

# TEST REPORT

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300-KLAB-22-011



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**Customer:** Company: Panasonic Marketing Europe GmbH  
Address: Hagenauer Str. 43  
City: D-65203 Wiesbaden  
Tel.: +49 1724 141441

**Component:** Brand: Panasonic  
Type: Air to water heat pump (mono bloc)  
Model: Unit: WH-MXC16J9E8  
Series no.: Unit: 5623500001  
Prod. year: Unit: 2021.07

**Dates:** Component tested: May 2022 – July 2022

**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.

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Test Rep. nr.



## 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.

Rating conditions low temperature (heating mode) according to EN 14511:2018 at A7/W35, A2/W35 and A-7/W35.

Rating conditions medium temperature (heating mode) according to EN 14511:2018 at A7/W55, A2/W55 and A-7/W55.

Operating requirements according to EN 14511-4:2013:

- 4.2.1 Starting and operating tests

Operating requirements according to EN 14511-4:2018:

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

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

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

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

This report includes all requirements for the European KEYMARK Scheme for Heat Pumps.





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## Test conditions

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

Part load conditions for reference SCOP and reference SCOP<sub>on</sub> 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	$(-7 - 16) / (T_{\text{designh}} - 16)$	88	n/a	61	-7(-8)	20(12)	<sup>a</sup> / 35	<sup>a</sup> / 34	n/a	<sup>a</sup> / 30
B	$(+2 - 16) / (T_{\text{designh}} - 16)$	54	100	37	2(1)	20(12)	<sup>a</sup> / 35	<sup>a</sup> / 30	<sup>a</sup> / 35	<sup>a</sup> / 27
C	$(+7 - 16) / (T_{\text{designh}} - 16)$	35	64	24	7(6)	20(12)	<sup>a</sup> / 35	<sup>a</sup> / 27	<sup>a</sup> / 31	<sup>a</sup> / 25
D	$(+12 - 16) / (T_{\text{designh}} - 16)$	15	29	11	12(11)	20(12)	<sup>a</sup> / 35	<sup>a</sup> / 24	<sup>a</sup> / 26	<sup>a</sup> / 24
E	$(TOL - 16) / (T_{\text{designh}} - 16)$				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	$(-15 - 16) / (T_{\text{designh}} - 16)$	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	$(-7 - 16) / (T_{\text{designh}} - 16)$	88	n/a	61	-7(-8)	20(12)	<sup>a</sup> / 55	<sup>a</sup> / 52	n/a	<sup>a</sup> / 44
B	$(+2 - 16) / (T_{\text{designh}} - 16)$	54	100	37	2(1)	20(12)	<sup>a</sup> / 55	<sup>a</sup> / 42	<sup>a</sup> / 55	<sup>a</sup> / 37
C	$(+7 - 16) / (T_{\text{designh}} - 16)$	35	64	24	7(6)	20(12)	<sup>a</sup> / 55	<sup>a</sup> / 36	<sup>a</sup> / 46	<sup>a</sup> / 32
D	$(+12 - 16) / (T_{\text{designh}} - 16)$	15	29	11	12(11)	20(12)	<sup>a</sup> / 55	<sup>a</sup> / 30	<sup>a</sup> / 34	<sup>a</sup> / 28
E	$(TOL - 16) / (T_{\text{designh}} - 16)$				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	$(-15 - 16) / (T_{\text{designh}} - 16)$	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	-10	-10	Variable	Variable



## Test conditions for rating conditions low temperature – EN 14511

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	30	35	
2	2	1	30	35	
3	-7	-8	30	35	

K) Keymark

## Test conditions for rating conditions medium temperature – EN 14511

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	
2	2	1	47	55	
3	-7	-8	47	55	

K) Keymark



### Test conditions for starting and operating tests – EN 14511-4: 2013

N <sup>#</sup>	Heat source		Heat sink	Water flow rate at indoor heat exchanger	Test
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Outlet temperature (°C)		
1	35	-	55	Maximum	Starting
2	35	-	25	Minimum	Operating

### Test conditions for starting and operating tests – EN 14511-4: 2018

N <sup>#</sup>	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 <sup>K</sup>	-20	-	20	Minimum	Starting
2 <sup>K</sup>	-20	-	47	Minimum	Operating

K) Keymark

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

N <sup>#</sup>	Heat source		Heat sink		Heat exchanger
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1 <sup>K</sup>	7	6	30	35	Indoor
2 <sup>K</sup>	7	6	30	35	Outdoor

K) Keymark





## 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	30	35	

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 1/2 (rpm)	Heating capacity (kW)	Power input (kW)
1 <sup>R</sup>	7/6	30/35	45	510/540	12.2	2.51
2 <sup>Q</sup>	7/6	30/35	33	320/360	8.4	1.70
3 <sup>R</sup>	7/6	47/55	51	510/550	12.1	3.94
4 <sup>Q</sup>	7/6	47/55	35	330/380	8.4	2.73
5 <sup>R</sup>	2/1	47/55	70	580/620	14.0	5.5
6 <sup>Q</sup>	2/1	47/55	48	400/430	9.7	3.6
7 <sup>R</sup>	-7/-8	47/55	85	580/620	13.4	6.3
8 <sup>Q</sup>	-7/-8	47/55	60	480/530	9.8	4.3
9 <sup>E</sup>	7/6	47/55	22	330/360	4.8	1.73

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



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## Test results

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

<b>Model (Outdoor)</b>	WH-MXC16J9E8
<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>13 [kW]</b>
<b>Seasonal space heating energy efficiency</b>	$\eta_s$	<b>183.8 [%]</b>
	SCOP	<b>4.67 [-]</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]
	-	$T_j = -7\text{ °C}$	$P_{dh}$	11.89 [kW]
	Low temperature application	$T_j = 2\text{ °C}$	$P_{dh}$	7.03 [kW]
		$T_j = 7\text{ °C}$	$P_{dh}$	8.35 [kW]
		$T_j = 12\text{ °C}$	$P_{dh}$	9.87 [kW]
		$T_j = \text{bivalent temperature}$	$P_{dh}$	13.70 [kW]
		$T_j = \text{operation limit}$	$P_{dh}$	13.70 [kW]

<b>Measured coefficient of performance at outdoor temperature <math>T_j</math></b>	Average Climate	$T_j = -15\text{ °C}$	$COP_d$	- [-]
	-	$T_j = -7\text{ °C}$	$COP_d$	2.82 [-]
	Low temperature application	$T_j = 2\text{ °C}$	$COP_d$	4.51 [-]
		$T_j = 7\text{ °C}$	$COP_d$	6.13 [-]
		$T_j = 12\text{ °C}$	$COP_d$	8.28 [-]
		$T_j = \text{bivalent temperature}$	$COP_d$	2.87 [-]
		$T_j = \text{operation limit}$	$COP_d$	2.87 [-]

<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	$P_{OFF}$	0.008 [kW]
	Thermostat-off mode	$P_{TO}$	0.008 [kW]
	Standby mode	$P_{SB}$	0.008 [kW]
	Crankcase heater mode	$P_{CK}$	0.008 [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	$Q_{HE}$	5750 [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,  $sup(T_j)$ .



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

<b>Model (Outdoor)</b>	WH-MXC16J9E8
<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>16 [kW]</b>
<b>Seasonal space heating energy efficiency</b>	$\eta_s$	<b>139.5 [%]</b>
	SCOP	<b>3.56 [-]</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]
		$T_j = -7\text{ °C}$	$P_{dh}$	15.33 [kW]
		$T_j = 2\text{ °C}$	$P_{dh}$	8.58 [kW]
		$T_j = 7\text{ °C}$	$P_{dh}$	8.16 [kW]
		$T_j = 12\text{ °C}$	$P_{dh}$	9.57 [kW]
		$T_j = \text{bivalent temperature}$	$P_{dh}$	16.36 [kW]
		$T_j = \text{operation limit}$	$P_{dh}$	16.36 [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	2.07 [-]
		$T_j = 2\text{ °C}$	COPd	3.50 [-]
		$T_j = 7\text{ °C}$	COPd	4.68 [-]
		$T_j = 12\text{ °C}$	COPd	6.19 [-]
		$T_j = \text{bivalent temperature}$	COPd	1.92 [-]
		$T_j = \text{operation limit}$	COPd	1.92 [-]

<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	$P_{OFF}$	0.008 [kW]
	Thermostat-off mode	$P_{TO}$	0.008 [kW]
	Standby mode	$P_{SB}$	0.008 [kW]
	Crankcase heater mode	$P_{CK}$	0.008 [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	$Q_{HE}$	9279 [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 standard rating test at low temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1 <sup>K</sup>	A7/W35	16.69	4.61
2	A2/W35	17.28	3.09
3	A-7/W35	17.76	2.49

K) Keymark

### Test results of standard rating test at medium temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1 <sup>K</sup>	A7/W55	16.61	2.96
2	A2/W55	17.08	2.19
3	A-7/W55	16.78	1.89

