Technical Report No.: 64.181.24.00496.01 Rev.00

Date: 2024-06-17

Client:	Name:	ThermoFLUX d.o.o
	Address:	Bage 3, 70101 Jajce, Bosnia and Herzegovina
	Contact person:	Amel Kopić
Manufacturer:	Name:	ThermoFLUX d.o.o
	Address:	Bage 3, 70101 Jajce, Bosnia and Herzegovina
Test object:	Product:	DC Inverter Air Source Heat Pumps
	Model:	MONOBLOCK TF15 R290 CT 220V
	Trade mark:	ThermoFLUX
Test specification:	☑	EN 14825:2022
	☑	EN 12102-1:2022
	☑	EN 14511-3:2022
	☑	EN 14511-4:2022 Clause 4
Purpose of examination:	Test according to the test specification	
	☑	(EU) No 813/2013
	☑	EU 2016/2282:2016-11-30
Test result:	The test results show that the presented product is in compliance with the above listed test specifications.	

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1 Description of the test object

1.1 Function

Manufacturer's specification for intended use:

The appliance is air to water heat pump.

Manufacturer's specification for predictive use:

According to user manual

1.2 Consideration of the foreseeable use

☐ Not applicable

☑ Covered through the applied standard

☐ Covered by the following comment

☐ Covered by attached risk analysis

1.3 Technical Data

Model :	MONOBLOCK TF15 R290 CT 220V
Rated Voltage (V) :	220-240V~
Rated Frequency (Hz) :	50
Rated Power (W) :	6800
Rated Current (A) :	32.54
Protection Class :	Class I
Protection Against Moisture :	IP X4
Construction :	Stationary
Supply connection :	☐ Non detachable cord
	☑ Permanent connection to fixed wiring
Operation mode:	☑ Continuous operation;
	☐ Intermittent operation;
	☐ Short time operation;
Refrigerant/charge (kg) :	R290 / 1.20kg
Declared parameters :	☑ Average ☐ Warmer ☐ Colder
Sound power level dB(A) :	N/A
Series No :	KAL092210600400035

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2 Order

2.1 Date of Purchase Order, Customer's Reference

Date of Purchase Order: 2023-08-31, 2024-06-17

Customer's Reference: ThermoFLUX d.o.o

2.2 Test Sample(s)

- Reception date(s): 2023-08-31
- Location(s) of reception:

For Energy test:

Guangzhou Customs District Technology Center
(CNAS accredited laboratory with Registration No.CNAS L2322)

Address: No.3, Desheng East Road, Daliang, Shunde District, Foshan, Guangdong, China

For Noise tests:

CVC Testing Technology Co., Ltd.
(CNAS accredited laboratory with Registration No.CNAS L0095)

Address: No.3, Tiantai Yilu, Kaitai Avenue, Science City, Guangzhou, Guangdong, China

- Condition of test sample(s): completed and can be normal operation

2.3 Date(s) of Testing

2023-08-31 to 2023-10-30

2.4 Location(s) of Testing

Same as 2.2

2.5 Points of Non-compliance or Exceptions of the Test Procedure

N/A

3 Test Results

☒ Decision rule according to ILAC-G8:09/2019 clause 4.2.1 Binary statement for simple acceptance rule or IEC Guide 115:2023, clause 4.3 Simple acceptance was applied.

☐ Decision rule according to customer's requirements was applied. It is:

☐ Decision rule according to ILAC-G8:09/2019 clause 4.2.2 Binary statement with guard band - guard band length = 95 % extended measurement uncertainty, was applied.

☐ Decision rule (based on ILAC-G8:09/2019 clause 4.2.3 Non-binary statement with guard band, guard band length = 95 % extended measurement uncertainty) for an upper specification limit (A lower limit or specification with an up-per and a lower limit is treated similarly.):

• Compliance with the requirement: If a specification limit is not breached by a measurement result plus the expanded uncertainty with a 95% coverage probability, then compliance with the specification will be stated (e. g. Pass).

• Non-compliance with the requirement: If a specification limit is exceeded by the measurement result minus the expanded uncertainty with a 95% coverage probability, then non-compliance with the specification will be stated (e. g. Fail).

• Inconclusive result: If a measurement result plus/minus the expanded uncertainty with a 95 % coverage probability overlaps the limit it will be stated that it is not possible to state compliance or non-compliance.

☐ There are no statements to conformity or no results with measurand stated in this report, no decision rule has been applied.

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3.1 Positive Test Results

See Appendix I

4 Remarks

4.1 General

The user manual has been examined according to the minimum requirements described in the product standard. The manufacturer is responsible for the accuracy of further particulars as well as of the composition and layout.

