

Appendix I Test results

Table 1.	Heating mode (Low temperature application):						P	
Model	Valdemar V1-8							
Product type	Air to Water	Heating season	<input checked="" type="checkbox"/>	Average	<input type="checkbox"/>	Warmer	<input type="checkbox"/>	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	$(-7-16)/(T_{designh}-16)$	88	N/A	N/A	-7(-8)	a / 34
B	$(+2-16)/(T_{designh}-16)$	54	N/A	N/A	2(1)	a / 30
C	$(+7-16)/(T_{designh}-16)$	35	N/A	N/A	7(6)	a / 27
D	$(+12-16)/(T_{designh}-16)$	15	N/A	N/A	12(11)	a / 24
E	$(TOL-16)/(T_{designh}-16)$				TOL	a / 35.3
F	$(T_{bivalent}-16)/(T_{designh}-16)$				T _{biv}	a / 34
G	$(-15-16)/(T_{designh}-16)$	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 7030.58W, the power is 1586.57W, the COP is 4.43.

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	228.6	229.0	229.2	228.9	228.6	228.6
Current input of the unit	A	7.12	3.39	2.36	2.00	8.35	7.12
Power input of the unit	kW	1.606	0.733	0.484	0.400	1.888	1.606

Test conditions indoor unit

Inlet Water temperature, DB	°C	30.01	27.56	24.92	21.77	31.15	30.01
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Outlet Water temperature, DB	°C	34.02	30.00	26.98	23.95	35.35	34.02
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Test conditions outdoor unit							
Air inlet temperature, DB	°C	-7.00	2.05	7.06	11.99	-10.00	-7.00
Air inlet temperature, WB	°C	-8.00	1.01	6.00	10.98	-11.00	-8.00
Summary of the results							
Total heating capacity	kW	5.637	3.446	3.000	3.089	5.849	5.637
Effective power input	kW	1.657	0.784	0.535	0.451	1.939	1.657
Coefficient of performance (COP)	--	3.40	4.40	5.61	6.85	3.02	3.40
Compressor frequency	Hz	81	40	30	30	90	81
Water flow	m³/h	1.24	1.24	1.24	1.24	1.24	1.24

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)	6.373	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	6.373	5.849	3.02	0.00	1.00	3.02
F	5.637	5.637	3.40	0.00	1.00	3.40
A	5.637	5.637	3.40	0.00	1.00	3.40
B	3.431	3.446	4.40	0.00	1.00	4.40
C	2.206	3.000	5.61	0.99	0.74	5.59
D	0.980	3.089	6.85	0.99	0.32	6.71

CR: part load divided by capacity;



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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	0.030
Off mode [P _{OFF}]	kW	0.005

Conclusions:	Unit	Value
SCOP _{on} :	kWh/kWh	4.60
SCOP:	kWh/kWh	4.59
Q _H :	kWh/year	13166
Q _{HE} :	kWh/year	2867
η _{s,h}	%	180.7
Seasonal space heating energy efficiency classes: (According (EU) No 811/2013 Table 2)	--	A+++

Appendix I Test results

Table 2.	Heating mode (Medium temperature application):						P	
Model	Valdemar V1-8							
Product type	Air to Water	Heating season	<input checked="" type="checkbox"/>	Average	<input type="checkbox"/>	Warmer	<input type="checkbox"/>	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	$(-7-16)/(T_{designh-16})$	88	N/A	N/A	-7(-8)	a / 52		
B	$(+2-16)/(T_{designh-16})$	54	N/A	N/A	2(1)	a / 42		
C	$(+7-16)/(T_{designh-16})$	35	N/A	N/A	7(6)	a / 36		
D	$(+12-16)/(T_{designh-16})$	15	N/A	N/A	12(11)	a / 30		
E	$(TOL-16)/(T_{designh-16})$				TOL	a / 55.3		
F	$(T_{bivalent-16})/(T_{designh-16})$				T _{biv}	a / 52		
G	$(-15-16)/(T_{designh-16})$	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 10386.17W, the power is 3004.24W, the COP is 3.46.								
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	229.0	229.1	229.2	229.1	228.7	229.0	
Current input of the unit	A	11.38	4.44	3.11	2.48	11.93	11.38	
Power input of the unit	kW	2.564	0.960	0.639	0.523	2.696	2.564	
Test conditions indoor unit								
Inlet Water temperature, DB	°C	47.37	39.27	33.79	27.39	50.44	47.37	
Outlet Water temperature, DB	°C	51.97	42.01	35.98	30.01	54.98	51.97	

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Test conditions outdoor unit							
Air inlet temperature, DB	°C	-6.95	2.01	7.06	11.99	-10.00	-6.95
Air inlet temperature, WB	°C	-7.95	0.99	6.00	10.98	-11.01	-7.95
Summary of the results							
Total heating capacity	kW	5.909	3.530	2.841	3.382	5.846	5.909
Effective power input	kW	2.609	1.005	0.683	0.568	2.740	2.609
Coefficient of performance (COP)	--	2.27	3.51	4.16	5.96	2.13	2.27
Compressor frequency	Hz	85	40	30	30	85	85
Water flow	m³/h	1.10	1.10	1.10	1.10	1.10	1.10
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)	6.680	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	6.680	5.846	2.13	0.00	1.00	2.13	
F	5.909	5.909	2.27	0.00	1.00	2.27	
A	5.909	5.909	2.27	0.00	1.00	2.27	
B	3.597	3.530	3.51	0.00	1.00	3.51	
C	2.312	2.841	4.16	0.99	0.81	4.15	
D	1.028	3.382	5.96	0.99	0.30	5.82	
CR: part load divided by capacity;							

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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	0.030
Off mode [P _{OFF}]	kW	0.005

Conclusions:	Unit	Value
SCOP _{on} :	kWh/kWh	3.47
SCOP:	kWh/kWh	3.47
Q _H :	kWh/year	13801
Q _{HE} :	kWh/year	3983
η _{s,h}	%	135.6
Seasonal space heating energy efficiency classes: (According (EU) No 811/2013 Table 1)	--	A++