

TEST REPORT

Report no.:
300-KLAB-22-036



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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
Model: Outdoor unit: WH-WDG09LE5
Indoor unit: WH-ADC0509L3E5
Series no.: Outdoor unit: 5624800003
Indoor unit: 5707200003
Prod. year: 2022.12

Dates: Component tested: March – July 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.

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Test Reg. nr. 300



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.

SCOP part load test conditions chosen by the manufacturer at low and medium temperature application for warmer climate according to EN 14825:2018.

SCOP part load test conditions chosen by the manufacturer at low and medium temperature application for colder 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) chosen by the manufacturer according to EN 14511:2018.

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

SEER test points 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.

Domestic hot water tests according to EN 16147:2017, chosen by the manufacturer.

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





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Test conditions

SCOP test conditions for low temperature – EN 14825

Part 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 ^a	Part Load Ratio in %				Outdoor heat exchanger		Indoor heat exchanger			
					Inlet dry (wet) bulb temperature °C		Fixed outlet °C	Variable outlet ^d °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)	^a / 35	^a / 34	n/a	^a / 30
B	$(+2 - 16) / (T_{\text{designh}} - 16)$	54	100	37	2(1)	20(12)	^a / 35	^a / 30	^a / 35	^a / 27
C	$(+7 - 16) / (T_{\text{designh}} - 16)$	35	64	24	7(6)	20(12)	^a / 35	^a / 27	^a / 31	^a / 25
D	$(+12 - 16) / (T_{\text{designh}} - 16)$	15	29	11	12(11)	20(12)	^a / 35	^a / 24	^a / 26	^a / 24
E	$(TOL - 16) / (T_{\text{designh}} - 16)$				TOL	20(12)	^a / 35	^a / b	^a / b	^a / b
F	$(T_{\text{bivalent}} - 16) / (T_{\text{designh}} - 16)$				T _{bivalent}	20(12)	^a / 35	^a / c	^a / c	^a / c
G	$(-15 - 16) / (T_{\text{designh}} - 16)$	n/a	n/a	82	-15	20(12)	^a / 35	n/a	n/a	^a / 32

^a 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.

^b Variable outlet shall be calculated by interpolation from T_{designh} and the temperature which is closest to the TOL.

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

^d 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 _{designh} [°C]	T _{bivalent} [°C]	TOL [°C]	Outlet temperature	Flow rate
Average	-10	-10	-10	Variable	Variable
Warmer	2	2	2	Variable	Variable
Colder	-22	-15	-22	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 ^d °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)	^a / 55	^a / 52	n/a	^a / 44
B	$\frac{(+2 - 16)}{(T_{\text{designh}} - 16)}$	54	100	37	2(1)	20(12)	^a / 55	^a / 42	^a / 55	^a / 37
C	$\frac{(+7 - 16)}{(T_{\text{designh}} - 16)}$	35	64	24	7(6)	20(12)	^a / 55	^a / 36	^a / 46	^a / 32
D	$\frac{(+12 - 16)}{(T_{\text{designh}} - 16)}$	15	29	11	12(11)	20(12)	^a / 55	^a / 30	^a / 34	^a / 28
E	$(T_{\text{OL}} - 16) / (T_{\text{designh}} - 16)$				TOL	20(12)	^a / 55	^a / ^b	^a / ^b	^a / ^b
F	$(T_{\text{bivalent}} - 16) / (T_{\text{designh}} - 16)$				T _{bivalent}	20(12)	^a / 55	^a / ^c	^a / ^c	^a / ^c
G	$\frac{(-15 - 16)}{(T_{\text{designh}} - 16)}$	n/a	n/a	82	-15	20(12)	^a / 55	n/a	n/a	^a / 49

^a 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.

^b Variable outlet shall be calculated by interpolation T_{designh} and the temperature which is closest to the TOL.

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

^d 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 _{designh} [°C]	T _{bivalent} [°C]	TOL [°C]	Outlet temperature	Flow rate
Average	-10	-7	-10	Variable	Variable
Warmer	2	2	2	Variable	Variable
Colder	-22	-15	-22	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 ^S	7	6	30	35	
2 ^A	2	1	30	35	
3 ^A	-7	-8	30	35	
4 ^A	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 ^A	2	1	47	55	
2 ^S	7	6	47	55	
3 ^A	-7	-8	47	55	

S: Standard rating condition

A: Application rating condition



COP test conditions - high 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 ^S	7	6	55	65	
2	7	6	50	60	
3 ^A	-7	-8	55	65	
4	-7	-8	50	60	
5 ^A	2	1	55	65	
6	2	1	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#	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#	Heat source		Heat sink	
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)
1	7	6	47	55

Test conditions for domestic hot water test - EN16147:2017

N#	Test climate	Heat source		Domestic hot water tapping profile	Setpoint tank / reheat temp. (°C)
		Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)		
1	Average	7	6	L	52/44
2	Colder	2	1	L	52/44
3	Warmer	14	13	L	52/44
4	Average	7	6	M	52/44



Test conditions for sound power measurements – EN 12102-1

N [#]	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 ^R	7/6	30/35	63	570	8.7	1.93
2 ^Q	7/6	30/35	27	330	3.65	0.73
3 ^R	7/6	47/55	70	490	8.4	2.85
4 ^Q	7/6	47/55	30	340	3.15	1.18
5 ^Q	2/1	30/35	30	570	3.64	0.87
6 ^R	-7/-8	30/35	82	670	7.7	2.63
7 ^Q	-7/-8	30/35	35	450	2.95	0.98
8 ^R	-7/-8	47/55	80	670	6.45	3.2
9 ^Q	-7/-8	47/55	33	450	1.9	1.2
10 ^{E-K}	7/6	47/55	23	360	2.67	0.95

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





Test results

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

Model (Outdoor)	WH-WDG09LE5		
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 ¹⁾	P _{rated}	8 [kW]
Seasonal space heating energy efficiency	η_s	200.4 [%]
	SCOP	5.09 [-]

Measured capacity for heating for part load at outdoor temperature T _j	Average Climate	T _j = -15 °C	P _{dH}	- [kW]
	-	T _j = -7 °C	P _{dH}	6.96 [kW]
	Low temperature application	T _j = 2 °C	P _{dH}	4.31 [kW]
		T _j = 7 °C	P _{dH}	2.99 [kW]
		T _j = 12 °C	P _{dH}	3.22 [kW]
		T _j = bivalent temperature	P _{dH}	8.35 [kW]
		T _j = operation limit	P _{dH}	8.35 [kW]

Measured coefficient of performance at outdoor temperature T _j	Average Climate	T _j = -15 °C	COP _d	- [-]
	-	T _j = -7 °C	COP _d	2.87 [-]
	Low temperature application	T _j = 2 °C	COP _d	4.96 [-]
		T _j = 7 °C	COP _d	7.17 [-]
		T _j = 12 °C	COP _d	8.14 [-]
		T _j = bivalent temperature	COP _d	2.64 [-]
		T _j = operation limit	COP _d	2.64 [-]

Bivalent temperature	T _{bivalent}	-10 [°C]
Operation limit	TOL	-10 [°C]
temperatures	WTOL	- [°C]
Degradation coefficient	C _{dH}	0.98 [-]

Power consumption in modes other than active mode	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]
Supplementary heater ¹⁾	Rated heat output	P _{SUP}	0.00 [kW]
	Type of energy input		Electrical

Other items	Capacity control	Variable	
	Water flow control	Variable	
	Water flow rate	-	
	Annual energy consumption	Q _{HE}	3250 [kWh]

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

K) Keymark





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

Model (Outdoor)	WH-WDG09LE5	
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 ¹⁾	P_{rated}	8 [kW]
Seasonal space heating energy efficiency	η_s	146.4 [%]
	SCOP	3.73 [-]

Measured capacity for heating for part load at outdoor temperature T_j	Average Climate	$T_j = -15\text{ °C}$	P_{dh}	- [kW]	K
	-	$T_j = -7\text{ °C}$	P_{dh}	6.51 [kW]	
	Medium temperature application	$T_j = 2\text{ °C}$	P_{dh}	4.17 [kW]	
		$T_j = 7\text{ °C}$	P_{dh}	2.69 [kW]	
		$T_j = 12\text{ °C}$	P_{dh}	3.12 [kW]	
		$T_j = \text{bivalent temperature}$	P_{dh}	6.51 [kW]	
		$T_j = \text{operation limit}$	P_{dh}	7.03 [kW]	

Measured coefficient of performance at outdoor temperature T_j	Average Climate	$T_j = -15\text{ °C}$	COPd	- [-]	K
	-	$T_j = -7\text{ °C}$	COPd	2.21 [-]	
	Medium temperature application	$T_j = 2\text{ °C}$	COPd	3.62 [-]	
		$T_j = 7\text{ °C}$	COPd	5.08 [-]	
		$T_j = 12\text{ °C}$	COPd	6.53 [-]	
		$T_j = \text{bivalent temperature}$	COPd	2.21 [-]	
		$T_j = \text{operation limit}$	COPd	2.01 [-]	

Bivalent temperature	$T_{bivalent}$	-7 [°C]
Operation limit temperatures	TOL	-10 [°C]
	WTOL	- [°C]
Degradation coefficient	C_{dh}	0.98 [-]

Power consumption in modes other than active mode	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]
Supplementary heater ¹⁾	Rated heat output	P_{SUP}	0.97 [kW]
	Type of energy input	Electrical	

Other items	Capacity control	Variable	
	Water flow control	Variable	
	Water flow rate	-	
	Annual energy consumption	Q_{HE}	4427 [kWh]

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

K) Keymark



Test results of warmer climate according to EN14825

N°	Temperature application	Info	Heating capacity [kW]	COP
1 ^K	Low temperature	Tbivalent E & F	7.196	3.494
2 ^K	Medium temperature	Tbivalent E & F	6.657	2.423

K) Keymark

Test results of colder climate according to EN14825

N°	Temperature application	Info	Heating capacity [kW]	COP
1 ^K	Low temperature	Tbivalent F & G	6.758	2.369
2 ^K	Medium temperature	Tbivalent F & G	6.701	2.039

K) Keymark

COP test results - low temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1 ^K	A7/W35	8.716	4.589
2	A2/W35	7.056	3.484
3	A-7/W35	6.908	2.746
4	A2/W35	3.674	4.423

K) Keymark





COP test results - medium temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A2/W55	6.679	2.397
2 ^K	A7/W55	8.507	2.988
3	A-7/W55	6.702	2.108

K) Keymark

COP test results - high temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W65	8.002	2.330
2	A7/W60	8.274	2.670
3	A2/W65	6.218	1.931
4	A2/W60	6.284	2.148
5	A-7/W65	5.828	1.696
6	A-7/W60	6.416	1.945



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

N°	Test conditions	Heating capacity [kW]	COP
1 ^K	A35/W7	8.184	3.038
2 ^K	A25/W10	3.820	6.252

K) Keymark

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

N°	Test conditions	Heating capacity [kW]	COP
1 ^K	A35/W18	8.485	4.289
2 ^K	A25/W18	4.067	8.873

K) Keymark



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

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

K) Keymark

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

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

K) Keymark

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

N#	Test validation
1 ^K	Passed

K) Keymark



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

N#	Test condition	Measured power consumption (W)	Test mode no.
A	A-7/W34	59 W	6
B	A2/W30	59 W	5
C	A7/W27	59 W	4
D	A12/W24	59 W	3
E&F	A-10/W35	59 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

N#	Test condition	Measured power consumption (W)	Test mode no.
A&F	A-7/W52	60 W	11
B	A2/W42	60 W	10
C	A7/W36	60 W	9
D	A12/W30	60 W	8
E	A-10/W55	60 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 no.
1	A7/W35	60 W	1
2	A2/W35	60 W	1
3	A-7/W35	60 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 no.
1	A7/W55	60 W	1
2	A2/W55	60 W	1
3	A-7/W55	60 W	1

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

Pre and post run time for liquid pump

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



Test results of domestic hot water test, average climate, load profile L - EN16147:2017

Presentation of main results

No		Symbol	Result	Unit
1)	Load profile	-	L	-
2)	Settings of the control	-	52	-
3)	Heating up time	t_h	4268	[s]
4)	Heating up electrical energy consumption	W_{eh-HP}	3.02	[kWh]
5)	Stand-by power input	P_{es}	0.02	[kW]
6)	Total useful energy content during the load profile	Q_{LP}	11.74	[kWh]
7)	Total electrical energy consumption during load profile	W_{EL-LP}	2.98	[kWh]
8)	Daily electrical energy consumption	Q_{elec}	2.96	[kWh]
9)	Coefficient of Performance	COP_{DHW}	3.934	[-]
10)	Water heating energy consumption	η_{wh}	164.4%	[%]
11)	Annual electrical energy consumption	AEC	623	[kWh/a]
12)	Reference hot water temperature	θ'_{WH}	51.9	[°C]
13)	Maximum volume of mixed water at 40°C	V_{40}	243	[L]
19)	Rated heat output	P_{rated}	-	[kW]
20)	Seasonal coefficient of performance	$SCOP_{DHW}$	-	[-]

