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TEST REPORT

Report no.:

300-KLAB-16-014 revision 1 (This report replaces report 300-KLAB-16-014)

Product:

Type: Air to water heat pump
Panasonic SXC09H3E8/UX09HE8

Customer:

Panasonic DE GmbH

Date:

December 2016

Consultants:

Kamalathasan Arumugam & Mads Kirk Foged



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TEST REPORT

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Customer: Contact person: Thomas Gross
Company: Panasonic DE GmbH
Address: Hagenauer Strasse 43
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Tel.: +49 1724 141441

Component: Brand: Panasonic
Type: Air to water heat pump
Model: SXC09H3E8 & UX09HE8
Series no.: 55182 & 56181
Production year: Indoor 2016, outdoor 2016.

Dates Component tested: December 2016

Procedure: Test procedure according to EHPA Air/Water Heat Pumps v. 2.3 and EN 14511:2013, part 1, 2 and 3.

Remarks: This report is revised because COP and heating capacity were interchanged for nominal performance test. The unit was delivered by the customer as model no. WH-SXC12H9E8 & WH-UX12HE8, cf. the rating plates of the units. By changing the software, the unit was changed to models no. WH-SXC09H3E8 & WH-UX09HE8. Installation, software change and setting of the unit's control system were done according to the manufacturer's instructions.

Conditions: Accredited testing was carried out in compliance with the current guidelines laid down by DANAK (Danish Laboratory Accreditation Scheme), please see www.danak.dk, and in compliance with Danish Technological Institute's General Terms and Conditions regarding Commissioned Work Accepted by Danish Technological Institute, March 2015.

The test results apply to the tested products only.

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Division/Centre: Danish Technological Institute
Energy and Climate
Refrigeration Laboratory, Aarhus

Date: 2016.12.23

Signature:

Co-reader:

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M.Sc. Engineer



Objective

The objective of this report is to document the following:

- Nominal performance test according to EN 14511:2013 for the determination of the heating capacity and COP.
- The Seasonal Coefficient of Performance (SCOP) according to EN 14825:2016. In order to calculate the SCOP, tests were carried out at the part load conditions stated in the table below.
- The sound power level of the unit at test conditions given in the EHPA Test Regulation version 2.3 for an air to water heat pump as well as two additional measurements, i.e. one measurement with quiet mode level 3 and another measurement with an outlet water temperature of 35°C.

The measurement of the sound power level is performed according to EN 12102:2013, using the Class A method. ISO 3743-1 is the basic method of carrying out sound power measurements. The method is briefly described in appendix 1. For a more detailed description, please view the accreditation papers DANAK-300 (in Danish only). The sound power level is not measured for the indoor unit as the compressor is not part of this.

- The operating range stated by the manufacturer. The test conditions are specified in the EHPA Test Regulation version 2.3 for an air to water heat pump.
- Four safety tests according to EHPA Test Regulation version 2.3.
- Extra test points (not included in the EHPA Test Regulation) according to EN 14511:2016.



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Test conditions for nominal performance test

Temperature application	N°	Test condition	Heat source		Heat sink	
			Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)
Low temperature	1	A7/W35	7	6	30	35
	2	A2/W35	2	1	*	35
Medium temperature	3	A7/W55	7	6	47	55

- Nominal performance test n°1 is required to determine the water flow rate for seasonal performance tests at low temperature application
- Nominal performance test n°2 is required to fulfil the minimum COP requirement of the EHPA Quality Label
- Nominal performance test n°3 is required to determine the water flow rate for seasonal performance tests at medium temperature application



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Test conditions for low temperature application at reference heating season average

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.

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



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Test conditions for medium temperature application at reference heating season average

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.

Condition	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 / 55	^a / 52	n/a	^a / 44
B	$(+2 - 16) / (T_{\text{designh}} - 16)$	54	100	37	2(1)	20(12)	^a / 55	^a / 42	^a / 55	^a / 37
C	$(+7 - 16) / (T_{\text{designh}} - 16)$	35	64	24	7(6)	20(12)	^a / 55	^a / 36	^a / 46	^a / 32
D	$(+12 - 16) / (T_{\text{designh}} - 16)$	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	$(-15 - 16) / (T_{\text{designh}} - 16)$	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	-10	-10	Variable	Variable



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Test conditions for sound power measurements

N°	Test condition		Heat pump setting	
	Outdoor heat exchanger (dry/wet bulb) (°C)	Indoor heat exchanger (inlet/outlet) (°C)	Compressor speed (Hz)	Water flow rate (l/h)
1	7/6	47/55	40-41	993
2	7/6	30/35	35-36	1576
3*	7/6	49.5/55	29-30	697

*Quiet mode level 3 with minimum water flow rate

Test conditions for testing of the operating range

N°	Air inlet dry bulb temperature (°C)	Outlet water temperature (°C)	Water flow rate (l/h)
1	35	55	1565
2	-20	55	1565
3	-20	25	774

Test conditions for safety tests

1	Shutting of the heat transfer medium flows (EN 14511-4 clause 4.4)
2	Complete power supply failure (EN 14511-4 clause 4.5)
3	Condensate draining and enclosure sweat test (EN 14511-4 clause 4.6)
4	Defrosting (EN 14511-4 clause 4.7)

Test conditions for extra test points

N°	Inlet dry bulb air temperature (°C)	Inlet wet bulb air temperature (°C)	Inlet water temperature (°C)	Outlet water temperature (°C)
1	7	6	40	45
2*	2	1	*	35
3	2	1	40	45
4	-7	-8	30	35

*Part load with same water flow rate as nominal performance test n°1



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Test results for nominal performance test

N°	Test condition	COP	Heating capacity [kW]
1	A7/W35	5.03	9.24
2	A2/W35	3.78	8.89
3	A7/W55	3.07	9.17