4.2 When the product is placed on the market, it must be accompanied with safety Instructions written in official language of the country. The instructions shall give information regarding safe operation, installation and maintenance.

5 Documentation

- Appendix I: Test results
- Appendix II: Marking plate
- Appendix III: photo documentation
- Appendix IV: Construction data form
- Appendix V: Test equipment list

6 Test History

1) These appliances are Air To Water Heat Pump Unit, each one including a whole compression type refrigerant circuit to heat water in another circuit. These appliances were for cooling and heating water function, this report only for heating capacity test.
2) The main power is supplied by a 3-pole supply cord connecting to fixed wiring.
3) Water enthalpy method was adopted in this report.
4) Standby mode power, off mode power and thermostat-off mode power were tested according to clause 12 of standard EN 14825:2022.
5) This test report 64.181.24.00496.01 Rev.00, dated 2024-06-17 bases on original test report 64.181.23.03117.01 Rev.00, dated 2023-11-07 to include the following changes and/or additions, which were considered technical modifications:

   a) Changing report holder name and address, manufacturer name and address, trademark and model name.

   b) After evaluating, no additional test was needed.

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TÜV SÜD Group

Tested by: William Liang, Project Handler

printed name, function & signature

Approved by: Plum Li, Designated Reviewer

printed name, function & signature

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Appendix I Test results

Table 1.	Heating mode (Low temperature application):							P
Model	MONOBLOCK TF15 R290 CT 220V							
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	Average climates	Inlet dry (wet) bulb temperature (°C)	Inlet/outlet water temperatures (°C)
A	(-7-16)/(Tdesignh-16)	88	-7(-8)	a / 34
B	(+2-16)/ (Tdesignh-16)	54	2(1)	a / 30
C	(+7-16)/(Tdesignh-16)	35	7(6)	a / 27
D	(+12-16)/(Tdesignh-16)	15	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	-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 10.657kW, the power is 2.342kW, the COP is 4.55kW/kW.

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	3:00:00	1:10:00	1:10:00	1:10:00	3:00:00	3:00:00
The heat pump defrosts	--	Yes	No	No	No	Yes	Yes
Electrical Properties							
Voltage	V	229.5	230.1	230.3	230.3	229.5	229.5
Current input of the unit	A	14.90	5.45	4.26	3.82	17.15	14.90
Power input of the unit	kW	3.389	1.200	0.919	0.817	3.902	3.389
Compressor frequency	Hz	85	35	30	30	85	85

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Appendix I Test results

Test conditions User Side							
Water flow	m^3/h	1.82	1.82	1.82	1.82	1.82	1.82
Inlet Water temperature	°C	29.25	27.28	25.29	23.15	30.39	29.25
Outlet Water temperature	°C	33.63*	29.98	28.07	26.34	34.93*	33.63*
Test conditions Source Side							
Barometric pressure	kPa	101.02	101.01	101.01	101.02	101.01	101.02
Air **inlet** temperature, DB	°C	-6.95	2.00	7.00	12.00	-9.97	-6.95
Air **inlet** temperature, WB	°C	-7.90	1.00	6.01	10.99	-11.00	-7.90
Summary of the results							
Total heating capacity	kW	9.199	5.648	5.831	6.702	9.541	9.199
Effective power input	kW	3.366	1.176	0.895	0.793	3.879	3.366
Coefficient of performance (COP)	kW/kW	2.73	4.80	6.51	8.45	2.46	2.73
Remark: * In part condition, outlet temperature data is recorded by the full average complete cycle's data.							

Electric power consumptions	**Unit**	**Value**
Thermostat-off mode [P_{TO}]	kW	0.025
Standby mode [P_{SB}]	kW	0.015
Crankcase heater [P_{CK}]	kW	0.038
Off mode [P_{OFF}]	kW	0.015

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Appendix I Test results

3.Calculation/conclusion for SCOP:			
Tdesignh(°C):	-10	Tbiv(°C) :	-7
Pdesignh(kW):	10.399	TOL(°C) :	-10

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

Condition	Part load	Measured capacity	Measured COP	Cdh	CR	COP at part load
E	10.399	9.541	2.46	0.90	1.00	2.46
F	9.199	9.199	2.73	0.90	1.00	2.73
A	9.199	9.199	2.73	0.90	1.00	2.73
B	5.600	5.648	4.80	0.90	0.99	4.80
C	3.600	5.831	6.51	0.90	0.62	6.13
D	1.600	6.702	8.45	0.90	0.24	6.41

