



EST Technology Co., Ltd.
Address: Chilingxiang, Qishantou, Santun, Houjie,
Dongguan, Guangdong, China
Tel: +86-769-83081888 Fax: +86-769-83081878

Ref. Report No.

ESTS-G22101805

TEST REPORT

Energy Efficiency Regulations Energy Efficiency of Battery Charger System For CEC+DOE

Report Reference No: ESTS-G22101805

Tested by (+ signature).....: Mayfly Qu/Engineer


2022-12-13

2022 12 13

Approved by (+ signature)...: Jimmy Liang/ Reviewer

Applicant.....: PINGHU CITY HONGKI ELECTRIC CO., LTD

Address.....: NO.133 TONGCHE ROAD, XINCANG TOWN, PINGHU CITY, ZHEJIANG
PROVINCE, CHINA

Manufacturer.....: Same as Applicant

Address.....: Same as Applicant

Factory: Same as Applicant

Address.....: Same as Applicant

Description.....: Class 2 Power Supply

Model No.....: HK012-120100AXU

Trade mark.....: PINGHU CITY HONGKI ELECTRIC CO., LTD

Rating.....: Input: 100-120Vac, 50/60Hz, 0.3A;

Output: 12.0Vdc, 1000mA, 12W

Test Result.....: **PASS**

Sample receipt date.....: October 18, 2022

Date(s) of Test.....: October 24, 2022

Date of Issue.....: December 13, 2022

Test procedure.....: ☒ CEC-140-2019-002: CALIFORNIA CODE OF REGULATIONS
Title 20. Public Utilities and Energy Article 4. Appliance Efficiency Regulations
☐ DOE: Office of Energy Efficiency and Renewable Energy 10 CFR Parts 429
and 430
☒ 10 C.F.R. section 430.23(aa) (Appendix Y to Subpart B of Part 430) as it
appeared in the code of Federal Regulations on June 20, 2016

Testing laboratory.....: EST Technology Co., Ltd.

Address.....: Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China

Laboratory Accreditation...: CNAS

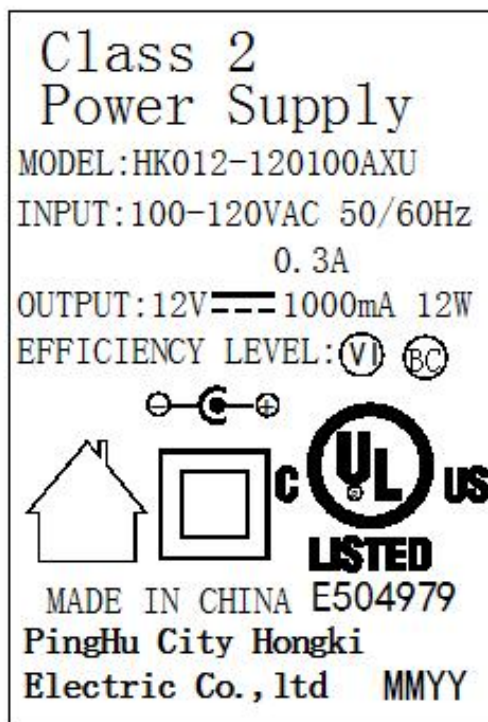
Test Report issued under the responsibility of:

EST Technology Co., Ltd.

