integrated circulation pump:		Yes	
<b>Included corrections (Final result)</b>			
Heating capacity	kW	<b>6.008</b>	
COP	-	<b>1.919</b>	
Power consumption	kW	<b>3.131</b>	
<b>Measured</b>			
Heating capacity	kW	6.040	
COP	-	1.904	
Power consumption	kW	3.172	
<b>During heating</b>			
Air temperature dry bulb	°C	-6.92	
Air temperature wet bulb	°C	-7.93	
Air temperature dry bulb outlet	°C	-9.37	
Inlet temperature	°C	55.01	
Outlet temperature	°C	64.98	
<b>Circulation pump</b>			
Measured: Static differential pressure, liquid pump	Pa	60769	
Calculated Hydraulic power	W	9	
Calculated global efficiency	η	0.22	
Calculated Capacity correction	W	32	
Calculated Power correction	W	41	
Water Flow	m <sup>3</sup> /s	0.000147	



<b>Detailed result for 'EN14511:2018' A-7/W60</b>			
Tested according to:		EN14511:2018	
Minimum flow reached:		No	
Measurement type:		Steady State	
Integrated circulation pump:		Yes	
<b>Included corrections (Final result)</b>			
Heating capacity	kW	<b>6.082</b>	
COP	-	<b>2.118</b>	
Power consumption	kW	<b>2.872</b>	
<b>Measured</b>			
Heating capacity	kW	6.114	
COP	-	2.099	
Power consumption	kW	2.912	
<b>During heating</b>			
Air temperature dry bulb	°C	-6.92	
Air temperature wet bulb	°C	-7.95	
Air temperature dry bulb outlet	°C	-9.49	
Inlet temperature	°C	50.03	
Outlet temperature	°C	60.10	
<b>Circulation pump</b>			
Measured: Static differential pressure, liquid pump	Pa	60540	
Calculated Hydraulic power	W	9	
Calculated global efficiency	$\eta$	0.22	
Calculated Capacity correction	W	32	
Calculated Power correction	W	41	
Water Flow	m <sup>3</sup> /s	0.000147	



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

<b>Detailed result for 'EN14825:2018 Cooling fan coil (A) A35/W7</b>		
Tested according to:		EN14825:2018
Temperature application:		Cooling fan coil
Condition name:		A
Condition temperature:	°C	35
Part load:	%	100%
Tdesign	°C	35
Pdesign	kW	7.00
Cooling demand:	kW	7.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Cooling capacity	kW	<b>6.734</b>
EER	-	<b>3.113</b>
Power consumption	kW	<b>2.163</b>
<b>Measured</b>		
Cooling capacity	kW	6.699
EER	-	3.031
Power consumption	kW	2.210
<b>During heating</b>		
Air temperature dry bulb	°C	35.12
Air temperature dry bulb outlet	°C	43.49
Inlet temperature	°C	12.01
Outlet temperature	°C	7.00
Outlet temperature (Time averaged)	°C	<b>7.00</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	35219
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	47
Water Flow	m <sup>3</sup> /s	0.000319



<b>Detailed result for 'EN14825:2018 Cooling fan coil (C) A25/W10</b>		
Tested according to:		EN14825:2018
Temperature application:		Cooling fan coil
Condition name:		C
Condition temperature:	°C	25
Part load:	%	47%
Tdesign	°C	35
Pdesign	kW	7.00
Cooling demand:	kW	3.29
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Cooling capacity	kW	<b>3.317</b>
EER	-	<b>6.039</b>
Power consumption	kW	<b>0.549</b>
<b>Measured</b>		
Cooling capacity	kW	3.288
EER	-	5.604
Power consumption	kW	0.587
<b>During heating</b>		
Air temperature dry bulb	°C	25.01
Air temperature dry bulb outlet	°C	31.67
Inlet temperature	°C	15.01
Outlet temperature	°C	10.02
Outlet temperature (Time averaged)	°C	<b>10.02</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	49248
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	30
Calculated Power correction	W	37
Water Flow	m <sup>3</sup> /s	0.000157



## Test results for SEER test points at floor cooling application for space cooling - EN 14825

<b>Detailed result for 'EN14825:2018 Cooling underfloor (A) A35/W18</b>		
Tested according to:		EN14825:2018
Temperature application:		Cooling underfloor
Condition name:		A
Condition temperature:	°C	35
Part load:	%	100%
Tdesign	°C	35
Pdesign	kW	7.00
Cooling demand:	kW	7.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Cooling capacity	kW	<b>6.747</b>
EER	-	<b>4.834</b>
Power consumption	kW	<b>1.396</b>
<b>Measured</b>		
Cooling capacity	kW	6.711
EER	-	4.650
Power consumption	kW	1.443
<b>During heating</b>		
Air temperature dry bulb	°C	35.03
Air temperature dry bulb outlet	°C	43.36
Inlet temperature	°C	22.95
Outlet temperature	°C	18.01
Outlet temperature (Time averaged)	°C	<b>18.01</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	35835
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	36
Calculated Power correction	W	48
Water Flow	m <sup>3</sup> /s	0.000325