K) Keymark





### Test results of starting and operating tests – EN 14511-4:2013

N#	Test conditions	Water flow rate at indoor heat exchanger (l/h)	Test validation
1	A35/W55	1245	Passed
2	A35/W25	1320	Passed

### Test results of starting and operating tests – EN 14511-4:2018

N#	Test conditions	Water flow rate at indoor heat exchanger (l/h)	Test validation
1 <sup>K</sup>	A-20/W20	934	Passed
2 <sup>K</sup>	A-20/W47	1720	Passed

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

N#	Test conditions	Test validation
1 <sup>K</sup>	A7/W35	Passed

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

N#	Test conditions	Test validation
1 <sup>K</sup>	A7/W35	Passed

K) Keymark



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### **Pre-running and post running time of liquid pump when heat pump starts and stops**

<b>N#</b>	<b>Pre-running time in seconds (S)</b>	<b>Post running time in seconds (S)</b>
1	184	62

### **Power consumption of liquid pump for COP test points**

<b>N#</b>	<b>COP test points</b>	<b>Measured power consumption (W)</b>	<b>Test mode no.</b>
1	A7/W35	95	1
2	A2/W35	95	1
3	A-7/W35	95	1
4	A7/W55	95	1
5	A2/W55	95	1
6	A-7/W55	95	1

The power consumptions of the liquid pump have been measured separately



### Power consumption of liquid pump for SCOP test points – low temperature application

N#	SCOP test points	Measured power consumption (W)	Test mode no.
1	A12/W24	95	3
2	A7/W27	95	4
3	A2/W30	95	5
4	A-7/W34	95	6
5	A10/W35	95	7

The power consumptions of the liquid pump have been measured separately

### Power consumption of liquid pump for SCOP test points – medium temperature application

N#	SCOP test points	Measured power consumption (W)	Test mode no.
1	A12/W30	95	8
2	A7/W36	95	9
3	A2/W42	95	10
4	A-7/W52	95	11
5	A10/W55	95	12

The power consumptions of the liquid pump have been measured separately



## Test results of sound power measurements – EN 12102

N <sup>#</sup>	Test conditions	Sound power level LW(A) [dB re 1pW]	Uncertainty (dB) (weighted value)
1 <sup>R</sup>	A7/W35	64.6	0.5
2 <sup>Q</sup>	A7/W35	57.0	0.5
3 <sup>R</sup>	A7/W55	65.6	0.5
4 <sup>Q</sup>	A7/W55	61.1	0.5
5 <sup>R</sup>	A2/W55	67.8	0.5
6 <sup>Q</sup>	A2/W55	66.0	0.5
7 <sup>R</sup>	A-7/W55	70.5	0.5
8 <sup>Q</sup>	A-7/W55	69.2	0.5
9 <sup>E</sup>	A7/W55	60.0	0.5

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

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.



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## Photo

### Rating plate

**Panasonic**

(MONO BLOC)  
AIR-TO-WATER HEATPUMP SYSTEM

Model No. **WH-MXC16J9E8**

POWER SUPPLY 1  
RATED VOLTAGE 400V  
PHASE 3N~  
RATED FREQUENCY 50Hz  
MAXIMUM INPUT 11.02kW / 16.4A  
REFRIGERANT R32 1.80kg  
GWP / CO<sub>2</sub>eq. 675 / 1.215t

	COOLING (A35W7)	HEATING (A7W35)	HEATING (A2W35)
CAPACITY	14.50kW	16.00kW	16.00kW
CURRENT	7.6A	5.3A	7.7A
POWER INPUT	5.11kW	3.54kW	5.16kW
EER/COP	2.84	4.52	3.10

(EN 14511)

POWER SUPPLY 2  
RATED VOLTAGE 400V  
PHASE 3N~  
RATED FREQUENCY 50Hz  
MAXIMUM POWER 9.00kW  
MAXIMUM CURRENT 13.0A  
HEATING WATER FLOW 2.8m<sup>3</sup>/h  
COOLING WATER FLOW 2.5m<sup>3</sup>/h  
PS H.P. 4.30MPa (43.0bar)  
L.P. 2.55MPa (25.5bar)  
MWP WATER 0.30MPa (3.00bar)

SERIAL NO.  
**5623500001**  
PRODUCTION DATE 2021.07

Panasonic Appliances  
Air-Conditioning Malaysia Sdn. Bhd.  
Shah Alam Malaysia  
Authorized representative in EU  
Panasonic Testing Centre  
Panasonic Marketing Europe GmbH  
Winsberggring 15, 22525 Hamburg, Germany

**CE 0035**  
IPX4  
Made in Malaysia

**R32**

THIS PRODUCT CONTAINS FLUORINATED GREENHOUSE GASES

**WARNING**  
 RISK OF EXPLOSION DURING SERVICE

After pump down operation, fully close 2, 3 way valve.  
Before remove refrigerant pipes, compressor must be stopped.

ACXF02-69920

### Unit





## SCOP - detailed calculation

### Detailed SCOP calculation of low 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	11.50	11.890	2.820	1.00	1.00	2.820
B	2	54	7.00	7.030	4.510	0.99	1.00	4.510
C	7	35	4.50	8.350	6.130	0.99	0.54	6.099
D	12	15	2.00	9.870	8.280	0.99	0.20	8.067
E	-10	100	13.00	13.700	2.870	1.00	1.00	2.870
F - BIV	-10	100	13.00	13.700	2.870	1.00	1.00	2.870

#### 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	0.008	0.008	0
Thermostat off	178	0.008	0.008	1.424
Standby	0	0.008	0.008	0
Crankcase heater	178	0.008	0	0





Calculation Bin for SCOPon

	Bin	Outdoor temperature [°C]	Hours [h]	Heat load [kW]	Heat load covered by heat pump [kW]	Electrical back up heater [kW]	Annual 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	13.00	13.00	0.00	0.00	2.870	13.000	4.530	13.000	4.530
	22	-9	25	12.50	12.50	0.00	0.00	2.853	312.500	109.521	312.500	109.521
	23	-8	23	12.00	12.00	0.00	0.00	2.837	276.000	97.297	276.000	97.297
<b>A</b>	24	-7	24	11.50	11.50	0.00	0.00	2.820	276.000	97.872	276.000	97.872
	25	-6	27	11.00	11.00	0.00	0.00	3.008	297.000	98.744	297.000	98.744
	26	-5	68	10.50	10.50	0.00	0.00	3.196	714.000	223.435	714.000	223.435
	27	-4	91	10.00	10.00	0.00	0.00	3.383	910.000	268.966	910.000	268.966
	28	-3	89	9.50	9.50	0.00	0.00	3.571	845.500	236.761	845.500	236.761
	29	-2	165	9.00	9.00	0.00	0.00	3.759	1485.000	395.064	1485.000	395.064
	30	-1	173	8.50	8.50	0.00	0.00	3.947	1470.500	372.593	1470.500	372.593
	31	0	240	8.00	8.00	0.00	0.00	4.134	1920.000	464.391	1920.000	464.391
	32	1	280	7.50	7.50	0.00	0.00	4.322	2100.000	485.861	2100.000	485.861
<b>B</b>	33	2	320	7.00	7.00	0.00	0.00	4.510	2240.000	496.674	2240.000	496.674
	34	3	357	6.50	6.50	0.00	0.00	4.828	2320.500	480.647	2320.500	480.647
	35	4	356	6.00	6.00	0.00	0.00	5.146	2136.000	415.101	2136.000	415.101
	36	5	303	5.50	5.50	0.00	0.00	5.464	1666.500	305.018	1666.500	305.018
	37	6	330	5.00	5.00	0.00	0.00	5.781	1650.000	285.394	1650.000	285.394
<b>C</b>	38	7	326	4.50	4.50	0.00	0.00	6.099	1467.000	240.517	1467.000	240.517
	39	8	348	4.00	4.00	0.00	0.00	6.493	1392.000	214.389	1392.000	214.389
	40	9	335	3.50	3.50	0.00	0.00	6.886	1172.500	170.263	1172.500	170.263
	41	10	315	3.00	3.00	0.00	0.00	7.280	945.000	129.809	945.000	129.809
	42	11	215	2.50	2.50	0.00	0.00	7.673	537.500	70.047	537.500	70.047
<b>D</b>	43	12	169	2.00	2.00	0.00	0.00	8.067	338.000	41.899	338.000	41.899
	44	13	151	1.50	1.50	0.00	0.00	8.460	226.500	26.772	226.500	26.772
	45	14	105	1.00	1.00	0.00	0.00	8.854	105.000	11.859	105.000	11.859
	46	15	74	0.50	0.50	0.00	0.00	9.248	37.000	4.001	37.000	4.001

**SUM** 26853.000 5747.425 26853.000 5747.425

**SCOPon** 4.672 **SCOPnet** 4.672



## 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	14.154	15.330	2.070	0.999	1.000	2.070
B	2	54	8.615	8.580	3.500	0.997	1.000	3.500
C	7	35	5.538	8.160	4.680	0.995	0.679	4.670
D	12	15	2.462	9.570	6.190	0.995	0.257	6.099
E	-10	100	16.000	16.360	1.920	0.999	1.000	1.920
F - BIV	-10	100	16.000	16.360	1.920	0.999	1.000	1.920

