TEST REPORT

Report no.:
300-KLAB-24-055

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Init: PRES/KAMA
File no.: 272383
Enclosures: 1

Customer:	Company:	NINGBO AUX ELECTRIC CO., LTD
	Address:	NO.1166 MingGuang North Road
	City:	JiangShan Town, Yinzhou Disrtict, Ningbo, Zhejiang,China PR CHINA
Component:	Brand:	AUX
	Type:	Air to water heat pump (Split)
	Model:	Outdoor unit: ACHP-H12/5R3HA-O
		Indoor unit: ACHP-H12/5R3HA-I
	Series no.:	Outdoor unit: E0385A959701W00003
		Indoor unit: C1672A959702N00011
	Prod. year:	Outdoor unit: 2024.02 Indoor unit: 2024.02
Dates:	Component tested:	September 2024

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. Between each test condition, AUX has been changing various parameters like compressor speed, expansion valve, fan speed, pump speed, defrost time, heating time.

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

Date: 2024.10.07

Signature:
Preben Elbek Eskerod
B.TecMan & MarEng

Co-reader:
Kamathasan Arumugam
B.Sc. Engineer

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 14825:2022.

In order to calculate the SCOP, tests were carried out at the part load conditions stated in the tables on page 4 and 5.

COP test at standard rating conditions A7/W35 and A7/W55 according to EN 14511:2022.

Sound power measurements according to EN 12102-1:2022.

Contents:

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.

	Part load ratio in %				Outdoor heat exchanger		Indoor heat exchanger			
					Dry (wet) bulb temperature °C		Fixed outlet °C	Variable outlet[d] °C		
	Formula	Average	Warmer	Colder	Outdoor air	Exhaust air	All climates	Average	Warmer	Colder
A	$(-7 - 16) / (T_{designh} - 16)$	88,46	n.a.	60,53	−7(−8)	20(12)	[a] / 35	[a] / 34	n.a.	[a] / 30
B	$(+2 - 16) / (T_{designh} - 16)$	53,85	100,00	36,84	2(1)	20(12)	[a] / 35	[a] / 30	[a] / 35	[a] / 27
C	$(+7 - 16) / (T_{designh} - 16)$	34,62	64,29	23,68	7(6)	20(12)	[a] / 35	[a] / 27	[a] / 31	[a] / 25
D	$(+12 - 16) / (T_{designh} - 16)$	15,38	28,57	10,53	12(11)	20(12)	[a] / 35	[a] / 24	[a] / 26	[a] / 24
E	$(TOL^{e} - 16) / (T_{designh} - 16)$				TOL^{e}	20(12)	[a] / 35	[a] / [b]	[a] / [b]	[a] / [b]
F	$(T_{biv} - 16) / (T_{designh} - 16)$				T_{biv}	20(12)	[a] / 35	[a] / [c]	[a] / [c]	[a] / [c]
G	$(-15 - 16) / (T_{designh} - 16)$	n.a.	n.a.	81,58	−15	20(12)	[a] / 35	n.a.	n.a.	[a] / 32

Additional information

Climate	$T_{designh}$ [°C]	$T_{bivalent}$ [°C]	TOL [°C]	Outlet temperature	Flow rate
Average	-10	-7	-10	Variable	Variable

SCOP test conditions for medium temperature – EN 14825

Part load conditions for reference SCOP and reference SCOPon calculation of air to water units for medium temperature application for the reference heating season;
"A" = average, "W" = warmer, and "C" = colder.

	Part load ratio in %				Outdoor heat exchanger		Indoor heat exchanger			
					Dry (wet) bulb temperature °C		Fixed outlet °C	Variable outlet[d] °C		
	Formula	Average	Warmer	Colder	Outdoor air	Exhaust air	All climates	Average	Warmer	Colder
A	$(-7 - 16) / (T_{designh} - 16)$	88,46	n.a.	60,53	-7(-8)	20(12)	[a] / 55	[a] / 52	n.a.	[a] / 44
B	$(+2 - 16) / (T_{designh} - 16)$	53,85	100	36,84	2(1)	20(12)	[a] / 55	[a] / 42	[a] / 55	[a] / 37
C	$(+7 - 16) / (T_{designh} - 16)$	34,62	64,29	23,68	7(6)	20(12)	[a] / 55	[a] / 36	[a] / 46	[a] / 32
D	$(+12 - 16) / (T_{designh} - 16)$	15,38	28,57	10,53	12(11)	20(12)	[a] / 55	[a] / 30	[a] / 34	[a] / 28
E	$(TOL^{e} - 16) / (T_{designh} - 16)$				TOL^{e}	20(12)	[a] / 55	[a] / [b]	[a] / [b]	[a] / [b]
F	$(T_{biv} - 16) / (T_{designh} - 16)$				T_{biv}	20(12)	[a] / 55	[a] / [c]	[a] / [c]	[a] / [c]
G	$(-15 - 16) / (T_{designh} - 16)$	n.a.	n.a.	81,58	-15	20(12)	[a] / 55	n.a.	n.a.	[a] / 49

Additional information

Climate	$T_{designh}$ [°C]	$T_{bivalent}$ [°C]	TOL [°C]	Outlet temperature	Flow rate
Average	-10	-7	-10	Variable	Variable

COP test conditions for standard rating test – EN 14511

N#	Heat source		Heat sink	
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)
1	7	6	30	35
2	7	6	47	55

Test conditions for sound power measurement - EN12102-1

N#	Test condition		Heat pump setting			
	Ambient air temperature (°C)	Out/indoor heat exchanger (°C)	Compressor speed (Hz)	Fan speed (rpm)	Heating capacity (kW)	Power input (kW)
1[1]	20	7/55	-	-	4.23	1.68
2[2]	7	7/55	22	360	4.23	1.68

1) Indoor unit
2) Outdoor unit

Test results

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

Model (Outdoor)	ACHP-H12/5R3HA-O
Air-to-water heat pump mono bloc	N
Low-temperature heat pump	N
Equipped with supplementary heater	N
Heat pump combination heater	N
Reversible	Y

Rated heat output[1)]	P_{rated}	**12.2** [kW]
Seasonal space heating energy efficiency	η_s	**190.3** [%]
	SCOP	**4.83** [-]

Measured capacity for heating for part load at outdoor temperature Tj	Average Climate - Low temperature application	Tj=-15 °C	Pdh	- [kW]
		Tj=-7 °C	Pdh	10.19 [kW]
		Tj=2 °C	Pdh	6.10 [kW]
		Tj=7 °C	Pdh	4.32 [kW]
		Tj=12 °C	Pdh	4.56 [kW]
		Tj=bivalent temperature	Pdh	10.19 [kW]
		Tj=operation limit	Pdh	11.60 [kW]

Measured coefficient of performance at outdoor temperature Tj	Average Climate - Low temperature application	Tj=-15 °C	COPd	- [-]
		Tj=-7 °C	COPd	3.02 [-]
		Tj=2 °C	COPd	4.65 [-]
		Tj=7 °C	COPd	6.54 [-]
		Tj=12 °C	COPd	8.34 [-]
		Tj=bivalent temperature	COPd	3.02 [-]
		Tj=operation limit	COPd	2.71 [-]

Bivalent temperature	Tbivalent	-7 [°C]
Operation limit	TOL	-10 [°C]
temperatures	WTOL	- [°C]
Degradation coefficient	Cdh	0.93 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.023 [kW]
	Thermostat-off mode	P_{TO}	0.038 [kW]
	Standby mode	P_{SB}	0.023 [kW]
	Crankcase heater mode	P_{CK}	0.023 [kW]
Supplementary heater[1)]	Rated heat output	P_{SUP}	0.60 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Variable
	Water flow rate		Variable
	Annual energy consumption	Q_{HE}	5215 [kWh]

[1)]For heat pump space heaters and heat pump combination heaters, the rated heat output, Prated, is equal to the design load for heating, Pdesignh, and the rated heat output of a supplementary heater, Psup, is equal to the supplementary capacity for heating, sup(Tj).