Main test results for low temperature application at reference heating season average

Type:				Air to water heat pump			
Brand:				Panasonic			
Model:				SXC09H3E8 & UX09HE8			
Serial no.:				55182 & 56181			
Production year:				2016 indoor, 2016 outdoor			
Refrigerant type:				R410A			
Refrigerant charge:				2.85 kg			
Build in water pump indoor heat exchanger				Yes			
Temperature application:				Low (reference water temperature 35°C)			
Reference heating season:				Average			
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Heating load of the building at Tdesignh	Pdesignh	9.24	kW	Seasonal Coefficient of Performance (heating only)	SCOP	4.89	-
Measured capacity for heating for part load at outdoor temperature Tj				Measured coefficient of performance at outdoor temperature Tj			
Tj = - 10 °C	Phm	9.24	kW	Tj = - 10 °C	COPm	2.98	
Tj = - 7 °C	Phm	8.94	kW	Tj = - 7 °C	COPm	3.13	-
Tj = + 2 °C	Phm	4.94	kW	Tj = + 2 °C	COPm	5.01	-
Tj = + 7 °C	Phm	5.30	kW	Tj = + 7 °C	COPm	6.39	-
Tj = + 12 °C	Phm	6.23	kW	Tj = + 12 °C	COPm	8.21	-
Design temperature	Tdesign	-10	°C	Heating water operating limit temperature	WTOL	-	°C
Bivalent temperature	Tbiv	-10	°C				
Degradation coefficient (measured)	Cdhm	1.00	-				
Power consumption in modes other than active mode				Supplementary heater			
Off mode	POFFm	0.009	kW	Rated heat output	Psupm	n.a.	kW
Thermostat-off mode	PTOm	0.002	kW				
Standby mode	PSBm	0.009	kW	Type of energy input	Electricity		
Crankcase heater mode	PCKm	0.039	kW				
Other items							
Capacity control	Variable speed compressor			For air to water heat pumps: Rated water flow rate, indoor heat exchanger	-	854-1556	l/h
	Variable indoor outlet temperature						
	Variable water flow indoor						
Sound power level, indoor/outdoor	LWA	n.a.	dB	For air to water heat pumps: Rated air flow rate, outdoor heat exchanger	-	n.a	l/h
Annual energy consumption	QHE	3907	kWh				



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Main test results for medium temperature application at reference heating season average

Type:	Air to water heat pump						
Brand:	Panasonic						
Model:	SXC09H3E8 & UX09HE8						
Serial no.:	55182 & 56181						
Production year:	2016 indoor, 2016 outdoor						
Refrigerant type:	R410A						
Refrigerant charge:	2.85 kg						
Build in water pump indoor heat exchanger	Yes						
Temperature application:	Medium (reference water temperature 55°C)						
Reference heating season:	Average						
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Heating load of the building at T_{designh}	<i>P_{designh}</i>	8.77	kW	Seasonal Coefficient of Performance (heating only)	SCOP	3.40	-
Measured capacity for heating for part load at outdoor temperature T _j				Measured coefficient of performance at outdoor temperature T _j			
T _j = - 10 °C	<i>Phm</i>	8.77	kW	T _j = - 10 °C	<i>COP_m</i>	2.09	
T _j = - 7 °C	<i>Phm</i>	7.76	kW	T _j = - 7 °C	<i>COP_m</i>	2.32	-
T _j = + 2 °C	<i>Phm</i>	4.44	kW	T _j = + 2 °C	<i>COP_m</i>	3.24	-
T _j = + 7 °C	<i>Phm</i>	4.79	kW	T _j = + 7 °C	<i>COP_m</i>	4.64	-
T _j = + 12 °C	<i>Phm</i>	5.94	kW	T _j = + 12 °C	<i>COP_m</i>	6.29	-
Design temperature	<i>T_{design}</i>	-10	°C	Heating water operating limit temperature	<i>WTOL</i>	-	°C
Bivalent temperature	<i>T_{biv}</i>	-10	°C				
Degradation coefficient (measured)	<i>C_{dhm}</i>	1.00	-				
Power consumption in modes other than active mode				Supplementary heater			
Off mode	<i>POFF_m</i>	0.009	kW	Rated heat output	<i>P_{supm}</i>	n.a.	kW
Thermostat-off mode	<i>PTOm</i>	0.002	kW	Type of energy input	Electricity		
Standby mode	<i>PSB_m</i>	0.009	kW				
Crankcase heater mode	<i>PCK_m</i>	0.039	kW				
Other items							
Capacity control	Variable speed compressor Variable indoor outlet temperature Variable water flow indoor			For air to water heat pumps: Rated water flow rate, indoor heat exchanger	-	624-944	l/h
Sound power level, indoor/outdoor	<i>LWA</i>	n.a.	dB	For air to water heat pumps: Rated air flow rate, outdoor heat exchanger	-	n.a.	l/h
Annual energy consumption	<i>QHE</i>	5324	kWh				

Detailed test results for low temperature application at reference heating season average

Calculation of reference SCOP (heating only)

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

Where

P_{design} = Heating load of the building at design temperature, kW
 H_{he} = Number of equivalent heating hours (1400), 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 calculation

	Outdoor air	Part load ratio	Part load	Measured capacity	COP at measured capacity COP _m	Degradation coefficient C _d	Capacity ratio CR	COP at part load COP _{pl}
	[°C]	[%]	[kW]	[kW]	[-]	[-]	[-]	[-]
A	-7	88	8,17	8,94	3,13	1,00	1,00	3,13
B	2	54	4,98	4,94	5,01	1,00	1,00	5,01
C	7	35	3,20	5,30	6,39	1,00	0,60	6,38
D	12	15	1,42	6,23	8,21	1,00	0,23	8,14
E(TOL)	-10	100	9,24	9,24	2,98	1,00	1,00	2,98
F(Bivalent)	-10	100	9,24	9,24	2,98	1,00	1,00	2,98

	Hours	Power input measured	Power input applied for SCOP calculation	Annual energy input
	[h]	[W]	[W]	[kWh]
Thermostat Off mode	178	2	0	0,00
Off mode	3672	9	9	33,05
Crankcase Heater	3850	39	30	115,50
Standby mode	0	9	9	0,00
			Total	148,55

Note: Prior to the SCOP calculation, the power consumption during standby mode is deducted from both the thermostat off mode and the crankcase heater mode, according to EN14825:2016.