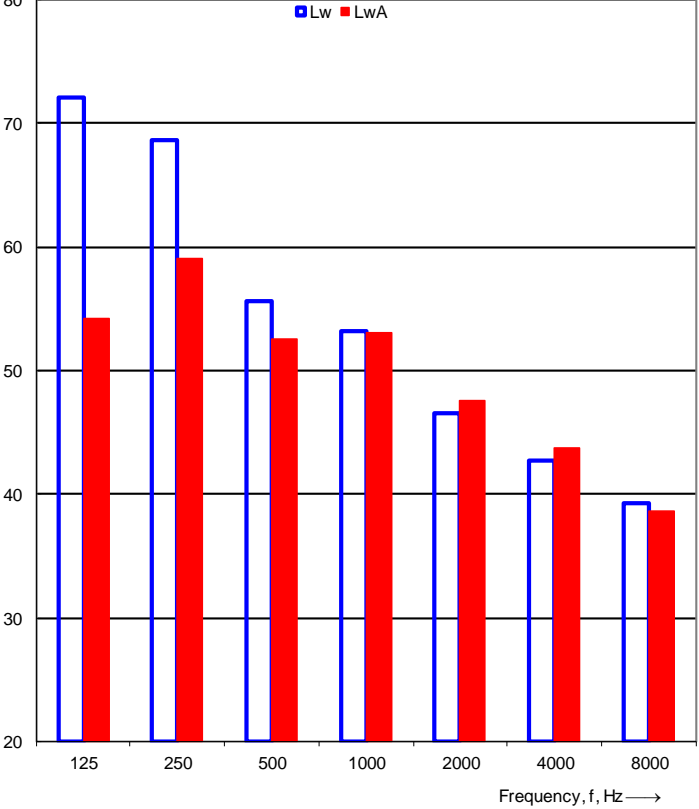
<b>Detailed result for 'EN14825:2018 Cooling underfloor (C) A25/W18</b>		
Tested according to:		EN14825:2018
Temperature application:		Cooling underfloor
Condition name:		C
Condition temperature:	°C	25
Part load:	%	47%
Tdesign	°C	35
Pdesign	kW	7.00
Cooling demand:	kW	3.29
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Cooling capacity	kW	3.537
EER	-	8.734
Power consumption	kW	0.405
<b>Measured</b>		
Cooling capacity	kW	3.506
EER	-	7.907
Power consumption	kW	0.443
<b>During heating</b>		
Air temperature dry bulb	°C	25.03
Air temperature dry bulb outlet	°C	31.75
Inlet temperature	°C	22.98
Outlet temperature	°C	17.94
Outlet temperature (Time averaged)	°C	17.94
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	48854
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	30
Calculated Power correction	W	39
Water Flow	m <sup>3</sup> /s	0.000167





## Detailed test results of sound power measurement




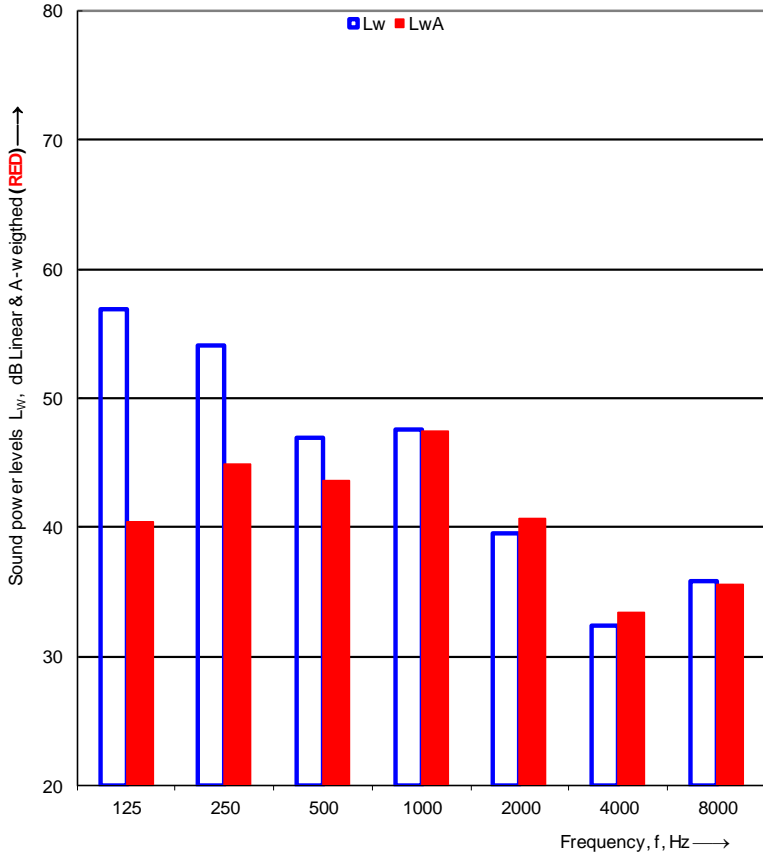
### Test N#1

 		Sound power levels according to ISO 3743-1:2010		 TEKNOLOGISK INSTITUT	
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms					
Client:		Panasonic Marketing Europe GmbH		Date of test: 11-10-2023	
Object:		Type: Air to water heat pump Model: OD: WH-WDG07LE5			
Mounting conditions:		"The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2."			
Operating conditions:		A7/W55, Compressor speed: 55[Hz], Fan speed: 430[rpm], Heating capacity: 7.2 [kW], Power_input: 2.23 [kW], Water flow rate: 770 [l/h], dp_water: 574 [mbar]			
Static pressure:		1000 kPa		Reference box:	
Air temperature:		7.0 °C		L1: 1.2 m	
Relative air humidity:		84.0 %		L2: 0.5 m	
Test room volume:		102.8 m³		L3: 0.9 m	
Area, S, of test room:		138.9 m²		Volume: 0.5 m³	
Room:		Room 2			
Frequency f [Hz]		L <sub>w</sub> 1/3 octave [dB]		1/1 oct [dB]	
100		70.6		72.0	
125		65.9		68.6	
160		57.0		55.6	
200		65.9		53.1	
250		65.2		46.5	
315		49.8		42.7	
400		50.0		39.2	
500		52.0		31.8	
630		50.2			
800		48.8			
1000		49.5			
1250		46.1			
1600		43.3			
2000		40.6			
2500		40.6			
3150		39.5			
4000		38.1			
5000		35.0			
6300		37.3			
8000		31.6			
10000		31.8			
Sound power levels L <sub>w</sub> , dB Linear & A-weighted (RED)					
Sound power level L <sub>w</sub> (A):		61.8 dB [re 1pW]			
Name of test institute:		DTI		Date: 11-10-2023	
No. of test report:		300-KLAB-22-035			
Measurements are in full conformity with ISO 3743					