CR: part load divided by capacity;

Conclusions:	Unit	Value
SCOPon:	kWh/kWh	4.70
SCOP:	kWh/kWh	4.69
Q_H:	kWh/year	21485
Q_{HE}:	kWh/year	4582
$\eta_{s,h}$	%	184.6
Seasonal space heating energy efficiency classes: (According (EU) No 811/2013 Table 2)	--	A+++

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Appendix I Test results

Table 2.	Heating mode (Medium temperature application):							P
Model	MONOBLOCK TF15 R290 CT 220V							
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	Average climates	Inlet dry (wet) bulb temperature (°C)	Inlet/outlet water temperatures (°C)
A	(-7-16)/(Tdesignh-16)	88	-7(-8)	a / 52
B	(+2-16)/ (Tdesignh-16)	54	2(1)	a / 42
C	(+7-16)/(Tdesignh-16)	35	7(6)	a / 36
D	(+12-16)/(Tdesignh-16)	15	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	-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 9.404kW, the power is 3.132kW, the COP is 3.00kW/kW.

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	3:00:00	1:10:00	1:10:00	1:10:00	3:00:00	3:00:00
The heat pump defrosts	--	Yes	No	No	No	Yes	Yes
Electrical Properties							
Voltage	V	229.3	230.5	230.3	230.3	230.0	229.3
Current input of the unit	A	15.78	6.56	5.10	4.58	19.38	15.78
Power input of the unit	kW	3.590	1.466	1.119	0.996	4.423	3.590
Compressor frequency	Hz	85	35	30	30	85	85

Appendix I Test results

Test conditions User Side							
Water flow	m³/h	1.04	1.04	1.04	1.04	1.04	1.04
Inlet Water temperature	°C	44.80	37.54	33.25	28.79	47.27	44.80
Outlet Water temperature	°C	51.64*	41.99	37.80	34.06	54.93*	51.64*
Test conditions Source Side							
Barometric pressure	kPa	99.85	99.85	99.85	99.80	99.75	99.85
Air **inlet** temperature, DB	°C	-6.97	2.01	7.27	12.00	-10.00	-6.97
Air **inlet** temperature, WB	°C	-8.09	1.03	6.02	10.99	-10.98	-8.09
Summary of the results							
Total heating capacity	kW	8.254	5.321	5.459	6.330	9.147	8.254
Effective power input	kW	3.586	1.462	1.115	0.992	4.419	3.586
Coefficient of performance (COP)	kW/kW	2.30	3.64	4.90	6.38	2.07	2.30
Remark: * In part condition, outlet temperature data is recorded by the full average complete cycle's data.							

Electric power consumptions	**Unit**	**Value**
Thermostat-off mode [P_{TO}]	kW	0.025
Standby mode [P_{SB}]	kW	0.015
Crankcase heater [P_{CK}]	kW	0.038
Off mode [P_{OFF}]	kW	0.015

Appendix I Test results

3.Calculation/conclusion for SCOP:			
Tdesignh(°C):	-10	Tbiv(°C) :	-7
Pdesignh(kW):	9.330	TOL(°C) :	-10

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

Condition	Part load	Measured capacity	Measured COP	Cdh	CR	COP at part load
E	9.330	9.147	2.07	0.90	1.00	2.07
F	8.254	8.254	2.30	0.90	1.00	2.30
A	8.254	8.254	2.30	0.90	1.00	2.30
B	5.024	5.321	3.64	0.90	0.94	3.64
C	3.230	5.459	4.90	0.90	0.59	4.58
D	1.435	6.330	6.38	0.90	0.23	4.76

CR: part load divided by capacity;

Conclusions:	Unit	Value
SCOPon:	kWh/kWh	3.63
SCOP:	kWh/kWh	3.62
Q_H:	kWh/year	19276
Q_{HE}:	kWh/year	5327
$\eta_{s,h}$	%	141.8
Seasonal space heating energy efficiency classes: (According (EU) No 811/2013 Table 1)	--	A++

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Appendix I Test results

Table 3a.	Sound power level measurement (Low temperature application)		P
Model	MONOBLOCK TF15 R290 CT 220V		
	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):		230
	Frequency (Hz):		50
	Working condition class :		Class A
	Acoustical environment :		Hemi-anechoic room
	Windshield type :		Sponge
	Measured position amount :		14

Measured quantity	$L_{WA,indoors}$ (dB(A))	$L_{WA,outdoors}$ (dB(A))	Remark
Sound pressure level $\overline{L}_{p(ST)}$****	--	45	--
Measurement distance d *	--	1.0m	--
Sound power level L_{WA}****	--	60	--