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Calculation of SCOP_{on}

	Outdoor temperature (dry bulb)	Hours	Heat demand	Heat demand covered by heat pump	Electrical back up heater	COP(pl)	Annual heat demand	Annual energy input including electrical back up heater
	T _j [°C]	h _j [h]	Ph(T _j) [kW]		elbu(T _j) [kW]		h _j x Ph(T _j) [kWh]	
E(TOL) and F(bival	-10	1	9,24	9,24	0,00	2,98	9,24	3,10
	-9	25	8,88	8,88	0,00	3,03	222,12	73,31
	-8	23	8,53	8,53	0,00	3,08	196,17	63,69
A	-7	24	8,17	8,17	0,00	3,13	196,17	62,67
	-6	27	7,82	7,82	0,00	3,34	211,10	63,22
	-5	68	7,46	7,46	0,00	3,55	507,49	143,04
	-4	91	7,11	7,11	0,00	3,76	646,80	172,17
	-3	89	6,75	6,75	0,00	3,97	600,96	151,54
	-2	165	6,40	6,40	0,00	4,17	1055,49	252,85
	-1	173	6,04	6,04	0,00	4,38	1045,19	238,45
	0	240	5,69	5,69	0,00	4,59	1364,68	297,17
	1	280	5,33	5,33	0,00	4,80	1492,62	310,89
B	2	320	4,98	4,94	0,00	5,01	1592,12	317,79
	3	357	4,62	4,62	0,00	5,28	1649,34	312,14
	4	356	4,26	4,26	0,00	5,56	1518,20	273,16
	5	303	3,91	3,91	0,00	5,83	1184,50	203,11
	6	330	3,55	3,55	0,00	6,11	1172,77	192,07
C	7	326	3,20	3,20	0,00	6,38	1042,70	163,44
	8	348	2,84	2,84	0,00	6,73	989,39	146,98
	9	335	2,49	2,49	0,00	7,08	833,38	117,66
	10	315	2,13	2,13	0,00	7,43	671,68	90,35
	11	215	1,78	1,78	0,00	7,79	382,04	49,07
D	12	169	1,42	1,42	0,00	8,14	240,24	29,52
	13	151	1,07	1,07	0,00	8,49	160,99	18,96
	14	105	0,71	0,71	0,00	8,84	74,63	8,44
	15	74	0,36	0,36	0,00	9,19	26,30	2,86
						Total	19086,29	3757,66
							SCOP _{on}	5,08
							SCOP _{ref}	4,89

Detailed test results for medium temperature application at reference heating season average

Calculation of reference SCOP (heating only)

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

Where

P_{design} = Heating load of the building at design temperature, kW
 H_{he} = Number of equivalent heating hours (1400), 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 calculation

	Outdoor air	Part load ratio	Part load	Measured capacity	COP at measured capacity COP _m	Degradation coefficient Cd	Capacity ratio CR	COP at part load COP _{pl}
	[°C]	[%]	[kW]	[kW]	[-]	[-]	[-]	[-]
A	-7	88	7,76	7,76	2,32	1,00	1,00	2,32
B	2	54	4,72	4,44	3,24	1,00	1,00	3,24
C	7	35	3,04	4,79	4,64	1,00	0,63	4,63
D	12	15	1,35	5,94	6,29	1,00	0,23	6,24
E(TOL)	-10	100	8,77	8,77	2,09	1,00	1,00	2,09
F(Bivalent)	-10	100	8,77	8,77	2,09	1,00	1,00	2,09

	Hours	Power input measured	Power input applied for SCOP calculation	Annual energy input
	[h]	[W]	[W]	[kWh]
Thermostat Off mode	178	2	0	0,00
Off mode	3672	9	9	33,05
Crankcase Heater	3850	39	30	115,50
Standby mode	0	9	9	0,00
			Total	148,55

Note: Prior to the SCOP calculation, the power consumption during standby mode is deducted from both the thermostat off mode and the crankcase heater mode, according to EN14825:2016.