K) Keymark

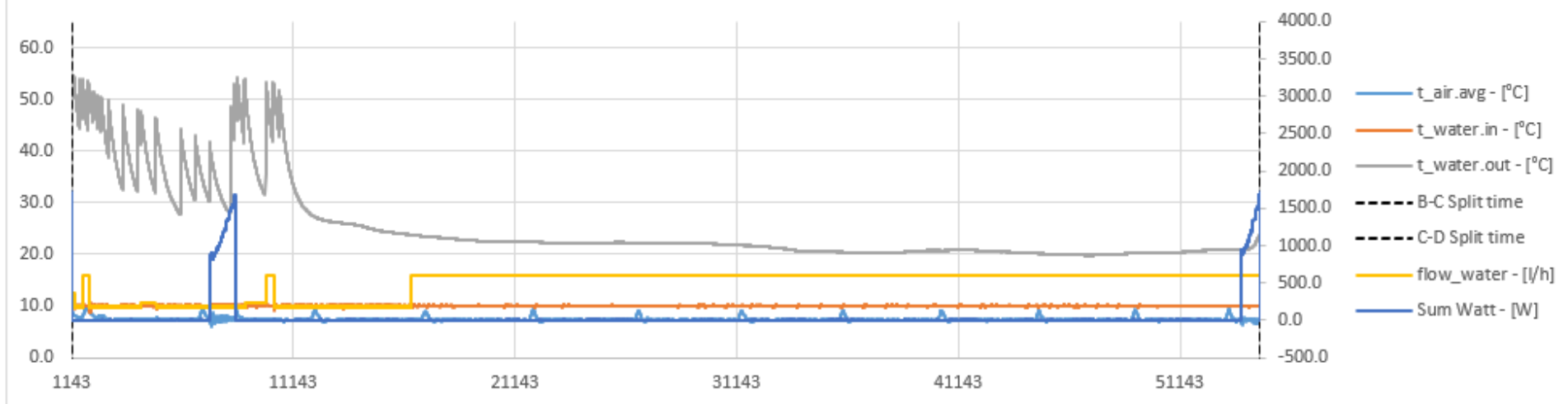




Time	Duration [s]	QHP-tap [kWh]	QEL-tap [kWh]	Tcold water, inlet [°C]			Thot water, outlet [°C]			Water Flow [L/min]			Tair dry [°C]	Tair wet [°C]	Comp mode
				Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Avg	
07:00:05	33	0.102	0.0	9.5	9.7	9.6	26.2	54.3	46.9	3.0	3.0	3.0	7.5	6.5	H
07:05:03	265	1.405	0.0	9.7	10.0	9.8	50.0	54.4	54.2	6.0	6.0	6.0	8.3	7.3	S
07:30:04	32	0.105	0.0	10.2	10.2	10.2	44.4	54.1	51.4	3.0	3.0	3.0	7.8	6.9	S
07:45:04	32	0.105	0.0	10.2	10.3	10.3	46.0	53.9	51.7	3.0	3.0	3.0	7.8	6.9	S
08:05:01	436	3.648	0.0	10.0	10.2	10.0	44.1	53.6	52.8	10.0	10.2	10.0	9.1	8.6	S
08:25:05	33	0.101	0.0	10.0	10.0	10.0	45.5	51.5	49.9	3.0	3.0	3.0	8.2	7.4	S
08:30:04	33	0.102	0.0	9.8	9.9	9.8	48.9	51.3	50.7	3.0	3.0	3.0	7.9	7.0	S
08:45:04	33	0.100	0.0	9.6	9.7	9.7	44.2	50.9	49.1	3.0	3.0	3.0	7.8	6.8	S
09:00:04	33	0.099	0.0	9.8	9.9	9.9	43.8	50.5	48.7	3.0	3.0	3.0	8.0	7.3	S
09:30:01	38	0.109	0.0	9.7	9.8	9.8	38.7	49.9	47.2	3.0	3.0	3.0	7.5	6.6	S
10:30:05	38	0.104	0.0	9.9	10.0	9.9	32.4	48.8	45.0	3.0	3.0	3.0	7.4	6.5	S
11:30:00	39	0.102	0.0	10.0	10.0	10.0	32.0	47.8	44.1	3.0	3.0	3.0	7.4	6.5	S
11:45:04	39	0.104	0.0	9.9	9.9	9.9	41.2	47.6	46.1	3.0	3.0	3.0	7.5	6.6	S
12:45:05	83	0.255	0.1	10.0	10.2	10.1	31.8	46.5	44.8	4.0	4.0	4.0	7.5	6.6	S
14:30:01	45	0.104	0.0	10.1	10.1	10.1	27.7	44.3	40.9	3.0	3.0	3.0	7.5	6.7	S
15:30:04	45	0.103	0.0	9.8	9.8	9.8	30.6	43.1	40.5	3.0	3.0	3.0	7.5	6.7	S
16:30:05	51	0.109	0.0	10.0	10.0	10.0	30.3	41.8	39.6	3.0	3.0	3.0	7.4	6.6	S
18:00:04	40	0.105	0.0	10.0	10.3	10.1	27.9	48.7	43.9	3.0	3.0	3.0	7.6	6.6	H
18:15:04	34	0.108	0.0	9.6	10.0	9.7	42.1	52.9	50.0	3.0	3.0	3.0	7.3	6.5	H
18:30:06	34	0.112	0.0	9.8	9.8	9.8	45.7	54.2	51.9	3.0	3.0	3.0	8.3	7.6	S
19:00:04	34	0.110	0.0	9.9	10.1	10.0	41.4	54.0	50.7	3.0	3.0	3.0	7.4	6.4	S
20:30:00	206	0.711	0.0	9.9	10.0	10.0	31.4	53.4	52.3	4.0	4.0	4.0	7.5	6.6	S
21:00:04	435	3.644	0.0	10.0	10.1	10.0	41.9	53.2	52.7	9.9	10.1	10.0	7.5	6.6	S
21:30:03	34	0.106	0.0	10.1	10.1	10.1	42.7	51.7	49.3	3.0	3.0	3.0	7.5	6.7	S



Water draw-offs





Test results of domestic hot water test, colder climate, load profile L - EN16147:2017

Presentation of main results

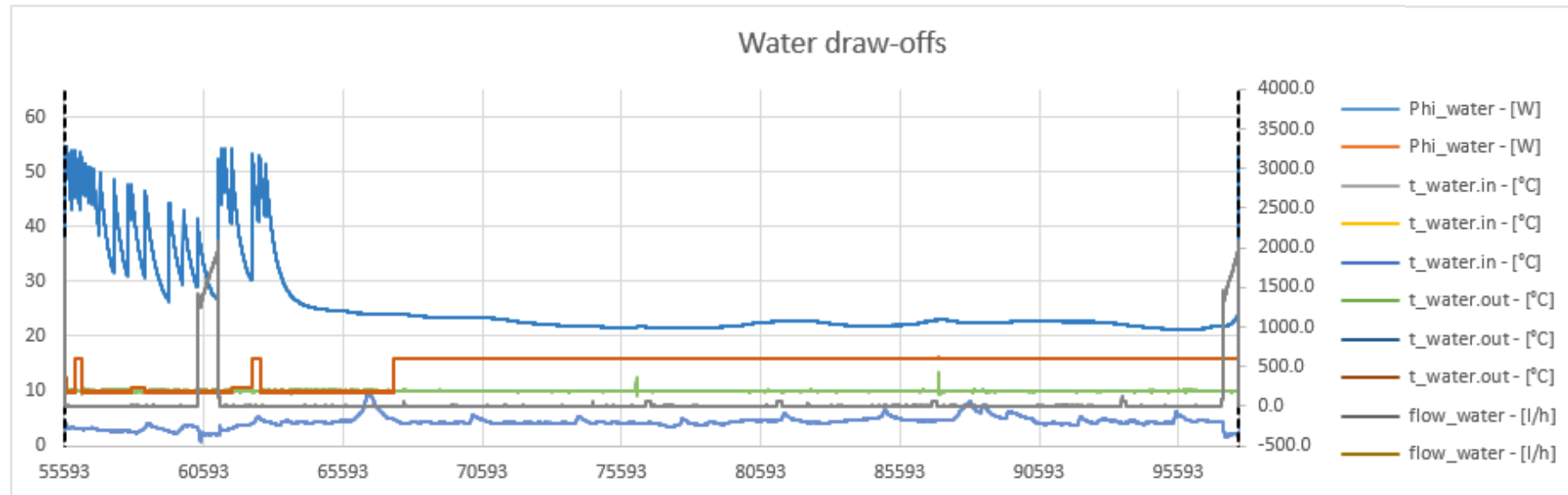
No		Symbol	Result	Unit
1)	Load profile	-	L	-
2)	Settings of the control	-	52	-
3)	Heating up time	t_h	5547	[s]
4)	Heating up electrical energy consumption	W_{eh-HP}	3.81	[kWh]
5)	Stand-by power input	P_{es}	0.03	[kW]
6)	Total useful energy content during the load profile	Q_{LP}	11.74	[kWh]
7)	Total electrical energy consumption during load profile	W_{EL-LP}	3.08	[kWh]
8)	Daily electrical energy consumption	Q_{elec}	3.06	[kWh]
9)	Coefficient of Performance	COP_{DHW}	3.811	[-]
10)	Water heating energy consumption	η_{wh}	162.5%	[%]
11)	Annual electrical energy consumption	AEC	630	[kWh/a]
12)	Reference hot water temperature	θ'_{WH}	51.9	[°C]
13)	Maximum volume of mixed water at 40°C	V_{40}	243	[L]
19)	Rated heat output	P_{rated}	-	[kW]
20)	Seasonal coefficient of performance	$SCOP_{DHW}$	-	[-]

K) Keymark





Time	Duration [s]	QHP-tap [kWh]	QEL-tap [kWh]	Tcold water, inlet [°C]			Thot water, outlet [°C]			Water Flow [L/min]			Tair dry [°C]	Tair wet [°C]	Comp mode
				Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Avg	
07:00:07	29	0.104	0.0	9.7	10.1	9.8	25.3	54.3	46.5	3.0	3.0	3.0	2.1	1.2	H
07:05:03	267	1.427	0.0	9.8	10.1	10.0	50.5	54.4	54.2	5.9	6.1	6.0	3.3	2.4	S
07:30:02	29	0.106	0.0	9.9	9.9	9.9	43.0	54.1	50.9	3.0	3.0	3.0	3.3	2.6	S
07:45:06	29	0.104	0.0	10.2	10.3	10.2	45.3	53.9	51.4	3.0	3.0	3.0	3.2	2.5	S
08:05:06	429	3.628	0.0	9.9	10.1	10.0	43.1	53.6	52.8	10.0	10.1	10.0	3.1	2.2	S
08:25:01	29	0.100	0.0	10.1	10.2	10.2	45.6	51.5	49.7	3.0	3.0	3.0	3.0	2.0	S
08:30:03	29	0.102	0.0	9.6	9.7	9.7	49.1	51.3	50.6	3.0	3.0	3.0	3.1	2.1	S
08:45:07	29	0.099	0.0	9.7	9.8	9.7	44.2	50.9	48.9	3.0	3.0	3.0	3.1	2.1	S
09:00:04	36	0.114	0.0	9.8	9.9	9.8	43.8	50.6	48.8	3.0	3.0	3.0	3.2	2.3	S
09:30:07	36	0.111	0.0	10.1	10.1	10.1	38.2	49.9	47.1	3.0	3.0	3.0	2.8	1.8	S
10:30:03	36	0.106	0.0	10.2	10.2	10.2	31.5	48.8	44.7	3.0	3.0	3.0	2.7	1.7	S
11:30:06	36	0.104	0.0	10.2	10.3	10.3	30.9	47.8	43.8	3.0	3.0	3.0	2.7	1.7	S
11:45:05	36	0.106	0.0	10.1	10.1	10.1	41.1	47.5	45.9	3.0	3.0	3.0	2.5	1.4	S
12:45:01	79	0.257	0.1	10.0	10.1	10.0	30.7	46.4	44.6	4.0	4.0	4.0	3.4	2.7	S
14:30:02	43	0.109	0.0	10.0	10.1	10.1	26.3	44.2	40.6	3.0	3.0	3.0	2.6	1.4	S
15:30:01	44	0.106	0.0	9.9	9.9	9.9	29.3	42.9	40.2	3.0	3.0	3.0	3.4	2.8	S
16:30:05	44	0.103	0.0	9.9	9.9	9.9	28.9	41.4	38.9	3.0	3.0	3.0	3.4	2.8	S
18:00:06	29	0.102	0.0	9.5	9.9	9.6	26.9	52.3	45.5	3.0	3.0	3.0	2.2	0.8	H
18:15:02	29	0.109	0.0	9.9	10.0	10.0	44.1	54.4	51.5	3.0	3.0	3.0	2.9	1.6	S
18:30:05	29	0.109	0.0	10.1	10.1	10.1	46.2	54.3	52.0	3.0	3.0	3.0	2.8	1.6	S
19:00:02	29	0.106	0.0	10.3	10.3	10.3	40.4	54.1	50.3	3.0	3.0	3.0	3.1	2.0	S
20:30:02	205	0.719	0.0	10.0	10.1	10.1	30.1	53.3	52.2	4.0	4.0	4.0	4.0	3.0	S
21:00:00	432	3.642	0.0	9.9	10.1	10.0	40.9	53.1	52.5	10.0	10.1	10.0	5.0	4.2	S
21:30:01	29	0.101	0.0	9.9	9.9	9.9	41.8	51.5	48.7	3.0	3.0	3.0	4.4	3.4	S





Test results of domestic hot water test, warmer climate, load profile L - EN16147:2017

Presentation of main results

No		Symbol	Result	Unit
1)	Load profile	-	M	-
2)	Settings of the control	-	52	-
3)	Heating up time	t_h	3945	[s]
4)	Heating up electrical energy consumption	W_{eh-HP}	2.63	[kWh]
5)	Stand-by power input	P_{es}	0.02	[kW]
6)	Total useful energy content during the load profile	Q_{LP}	11.72	[kWh]
7)	Total electrical energy consumption during load profile	W_{EL-LP}	2.36	[kWh]
8)	Daily electrical energy consumption	Q_{elec}	2.35	[kWh]
9)	Coefficient of Performance	COP_{DHW}	4.968	[-]
10)	Water heating energy consumption	η_{wh}	209.3%	[%]
11)	Annual electrical energy consumption	AEC	489	[kWh/a]
12)	Reference hot water temperature	θ'_{WH}	52.0	[°C]
13)	Maximum volume of mixed water at 40°C	V_{40}	244	[L]
19)	Rated heat output	P_{rated}	-	[kW]
20)	Seasonal coefficient of performance	$SCOP_{DHW}$	-	[-]

