

Test Report

检测报告

Report No.
报告编号

: 1811C60210713101

Applicant
委托单位

: Huizhou Epever Technology Co., Ltd.
惠州汇能精电科技有限公司

Address
单位地址

: No.6 Laowu Road, Start-up Area of China-Korea (Huizhou) Industrial Park, Zhongkai District, Huizhou City, Guangdong Province, China.
广东省惠州市仲恺区中韩惠州产业园起步区老屋路 6 号

Product Name
产品名称

: DC-DC Battery Charger
DC-DC 电池充电器

Report Date
日期

: 2026-05-20

Guangdong Anbotek Testing Co., Ltd.

广东安博检测有限公司



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- 9.Detecting address:Building C, No. 76, Huifeng 4th Road, Zhongkai High-tech Zone, Huizhou, Guangdong, China.
9.检测地址:广东省惠州市仲恺高新区惠风四路76号(厂房C)。

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Test report

检测报告

Client Name : Huizhou Epever Technology Co., Ltd.
委托单位 : 惠州汇能精电科技有限公司
Address : No.6 Laowu Road, Start-up Area of China-Korea (Huizhou) Industrial Park,
地 址 : Zhongkai District, Huizhou City, Guangdong Province, China.
广东省惠州市仲恺区中韩惠州产业园起步区老屋路 6 号

Report on the submitted sample(s) said to be:

提交的样品信息如下:

Product Name : DC-DC Battery Charger
产品名称 : DC-DC 电池充电器
Model : DUC5011(main test/主测), DUC1011, DUC2011, DUC3011, DUC3511,
型 号 : DUC4011
Trademark : EPEVER
商 标 :
Description : /
样品描述 :
Sample(s)
received quantity : 1pc
样品接收数量 :
Sample(s)
Testing quantity : 1pc
样品测试数量 :
Manufacturer : Huizhou Epever Technology Co., Ltd.
制 造 商 : 惠州汇能精电科技有限公司
Factory : Huizhou Epever Technology Co., Ltd.
生 产 商 : 惠州汇能精电科技有限公司
Other information : /
其他信息 :
Sample(s)
received Date : 2026-04-24
样品接收日期 :
Testing period : 2026-04-27
样品测试日期 :

Test Conclusion :
测试结论 :

Test item : IP32
测试项目 :
Test standard : IEC 60529:1989+A1:1999+A2:2013
测试标准 : GB/T 4208-2017
Evaluation : Pass
评判结果 : 合格

Prepared by:
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叶柏煊

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姓名: 叶柏煊

1. Test standards 测试标准

IEC 60529:1989+A1:1999+A2:2013		
GB/T 4208-2017		
Degrees of protection provided by enclosures(IP Code)		
外壳防护等级(IP 代码)		

2. Conformity verification-Summary of inspection 合格验证 - 检验总结

Clause 条款	Summary of inspection 检查总结	Test result 测试结果		
		N/A	Pass	Fail
12	TESTS FOR PROTECTION AGAINST ACCESS TO HAZARDOUS PARTS INDICATED BY THE FIRST CHARACTERISTIC NUMERAL 第一位特征数字所表示的对接近危险部件防护的试验	☐	☒	☐
13	TESTS FOR PROTECTION AGAINST SOLID FOREIGN OBJECTS INDICATED BY THE FIRST CHARACTERISTIC NUMERAL 第一位特征数字所表示的防止固体异物进入的试验	☐	☒	☐
14	TESTS FOR PROTECTION AGAINST WATER INDICATED BY THE SECOND CHARACTERISTIC NUMERAL 第二位特征数字所表示的防止水进入的试验	☐	☒	☐

Test case verdicts 测试结果判决:

N/A: Test case does not apply to the test object 测试用例不适用于测试对象

P: Test item does meet the requirement 测试项目确实符合要求

F: Test item does not meet the requirement 测试项目不符合要求

2.1 Environmental Conditions 实验室环境 :

Environmental Temperature: 15℃~35℃

环境温度: 15℃~35℃

Relative Humidity: 25%~75%

相对湿度: 25%~75%

Pressure: 86kpa~106kpa

大气压: 86kpa~106kpa

2.2 Test equipment 设备信息 :

Equipment Name 设备名称	Equipment No. 设备编号	Equipment model 设备型号	validity period 设备校准有效期
IPX12 vertical drip test device IPX12 垂直滴水试验装置	ABSE-00582	GR-IPX12A	2026-07-02
IP Tester C IP 试具 C	ABSE-00759	IP3X	2027-01-22

3. Test information and results 测试信息与结果

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决

11.4	Combination of test conditions for the first characteristic numeral 第一位特征数字试验条件的组合
	Designation with a first characteristic numeral implies that all test conditions are met for this numeral 标识第一位特征数字意味着满足该数字的所有试验条件

Table5 表 5	First characteristic number 第一位特征数字	Test for protection against 防护试验		
		Access to hazardous parts 防止接近危险部件	Solid foreign objects 固体异物	Verdict 判决
	0	No test required 不要求试验	No test required 不要求试验	N/A
	1	The sphere of 50mm ϕ shall not fully penetrate and adequate clearance shall be kept 直径 50mm 的球不得完全进入外壳，并与带电部分保持足够的间隙		N/A
	2	The jointed test finger may penetrate up to its 80 mm length, but adequate clearance shall be kept 铰接试指可进入 80mm 长，但应与带电部分保持足够的间隙	The sphere of 12.5mm ϕ shall not fully penetrate 直径 12.5mm 的球不得完全进入外壳	N/A
	3	The test rod of 2.5 mm ϕ shall not penetrate and adequate clearance shall be kept 直径 2.5mm 的试棒不得进入外壳，并与带电部分保持足够的间隙		P

IEC 60529:1989+A1:1999+A2:2013

GB/T 4208-2017

Clause 条款	Requirement-Test 测试要求	Verdict 判决
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Table5 表 5	4	The test wire of 1.0mm ϕ shall not penetrate and adequate clearance shall be kept 直径 1mm 的试验金属线不得进入外壳，并与带电部分保持足够的间隙		N/A
	5	The test wire of 1.0 mm ϕ shall not penetrate and adequate clearance shall be kept 直径 1mm 的试验金属线不得进入外壳，并与带电部分保持足够的间隙	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety 不能完全防止尘埃进入，但进入的灰尘量不得影响设备的正常运行，不得影响安全	N/A
	6	The test wire of 1.0 mm ϕ shall not penetrate and adequate clearance shall be kept 直径 1mm 的试验金属线不得进入外壳，并与带电部分保持足够的间隙	No ingress of dust 无灰尘进入	N/A
	In the case of the first characteristic numerals 1 and 2, "not fully penetrate" means that the full diameter of the sphere shall not pass through an opening of the enclosure. 注：第一位特征数字为 1 和 2 中，“不得完全进入”即球的直径部分不得通过外壳开口。			

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决

13	TESTS FOR PROTECTION AGAINST SOLID FOREIGN OBJECTS INDICATED BY THE FIRST CHARACTERISTIC NUMERAL 第一位特征数字所表示的防止固体异物进入的试验			
13.1	Test means 测试方法			
	Test means and the main test conditions are given in Tab.7. 试验方法和主要试验条件见表 7			
	Tab.VII-7 Test means for the tests for protection against solid Foreign objects 物体试具推入外壳开口所用力由表 7 规定			
Table 7 表 7	First characteristic numeral 第一位特征数字	Test means 试验方法	Test force 试验用力	Verdict 判决
	0	No test required 不要求试验	不要求试验	N/A
	1	Rigid sphere without handle or guard 50mm diameter 没有手柄和护板的直径 50mm 的刚性球	50 N ± 10 %	N/A
	2	Rigid sphere without handle or guard 12.5mm diameter 没有手柄和护板的直径 12.5mm 的刚性球	30 N ± 10 %	N/A
	3	Rigid steel rod 2.5mm diameter with edges free from burrs 边缘无毛刺的直径 2.5mm 的刚性钢棒	3 N ± 10 %	P
	4	Rigid steel rod 1mm diameter with edges free from burrs 边缘无毛刺的直径 1.0mm 的刚性钢线	1 N ± 10 %	N/A