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

Model (Outdoor)	ACHP-H12/5R3HA-O
Air-to-water heat pump mono bloc	N
Low-temperature heat pump	N
Equipped with supplementary heater	N
Heat pump combination heater	N
Reversible	Y

Rated heat output[1)]	P_{rated}	**12**	[kW]
Seasonal space heating energy efficiency	η_s	**140.4**	[%]
	SCOP	**3.59**	[-]

Measured capacity for heating for part load at outdoor temperature Tj	Average Climate - Medium temperature application	Tj=-15 °C	Pdh	-	[kW]
		Tj=-7 °C	Pdh	10.65	[kW]
		Tj=2 °C	Pdh	6.15	[kW]
		Tj=7 °C	Pdh	4.22	[kW]
		Tj=12 °C	Pdh	4.16	[kW]
		Tj=bivalent temperature	Pdh	10.65	[kW]
		Tj=operation limit	Pdh	9.51	[kW]

Measured coefficient of performance at outdoor temperature Tj	Average Climate - Medium temperature application	Tj=-15 °C	COPd	-	[-]
		Tj=-7 °C	COPd	2.26	[-]
		Tj=2 °C	COPd	3.47	[-]
		Tj=7 °C	COPd	4.73	[-]
		Tj=12 °C	COPd	6.20	[-]
		Tj=bivalent temperature	COPd	2.26	[-]
		Tj=operation limit	COPd	1.97	[-]

Bivalent temperature	Tbivalent	-7	[°C]
Operation limit	TOL	-10	[°C]
temperatures	WTOL	-	[°C]
Degradation coefficient	Cdh	0.94	[-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.023	[kW]
	Thermostat-off mode	P_{TO}	0.038	[kW]
	Standby mode	P_{SB}	0.023	[kW]
	Crankcase heater mode	P_{CK}	0.023	[kW]
Supplementary heater[1)]	Rated heat output	P_{SUP}	2.49	[kW]
	Type of energy input		Electrical	

Other items	Capacity control		Variable	
	Water flow control		Variable	
	Water flow rate		Variable	
	Annual energy consumption	Q_{HE}	6915	[kWh]

[1)]For heat pump space heaters and heat pump combination heaters, the rated heat output, Prated, is equal to the design load for heating, Pdesignh, and the rated heat output of a supplementary heater, Psup, is equal to the supplementary capacity for heating, sup(Tj).

COP test results of standard rating test – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W35	12.148	4.881
2	A7/W55	12.013	3.157

Test results of sound power measurements - EN 12102-1

N#	Sound power level LW(A) [dB re 1pW]	Uncertainty (dB) (weighted value)
1[1]	**45.4**	1.6
2[2]	**56.4**	1.6

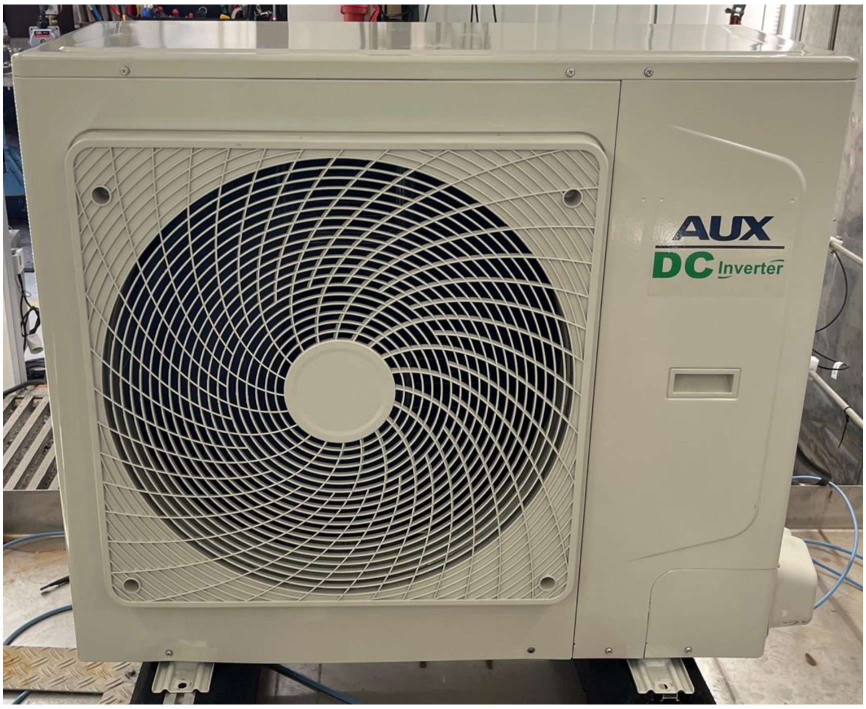
1) Indoor unit
2) Outdoor unit

The A-weighted total sound power level is determined for the measured frequency range from 100 Hz to 10 kHz. For the calculation of uncertainty, see appendix 1.

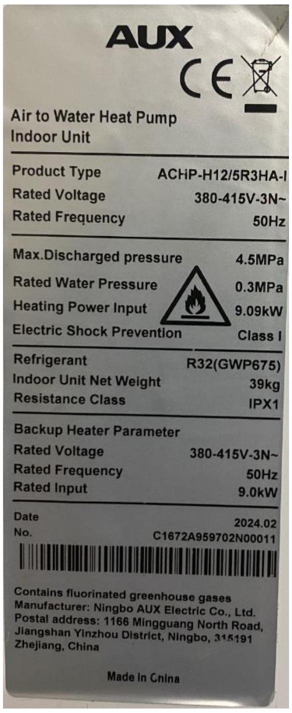
The sound power measurements are carried out by Kamalathasan Arumugam (KAMA) and co-read by Patrick Glibert (PGL), Danish Technological Institute.

Photos

Rating plate - Outdoor unit



Rating plate - 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	10.79	10.19	3.02	0.99	1.00	3.02
B	2	54	6.57	6.10	4.65	0.97	1.00	4.65
C	7	35	4.22	4.32	6.54	0.94	1.00	6.54
D	12	15	1.88	4.56	8.34	0.93	0.41	7.58
E	-10	100	12.20	11.60	2.71	0.99	1.00	2.71
F - BIV	-7	88	10.79	10.19	3.02	0.99	1.00	3.02