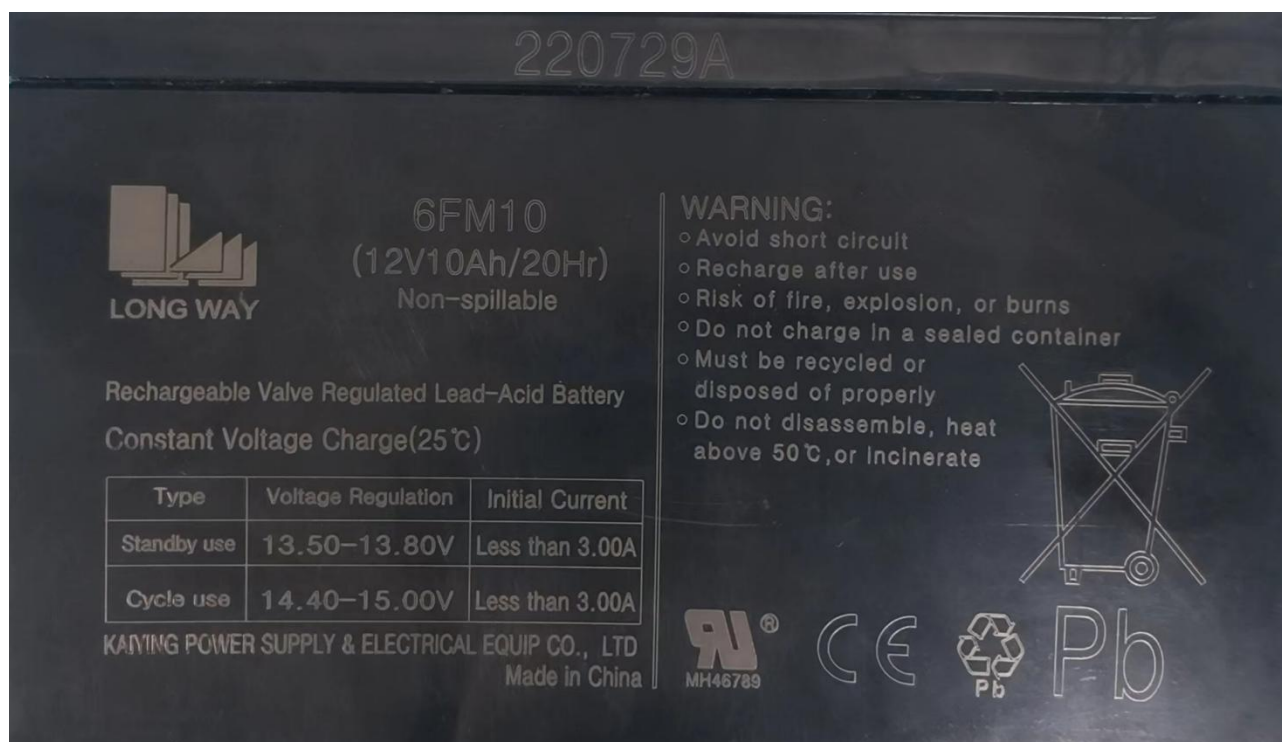
Copy of marking plate(Representative):

The artwork below may be only a draft.

For End Product:



For Battery:



General product information:

1. The submitted samples were found to comply with the above standard.
2. This test results relate only to the submit samples.
3. Product with EPS (External Power Supply):

Model	Output Rating	Manufacturer	Efficiency level	Energy efficiency report No.
HK012-120100AXU	12.0Vdc, 1.0A	PINGHU CITY HONGKI ELECTRIC CO., LTD	VI	ESTS-G19021404- M1

Note: This report shall not be reproduced except for authorized by testing laboratory.

General condition

1. Test Room

The tests shall be carried out in a room that has an air speed close to the appliance under test of ≤ 0.5 m/s. The ambient temperature shall be maintained at (20 ± 5) °C throughout the test.

2. Power supply

Where this standard is referenced by an external standard or regulation that specifies a test voltage and frequency, the test voltage and frequency so defined shall be used for all tests. Where the test voltage and frequency are not defined by an external standard, the test voltage and the test frequency shall be the nominal voltage and the nominal frequency of the country for which the measurement is being determined ± 1 %.

3. Supply voltage waveform

The total harmonic content of the supply voltage when supplying the appliance under test in the specified mode shall not exceed 2 %; harmonic content is defined as the root-mean-square (r.m.s.) summation of the individual components using the fundamental as 100 %.

4. Power measurement accuracy

Precision measurement of energy consumption shall be made with a precision equal to the greater of 0.1 Watt-hour or 1% of full-scale measurement.

5. Testing Setup

Charge the battery with the UUT for the period specified by the UUT manufacturer as the time needed to fully charge the battery under test.

- 1) All limited time functions used to deliver the primary charge to the battery, including cell equalization, are to be excluded from the measurement of battery maintenance mode.
- 2) If these events are known to occur for a time period beyond the manufacturer specified charge time, the battery is to be left in place until all such functions are complete.
- 3) In cases where no charge time is specified, the batteries are to be charged for a period of at least 24 hours.