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017			
Clause 条款	Requirement-Test 测试要求		Verdict 判决
Table 7 表 7	First characteristic numeral 第一位特征数字	Test means 试验方法	Verdict 判决
	5	Dust chamber Fig.2,with or without underpressure 图 2 防尘箱, 加或不加负压	N/A
	6	Dust chamber Fig.2,with Underpressure 图 2 防尘箱, 加负压	N/A
13.2	Test conditions for first characteristic numerals 1, 2, 3, 4 第一位特征数字为 1、2、3、4 的试验条件		
	The object probe is pushed against any openings of the enclosure with the force specified in table 7. 物体试具推入外壳开口所用的力由表 7 规定		
13.3	Acceptance conditions for first characteristic numerals 1, 2, 3, 4 第一位特征数字为 1、2、3、4 的接受条件		Verdict 判决
	The protection is satisfactory if the full diameter of the probe specified in table 7 does not pass through any opening. 如果表 7 中的试具的直径不能通过任何开口, 则试验合格		P
13.4	Dust test for first characteristic numerals 5 and 6 第一位特征数字为 5 和 6 的防尘试验		Verdict 判决
	The test is made using a dust chamber incorporating the basic principles shown in figure 2 whereby the power circulation pump may be replace by other means suitable to maintain the talcum powder in suspension in a closed test chamber. The talcum powder used shall be able to pass through a square-meshed sieve the nominal wire diameter of which is 50 and the nominal width of a gap between wires 75µm . The amount of talcum powder to be used is 2Kg per cubic metre of the test chamber volume. It shall not have been used for more than 20 tests. 试验应在防尘箱中进行, 其基本原理如图 2 所示。密闭试验箱内的粉末循环泵可用能使滑石粉悬浮的其他方法代替。滑石粉应用金属方孔筛滤过。金属丝直径 50µm, 筛孔尺寸为 75µm。滑石粉用量为每立方米试验箱容积 2kg, 使用次数不得超过 20 次。		N/A

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决
13.4	Dust test for first characteristic numerals 5 and 6 第一位特征数字为 5 和 6 的防尘试验	Verdict 判决
	Enclosures are of necessity in one of two categories: Category1: Enclosures where the normal working cycle of the equipment causes reductions in air pressure within the enclosure below that of the surrounding air, for example, due to thermal cycling effects. Category 2:Enclosures where no pressure difference relative to surrounding air is present. 外壳类型须为下列二者之一: 第一种类型: 设备正常工作周期内壳内的气压低于周围大气压力, 例如因热循环效应引起的。 第二种类型: 外壳内气压与周围大气压力相同	N/A
	Category 1 enclosures: The enclosure under test is supported inside the test chamber and the pressure inside the enclosure is maintained below the surrounding atmospheric pressure by a vacuum pump.The suction connection shall be made to a hole specially provided for this test. A volume of air 80 times the volume of the sample enclosure tested without exceeding the extraction rate of 60 volumes per hour. In no event shall the depression exceed 2 kPa(20 mbar) on the manometer shown in figure 2. 对于第一种类型外壳: 被试外壳放在试验箱内, 壳内压力用真空泵保持低于大气压。抽气孔应连到专为试验设置的孔上。 抽气量为 80 倍被试外壳容积, 抽气速度每小时不超过 60 倍外壳容积。任何情况下压差不得超过 2kPa。	N/A
	Category 2 enclosures: The enclosure under test is supported in its normal operating position inside the test chamber, but is not connected to a vacuum pump. Any drain-hole normally open shall be left open for the duration of the test.The test shall be continued for a period of 8h. 对于第二种类型外壳: 被试外壳按正常工作位置放入试验箱内, 但不与真空泵连接。在正常情况下开启的泄水孔, 试验期间应保持开启。试验持续 8 小时。	N/A

