Appendix I Test results

Table 3.	Heating mode(Low temperature application):						P
Model	Valdemar V1-13						
Product type	Air to Water	**Heating season**	☑	Average	☐	Warmer ☐	Colder

1. Test conditions:

Condition	Part Load Ratio in %				Outdoor heat exchanger	Indoor heat exchanger
	Formula	A	W	C	Inlet dry (wet) bulb temperature °C	Inlet/outlet water temperatures (°C)
A	(-7-16)/(Tdesignh-16)	88	N/A	N/A	-7(-8)	a / 34
B	(+2-16)/ (Tdesignh-16)	54	N/A	N/A	2(1)	a / 30
C	(+7-16)/(Tdesignh-16)	35	N/A	N/A	7(6)	a / 27
D	(+12-16)/(Tdesignh-16)	15	N/A	N/A	12(11)	a / 24
E	(TOL-16)/ (Tdesignh-16)				TOL	a / 35.3
F	(Tbivalent-16)/(Tdesignh-16)				Tbiv	a / 34
G	(-15-16)/(Tdesignh-16)	N/A	N/A	N/A	-15	N/A

Remark: a) With the water flow rate as determined at the standard rating conditions given in EN14511-2 at 30/35 conditions. the capacity is 11362.50W, the power is 2434.79W, the COP is 4.67.

2.Tested data/correction data(Average):

General test conditions/ Part-Load	Unit	A(-7)/W34 (88%)	A2/W30 (54%)	A7/W27 (35%)	A12/W24 (15%)	A(-10)/W35.3 (100%)	A(-7)/W34 (88%)
	--	A	B	C	D	E	F
Data collection period	hh: min:sec	2:00:00	2:00:00	2:00:00	2:00:00	2:00:00	2:00:00
The heat pump defrosts	--	No	No	No	No	No	No
Complete Cycles	--	0	0	0	0	0	0
Barometric pressure	kPa	101.02	101.02	101.02	101.02	101.02	101.02
Voltage	V	397.7	398.2	398.4	398.4	389.6	397.7
Current input of the unit	A	4.07	2.22	1.56	1.27	4.67	4.07
Power input of the unit	kW	2.535	1.154	0.757	0.639	2.889	2.535
Test conditions **indoor** unit							
Inlet Water temperature, DB	°C	30.31	27.51	25.20	21.70	31.50	30.31
Outlet Water temperature, DB	°C	34.03	29.78	27.16	23.98	35.34	34.03

Appendix I Test results

Test conditions **outdoor** unit							
Air **inlet** temperature, DB	°C	-6.97	2.04	7.00	12.01	-9.98	-6.97
Air **inlet** temperature, WB	°C	-7.98	1.00	6.09	10.99	-10.99	-7.98
Summary of the results							
Total heating capacity	kW	8.678	5.299	4.576	5.338	8.947	8.678
Effective power input	kW	2.565	1.184	0.787	0.669	2.919	2.565
Coefficient of performance (COP)	--	3.38	4.48	5.82	7.98	3.07	3.38
Compressor frequency	Hz	85	40	30	30	90	85
Water flow	m³/h	2.00	2.00	2.00	2.00	2.00	2.00
Remark: * In part condition, outlet temperature data is recorded by a full average complete cycle's data.							

3.Calculation/conclusion for SCOP(Average):

Tdesignh(°C)	-10	Tbiv(°C)	-7
Pdesignh(kW)	9.810	TOL(°C)	-10

Test result A, B, C, D, E, F conditions:

Condition	Part load	Measured capacity	COP at measured capacity	Cdh	CR	COP at part load
E	9.810	8.947	3.07	0.00	1.00	3.07
F	8.678	8.678	3.38	0.00	1.00	3.38
A	8.678	8.678	3.38	0.00	1.00	3.38
B	5.282	5.299	4.48	0.00	1.00	4.48
C	3.396	4.576	5.82	0.99	0.74	5.80
D	1.509	5.338	7.98	0.99	0.28	7.78

CR: part load divided by capacity;

Appendix I Test results

Electric power consumptions	Unit	Value
Thermostat-off mode [P_{TO}]	kW	0.005
Standby mode [P_{SB}]	kW	0.005
Crankcase heater [P_{CK}]	kW	0.040
Off mode [P_{OFF}]	kW	0.005