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	0.023167	0.02317	0
Thermostat off	178	0.038383	0.03838	6.8322581
Standby	0	0.023167	0.02317	0
Crankcase heater	178	0.023167	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	21	-10	1	12.20	11.60	0.60	0.60	2.71	12.20	4.87	11.60	4.27
	22	-9	25	11.73	11.13	0.60	14.95	2.82	293.27	113.81	278.31	98.85
	23	-8	23	11.26	10.66	0.60	13.81	2.92	259.02	97.89	245.21	84.08
A / F - BIV	24	-7	24	10.79	10.19	0.00	0.00	3.02	259.02	85.85	259.02	85.85
	25	-6	27	10.32	9.73	0.00	0.00	3.20	278.72	87.13	278.72	87.13
	26	-5	68	9.85	9.28	0.00	0.00	3.38	670.06	198.19	670.06	198.19
	27	-4	91	9.38	8.83	0.00	0.00	3.56	854.00	239.69	854.00	239.69
	28	-3	89	8.92	8.37	0.00	0.00	3.74	793.47	211.89	793.47	211.89
	29	-2	165	8.45	7.92	0.00	0.00	3.93	1393.62	354.91	1393.62	354.91
	30	-1	173	7.98	7.46	0.00	0.00	4.11	1380.01	335.88	1380.01	335.88
	31	0	240	7.51	7.01	0.00	0.00	4.29	1801.85	419.96	1801.85	419.96
	32	1	280	7.04	6.55	0.00	0.00	4.47	1970.77	440.65	1970.77	440.65
B	33	2	320	6.57	6.10	0.00	0.00	4.65	2102.15	451.65	2102.15	451.65
	34	3	357	6.10	5.72	0.00	0.00	5.03	2177.70	432.77	2177.70	432.77
	35	4	356	5.63	5.35	0.00	0.00	5.41	2004.55	370.55	2004.55	370.55
	36	5	303	5.16	4.97	0.00	0.00	5.79	1563.95	270.24	1563.95	270.24
	37	6	330	4.69	4.60	0.00	0.00	6.16	1548.46	251.17	1548.46	251.17
C	38	7	326	4.22	4.22	0.00	0.00	6.54	1376.72	210.42	1376.72	210.42
	39	8	348	3.75	3.75	0.00	0.00	6.75	1306.34	193.51	1306.34	193.51
	40	9	335	3.28	3.28	0.00	0.00	6.96	1100.35	158.12	1100.35	158.12
	41	10	315	2.82	2.82	0.00	0.00	7.17	886.85	123.74	886.85	123.74
	42	11	215	2.35	2.35	0.00	0.00	7.38	504.42	68.39	504.42	68.39
D	43	12	169	1.88	1.88	0.00	0.00	7.58	317.20	41.83	317.20	41.83
	44	13	151	1.41	1.41	0.00	0.00	7.79	212.56	27.28	212.56	27.28
	45	14	105	0.94	0.94	0.00	0.00	8.00	98.54	12.32	98.54	12.32
	46	15	74	0.47	0.47	0.00	0.00	8.21	34.72	4.23	34.72	4.23

SUM	25200.51	5206.92	25171.15	5177.56
SCOPon		4.84	**SCOPnet**	4.86

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	10.62	10.65	2.26	0.99	1.00	2.26
B	2	54	6.46	6.15	3.47	0.98	1.00	3.47
C	7	35	4.15	4.22	4.73	0.96	1.00	4.73
D	12	15	1.85	4.16	6.20	0.94	0.44	5.79
E	-10	100	12.00	9.51	1.97	0.99	1.00	1.97
F - BIV	-7	88	10.62	10.65	2.26	0.99	1.00	2.26

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	0.023167	0.02317	0
Thermostat off	178	0.038383	0.03838	6.8322581
Standby	0	0.023167	0.02317	0
Crankcase heater	178	0.023167	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	21	-10	1	12.00	9.51	2.49	2.49	1.97	12.00	7.31	9.51	4.82
	22	-9	25	11.54	9.88	1.66	41.43	2.07	288.46	160.88	247.03	119.45
	23	-8	23	11.08	10.25	0.83	19.06	2.16	254.77	127.96	235.71	108.90
A / F - BIV	24	-7	24	10.62	10.62	0.00	0.00	2.26	254.77	112.70	254.77	112.70
	25	-6	27	10.15	10.12	0.00	0.00	2.40	274.15	114.45	274.15	114.45
	26	-5	68	9.69	9.62	0.00	0.00	2.53	659.08	260.47	659.08	260.47
	27	-4	91	9.23	9.13	0.00	0.00	2.67	840.00	315.17	840.00	315.17
	28	-3	89	8.77	8.63	0.00	0.00	2.80	780.46	278.72	780.46	278.72
	29	-2	165	8.31	8.14	0.00	0.00	2.94	1370.77	467.04	1370.77	467.04
	30	-1	173	7.85	7.64	0.00	0.00	3.07	1357.38	442.16	1357.38	442.16
	31	0	240	7.38	7.14	0.00	0.00	3.20	1772.31	553.02	1772.31	553.02
	32	1	280	6.92	6.65	0.00	0.00	3.34	1938.46	580.43	1938.46	580.43
B	33	2	320	6.46	6.15	0.00	0.00	3.47	2067.69	595.09	2067.69	595.09
	34	3	357	6.00	5.75	0.00	0.00	3.73	2142.00	574.88	2142.00	574.88
	35	4	356	5.54	5.35	0.00	0.00	3.98	1971.69	495.73	1971.69	495.73
	36	5	303	5.08	4.95	0.00	0.00	4.23	1538.31	363.77	1538.31	363.77
	37	6	330	4.62	4.55	0.00	0.00	4.48	1523.08	339.96	1523.08	339.96
C	38	7	326	4.15	4.15	0.00	0.00	4.73	1354.15	286.20	1354.15	286.20
	39	8	348	3.69	3.69	0.00	0.00	4.94	1284.92	259.97	1284.92	259.97
	40	9	335	3.23	3.23	0.00	0.00	5.15	1082.31	210.01	1082.31	210.01
	41	10	315	2.77	2.77	0.00	0.00	5.36	872.31	162.60	872.31	162.60
	42	11	215	2.31	2.31	0.00	0.00	5.58	496.15	88.98	496.15	88.98
D	43	12	169	1.85	1.85	0.00	0.00	5.79	312.00	53.92	312.00	53.92
	44	13	151	1.38	1.38	0.00	0.00	6.00	209.08	34.86	209.08	34.86
	45	14	105	0.92	0.92	0.00	0.00	6.21	96.92	15.61	96.92	15.61
	46	15	74	0.46	0.46	0.00	0.00	6.42	34.15	5.32	34.15	5.32

SUM	24787.38	6907.19	24724.41	6844.22
SCOPon		3.59	**SCOPnet**	3.61

Detailed test results

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

Detailed result for 'EN14825:2022' Average Low (A and F) A -7 /W34		
Tested according to:		EN14511:2022 and EN14825:2022
Climate zone:		Average
Temperature application:		Low
Condition name:		A and F
Condition temperature:	°C	-7
Part load:	%	88%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	12.20
Heating demand:	kW	10.79
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		No
Included corrections (Final result)		
Heating capacity	kW	**10.190**
COP	-	**3.017**
Power consumption	kW	**3.377**
Measured		
Heating capacity	kW	10.158
COP	-	3.044
Power consumption	kW	3.337
During heating		
Air_inlet temperature dry bulb	°C	-7.02
Air temperature wet bulb	°C	-8.10
Water_inlet temperature	°C	29.00
water_outlet temperature	°C	34.03
Water_outlet temperature (Time averaged)	°C	**34.03**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	18619
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	0.000486

Detailed result for 'EN14825:2022' Average Low (B) A 2 /W30		
Tested according to:		EN14511:2022 and EN14825:2022
Climate zone:		Average
Temperature application:		Low
Condition name:		B
Condition temperature:	°C	2
Part load:	%	54%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	12.20
Heating demand:	kW	6.57
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		No
Included corrections (Final result)		
Heating capacity	kW	**6.096**
COP	-	**4.654**
Power consumption	kW	**1.310**
Measured		
Heating capacity	kW	6.089
COP	-	4.676
Power consumption	kW	1.302
During heating		
Air_inlet temperature dry bulb	°C	2.01
Air temperature wet bulb	°C	1.00
Water_inlet temperature	°C	25.01
water_outlet temperature	°C	30.03
Water_outlet temperature (Time averaged)	°C	**30.03**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	3277
Calculated Hydraulic power	W	1
Calculated global efficiency	η	0.12
Calculated Capacity correction	W	-7
Calculated Power correction	W	-8
Water Flow	m^3/s	0.000292

Detailed result for 'EN14825:2022' Average Low (C) A 7 /W27		
Tested according to:		EN14511:2022 and EN14825:2022
Climate zone:		Average
Temperature application:		Low
Condition name:		C
Condition temperature:	°C	7
Part load:	%	35%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	12.20
Heating demand:	kW	4.22
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		Yes
Included corrections (Final result)		
Heating capacity	kW	**4.316**
COP	-	**6.543**
Power consumption	kW	**0.660**
Measured		
Heating capacity	kW	4.318
COP	-	6.524
Power consumption	kW	0.662
During heating		
Air_inlet temperature dry bulb	°C	6.99
Air temperature wet bulb	°C	5.97
Water_inlet temperature	°C	22.00
water_outlet temperature	°C	26.97
Water_outlet temperature (Time averaged)	°C	**26.97**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	1022
Calculated Hydraulic power	W	0
Calculated global efficiency	η	0.11
Calculated Capacity correction	W	2
Calculated Power correction	W	2
Water Flow	m^3/s	0.000208