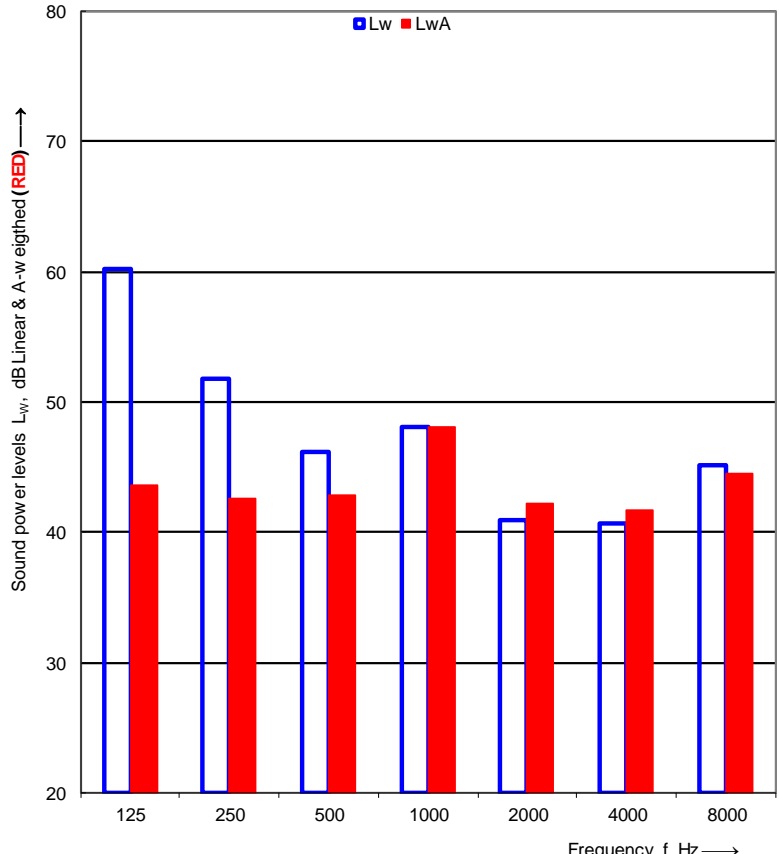
## Test N#2

 		<b>Sound power levels according to ISO 3743-1:2010</b>		 <b>TEKNOLOGISK INSTITUT</b>																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:		Panasonic Marketing Europe GmbH		Date of test: 11-10-2023																																																																			
Object:		Type: Air to water heat pump, Model: OD: WH-WDG07LE5																																																																					
Mounting conditions:		"The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2."																																																																					
Operating conditions:		A7/W55, Compressor speed: 23[Hz], Fan speed: 360[rpm], Heating capacity: 2.75 [kW], Power_input: 0.92 [kW], Water flow rate: 480 [l/h], dp_water: 616 [mbar]																																																																					
Static pressure:		1000 kPa		<u>Reference box:</u>																																																																			
Air temperature:		7.0 °C		L1: 1.2 m																																																																			
Relative air humidity:		84.0 %		L2: 0.5 m																																																																			
Test room volume:		102.8 m³		L3: 0.9 m																																																																			
Area, S, of test room:		138.9 m²		Volume: 0.5 m³																																																																			
Room:		Room 2																																																																					
<table border="1"><thead><tr><th>Frequency f [Hz]</th><th>L<sub>w</sub> 1/3 octave [dB]</th><th>1/1 oct [dB]</th></tr></thead><tbody><tr><td>100</td><td>52.5</td><td></td></tr><tr><td>125</td><td>54.1</td><td>56.9</td></tr><tr><td>160</td><td>47.1</td><td></td></tr><tr><td>200</td><td>51.4</td><td></td></tr><tr><td>250</td><td>49.0</td><td>54.1</td></tr><tr><td>315</td><td>45.7</td><td></td></tr><tr><td>400</td><td>42.9</td><td></td></tr><tr><td>500</td><td>42.0</td><td>46.9</td></tr><tr><td>630</td><td>41.3</td><td></td></tr><tr><td>800</td><td>42.6</td><td></td></tr><tr><td>1000</td><td>44.6</td><td>47.5</td></tr><tr><td>1250</td><td>39.8</td><td></td></tr><tr><td>1600</td><td>35.2</td><td></td></tr><tr><td>2000</td><td>36.2</td><td>39.6</td></tr><tr><td>2500</td><td>32.0</td><td></td></tr><tr><td>3150</td><td>28.6</td><td></td></tr><tr><td>4000</td><td>27.9</td><td>32.4</td></tr><tr><td>5000</td><td>25.8</td><td></td></tr><tr><td>6300</td><td>35.0</td><td></td></tr><tr><td>8000</td><td>26.4</td><td>35.8</td></tr><tr><td>10000</td><td>23.0</td><td></td></tr></tbody></table>		Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]	100	52.5		125	54.1	56.9	160	47.1		200	51.4		250	49.0	54.1	315	45.7		400	42.9		500	42.0	46.9	630	41.3		800	42.6		1000	44.6	47.5	1250	39.8		1600	35.2		2000	36.2	39.6	2500	32.0		3150	28.6		4000	27.9	32.4	5000	25.8		6300	35.0		8000	26.4	35.8	10000	23.0					
Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]																																																																					
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<sup>1</sup> Diff. to backgr. noise < 6dB																																																																							
<b>Sound power level L<sub>w</sub>(A):</b>		<b>51.3 dB [re 1pW]</b>																																																																					
Name of test institute:		DTI		Date: 11-10-2023																																																																			
No. of test report:		300-KLAB-22-035																																																																					
Measurements are in full conformity with ISO 3743																																																																							