Setting of controls: according to user manual.
Duct connection:--
Rounding to: *) 1 decimal places; **) 2 decimal places; ***) 3 decimal places; ****) nearest integer

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Appendix I Test results

Table 3b.	Sound power level measurement (Medium temperature application)		P
Model	MONOBLOCK TF15 R290 CT 220V		
	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):		230
	Frequency (Hz):		50
	Working condition class :		Class A
	Acoustical environment :		Hemi-anechoic room
	Windshield type :		Sponge
	Measured position amount :		14

Measured quantity	$L_{WA,indoors}$ (dB(A))	$L_{WA,outdoors}$ (dB(A))	Remark
Sound pressure level $\overline{L}_{p(ST)}$****	--	47	--
Measurement distance d *	--	1.0m	--
Sound power level L_{wA}****	--	62	--

Setting of controls: according to user manual.
Duct connection:--
Rounding to: *) 1 decimal places; **) 2 decimal places; ***) 3 decimal places; ****) nearest integer

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Appendix I Test results

Table 4.	Clause 4 of EN 14511-4:2022	P
Model:	**MONOBLOCK TF15 R290 CT 220V**	
TEST 1	STARTING TEST (§4.2.1.2 Table 3)	
Requirement: The "lower" starting operating conditions declared by the manufacturer for the heating mode- i.e. Tair= -25.03 °C, T in water = 9.17 °C, Flow rate 0.94 m³/h have been set and obtained. At those conditions, the machine was switched on.		
Observation/ Evaluation: It started without any problem and worked for 30 minutes without showing any warning or alarm. During the test the machine operated in auto mode. No damage was recorded on the machine during and after the test.		
Test Response: Pass		

TEST 2	OPERATING TEST (§4.2.1.2 Table 3)
Requirement: 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= -25.01 °C, T in water = 50.75°C, Flow rate 0.94 m³/h. Once these conditions were obtained, the machine was let operate for over 1 hour in auto mode.	
Observation/ Evaluation: During the test, no waring or alarm were showed. No damage was recorded on the machine during and after the test.	
Test Response: Pass	

TEST 3	SHUTTING OFF WATER FLOW (§ 4.5)
Requirement: The water flow rate was shuted 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.	
Observation/ Evaluation: 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.	
Test Response: Pass	

TEST 4	SHUTTING OFF AIR FLOW (§ 4.5)
Requirement: 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.	
Observation/ Evaluation: During the test, no waring or alarm were showed. No damage was recorded on the machine during and after the test.	
Test Response: Pass	

TEST 5	COMPLETE POWER SUPPLY FAILURE (§ 4.6)
Requirement: The power supply was cut off for about 5 seconds.	
Observation/ Evaluation: The unit restarted automatically within about 3 minutes after the power supply was reactivated.	
Test Response: Pass	

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Appendix II Marking plate

Nameplate

Model: MONOBLOCK TF15 R290 CT 220V

ThermoFLUX

DC Inverter toplotne pumpa zrak-voda
DC Inverter Air Source Heat Pumps

Model	MONOBLOCK TF15 R290 CT 220V
Napajanje Power Supply	220-240V~/50Hz
Kapacitet grijanja min./max. Heating Capacity min./max.	5,93 / 12,9 kW
Potrošnja el. energije - grijanje Heating Input Power min./max.	1,24 / 3,51 kWh
COP grijanje min./max. Heating COP min./max.	3,68 / 4,78
Kapacitet hlađenja min./max. Cooling Capacity min./max.	4,88 / 10,6 kW
Potrošnja el. energije - hlađenje Cooling Input Power min./max.	1,55 / 4,42 kWh
Prosječna potrošnja/Jačina struje Rated. Input Power/Current	6,8 kWh / 32,54 A
Max. temperatura polaza vode Max. Water Outlet Temperature	75℃
Max. protok cirk. pumpe Max. Water Pump Flow	6,2m^3/h
Max. dobava cirk. pumpe Max. Water Pump Head	10,5 m
Nazivni protok Rated Water Flow	2,6 m^3/h
Rashladno sredstvo / težina Refrigerant/Weight	R290 / 1,2 kg
Niski i visoki radni pritisak freona Low/High side operation pressure	0,85 / 3,2 MPa
Max. dozvoljeni pritisak freona Maximum allowable pressure	3,2 MPa
Max. pritisak vode Max Water Pressure	1,0 MPa
Otpornost na udarce Shock Proof Grade	I
Klasa vodootpornosti WaterProof Level	IPX4
Pad pritiska na vodenoj strani Water Pressure Drop	23 kPa
Hidraulički priključak Water Pipe Connection	1"
Netto težina Net Weight	145 kg
Datum:/Serijski broj: Date: /NO.:	Pogledati bar code See bar code