Detailed result for 'EN14825:2022' Average Low (D) A 12 /W24		
Tested according to:		EN14511:2022 and EN14825:2022
Climate zone:		Average
Temperature application:		Low
Condition name:		D
Condition temperature:	°C	12
Part load:	%	15%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	12.20
Heating demand:	kW	1.88
CR:	-	0.4
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		Yes
Included corrections (Final result)		
Heating capacity	kW	**4.558**
COP	-	**8.345**
Power consumption	kW	**0.546**
Measured		
Heating capacity	kW	4.559
COP	-	8.363
Power consumption	kW	0.545
During heating		
Air_inlet temperature dry bulb	°C	12.00
Air temperature wet bulb	°C	10.99
Water_inlet temperature	°C	21.93
water_outlet temperature	°C	26.97
Water_outlet temperature (Time averaged)	°C	**24.00**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	655
Calculated Hydraulic power	W	0
Calculated global efficiency	η	0.11
Calculated Capacity correction	W	1
Calculated Power correction	W	1
Water Flow	m^3/s	0.000217

Detailed result for 'EN14825:2022' Average Low (E) A -10 /W35		
Tested according to:		EN14511:2022 and EN14825:2022
Climate zone:		Average
Temperature application:		Low
Condition name:		E
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	12.20
Heating demand:	kW	12.20
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		No
Included corrections (Final result)		
Heating capacity	kW	**11.604**
COP	-	**2.715**
Power consumption	kW	**4.275**
Measured		
Heating capacity	kW	11.563
COP	-	2.741
Power consumption	kW	4.218
During heating		
Air_inlet temperature dry bulb	°C	-9.92
Air temperature wet bulb	°C	-11.06
Water_inlet temperature	°C	29.99
water_outlet temperature	°C	34.92
Water_outlet temperature (Time averaged)	°C	**34.92**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	27351
Calculated Hydraulic power	W	15
Calculated global efficiency	η	0.27
Calculated Capacity correction	W	-41
Calculated Power correction	W	-56
Water Flow	m^3/s	0.000564

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

Detailed result for 'EN14825:2022' Average Medium (A and F) A -7 /W52		
Tested according to:		EN14511:2022 and EN14825:2022
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	12.00
Heating demand:	kW	10.62
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		No
Included corrections (Final result)		
Heating capacity	kW	**10.648**
COP	-	**2.261**
Power consumption	kW	**4.710**
Measured		
Heating capacity	kW	10.638
COP	-	2.264
Power consumption	kW	4.699
During heating		
Air_inlet temperature dry bulb	°C	-7.00
Air temperature wet bulb	°C	-7.92
Water_inlet temperature	°C	44.01
water_outlet temperature	°C	52.07
Water_outlet temperature (Time averaged)	°C	**52.07**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	4641
Calculated Hydraulic power	W	1
Calculated global efficiency	η	0.13
Calculated Capacity correction	W	-10
Calculated Power correction	W	-11
Water Flow	m^3/s	0.000319

Detailed result for 'EN14825:2022' Average Medium (B) A 2 /W42		
Tested according to:		EN14511:2022 and EN14825:2022
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	12.00
Heating demand:	kW	6.46
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		Yes
Included corrections (Final result)		
Heating capacity	kW	**6.152**
COP	-	**3.475**
Power consumption	kW	**1.771**
Measured		
Heating capacity	kW	6.155
COP	-	3.479
Power consumption	kW	1.769
During heating		
Air_inlet temperature dry bulb	°C	2.01
Air temperature wet bulb	°C	0.81
Water_inlet temperature	°C	34.38
water_outlet temperature	°C	42.01
Water_outlet temperature (Time averaged)	°C	**42.01**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	1924
Calculated Hydraulic power	W	0
Calculated global efficiency	η	0.12
Calculated Capacity correction	W	3
Calculated Power correction	W	3
Water Flow	m^3/s	0.000194

Detailed result for 'EN14825:2022' Average Medium (C) A 7 /W36		
Tested according to:		EN14511:2022 and EN14825:2022
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	12.00
Heating demand:	kW	4.15
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		Yes
Included corrections (Final result)		
Heating capacity	kW	**4.219**
COP	-	**4.732**
Power consumption	kW	**0.892**
Measured		
Heating capacity	kW	4.221
COP	-	4.731
Power consumption	kW	0.892
During heating		
Air_inlet temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	6.12
Water_inlet temperature	°C	30.71
water_outlet temperature	°C	35.93
Water_outlet temperature (Time averaged)	°C	**35.93**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	1573
Calculated Hydraulic power	W	0
Calculated global efficiency	η	0.12
Calculated Capacity correction	W	2
Calculated Power correction	W	3
Water Flow	m^3/s	0.000194

Detailed result for 'EN14825:2022' Average Medium (D) A 12 /W30		
Tested according to:		EN14511:2022 and EN14825:2022
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	12.00
Heating demand:	kW	1.85
CR:	-	0.4
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		Yes
Included corrections (Final result)		
Heating capacity	kW	**4.158**
COP	-	**6.202**
Power consumption	kW	**0.670**
Measured		
Heating capacity	kW	4.160
COP	-	6.183
Power consumption	kW	0.673
During heating		
Air_inlet temperature dry bulb	°C	12.00
Air temperature wet bulb	°C	11.00
Water_inlet temperature	°C	27.71
water_outlet temperature	°C	32.85
Water_outlet temperature (Time averaged)	°C	**29.99**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	1297
Calculated Hydraulic power	W	0
Calculated global efficiency	η	0.12
Calculated Capacity correction	W	2
Calculated Power correction	W	2
Water Flow	m^3/s	0.000194

Detailed result for 'EN14825:2022' Average Medium (E) A -10 /W55		
Tested according to:		EN14511:2022 and EN14825:2022
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	12.00
Heating demand:	kW	12.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		No
Included corrections (Final result)		
Heating capacity	kW	**9.514**
COP	-	**1.972**
Power consumption	kW	**4.825**
Measured		
Heating capacity	kW	9.508
COP	-	1.978
Power consumption	kW	4.807
During heating		
Air_inlet temperature dry bulb	°C	-9.90
Air temperature wet bulb	°C	-10.90
Water_inlet temperature	°C	46.99
water_outlet temperature	°C	54.88
Water_outlet temperature (Time averaged)	°C	**54.88**
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	3049
Calculated Hydraulic power	W	1
Calculated global efficiency	η	0.12
Calculated Capacity correction	W	-6
Calculated Power correction	W	-7
Water Flow	m^3/s	0.000292

Detailed COP test results of standard rating test – EN 14511

Detailed result for 'EN14511:2022' A7/W35		
Tested according to:		EN14511:2022
Minimum flow reached:		No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		No
Included corrections (Final result)		
Heating capacity	kW	**12.148**
COP	-	**4.881**
Power consumption	kW	**2.489**
Measured		
Heating capacity	kW	12.103
COP	-	4.987
Power consumption	kW	2.427
During heating		
Air_inlet temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	5.98
Water_inlet temperature	°C	30.01
water_outlet temperature	°C	34.96
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	30377
Calculated Hydraulic power	W	18
Calculated global efficiency	η	0.29
Calculated Capacity correction	W	-44
Calculated Power correction	W	-62
Water Flow	m^3/s	0.000589