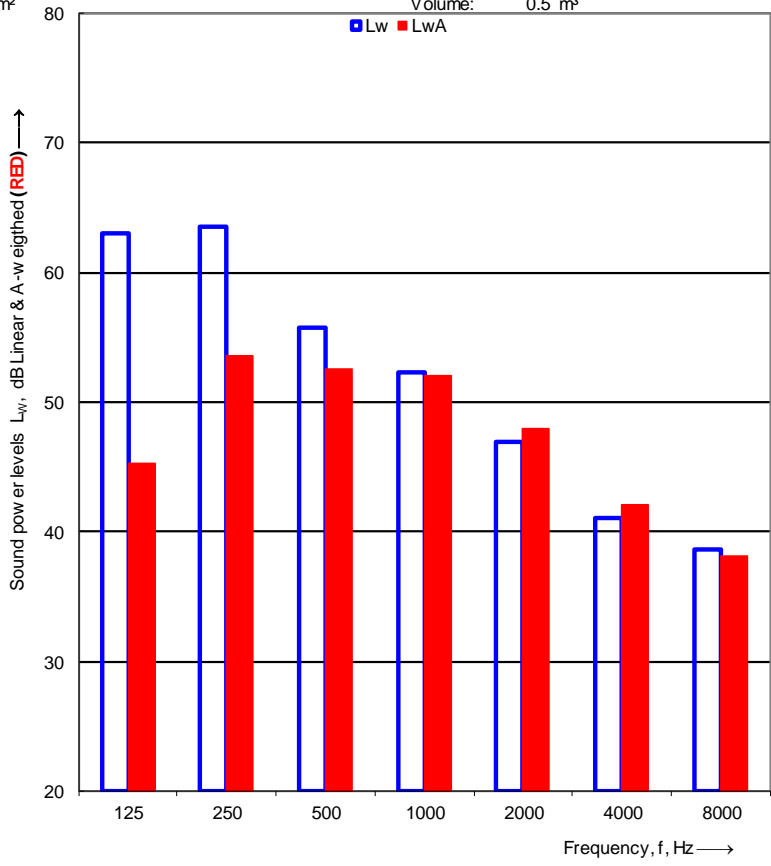


### Test N#3

 		<b>Sound power levels according to ISO 3743-1:2010</b>		 <b>TEKNOLOGISK INSTITUT</b>																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:		Panasonic Marketing Europe GmbH		Date of test: 11-10-2023																																																																			
Object:		Type: Air to water heat pump, Model: OD: WH-WDG07LE5																																																																					
Mounting conditions:		"The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2."																																																																					
Operating conditions:		A7/W55, Compressor speed: 24[Hz], Fan speed: 340[rpm], Heating capacity: 2.8 [kW], Power_input: 0.96 [kW], Water flow rate: 480 [l/h], dp_water: 616 [mbar]																																																																					
Static pressure:		1000 kPa		<u>Reference box:</u>																																																																			
Air temperature:		7.0 °C		L1: 1.2 m																																																																			
Relative air humidity:		84.0 %		L2: 0.5 m																																																																			
Test room volume:		102.8 m³		Room: Room 2																																																																			
Area, S, of test room:		138.9 m²		L3: 0.9 m																																																																			
				Volume: 0.5 m³																																																																			
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Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]																																																																					
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<b>Sound power level L<sub>w</sub>(A):</b>		<b>52.6 dB [re 1pW]</b>																																																																					
Name of test institute:		DTI		Date: 11-10-2023																																																																			
No. of test report:		300-KLAB-22-035																																																																					
Measurements are in full conformity with ISO 3743																																																																							





## Test N#4


 		<b>Sound power levels according to ISO 3743-1:2010</b>		 <b>DANISH TECHNOLOGICAL INSTITUTE</b>																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:		Panasonic Marketing Europe GmbH		Date of test: 12-10-2023																																																																			
Object:		Type: Air to water heat pump, Model: OD: WH-WDG07LE5																																																																					
Mounting conditions:		"The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2."																																																																					
Operating conditions:		A7/W35, Compressor speed: 49[rpm], Fan speed: 480[rpm], Heating capacity: 7.12 [kW], Power input: 1.40 [kW], Water flow rate: 1220 [l/h], dp_water: 480 [mbar]																																																																					
Static pressure:		1007 kPa		<u>Reference box:</u>																																																																			
Air temperature:		7.0 °C		L1: 1.2 m																																																																			
Relative air humidity:		84.0 %		L2: 0.5 m																																																																			
Test room volume:		102.8 m³		L3: 0.9 m																																																																			
Area, S, of test room:		138.9 m²		Volume: 0.5 m³																																																																			
		Room: Room 2																																																																					
																																																																							
		<table border="1"><thead><tr><th>Frequency f [Hz]</th><th>L<sub>w</sub> 1/3 octave [dB]</th><th>1/1 oct [dB]</th></tr></thead><tbody><tr><td>100</td><td>62.2</td><td></td></tr><tr><td>125</td><td>52.1</td><td>63.0</td></tr><tr><td>160</td><td>52.9</td><td></td></tr><tr><td>200</td><td>62.2</td><td></td></tr><tr><td>250</td><td>56.7</td><td>63.5</td></tr><tr><td>315</td><td>51.1</td><td></td></tr><tr><td>400</td><td>50.9</td><td></td></tr><tr><td>500</td><td>51.3</td><td>55.7</td></tr><tr><td>630</td><td>50.5</td><td></td></tr><tr><td>800</td><td>49.3</td><td></td></tr><tr><td>1000</td><td>46.9</td><td>52.3</td></tr><tr><td>1250</td><td>45.6</td><td></td></tr><tr><td>1600</td><td>43.9</td><td></td></tr><tr><td>2000</td><td>41.7</td><td>46.9</td></tr><tr><td>2500</td><td>39.7</td><td></td></tr><tr><td>3150</td><td>37.9</td><td></td></tr><tr><td>4000</td><td>36.1</td><td>41.1</td></tr><tr><td>5000</td><td>34.0</td><td></td></tr><tr><td>6300</td><td>37.0</td><td></td></tr><tr><td>8000</td><td>31.2</td><td>38.6</td></tr><tr><td>10000</td><td>29.8</td><td></td></tr></tbody></table>				Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]	100	62.2		125	52.1	63.0	160	52.9		200	62.2		250	56.7	63.5	315	51.1		400	50.9		500	51.3	55.7	630	50.5		800	49.3		1000	46.9	52.3	1250	45.6		1600	43.9		2000	41.7	46.9	2500	39.7		3150	37.9		4000	36.1	41.1	5000	34.0		6300	37.0		8000	31.2	38.6	10000	29.8	
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		<div>Sound power level L<sub>w</sub>(A): <b>58.4 dB [re 1pW]</b></div>																																																																					
Name of test institute:		DTI		Date: 12-10-2023																																																																			
No. of test report:		300-KLAB-22-035																																																																					
Measurements are in full conformity with ISO 3743																																																																							