### 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	0.008	0.008	0
Thermostat off	178	0.008	0.008	1.424
Standby	0	0.008	0.008	0
Crankcase heater	178	0.008	0	0



Calculation Bin for SCOPon

	Bin	Outdoor temperature [°C]	Hours [h]	Heat load [kW]	Heat load covered by heat pump [kW]	Electrical back up heater [kW]	Annual backup heater energy input [kWh]	COPbin	Annual heating demand [kWh]	Annual energy input [kWh]	Net annual heating capacity [kWh]	Net annual power input [kWh]
<b>E / F - BIV</b>	21	-10.000	1	16.000	16.000	0.00	0.00	1.920	16.000	8.333	16.000	8.333
	22	-9.000	25	15.385	15.385	0.00	0.00	1.970	384.615	195.236	384.615	195.236
	23	-8.000	23	14.769	14.769	0.00	0.00	2.020	339.692	168.165	339.692	168.165
<b>A</b>	24	-7.000	24	14.154	14.154	0.00	0.00	2.070	339.692	164.103	339.692	164.103
	25	-6.000	27	13.538	13.535	0.00	0.00	2.229	365.538	164.000	365.538	164.000
	26	-5.000	68	12.923	12.915	0.00	0.00	2.388	878.769	368.028	878.769	368.028
	27	-4.000	91	12.308	12.296	0.00	0.00	2.547	1120.000	439.791	1120.000	439.791
	28	-3.000	89	11.692	11.677	0.00	0.00	2.706	1040.615	384.622	1040.615	384.622
	29	-2.000	165	11.077	11.057	0.00	0.00	2.864	1827.692	638.062	1827.692	638.062
	30	-1.000	173	10.462	10.438	0.00	0.00	3.023	1809.846	598.626	1809.846	598.626
	31	0.000	240	9.846	9.819	0.00	0.00	3.182	2363.077	742.587	2363.077	742.587
	32	1.000	280	9.231	9.199	0.00	0.00	3.341	2584.615	773.580	2584.615	773.580
<b>B</b>	33	2.000	320	8.615	8.580	0.00	0.00	3.500	2756.923	787.692	2756.923	787.692
	34	3.000	357	8.000	7.972	0.00	0.00	3.734	2856.000	764.869	2856.000	764.869
	35	4.000	356	7.385	7.363	0.00	0.00	3.968	2628.923	662.540	2628.923	662.540
	36	5.000	303	6.769	6.755	0.00	0.00	4.202	2051.077	488.129	2051.077	488.129
	37	6.000	330	6.154	6.147	0.00	0.00	4.436	2030.769	457.805	2030.769	457.805
<b>C</b>	38	7.000	326	5.538	5.538	0.00	0.00	4.670	1805.538	386.637	1805.538	386.637
	39	8.000	348	4.923	4.923	0.00	0.00	4.956	1713.231	345.712	1713.231	345.712
	40	9.000	335	4.308	4.308	0.00	0.00	5.241	1443.077	275.320	1443.077	275.320
	41	10.000	315	3.692	3.692	0.00	0.00	5.527	1163.077	210.426	1163.077	210.426
	42	11.000	215	3.077	3.077	0.00	0.00	5.813	661.538	113.802	661.538	113.802
<b>D</b>	43	12.000	169	2.462	2.462	0.00	0.00	6.099	416.000	68.209	416.000	68.209
	44	13.000	151	1.846	1.846	0.00	0.00	6.385	278.769	43.662	278.769	43.662
	45	14.000	105	1.231	1.231	0.00	0.00	6.670	129.231	19.374	129.231	19.374
	46	15.000	74	0.615	0.615	0.00	0.00	6.956	45.538	6.546	45.538	6.546
<b>SUM</b>									33049.846	9275.855	33049.846	9275.855
<b>SCOPon</b>										3.563	<b>SCOPnet</b>	3.563



## Detailed test results

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

Detailed result for 'EN14825:2018' Average Low (A) A -7 /W34		
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	13.00
Heating demand:	kW	11.50
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Transient	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	11.887
COP	-	2.822
Power consumption	kW	4.212
Measured		
Heating capacity	kW	11.912
COP	-	2.808
Power consumption	kW	4.243
During heating		
Air temperature dry bulb	°C	-7.10
Air temperature wet bulb	°C	-8.20
Air temperature dry bulb outlet	°C	-7.10
Inlet temperature	°C	29.01
Outlet temperature	°C	33.93
Outlet temperature (Time averaged)	°C	33.93
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	8536
Calculated Hydraulic power	W	5.74
Calculated global efficiency	η	0.18
Calculated Capacity correction	W	25.4
Calculated Power correction	W	31.1
Water Flow	m³/s	0.000673





<b>Detailed result for 'EN14825:2016' Average Low (B) A 2 /W30</b>		
Tested according to:	EN14511:2018 and EN14825:2016	
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	13.00
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>7.026</b>
COP	-	<b>4.514</b>
Power consumption	kW	<b>1.557</b>
<b>Measured</b>		
Heating capacity	kW	7.082
COP	-	4.320
Power consumption	kW	1.640
<b>During heating</b>		
Air temperature dry bulb	°C	2.04
Air temperature wet bulb	°C	0.79
Air temperature dry bulb outlet	°C	-0.89
Inlet temperature	°C	25.03
Outlet temperature	°C	29.99
Outlet temperature (Time averaged)	°C	<b>29.99</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	79533
Calculated Hydraulic power	W	27
Calculated global efficiency	η	0.33
Calculated Capacity correction	W	56
Calculated Power correction	W	83
Water Flow	m <sup>3</sup> /s	0.000343







<b>Detailed result for 'EN14825:2018' Average Low (C) A 7 /W27</b>		
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	13.00
Heating demand:	kW	4.50
CR:	-	0.5
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>8.354</b>
COP	-	<b>6.125</b>
Power consumption	kW	<b>1.364</b>
<b>Measured</b>		
Heating capacity	kW	8.396
COP	-	5.904
Power consumption	kW	1.422
<b>During heating</b>		
Air temperature dry bulb	°C	7.03
Air temperature wet bulb	°C	5.90
Air temperature dry bulb outlet	°C	3.88
Inlet temperature	°C	25.20
Outlet temperature	°C	28.51
Outlet temperature (Time averaged)	°C	<b>26.98</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	26676
Calculated Hydraulic power	W	16
Calculated global efficiency	η	0.28
Calculated Capacity correction	W	42
Calculated Power correction	W	58
Water Flow	m <sup>3</sup> /s	0.000610



<b>Detailed result for 'EN14825:2018' Average Low (D) A 12 /W24</b>		
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	13.00
Heating demand:	kW	2.00
CR:	-	0.2
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>9.871</b>
COP	-	<b>8.277</b>
Power consumption	kW	<b>1.193</b>
<b>Measured</b>		
Heating capacity	kW	9.926
COP	-	7.787
Power consumption	kW	1.275
<b>During heating</b>		
Air temperature dry bulb	°C	11.99
Air temperature wet bulb	°C	11.00
Air temperature dry bulb outlet	°C	8.85
Inlet temperature	°C	22.99
Outlet temperature	°C	27.99
Outlet temperature (Time averaged)	°C	<b>24.01</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	56251
Calculated Hydraulic power	W	27
Calculated global efficiency	η	0.33
Calculated Capacity correction	W	55
Calculated Power correction	W	82
Water Flow	m <sup>3</sup> /s	0.000477



<b>Detailed result for 'EN14825:2018' Average Low (E and F) A -10 /W35</b>		
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	13.00
Heating demand:	kW	13.00
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>13.698</b>
COP	-	<b>2.873</b>
Power consumption	kW	<b>4.768</b>
<b>Measured</b>		
Heating capacity	kW	13.741
COP	-	2.846
Power consumption	kW	4.828
<b>During heating</b>		
Air temperature dry bulb	°C	-9.99
Air temperature wet bulb	°C	-11.16
Air temperature dry bulb outlet	°C	-14.28
Inlet temperature	°C	29.99
Outlet temperature	°C	34.98
Outlet temperature (Time averaged)	°C	<b>34.98</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	25676
Calculated Hydraulic power	W	17
Calculated global efficiency	η	0.28
Calculated Capacity correction	W	43
Calculated Power correction	W	60
Water Flow	m <sup>3</sup> /s	0.000663



## Detailed SCOP test results - medium temperature application - EN 14825

Detailed result for 'EN14825:2018' Average Medium (A) A -7 /W52		
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	-10
Tdesign	°C	-10
Pdesign	kW	16.00
Heating demand:	kW	14.15
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Transient	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	15.325
COP	-	2.068
Power consumption	kW	7.410
Measured		
Heating capacity	kW	15.399
COP	-	2.046
Power consumption	kW	7.526
During heating		
Air temperature dry bulb	°C	-6.96
Air temperature wet bulb	°C	-8.15
Air temperature dry bulb outlet	°C	-6.96
Inlet temperature	°C	44.00
Outlet temperature	°C	52.00
Outlet temperature (Time averaged)	°C	52.00
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	84217
Calculated Hydraulic power	W	42
Calculated global efficiency	η	0.36
Calculated Capacity correction	W	74
Calculated Power correction	W	116
Water Flow	m³/s	0.000500