K) Keymark

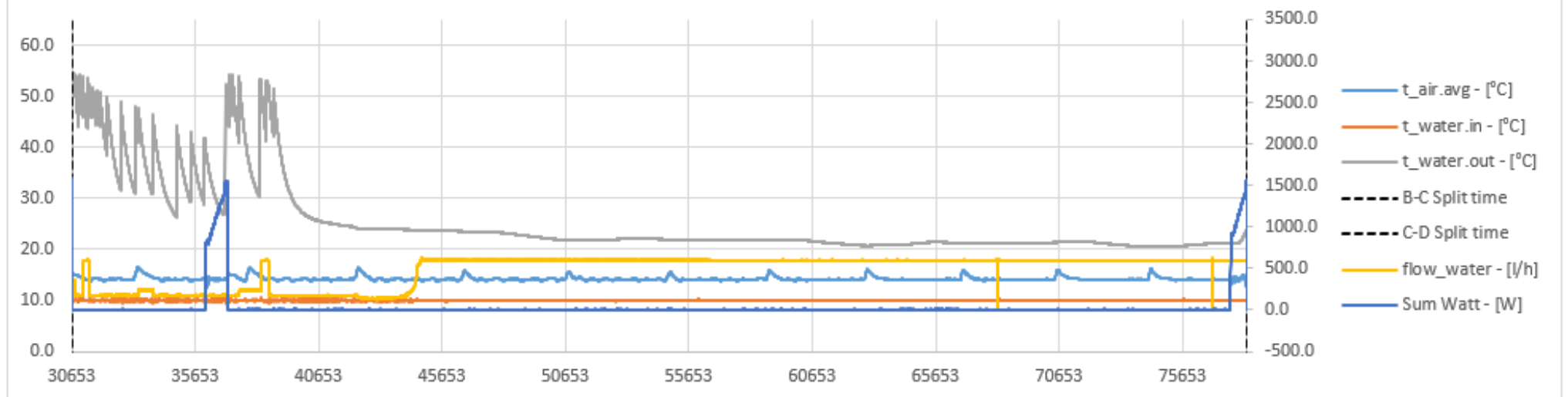




Time	Duration [s]	QHP-tap [kWh]	QEL-tap [kWh]	Tcold water, inlet [°C]			Thot water, outlet [°C]			Water Flow [L/min]			Tair dry [°C]	Tair wet [°C]	Comp mode
				Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Avg	
07:00:06	32	0.102	0.0	9.7	10.0	9.8	24.1	54.4	46.2	3.0	3.0	3.0	14.1	13.3	H
07:05:03	265	1.414	0.0	9.6	10.0	9.8	49.8	54.5	54.3	6.0	6.1	6.0	15.0	14.4	S
07:30:05	31	0.107	0.0	10.0	10.1	10.1	44.0	54.1	51.2	3.0	3.0	3.0	14.8	14.1	S
07:45:01	32	0.108	0.0	10.0	10.0	10.0	45.9	53.9	51.6	3.0	3.0	3.0	14.4	13.5	S
08:05:02	430	3.621	0.0	9.9	10.0	9.9	43.7	53.7	52.8	9.9	10.1	10.0	14.0	12.7	S
08:25:04	31	0.102	0.0	9.8	9.9	9.9	45.7	51.6	49.9	3.0	3.0	3.0	14.1	13.2	S
08:30:00	32	0.103	0.0	10.0	10.0	10.0	49.0	51.4	50.7	3.0	3.0	3.0	14.4	13.9	S
08:45:03	31	0.101	0.0	10.0	10.0	10.0	44.4	51.0	49.1	3.0	3.0	3.0	14.4	13.8	S
09:00:01	32	0.100	0.0	10.1	10.1	10.1	43.9	50.6	48.7	3.0	3.0	3.0	14.2	13.5	S
09:30:01	38	0.111	0.0	10.2	10.2	10.2	38.3	50.0	47.1	3.0	3.0	3.0	14.1	12.8	S
10:30:05	38	0.107	0.0	10.0	10.2	10.1	31.5	48.9	44.8	3.0	3.0	3.0	14.2	13.5	S
11:30:00	38	0.106	0.0	9.8	9.8	9.8	31.0	47.9	44.0	3.0	3.0	3.0	14.7	14.1	S
11:45:05	38	0.106	0.0	10.1	10.1	10.1	41.0	47.6	46.0	3.0	3.0	3.0	16.5	16.1	S
12:45:05	82	0.260	0.1	9.9	10.1	10.0	30.7	46.5	44.8	4.0	4.0	4.0	14.6	13.4	S
14:30:05	45	0.107	0.0	10.1	10.1	10.1	26.2	44.3	40.6	3.0	3.0	3.0	14.0	12.8	S
15:30:02	45	0.105	0.0	10.0	10.0	10.0	29.2	43.1	40.2	2.9	3.0	3.0	13.9	13.2	S
16:30:01	45	0.102	0.0	9.8	9.8	9.8	28.7	41.7	39.1	3.0	3.0	3.0	14.3	13.9	S
18:00:02	32	0.101	0.0	9.8	10.2	9.9	26.8	52.2	45.5	3.0	3.0	3.0	14.2	13.3	H
18:15:04	32	0.110	0.0	9.8	9.8	9.8	43.8	54.3	51.4	3.0	3.0	3.0	15.2	14.6	S
18:30:06	32	0.110	0.0	10.0	10.0	10.0	46.2	54.2	51.9	3.0	3.0	3.0	15.0	14.4	S
19:00:02	32	0.108	0.0	10.0	10.1	10.0	40.8	54.0	50.4	3.0	3.0	3.0	14.4	13.3	S
20:30:03	207	0.717	0.0	9.9	10.0	10.0	30.2	53.3	52.2	4.0	4.0	4.0	14.8	13.8	S
21:00:02	434	3.637	0.0	9.8	10.1	9.9	41.3	53.1	52.5	9.9	10.1	10.0	14.1	13.5	S
21:30:05	33	0.104	0.0	10.2	10.3	10.2	42.2	51.6	48.9	3.0	3.0	3.0	14.2	13.5	S



Water draw-offs





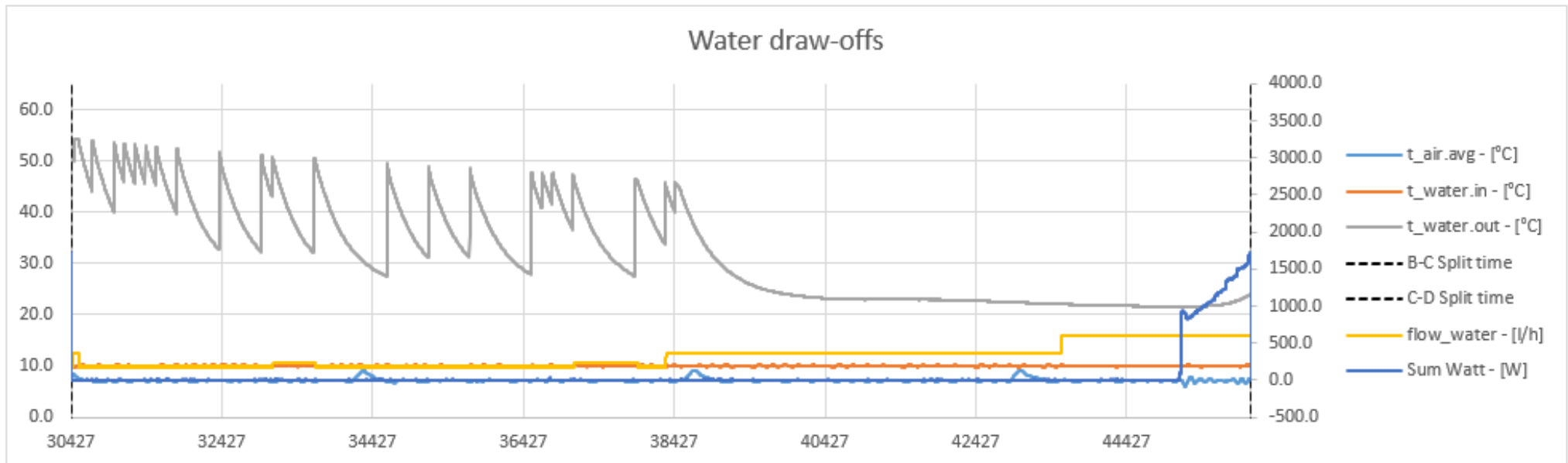
Test results of domestic hot water test, average climate, load profile M - EN16147:2017

Presentation of main results

No		Symbol	Result	Unit
1)	Load profile	-	M	-
2)	Settings of the control	-	52	-
3)	Heating up time	t_h	4278	[s]
4)	Heating up electrical energy consumption	W_{eh-HP}	3.09	[kWh]
5)	Stand-by power input	P_{es}	0.03	[kW]
6)	Total useful energy content during the load profile	Q_{LP}	5.94	[kWh]
7)	Total electrical energy consumption during load profile	W_{EL-LP}	2.08	[kWh]
8)	Daily electrical energy consumption	Q_{elec}	2.05	[kWh]
9)	Coefficient of Performance	COP_{DHW}	2.855	[-]
10)	Water heating energy consumption	η_{wh}	122.9%	[%]
11)	Annual electrical energy consumption	AEC	418	[kWh/a]
12)	Reference hot water temperature	θ'_{WH}	51.8	[°C]
13)	Maximum volume of mixed water at 40°C	V_{40}	242	[L]
19)	Rated heat output	P_{rated}	-	[kW]
20)	Seasonal coefficient of performance	$SCOP_{DHW}$	-	[-]



Time	Duration [s]	QHP-tap [kWh]	QEL-tap [kWh]	Tcold water, inlet [°C]			Thot water, outlet [°C]			Water Flow [L/min]			Tair dry [°C]	Tair wet [°C]	Comp mode
				Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Avg	
07:00:06	32	0.104	0.0	9.7	10.0	9.8	24.7	54.3	46.4	3.0	3.0	3.0	7.7	6.4	S
07:05:01	269	1.430	0.0	9.8	10.0	9.9	50.0	54.4	54.2	6.0	6.1	6.0	7.9	7.0	S
07:30:01	32	0.110	0.0	10.0	10.0	10.0	44.1	54.0	51.2	3.0	3.0	3.0	7.0	6.2	S
08:01:06	32	0.107	0.0	9.9	9.9	9.9	39.9	53.6	49.9	3.0	3.0	3.0	6.9	6.1	S
08:15:02	32	0.108	0.0	9.8	9.8	9.8	45.9	53.4	51.3	3.0	3.0	3.0	7.2	6.2	S
08:30:03	32	0.108	0.0	10.0	10.0	10.0	45.6	53.2	51.1	3.0	3.0	3.0	7.2	6.2	S
08:45:01	32	0.108	0.0	10.1	10.1	10.1	45.5	53.0	50.8	3.0	3.0	3.0	7.1	6.3	S
09:00:02	32	0.108	0.0	9.8	9.8	9.8	45.3	52.8	50.6	3.0	3.0	3.0	7.1	6.3	S
09:30:01	32	0.103	0.0	10.2	10.2	10.2	39.5	52.3	48.8	3.0	3.0	3.0	7.1	6.1	S
10:30:03	32	0.101	0.0	9.9	9.9	9.9	32.6	51.6	46.5	3.0	3.0	3.0	7.1	6.3	S
11:30:01	32	0.101	0.0	9.7	9.7	9.7	32.2	51.0	46.1	3.0	3.0	3.0	7.2	6.4	S
11:45:02	32	0.103	0.0	9.8	9.8	9.8	43.1	50.9	48.7	3.0	3.0	3.0	6.9	6.2	S
12:45:02	98	0.335	0.0	9.9	10.0	10.0	32.0	50.4	48.6	3.9	4.0	4.0	7.0	6.2	S
14:30:05	39	0.110	0.0	10.3	10.3	10.3	27.5	49.4	44.5	3.0	3.0	3.0	7.0	6.1	S
15:30:03	39	0.111	0.0	9.9	10.0	10.0	31.2	49.0	44.9	3.0	3.0	3.0	7.1	6.1	S
16:30:04	39	0.110	0.0	10.1	10.2	10.1	31.2	48.5	44.5	3.0	3.0	3.0	7.0	6.3	S
18:00:03	39	0.107	0.0	10.1	10.2	10.1	27.8	47.8	43.3	3.0	3.0	3.0	7.0	6.0	S
18:15:05	40	0.111	0.0	10.1	10.1	10.1	40.8	47.7	46.0	3.0	3.0	3.0	7.2	6.2	S
18:30:03	40	0.110	0.0	10.1	10.1	10.1	41.5	47.5	46.0	3.0	3.0	3.0	7.1	6.3	S
19:00:05	40	0.108	0.0	10.1	10.1	10.1	36.6	47.3	44.7	3.0	3.0	3.0	7.1	6.2	S
20:30:01	252	0.735	0.0	9.9	10.0	9.9	27.5	46.4	45.6	4.0	4.0	4.0	7.0	6.2	S
21:15:02	40	0.104	0.0	9.9	10.0	9.9	33.8	45.8	43.0	3.0	3.0	3.0	7.2	6.3	S
21:30:06	337	1.413	0.0	10.0	10.1	10.1	39.9	45.7	45.2	6.0	6.1	6.0	7.1	6.2	S





Test results of sound power measurements – EN 12102

N#	Test conditions	Sound power level LW(A) [dB re 1pW]	Uncertainty (dB) (weighted value)
1 ^R	A7/W35	61.4	0.5
2 ^Q	A7/W35	49.1	0.5
3 ^R	A7/W55	60.7	0.5
4 ^Q	A7/W55	54.5	0.5
5 ^Q	A2/W35	59.2	0.5
6 ^R	A-7/W35	65.6	0.5
7 ^Q	A-7/W35	54.9	0.5
8 ^R	A-7/W55	65.8	0.5
9 ^Q	A-7/W55	56.5	0.5
10 ^{E-K}	A7/W55	51.1	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.