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Calculation of SCOP_{on}

	Outdoor temperature (dry bulb)	Hours	Heat demand	Heat demand covered by heat pump	Electrical back up heater	COP(pl)	Annual heat demand	Annual energy input including electrical back up heater
	T _j	h _j	Ph(T _j)		elbu(T _j)		h _j x Ph(T _j)	
	[°C]	[h]	[kW]	[kW]	[kW]	[-]	[kWh]	[kWh]
E(TOL) and F(bival)	-10	1	8,77	8,77	0,00	2,09	8,77	4,20
	-9	25	8,43	8,43	0,00	2,17	210,82	97,30
	-8	23	8,10	8,10	0,00	2,24	186,19	83,00
A	-7	24	7,76	7,76	0,00	2,32	186,19	80,26
	-6	27	7,42	7,39	0,00	2,42	200,36	82,72
	-5	68	7,08	7,02	0,00	2,52	481,68	190,80
	-4	91	6,75	6,65	0,00	2,63	613,90	233,72
	-3	89	6,41	6,28	0,00	2,73	570,39	209,02
	-2	165	6,07	5,92	0,00	2,83	1001,80	353,86
	-1	173	5,73	5,55	0,00	2,93	992,02	338,19
	0	240	5,40	5,18	0,00	3,04	1295,26	426,70
	1	280	5,06	4,81	0,00	3,14	1416,69	451,50
B	2	320	4,72	4,44	0,00	3,24	1511,14	466,40
	3	357	4,39	4,39	0,00	3,52	1565,45	444,86
	4	356	4,05	4,05	0,00	3,80	1440,98	379,41
	5	303	3,71	3,71	0,00	4,08	1124,25	275,76
	6	330	3,37	3,37	0,00	4,36	1113,12	255,54
C	7	326	3,04	3,04	0,00	4,63	989,66	213,53
	8	348	2,70	2,70	0,00	4,96	939,06	189,45
	9	335	2,36	2,36	0,00	5,28	790,99	149,84
	10	315	2,02	2,02	0,00	5,60	637,51	113,82
	11	215	1,69	1,69	0,00	5,92	362,61	61,22
D	12	169	1,35	1,35	0,00	6,24	228,02	36,51
	13	151	1,01	1,01	0,00	6,57	152,80	23,27
	14	105	0,67	0,67	0,00	6,89	70,83	10,28
	15	74	0,34	0,34	0,00	7,21	24,96	3,46
						Total	18115,45	5174,61
							SCOP _{on}	3,50
							SCOP _{ref}	3,40



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Test results of the sound power test

Test results of the sound power measurements N°	Sound power level LW(A) [dB re 1pW]	Uncertainty (dB) (weighted value)
1	64	0.3
2	60	0.4
3	62	0.3

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.

Test results of the operating range test

N°	Air inlet dry bulb temperature (°C)	Outlet water temperature (°C)	Result
1	35	55	Passed
2	-20	55	Passed
3	-20	25	Passed

Test results of the safety tests

N°	Safety test	Result
1	Shutting of the heat transfer medium flows (EN 14511-4 clause 4.4)	Passed
2	Complete power supply failure (EN 14511-4 clause 4.5)	Passed
3	Condensate draining and enclosure sweat test (EN 14511-4 clause 4.6)	Passed
4	Defrosting (EN 14511-4 clause 4.7)	Passed



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Test conditions for extra test points

N°	Test condition	COP	Heating capacity – [kW]
1	A7/W45	3.83	9.3
2	A2/W35	3.86	4.34
3	A2/W45	3.01	9.09
4	A-7/W35	3.16	10.04



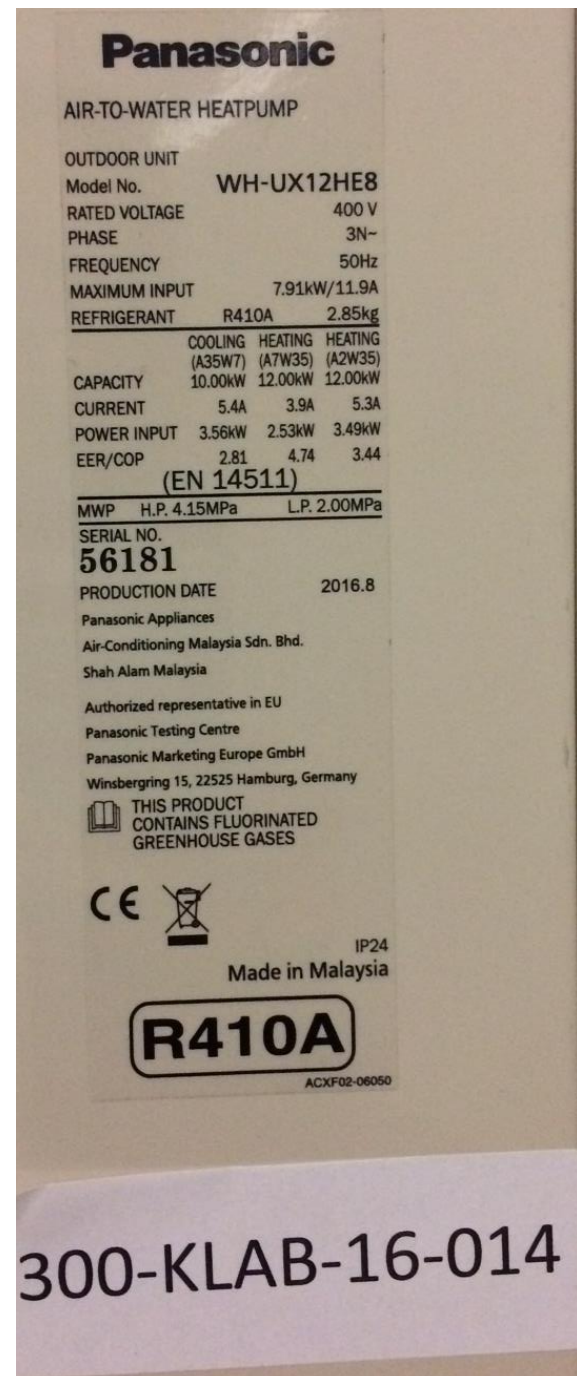
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Outdoor unit