## Test N#5



# Sound power levels according to ISO 3743-1:2010



Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms

Client:  
Object:  
Mounting conditions:

Parasonic Marketing Europe GmbH  
Type: Air to water heat pump, Model: OD: WH-WDG07LE5  
"The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2.

"

Operating conditions:

A7/W35, Compressor speed: 21[Hz], Fan speed: 330[rpm], Heating capacity: 3.1 [kW], Power\_input: 0.58 [kW], Water flow rate: 545 [l/h], dp\_water: 600 [mbar]

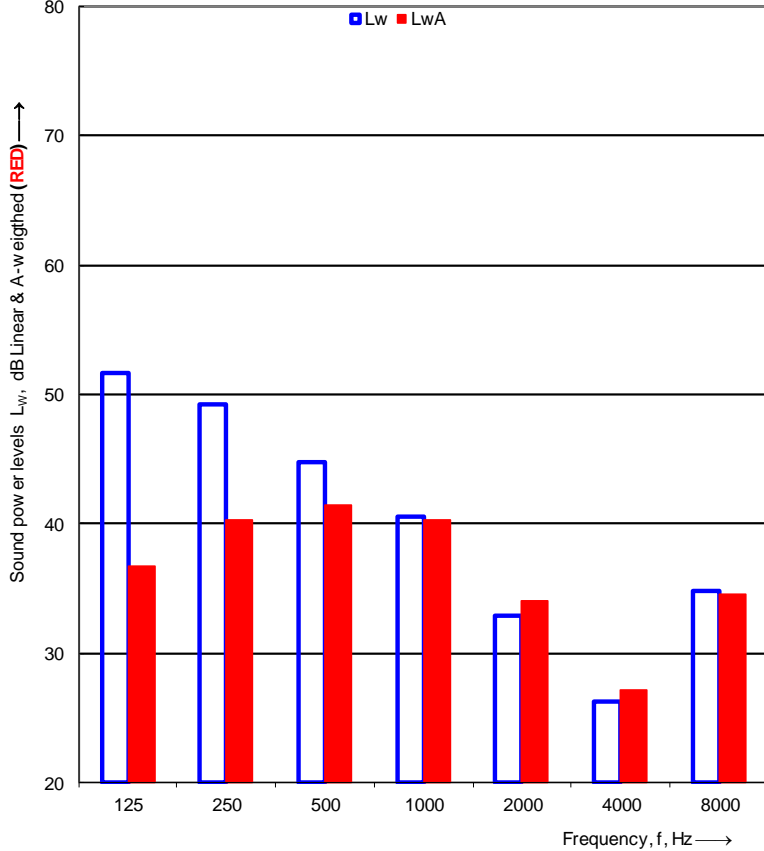
Static pressure: 1000 kPa  
Air temperature: 7.0 °C  
Relative air humidity: 84.0 %  
Test room volume: 102.8 m³  
Area, S, of test room: 138.9 m²

Room: Room 2

Reference box:  
L1: 1.2 m  
L2: 0.5 m  
L3: 0.9 m  
Volume: 0.5 m³

Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]
100	46.5	1
125	43.9	51.7
160	48.9	
200	45.5	
250	45.5	49.2
315	41.0	
400	40.7	
500	40.4	44.8
630	38.6	
800	37.5	
1000	35.5	40.6
1250	33.5	
1600	30.3	
2000	27.7	32.9
2500	24.8	
3150	21.5	
4000	21.1	26.3
5000	21.9	
6300	34.1	
8000	25.2	34.8
10000	20.5	1

1 Diff. to backgr. noise < 6dB



Frequency, f, Hz	L <sub>w</sub> [dB]	L <sub>wA</sub> [dB]
125	46.5	36.5
250	45.5	40.5
500	40.4	41.5
1000	35.5	40.5
2000	27.7	34.0
4000	21.1	27.0
8000	25.2	34.8

Sound power level L<sub>w</sub>(A): 46.6 dB [re 1pW]