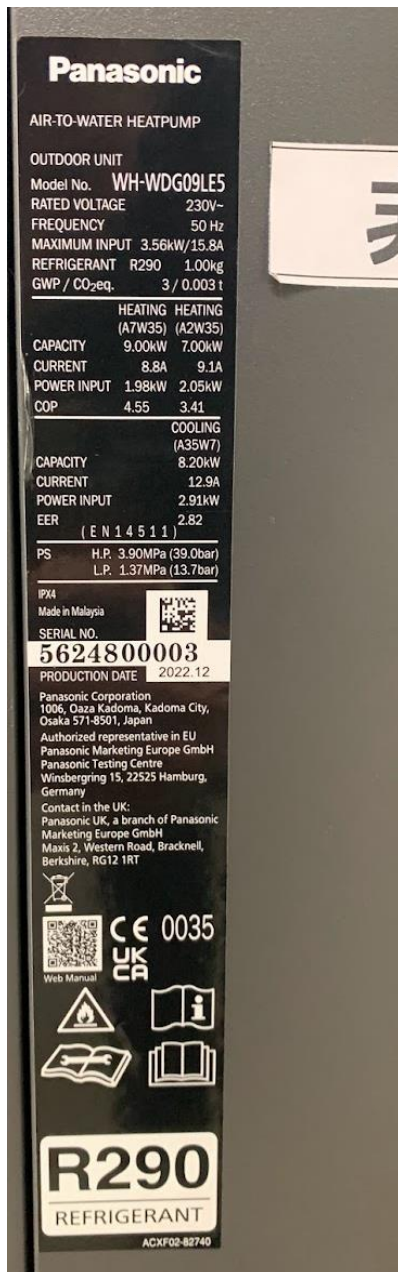
The sound power measurements are carried out by Kamalathasan Arumugam (KAMA) and co-read by Birger Bech Jessen (BBJN).



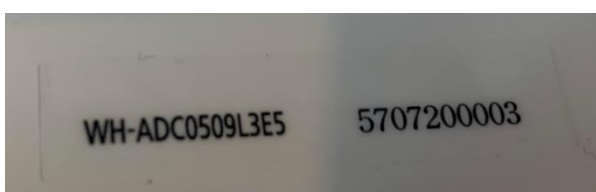


Photo

Rating plate (outdoor unit)



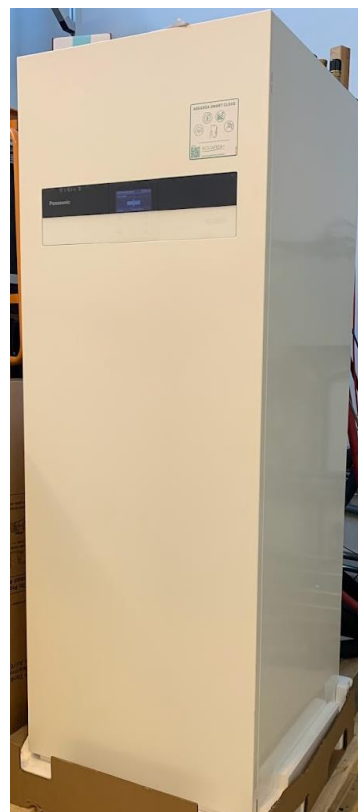
Rating plate (indoor unit)



Outdoor unit



Indoor unit





SCOP - detailed calculation

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

Calculation of reference SCOP

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

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	7.08	6.96	2.87	1.00	1.00	2.87
B	2	54	4.31	4.31	4.96	0.99	1.00	4.96
C	7	35	2.77	2.99	7.17	0.98	1.00	7.17
D	12	15	1.23	3.22	8.14	0.98	0.38	7.88
E	-10	100	8.00	8.35	2.64	1.00	1.00	2.64
F - BIV	-10	100	8.00	8.35	2.64	1.00	1.00	2.64

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	0.005	0.005	0
Thermostat off	178	0.008	0.008	1.424
Standby	0	0.005	0.005	0
Crankcase heater	178	0.005	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]
E / F - BIV	21	-10	1	8.00	8.00	0.00	0.00	2.64	8.00	3.03	8.00	3.03
	22	-9	25	7.69	7.65	0.00	0.00	2.72	192.31	70.79	192.31	70.79
	23	-8	23	7.38	7.31	0.00	0.00	2.79	169.85	60.81	169.85	60.81
A	24	-7	24	7.08	6.96	0.00	0.00	2.87	169.85	59.18	169.85	59.18
	25	-6	27	6.77	6.66	0.00	0.00	3.10	182.77	58.91	182.77	58.91
	26	-5	68	6.46	6.37	0.00	0.00	3.34	439.38	131.75	439.38	131.75
	27	-4	91	6.15	6.07	0.00	0.00	3.57	560.00	156.97	560.00	156.97
	28	-3	89	5.85	5.78	0.00	0.00	3.80	520.31	136.92	520.31	136.92
	29	-2	165	5.54	5.49	0.00	0.00	4.03	913.85	226.61	913.85	226.61
	30	-1	173	5.23	5.19	0.00	0.00	4.27	904.92	212.16	904.92	212.16
	31	0	240	4.92	4.90	0.00	0.00	4.50	1181.54	262.69	1181.54	262.69
	32	1	280	4.62	4.60	0.00	0.00	4.73	1292.31	273.19	1292.31	273.19
B	33	2	320	4.31	4.31	0.00	0.00	4.96	1378.46	277.75	1378.46	277.75
	34	3	357	4.00	4.00	0.00	0.00	5.40	1428.00	264.28	1428.00	264.28
	35	4	356	3.69	3.69	0.00	0.00	5.84	1314.46	224.93	1314.46	224.93
	36	5	303	3.38	3.38	0.00	0.00	6.28	1025.54	163.19	1025.54	163.19
	37	6	330	3.08	3.08	0.00	0.00	6.72	1015.38	151.00	1015.38	151.00
C	38	7	326	2.77	2.77	0.00	0.00	7.17	902.77	126.00	902.77	126.00
	39	8	348	2.46	2.46	0.00	0.00	7.31	856.62	117.20	856.62	117.20
	40	9	335	2.15	2.15	0.00	0.00	7.45	721.54	96.81	721.54	96.81
	41	10	315	1.85	1.85	0.00	0.00	7.60	581.54	76.55	581.54	76.55
	42	11	215	1.54	1.54	0.00	0.00	7.74	330.77	42.73	330.77	42.73
D	43	12	169	1.23	1.23	0.00	0.00	7.88	208.00	26.38	208.00	26.38
	44	13	151	0.92	0.92	0.00	0.00	8.03	139.38	17.36	139.38	17.36
	45	14	105	0.62	0.62	0.00	0.00	8.17	64.62	7.91	64.62	7.91
	46	15	74	0.31	0.31	0.00	0.00	8.32	22.77	2.74	22.77	2.74
SUM									16524.92	3247.81	16524.92	3247.81
SCOPon									5.09		SCOPnet	5.09



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	7.08	6.51	2.21	1.00	1.00	2.21
B	2	54	4.31	4.17	3.62	0.99	1.00	3.62
C	7	35	2.77	2.69	5.08	0.98	1.00	5.08
D	12	15	1.23	3.12	6.53	0.98	0.39	6.37
E	-10	100	8.00	7.03	2.01	1.00	1.00	2.01
F - BIV	-7	88	7.08	6.51	2.21	1.00	1.00	2.21

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	0.005	0.005	0
Thermostat off	178	0.008	0.008	1.424
Standby	0	0.005	0.005	0
Crankcase heater	178	0.005	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 _{bin} [-]	Annual heating demand [kWh]	Annual energy input [kWh]	Net annual heating capacity [kWh]	Net annual power input [kWh]
E	21	-10	1	8.00	7.03	0.97	0.97	2.01	8.00	4.47	7.03	3.50
	22	-9	25	7.69	6.85	0.84	20.93	2.07	192.31	103.53	171.37	82.60
	23	-8	23	7.38	6.68	0.70	16.14	2.14	169.85	87.88	153.71	71.74
A / F - BIV	24	-7	24	7.08	6.51	0.00	0.00	2.21	169.85	76.84	169.85	76.84
	25	-6	27	6.77	6.25	0.00	0.00	2.37	182.77	77.21	182.77	77.21
	26	-5	68	6.46	5.99	0.00	0.00	2.52	439.38	174.08	439.38	174.08
	27	-4	91	6.15	5.73	0.00	0.00	2.68	560.00	208.89	560.00	208.89
	28	-3	89	5.85	5.47	0.00	0.00	2.84	520.31	183.35	520.31	183.35
	29	-2	165	5.54	5.21	0.00	0.00	2.99	913.85	305.17	913.85	305.17
	30	-1	173	5.23	4.95	0.00	0.00	3.15	904.92	287.15	904.92	287.15
	31	0	240	4.92	4.69	0.00	0.00	3.31	1181.54	357.14	1181.54	357.14
	32	1	280	4.62	4.43	0.00	0.00	3.47	1292.31	372.94	1292.31	372.94
B	33	2	320	4.31	4.17	0.00	0.00	3.62	1378.46	380.58	1378.46	380.58
	34	3	357	4.00	3.87	0.00	0.00	3.91	1428.00	364.94	1428.00	364.94
	35	4	356	3.69	3.58	0.00	0.00	4.20	1314.46	312.67	1314.46	312.67
	36	5	303	3.38	3.28	0.00	0.00	4.49	1025.54	228.15	1025.54	228.15
	37	6	330	3.08	2.99	0.00	0.00	4.79	1015.38	212.16	1015.38	212.16
C	38	7	326	2.77	2.69	0.00	0.00	5.08	902.77	177.82	902.77	177.82
	39	8	348	2.46	2.40	0.00	0.00	5.34	856.62	160.56	856.62	160.56
	40	9	335	2.15	2.11	0.00	0.00	5.59	721.54	129.00	721.54	129.00
	41	10	315	1.85	1.82	0.00	0.00	5.85	581.54	99.39	581.54	99.39
	42	11	215	1.54	1.52	0.00	0.00	6.11	330.77	54.14	330.77	54.14
D	43	12	169	1.23	1.23	0.00	0.00	6.37	208.00	32.67	208.00	32.67
	44	13	151	0.92	0.94	0.00	0.00	6.63	139.38	21.04	139.38	21.04
	45	14	105	0.62	0.65	0.00	0.00	6.88	64.62	9.39	64.62	9.39
	46	15	74	0.31	0.35	0.00	0.00	7.14	22.77	3.19	22.77	3.19

SUM	16524.92	4424.35	16486.88	4386.31
SCOPon		3.73	SCOPnet	3.76



Detailed test results

Detailed SCOP test results - low temperature application - average climate – 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	8.00
Heating demand:	kW	7.08
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	6.958
COP	-	2.870
Power consumption	kW	2.424
Measured		
Heating capacity	kW	6.997
COP	-	2.824
Power consumption	kW	2.477
During heating		
Air temperature dry bulb	°C	-7.10
Air temperature wet bulb	°C	-8.16
Air temperature dry bulb outlet	°C	-10.47
Inlet temperature	°C	29.09
Outlet temperature	°C	34.05
Outlet temperature (Time averaged)	°C	34.05
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	37075
Calculated Hydraulic power	W	14
Calculated global efficiency	η	0.26
Calculated Capacity correction	W	39
Calculated Power correction	W	53
Water Flow	m ³ /s	0.000375



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	8.00
Heating demand:	kW	4.31
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	4.307
COP	-	4.963
Power consumption	kW	0.868
Measured		
Heating capacity	kW	4.342
COP	-	4.751
Power consumption	kW	0.914
During heating		
Air temperature dry bulb	°C	2.01
Air temperature wet bulb	°C	0.88
Air temperature dry bulb outlet	°C	-0.33
Inlet temperature	°C	25.04
Outlet temperature	°C	30.18
Outlet temperature (Time averaged)	°C	30.18
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	54557
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	0.000203



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	8.00
Heating demand:	kW	2.77
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	2.994
COP	-	7.165
Power consumption	kW	0.418
Measured		
Heating capacity	kW	3.024
COP	-	6.621
Power consumption	kW	0.457
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	5.97
Air temperature dry bulb outlet	°C	4.03
Inlet temperature	°C	21.98
Outlet temperature	°C	27.21
Outlet temperature (Time averaged)	°C	27.21
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	59873
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	31
Calculated Power correction	W	39
Water Flow	m ³ /s	0.000139



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	8.00
Heating demand:	kW	1.23
CR:	-	0.4
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	3.224
COP	-	8.143
Power consumption	kW	0.396
Measured		
Heating capacity	kW	3.255
COP	-	7.461
Power consumption	kW	0.436
During heating		
Air temperature dry bulb	°C	12.00
Air temperature wet bulb	°C	11.02
Air temperature dry bulb outlet	°C	9.01
Inlet temperature	°C	21.90
Outlet temperature	°C	27.02
Outlet temperature (Time averaged)	°C	23.86
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	57951
Calculated Hydraulic power	W	9
Calculated global efficiency	η	0.22
Calculated Capacity correction	W	32
Calculated Power correction	W	40
Water Flow	m ³ /s	0.000153



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	8.00
Heating demand:	kW	8.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	8.346
COP	-	2.640
Power consumption	kW	3.161
Measured		
Heating capacity	kW	8.383
COP	-	2.611
Power consumption	kW	3.210
During heating		
Air temperature dry bulb	°C	-10.00
Air temperature wet bulb	°C	-11.18
Air temperature dry bulb outlet	°C	-13.69
Inlet temperature	°C	29.97
Outlet temperature	°C	34.98
Outlet temperature (Time averaged)	°C	34.98
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	31137
Calculated Hydraulic power	W	13
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	37
Calculated Power correction	W	50
Water Flow	m ³ /s	0.000403



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

Detailed result for 'EN14825:2018' Average Medium (A and F) A -7 /W52		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Medium	
Condition name:	A and F	
Condition temperature:	°C	-7
Part load:	%	88%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	8.00
Heating demand:	kW	7.08
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	6.511
COP	-	2.210
Power consumption	kW	2.946
Measured		
Heating capacity	kW	6.547
COP	-	2.188
Power consumption	kW	2.993
During heating		
Air temperature dry bulb	°C	-7.01
Air temperature wet bulb	°C	-8.05
Air temperature dry bulb outlet	°C	-9.73
Inlet temperature	°C	43.98
Outlet temperature	°C	52.02
Outlet temperature (Time averaged)	°C	52.02
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	57816
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	36
Calculated Power correction	W	47
Water Flow	m³/s	0.000197