<b>Detailed result for 'EN14825:2018' Average Medium (B) A 2 /W42</b>		
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	-10
Tdesign	°C	-10
Pdesign	kW	16.00
Heating demand:	kW	8.62
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>8.580</b>
COP	-	<b>3.501</b>
Power consumption	kW	<b>2.451</b>
<b>Measured</b>		
Heating capacity	kW	8.632
COP	-	3.417
Power consumption	kW	2.526
<b>During heating</b>		
Air temperature dry bulb	°C	1.98
Air temperature wet bulb	°C	0.75
Air temperature dry bulb outlet	°C	-0.37
Inlet temperature	°C	34.02
Outlet temperature	°C	42.02
Outlet temperature (Time averaged)	°C	<b>42.02</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	91558
Calculated Hydraulic power	W	24
Calculated global efficiency	η	0.32
Calculated Capacity correction	W	52
Calculated Power correction	W	75
Water Flow	m <sup>3</sup> /s	0.000260





<b>Detailed result for 'EN14825:2018' Average Medium (C) A 7 /W36</b>		
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	-10
Tdesign	°C	-10
Pdesign	kW	16.00
Heating demand:	kW	5.54
CR:	-	0.7
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>8.156</b>
COP	-	<b>4.684</b>
Power consumption	kW	<b>1.741</b>
<b>Measured</b>		
Heating capacity	kW	8.208
COP	-	4.519
Power consumption	kW	1.816
<b>During heating</b>		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	5.92
Air temperature dry bulb outlet	°C	4.18
Inlet temperature	°C	30.61
Outlet temperature	°C	38.52
Outlet temperature (Time averaged)	°C	<b>35.98</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	94014
Calculated Hydraulic power	W	24
Calculated global efficiency	η	0.31
Calculated Capacity correction	W	51
Calculated Power correction	W	75
Water Flow	m <sup>3</sup> /s	0.000250



<b>Detailed result for 'EN14825:2018' Average Medium (D) A 12 /W30</b>		
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	-10
Tdesign	°C	-10
Pdesign	kW	16.00
Heating demand:	kW	2.46
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>9.574</b>
COP	-	<b>6.193</b>
Power consumption	kW	<b>1.546</b>
<b>Measured</b>		
Heating capacity	kW	9.629
COP	-	5.919
Power consumption	kW	1.627
<b>During heating</b>		
Air temperature dry bulb	°C	12.00
Air temperature wet bulb	°C	10.91
Air temperature dry bulb outlet	°C	8.66
Inlet temperature	°C	28.00
Outlet temperature	°C	35.92
Outlet temperature (Time averaged)	°C	<b>30.04</b>
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	89767
Calculated Hydraulic power	W	26
Calculated global efficiency	η	0.32
Calculated Capacity correction	W	55
Calculated Power correction	W	81
Water Flow	m <sup>3</sup> /s	0.000293



Detailed result for 'EN14825:2018' Average Medium (E and F) A -10 /W55		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Medium	
Condition name:	E and F	
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	16.00
Heating demand:	kW	16.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	16.363
COP	-	1.923
Power consumption	kW	8.508
Measured		
Heating capacity	kW	16.431
COP	-	1.907
Power consumption	kW	8.615
During heating		
Air temperature dry bulb	°C	-9.90
Air temperature wet bulb	°C	-11.04
Air temperature dry bulb outlet	°C	-13.72
Inlet temperature	°C	46.98
Outlet temperature	°C	54.96
Outlet temperature (Time averaged)	°C	54.96
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	75359
Calculated Hydraulic power	W	38
Calculated global efficiency	η	0.35
Calculated Capacity correction	W	69
Calculated Power correction	W	106
Water Flow	m³/s	0.000500



## Detailed test results for rating conditions – 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:		No	
<b>Included corrections (Final result)</b>			
Heating capacity	kW	<b>16.688</b>	
COP	-	<b>4.605</b>	
Power consumption	kW	<b>3.624</b>	
<b>Measured</b>			
Heating capacity	kW	16.639	
COP	-	4.684	
Power consumption	kW	3.552	
<b>During heating</b>			
Air temperature dry bulb	°C	7.00	
Air temperature wet bulb	°C	5.79	
Air temperature dry bulb outlet	°C	2.92	
Inlet temperature	°C	30.00	
Outlet temperature	°C	34.97	
<b>Circulation pump</b>			
Measured: Static differential pressure, liquid pump	Pa	27461	
Calculated Hydraulic power	W	22	
Calculated global efficiency	η	0.31	
Calculated Capacity correction	W	-49	
Calculated Power correction	W	-72	
Water Flow	m <sup>3</sup> /s	0.000807	



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

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Transient	
Integrated circulation pump:	No	
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>17.280</b>
COP	-	<b>3.087</b>
Power consumption	kW	<b>5.597</b>
<b>Measured</b>		
Heating capacity	kW	17.166
COP	-	3.174
Power consumption	kW	5.409
<b>During heating</b>		
Air temperature dry bulb	°C	2.010
Air temperature wet bulb	°C	0.852
Air temperature dry bulb outlet	°C	-4.487
Inlet temperature	°C	29.872
Outlet temperature	°C	35.201
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	77975
Calculated Hydraulic power	W	75
Calculated global efficiency	η	0.40
Calculated Capacity correction	W	-114
Calculated Power correction	W	-189
Water Flow	m <sup>3</sup> /s	0.000958



**Detailed result for 'EN14511:2018' A-7/W35**

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Transient	
Integrated circulation pump:	No	
<b>Included corrections (Final result)</b>		
Heating capacity	kW	<b>17.758</b>
COP	-	<b>2.488</b>
Power consumption	kW	<b>7.138</b>
<b>Measured</b>		
Heating capacity	kW	17.638
COP	-	2.542
Power consumption	kW	6.938
<b>During heating</b>		
Air temperature dry bulb	°C	-7.04
Air temperature wet bulb	°C	-8.19
Air temperature dry bulb outlet	°C	-12.97
Inlet temperature	°C	30.02
Outlet temperature	°C	35.04
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	83854
Calculated Hydraulic power	W	80
Calculated global efficiency	η	0.40
Calculated Capacity correction	W	-121
Calculated Power correction	W	-200
Water Flow	m <sup>3</sup> /s	0.000953



## Detailed test results for rating conditions – 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>16.608</b>
COP	-	<b>2.964</b>
Power consumption	kW	<b>5.603</b>
<b>Measured</b>		
Heating capacity	kW	16.664
COP	-	2.931
Power consumption	kW	5.686
<b>During heating</b>		
Air temperature dry bulb	°C	7.09
Air temperature wet bulb	°C	5.88
Air temperature dry bulb outlet	°C	3.56
Inlet temperature	°C	46.99
Outlet temperature	°C	54.91
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	53900
Calculated Hydraulic power	W	28
Calculated global efficiency	$\eta$	0.33
Calculated Capacity correction	W	56
Calculated Power correction	W	84
Water Flow	m <sup>3</sup> /s	0.000511





### 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>17.083</b>
COP	-	<b>2.186</b>
Power consumption	kW	<b>7.816</b>
<b>Measured</b>		
Heating capacity	kW	17.128
COP	-	2.174
Power consumption	kW	7.880
<b>During heating</b>		
Air temperature dry bulb	°C	2.07
Air temperature wet bulb	°C	0.78
Air temperature dry bulb outlet	°C	-2.84
Inlet temperature	°C	47.15
Outlet temperature	°C	55.07
<b>Circulation pump</b>		
Measured: Static differential pressure, liquid pump	Pa	30492
Calculated Hydraulic power	W	19
Calculated global efficiency	η	0.29
Calculated Capacity correction	W	45
Calculated Power correction	W	63
Water Flow	m <sup>3</sup> /s	0.000607



<b>Detailed result for 'EN14511:2018' A-7/W55</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>16.780</b>	
COP	-	<b>1.890</b>	
Power consumption	kW	<b>8.876</b>	
<b>Measured</b>			
Heating capacity	kW	16.850	
COP	-	1.875	
Power consumption	kW	8.985	
<b>During heating</b>			
Air temperature dry bulb	°C	-7.08	
Air temperature wet bulb	°C	-8.15	
Air temperature dry bulb outlet	°C	-11.79	
Inlet temperature	°C	47.02	
Outlet temperature	°C	54.97	
<b>Circulation pump</b>			
Measured: Static differential pressure, liquid pump	Pa	69755	
Calculated Hydraulic power	W	39	
Calculated global efficiency	$\eta$	0.36	
Calculated Capacity correction	W	70	
Calculated Power correction	W	109	
Water Flow	m <sup>3</sup> /s	0.000557	