Detailed result for 'EN14511:2022' A7/W55		
Tested according to:		EN14511:2022
Minimum flow reached:		No
Measurement type:		Steady State
Integrated liquid pump:		Yes
Integrated liquid pump able to generate a positve ext. static pressure difference:		No
Included corrections (Final result)		
Heating capacity	kW	**12.013**
COP	-	**3.157**
Power consumption	kW	**3.805**
Measured		
Heating capacity	kW	11.997
COP	-	3.169
Power consumption	kW	3.786
During heating		
Air_inlet temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	6.00
Water_inlet temperature	°C	46.97
water_outlet temperature	°C	55.02
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	7641
Calculated Hydraulic power	W	3
Calculated global efficiency	η	0.15
Calculated Capacity correction	W	-16
Calculated Power correction	W	-19
Water Flow	m^3/s	0.000361

Detailed test results of sound power measurement – EN 12102-1

Test 1_Indoor unit

Sound power levels according to ISO 3743-1:2010

TEKNOLOGISK INSTITUT

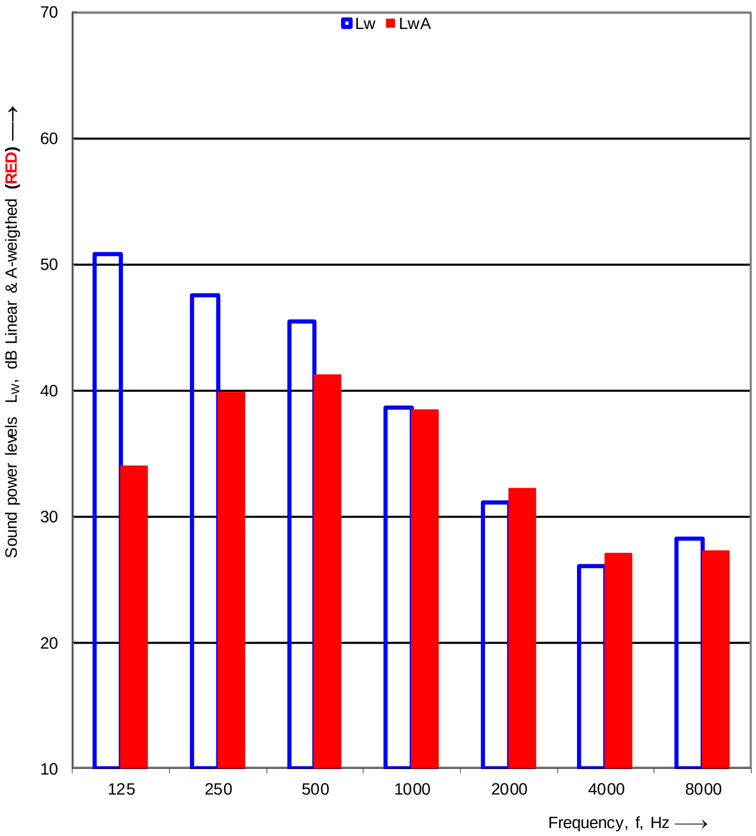
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms

Client:	KLIMA-THERM — Date of test: 20-09-2024
Object:	Type: Split air to water heat pump, Model: IDU: ACHP_H12/5R3HA-I & ODU: ACHP-H12/5R3HA-O
Mounting conditions:	The indoor unit is mounted at a hight of 1.7 meter above floor level using a metal support frame and a wooden board (90 x 110 cm). The IDU is mounted on the wooden board using vibration isolatores. The metal frame is damped by filling the pipes with dry sand placed it all on placed on four pices of concrete tiles (50x50x2.5 cm), which are placed in a water drop dray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the indoor unit has been measured in Test room 1 and the outdoor unit is installed in the neighboring Test room 2.
Operating conditions:	IDU: Ambient temperature = 20*C, ODU: A7W55, Compressor speed: 22[Hz], Fan speed: 360 [rpm], Heating capacity: 4.23 [kW], Power_input: 1.68[kW], Water flow rate: 700 [l/h] and dP_water: 853 [mbar]

Static pressure:	1030 hPa			Reference box:	
Air temperature:	20.0 °C			L1:	0.4 m
Relative air humidity:	67.0 %			L2:	0.3 m
Test room volume:	102.8 m³	Room:	Room 1	L3:	0.8 m
Area, S, of test room:	138.9 m²			Volume:	0.5 m³

Frequency f [Hz]	L_W 1/3 octave [dB]	1/1 oct [dB]
100	49.0	
125	42.9	50.8 [2]
160	43.5	
200	42.1	
250	39.6	47.6
315	45.0	
400	43.9	
500	39.5	45.4
630	31.3	
800	33.6	
1000	36.5	38.6
1250	26.7	
1600	29.0	
2000	26.3	31.1
2500	17.5	
3150	19.4	
4000	22.8	26.1 [2]
5000	21.1	
6300	23.9	
8000	23.7	28.3 [2]
10000	22.8	

[2] Correction



Sound power level L_W(A): 45.4 dB [re 1pW] **Uncertainty σ_{tot}: 1.6 dB**

Name of test institute:	DTI	Date:	20-09-2024
No. of test report:	300-KLAB-24-055		

Measurements are in full conformity with ISO 3743-1

Test 2_outdoor unit

ilac-MRA DANAK TEST Reg. nr. 300

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: KLIMA-THERM Date of test: 20-09-2024

Object: Type: Split air to water heat pump, Model: IDU: ACHP_H12/5R3HA-I & ODU: ACHP-H12/5R3HA-O

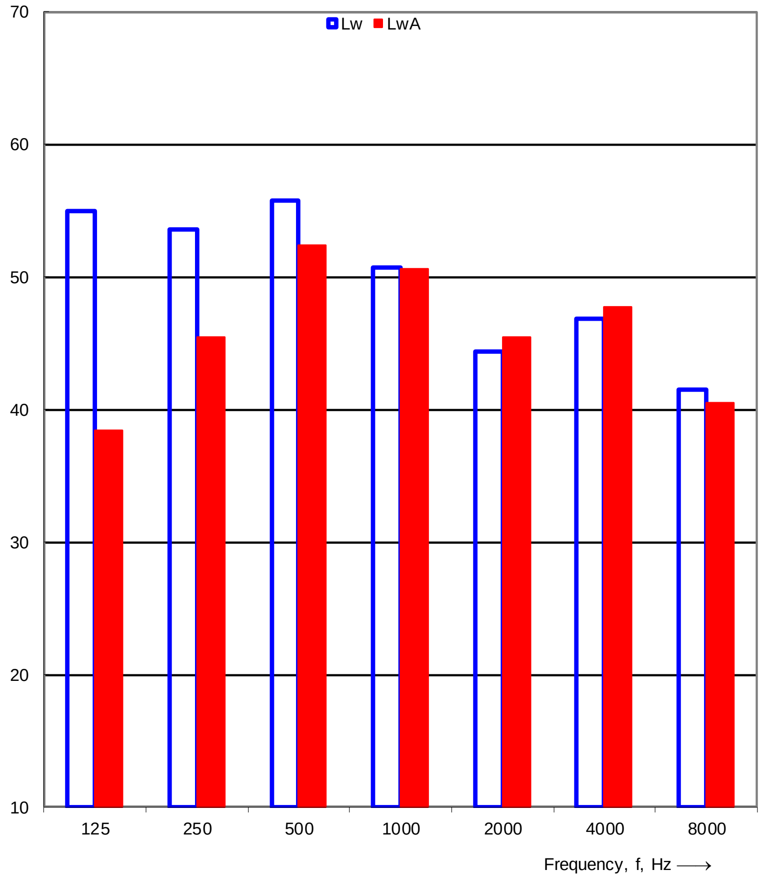
Mounting conditions: The outdoor unit is mounted on the supporting metal support frame using two pieces of vibration isolation mounts and placed on four pices of concrete tiles (49x49x5 cm). All of these are placed in a water drop dray on two pieces of heavy concrete tiles (90x90x10cm) laying on a vibration damping mat on the floor. The noise radiated by the outdoor unit has been measured in Test room 2 and the indoor unit is installed in the neighboring test room 1.