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		8.00
Heating demand:	kW		4.31
CR:	-		1.0
Minimum flow reached:	-		Yes
Measurement type:		Steady State	
Integrated circulation pump:		Yes	
<hr/>			
Included corrections (Final result)			
Heating capacity	kW		4.167
COP	-		3.622
Power consumption	kW		1.150
Measured			
Heating capacity	kW		4.197
COP	-		3.531
Power consumption	kW		1.188
During heating			
Air temperature dry bulb	°C		1.99
Air temperature wet bulb	°C		0.95
Air temperature dry bulb outlet	°C		-0.16
Inlet temperature	°C		34.61
Outlet temperature	°C		42.21
Outlet temperature (Time averaged)	°C		42.21
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa		59682
Calculated Hydraulic power	W		8
Calculated global efficiency	η		0.21
Calculated Capacity correction	W		30
Calculated Power correction	W		38
Water Flow	m ³ /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	8.00
Heating demand:	kW	2.77
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	2.694
COP	-	5.077
Power consumption	kW	0.531
Measured		
Heating capacity	kW	2.724
COP	-	4.791
Power consumption	kW	0.569
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	6.03
Air temperature dry bulb outlet	°C	3.82
Inlet temperature	°C	31.13
Outlet temperature	°C	36.05
Outlet temperature (Time averaged)	°C	36.05
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	59471
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	30
Calculated Power correction	W	38
Water Flow	m³/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	8.00
Heating demand:	kW	1.23
CR:	-	0.4
Minimum flow reached:	-	Yes
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	3.117
COP	-	6.531
Power consumption	kW	0.477
Measured		
Heating capacity	kW	3.147
COP	-	6.107
Power consumption	kW	0.515
During heating		
Air temperature dry bulb	°C	12.00
Air temperature wet bulb	°C	11.02
Air temperature dry bulb outlet	°C	8.93
Inlet temperature	°C	27.98
Outlet temperature	°C	33.67
Outlet temperature (Time averaged)	°C	30.23
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	59716
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	30
Calculated Power correction	W	38
Water Flow	m ³ /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	8.00
Heating demand:	kW	8.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	7.027
COP	-	2.007
Power consumption	kW	3.501
Measured		
Heating capacity	kW	7.064
COP	-	1.990
Power consumption	kW	3.550
During heating		
Air temperature dry bulb	°C	-10.00
Air temperature wet bulb	°C	-10.93
Air temperature dry bulb outlet	°C	-12.75
Inlet temperature	°C	47.01
Outlet temperature	°C	55.13
Outlet temperature (Time averaged)	°C	55.13
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	57378
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	37
Calculated Power correction	W	49
Water Flow	m³/s	0.000211



Detailed SCOP part load test results - low temperature application - warmer climate – EN 14825

Detailed result for 'EN14825:2018' Warmer Low (E and F) A 2 /W35		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:		Warmer
Temperature application:		Low
Condition name:		E and F
Condition temperature:	°C	2
Part load:	%	100%
Chosen Tbivalent	°C	2
Tdesign	°C	2
Pdesign	kW	7.00
Heating demand:	kW	7.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	7.196
COP	-	3.494
Power consumption	kW	2.059
Measured		
Heating capacity	kW	7.231
COP	-	3.435
Power consumption	kW	2.105
During heating		
Air temperature dry bulb	°C	1.89
Air temperature wet bulb	°C	0.72
Air temperature dry bulb outlet	°C	-1.92
Inlet temperature	°C	30.08
Outlet temperature	°C	35.00
Outlet temperature (Time averaged)	°C	35.00
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	26449
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	46
Water Flow	m ³ /s	0.000410



Detailed SCOP part load test results - medium temperature application - warmer climate – EN 14825

Detailed result for 'EN14825:2018' Warmer Medium (E and F) A 2 /W55		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:		Warmer
Temperature application:		Medium
Condition name:		E and F
Condition temperature:	°C	2
Part load:	%	100%
Chosen Tbivalent	°C	2
Tdesign	°C	2
Pdesign	kW	7.00
Heating demand:	kW	7.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	6.657
COP	-	2.423
Power consumption	kW	2.747
Measured		
Heating capacity	kW	6.694
COP	-	2.393
Power consumption	kW	2.797
During heating		
Air temperature dry bulb	°C	1.86
Air temperature wet bulb	°C	0.72
Air temperature dry bulb outlet	°C	-1.33
Inlet temperature	°C	47.11
Outlet temperature	°C	55.17
Outlet temperature (Time averaged)	°C	55.17
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	54554
Calculated Hydraulic power	W	13
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	37
Calculated Power correction	W	50
Water Flow	m ³ /s	0.000231



Detailed SCOP part load test results - low temperature application - colder climate – EN 14825

Detailed result for 'EN14825:2018' Colder Low (F and G) A -15 /W32		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:		Colder
Temperature application:		Low
Condition name:		F and G
Condition temperature:	°C	-15
Part load:	%	82%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	9.00
Heating demand:	kW	7.34
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	6.758
COP	-	2.369
Power consumption	kW	2.852
Measured		
Heating capacity	kW	6.798
COP	-	2.339
Power consumption	kW	2.906
During heating		
Air temperature dry bulb	°C	-14.82
Air temperature dry bulb outlet	°C	-17.95
Inlet temperature	°C	27.07
Outlet temperature	°C	32.09
Outlet temperature (Time averaged)	°C	32.09
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	39695
Calculated Hydraulic power	W	14
Calculated global efficiency	η	0.27
Calculated Capacity correction	W	40
Calculated Power correction	W	54
Water Flow	m ³ /s	0.000361



Detailed SCOP part load test results - medium temperature application - colder climate – EN 14825

Detailed result for 'EN14825:2018' Colder Medium (F and G) A -15 /W49		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:		Colder
Temperature application:		Medium
Condition name:		F and G
Condition temperature:	°C	-15
Part load:	%	82%
Chosen Tbivalent	°C	-15
Tdesign	°C	-22
Pdesign	kW	8.00
Heating demand:	kW	6.53
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	6.701
COP	-	2.039
Power consumption	kW	3.286
Measured		
Heating capacity	kW	6.737
COP	-	2.021
Power consumption	kW	3.333
During heating		
Air temperature dry bulb	°C	-15.01
Air temperature dry bulb outlet	°C	-17.94
Inlet temperature	°C	40.98
Outlet temperature	°C	49.13
Outlet temperature (Time averaged)	°C	49.13
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	57518
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	36
Calculated Power correction	W	47
Water Flow	m ³ /s	0.000200



Detailed COP test results - low temperature – EN 14511

Detailed result for 'EN14511:2018' A7/W35		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	8.716
COP	-	4.589
Power consumption	kW	1.899
Measured		
Heating capacity	kW	8.752
COP	-	4.498
Power consumption	kW	1.946
During heating		
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	30.01
Outlet temperature	°C	35.03
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	26729
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	47
Water Flow	m ³ /s	0.000420



Detailed result for 'EN14511:2018' A2/W35			
Tested according to:			EN14511:2018
Minimum flow reached:			No
Measurement type:			Transient
Integrated circulation pump:			Yes
Included corrections (Final result)			
Heating capacity	kW		7.056
COP	-		3.484
Power consumption	kW		2.025
Measured			
Heating capacity	kW		7.091
COP	-		3.422
Power consumption	kW		2.072
During heating			
Air temperature dry bulb	°C		1.91
Air temperature wet bulb	°C		1.07
Air temperature dry bulb outlet	°C		-1.73
Inlet temperature	°C		30.03
Outlet temperature	°C		34.88
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa		27067
Calculated Hydraulic power	W		11
Calculated global efficiency	η		0.24
Calculated Capacity correction	W		36
Calculated Power correction	W		47
Water Flow	m ³ /s		0.000419



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

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Transient	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	6.908
COP	-	2.746
Power consumption	kW	2.516
Measured		
Heating capacity	kW	6.943
COP	-	2.710
Power consumption	kW	2.562
During heating		
Air temperature dry bulb	°C	-7.09
Air temperature wet bulb	°C	-8.13
Air temperature dry bulb outlet	°C	-10.29
Inlet temperature	°C	30.65
Outlet temperature	°C	35.02
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	26391
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	46
Water Flow	m ³ /s	0.000419



Detailed result for 'EN14511:2018' A2/W35			
Tested according to:			EN14511:2018
Minimum flow reached:			No
Measurement type:			Steady State
Integrated circulation pump:			Yes
Included corrections (Final result)			
Heating capacity	kW		3.674
COP	-		4.423
Power consumption	kW		0.831
Measured			
Heating capacity	kW		3.707
COP	-		4.240
Power consumption	kW		0.874
During heating			
Air temperature dry bulb	°C		2.00
Air temperature wet bulb	°C		1.23
Air temperature dry bulb outlet	°C		-0.01
Inlet temperature	°C		30.00
Outlet temperature	°C		35.03
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa		56740
Calculated Hydraulic power	W		10
Calculated global efficiency	η		0.23
Calculated Capacity correction	W		34
Calculated Power correction	W		44
Water Flow	m ³ /s		0.000178



Detailed COP test results - medium temperature – EN 14511

Detailed result for 'EN14511:2018' A2/W55		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	6.679
COP	-	2.397
Power consumption	kW	2.786
Measured		
Heating capacity	kW	6.718
COP	-	2.366
Power consumption	kW	2.839
During heating		
Air temperature dry bulb	°C	1.91
Air temperature wet bulb	°C	0.86
Air temperature dry bulb outlet	°C	-1.16
Inlet temperature	°C	47.84
Outlet temperature	°C	55.05
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	54093
Calculated Hydraulic power	W	14
Calculated global efficiency	η	0.26
Calculated Capacity correction	W	39
Calculated Power correction	W	53
Water Flow	m ³ /s	0.000255



Detailed result for 'EN14511:2018' A7/W55

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	8.507
COP	-	2.988
Power consumption	kW	2.847
Measured		
Heating capacity	kW	8.546
COP	-	2.948
Power consumption	kW	2.899
During heating		
Air temperature dry bulb	°C	7.01
Air temperature wet bulb	°C	6.00
Air temperature dry bulb outlet	°C	3.13
Inlet temperature	°C	46.99
Outlet temperature	°C	54.97
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	52845
Calculated Hydraulic power	W	14
Calculated global efficiency	η	0.26
Calculated Capacity correction	W	39
Calculated Power correction	W	53
Water Flow	m ³ /s	0.000260



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
Included corrections (Final result)			
Heating capacity	kW		6.702
COP	-		2.108
Power consumption	kW		3.179
Measured			
Heating capacity	kW		6.738
COP	-		2.088
Power consumption	kW		3.227
During heating			
Air temperature dry bulb	°C		-6.95
Air temperature wet bulb	°C		-7.89
Air temperature dry bulb outlet	°C		-9.39
Inlet temperature	°C		47.00
Outlet temperature	°C		55.02
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa		57075
Calculated Hydraulic power	W	✓	12
Calculated global efficiency	η		0.24
Calculated Capacity correction	W		36
Calculated Power correction	W		48
Water Flow	m ³ /s		0.000204



Detailed COP test results - high temperature – EN 14511

Detailed result for 'EN14511:2018' A7/W65		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	8.002
COP	-	2.330
Power consumption	kW	3.434
Measured		
Heating capacity	kW	8.038
COP	-	2.309
Power consumption	kW	3.481
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	5.93
Air temperature dry bulb outlet	°C	3.09
Inlet temperature	°C	55.01
Outlet temperature	°C	65.08
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	59638
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	36
Calculated Power correction	W	47
Water Flow	m ³ /s	0.000195



Detailed result for 'EN14511:2018' A7/W60

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	8.274
COP	-	2.670
Power consumption	kW	3.098
Measured		
Heating capacity	kW	8.310
COP	-	2.641
Power consumption	kW	3.147
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	5.96
Air temperature dry bulb outlet	°C	2.90
Inlet temperature	°C	49.98
Outlet temperature	°C	59.95
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	58352
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	36
Calculated Power correction	W	48
Water Flow	m ³ /s	0.000203



Detailed result for 'EN14511:2018' A2/W65

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Transient	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	6.218
COP	-	1.931
Power consumption	kW	3.220
Measured		
Heating capacity	kW	6.254
COP	-	1.914
Power consumption	kW	3.268
During heating		
Air temperature dry bulb	°C	2.00
Air temperature wet bulb	°C	0.98
Air temperature dry bulb outlet	°C	-0.75
Inlet temperature	°C	56.64
Outlet temperature	°C	65.49
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	59550
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	36
Calculated Power correction	W	47
Water Flow	m ³ /s	0.000194



Detailed result for 'EN14511:2018' A2/W60			
Tested according to:		EN14511:2018	
Minimum flow reached:		No	
Measurement type:		Transient	
Integrated circulation pump:		Yes	
Included corrections (Final result)			
Heating capacity	kW	6.284	
COP	-	2.148	
Power consumption	kW	2.926	
Measured			
Heating capacity	kW	6.320	
COP	-	2.125	
Power consumption	kW	2.974	
During heating			
Air temperature dry bulb	°C	2.00	
Air temperature wet bulb	°C	0.97	
Air temperature dry bulb outlet	°C	-0.94	
Inlet temperature	°C	51.23	
Outlet temperature	°C	59.97	
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa	58060	
Calculated Hydraulic power	W	12	
Calculated global efficiency	η	0.25	
Calculated Capacity correction	W	36	
Calculated Power correction	W	48	
Water Flow	m ³ /s	0.000203	



Detailed result for 'EN14511:2018' A-7/W65

Tested according to:	EN14511:2018	
Minimum flow reached:	No	
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	5.828
COP	-	1.696
Power consumption	kW	3.437
Measured		
Heating capacity	kW	5.864
COP	-	1.683
Power consumption	kW	3.484
During heating		
Air temperature dry bulb	°C	-6.97
Air temperature wet bulb	°C	-8.08
Air temperature dry bulb outlet	°C	-9.55
Inlet temperature	°C	57.81
Outlet temperature	°C	65.16
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	59863
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	36
Calculated Power correction	W	48
Water Flow	m ³ /s	0.000194



Detailed result for 'EN14511:2018' A-7/W60			
Tested according to:			EN14511:2018
Minimum flow reached:			No
Measurement type:			Steady State
Integrated circulation pump:			Yes
Included corrections (Final result)			
Heating capacity	kW		6.416
COP	-		1.945
Power consumption	kW		3.299
Measured			
Heating capacity	kW		6.452
COP	-		1.928
Power consumption	kW		3.346
During heating			
Air temperature dry bulb	°C		-6.97
Air temperature wet bulb	°C		-8.09
Air temperature dry bulb outlet	°C		-10.13
Inlet temperature	°C		52.49
Outlet temperature	°C		60.23
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa		57235
Calculated Hydraulic power	W	✓	12
Calculated global efficiency	η		0.24
Calculated Capacity correction	W		36
Calculated Power correction	W		47
Water Flow	m ³ /s		0.000203