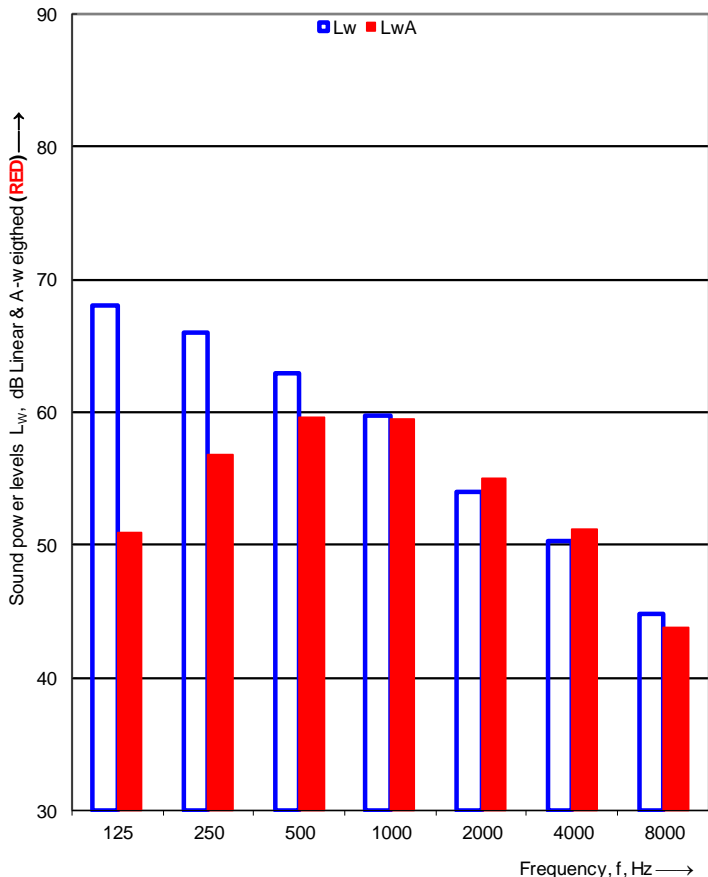


## Detailed test results of sound power measurement – Test N#1

 		<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 Europe GmbH			Date of test: 13-06-2022	
Object:	Type: Mono air to water heat pump Model: WH-MXC16J9E8				
Mounting conditions:	The outdoor unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray 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/W30-35, Compressor speed: 42 [Hz], Fan speed_1: 630 [rpm], Fan speed_2: 660 [rpm], Heating capacity: 16.7 [kW], Power_input: 3.62 [kW], Water flow rate: 2904 [l/h], dP_water: -275				
Static pressure:	1014 kPa			Reference box:	
Air temperature:	7.0 °C			L1:	1.3 m
Relative air humidity:	85.0 %			L2:	0.4 m
Test room volume:	102.8 m³	Room:	Room 2	L3:	1.4 m
Area, S, of test room:	138.9 m²			Volume:	0.7 m³

Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]
100	66.0	
125	62.2	68.0
160	58.7	
200	63.6	
250	59.4	66.0
315	59.0	
400	58.7	
500	57.9	62.9
630	57.6	
800	56.4	
1000	55.2	59.7
1250	52.0	
1600	50.5	
2000	48.8	53.9
2500	47.7	
3150	45.4	
4000	46.9	50.2
5000	43.4	
6300	40.0	
8000	40.4	44.8
10000	39.8	

1 Too high

Sound power level L <sub>w</sub> (A):	<b>64.6 dB [re 1pW]</b>
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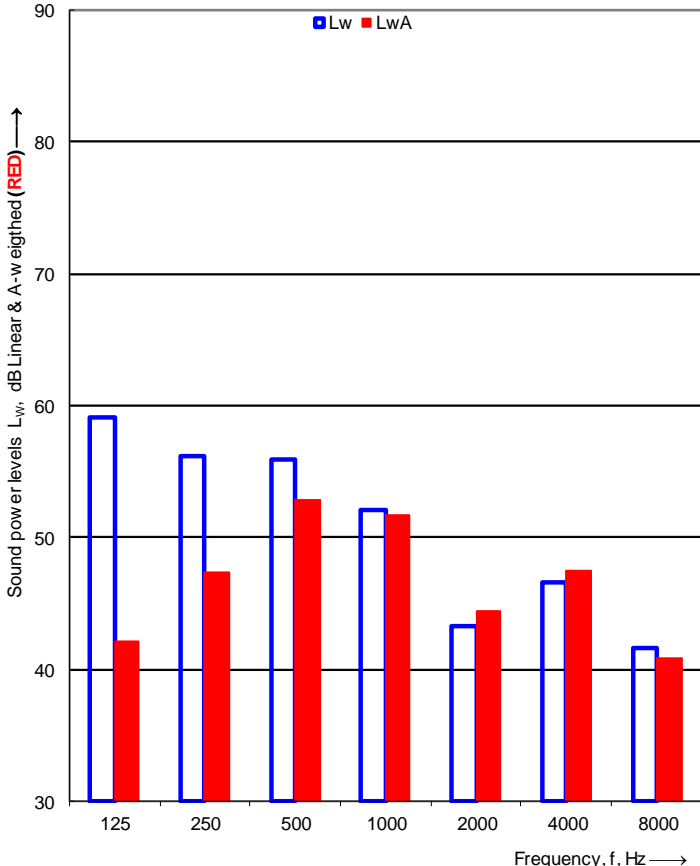
  

Name of test institute:	DTI
No. of test report:	300-KLAB-22-011
Date:	13-06-2022








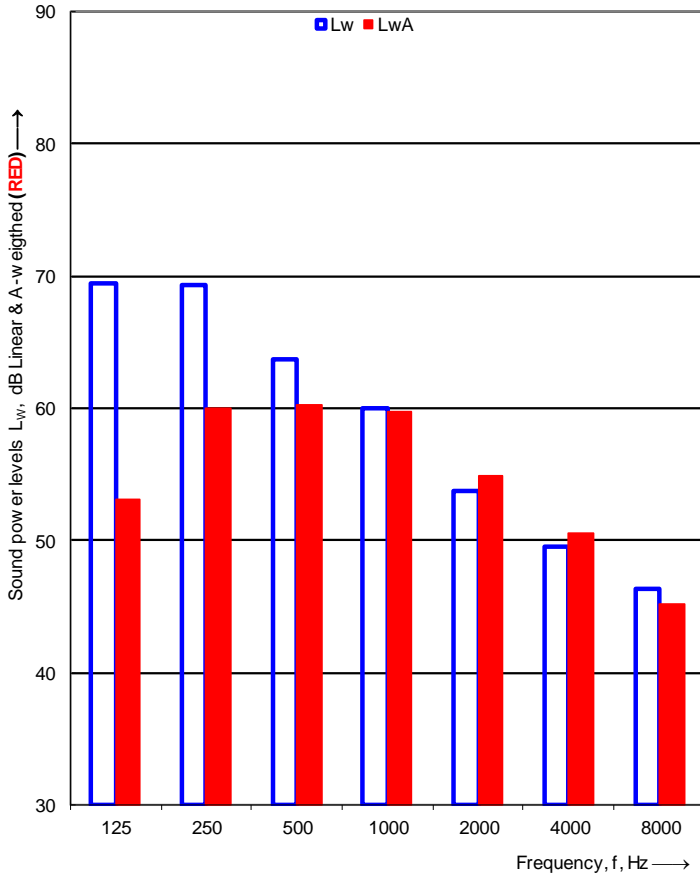
## Detailed test results of sound power measurement – Test N#2

 		<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 Europe GmbH		Date of test: 13-06-2022																																																																			
Object:	Type: Mono air to water heat pump Model: WH-MXC16J9E8																																																																					
Mounting conditions:	The out door unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.																																																																					
Operating conditions:	A7/W30-35, Quiet mode 3, Compressor speed: 28 [Hz], Fan speed_1: 390 [rpm], Fan speed_2: 430 [rpm], Heating capacity: 10.2 [kW], Power_input: 2.28 [kW], Water flow rate: 1788 [l/h],																																																																					
Static pressure:	1014 kPa			<u>Reference box:</u>																																																																		
Air temperature:	7.0 °C			L1:	1.3 m																																																																	
Relative air humidity:	85.0 %			L2:	0.4 m																																																																	
Test room volume:	102.8 m³	Room:	Room 2	L3:	1.4 m																																																																	
Area, S, of test room:	138.9 m²			Volume:	0.7 m³																																																																	
<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>56.5</td><td></td></tr> <tr><td>125</td><td>54.4</td><td>59.1</td></tr> <tr><td>160</td><td>49.6</td><td></td></tr> <tr><td>200</td><td>52.2</td><td></td></tr> <tr><td>250</td><td>52.1</td><td>56.1</td></tr> <tr><td>315</td><td>49.1</td><td></td></tr> <tr><td>400</td><td>51.4</td><td></td></tr> <tr><td>500</td><td>49.5</td><td>55.9</td></tr> <tr><td>630</td><td>52.0</td><td></td></tr> <tr><td>800</td><td>49.8</td><td></td></tr> <tr><td>1000</td><td>47.2</td><td>52.1</td></tr> <tr><td>1250</td><td>41.7</td><td></td></tr> <tr><td>1600</td><td>40.1</td><td></td></tr> <tr><td>2000</td><td>37.8</td><td>43.2</td></tr> <tr><td>2500</td><td>36.8</td><td></td></tr> <tr><td>3150</td><td>35.1</td><td></td></tr> <tr><td>4000</td><td>45.2</td><td>46.6</td></tr> <tr><td>5000</td><td>39.7</td><td></td></tr> <tr><td>6300</td><td>38.5</td><td></td></tr> <tr><td>8000</td><td>36.6</td><td>41.6</td></tr> <tr><td>10000</td><td>34.5</td><td></td></tr> </tbody> </table>		Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]	100	56.5		125	54.4	59.1	160	49.6		200	52.2		250	52.1	56.1	315	49.1		400	51.4		500	49.5	55.9	630	52.0		800	49.8		1000	47.2	52.1	1250	41.7		1600	40.1		2000	37.8	43.2	2500	36.8		3150	35.1		4000	45.2	46.6	5000	39.7		6300	38.5		8000	36.6	41.6	10000	34.5				
Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]																																																																				
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<div style="border: 1px solid black; padding: 5px;"> <b>Sound power level L<sub>w</sub>(A): 57.0 dB [re 1pW]</b> </div>																																																																						
Name of test institute:	DTI																																																																					
No. of test report:	300-KLAB-22-011																																																																					
Date:	13-06-2022																																																																					








