TÜVRheinland®

Prüfbericht - Nr.: 15039191 001
Test Report No.:

Auftraggeber: *Client:*	**Taizhou Free-energy Development Co., Ltd.** *Batou Village, Tongyu, Luqiao, Taizhou, Zhejiang , 318053 P.R. China*
Gegenstand der Prüfung: *Test item:*	**Air Source Heat Pump Water Heater**
Bezeichnung: *Identification:*	FREE-CP300L **Serien-Nr.:** *Serial No.:* **Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**153145940** **Eingangsdatum:** *Date of receipt:* **28.06.2010**
Prüfort: *Testing location:*	**Hefei General Machinery & Electrical Products Inspection Institute** *No.888 West Changjiang Road, Hefei, Anhui 230031,P.R.China*
Prüfgrundlage: *Test specification:*	**EN 255-3:1997**
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test item passed the test specification(s).*
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (Shanghai) Co., Ltd.** *10-15/F, Huatsing Building, No. 88, Lane 777, West Guangzhong Road, Zhabei District, Shanghai 200072, P.R. China*

geprüft/ *tested by:*			**kontrolliert**/ *reviewed by:*		
Aug. 10, 2010	Aileen Hu /PE		2010.8.10	Lihong Xiong	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges/ *Other Aspects:*

According to requirement from client, coefficient of performance test according to EN 255-3 performed, manufacturer requested default setting of thermostat for water temperature (temperature sensor) is 43℃.

Reference hot water temperature and Maximum quantity of usable hot water are not measured.

Attachment 1: Measuring and Testing equipments list (1 page)

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*N/T*	=	*not tested*

Test item particulars:	
Class of protection ..... :	Class I
Degree of protection ..... :	IPX0
Class of temperature..... :	
Testing:	
Date of receipt of test item..... :	2010.06.28
Date(s) of performance of test..... :	2010.06.28 – 2010.06.30

General product information:

The appliance is air to water heat pump water heater, with can provide hot water up to 55°C. It is designed to be indoor installation by authorized professional person.

Upper part covered by plastic enclosure, contain most of the refrigerating system and electric control system. The refrigerating system is composed of one compressor, one finned tube heat exchanger (air side evaporator), one coil heat exchanger (immerse in water tank, condenser), one fan motor, one electric valve and one electrical expansion valve. Refrigerant R417a is used.

Lower part is 300 litre water tank, electric heater with 1500W power and thermal control system mounted in middle of water tank, 121°C thermal link inside heater to prevent dry heating, 60°C thermal control and 93°C thermal cut-out fixed in inner enclosure of water tank.

Electric control system is composed of one main PCB and one electronic controller. For main control, on the refrigerating system, there are pressure switches on both suction and discharge side of compressor, 5 temperature sensors located on the pipe of finned tube heat exchanger, suction and discharge pipe of compressor, water tank and ambient air temperature. Electronic controller was supplied from main PCB with SELV.

Compressor SL193RV-C7LU used (220-240V/ 50Hz/ single phase), made by Shanghai Hitachi electrical appliances Co., Ltd.

Copy of marking plate:

FREE ENERGY

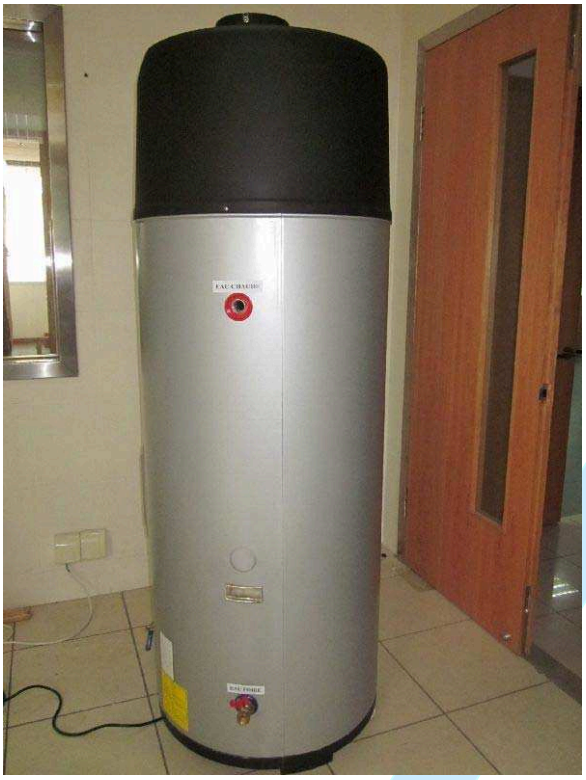
AIR SOURCE WATER HEAT PUMP

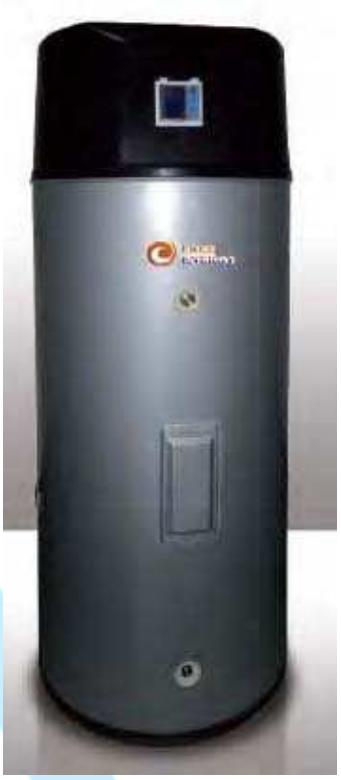
Model	FREE-CP300L
Voltage	230V/1/50Hz
Protection index	IPX0
Electrical protection index	I
Rated thermal power	2766w
Rated consumption power	859w
Rated consumption current	3,73A
Electric heating power	1500w
Max consumption power	2880w
Max consumption current	12.5A
Refrigerant type / weight	R417a/1,0kg
Water tank capacity	300L
Rated pressure	0,6MPa
Rated outlet water temperature	55°C
Water inlet and outlet diameter	3/4"
Noise level	47dB(A)
Net weight	95kg
Refrigerant high pressure	2,9MPa
Refrigerant low pressure	0,02MPa

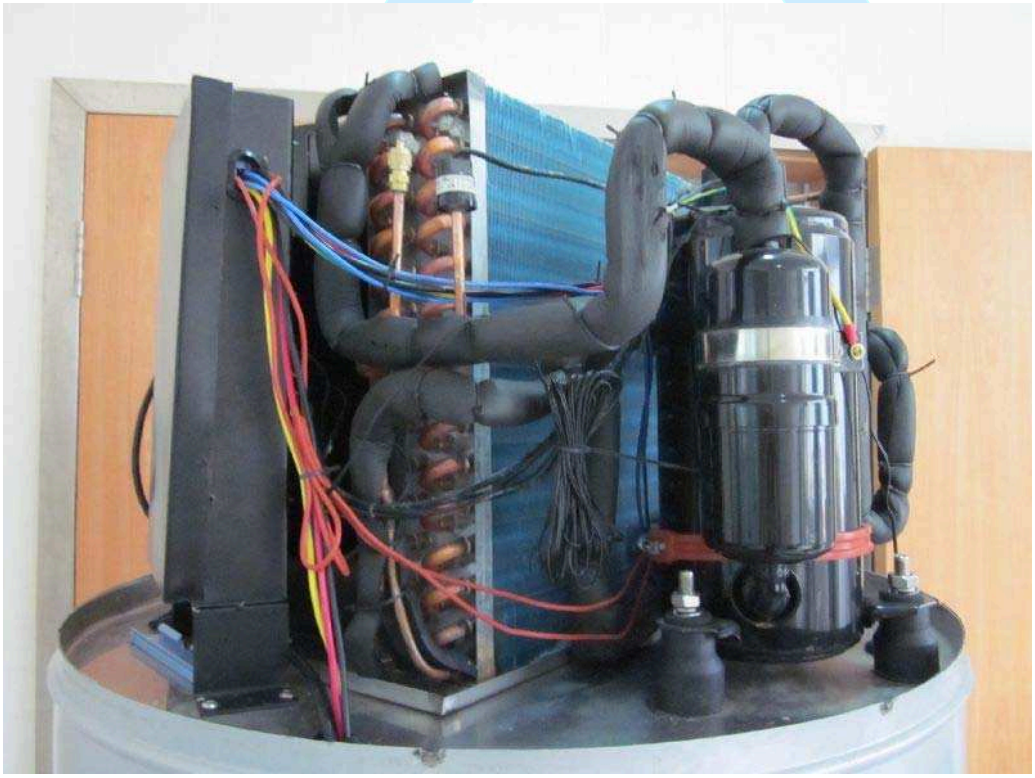
CE

FREE ENERGY
TAIZHOU CHINA

Photos:







EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
4.1	General		P
	The method of test described in this clause is designed to evaluate the performance of heat pumps for heating sanitary water. It can be applied to heat pumps designed for the sole purpose of heating sanitary water as well as to heat pumps designed for combined space and sanitary water heating.	Sole purpose of heating sanitary water	P
4.2	Basic principles		P
4.2.1	Test overview		P
	The performance test consists of the following 5 principal stages:		P
	— a heating up period (see 4.2.2);		P
	— a determination of the coefficient of performance for healing sanitary water (see 4.2.3);		P
	— a determination of a reference hot water temperature (see 42.4);		N/T
	— a determination of standby power input (see 42.5);		P
	- a determination of the maximum quantity of usable hot water in a single tapping (see 4.2.6).		N/T
	All tests are performed with power supplied at the rated voltage and frequency as recommended by the manufacture	AC 230V, 50Hz	P
	After the initial start of the heat pump the power supply is left on for the duration of the test.		P
	Any supplementary heat supply which can be manually switched by the user shall be switched off during the entire test	Supplementary heater switched off during the entire test	P
	If the water heater is equipped with a mixing valve for the hot water this valve shall be set at the manufacturer's recommended setting throughout the test	Appliance not equipped with a mixing valve	P
	The thermostat of the water heater shall be installed according to the manufacturer's recommendation and shall remain in the same position for the duration of the test. At least one thermostat shall sense the temperature of the sanitary hot water in the tank to make the described test procedure valid.	Temp. sensor contact with sanitary hot water and mechanical thermostat contact with inner enclosure of water tank.	P
	All measured parameters, with the exception of time, volume, energy and number of cycles, are understood to be average values calculated over the duration of the test period.		P

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
4.2.2	Heating up period		P
	Measurements are made of the time necessary to heat the stored quantity of water from an initial state of uniform low temperature until the first time the compressor is switched off by the thermostat sensing the water temperature in the tank. The corresponding input of electrical energy is measured.	Measured (water heated from 15℃ to 43℃) electrical energy input: 2,724 kWh duration: 3h 11min	P
4.2.3	Coefficient of performance		P
	Hot water draw-offs are initiated directly after the heating up period. The energy content of the tapped hot water is calculated from measurements of flow rate and temperature difference. The electrical energy input and time duration between the start of the second draw-off and the first time after this that the compressor is switched off by the thermostat sensing the water temperature in the tank are also measured.	Calculated energy content of the tapped hot water by measurements of flow rate and temperature difference	P
4.2.5	Standby power input		P
	The standby power input is determined by measuring the electrical power input over an integral number of on-off cycles of the heat pump, initiated by the thermostat situated in the tank, when no hot water is drawn off.	>24h, >=3 cycles	P
4.2.7	Power input of fans for heat pumps without duct connection		N/A
	In the case of heat pumps which are not designed for duct connection, i.e. which do not permit any external pressure differences, and which are equipped with an integral fan, the power absorbed by the fan shall be included in the effective power absorbed by the heat pump.	Designed for with or without duct connection	N/A
4.2.8	Power input of fans for heat pumps with duct connection		P
4.2.8.1	In the case of heat pumps which allow an external static pressure difference, only a fraction of the input to the fan motor shall be included in the effective power absorbed by the heat pump.	Test without duct connection	N/A
4.2.8.2	If no fan is provided with the heat pump, the proportional power input which is to be included in the effective power absorbed by the heat pump shall be calculated using the formula		N/A
4.2.8.3	if a fan is an integral part of the heat pump, only a fraction of the input to the fan motor shall be included in the effective power absorbed by the heat pump	Only input of fan motor	P