Operating conditions: IDU: Ambient temperature = 20*C, ODU: A7W55, Compressor speed: 22[Hz], Fan speed: 360 [rpm], Heating capacity: 4.23 [kW], Power_input: 1.68[kW], Water flow rate: 700 [l/h] and dP_water:

Static pressure:	1030 hPa			Reference box:	
Air temperature:	7.0 °C			L1:	1.1 m
Relative air humidity:	84.0 %			L2:	0.5 m
Test room volume:	102.8 m³	Room:	Room 2	L3:	0.9 m
Area, S, of test room:	138.9 m²			Volume:	0.5 m³

Frequency f [Hz]	L_W 1/3 octave [dB]	1/1 oct [dB]
100	50.7	
125	52.1	55.0 [2]
160	45.3	
200	48.1	
250	48.5	53.6
315	49.6	
400	52.7	
500	48.8	55.8
630	50.6	
800	47.0	
1000	45.9	50.7
1250	44.7	
1600	43.1	
2000	36.8	44.4
2500	33.2	
3150	39.9	
4000	43.2	46.8
5000	42.4	
6300	37.5	
8000	36.3	41.4
10000	36.1	

[2] Correction



Sound power level L_W(A): 56.4 dB [re 1pW] Uncertainty σ_{tot}: 1.6 dB

Name of test institute: DTI Date: 20-09-2024

No. of test report: 300-KLAB-24-055

Measurements are in full conformity with ISO 3743-1

Appendix 1

Unit specification

Type of unit: Split air to water heat pump
Manufacturer: Aux
Size of the heat pump -_IDU: 0.3 x 0.4 x 0.8 m (W x L x H)
Size of the heat pump -_ODU: 0.5 x 1.1 x 0.9 m (W x L x H)
Year of production: 2024

Operating conditions and environment

The operating conditions of the unit under test fulfil the requirements for Class A.

The acoustic test chamber is a hard wall reverberant room (103 m^3) and equipped with relevant sound diffusing reflector panels. The acoustical test chamber fulfils the requirements of ISO3743-1 accuracy grade 2 (engineering grade).

The measurements of the average sound pressure levels in 1/3 octave frequency bands are carried out using three microphones in the test chamber. During the measurements, the microphones are traversed up and down for one meter in the arc of a quarter circle.

The pictures below show the installation of the indoor- and outdoor unit during the test, position of microphones, sound diffusing reflector panels, and the reference sound source.

Measurement instruments

Id nr.	Manufacturer	Description	Calibration company
100864	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 1	Norsonic A/S, Norway
100865	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 1	Norsonic A/S, Norway
100866	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 1	Norsonic A/S, Norway
100867	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 2	Norsonic A/S, Norway
100868	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 2	Norsonic A/S, Norway
100869	GRAS	Gras 40AE_26CA, ½" free field microphone, Room 2	Norsonic A/S, Norway
100870	GRAS	Gras 40AE_26CA, ½" free field microphone, Roof monitor	Norsonic A/S, Norway
100873	Brüel & Kjær	Acoustical calibrator, Brüel & Kjær 4231	Element Metech, Denmark
100859	Norsonic	Reference sound source, Norsonic Nor278 Room 1	RISE, Sweden
100872	Norsonic	Reference sound source, Norsonic Nor278 Room 2	RISE, Sweden
100620	Norsonic	Multi-channel measurement system Nor850	Norsonic A/S, Norway

All microphones are equipped with windshields.

Test Procedure

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

- DS/EN 14511:2022
- EN 12102-1:2022
- ISO/EN 3743-1:2010

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

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.

Measurement uncertainty

The uncertainty of sound power level in decibel is determined in accordance with ISO 3743-1, equation 22 $\sigma_{tot} = \sqrt{\sigma_{RO}{}^2 + \sigma_{omc}{}^2}$ where:

- σ_{RO} is the standard deviation of the reproducibility of the method
- σ_{omc} is the standard deviation describing the uncertainty associated with the instability of the operating and mounting conditions for the particular noise source during test.

σ_{RO} expresses the uncertainty in test results delivered by the different accredited test laboratories due to different instrumentation and implementation of measurement procedure as well different radiation characteristics of the noise source during test.

σ_{omc} expresses the uncertainty associated with the instability of the operating and mounting conditions for the particular noise source during test. The mounting and installation conditions in two DTI acoustical test chambers are well defined in the test procedure. Possible instability of the operating conditions is monitored and assessed prior to each noise test.

The test uncertainty σ_{omc} is calculated according to ISO3743-1 Annex C formula C.1 and is typically below 1.0dB. However, the uncertainty is rounded up to the nearest 0.5 or 1.0dB increment in the report. As pr. Table C.1 (accuracy grade 2), the uncertainty σ_{RO} is set to 1.5.

The expanded uncertainty U is calculated according to ISO 3743-1 equation 23:
$U = k\,\sigma_{tot}$ where k = 2 for 95% confidence.

EXAMPLE: $\sigma_{tot}: \sqrt{1.5^2 + 0.5^2} = 1.6\ dB$ and $U(95\%) = 3.2\ dB$

Note: The expanded uncertainty does not include the standard deviation of production which is used in ISO4871 for the purpose of making noise declaration for batches of machines.

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Uwierzytelnione tłumaczenie z języka angielskiego

RAPORT Z PRZEPROWADZONEJ PRÓBY

Nr raportu:
300-KLAB-24-055

DANISH
TECHNOLOGICAL
INSTITUTE

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

Znak: PRES/KAMA
Nr pliku: 272383
Załączniki: 1

Klient:
Firma: NINGBO AUX ELECTRIC CO., LTD
Adres: NO.1166 MingGuang North Road
Miejscowość: JiangShan Town, Yinzhou District, Ningbo, Zhejiang, ChRL

Charakt. prod.:
Nazwa marki: AUX
Typ: Pompa ciepła typu powietrze-woda (dzielona)
Model: Jedn. zewn.: ACHP-H12/5R3HA-O
Jedn. wewn.: ACHP-H12/5R3HA-I
Nr fabr.: Jedn. zewn.: E0385A959701W00003
Jedn. wewn.: C1672A959702N00011
Rok prod.: Jedn. zewn.: 2024.02 Jedn. wewn.: 2024.02

Data: Prod. badany: wrzesień 2024 r.

Procedura: W rozdziale Cel przeprowadzenia próby (strona 2) znajduje się wykaz norm.

Uwagi: Urządzenie dostarczył klient. Instalacja i ustawienia testowe zostały wykonane zgodnie z zaleceniami producenta. Pomiędzy każdą próbą klient zmieniał poszczególne parametry, takie jak prędkość sprężarki, zawór rozprężny, prędkość wentylatora, prędkość pompy, czas odszraniania, czas ogrzewania.

Warunki przeprowadzenia próby: Niniejsza próba została przeprowadzona w ramach akredytacji zgodnie z międzynarodowymi wymogami (ISO/IEC 17025:2017) oraz zgodnie z Ogólnymi Warunkami Duńskiego Instytutu Technologicznego. Wyniki próby odnoszą się wyłącznie do testowanego produktu. Niniejszy raport z przeprowadzonej próby można przytaczać we fragmentach wyłącznie za pisemną zgodą Duńskiego Instytutu Technologicznego.

Klient nie może powoływać się na Duński Instytut Technologiczny lub jego pracowników w celach reklamowych lub marketingowych, chyba że Duński Instytut Technologiczny wyrazi na to każdorazowo pisemną zgodę.