## Detailed test results of sound power measurement – 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 Europe GmbH			Date of test: 12-06-2022																																																																			
Object:	Type: Mono air to water heat pump Model: WH-MXC16J9E8																																																																						
Mounting conditions:	The out door unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.																																																																						
Operating conditions:	A7/W47-55, Compressor speed: 45 [Hz], Fan speed_1: 630 [rpm], Fan speed_2: 670 [rpm], Heating capacity: 16.6 [kW], Power_input: 5.6 [kW], Water flow rate: 11839 [l/h], dP_water : 539																																																																						
Static pressure:	1017 kPa	Room:		Reference box:																																																																			
Air temperature:	7.0 °C	Room 2		L1: 1.3 m																																																																			
Relative air humidity:	85.0 %			L2: 0.4 m																																																																			
Test room volume:	102.8 m³			L3: 1.4 m																																																																			
Area, S, of test room:	138.9 m²			Volume: 0.7 m³																																																																			
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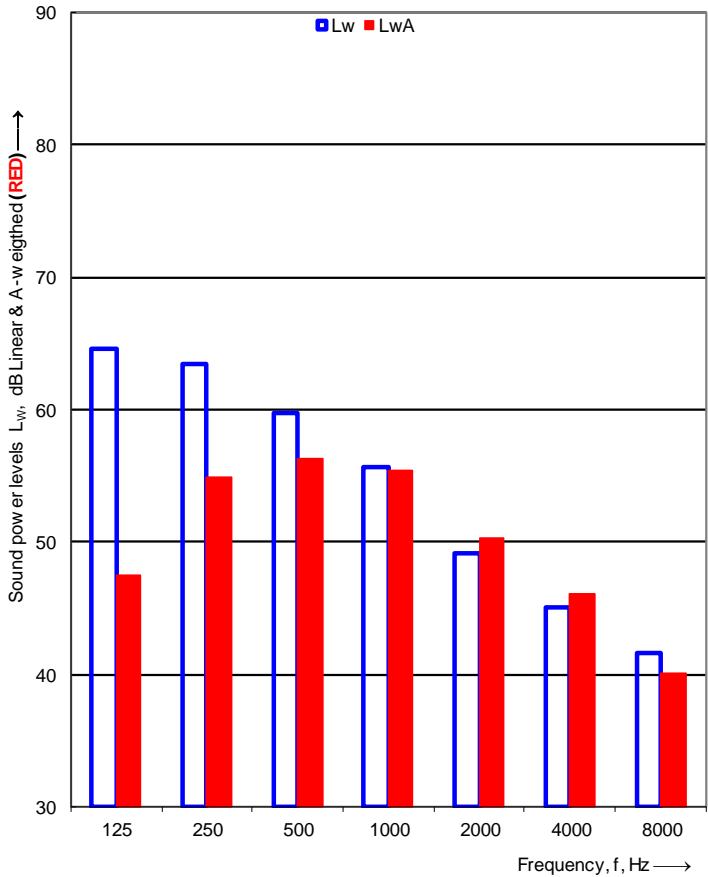


## Detailed test results of sound power measurement – Test N#4

 		<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 Europe GmbH			Date of test: 12-06-2022	
Object:	Type: Mono air to water heat pump Model: WH-MXC16J9E8				
Mounting conditions:	The out door unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.				
Operating conditions:	A7/W47-55, Quiet mode 3, Compressor speed: 29 [Hz], Fan speed_1: 530 [rpm], Fan speed_2: 570 [rpm], Heating capacity: 10.8 [kW], Power_input: 3.8 [kW], Water flow rate: 1195 [l/h],				
Static pressure:	1017 kPa	Room:	Room 2	Reference box:	
Air temperature:	7.0 °C			L1:	1.3 m
Relative air humidity:	85.0 %			L2:	0.4 m
Test room volume:	102.8 m³			L3:	1.4 m
Area, S, of test room:	138.9 m²			Volume:	0.7 m³

Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]
100	62.4	
125	58.9	64.6
160	55.4	
200	58.7	
250	59.9	63.5
315	57.1	
400	56.7	
500	54.3	59.8
630	53.3	
800	53.1	
1000	50.5	55.7
1250	47.2	
1600	45.9	
2000	43.9	49.1
2500	42.5	
3150	40.2	
4000	41.9	45.0
5000	37.8	
6300	34.7	
8000	36.1	41.6
10000	38.7	

Sound power level L<sub>w</sub>(A): **61.1 dB [re 1pW]**

<sup>1</sup> Too high




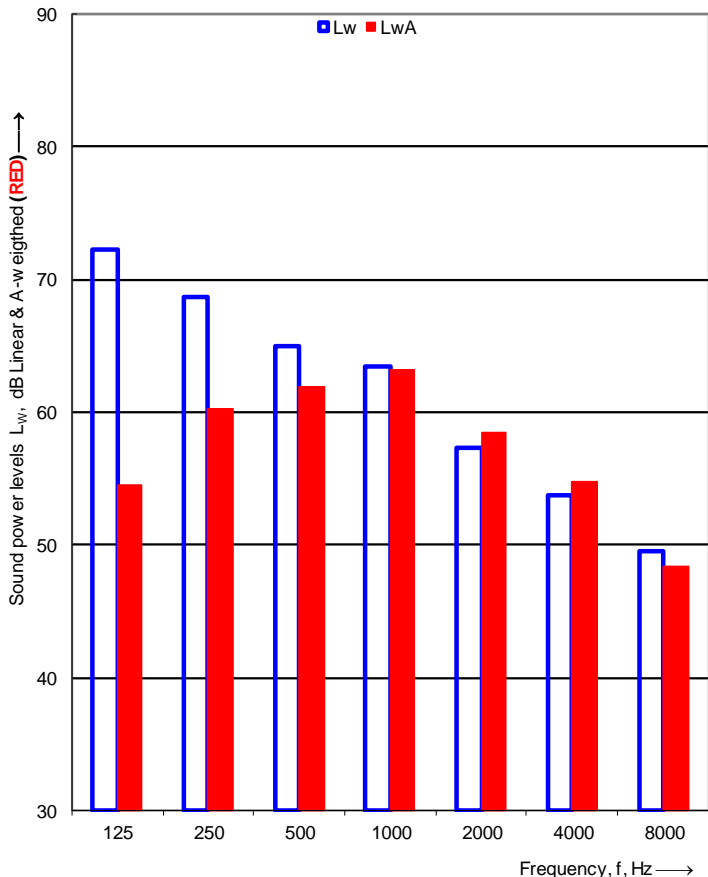
Name of test institute: DTI  
No. of test report: 300-KLAB-22-011  
Date: 12-06-2022



Test Rep. nr.