Conclusions:	Unit	Value
SCOPon:	kWh/kWh	4.73
SCOP:	kWh/kWh	4.72
Q_H:	kWh/year	20267
Q_{HE}:	kWh/year	4295
$\eta_{s,h}$	%	185.7
Seasonal space heating energy efficiency classes: (According (EU) No 811/2013 Table 2)	--	A+++

Appendix I Test results

Table 4.	Heating mode(Medium temperature application):							P
Model	Valdemar V1-13							
Product type	Air to Water	**Heating season**	☑	Average	☐	Warmer	☐	Colder

1. Test conditions:

Condition	Part Load Ratio in %				Outdoor heat exchanger	Indoor heat exchanger
	Formula	A	W	C	Inlet dry (wet) bulb temperature °C	Inlet/outlet water temperatures (°C)
A	(-7-16)/(Tdesignh-16)	88	N/A	N/A	-7(-8)	a / 52
B	(+2-16)/ (Tdesignh-16)	54	N/A	N/A	2(1)	a / 42
C	(+7-16)/(Tdesignh-16)	35	N/A	N/A	7(6)	a / 36
D	(+12-16)/(Tdesignh-16)	15	N/A	N/A	12(11)	a / 30
E	(TOL-16)/ (Tdesignh-16)				TOL	a / 55.3
F	(Tbivalent-16)/(Tdesignh-16)				Tbiv	a / 52
G	(-15-16)/(Tdesignh-16)	N/A	N/A	N/A	-15	N/A

Remark: a) With the water flow rate as determined at the standard rating conditions given in EN14511-2 at 47/55 conditions. the capacity is 17283.06W, the power is 4685.74W, the COP is 3.69.

2.Tested data/correction data(Average):

General test conditions/ Part-Load	Unit	A(-7)/W52 (88%)	A2/W42 (54%)	A7/W36 (35%)	A12/W30 (15%)	A(-10)/W55.3 (100%)	A(-7)/W52 (88%)
	--	A	B	C	D	E	F
Data collection period	hh: min:sec	2:00:00	2:00:00	2:00:00	2:00:00	2:00:00	2:00:00
The heat pump defrosts	--	No	No	No	No	No	No
Complete Cycles	--	0	0	0	0	0	0
Barometric pressure	kPa	99.85	99.85	99.85	99.80	99.75	99.85
Voltage	V	397.7	398.1	397.9	398.0	396.9	397.7
Current input of the unit	A	6.06	2.85	2.05	1.80	6.45	6.06
Power input of the unit	kW	3.851	1.569	1.063	0.916	4.070	3.851
Test conditions **indoor** unit							
Inlet Water temperature, DB	°C	48.06	39.58	33.82	27.30	51.07	48.06
Outlet Water temperature, DB	°C	52.05	42.00	35.94	29.93	55.09	52.05

Appendix I Test results

Test conditions **outdoor** unit							
Air **inlet** temperature, DB	°C	-6.98	2.07	7.03	11.99	-10.02	-6.98
Air **inlet** temperature, WB	°C	-7.98	0.99	5.98	10.98	-11.02	-7.98
Summary of the results							
Total heating capacity	kW	8.846	5.370	4.700	5.830	8.911	8.846
Effective power input	kW	3.880	1.598	1.092	0.944	4.099	3.880
Coefficient of performance (COP)	--	2.28	3.36	4.30	6.18	2.17	2.28
Compressor frequency	Hz	85	40	30	30	88	85
Water flow	m³/h	1.90	1.90	1.90	1.90	1.90	1.90

Remark: * In part condition, outlet temperature data is recorded by a full average complete cycle's data.