Test Standards for Federally-regulated Battery Chargers Systems:

Performance Parameter	Standard
Maximum 24 charge and maintenance Energy(Wh) (Eb=capacity of all batteries in ports and N=number of charger ports)	For Eb of 2.5Wh or less:16xN
	For Eb greater than 2.5Wh and less than or equal to 100Wh:12xN+1.6Eb
	For Eb greater than 100Wh and less than or equal to 1000Wh:22xN+1.5Eb
	For Eb greater than 1000Wh:36.4xN+1.486Eb
Maintenance Mode Power and No battery Mode Power(W) (Eb=capacity of all batteries in ports and N=number of charger ports)	The sum of maintenance mode power and no battery mode power must be less than or equal to:1xN+0.0021xEb Watts

Unit Energy Consumption(UEC)

Product class	Product class description	Rated battery energy (Ebatt **)	Special characteristic or battery voltage	Maximum UEC (kWh/yr)(as a function of Ebatt **)
1.....	Low-Energy.....	≤5 Wh.....	Inductive Connection*..	3.04
2.....	Low-Energy,Low-Voltage.....	<100 Wh.....	<4 V.....	0.1440 * Ebatt + 2.95
3.....	Low-Energy, Medium-Voltage..		4–10 V.....	For Ebatt <10Wh, 1.42 kWh/y Ebatt ≥10 Wh, 0.0255 * Ebatt + 1.16
4.....	Low-Energy, High-Voltage.....		>10 V.....	0.11 * Ebatt + 3.18
5.....	Medium-Energy, Low-Voltage..	100–3000 Wh ...	<20 V.....	0.0257 * Ebatt +0.815
6.....	Medium-Energy, High-Voltage..		≥20 V.....	0.0778 * Ebatt + 2.4
7.....	High-Energy.....	>3000 Wh.....		0.0502 * Ebatt + 4.53

*Inductive connection and designed for use in a wet environment (e.g. electric toothbrushes).

**Ebatt = Rated battery energy as determined in 10 CFR part 429.39(a).

TABLE IV–2—THRESHOLD CHARGE TIMES

Product class	T _{a&m} (time spent in active and maintenance mode)	n (number of full charges per day)	Incorrectly calculated SNOPR threshold charge time (hr)	Correctly calculated final rule threshold charge time (hr)
1	20.66	0.15	135.41	137.73
2	7.82	0.54	19.00	14.48
3	6.42	0.1	67.21	64.20
4	16.84	0.5	33.04	33.68
5	6.52	0.11	56.83	59.27
6	17.15	0.34	50.89	50.44
7	8.14	0.32	25.15	25.44

General product information

Federally-regulated Battery Chargers	☒ Yes ☐ No	
USB Charger Systems with battery capacity of 20Wh or more	☐ Yes ☒ No	
Not consumer product	☐ Yes ☒ No	
Required information	Class 2 Power Supply	
Product Type	Class 2 Power Supply	
	Sample 1	Sample 2
24-hour charge and maintenance energy (Wh)	168.86	169.03
Duration of the charge and maintenance mode (hrs)	24	24
The Sum of Battery maintenance mode and No battery mode power (W)	0.21	0.18
Battery capacity of tested battery(if more than 1 charger port report the total of all battery capacities connected during test) (Wh)	119.39	121.77
Inductive charger system	☐ Yes ☒ No	
Number of charger ports(N)	1	
Compatible battery chemistries	Lithium Ion	
Electrical ratings of battery:	12.0V, 10.0Ah	
Battery manufacturer:	Kaiying Power Supply & Electrical Equip Co., Ltd (Model: 6FM10 (12V10Ah))	
Battery backup or uninterruptible power supply	☐ Yes ☒ No	
A la carte charger	☐ Yes ☒ No	
USB charger system	☐ Yes ☒ No	
Location of Marking or Labeling(The BC circle mark)	Affixed to product nameplate	
☒ $t_{cd} \leq 5t_{a\&m}/n$	Sample 1: $UEC = 365(n(E_{24} - 5P_m - E_{batt})24/t_{cd} + (P_m(t_{a\&m} - (t_{cd} - 5)n)) + (P_{sb}t_{sb}) + (P_{off}t_{off})) = 2.23$ (kWh/yr) Sample 2: $UEC = 365(n(E_{24} - 5P_m - E_{batt})24/t_{cd} + (P_m(t_{a\&m} - (t_{cd} - 5)n)) + (P_{sb}t_{sb}) + (P_{off}t_{off})) = 2.10$ (kWh/yr)	
☐ $t_{cd} > 5t_{a\&m}/n$	Sample 1: $UEC = 365(n(E_{24} - 5P_m - E_{batt})24/(t_{cd} - 5) + (P_{sb}t_{sb}) + (P_{off}t_{off})) =$ (kWh/yr)	
Maximum UEC (kWh/yr)	The Product class is Class 5, the $UEC_{Max} = 0.1440 * E_{batt} + 2.95 = 3.91$ (kWh/yr).	
Verdict	Pass	