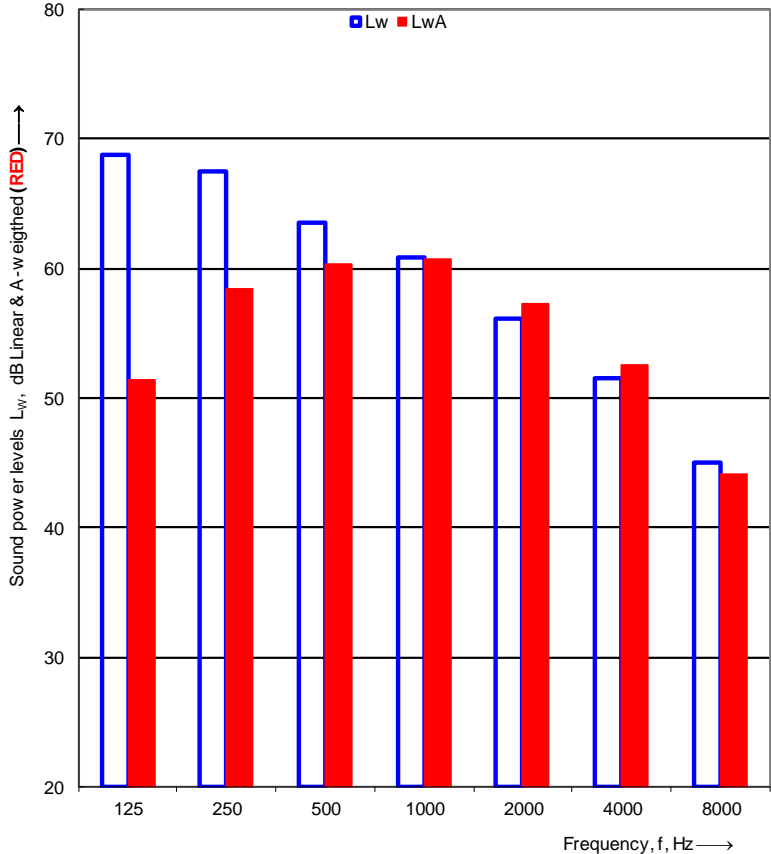
Name of test institute: DTI  
No. of test report: 300-KLAB-22-035

Date: 11-10-2023

Measurements are in full conformity with ISO 3743



## Test N#6

 		<b>Sound power levels according to ISO 3743-1:2010</b>		 <b>TEKNOLOGISK INSTITUT</b>																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:		Panasonic Marketing Europe GmbH		Date of test: 16-10-2023																																																																			
Object:		Type: Air to water heat pump, Model: OD: WH-WDG07LE5																																																																					
Mounting conditions:		The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2.																																																																					
Operating conditions:		A-7/W55, Compressor speed: 67[Hz], Fan speed: 660[rpm], Heating capacity: 5.97 [kW], Power_input: 2.61 [kW], Water flow rate: 660 [l/h], dp_water: 575 [mbar]																																																																					
Static pressure:		1016 kPa		<u>Reference box:</u>																																																																			
Air temperature:		-7.0 °C		L1: 1.2 m																																																																			
Relative air humidity:		74.0 %		L2: 0.5 m																																																																			
Test room volume:		102.8 m³		L3: 0.9 m																																																																			
Area, S, of test room:		138.9 m²		Volume: 0.5 m³																																																																			
		Room: Room 2																																																																					
																																																																							
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Name of test institute:		DTI		Date: 16-10-2023																																																																			
No. of test report:		300-KLAB-22-035																																																																					
Measurements are in full conformity with ISO 3743																																																																							

## Test N#7



## Sound power levels according to ISO 3743-1:2010



**TEKNOLOGISK  
INSTITUT**

Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms

Client:	Panasonic Marketing Europe GmbH	Date of test:	16-10-2023
Object:	Type: Air to water heat pump, Model: OD: WH-WDG07LE5		
Mounting conditions:	The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2.		

Operating conditions: A-7/W55, Compressor speed: 28[Hz], Fan speed: 460[rpm], Heating capacity: 1.83 [kW], Power\_input: 1.14 [kW], Water flow rate: 480 [l/h], dp\_water: 614 [mbar]

Static pressure:	1016 kPa
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Air temperature: -7.0 °C

Relative air humidity: 74.0 %

Test room volume:	102.8 m <sup>3</sup>
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Area,  $S$ , of test room: 138.9 m<sup>2</sup>

Reference box:

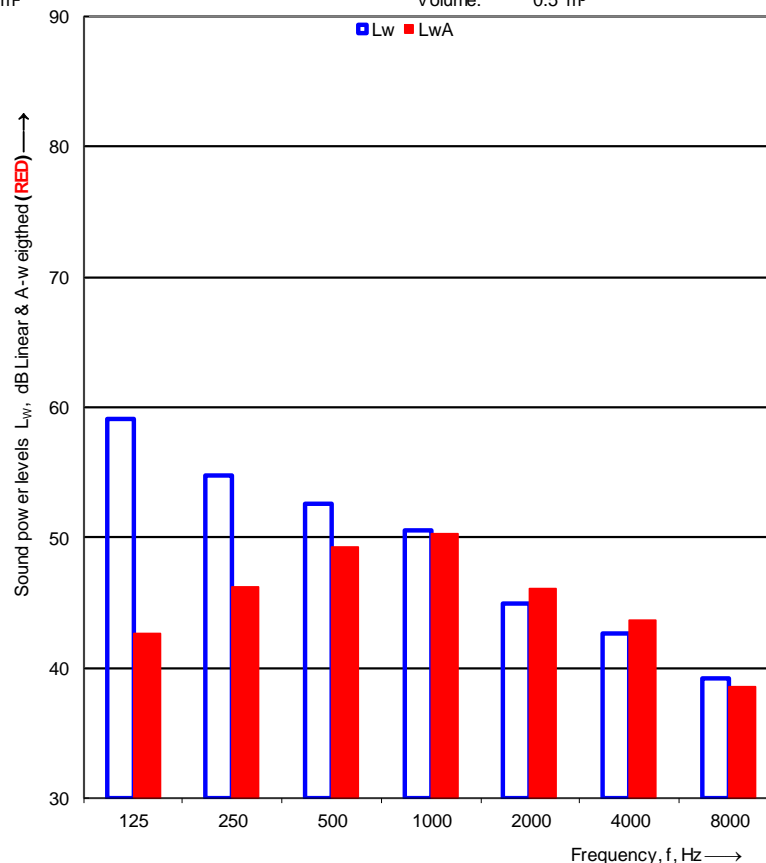
L1: 1.2 m

L2: 0.5 m

L3: 0.9 m

Volume: 0.5 m<sup>3</sup>

Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]
100	55.8	
125	54.6	59.1
160	51.7	
200	49.1	
250	51.6	54.7
315	48.5	
400	48.7	
500	47.3	52.6
630	47.3	
800	47.8	
1000	43.9	50.6
1250	44.6	
1600	41.4	
2000	39.1	44.9
2500	39.4	
3150	38.7	
4000	39.4	42.6
5000	33.4	
6300	37.0	
8000	32.4	39.2
10000	31.9	



**Sound power level  $L_W(A)$ :**      **55.1 dB [re 1pW]**

Name of test institute:	DTI
<b>No. of test report:</b>	300-KLAB-22-035

Date: 16-10-2023

Measurements are in full conformity with ISO 3743



2. **DANAK**

Test Req. nr.