Rating plate - outdoor unit





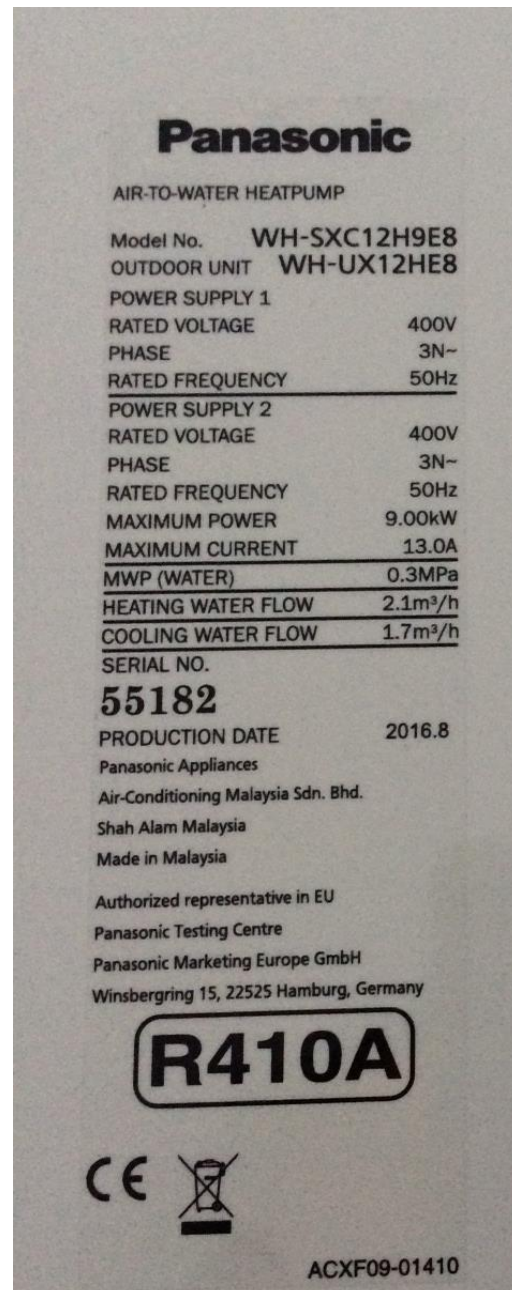
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Indoor unit



Rating plate - indoor unit





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Detailed test results - nominal performance test

Detailed result for 'EN 14511:2013' A7/W35		
Tested according to:		EN 14511:2013
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	9,24
COP	-	5,03
Power consumption	kW	1,84
Measured		
Heating capacity	kW	9,28
COP	-	4,94
Power consumption	kW	1,88
During heating		
Air temperature dry bulb	°C	7,0
Air temperature wet bulb	°C	6,0
Inlet temperature	°C	30,0
Outlet temperature	°C	35,1
Flow	l/h	1576
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	409
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,038



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Detailed result for 'EN 14511:2013' A2/W35		
Tested according to:		EN 14511:2013
Measurement type:		Transient
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	8,89
COP	-	3,78
Power consumption	kW	2,35
Measured		
Heating capacity	kW	8,93
COP	-	3,73
Power consumption	kW	2,39
During heating		
Air temperature dry bulb	°C	1,8
Air temperature wet bulb	°C	1,0
Inlet temperature	°C	29,4
Outlet temperature	°C	35,0
Flow	l/h	1566
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	410
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,038



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Detailed result for 'EN 14511:2013' A7/W55		
Tested according to:	EN 14511:2013	
Measurement type:	Steady state	
Data treatment according to EN14511-3:2013 Annex C		
Integrated circulation pump:	Yes	
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	9,17
COP	-	3,07
Power consumption	kW	2,99
Measured		
Heating capacity	kW	9,20
COP	-	3,05
Power consumption	kW	3,01
During heating		
Air temperature dry bulb	°C	7,1
Air temperature wet bulb	°C	6,0
Inlet temperature	°C	47,0
Outlet temperature	°C	55,0
Flow	l/h	993
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	612
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,028



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Detailed test results - low temperature application

Detailed result for 'EN 14825:2016' Average Low (E) A-10/W35		
Tested according to:		EN 14825:2016
Climate zone:		Average
Temperature application:		Low
Condition name:		E
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9,24
Heating demand:	kW	9,24
CR:	-	1,00
Minimum flow reached:	-	No
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	9,24
COP	-	2,98
Power consumption	kW	3,10
Measured		
Heating capacity	kW	9,28
COP	-	2,96
Power consumption	kW	3,13
During heating		
Air temperature dry bulb	°C	-9,9
Air temperature wet bulb	°C	-11,0
Inlet temperature	°C	30,0
Outlet temperature	°C	35,1
Outlet temperature (Time averaged)	°C	35,1
Flow	l/h	1556
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	408
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,038



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Detailed result for 'EN 14825:2016' Average Low (A) A-7/W34		
Tested according to:		EN 14825:2016
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	9,24
Heating demand:	kW	8,17
CR:	-	1,00
Minimum flow reached:	-	No
Measurement type:		Transient
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	8,94
COP	-	3,13
Power consumption	kW	2,86
Measured		
Heating capacity	kW	8,98
COP	-	3,10
Power consumption	kW	2,90
During heating		
Air temperature dry bulb	°C	-7,1
Air temperature wet bulb	°C	-8,1
Inlet temperature	°C	29,0
Outlet temperature	°C	34,0
Outlet temperature (Time averaged)	°C	34,0
Flow	l/h	1636
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	383
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,039



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Detailed result for 'EN 14825:2016' Average Low (B) A2/W30		
Tested according to:		EN 14825:2016
Climate zone:		Average
Temperature application:		Low
Condition name:		B
Condition temperature:	°C	2
Part load:	%	54%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9,24
Heating demand:	kW	4,98
CR:	-	1,00
Minimum flow reached:	-	No
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	4,94
COP	-	5,01
Power consumption	kW	0,99
Measured		
Heating capacity	kW	4,97
COP	-	4,91
Power consumption	kW	1,01
During heating		
Air temperature dry bulb	°C	2,0
Air temperature wet bulb	°C	1,2
Inlet temperature	°C	25,0
Outlet temperature	°C	30,0
Outlet temperature (Time averaged)	°C	30,0
Flow	l/h	854
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	586
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,025