3.Calculation/conclusion for SCOP(Average):

Tdesignh(°C)	-10	Tbiv(°C)	-7
Pdesignh(kW)	10.000	TOL(°C)	-10

Test result A, B, C, D, E, F conditions:

Condition	Part load	Measured capacity	COP at measured capacity	Cdh	CR	COP at part load
E	10.000	8.911	2.17	0.00	1.00	2.17
F	8.846	8.846	2.28	0.00	1.00	2.28
A	8.846	8.846	2.28	0.00	1.00	2.28
B	5.384	5.370	3.36	0.00	1.00	3.36
C	3.461	4.700	4.30	0.99	0.74	4.29
D	1.538	5.830	6.18	0.99	0.26	6.01

CR: part load divided by capacity;

Appendix I Test results

Electric power consumptions	Unit	Value
Thermostat-off mode [P_{TO}]	kW	0.005
Standby mode [P_{SB}]	kW	0.005
Crankcase heater [P_{CK}]	kW	0.040
Off mode [P_{OFF}]	kW	0.005

Conclusions:	Unit	Value
SCOPon:	kWh/kWh	3.47
SCOP:	kWh/kWh	3.47
Q_H:	kWh/year	20659
Q_{HE}:	kWh/year	5959
$\eta_{s,h}$	%	135.7
Seasonal space heating energy efficiency classes: (According (EU) No 811/2013 Table 1)	--	A++

Appendix I Test results

Table 6.	Clause 4 of EN 14511-4:2018				P
Model	Valdemar V1-13				
Customer Code	Execution Date [dd-mm-yyyy]	Testing item	Standard Reference	Comment	Test Response
TEST 1	15-05-2022	STARTING TEST	EN14511-4:2018, §4.2.1.2 Table 3	The "lower" starting operating conditions declared by the manufacturer for the heating mode- i.e. Tair=-24.98°C, T out water 8.97°C, Flow rate 1.88m^3/h have been set and obtained. At those conditions, the machine was switched on. It started without any problem and worked for 30 minutes without showing any warning or allarm. During the test the machine operated in automode. No damage was recorded on the machine during and after the test.	Passed
TEST 2	15-05-2022	OPERATING TEST	EN14511-4:2018, §4.2.1.2Table 3	From the machine "lower" starting conditions - i.e. - the machine was brought to the lower operating conditions declared by the manufacturer for the heating mode- i.e. Tair=-24.96°C, T out water 50.47°C, Flow rate 1.88m^3/h. Once these conditions were obtained, the machine was let operate for over 1 hour in automode. During the test, no waring or alarm were showed. No damage was recorded on the machine during and after the test.	Passed
TEST 3	15-05-2022	SHUTTING OFF WATER FLOW	EN14511-4:2018, § 4.5	The water flow rate was shutted off through manual and automatic valves of the test rig. The machine switched off and only the flow switch Protection appeared on the user interface of indoor unit. Perform error reset operation , once the water flow rate was restored, the machine restarted automatically and worked for 30 minutes normally. No damage was recorded on the machine during and after the test.	Passed
TEST 4	15-05-2022	SHUTTING OFF AIR FLOW	EN14511-4:2018, § 4.5	The air flow rate was shutted off through a plastic sheet and a panel. The machine never turned off. It continued to operate with continuous frosting and defrosting cycles. After more than half an hour, the air flow rate was restored and the machine started to operate normally. During the test, no waring or alarm were showed. No damage was recorded on the machine during and after the test.	Passed
TEST 5	15-05-2022	COMPLETE POWER SUPPLY FAILURE	EN14511-4:2018, § 4.6	The power supply was cut off for about 10 seconds.The unit restarted automatically within about 3 minutes after the power supply was reactivated.	Passed

Appendix I Test results

Table 8a.	Sound power level measurement(Low temperature application)		P
Model	Valdemar V1-13		
	Product type :		Air to Water
	Outdoor heat exchanger, Air temperature DB/WB (°C):		7.0 /6.0
	Indoor heat exchanger, Water inlet/outlet temperature (°C):		30.0 /35.0
	Voltage (V):		400
	Frequency (Hz):		50
	Working condition class :		Class A
	Acoustical environment :		Hemi-anechoic room
	Windshield type :		Sponge
	Measured position amount :		14
	Water flow (m³/h):		2.00
Measured quantity	**$L_{WA,indoors}$ (dB(A))**	**$L_{WA,outdoors}$ (dB(A))**	**Remark**
Sound pressure level $\overline{L}_{p(ST)}$****	--	50	--
Spheres radius r *	--	1.0m	--
Sound power level L_{wA}****	--	65	--

Setting of controls: according to user manual.
Duct connection:--
Rounding to: *) 1 decimal places; **) 2 decimal places; ***) 3 decimal places; ****) nearest integer
Fan speed: 650 r/min, compressor speed: 60Hz.