Measurement data:

Table: Energy of Maximum 24 hours charge and maintenance measurement					P
Testing Methods:	Testing shall commence with a fully discharged battery. The Charge and Battery Maintenance Mode test measures the energy consumed during charge mode and some time spent in the maintenance mode of the UUT. Functions required for battery conditioning that happen only with some user-selected switch or other control shall not be included in this measurement.				
	The accumulated energy or the average input power, integrated over the test period from the charge and maintenance mode test, shall be used to calculate 24-hour energy consumption.				
	Rated Input Voltage(Vac)	Rated Frequency (Hz)	Measured Input voltage(Vac)	Measured accumulated energy in(Wh)	Condition/status
Sample 1	115	60	115	168.86	Test with Battery Li-ion: 10.0Ah
Sample 2			115	169.03	
Measurement of Battery Maintenance Mode Power					P
Testing Method:	After the measurement period is complete, the technician shall determine the average maintenance mode power consumption by examining the power-versus-time data from the charge and maintenance test and:				
	☒ If the maintenance mode power is cyclic or shows periodic pulses, compute the average power over a time period that spans a whole number of cycles and includes at least the last 4 hours.				
	Rated Input Voltage(Vac)	Rated Frequency (Hz)	Measured Input voltage(Vac)	Measured accumulated energy in(W)	Condition/status
Sample 1	115	60	115	0.16	Test with Battery Li-ion: 10.0Ah
Sample 2			115	0.13	

Measurement of No Battery Mode Power					P
Testing Method:	Conduct a measurement of standby power consumption while the battery charger is connected to the power source. Disconnect the battery from the charger; allow the charger to operate for at least 30 minutes, and record the power (i.e., watts) consumed as the time series integral of the power consumed over a 10-minute test period, divided by the period of measurement. If the battery charger has manual on-off switches, all must be turned on for the duration of the standby mode test.				
	Rated Input Voltage(Vac)	Rated Frequency (Hz)	Measured Input voltage(Vac)	Measured accumulated energy in(W)	Condition/status
Sample 1	115	60	115	0.05	Test with Battery Li-ion:10.0Ah
Sample 2			115	0.05	
Note: The average input power is only needed if the power being measured is not stable (A variation of less than 5% in the measured power over 5 mins is considered stable for the purpose of this standard.). Total Harmonic Distortion of the electricity supply system: < 0.2%					

Measurement results:

- Test object does meet the requirement:			P (Pass)		
- Test case does not apply to the test object:			N/A (Not applicable)		
- Test object does not meet the requirement:			F (Fail)		
General remarks:					
Standards for Federally-regulated Battery Chargers Systems				P	
Performance Parameter	Requirements			Measured	Verdict
Maximum 24 hour charge and maintenance energy (Wh) (Eb = capacity of all batteries in ports and N = number of charger ports)	For Eb of 2.5 Wh or less: 16 x N	Sample 1	--	--	N/A
		Sample 2	--	--	N/A
	For Eb greater than 2.5 Wh and less than or equal to 100 Wh: 12 x N + 1.6Eb	Sample 1	203.02	168.86	P
		Sample 2	206.83	169.03	P
	For Eb greater than 100 Wh and less than or equal to 1000 Wh: 22 x N+1.5Eb	Sample 1	--	--	N/A
		Sample 2	--	--	N/A
	For Eb greater than 1000 Wh: 36.4 x N +1.486Eb	Sample 1	--	--	N/A
		Sample 2	--	--	N/A
Maintenance Mode Power and No Battery Mode Power (W) (Eb = capacity of all batteries in ports and N = number of charger ports)	The sum of maintenance mode power and no battery mode power must be less than or equal to: 1x N+0.0021xEb Watts	Sample 1	1.25	0.21	P
		Sample 2	1.26	0.18	P
Note: measured Eb of battery is 119.39Wh Number of charger ports is 1.(Sample 1) measured Eb of battery is 121.77Wh Number of charger ports is 1. (Sample 2)					