## Test N#8



## Sound power levels according to ISO 3743-1:2010



**TEKNOLOGISK  
INSTITUT**

Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms

Client:	Panasonic Marketing Europe GmbH	Date of test:	12-10-2023
Object:	Type: Air to water heat pump, Model: OD: WH-WDG07LE5		
Mounting conditions:	The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2.		

Operating conditions:	A7/W35, Compressor speed: 62[Hz], Fan speed: 640[rpm], Heating capacity: 6.15 [kW], Power_input: 1.90 [kW], Water flow rate: 1080 [l/h], dp_water: 480 [mbar]
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Static pressure:	1007 kPa
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Air temperature:

Relative air humidity: 74.0 %

Test room volume:	102.8 m <sup>3</sup>
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Area,  $S$ , of test room: 138.9 m<sup>2</sup>

Room: Room 2

Reference box:

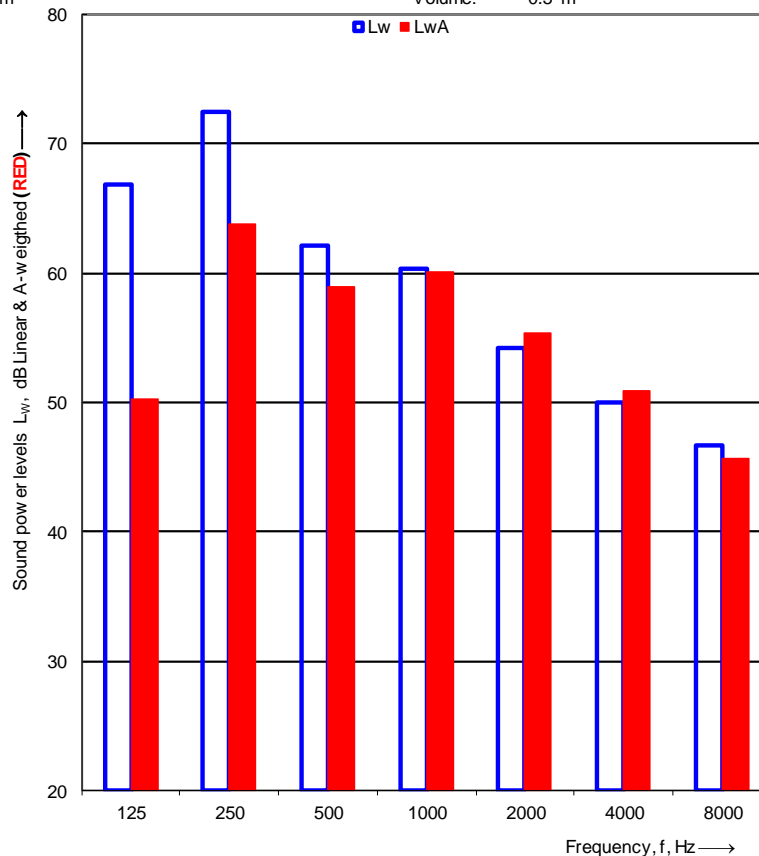
L1: 1.2 m

L2: 0.5 m

L3: 0.9 m

Volume: 0.5 m<sup>3</sup>

Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]
100	63.2	
125	63.4	66.9
160	57.6	
200	60.2	
250	71.9	72.4
315	58.9	
400	57.9	
500	57.0	62.1
630	57.1	
800	57.7	
1000	54.6	60.3
1250	53.1	
1600	50.7	
2000	48.9	54.2
2500	48.3	
3150	46.7	
4000	44.9	49.9
5000	43.1	
6300	42.5	
8000	41.5	46.6
10000	41.4	



**Sound power level  $L_w(A)$ :**      **66.8 dB [re 1pW]**

Name of test institute:	DTI
<b>No. of test report:</b>	300-KLAB-22-035

Date: 12-10-2023

Measurements are in full conformity with ISO 3743






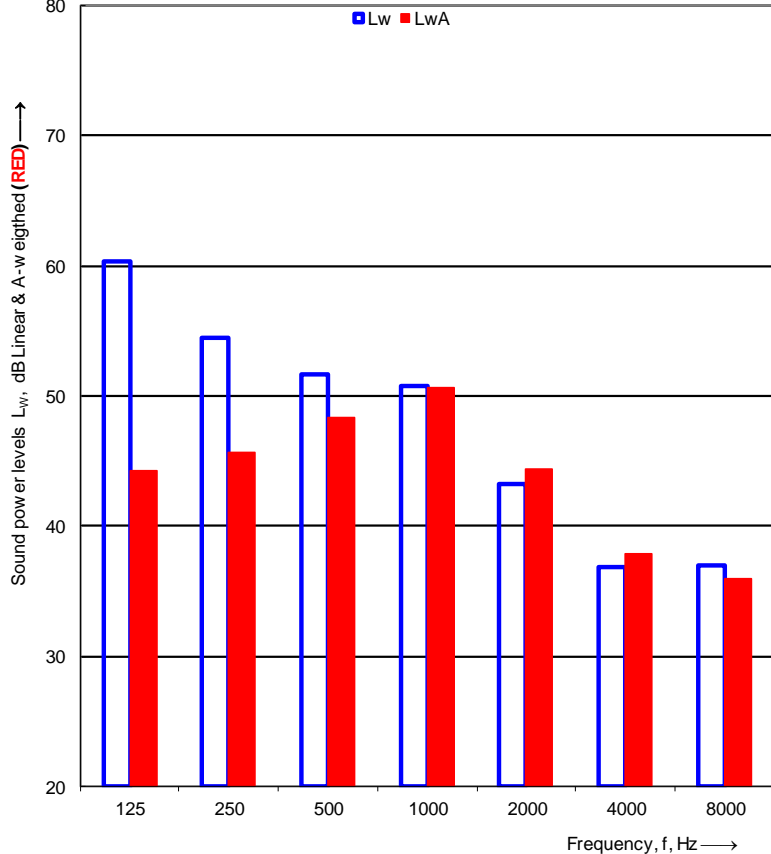
**DANAK**

Test Req. nr.