Ekvivalentna težina punjenja sustava CO2: 0,0036 tona
System CO2 aquivalent charge weight: 0,0036 ton

*Radni uslovi grijanja:
*Heating working condition:
Temperatura suhog termometra 7℃, temperatura mokrog 6℃
Dry bulb temperature 7℃, Wet bulb temperature 6℃
Temperatura ulazne vode 30℃, temperatura izlazne vode 35℃
Inlet water temperature 30℃, Outlet water temperature 35℃

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Doc No.: ITC-TTW0902.02E – Rev.15

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Appendix III photo documentation

Details of:	Overall view
View: ☐ General ☐ Front ☐ Rear ☐ Right ☐ Left ☐ Top ☐ Bottom	

Details of:	Compressor
View: ☐ General ☐ Front ☐ Rear ☐ Right ☐ Left ☐ Top ☐ Bottom	

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Appendix III photo documentation

Details of:	Fan Motor
View: ☐ General ☐ Front ☐ Rear ☐ Right ☐ Left ☐ Top ☐ Bottom	

Details of:	Main Control Board
View: ☐ General ☐ Front ☐ Rear ☐ Right ☐ Left ☐ Top ☐ Bottom	

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Appendix III photo documentation

Details of:	Water Pump
View: ☐ General ☐ Front ☐ Rear ☐ Right ☐ Left ☐ Top ☐ Bottom	

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Appendix IV Construction data form

Model：MONOBLOCK TF15 R290 CT 220V		
Part		**Technical data**
1. Compressor		
	Manufacture:	Panasonic Wanbao Appliances Compressor (Guangzhou) Co.， Ltd.
	Type:	H550D7VZAAC6
	Rated capacity:	3120W
	Serial-number:	F9999998
	Specification:	DC520V; R290
2. Condenser		
	Manufacture:	Jiangsu Yuanzhuo Equipment Manfactur Co.,Ltd
	Type:	ZL62FA-40AD-CG
	Heat exchanger:	Plate heat exchanger
	Dimension(mm):	526(L)mmX119(H)mmX91(D)mm
3. Evaporator		
	Manufacture:	Guangzhou Aotai Refrigeration Equipment Co.,Ltd.
	Type:	05KH-CP-01
	Heat exchanger:	Finned-coil heat exchanger
	Dimension(mm):	660.4(L)mmX1300(H)mmX343.3(D)mm
4. Fan motor		
	Manufacture:	Wolong Electric Group Co., Ltd
	Type:	ZWB278D04A
	Fan type:	3 blade
	Specification:	DC310V; 102W
5. Main control board		
	Manufacture:	CAREL
	Type:	UP3F00200T3S04
	Specification:	220-240V~; 50Hz
6. Water pump		
	Manufacture:	GRUNDFOS
	Type:	UPM10L 25-105 130
	Specification:	230V~; 50/60Hz
*(Alternative)		
	Manufacture:	Shinhoo
	Type:	GPA25-11H
	Specification:	230V~; 50Hz

Remark: * means the test results were not performed on the alternative components.

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Appendix V Equipment List

No.	Type	Manufacture	Model	Equipment ID	Calibration Due Date
1	Heat pump energy efficiency testing system	PINXIN	10HP	2017J00001	2023-11-24
2	Electromagnetic flowmeter	KROHNE	OPTIFLUX4100C	H17221264	2023-12-21
3	Anechoic rooms (hemi-anechoic rooms)	Guangzhou Kinte	-	NC-036-2	2024-10-07
4	AC source Supply	YANGHONG	YF-3600	VGDS-0637	2024-11-07
5	6 channel data logger	—	PXI-1033	VGDY-0257	2024-05-20
6	PULSE system	B & K	3660C	VGDY-0184	2024-04-12
7	Calibrator	B & K	4231	HJ-000095	2024-06-30
8	Long steel tape	—	5m	HJ-000150	2024-01-01
9	Temperature measurement system	—	—	NC-036-1	2024-06-07
10	Atmospheric pressure meter	—	—	HJ-000165	2023-11-22
11	Constant temperature water system	B & K	—	VGDS-0448	2024-04-18
12	Windscreen	B & K	WS002-5	—	—

-- End of Report --

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