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Detailed result for 'EN 14825:2016' Average Low (C) A7/W27		
Tested according to:		EN 14825:2016
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	9,24
Heating demand:	kW	3,20
CR:	-	0,60
Minimum flow reached:	-	Yes
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	5,30
COP	-	6,39
Power consumption	kW	0,83
Measured		
Heating capacity	kW	5,33
COP	-	6,22
Power consumption	kW	0,86
During heating		
Air temperature dry bulb	°C	7,0
Air temperature wet bulb	°C	6,0
Inlet temperature	°C	24,1
Outlet temperature	°C	29,0
Outlet temperature (Time averaged)	°C	27,0
Flow	l/h	925
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	574
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,026



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Detailed result for 'EN 14825:2016' Average Low (D) A12/W24		
Tested according to:		EN 14825:2016
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	9,24
Heating demand:	kW	1,42
CR:	-	0,23
Minimum flow reached:	-	Yes
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	6,23
COP	-	8,21
Power consumption	kW	0,76
Measured		
Heating capacity	kW	6,26
COP	-	7,94
Power consumption	kW	0,79
During heating		
Air temperature dry bulb	°C	12,0
Air temperature wet bulb	°C	11,0
Inlet temperature	°C	23,0
Outlet temperature	°C	28,0
Outlet temperature (Time averaged)	°C	24,1
Flow	l/h	1062
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	560
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,029



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Detailed test results - medium temperature application

Detailed result for 'EN 14825:2016' Average Medium (A) A-7/W52		
Tested according to:		EN 14825:2016
Climate zone:		Average
Temperature application:		Medium
Condition name:		A
Condition temperature:	°C	-7
Part load:	%	88%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	8,7
Heating demand:	kW	7,70
CR:	-	1,00
Minimum flow reached:	-	No
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	7,76
COP	-	2,32
Power consumption	kW	3,34
Measured		
Heating capacity	kW	7,78
COP	-	2,31
Power consumption	kW	3,36
During heating		
Air temperature dry bulb	°C	-6,9
Air temperature wet bulb	°C	-8,0
Inlet temperature	°C	44,0
Outlet temperature	°C	52,1
Outlet temperature (Time averaged)	°C	52,1
Flow	l/h	824
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	646
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,024



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Detailed result for 'EN 14825:2016' Average Medium (B) A2/W42		
Tested according to:		EN 14825:2016
Climate zone:		Average
Temperature application:		Medium
Condition name:		B
Condition temperature:	°C	2
Part load:	%	54%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	8,7
Heating demand:	kW	4,68
CR:	-	1,00
Minimum flow reached:	-	Yes
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	4,44
COP	-	3,24
Power consumption	kW	1,37
Measured		
Heating capacity	kW	4,46
COP	-	3,20
Power consumption	kW	1,39
During heating		
Air temperature dry bulb	°C	1,9
Air temperature wet bulb	°C	1,2
Inlet temperature	°C	36,4
Outlet temperature	°C	41,9
Outlet temperature (Time averaged)	°C	41,9
Flow	l/h	695
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	624
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,022



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Detailed result for 'EN 14825:2016' Average Medium (C) A7/W36		
Tested according to:		EN 14825:2016
Climate zone:		Average
Temperature application:		Medium
Condition name:		C
Condition temperature:	°C	7
Part load:	%	35%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	8.7
Heating demand:	kW	3.01
CR:	-	0.63
Minimum flow reached:	-	Yes
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	4.78
COP	-	4.64
Power consumption	kW	1.03
Measured		
Heating capacity	kW	4.80
COP	-	4.56
Power consumption	kW	1.05
During heating		
Air temperature dry bulb	°C	7.1
Air temperature wet bulb	°C	6.0
Inlet temperature	°C	32.4
Outlet temperature	°C	38.0
Outlet temperature (Time averaged)	°C	35.9
Flow	l/h	745
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	615
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0.023



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Detailed result for 'EN 14825:2016' Average Medium (D) A12/W30		
Tested according to:		EN 14825:2016
Climate zone:		Average
Temperature application:		Medium
Condition name:		D
Condition temperature:	°C	12
Part load:	%	15%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	8,7
Heating demand:	kW	1,34
CR:	-	0,23
Minimum flow reached:	-	Yes
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	5,94
COP	-	6,29
Power consumption	kW	0,95
Measured		
Heating capacity	kW	5,97
COP	-	6,16
Power consumption	kW	0,97
During heating		
Air temperature dry bulb	°C	12,0
Air temperature wet bulb	°C	11,0
Inlet temperature	°C	28,5
Outlet temperature	°C	35,4
Outlet temperature (Time averaged)	°C	30,0
Flow	l/h	746
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	610
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,023



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Detailed result for 'EN 14825:2016' Average Medium (E) A-10/W55		
Tested according to:		EN 14825:2016
Climate zone:		Average
Temperature application:		Medium
Condition name:		E
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	8,77
Heating demand:	kW	8,77
CR:	-	1,00
Minimum flow reached:	-	No
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	8,77
COP	-	2,09
Power consumption	kW	4,19
Measured		
Heating capacity	kW	8,80
COP	-	2,09
Power consumption	kW	4,21
During heating		
Air temperature dry bulb	°C	-9,9
Air temperature wet bulb	°C	-10,9
Inlet temperature	°C	47,0
Outlet temperature	°C	55,0
Outlet temperature (Time averaged)	°C	55,0
Flow	l/h	944
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	635
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,027



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Detailed test results - extra test points

Detailed result for 'EN 14511:2013' A7/W45		
Tested according to:		EN 14511:2013
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	9,30
COP	-	3,83
Power consumption	kW	2,43
Measured		
Heating capacity	kW	9,34
COP	-	3,78
Power consumption	kW	2,47
During heating		
Air temperature dry bulb	°C	7,0
Air temperature wet bulb	°C	6,0
Inlet temperature	°C	40,0
Outlet temperature	°C	45,1
Flow	l/h	1577
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	427
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,038