Oddział/Centrum: Danish Technological Institute
Energy and Climate
Heat Pump Laboratory, Aarhus

Data: 2024.10.07

Podpis:
Preben Elbek Eskerod
B.TecMan & MarEng

Współpraca:
Kamathasan Arumugam
B.Sc. Engineer

ilac-MRA
DANAK
Test Reg. nr. 300

Cel przeprowadzenia próby

Celem niniejszego raportu jest udokumentowanie następujących kwestii:

Sezonowy współczynnik wydajności (SCOP) przy zastosowaniu w niskiej i średniej temperaturze dla klimatu umiarkowanego zgodnie z normą EN 14825:2022.

W celu obliczenia SCOP przeprowadzono próby w warunkach obciążenia częściowego podanych w tabelach na stronie 4 i 5.

Standardowe warunki znamionowe próby COP A7/W35 i A7/W55 według normy EN 14511:2022

Pomiary mocy akustycznej według normy EN 12102-1:2022.

Warunki prowadzenia próby

Warunki próby SCOP dla niskich temperatur - EN 14825

Warunki częściowego obciążenia dla referencyjnego SCOP i referencyjnego SCOPon do obliczania jednostek powietrze-woda dla zastosowań niskotemperaturowych dla referencyjnego sezonu grzewczego;
„A" = umiarkowanie, „W" = cieplej, „C" = chłodniej.

	Współczynnik obciążenia częściowego w %				Zewnętrzny wymiennik ciepła		Wewnętrzny wymiennik ciepła			
					Temperatura termometru suchego (mokrego) °C		Wylot stały °C	Wylot zmienny[d] °C		
	Wzór	War. umiarkow.	Cieplej	Chłodniej	Powietrze zewnętrzne	Powietrze wylotowe	Wsz. war. klimatyczne	War. umiarkow.	Cieplej	Chłodniej
A	(-7 - 16) / (Tdesignh - 16)	88,46	n.d.	60,53	-7(-8)	20(12)	a / 35	a / 34	n.d.	a / 30
B	(+2 - 16)/ (Tdesignh - 16]	53,85	100,00	36,84	2(1)	20(12)	a / 35	a / 30	a / 35	a / 27
C	(+7 - 16)/ (Tdesignh - 16)	34,62	64,29	23,68	7(6)	20(12)	a / 35	a / 27	a / 31	a / 25
D	(+12 - 16)/ (Tdesignh - 16)	15,38	28,57	10,53	12(11)	20(12)	a / 35	a / 24	a / 26	a / 24
E	(TOLe - 16) / (Tdesignh - 16)				TOLe	20(12)	a / 35	a / b	a / b	a / b
F	(Tbiv - 16) / (Tdesignh – 16)				Tbiv	20(12)	a / 35	a / c	a / c	a / c
G	(-15-16)/ (Tdesignh - 16)	n.d.	n.d.	81,58	-15	20(12)	a / 35	n.d.	n.d.	a / 32

Informacje dodatkowe

Uwarunk. klimatyczne	$T_{designh}$ [°C]	$T_{bivalent}$ [°C]	TOL [°C]	Temperatura zewnętrzna	Natężenie przepływu
War. umiarkow.	-10	-7	-10	Zmienna	Zmienna

Warunki próby SCOP dla średnich temperatur - EN 14825

Warunki częściowego obciążenia dla referencyjnego SCOP i referencyjnego SCOPon do obliczania jednostek powietrze-woda dla zastosowań średniotemperaturowych dla referencyjnego sezonu grzewczego;
„A” = umiarkowanie, „W” = cieplej, „C” = chłodniej.

	Współczynnik obciążenia częściowego w %				**Zewnętrzny wymiennik ciepła**		**Wewnętrzny wymiennik ciepła**			
					Temperatura termometru suchego (mokrego) °C		Wylot stały °C	Wylot zmienny[d] °C		
	Wzór	War. umiarkow.	Cieplej	Chłodniej	Powietrze zewnętrzne	Powietrze wylotowe	Wsz. war. klimatyczne	War. umiarkow.	Cieplej	Chłodniej
A	(-7 - 16) / (*T*designh -	88,46	n.d.	60,53	-7(-8)	20(12)	[a] / 55	[a] / 52	n.d.	[a] / 44
B	(+2 - 16)/ (*T*designh - 16]	53,85	100	36,84	2(1)	20(12)	[a] / 55	[a] / 42	[a] / 55	[a] / 37
C	(+7 - 16)/ (*T*designh - 16)	34,62	64,29	23,68	7(6)	20(12)	[a] / 55	[a] / 36	[a] / 46	[a] / 32
D	(+12 - 16)/ (*T*designh - 16)	15,38	28,57	10,53	12(11)	20(12)	[a] / 55	[a] / 30	[a] / 34	[a] / 28
E	(*TOLe* - 16) / (Tdesignh - 16)				*TOLe*	20(12)	[a] / 55	[a] / [b]	[a] / [b]	[a] / [b]
F	(Tbiv - 16) / (Tdesignh – 16)				*T*biv	20(12)	[a] / 55	[a] / [c]	[a] / [c]	[a] / [c]
G	(-15-16)/ (*T*designh - 16)	n.d.	n.d.	81,58	-15	20(12)	[a] / 55	n.d.	n.d.	[a] / 49

Informacje dodatkowe

Uwarunk. klimatyczne	**$T_{designh}$ [°C]**	**$T_{bivalent}$ [°C]**	**TOL [°C]**	**Temperatura zewnętrzna**	**Natężenie przepływu**
War. umiarkow.	-10	-7	-10	Zmienna	Zmienna

Warunki próby COP dla standardowej próby znamionowej - EN 14511

N#	Źródło ciepła		Ujście ciepła	
	Temperatura termometru suchego na wlocie (°C)	Temperatura termometru mokrego na wlocie (°C)	Temperatura wlotowa (°C)	Temperatura wylotowa (°C)
1	7	6	30	35
2	7	6	47	55

Warunki prowadzenia prób dla pomiaru mocy akustycznej - EN12102-1

N#	Warunki prowadzenia próby		Ustawienia pompy ciepła			
	Temperatura otaczającego powietrza (°C)	Zewnętrzny/ wewnętrzny wymiennik ciepła (°C)	Prędkość obrotowa sprężarki (Hz)	Prędkość obrotowa wentylatora	Wydajność grzewcza (kW)	Moc wejściowa (kW)
1[1]	20	7/55	-	-	4,23	1,68
2[2]	7	7/55	22	360	4,23	1,68

1) Jedn. wewnętrzna
2) Jedn. zewnętrzna

Wyniki przeprowadzonej próby

Wyniki przeprowadzonej próby SCOP w niskiej temperaturze - średnia sezonu grzewczego - EN 14825

Model (zewnętrzny)	ACHP-H12/5R3HA-O
Monoblokowa pompa ciepła powietrze-woda	N
Niskotemperaturowa pompa ciepła	N
Wyposażona w dodatkowy podgrzewacz	N
Podgrzewacz kombinowany z pompą ciepła	N
Odwracalna	Y

Znamionowa moc cieplna[1)]	P_{rated}	**12,2** [kW]
Sezonowa efektywność energetyczna pomieszczeń	η_S	**190,3** [%]
	SCOP	**4,83 [-]**

Zmierzona wydajność ogrzewania dla częściowego obciążenia przy temperaturze zewnętrznej Tj	Umiark. war. klimatyczne - Aplikacja niskotemperaturowa	Tj=-15°C	Pdh	- [kW]
		Tj=-7°C	Pdh	10,19 [kW]
		Tj = 2°C	Pdh	6,10 [kW]
		Tj=7°C	Pdh	4,32 [kW]
		Tj=12°C	Pdh	4,56 [kW]
		Tj=temperatura dwuwartościowa	Pdh	10,19 [kW]
		Tj=limit operacyjny	Pdh	11,60 [kW]