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

Detailed result for 'EN14825:2018 Cooling fan coil (A) A35/W7		
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	8.20
Cooling demand:	kW	8.20
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Cooling capacity	kW	8.184
EER	-	3.038
Power consumption	kW	2.694
Measured		
Cooling capacity	kW	8.155
EER	-	2.986
Power consumption	kW	2.731
During heating		
Air temperature dry bulb	°C	35.01
Air temperature dry bulb outlet	°C	43.82
Inlet temperature	°C	11.98
Outlet temperature	°C	6.97
Outlet temperature (Time averaged)	°C	6.97
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	19181
Calculated Hydraulic power	W	7
Calculated global efficiency	η	0.20
Calculated Capacity correction	W	29
Calculated Power correction	W	37
Water Flow	m ³ /s	0.000389



Detailed result for 'EN14825:2018 Cooling fan coil (C) A35/W10		
Tested according to:		EN14825:2018
Temperature application:		Cooling fan coil
Condition name:		C
Condition temperature:	°C	35
Part load:	%	47%
Tdesign	°C	35
Pdesign	kW	8.20
Cooling demand:	kW	3.85
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Cooling capacity	kW	3.820
EER	-	6.252
Power consumption	kW	0.611
Measured		
Cooling capacity	kW	3.789
EER	-	5.825
Power consumption	kW	0.650
During heating		
Air temperature dry bulb	°C	25.00
Air temperature dry bulb outlet	°C	31.94
Inlet temperature	°C	15.02
Outlet temperature	°C	9.92
Outlet temperature (Time averaged)	°C	9.92
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	47713
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.22
Calculated Capacity correction	W	31
Calculated Power correction	W	39
Water Flow	m ³ /s	0.000178



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

Detailed result for 'EN14825:2018 Cooling underfloor (A) A35/W18		
Tested according to:		EN14825:2018
Temperature application:		Cooling underfloor
Condition name:		A
Condition temperature:	°C	35
Part load:	%	100%
Tdesign	°C	35
Pdesign	kW	9.00
Cooling demand:	kW	9.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Cooling capacity	kW	8.485
EER	-	4.289
Power consumption	kW	1.978
Measured		
Cooling capacity	kW	8.454
EER	-	4.191
Power consumption	kW	2.017
During heating		
Air temperature dry bulb	°C	35.01
Air temperature dry bulb outlet	°C	44.21
Inlet temperature	°C	23.03
Outlet temperature	°C	17.97
Outlet temperature (Time averaged)	°C	17.97
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	20967
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	31
Calculated Power correction	W	39
Water Flow	m ³ /s	0.000400



Detailed result for 'EN14825:2018 Cooling underfloor (C) A35/W18		
Tested according to:		EN14825:2018
Temperature application:		Cooling underfloor
Condition name:		C
Condition temperature:	°C	35
Part load:	%	47%
Tdesign	°C	35
Pdesign	kW	9.00
Cooling demand:	kW	4.23
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Cooling capacity	kW	4.067
EER	-	8.873
Power consumption	kW	0.458
Measured		
Cooling capacity	kW	4.035
EER	-	8.078
Power consumption	kW	0.499
During heating		
Air temperature dry bulb	°C	24.99
Air temperature dry bulb outlet	°C	32.68
Inlet temperature	°C	22.99
Outlet temperature	°C	18.02
Outlet temperature (Time averaged)	°C	18.02
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	46892
Calculated Hydraulic power	W	9
Calculated global efficiency	η	0.22
Calculated Capacity correction	W	32
Calculated Power correction	W	41
Water Flow	m ³ /s	0.000194

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 Europe GmbH	Date of test:	05-04-2023
Object:	Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5		
Mounting conditions:	The out door unit is mounted on the supporting metal support frame using four vibration damping insulators, 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/W35, Compressor speed: 63 [Hz], Fan speed: 570 [rpm], Heating capacity: 8.7 [kW], Power_input: 1.93 [kW], Water flow rate: 1510 [l/h], dP_water: 250 [mBar]

Static pressure:	1025 kPa
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Air temperature: 7.

Relative air humidity: 84.

Test room volume:	102.8 m ³
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Area, S , of test room:	138.9 m ²
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Reference box:

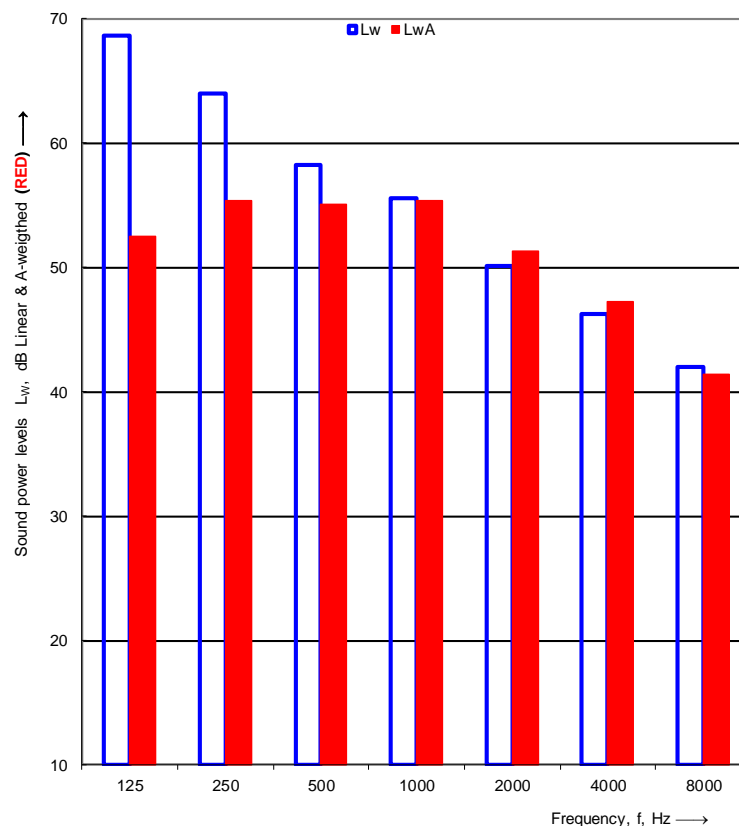
L1: 1.0 m

L2: 0.4 m

L3: 1.0 m

Volume: 0.4 m³

Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]
100	59.3	
125	67.8	68.6
160	56.3	
200	57.2	
250	62.0	63.9
315	55.5	
400	53.7	
500	53.3	58.2
630	53.3	
800	52.1	
1000	50.6	55.5
1250	49.1	
1600	47.0	
2000	45.1	50.1
2500	43.2	
3150	43.0	
4000	40.7	46.2
5000	40.0	
6300	40.2	
8000	35.1	42.0
10000	33.1	

¹ Diff. to backgr. noise < 6dB

Sound power level $L_W(A)$: **61.4 dB [re 1pW]**

Name of test institute:	DTI
No. of test report:	300-KLAB-22-036

Date: 05-04-2023

Measurements are in full conformity with ISO 3743




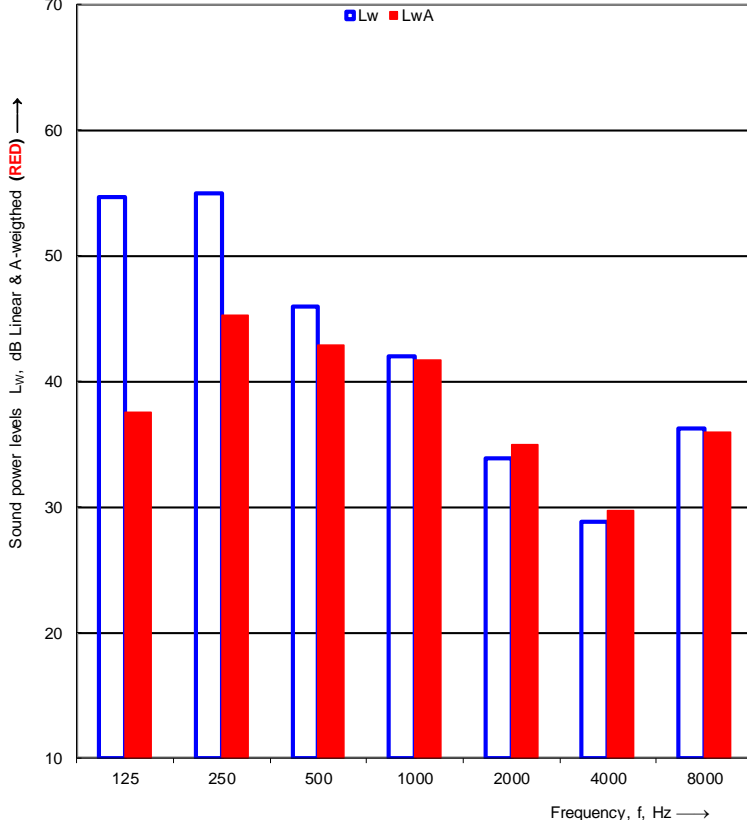


2 DANAK

Test Req. nr. 300




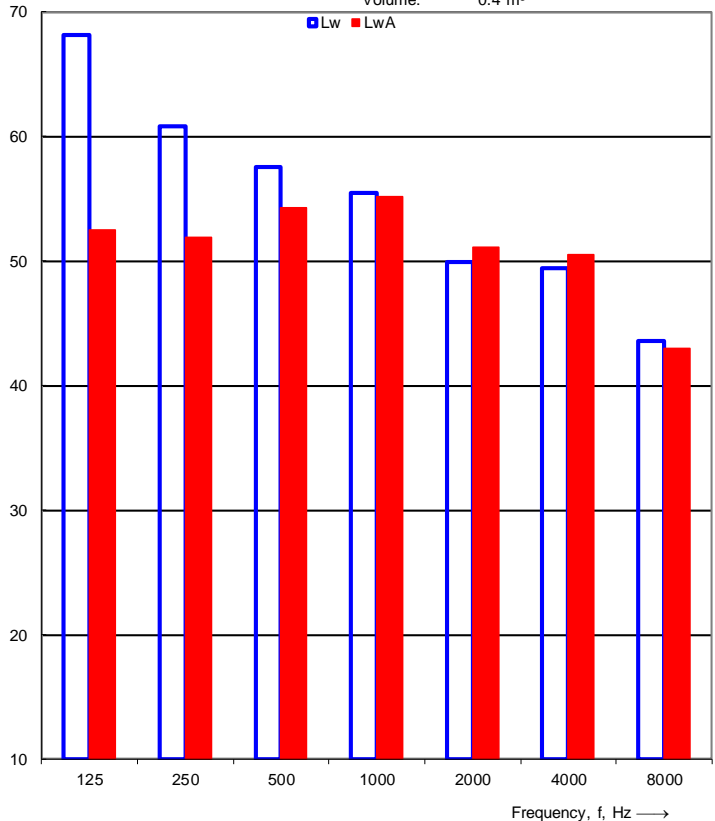


Detailed test results of sound power measurement – Test N#2

 		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 Europe GmbH		Date of test: 05-04-2023																																																																					
Object: Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																																							
Mounting conditions: The out door unit is mounted on the supporting metal support frame using four vibration damping insulators, 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/W35, Compressor speed: 27 [Hz], Fan speed: 330 [rpm], Heating capacity: 3.65 [kW], Power_input: 0.73 [kW], Water flow rate: 640 [l/h], dP_water : 580 [mBar]																																																																							
Static pressure: 1025 kPa		Reference box:																																																																					
Air temperature: 7.0 °C		L1: 1.0 m																																																																					
Relative air humidity: 84.0 %		L2: 0.4 m																																																																					
Test room volume: 102.8 m³		Room: Room 2		L3: 1.0 m																																																																			
Area, S, of test room: 138.9 m²				Volume: 0.4 m³																																																																			
<table border="1"><thead><tr><th>Frequency f [Hz]</th><th>L_w 1/3 octave [dB]</th><th>1/1 oct [dB]</th></tr></thead><tbody><tr><td>100</td><td>53.1</td><td></td></tr><tr><td>125</td><td>46.2</td><td>54.7</td></tr><tr><td>160</td><td>46.8</td><td></td></tr><tr><td>200</td><td>52.8</td><td></td></tr><tr><td>250</td><td>50.0</td><td>54.9</td></tr><tr><td>315</td><td>43.1</td><td></td></tr><tr><td>400</td><td>41.0</td><td></td></tr><tr><td>500</td><td>40.9</td><td>45.9</td></tr><tr><td>630</td><td>41.6</td><td></td></tr><tr><td>800</td><td>39.5</td><td></td></tr><tr><td>1000</td><td>36.3</td><td>42.0</td></tr><tr><td>1250</td><td>34.4</td><td></td></tr><tr><td>1600</td><td>31.4</td><td></td></tr><tr><td>2000</td><td>28.0</td><td>33.8</td></tr><tr><td>2500</td><td>26.0</td><td></td></tr><tr><td>3150</td><td>25.1</td><td></td></tr><tr><td>4000</td><td>22.1</td><td>28.8</td></tr><tr><td>5000</td><td>24.4</td><td></td></tr><tr><td>6300</td><td>35.6</td><td></td></tr><tr><td>8000</td><td>26.4</td><td>36.2</td></tr><tr><td>10000</td><td>20.5¹</td><td></td></tr></tbody></table>		Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]	100	53.1		125	46.2	54.7	160	46.8		200	52.8		250	50.0	54.9	315	43.1		400	41.0		500	40.9	45.9	630	41.6		800	39.5		1000	36.3	42.0	1250	34.4		1600	31.4		2000	28.0	33.8	2500	26.0		3150	25.1		4000	22.1	28.8	5000	24.4		6300	35.6		8000	26.4	36.2	10000	20.5 ¹					
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¹ Diff. to backgr. noise < 6dB																																																																							
Sound power level L_w(A):		49.1 dB [re 1pW]																																																																					
Name of test institute: DTI		Date: 05-04-2023																																																																					
No. of test report: 300-KLAB-22-036																																																																							
Measurements are in full conformity with ISO 3743																																																																							