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
	The faction which is to be excluded from the total power absorbed by the heat pump shall he calculated using the formula:	Test without duct connection	N/A
4.2.9	Power input of liquid pumps	No liquid pumps	N/A
4.2.9.1	The power input of pumps in any intermediate circuit or for circulation of water through the heat pump shall be fully included in the effective power absorbed by the heat pump.		N/A
4.2.9.2	At the outdoor heat exchanger, the fraction of the power absorbed by a pump which is required to overcome the internal static pressure difference of the heat pump shall be calculated from the measured volume flow of the heat transfer medium and the measured internal static pressure difference of the heat pump, assuming an overall efficiency of 0.3 for the pumps, including their driving motors.		N/A
	If no pump is provided with the heat pump, the proportional power input which is to be included in the effective power absorbed by the heat pump shall be calculated using the formula		N/A
4.2.9.3	If a pump is an integral part of the heat pump only a fraction of the input to the pump motor shall be included in the effective power absorbed by the heat pump The fraction which is to be excluded from the total power absorbed by the heat pump shall be calculated using the formula		N/A
4.3	Test apparatus		P
4.3.1	Arrangement of the test apparatus		P
4.3.1.1	General requirements		P
	The test apparatus shall be designed in such a way that all requirements for adjustment of set values, stability criteria and accuracy of measurement according to this European Standard can be fulfilled. Water systems or other heat transfer liquid systems shall be sufficiently free of entrained gas as to ensure that the measured results are not significantly influenced.		P
	Ducted air systems shall be sufficiently airtight to ensure that the measured results are not significantly influenced by exchange of air with the surroundings.		N/A
	Permissible deviations from set values are described in table 4 and limits on uncertainties of measurement are described in table 1		P
4.3.1.2	Test room for the outdoor heat exchanger of air source heat pumps		P

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
	The size of the test room shall be selected to avoid any resistance to air flow at the air inlet and air outlet orifices of the test object The air flow through the room shall not be capable of initiating any short circuit between the two orifices, and therefore the velocity of air flow at these two locations shall not exceed 1,5 m/s when the test object is switched off. The air velocity in the room shall also not be greater than the mean velocity through the unit inlet Unless otherwise stated by the manufacturer; the air inlet and air outlet orifices shall not be less than 1 m from the surfaces of the test room; this also applies to any measuring ducts.		P
	Any direct heat radiation from heating units in the test room onto the heat pump or onto the temperature measuring points shall be avoided.		P
4.3.1.3	Setting the external static pressure difference on the air side for heat pumps with duct connection	No duct connection	N/A
	For heat pumps with duct connection, the maximum external static pressure difference available at the nominal flow rate specified by the manufacturer is preferably set on the air outlet side of the heat pump when the heating system does not operate. The nominal air flow shall then be verified.		N/A
4.3.1.4	Setting the external pressure difference on the liquid side of heat pumps with integral liquid pumps	No integral liquid pumps	N/A
	For heat pumps with integral liquid pumps the maximum external static pressure difference available at the nominal flow rate specified by the manufacturer is preferably set on the liquid outlet side of the heat pump. This also sets the liquid flow.		N/A
4.3.2	Installation and connection of the heat pump		P
	The heat pump shall be installed and connected for the test as recommended by the manufacturer, in his installation and operation manual.		P
	Temperature and pressure measuring points shall be arranged in order to obtain significant mean values.		P
	Set points for internal control equipment such as thermostats, pressure switches or mixing valves shall be checked for compliance with the values stated by the manufacturer		P
	Air and entrained gases shall be carefully removed from all water and other heat transfer liquid systems.		P