Appendix I Test results

Table 8b.	Sound power level measurement(Medium temperature application)		P
Model	Valdemar V1-13		
	Product type :		Air to Water
	Outdoor heat exchanger, Air temperature DB/WB (°C):		7.0 /6.0
	Indoor heat exchanger, Water inlet/outlet temperature (°C):		47.0 /55.0
	Voltage (V):		400
	Frequency (Hz):		50
	Working condition class :		Class A
	Acoustical environment :		Hemi-anechoic room
	Windshield type :		Sponge
	Measured position amount :		14
	Water flow (m³/h):		1.90
Measured quantity	**$L_{WA,indoors}$ (dB(A))**	**$L_{WA,outdoors}$ (dB(A))**	**Remark**
Sound pressure level $\overline{L}_{p(ST)}$****	--	52	--
Spheres radius r *	--	1.0m	--
Sound power level L_{wA}****	--	67	--

Setting of controls: according to user manual.
Duct connection:--
Rounding to: *) 1 decimal places; **) 2 decimal places; ***) 3 decimal places; ****) nearest integer
Fan speed: 650 r/min, compressor speed: 63Hz.

Appendix IV Construction data form

Model: Valdemar V1-13		
Part		**Technical data**
1. Compressor		
	Manufacture:	Panasonic Wanbao Appliances Compressor (Guangzhou) Co.,Ltd.
	Type:	9RD220ZAA2J
	Rated capacity:	2265W
	Serial-number:	F041822
	Specification:	DC280V; R32
2. Condenser		
	Manufacture:	Ningbo Hrale Plate Heat Exchanger Co., Ltd.
	Type:	B3-40RD-46-4.5
	Heat exchanger:	Plate heat exchanger
	Dimension(mm):	120(L)mmX333(H)mmX83.2(D)mm
3. Evaporator		
	Manufacture:	Guangzhou AOTAI Refrigeration Equipment Co.，LTD
	Type:	ZC-040085722-01
	Heat exchanger:	Finned-coil heat exchanger
	Dimension(mm):	714(L)mmX900(H)mmX355(D)mm
4. Fan motor		
	Manufacture:	Jiangmen LT motor Co.,Ltd
	Type:	RD150HA
	Fan type:	3 blades
	Specification:	DC310V; 150W
5. Main control board		
	Manufacture:	Guangdong Chico Electronic Inc.
	Type:	PW58182
	Specification:	400V, 3N~, 50Hz

Appendix V Equipment List

No.	Type	Manufacture	Model	Equipment ID	Calibration Due Date
1	R&A performance measuring system	GEI	20kW	—	2022-08-02
2	Temperature and humidity meter	VAISALA	HMD42	H5110021	2022-08-02
3	Platinum resistance	YINUO	Pt100	TS-0167C0447	2022-10-12
4	Platinum resistance	YINUO	Pt100	TS-0167C0436	2022-10-12
5	Flowmeter	YOKOGAWA	LDY-25S	2161283	2022-10-12
6	Water pressure difference transmitter	MICRO	MDM3051	291459	2022-08-02
7	AC source Supply	YANGHONG	YF-3600	VGDS-0637	2022-11-07
8	Anechoic rooms (hemi-anechoic rooms)	Guangzhou Kinte	5.2m×4.7m×4.6 m	NC-036-2	2023-10-07
9	6 channel data logger	—	PXI-1033	VGDY-0257	2023-05-20
10	PULSE system	B & K	3660C	VGDY-0184	2023-04-12
11	Calibrator	B & K	4231	HJ-000095	2023-06-30
12	Long steel tape	—	5m	HJ-000150	2023-01-01
13	Temperature measurement system	—	—	NC-036-1	2023-06-07
14	Atmospheric pressure meter	—	—	HJ-000165	2022.11.22
15	Constant temperature water system	B & K	—	VGDS-0448	2023.04.18
16	Windscreen	B & K	WS002-5	—	—

-- End of Report --