Zmierzony współczynnik wydajności przy temperaturze zewnętrznej Tj	Umiark. war. klimatyczne - Aplikacja niskotemperaturowa	Tj=-15°C	COPd	- [-]
		Tj=-7°C	COPd	3,02 [-]
		Tj=2°C	COPd	4,65 [-]
		Tj=7°C	COPd	6,54 [-]
		Tj=12°C	COPd	8,34 [-]
		Tj=temperatura dwuwartościowa	COPd	3,02 [-]
		Tj=limit operacyjny	COPd	2,71 [-]

Temperatura dwuwartościowa	Tbivalent	-7 [°C]
Limit operacyjny	TOL	-10 [°C]
temperatury	WTOL	- [°C]
Współczynnik utraty energii	Cdh	0,93 [-]

Pobór mocy w trybach innych niż tryb aktywny	Tryb wył.	P_{OFF}	0,023 [kW]
	Tryb wył. termostatu	P_{TO}	0,038 [kW]
	Tryb oczekiwania	P_{SB}	0,023 [kW]
	Tryb grzania skrzyni korbowej	P_{CK}	0,023 [kW]
Podgrzewacz dodatkowy[1)]	Znamionowa moc cieplna	P_{SUP}	0,60 [kW]
	Rodzaj dostarczanej energii		Elektryczna

Pozostałe elementy	Sterowanie przepustowością		Zmienna
	Sterowanie przepływem wody		Zmienna
	Natężenie przepływu wody		Zmienna
	Roczne zapotrzebowanie na energię	Q_{HE}	5215 [kWh]

[1)]W przypadku ogrzewaczy pomieszczeń z pompą ciepła i wielofunkcyjnych podgrzewaczy z pompą ciepła znamionowa moc cieplna Prated, jest równa projektowemu obciążeniu grzewczemu, Pdesignh, a znamionowa moc cieplna dodatkowego ogrzewacza, Psup, jest równa dodatkowej wydajności grzewczej, sup(Tj).

Wyniki próby SCOP w średnich temperaturach - średnia sezonu grzewczego – EN 14825

Model (zewnętrzny)	ACHP-H12/5R3HA-O
Monoblokowa pompa ciepła powietrze-woda	N
Niskotemperaturowa pompa ciepła	N
Wyposażona w dodatkowy podgrzewacz	N
Podgrzewacz kombinowany z pompą ciepła	N
Odwracalna	Y

Znamionowa moc cieplna[1]	P_{rated}	**12** [kW]
Sezonowa efektywność energetyczna pomieszczeń	ηs	**140,4** [%]
	SCOP	**3,59 [-]**

Zmierzona wydajność ogrzewania dla częściowego obciążenia przy temperaturze zewnętrznej Tj	Umiark. war. klimatyczne - Aplikacja średniotemperaturowa	Tj=-15°C	Pdh	- [kW]
		Tj=-7°C	Pdh	10,65 [kW]
		Tj = 2°C	Pdh	6,15 [kW]
		Tj=7°C	Pdh	4,22 [kW]
		Tj=12°C	Pdh	4,16 [kW]
		Tj=temperatura dwuwartościowa	Pdh	10,65 [kW]
		Tj=limit operacyjny	Pdh	9,51 [kW]

Zmierzony współczynnik wydajności przy temperaturze zewnętrznej Tj	Umiark. war. klimatyczne - Aplikacja średniotemperaturowa	Tj=-15°C	COPd	- [-]
		Tj=-7°C	COPd	2,26 [-]
		Tj = 2°C	COPd	3,47 [-]
		Tj=7°C	COPd	4,73 [-]
		Tj = 12°C	COPd	6,20 [-]
		Tj=temperatura dwuwartościowa	COPd	2,26 [-]
		Tj=limit operacyjny	COPd	1,97 [-]

Temperatura dwuwartościowa	Tbivalent	-7 [°C]
Limit operacyjny	TOL	-10 [°C]
temperatury	WTOL	- [°C]
Współczynnik utraty energii	Cdh	0,94 [-]

Pobór mocy w trybach innych niż tryb aktywny	Tryb wył.	P_{OFF}	0,023 [kW]
	Tryb wył. termostatu	P_{TO}	0,038 [kW]
	Tryb oczekiwania	P_{SB}	0,023 [kW]
	Tryb grzania skrzyni korbowej	P_{CK}	0,023 [kW]
Podgrzewacz dodatkowy[1]	Znamionowa moc cieplna	P_{SUP}	2,49 [kW]
	Rodzaj dostarczanej energii		Elektryczna

Pozostałe elementy	Sterowanie przepustowością		Zmienna
	Sterowanie przepływem wody		Zmienna
	Natężenie przepływu wody		Zmienna
	Roczne zapotrzebowanie na energię	Q_{HE}	6915 [kWh]

[1]W przypadku ogrzewaczy pomieszczeń z pompą ciepła i wielofunkcyjnych podgrzewaczy z pompą ciepła znamionowa moc cieplna Prated, jest równa projektowemu obciążeniu grzewczemu, Pdesignh, a znamionowa moc cieplna dodatkowego ogrzewacza, Psup, jest równa dodatkowej wydajności grzewczej, sup(Tj).

Wyniki próby COP dla standardowej próby znamionowej - EN 14511

N#	Warunki prowadzenia próby	Wydajność grzewcza [kW]	COP
1	A7/W35	12,148	4,881
2	A7/W55	12,013	3,157

Wyniki próby pomiaru mocy akustycznej – EN 12102-1

N#	Poziom mocy akustycznej LW(A) [dB re 1pW]	Niepewność (dB) (wartość ważona)
1[1]	**45,4**	1,6
2[2]	**56,4**	1,6

1) Jedn. wewnętrzna
2) Jedn. zewnętrzna

Całkowity poziom mocy akustycznej skorygowany charakterystyką A jest określany dla mierzonego zakresu częstotliwości od 100 Hz do 10 kHz. W celu obliczenia niepewności należy zapoznać się z załącznikiem 1.

Pomiary mocy akustycznej zostały przeprowadzone przez Kamalathasana Arumugama (KAMA) i nadzorowane przez Patricka Gliberta (PGL) z Duńskiego Instytutu Technologicznego.

Poświadczam zgodność powyższego tłumaczenia z okazanym mi dokumentem w języku angielskim.

Kraków, dnia 13 listopada 2024 r. Rep. nr 11/666/24

Edyta Winiarska-Stachowicz
Tłumacz przysięgły języka angielskiego

OŚWIADCZENIE

Producent AUX oświadcza, iż pompy ciepła

1) ACHP-H12/5R3HA-O + ACHP-H12/5R3HA-I

2) ACHP-H14/5R3HA-O + ACHP-H14/5R3HA-I

Oznaczenie/typ/identyfikator modelu

3) ACHP-H16/5R3HA-O + ACHP-H16/5R3HA-I

Oznaczenie/typ/identyfikator modelu

4)

Oznaczenie/typ/identyfikator modelu

5)

Oznaczenie/typ/identyfikator modelu

Należą do jednego podtypu w danym typoszeregu i spełniają łącznie następujące warunki:

- identyczna konstrukcja obiegu chłodniczego, ten sam czynnik chłodniczy/roboczy;
- ten sam producent, typ i liczba sprężarek;
- ten sam typ elementu rozprężnego;
- ten sam typ skraplacza;
- ten sam typ parownika;
- ten sam typ procesu odszraniania;
- ten sam sterownik i zasada sterowania wydajnością;
- ten sam producent, typ i liczba wentylatorów parownika (w przypadku powietrznych pomp ciepła) i zasada sterowania wydajnością (stała, zmienna lub stopniowana regulacja prędkości obrotowej);
- urządzenia z i bez zaworu czterodrogowego nie mogą być zaliczone do tego samego typoszeregu.

Maciej Kowal

Kraków, 15.10.2024

Miejscowość, data

Podpis osoby upoważnionej