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Detailed result for 'EN 14511:2013' A2/W35 part load		
Tested according to:		EN 14511:2013
Measurement type:		Steady state
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:		Yes
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	4.34
COP	-	3.86
Power consumption	kW	1.12
Measured		
Heating capacity	kW	4.38
COP	-	3.77
Power consumption	kW	1.16
During heating		
Air temperature dry bulb	°C	1.8
Air temperature wet bulb	°C	1.0
Inlet temperature	°C	32.8
Outlet temperature	°C	35.2
Flow	l/h	1566
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	403
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0.038



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Detailed result for 'EN 14511:2013' A2/W45		
Tested according to:	EN 14511:2013	
Measurement type:	Transient	
Data treatment according to EN14511-3:2013 Annex C		
Integrated circulation pump:	Yes	
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	9,09
COP	-	3,01
Power consumption	kW	3,02
Measured		
Heating capacity	kW	9,13
COP	-	2,99
Power consumption	kW	3,05
During heating		
Air temperature dry bulb	°C	1,9
Air temperature wet bulb	°C	1,0
Inlet temperature	°C	39,4
Outlet temperature	°C	44,9
Flow	l/h	1566
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	435
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,038



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Detailed result for 'EN 14511:2013' A-7/W35




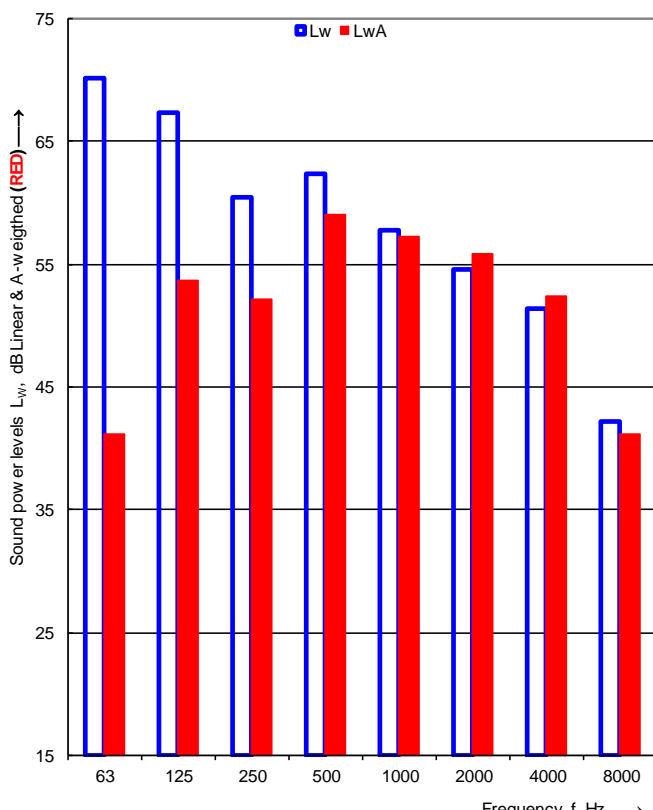
Tested according to:	EN 14511:2013	
Measurement type:	Steady state	
<i>Data treatment according to EN14511-3:2013 Annex C</i>		
Integrated circulation pump:	Yes	
Corrected for power input of liquid pumps (Final result)		
Heating capacity	kW	10,04
COP	-	3,16
Power consumption	kW	3,17
Measured		
Heating capacity	kW	10,08
COP	-	3,14
Power consumption	kW	3,21
During heating		
Air temperature dry bulb	°C	-6,9
Air temperature wet bulb	°C	-8,0
Inlet temperature	°C	29,7
Outlet temperature	°C	35,2
Flow	l/h	1566
Circulation pump		
Measured: Static differential pressure, liquid pump	mbar	402
Used in calculation: Static differential pressure, liquid pump	mbar	100
Correction of power input, liquid pump	kW	0,038



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Detailed test results - sound power level - test 1




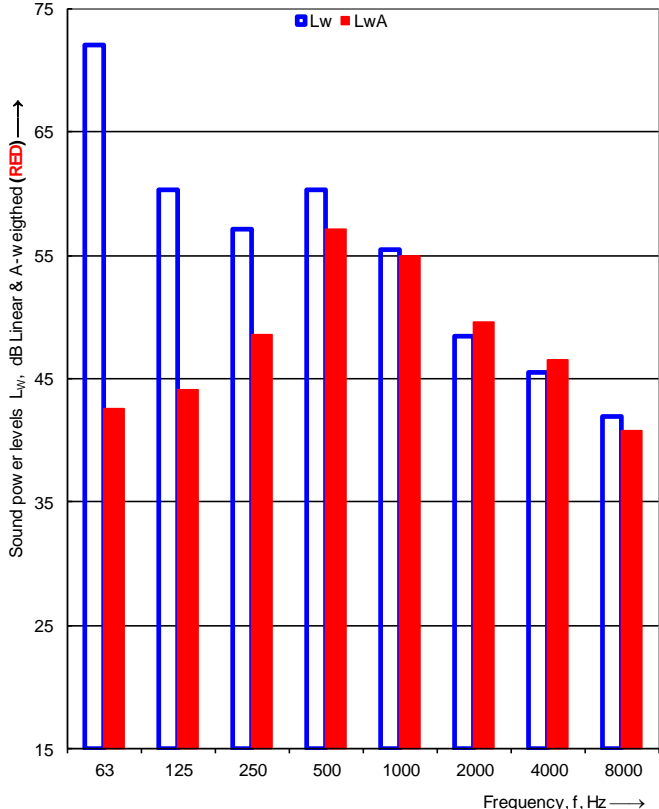
 		Sound power levels according to ISO 3743-1:2010	 TEKNOLOGISK INSTITUT																																																																		
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																					
Client:	Panasonic DE GmbH		Date of test: 15-12-2016																																																																		
Object:	Type: Split air to water heatpump Model: Panasonic UX09HE8 (Out door) - SXC09H3E8 (In door)																																																																				
Mounting conditions:	The outdoor unit is standing free on four 5.5 cm thick heavy concrete tiles placed on a vibration damping mat, which is placed on a water drop tray. The water drop tray is located on a 2.5 cm thick wooden board laying on the floor. The outdoor unit is mounted on the supporting 4 meta/rubber support frame.																																																																				
Operating conditions:	A7/W55, Compressor speed: 40 - 41 [Hz], Heating capacity: 9.17[kW], COP: 3.07, Water flow rate: 993 [l/h]																																																																				
Static pressure:	1013 kPa	<u>Reference box:</u>																																																																			
Air temperature:	7,0 °C	L1: 0,9 m																																																																			
Relative air humidity:	84,0 %	L2: 0,3 m																																																																			
Test room volume:	102,8 m ³	L3: 1,3 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): 64 dB [re 1pW]																																																																					
Name of test institute:	DTI																																																																				
No. of test report:	300-KLAB-16-014																																																																				
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Detailed test results - sound power level - test 2