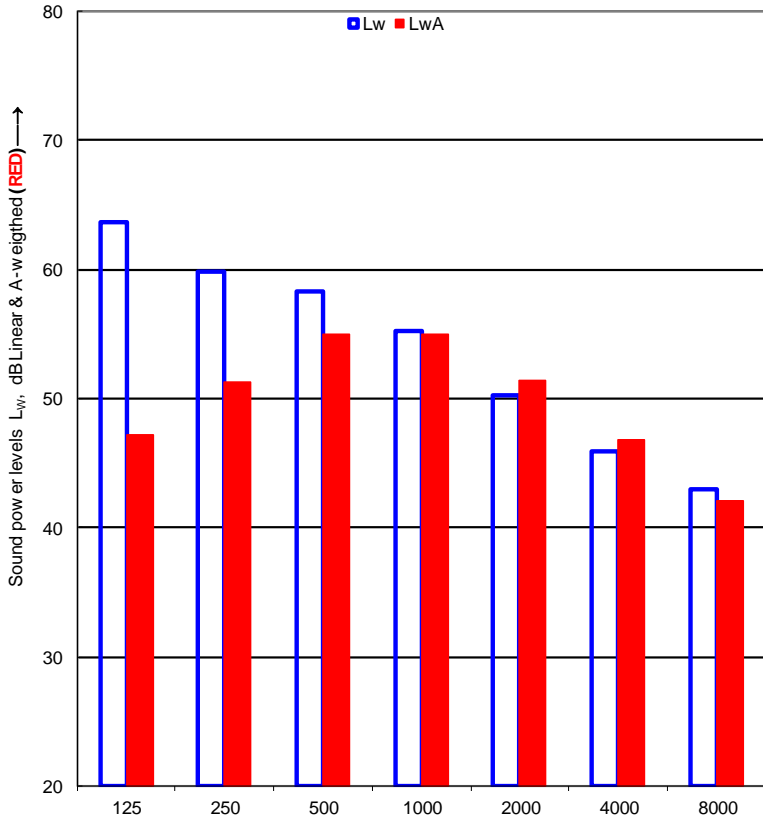


## Test N#9

 		<b>Sound power levels according to ISO 3743-1:2010</b>		 <b>TEKNOLOGISK INSTITUT</b>																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:		Panasonic Marketing Europe GmbH		Date of test: 13-10-2023																																																																			
Object:		Type: Air to water heat pump, Model: OD: WH-WDG07LE5																																																																					
Mounting conditions:		The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2.																																																																					
Operating conditions:		A-7/W35, Compressor speed: 26[Hz], Fan speed: 450[rpm], Heating capacity: 2.46 [kW], Power_input: 0.73 [kW], Water flow rate: 480 [l/h], dp_water: 588 [mbar]																																																																					
Static pressure:		1002 kPa		<u>Reference box:</u>																																																																			
Air temperature:		-7.0 °C		L1: 1.2 m																																																																			
Relative air humidity:		74.0 %		L2: 0.5 m																																																																			
Test room volume:		102.8 m³		Room: Room 2																																																																			
Area, S, of test room:		138.9 m²		L3: 0.9 m																																																																			
				Volume: 0.5 m³																																																																			
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Name of test institute:		DTI		Date: 13-10-2023																																																																			
No. of test report:		300-KLAB-22-035																																																																					
Measurements are in full conformity with ISO 3743																																																																							



## Test N#10

 		<b>Sound power levels according to ISO 3743-1:2010</b>		 <b>TEKNOLOGISK INSTITUT</b>																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:		Panasonic Marketing Europe GmbH		Date of test: 12-10-2023																																																																			
Object:		Type: Air to water heat pump, Model: OD: WH-WDG07LE5																																																																					
Mounting conditions:		"The outdoor unit is mounted on the supporting metal support frame using four vibration damping insulators and placed on four pieces of concrete tiles (20x20x5 cm). The support is placed on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2."																																																																					
Operating conditions:		A2/W35, Compressor speed: 29[Hz], Fan speed: 580[rpm], Heating capacity: 3.75 [kW], Power input: 0.85 [kW], Water flow rate: 640 [l/h], dp water: 578 [mbar]																																																																					
Static pressure:		1007 kPa		<u>Reference box:</u>																																																																			
Air temperature:		2.0 °C		L1: 1.2 m																																																																			
Relative air humidity:		84.0 %		L2: 0.5 m																																																																			
Test room volume:		102.8 m³		L3: 0.9 m																																																																			
Area, S, of test room:		138.9 m²		Volume: 0.5 m³																																																																			
Room:		Room 2																																																																					
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<b>Sound power level L<sub>w</sub>(A):</b>		<b>60.1 dB [re 1pW]</b>																																																																					
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## Appendix 1: Test Procedure

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

- DS/EN 14511:2018
- EN 12102-1:2017
- ISO/EN 3743-1

The basic acoustic measurement standard ISO/EN 3743-1 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 heat 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 1/1-octave levels. The uncertainty is estimated on the weighted standard deviations in 1/1-octave levels.

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

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

The detailed description of the measurement method is given in Danish in the quality database system "QA Web" at Danish Technological Institute, which is accessible by DANAK.