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决

13.5	Special conditions for first characteristic numeral 5 第一位特征数字为 5 的特殊条件	
13.5.1	Test conditions for first characteristic numeral 5 第一位特征数字为 5 的试验条件	Verdict 判决
	The enclosure shall be deemed category 1 unless the relevant product standard for the equipment specifies that the enclosure is category 2. 除了有关产品规定外壳为第二种以外，外壳都看作第一种	N/A
13.5.2	Acceptance conditions for first characteristic numeral 5 第一位特征数字为 5 的接受条件	Verdict 判决
	The protection is satisfactory if, on inspection, talcum powder has not accumulated in a quantity or location such that, as with any other kind of dust, it could interfere with the correct operation of the equipment or impair safety. Except for special cases to be clearly specified in the relevant product standard, no dust shall deposit where it could lead to tracking along the creepage distances . 试验后，观察滑石粉沉积量及沉积地点，如果同其他灰尘一样，不足以影响设备的正常操作或安全，即认为试验合格。除非有关产品标准明确规定了特例，在可有沿爬电距离导致漏电起痕处不允许有灰尘沉积。	N/A

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决

13.6	Special conditions for first characteristic numeral is 6 第一位特征数字为 6 的特殊条件	
13.6.1	The enclosure shall be deemed category 1, whether reductions in pressure below the atmospheric pressure are present or not 第一位特征数字为 6 的试验条件	Verdict 判决
	The enclosure shall be deemed category 1, whether reductions in pressure below the atmospheric pressure are present or not 无论外壳内压力是否减至低于大气压力，都看作是第一种外壳	N/A
13.6.2	Acceptance conditions for first characteristic Numeral 6 第一位特征数字为 6 的接受条件	Verdict 判决
	The protection is satisfactory if no deposit of dust is observable inside the enclosure at the end of the test. 试验后壳内无明显的灰尘沉积，即认为试验合格	N/A

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决

14	TESTS FOR PROTECTION AGAINST WATER INDICATED BY THE SECOND CHARACTERISTIC NUMERAL 第二位特征数字所表示的防止水进入的试验					
14.1	Test means 测试方法					
	The test means and the main test conditions are given in the table 8 试验方法和主要试验条件见表 8					
Table 8 表 8	Test means and main test conditions for the tests for Protection against water 防水试验方法和主要试验条件					Verdict 判决
	Second Characteristic Numeral 第二位特征数字	Test means 试验方法	Water flow Rate 水流量	Duration of Test 试验持续时间	Test Conditions 试验条件 参见章条	
	0	No test required 不需要实验	N/A	N/A	N/A	
	1	Drip box Fig.3, Enclosure on Turntable 使用图 3 滴水箱，外壳置于转台上	1 mm/min	10 min 10 分钟	14.2.1	
	2	Drip box Fig.3, Enclosure in 4 fixed positions of 15°tilt 使用图 3 滴水箱，外壳在四个固定的位置上倾斜 15°	3 mm/min	2.5 min for each position of tilt 每一个倾斜位置 2.5 分钟	14.2.2	