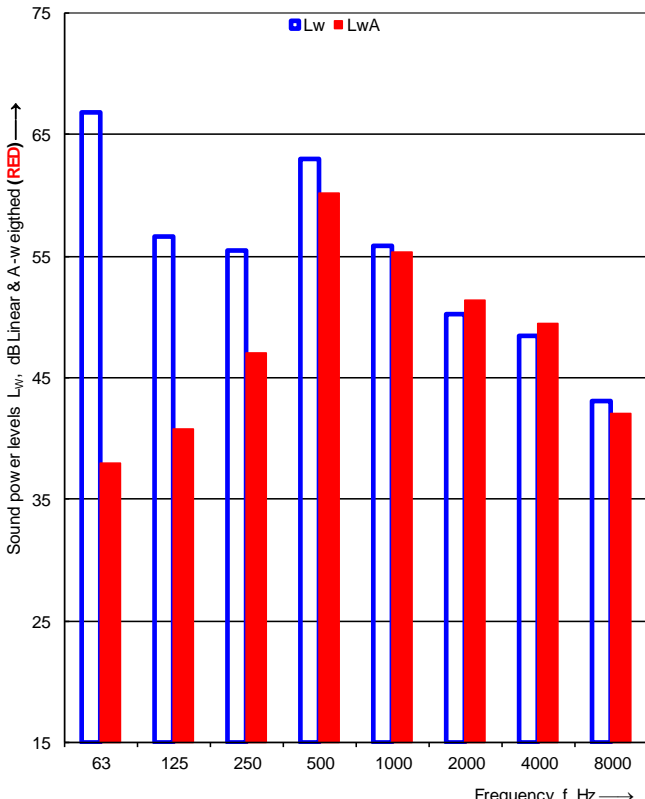
 		Sound power levels according to ISO 3743-1:2010	 TEKNOLOGISK INSTITUT																																																																		
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																					
Client:	Panasonic DE GmbH		Date of test: 15-12-2016																																																																		
Object:	Type: Split air to water heatpump Model: Panasonic UX09HE8(Out door) - SXC09H3EB(In door)																																																																				
Mounting conditions:	The outdoor unit is standing free on four 5.5 cm thick heavy concrete tiles placed on a vibration damping mat, which is placed on a water drop tray. The water drop tray is located on a 2.5 cm thick wooden board laying on the floor. The outdoor unit is mounted on the supporting 4 meta/rubber support frame.																																																																				
Operating conditions:	A7/W35, Compressor speed: 35 - 36 [Hz], Heating capacity: 9.24[kW], COP: 5.03, Water flow rate: 1576 [l/h]																																																																				
Static pressure:	1013 kPa	<u>Reference box:</u>																																																																			
Air temperature:	7,0 °C	L1: 0,9 m																																																																			
Relative air humidity:	84,0 %	L2: 0,3 m																																																																			
Test room volume:	102,8 m³	L3: 1,3 m																																																																			
Area, S, of test room:	138,9 m²	Volume: 0,4 m³																																																																			
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Sound power level L _w (A):		60 dB [re 1pW]																																																																			
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Detailed test results - sound power level - test 3

 		Sound power levels according to ISO 3743-1:2010	 TEKNOLOGISK INSTITUT																																																																		
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Client:	Panasonic DE GmbH		Date of test: 15-12-2016																																																																		
Object:	Type: Split air to water heatpump Model: Panasonic UX09HE8(Out door) - SXC09H3E8(In door)																																																																				
Mounting conditions:	The outdoor unit is standing free on four 5.5 cm thick heavy concrete tiles placed on a vibration damping mat, which is placed on a water drop tray. The water drop tray is located on a 2.5 cm thick wooden board laying on the floor. The outdoor unit is mounted on the supporting 4 meta/rubber support frame.																																																																				
Operating conditions:		A7/W 49.5 - 55, Compressor speed: 29 - 30 [Hz], Heating capacity: 4.4[kW], COP: 2.1, Water flow rate: 697 [l/h], Quiet mode: Level 3																																																																			
Static pressure:	1013 kPa	Reference box:																																																																			
Air temperature:	7,0 °C	L1: 0,9 m																																																																			
Relative air humidity:	84,0 %	L2: 0,3 m																																																																			
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Sound power level L _w (A):		62 dB [re 1pW]																																																																			
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Appendix 1: Test Procedure

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

- DS/EN 14511:2013
- EN 12102
- DS/EN 3743/1

The basic acoustic measurement standard DS/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.