Summary of testing:

The sample(s) tested complies with:

- ☐ DOE: Energy conservation standards specified in the Code of Federal Regulations at 10 CFR 430.32(z)
- ☒ CEC: Appliance Efficiency Regulations(California Code of Regulations, Title 20, Sections 1601 through 1608)-Federally-regulated Battery Chargers System

The represented values of testing results:

Tabel 1	Test parameters for measurements		
List of measured of calculated values	Sample 1	Sample 2	Represented value mean
24-hour charge and maintenance energy E ₂₄ (Wh)	168.86	169.03	168.95
Battery capacity of tested battery E _{batt} (Wh)	119.39	121.77	120.58
Measurement of Battery Maintenance Mode Power P _m (W)	0.16	0.13	0.15
Measurement of No Battery Mode Power P _{sb} (W)	0.05	0.05	0.05
Measurement of Off Mode Power P _{off} (W)	N/A	N/A	N/A
Number of charger ports (N)	1	1	1
Unit Energy Consumption(UEC) (kWh/yr)	2.23	2.10	2.17
Charge test duration tcd (h)	24	24	
Ta&m	6.52	6.52	
Number of full charges per day(n)	0.11	0.11	
t _{sb}	1.16	1.16	
t _{off}	0	0	
The test results:			
UCL/1.05	2.86		
Unit Energy Consumption(UEC) (kWh/yr)	2.86		
Maximum UEC (kWh/yr)	3.91		

Photo documentation:



Photo 1

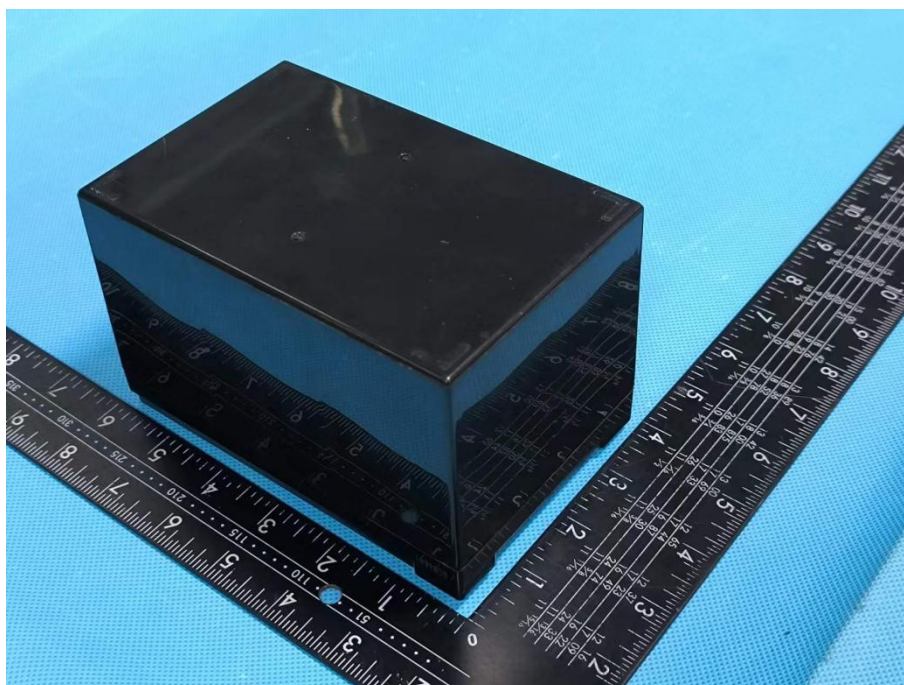


Photo 2



Photo 3

Equipments used for measurement

Test Equipments List					
Equipment Name	Manufacturer	Model #	Reg. No.	Cal. Date	Next Cal.
Digital Power Meter	YOKOGAWA	WT310	EST-S015-016	2022-05-21	2023-05-20
Digital Multimeter	FLUKE	Fluke17B	EST-S001-001	2022-05-21	2023-05-20
Meter ruler	Henan Yu Cheng Xinxin Measureing Factory	7.5m	EST-S110-001	2022-05-25	2023-05-24
Temperature-Humidity Recorder	KTJ	TA218	EST-S019-001	2022-05-24	2023-05-23
Battery analyzer	NEWARE	CT-3008-1 5V3A	EST-S032-001	2022-05-21	2023-05-20

-----End of Report-----