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决

Table 8 表 8	Second Characteristic Numeral 第二位 特征数字	Test means 试验方法	Water flow Rate 水流量	Duration of Test 试验持续时 间	Test Conditions 试验条件 参见章条	Verdict 判决
	3	Oscillating tube Fig.a Spray $\pm 60^\circ$ from vertical, distance max.200mm Or Spray nozzle Fig.5 Spray $\pm 60^\circ$ from vertical 使用图 4 摆管, 与垂直方 向 $\pm 60^\circ$ 范围淋水, 最大距 离 200mm 或使用图 5 淋水喷头, 与 垂直方向 $\pm 60^\circ$ 范围内淋水	0.07L/min $\pm 5\%$ per hole, multiplied by Number of holes 10L/min $\pm 5\%$ 每孔 0.07L/min $\pm 5\%$ 乘以孔数 10L/min $\pm 5\%$	10min 10 分钟	14.2.3a)	N/A
				1 min/m ² at least 5 min 1 min/m ² 至少 5 分钟	14.2.3b)	N/A
	4	As for numeral 3, Spray $\pm 180^\circ$ from vertical 同数字为 3 的试验, 角度 为与垂直方向 $\pm 180^\circ$ 范围 淋水	As for numeral 3 同数字 3	As for numeral 3 同数字 3	14.2.4	N/A
	5	Water jet hose Nozzle Fig.6, Nozzle 6.3mm diameter,distance 2.5m to 3m 使用图 6 喷嘴, 喷嘴直径 6.3mm, 距离 2.5m ~ 3m	12.5L/min $\pm 5\%$	1 min/m ² at least 3 min 1 min/m ² 至少 3 min	14.2.5	N/A

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017						
Clause 条款	Requirement-Test 测试要求					Verdict 判决
Table 8 表 8	Second Characteristic Numeral 第二位 特征数字	Test means 试验方法	Water flow Rate 水流量	Duration of Test 试验持续时间	Test Conditions 试验条件 参见章条	Verdict 判决
	6	Water jet hose Nozzle Fig.6 Nozzle 12.5mm diameter,distance 2.5m to 3m 使用图 6 喷嘴, 喷嘴 直径 12.5mm, 距离 2.5m ~ 3m	100L/min ±5%	1 min/m ² at least 3 min 1 min/m ² 至少 3 min	14.2.6	N/A
	7	Immersion tank Water-level on Enclosure:0.15m above top 1m above bottom 使用潜水箱, 水面在 外壳顶部以上至少 0.15m, 外壳底面在 水面下至少 1m	N/A	30min 30 分钟	14.2.7	N/A
	8	Immersion tank Water-level:by Agreement 使用潜水箱, 水面高 度由用户和制造厂协 商	N/A	by agreement 协议由用户和 制造厂协商	14.2.8	N/A

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决

Table 8 表 8	Second Characteristic Numeral 第二位 特征数字	Test means 试验方法	Water flow Rate 水流量	Duration of Test 试验持续时间	Test Conditions 试验条件 参见章条	Verdict 判决
	9	Fan jet nozzle, Figure 7, Test of small enclosure on turntable, Figure12 Turntable speed (5±1)r/min Spray at 0°, 30°, 60°, 90° 扇形喷嘴, 图 7 在转台上对小型外壳 进行试验, 图 12 转速 (5±1) r/min 在 0°、30°、60°、 90°方向喷射	(15±1)L/min	30s per position 每个方向 30s	14.2.9(a)	N/A
		Test of large enclosures as per intended use Spray from all practical directions Distance (175±25)mm 按预期使用对大型外 壳进行试验 从距离 (175±25) mm 的位置喷射		1min/m ² at least 3 min 1min/m ² 至少 3min	14.2.9(b)	N/A

IEC 60529:1989+A1:1999+A2:2013 GB/T 4208-2017		
Clause 条款	Requirement-Test 测试要求	Verdict 判决

14.2.2	The second characteristic number of the test is 2 测试的第二位特征数字为 2	Verdict 判决
	Water flow rate :3mm/min 水流速度: 3mm/min Tilt angle: 15 degrees 倾斜角度: 15° 2.5 min foreach position of tilt 每一个倾斜位置 2.5 分钟 Test time :10 min 测试时间: 10min	P

4.Test result 测试结果:

Sample No. 样品编号	Test Item 测试项目	Test requirements 测试要求	Test result 测试结果	Evaluation 评判结果
1811C602107131 -1-1-1	IP3X	The test wire of 2.5 mm diameter shall not penetrate the sample inside. 直径为 2.5 毫米的测试导线不得穿透样品内部。	The test wire of 2.5 mm diameter doesn't penetrate the sample inside. 直径为 2.5 毫米的测试导线未能深入样品内部。	Pass 合格
1811C602107131 -1-1-1	IPX2	There is no water enter the sample inside or the water inside does not affect the electrical properties of the sample. 样本内部没有水进入，而且样本内部的水也不会影响其电学性能。	There is water ingress inside the sample. 样品内部无进水。	Pass 合格