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
4.3.3	Installation of heat pumps consisting of several parts	Integrated heat pump	N/A
	In the case of heat pumps consisting of several refrigeration parts (split heat pumps) the following installation conditions shall be complied with for the tests:		N/A
	a) each refrigerant line shall be installed in accordance with the manufacturer's instructions with the maximum stated length or 8m, whichever is shorter;		N/A
	b) the lines shall be installed so that the difference in elevation does not exceed 1 m		N/A
	c) thermal insulation shall be applied to the lines in accordance with the manufacturer's instructions;		N/A
	d) unless constrained by the design at least half of the interconnecting lines shall be exposed to the outdoor conditions with the rest of the lines exposed to the indoor conditions.		N/A
	For indirect systems each water line shall be installed in accordance with the manufacturer's instructions to the maximum stated length or 5 m whichever is shorter Thermal insulation shall be applied to the lines in accordance with the manufacturer's instructions.		N/A
4.4	Uncertainties of measurement		P
	Uncertainties of measurement shall not exceed the values specified in table 1. The stated values include all sources of uncertainty i.e. both the measuring equipment and the method of measurement		P
4.5	Test conditions		P
	The performance test shall be carried out at the test conditions specified in tables 2 and 3 as appropriate.		P
4.6	Test procedure		P
4.6.1	General		P
	The general test procedure is described in 4.2 and illustrated in figure 1.		P
	Tests are performed at the test conditions specified in tables 2 and 3 (see 4.5).		P
	Specific test requirements for different heat sources (e.g. testing under frosting conditions) are referred to in EN 255-2.		N/A

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
	In the case of appliances with duct connection and where the heat pump has a variable speed fan motor, the output measurement shall be carried out at the maximum permissible external static pressure difference at the nominal flow rate specified by the manufacturer.		N/A
	If the appliances can be used without duct connection, then the measurement with duct connection is sufficient		P
	Table 4 for permissible deviations of the measured values from the test conditions,		P
4.6.2	Heating up period		P
	The test is started with the entire contents of the storage tank at the temperature of the ambient air specified in table 3. This is achieved by circulating the water until the temperature at the outlet is within the limits for the ambient air specified in table 4. It shall be ensured that the entire heat pump system is in thermal equilibrium with its surroundings.	Indoor ambient air: DB 15℃/ WB 12℃ Ambient of water tank: 15℃	P
	The healing up time, measured from the time the heat pump is switched on until it is shut off by the hot water thermostat situated in the tank	Measured time: t_h = 3h 11min	P
	The healing up energy input, W_{eh}, is determined over the same period as the heating up time.	Measured energy input: W_{eh} = 2,724 kWh	P
4.6.3	Coefficient of performance		P
	At the same time as the heat pump is first shut off by the thermostat situated in the tank, a volume of hot water is tapped equivalent to 0,5 Vn, where Vn is the nominal volume of the hot water storage container. The heat pump is allowed to heat the water until the thermostat shuts it off again.	The first 150 l hot water tapped	P
	At the second thermostat shut off another volume of hot water equivalent to 0,5 Vn is tapped. The heat pump is allowed to heat the water again until the thermostat shuts it off for the third time.	The sec. 150 l hot water tapped	P
	The energy contents of the two draw-offs shall not differ by more than 10%. Otherwise further draw-off cycles shall be repeated until the difference between two successive draw-offs is less than 10%.	The energy contents of the two draw-offs <10%	P
	The tapping and reheating time t_t for the tapping period is measured between the two final shut offs by the thermostat situated in the tank		P

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
	The tapping flow rate, q_{wh}, together with the temperatures of the incoming cold water, θ_{wc}, and the outgoing hot water θ_{wh}, are measured repeatedly during the tapping period at least each 10 s. The tapped hot water energy is calculated for hot water temperatures greater than or equal to 40 ℃		P
	The required reheating energy input, W_{et}, is determinated over the final tapping period.		P
	From the result taken during the final draw-off a coefficient of performance for hot water tapping, COP_t, is determined	See appended table 1 for calculated COP_t	P
4.6.5	Standby effective power input		P
	After the last time the thermostat shuts off the heat pump, following the reference temperature test (θ'_{wh}), the system is left to operate for a number of full cycles with no hot water being tapped. This is a stabilization period to prepare for determination of the standby power input, P_{es}, of the system. This stabilization period should not be less than 24 h and should comprise at least one complete on-off cycle switched by the thermostat in the tank		P
	After 24 h of standby operation the first shut off by the thermostat situated in the tank initiates the determination of the standby power input. This period continues until the first thermostat shut off after another minimum period of 24h and should comprise at least three complete on-off cycles.		P
	The duration of the standby measurement period, t_s, is measured.		P
	The required energy input, W_{es}, to cover the losses during the standby period is determined. From these measurements the standby power input is calculated	31,0 W	P
	This energy input W_{es} takes into account the correction of energy input of fans and liquid pumps calculated according to 4.2.8 and 4.2.9 for their respective time of operation	No correction needed	P
4.7	Expression of results		P
4.7.1	General		P
	The performance of a heat pump system for heating sanitary water is expressed by the following measured and calculated results.		P
	All results (except 4.7.2) should be expressed by not more than three significant figures.		P
4.7.2	Heating up time, t_h		P