## Detailed test results of sound power measurement – Test N#5

 		<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 Europe GmbH			Date of test: 13-06-2022																																																																			
Object:	Type: Mono air to water heat pump Model: WH-MXC16J9E8																																																																						
Mounting conditions:	The out door unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.																																																																						
Operating conditions:	A2/W47-55, Compressor speed: 67 [Hz], Fan speed_1: 680 [rpm], Fan speed_2: 720 [rpm], Heating capacity: 21.0 [kW], Power_input: 8.86 [kW], Water flow rate: 2260/h, dP_water: 300																																																																						
Static pressure:	1014 kPa	Room:		Room 2																																																																			
Air temperature:	2.0 °C	Reference box:		L1: 1.3 m																																																																			
Relative air humidity:	83.0 %			L2: 0.4 m																																																																			
Test room volume:	102.8 m³			L3: 1.4 m																																																																			
Area, S, of test room:	138.9 m²			Volume: 0.7 m³																																																																			
<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>71.1</td><td></td></tr> <tr><td>125</td><td>64.0</td><td>72.2</td></tr> <tr><td>160</td><td>61.4</td><td></td></tr> <tr><td>200</td><td>63.0</td><td></td></tr> <tr><td>250</td><td>65.2</td><td>68.7</td></tr> <tr><td>315</td><td>63.1</td><td></td></tr> <tr><td>400</td><td>59.9</td><td></td></tr> <tr><td>500</td><td>60.8</td><td>65.0</td></tr> <tr><td>630</td><td>59.9</td><td></td></tr> <tr><td>800</td><td>60.9</td><td></td></tr> <tr><td>1000</td><td>58.2</td><td>63.5</td></tr> <tr><td>1250</td><td>55.2</td><td></td></tr> <tr><td>1600</td><td>53.3</td><td></td></tr> <tr><td>2000</td><td>51.4</td><td>57.2</td></tr> <tr><td>2500</td><td>52.5</td><td></td></tr> <tr><td>3150</td><td>49.7</td><td></td></tr> <tr><td>4000</td><td>49.4</td><td>53.8</td></tr> <tr><td>5000</td><td>47.6</td><td></td></tr> <tr><td>6300</td><td>44.9</td><td></td></tr> <tr><td>8000</td><td>44.4</td><td>49.5</td></tr> <tr><td>10000</td><td>44.9</td><td></td></tr> </tbody> </table>		Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]	100	71.1		125	64.0	72.2	160	61.4		200	63.0		250	65.2	68.7	315	63.1		400	59.9		500	60.8	65.0	630	59.9		800	60.9		1000	58.2	63.5	1250	55.2		1600	53.3		2000	51.4	57.2	2500	52.5		3150	49.7		4000	49.4	53.8	5000	47.6		6300	44.9		8000	44.4	49.5	10000	44.9					
Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]																																																																					
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10000	44.9																																																																						
<sup>1</sup> Too high																																																																							
<b>Sound power level L<sub>w</sub>(A): 67.8 dB [re 1pW]</b>																																																																							
Name of test institute:	DTI																																																																						
No. of test report:	300-KLAB-22-011																																																																						
Date:	13-06-2022																																																																						






## Detailed test results of sound power measurement – Test N#6

# 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: Panasonic Europe GmbH  
 Object: Type: Mono air to water heat pump Model: WH-MXC16J9E8  
 Mounting conditions: The out door unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.

Date of test: 13-06-2022

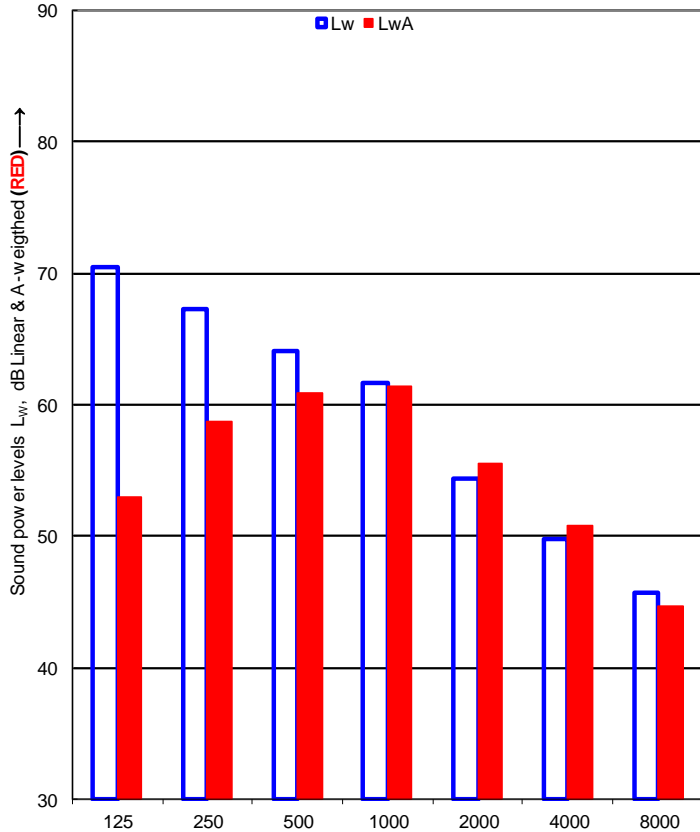
Operating conditions: A2/W47-55, Quiet mode 3, Compressor speed: 40 [Hz], Fan speed\_1: 630 [rpm], Fan speed\_2: 670 [rpm], Heating capacity: 12.8 [kW], Power\_input: 5.38 [kW], Water flow rate: 1355 [l/h],

Static pressure: 1014 kPa  
 Air temperature: 2.0 °C  
 Relative air humidity: 83.0 %  
 Test room volume: 102.8 m³  
 Area, S, of test room: 138.9 m²

Reference box:  
 L1: 1.3 m  
 L2: 0.4 m  
 L3: 1.4 m  
 Volume: 0.7 m³

Room: Room 2

Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]
100	69.1	
125	61.9	70.4
160	61.3	
200	62.3	
250	63.4	67.2
315	61.5	
400	59.8	
500	59.1	64.1
630	58.9	
800	59.1	
1000	56.6	61.7
1250	53.1	
1600	51.1	
2000	49.4	54.4
2500	47.6	
3150	45.9	
4000	45.7	49.8
5000	43.0	
6300	41.4	
8000	40.6	45.7
10000	40.7	






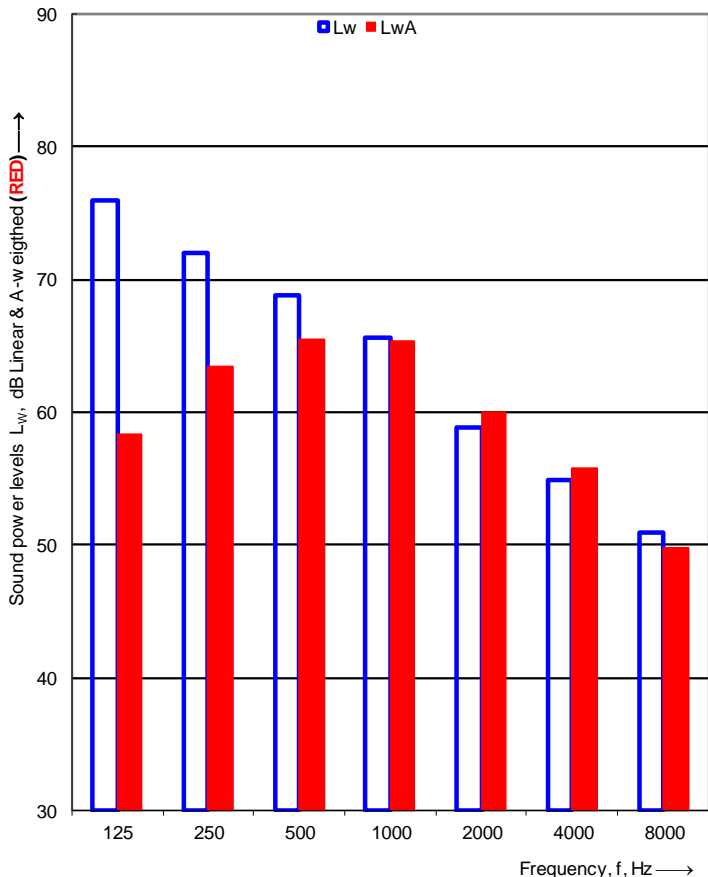
1 Too high

Sound power level L<sub>w</sub>(A): 66.0 dB [re 1pW]

Name of test institute: DTI  
 No. of test report: 300-KLAB-22-011  
 Date: 13-06-2022






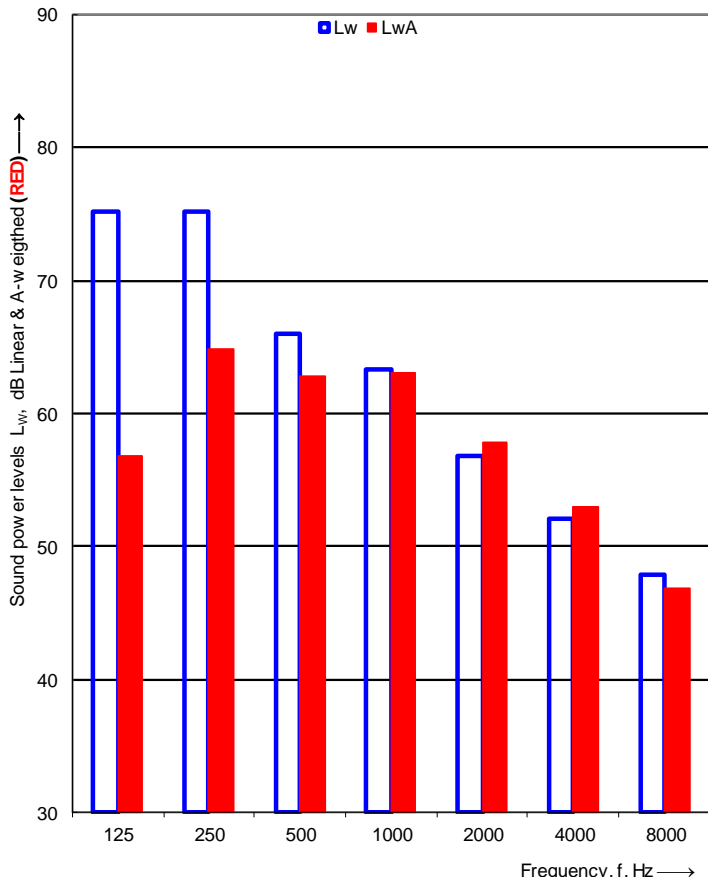
## Detailed test results of sound power measurement – Test N#7