5.Photos 照片



Before test
测试前



IP3X-Test set-up
IP3X-测试中



IP3X-Test set-up
IP3X-测试中



IP3X-Test set-up
IP3X-测试中



IP3X-Test set-up
IP3X-测试中



IP3X-Test set-up
IP3X-测试中



IP3X-Test set-up
IP3X-测试中



IPX2-Test set-up
IPX2-测试中



After test
测试后



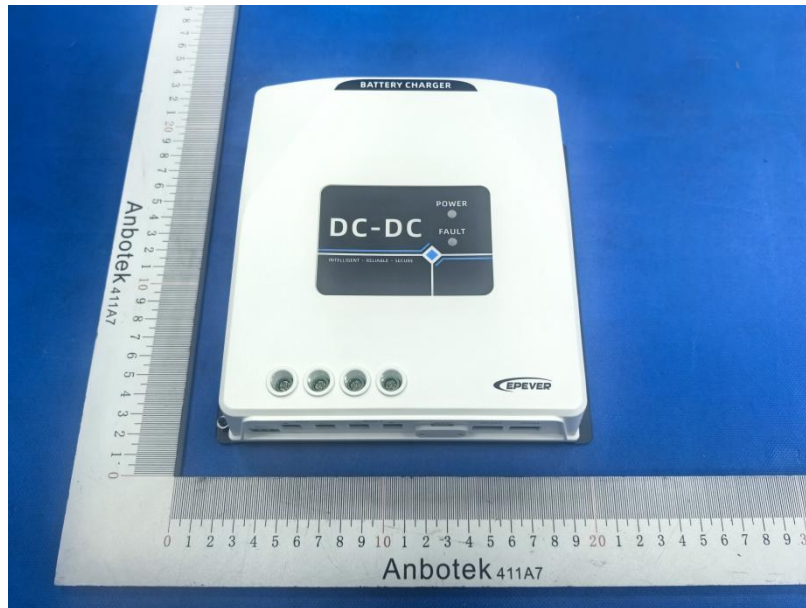
After test
测试后



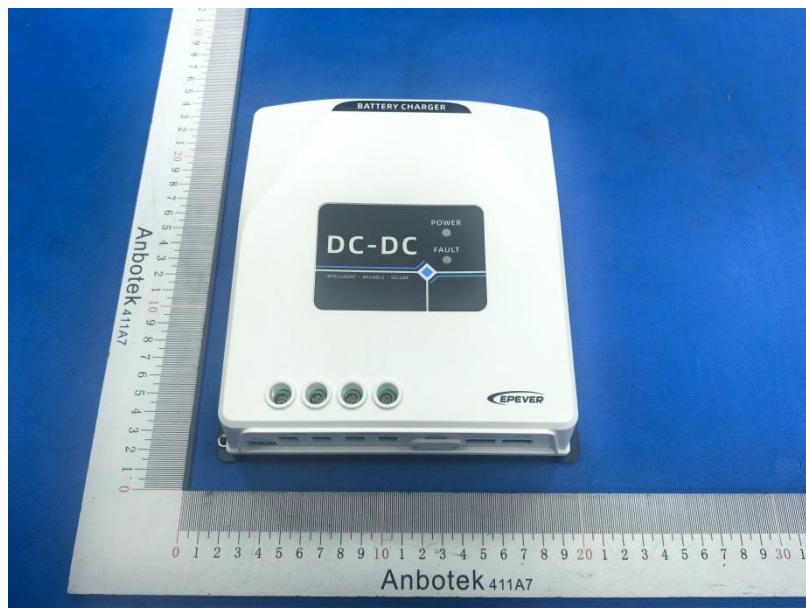
After test
测试后



After test
测试后



DUC3011
Series model
系列型号



DUC4011
Series model
系列型号

End of report
报告结束