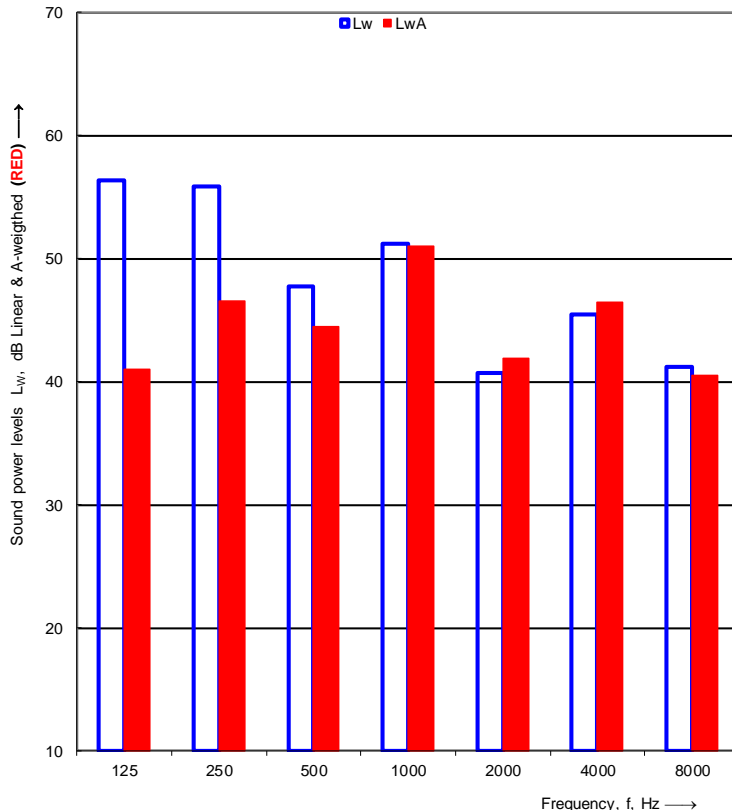
Detailed test results of sound power measurement – Test N#3

 		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 Europe GmbH		Date of test: 04-04-2023																																																					
Object:		Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																							
Mounting conditions:		The out door unit is mounted on the supporting metal support frame using four vibration damping insulators, 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/W55, Compressor speed: 70 [Hz], Fan speed: 490 [rpm], Heating capacity: 8.4 [kW], Power_input: 2.85 [kW], Water flow rate: 920 [l/h], dP_water : 502 [mBar]																																																							
Static pressure:		1029 kPa		<u>Reference box:</u>																																																					
Air temperature:		7.0 °C		L1: 1.0 m																																																					
Relative air humidity:		84.0 %		L2: 0.4 m																																																					
Test room volume:		102.8 m³		L3: 1.0 m																																																					
Area, S, of test room:		138.9 m²		Volume: 0.4 m³																																																					
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Sound power level L _w (A):		60.7 dB [re 1pW]																																																							
Name of test institute:		DTI		Date: 04-04-2023																																																					
No. of test report:		300-KLAB-22-036																																																							
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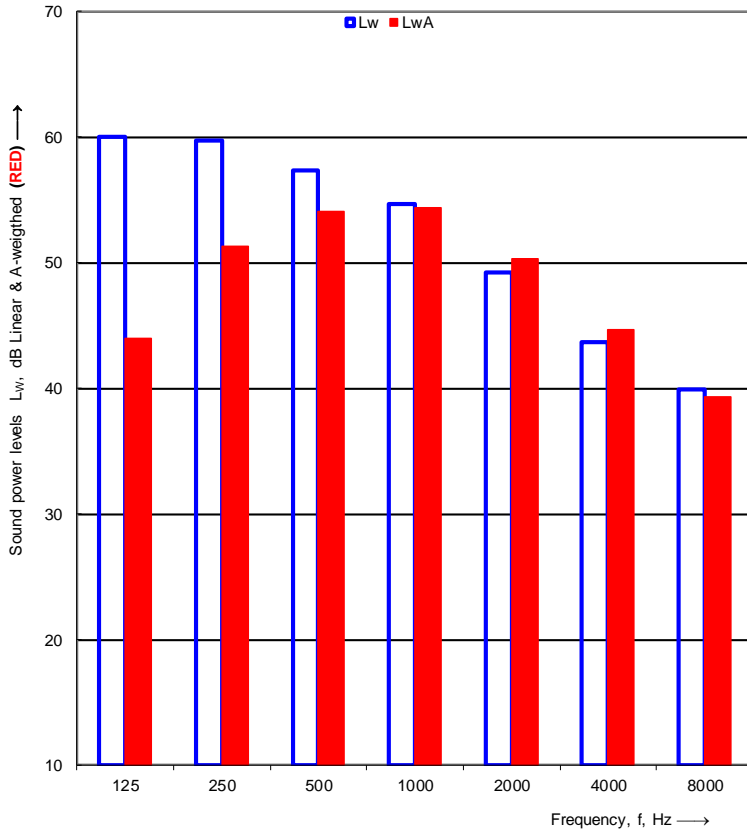


Detailed test results of sound power measurement – Test N#4

 		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 Europe GmbH		Date of test: 05-04-2023																																																																					
Object: Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																																							
Mounting conditions: The out door unit is mounted on the supporting metal support frame using four vibration damping insulators. 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/W55, Compressor speed: 30 [Hz], Fan speed: 340 [rpm], Heating capacity: 3.15 [kW], Power_input: 1.18 [kW], Water flow rate: 480 [l/h], dP_water : 616 [mBar]																																																																							
Static pressure: 1025 kPa		Reference box:																																																																					
Air temperature: 7.0 °C		L1: 1.0 m																																																																					
Relative air humidity: 84.0 %		L2: 0.4 m																																																																					
Test room volume: 102.8 m³		Room: Room 2		L3: 1.0 m																																																																			
Area, S, of test room: 138.9 m²				Volume: 0.4 m³																																																																			
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Sound power level L_w(A):		54.5 dB [re 1pW]																																																																					
Name of test institute: DTI		Date: 05-04-2023																																																																					
No. of test report: 300-KLAB-22-036																																																																							
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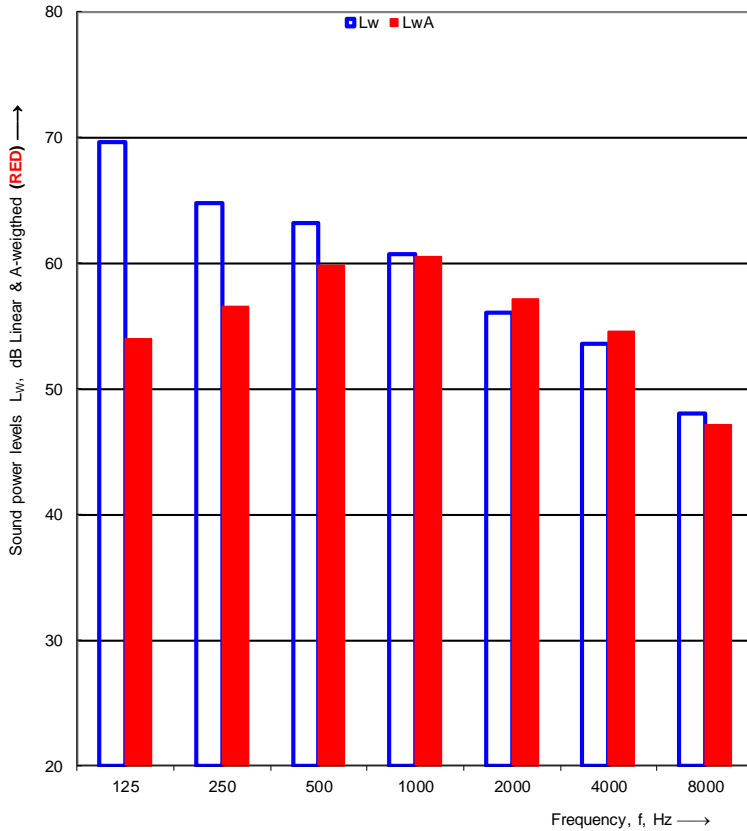


Detailed test results of sound power measurement – Test N#5

 		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 Europe GmbH		Date of test: 06-04-2023																																																																					
Object: Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																																							
Mounting conditions: The out door unit is mounted on the supporting metal support frame using four vibration damping insulators. 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/W35, Compressor speed: 30 [Hz], Fan speed: 570 [rpm], Heating capacity: 3.64 [kW], Power_input: 0.87 [kW], Water flow rate: 650 [l/h], dP_water : 576 [mBar]																																																																							
Static pressure: 1020 kPa		<u>Reference box:</u>																																																																					
Air temperature: 2.0 °C		L1: 1.0 m																																																																					
Relative air humidity: 82.0 %		L2: 0.4 m																																																																					
Test room volume: 102.8 m ³		Room: Room 2		L3: 1.0 m																																																																			
Area, S, of test room: 138.9 m ²				Volume: 0.4 m ³																																																																			
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Sound power level L _w (A):		59.2 dB [re 1pW]																																																																					
Name of test institute: DTI		Date: 06-04-2023																																																																					
No. of test report: 300-KLAB-22-036																																																																							
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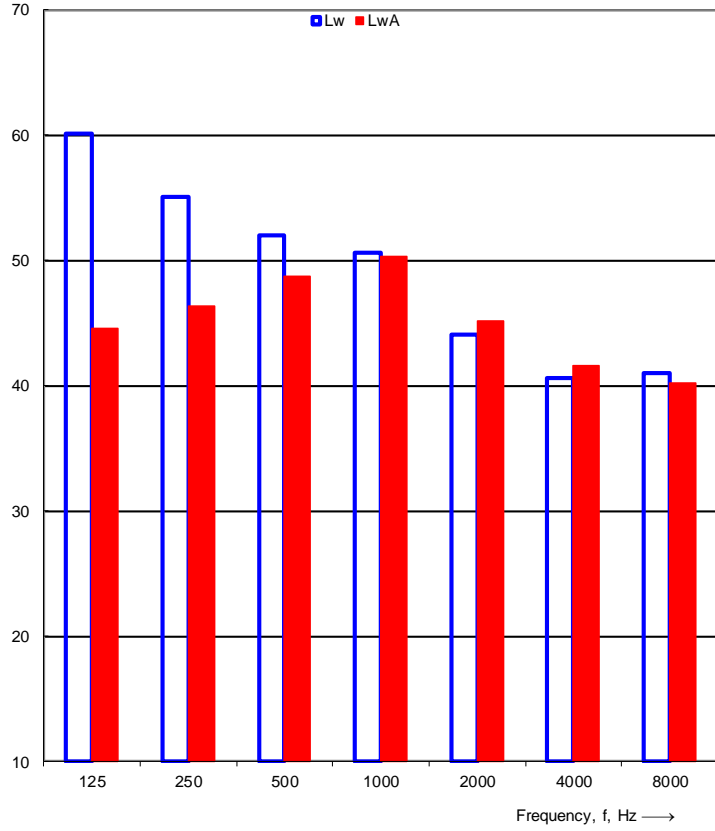


Detailed test results of sound power measurement – Test N#6

 		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 Europe GmbH		Date of test: 06-04-2023																																																																					
Object: Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																																							
Mounting conditions: The out door unit is mounted on the supporting metal support frame using four vibration damping insulators. 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/W35, Compressor speed: 82 [Hz], Fan speed: 670 [rpm], Heating capacity: 7.7 [kW], Power_input: 2.63 [kW], Water flow rate: 1390 [l/h], dP_water : 351 [mBar]																																																																							
Static pressure: 1020 kPa		<u>Reference box:</u>																																																																					
Air temperature: -7.0 °C		L1: 1.0 m																																																																					
Relative air humidity: 70.0 %		L2: 0.4 m																																																																					
Test room volume: 102.8 m ³		Room: Room 2		L3: 1.0 m																																																																			
Area, S, of test room: 138.9 m ²				Volume: 0.4 m ³																																																																			
<table border="1"><thead><tr><th>Frequency f [Hz]</th><th>L_w 1/3 octave [dB]</th><th>1/1 oct [dB]</th></tr></thead><tbody><tr><td>100</td><td>66.4</td><td></td></tr><tr><td>125</td><td>60.5</td><td>69.6</td></tr><tr><td>160</td><td>65.7</td><td></td></tr><tr><td>200</td><td>59.1</td><td></td></tr><tr><td>250</td><td>60.7</td><td>64.8</td></tr><tr><td>315</td><td>60.1</td><td></td></tr><tr><td>400</td><td>59.6</td><td></td></tr><tr><td>500</td><td>58.0</td><td>63.2</td></tr><tr><td>630</td><td>57.3</td><td></td></tr><tr><td>800</td><td>57.7</td><td></td></tr><tr><td>1000</td><td>55.1</td><td>60.7</td></tr><tr><td>1250</td><td>54.2</td><td></td></tr><tr><td>1600</td><td>52.2</td><td></td></tr><tr><td>2000</td><td>50.7</td><td>56.0</td></tr><tr><td>2500</td><td>50.7</td><td></td></tr><tr><td>3150</td><td>51.0</td><td></td></tr><tr><td>4000</td><td>47.6</td><td>53.5</td></tr><tr><td>5000</td><td>46.2</td><td></td></tr><tr><td>6300</td><td>44.4</td><td></td></tr><tr><td>8000</td><td>42.8</td><td>48.1</td></tr><tr><td>10000</td><td>42.4</td><td></td></tr></tbody></table>		Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]	100	66.4		125	60.5	69.6	160	65.7		200	59.1		250	60.7	64.8	315	60.1		400	59.6		500	58.0	63.2	630	57.3		800	57.7		1000	55.1	60.7	1250	54.2		1600	52.2		2000	50.7	56.0	2500	50.7		3150	51.0		4000	47.6	53.5	5000	46.2		6300	44.4		8000	42.8	48.1	10000	42.4					
Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]																																																																					
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Sound power level L _w (A):		65.6 dB [re 1pW]																																																																					
Name of test institute: DTI		Date: 06-04-2023																																																																					
No. of test report: 300-KLAB-22-036																																																																							
Measurements are in full conformity with ISO 3743																																																																							