 		<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 Europe GmbH			Date of test: 14-06-2022																																																																		
Object:	Type: Mono air to water heat pump Model: WH-MXC16J9E8																																																																					
Mounting conditions:	The outdoor unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray 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/W47-55, Compressor speed: 77 [Hz], Fan speed_1: 680 [rpm], Fan speed_2: 720 [rpm], Heating capacity: 17.5 [kW], Power input: 9.3 [kW], Water flow rate: 1950 [l/h], dP_water: 425																																																																					
Static pressure:	1018 kPa			Reference box:																																																																		
Air temperature:	-7.0 °C			L1:	1.3 m																																																																	
Relative air humidity:	74.0 %			L2:	0.4 m																																																																	
Test room volume:	102.8 m³	Room:	Room 2	L3:	1.4 m																																																																	
Area, S, of test room:	138.9 m²			Volume:	0.7 m³																																																																	
<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>75.0</td><td></td></tr> <tr><td>125</td><td>66.0</td><td>76.0</td></tr> <tr><td>160</td><td>66.2</td><td></td></tr> <tr><td>200</td><td>66.1</td><td></td></tr> <tr><td>250</td><td>69.4</td><td>72.0</td></tr> <tr><td>315</td><td>64.9</td><td></td></tr> <tr><td>400</td><td>65.0</td><td></td></tr> <tr><td>500</td><td>63.6</td><td>68.8</td></tr> <tr><td>630</td><td>63.4</td><td></td></tr> <tr><td>800</td><td>62.4</td><td></td></tr> <tr><td>1000</td><td>61.0</td><td>65.6</td></tr> <tr><td>1250</td><td>58.0</td><td></td></tr> <tr><td>1600</td><td>55.3</td><td></td></tr> <tr><td>2000</td><td>53.5</td><td>58.8</td></tr> <tr><td>2500</td><td>53.1</td><td></td></tr> <tr><td>3150</td><td>50.9</td><td></td></tr> <tr><td>4000</td><td>50.3</td><td>54.8</td></tr> <tr><td>5000</td><td>48.6</td><td></td></tr> <tr><td>6300</td><td>46.0</td><td></td></tr> <tr><td>8000</td><td>45.3</td><td>51.0</td></tr> <tr><td>10000</td><td>47.1</td><td></td></tr> </tbody> </table>		Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]	100	75.0		125	66.0	76.0	160	66.2		200	66.1		250	69.4	72.0	315	64.9		400	65.0		500	63.6	68.8	630	63.4		800	62.4		1000	61.0	65.6	1250	58.0		1600	55.3		2000	53.5	58.8	2500	53.1		3150	50.9		4000	50.3	54.8	5000	48.6		6300	46.0		8000	45.3	51.0	10000	47.1				
Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]																																																																				
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8000	45.3	51.0																																																																				
10000	47.1																																																																					
<sup>1</sup> Too high																																																																						
<b>Sound power level L<sub>w</sub>(A): 70.5 dB [re 1pW]</b>																																																																						
Name of test institute:	DTI																																																																					
No. of test report:	300-KLAB-22-011																																																																					
Date:	14-06-2022																																																																					








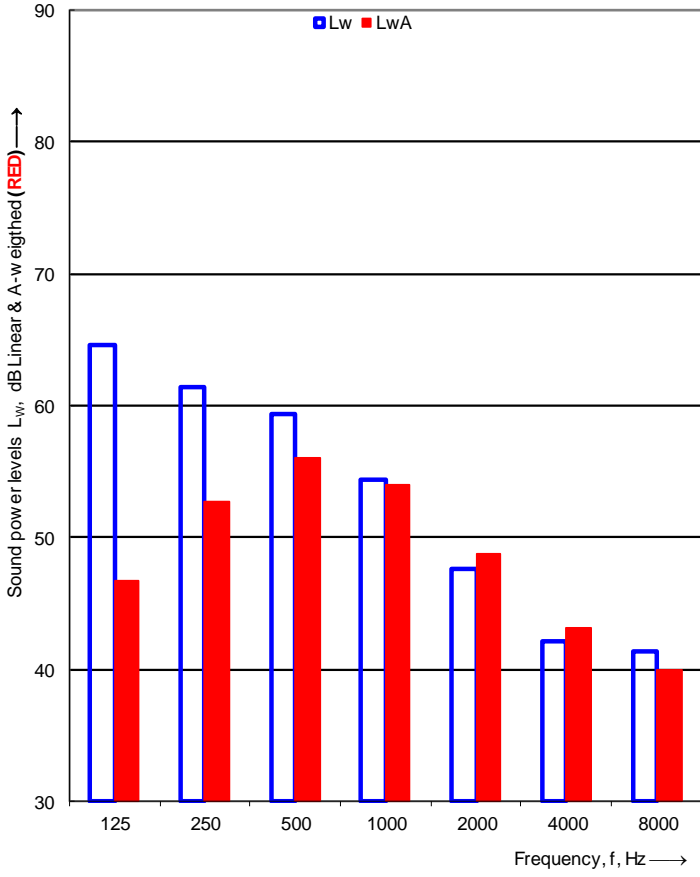
## Detailed test results of sound power measurement – Test N#8

 		<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 Europe GmbH		Date of test: 14-06-2022																																																																			
Object:		Type: Mono air to water heat pump Model: WH-MXC16J9E8																																																																					
Mounting conditions:		The out door unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.																																																																					
Operating conditions:		A-7/W47-55, Quiet mode 3, Compressor speed: 51 [Hz], Fan speed_1: 680 [rpm], Fan speed_2: 720 [rpm], Heating capacity: 12.2 [kW], Power input: 5.94 [kW], Water flow rate: 1346 [l/h],																																																																					
Static pressure:		1018 kPa		Reference box:																																																																			
Air temperature:		-7.0 °C		L1: 1.3 m																																																																			
Relative air humidity:		74.0 %		L2: 0.4 m																																																																			
Test room volume:		102.8 m³		L3: 1.4 m																																																																			
Area, S, of test room:		138.9 m²		Volume: 0.7 m³																																																																			
Room:		Room 2																																																																					
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Frequency f [Hz]	L <sub>w</sub> 1/3 octave [dB]	1/1 oct [dB]																																																																					
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<sup>1</sup> Too high																																																																							
<b>Sound power level L<sub>w</sub>(A): 69.2 dB [re 1pW]</b>																																																																							
Name of test institute:		DTI																																																																					
No. of test report:		300-KLAB-22-011																																																																					
Date:		14-06-2022																																																																					





## Detailed test results of sound power measurement – 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 Europe GmbH		Date of test: 12-06-2022	
Object:		Type: Mono air to water heat pump Model: WH-MXC16J9E8			
Mounting conditions:		The out door unit is mounted on the supporting metal support frame using six vibration isolators. The support is placed in a water drop tray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the out door unit has been measured in Test room 2.			
Operating conditions:		A7/W47-55, Compressor speed: 22 [Hz], Fan speed_1: 500 [rpm], Fan speed_2: 540 [rpm], Heating capacity: 7.83 [kW], Power_input: 2.97 [kW], Water flow rate: 885 [l/h], dP_water : 990			
Static pressure:		1017 kPa		<u>Reference box:</u>	
Air temperature:		7.0 °C		L1: 1.3 m	
Relative air humidity:		85.0 %		L2: 0.4 m	
Test room volume:		102.8 m³		L3: 1.4 m	
Area, S, of test room:		138.9 m²		Volume: 0.7 m³	
Room:		Room 2			
Frequency f [Hz]		L <sub>w</sub> 1/3 octave [dB]		1/1 oct [dB]	
100		63.5		64.5	
125		55.7		61.4	
160		53.7		59.4	
200		57.6		54.3	
250		56.3		47.7	
315		55.8		42.1	
400		55.7		41.3	
500		53.8		36.9	
630		54.0			
800		52.2			
1000		48.3			
1250		45.7			
1600		44.8			
2000		42.4			
2500		40.3			
3150		38.3			
4000		37.6			
5000		35.9			
6300		34.1			
8000		37.8			
10000		36.9			
1		Too high			
					
		Sound power level L <sub>w</sub> (A): 60.0 dB [re 1pW]			
Name of test institute:		DTI			
No. of test report:		300-KLAB-22-011			
Date:		12-06-2022			





## 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.