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
	The heating up time is the measured time according to 4.6.2 expressed in hours and minutes.	3h 11min	P
4.7.3	Heating up energy input, W_{eh}		P
	The heating up energy input is the energy input according to 4.6.2 expressed in kilowatt hours.	2,724 kWh	P
4.7.4	Standby effective power input, P_{es}		P
	The standby power input is calculated from the electrical energy input, W_{es}, and the time, t_s, of the standby period according to 4.6.5:	31,0 W	P
4.7.5	Coefficient of performance for tapping sanitary hot water, COP_t	COP_t = 3,43	P
	The coefficient of performance for tapping hot water is calculated from the measurement of hot water energy output, Q_t, and the determination of electrical energy input, W_{et}, according to 4.6.3:		P
5	Test report		P
5.1	General information		P
	The test report shall at least contain:	See appended table 2	P
	a) date;		P
	b) test institute;		P
	c) test place;		P
	d) test supervisor;		P
	e) test object denomination;		P
	f) reference to this European Standard;		P
	g) manufacturer's serial numbers of the heat pump tested and the storage tank;		P
	h) descriptions of the heat pump tested and the storage tank;		P
	i) any deviations from the test method;		N/A
	j) measured values (see 5.3);		P
	k) presentation of main results (see 5.4);		P
	l) uncertainty of the test results;		P
	m) date, and signature of the test supervisor.		P
5.2	Additional information		P
	Any additional information given on the rating plate shall be noted.		P
5.3	Performance test		P

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict
	The values to be indicated in table 5 shall be the mean of values taken over the test period.		P
5.4	Presentation of main results		P
	The values indicated in table 6 shall be calculated according to 4.7. If table 6 is not reproduced in full the reference hot water temperature shall still be given together with any other result	See appended table 1	P
6	Marking	See copy of marking plate	P
	Each heat pump shall have a durable, permanently fixed marking that is easily readable when the unit is in position for use.		P
	a) manufacturer or supplier		P
	b) manufacturers model designation and serial number		P
	c) type and mass of refrigerant		P
	d) nominal volume of the storage tank (Vn).		P
	Further information can be provided		P

Appended table

Table 1 for EN255-3 5.4 presentation of main results		
Model:	FREE-CP300L	
Test condition	Indoor test room: dry/wet (°C)	15/12
	Incoming cold water: (°C)	15
	Hot water flow rate: (dm^3/s)	0,2
	Thermostat setting: (°C)	43°C operate
Rated voltage / frequency	230VAC / 50Hz	
Tested voltage / frequency	230VAC / 50Hz	
Coefficient of performance for tapping hot water (COP_t)	3,43	
Heating up time (t_h): (h and min)	3h 11min	
Heating up energy input (W_{eh}): (kWh)	2,724	
Standby power input (P_{es}): (W)	31,0	

EN 255-3:1997			
Clause	Requirement - Test	Result - Remark	Verdict

Table 2 for EN255-3 5.1 General information; 5.2 Additional information	
a) Test date: (month/year)	2010.06.28 – 2010.06.30
b) Test institute:	TÜV Rheinland (Shanghai) Co., Ltd.
Test location:	Hefei General Machinery Product Inspection Institute No.888 West Changjiang Road, Hefei, Anhui 230031,P.R.China
c) Test supervisor:	Aileen Hu
d) Test object designation	See below
-Type	FREE-CP300L
-Serial number	Engineering sample, Pre-production without serial number.
-Name of manufacturer	Taizhou Free-energy Development Co., Ltd.
-Year of initial installation	2010
-storage tank	300 litre
e) Type of refrigerant	R417a
f) Mass of refrigerant (kg)	1,0 kg

---end of report---