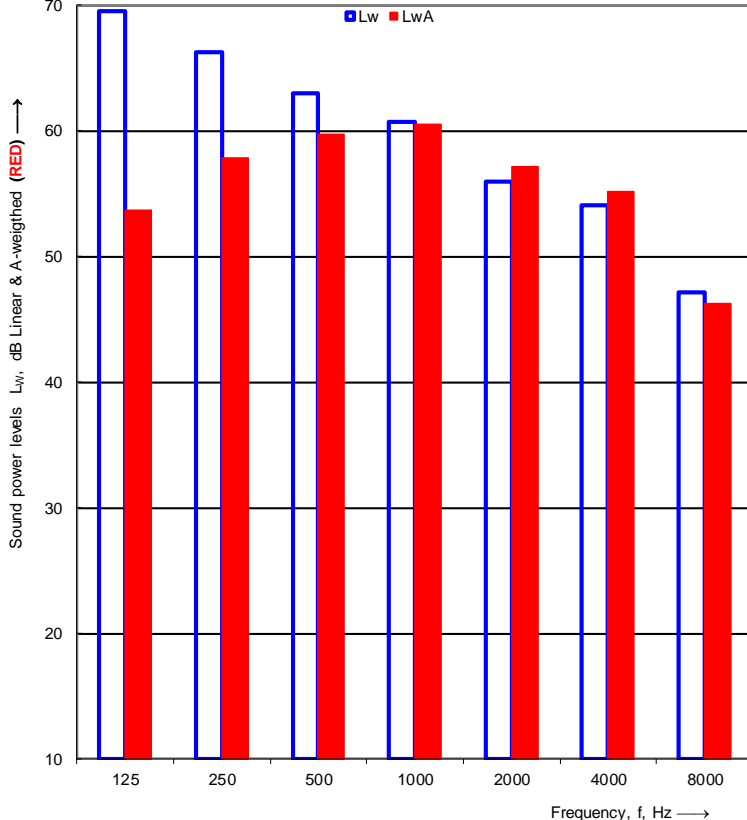


Detailed test results of sound power measurement – Test N#7

 		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 Europe GmbH		Date of test: 06-04-2023																																																																					
Object: Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																																							
Mounting conditions: The out door unit is mounted on the supporting metal support frame using four vibration damping insulators. 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/W35, Compressor speed: 35 [Hz], Fan speed: 450 [rpm], Heating capacity: 2.95 [kW], Power_input: 0.98 [kW], Water flow rate: 510 [l/h], dP_water : 600 [mBar]																																																																							
Static pressure: 1020 kPa		<u>Reference box:</u>																																																																					
Air temperature: -7.0 °C		L1: 1.0 m																																																																					
Relative air humidity: 70.0 %		L2: 0.4 m																																																																					
Test room volume: 102.8 m ³		Room: Room 2		L3: 1.0 m																																																																			
Area, S, of test room: 138.9 m ²				Volume: 0.4 m ³																																																																			
<table border="1"><thead><tr><th>Frequency f [Hz]</th><th>L_w 1/3 octave [dB]</th><th>1/1 oct [dB]</th></tr></thead><tbody><tr><td>100</td><td>54.7</td><td></td></tr><tr><td>125</td><td>56.2</td><td>60.2</td></tr><tr><td>160</td><td>55.1</td><td></td></tr><tr><td>200</td><td>51.6</td><td></td></tr><tr><td>250</td><td>49.9</td><td>55.1</td></tr><tr><td>315</td><td>49.0</td><td></td></tr><tr><td>400</td><td>47.8</td><td></td></tr><tr><td>500</td><td>47.6</td><td>52.0</td></tr><tr><td>630</td><td>46.1</td><td></td></tr><tr><td>800</td><td>48.1</td><td></td></tr><tr><td>1000</td><td>45.3</td><td>50.6</td></tr><tr><td>1250</td><td>42.3</td><td></td></tr><tr><td>1600</td><td>40.4</td><td></td></tr><tr><td>2000</td><td>38.2</td><td>44.0</td></tr><tr><td>2500</td><td>38.9</td><td></td></tr><tr><td>3150</td><td>36.3</td><td></td></tr><tr><td>4000</td><td>36.1</td><td>40.6</td></tr><tr><td>5000</td><td>35.0</td><td></td></tr><tr><td>6300</td><td>38.6</td><td></td></tr><tr><td>8000</td><td>33.5</td><td>41.0</td></tr><tr><td>10000</td><td>34.9</td><td></td></tr></tbody></table>		Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]	100	54.7		125	56.2	60.2	160	55.1		200	51.6		250	49.9	55.1	315	49.0		400	47.8		500	47.6	52.0	630	46.1		800	48.1		1000	45.3	50.6	1250	42.3		1600	40.4		2000	38.2	44.0	2500	38.9		3150	36.3		4000	36.1	40.6	5000	35.0		6300	38.6		8000	33.5	41.0	10000	34.9					
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Sound power level L _w (A):		54.9 dB [re 1pW]																																																																					
Name of test institute: DTI		Date: 06-04-2023																																																																					
No. of test report: 300-KLAB-22-036																																																																							
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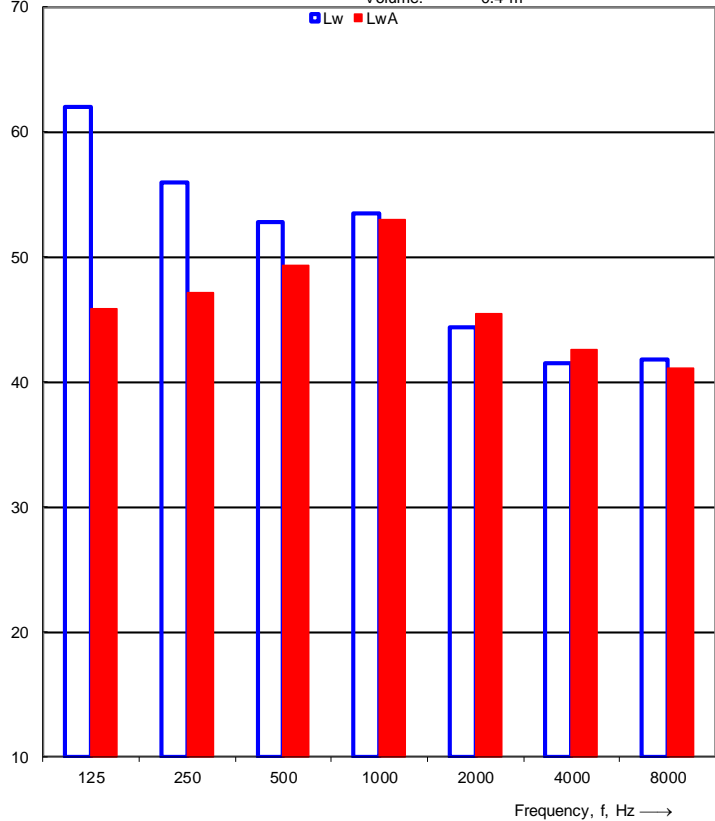


Detailed test results of sound power measurement – Test N#8

 		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		Date of test: 06-04-2023																																																																					
Object: Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																																							
Mounting conditions: The out door unit is mounted on the supporting metal support frame using four vibration damping insulators. 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/W55, Compressor speed: 80 [Hz], Fan speed: 670 [rpm], Heating capacity: 6.45 [kW], Power_input: 3.2 [kW], Water flow rate: 720 [l/h], dP_water : 577 [mBar]																																																																							
Static pressure: 1020 kPa				<u>Reference box:</u>																																																																			
Air temperature: -7.0 °C				L1: 1.0 m																																																																			
Relative air humidity: 70.0 %				L2: 0.4 m																																																																			
Test room volume: 102.8 m ³		Room: Room 2		L3: 1.0 m																																																																			
Area, S, of test room: 138.9 m ²				Volume: 0.4 m ³																																																																			
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		Sound power level L_w(A): 65.8 dB [re 1pW]																																																																					
Name of test institute: DTI		Date: 06-04-2023																																																																					
No. of test report: 300-KLAB-22-036																																																																							
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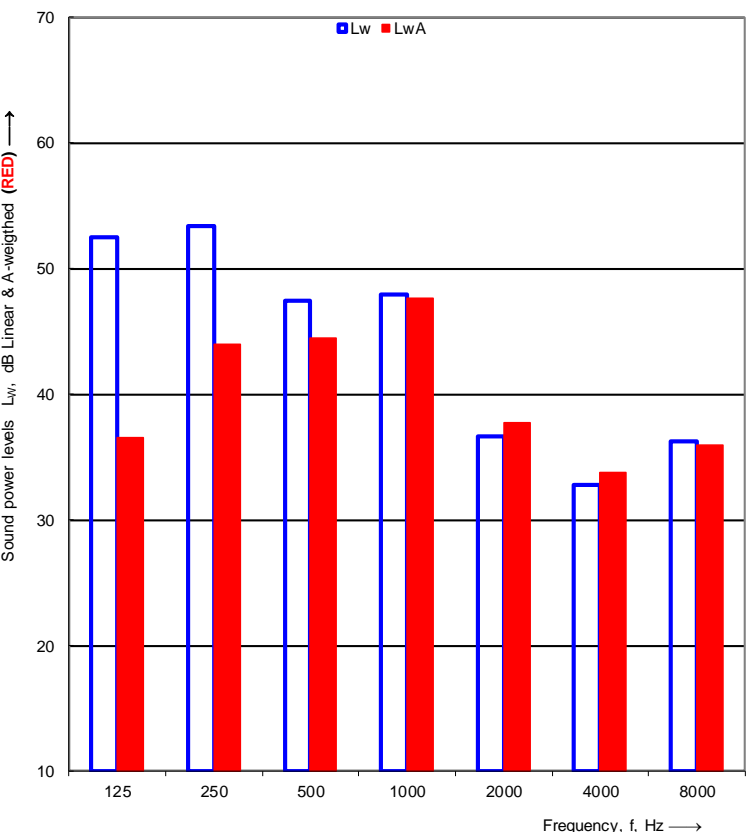


Detailed test results of sound power measurement – Test N#9

 		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 Europe GmbH		Date of test: 06-04-2023																																																																					
Object: Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																																							
Mounting conditions: The out door unit is mounted on the supporting metal support frame using four vibration damping insulators. 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/W55, Compressor speed: 33 [Hz], Fan speed: 450 [rpm], Heating capacity: 1.9 [kW], Power_input: 1.2 [kW], Water flow rate: 480 [l/h], dP_water : 623 [mBar]																																																																							
Static pressure: 1020 kPa		<u>Reference box:</u>																																																																					
Air temperature: -7.0 °C		L1: 1.0 m																																																																					
Relative air humidity: 70.0 %		L2: 0.4 m																																																																					
Test room volume: 102.8 m ³		Room: Room 2		L3: 1.0 m																																																																			
Area, S, of test room: 138.9 m ²				Volume: 0.4 m ³																																																																			
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Sound power level L _w (A):		56.5 dB [re 1pW]																																																																					
Name of test institute: DTI		Date: 06-04-2023																																																																					
No. of test report: 300-KLAB-22-036																																																																							
Measurements are in full conformity with ISO 3743																																																																							



Detailed test results of sound power measurement – Test N#10

 		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		Date of test: 05-04-2023																																																																					
Object: Type: Air to water heat pump, Model: OD: WH-WDG09LE5 + ID: WH-ADC0509L3E5																																																																							
Mounting conditions: The out door unit is mounted on the supporting metal support frame using four vibration damping insulators. 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/W55, Compressor speed: 23 [Hz], Fan speed: 360 [rpm], Heating capacity: 2.67 [kW], Power_input: 0.947 [kW], Water flow rate: 480 [l/h], dP_water : 616 [mBar]																																																																							
Static pressure: 1025 kPa		Reference box:																																																																					
Air temperature: 7.0 °C		L1: 1.0 m																																																																					
Relative air humidity: 84.0 %		L2: 0.4 m																																																																					
Test room volume: 102.8 m ³		Room: Room 2		L3: 1.0 m																																																																			
Area, S, of test room: 138.9 m ²				Volume: 0.4 m ³																																																																			
<table border="1"><thead><tr><th>Frequency f [Hz]</th><th>L_w 1/3 octave [dB]</th><th>1/1 oct [dB]</th></tr></thead><tbody><tr><td>100</td><td>48.6</td><td></td></tr><tr><td>125</td><td>46.9</td><td>52.4</td></tr><tr><td>160</td><td>47.3</td><td></td></tr><tr><td>200</td><td>51.1</td><td></td></tr><tr><td>250</td><td>47.8</td><td>53.4</td></tr><tr><td>315</td><td>44.4</td><td></td></tr><tr><td>400</td><td>42.2</td><td></td></tr><tr><td>500</td><td>42.5</td><td>47.5</td></tr><tr><td>630</td><td>43.3</td><td></td></tr><tr><td>800</td><td>45.2</td><td></td></tr><tr><td>1000</td><td>43.2</td><td>47.9</td></tr><tr><td>1250</td><td>39.2</td><td></td></tr><tr><td>1600</td><td>33.5</td><td></td></tr><tr><td>2000</td><td>30.1</td><td>36.6</td></tr><tr><td>2500</td><td>31.3</td><td></td></tr><tr><td>3150</td><td>30.0</td><td></td></tr><tr><td>4000</td><td>27.1</td><td>32.8</td></tr><tr><td>5000</td><td>25.7</td><td></td></tr><tr><td>6300</td><td>35.4</td><td></td></tr><tr><td>8000</td><td>27.2</td><td>36.3</td></tr><tr><td>10000</td><td>23.9</td><td></td></tr></tbody></table>		Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]	100	48.6		125	46.9	52.4	160	47.3		200	51.1		250	47.8	53.4	315	44.4		400	42.2		500	42.5	47.5	630	43.3		800	45.2		1000	43.2	47.9	1250	39.2		1600	33.5		2000	30.1	36.6	2500	31.3		3150	30.0		4000	27.1	32.8	5000	25.7		6300	35.4		8000	27.2	36.3	10000	23.9					
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Name of test institute: DTI		Date: 05-04-2023																																																																					
No. of test report: 300-KLAB-22-036																																																																							
Measurements are in full conformity with ISO 3743																																																																							



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.

