

TEST REPORT

UL 2849

Cycles - Electrically Power Assisted Cycles - Epac Bicycles

Job Number.....: XK2205200371S

Test by (print+signature).....: Rachel Yang

Checked by (print+signature).....: Jean Shu

Approved by (print+signature).....: Andy Wang

Date of issue.....: May 26, 2022

Total number of pages.....: 21 pages

Testing Laboratory.....: Shenzhen SiCT Technology Co., Ltd.

Address.....: 202, Building 3, No.111, Huanguan Middle Road, Songyuanxia Community, Guanhu Street, Longhua District, Shenzhen, Guangdong, China

Applicant's name.....: Shenzhen Coswheel Technology Co., Ltd.

Address.....: 2B04, Baoyunda Building, Fuhua Community, Xixiang, Bao'an District, Shenzhen City, Guangdong Province

Manufacturer's name.....: Dongguan Coswheel Technology Co., Ltd.

Address.....: Room 701, No.10, Miner Road, Chang 'an Town, Dongguan City, Guangdong Province

Test specification:

Standard.....: UL 2849, Edition 1, Edition Date: January 02, 2020

Test procedure.....: UL test report

Non-standard test method.....: N/A

Test Report Form No.....: UL2849_2020

Test Report Form(s) Originator.....: SiCT

Master TRF.....: Dated 2019-10

Product description.....: E-BIKE

Trade Mark.....: COSWHEEL

Model/Type reference.....: T20

Ratings.....: Battery charger Input: 100-240V~, 50-60Hz, 2.5A
Output: 54.6V===3.0A

Battery capacity: DC48V, 20Ah



Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement..... :	P (Pass)
- test object does not meet the requirement..... :	F (Fail)
Testing..... :	
Date of receipt of test item..... :	May 19, 2022
Date (s) of performance of tests..... :	May 19, 2022 to May 26, 2022



General product information:

The product covered in this report is an electric bicycle, this product has a built-in DC48V/20.0Ah lithium battery, these ratings see the label of rating for details.

Relevant Technical consideration:

- Mass of equipment (kg): 25.8kg
- Motor power: 48V, 500W
- Maximum ambient temperature: 35°C

Copy of marking plate:

COSWHEEL
Model: T20
Input: 54.6V  3.0A
Battery capacity: DC48V, 20Ah

Manufacturer: Dongguan Coswheel Technology Co., Ltd.
Address: Room 701, No.10, Miner Road, Chang 'an Town, Dongguan City, Guangdong Province
Made in China

Marking label

Notes:

- The above markings are the minimum requirements required by the safety standard as a reference marking label. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.

TEST SUMMARY PAGE

Required Tests	Section No.	Verdict
Input Test	28	Pass[<input checked="" type="checkbox"/>] N/A[<input type="checkbox"/>]
Leakage Current	29	Pass[<input type="checkbox"/>] N/A[<input checked="" type="checkbox"/>]
Capacitor Discharge Test	30	Pass[<input type="checkbox"/>] N/A[<input checked="" type="checkbox"/>]
Temperature Test	31	Pass[<input checked="" type="checkbox"/>] N/A[<input type="checkbox"/>]
Dielectric Strength Test	32	Pass[<input type="checkbox"/>] N/A[<input checked="" type="checkbox"/>]
Isolation Resistance Test	33	Pass[<input type="checkbox"/>] N/A[<input checked="" type="checkbox"/>]
Humidity Conditioning	34	Pass[<input type="checkbox"/>] N/A[<input checked="" type="checkbox"/>]
Abnormal Operations Tests	35	Pass[<input checked="" type="checkbox"/>] N/A[<input type="checkbox"/>]
Vibration Test	36	Pass[<input checked="" type="checkbox"/>] N/A[<input type="checkbox"/>]
Impact Test	37	Pass[<input checked="" type="checkbox"/>] N/A[<input type="checkbox"/>]
Environmental Tests	38	Pass[<input checked="" type="checkbox"/>] N/A[<input type="checkbox"/>]
Mold Stress Test	42	Pass[<input checked="" type="checkbox"/>] N/A[<input type="checkbox"/>]
Permanence of Marking	43	Pass[<input checked="" type="checkbox"/>] N/A[<input type="checkbox"/>]
General: <ul style="list-style-type: none">- Results of the tests indicate the specimens conform to applicable test criteria.- Determination of the result includes consideration of measurement uncertainty from the test equipment and methods.- The most unfavourable results are to be recorded.		

1.0 Critical Components						
No.	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Test standards	Mark(s) of conformity ³
1	Plastic Enclosure	CHI MEI CORPORATION	PC-122(+)	Min thickness 1.7mm, V-2, HWI=2, HAI=0, 105°C, screw for fixing	UL 94	UL
2	Battery charger	Shenzhen Atnen Technology Co., Ltd.	LBC015480301	Input: 100-240V, 50- 60Hz, 2.5A Output: 54.6V ⁻⁻⁻ , 3.0A	UL 1012	UL
3	Battery	Shenzhen Zbpower Technology Co., Ltd	ZBL-48V20Ah	DC 48V, 20.0Ah, 960Wh	UL 2271	UL
<p>NOTES:</p> <p>1) Not all item numbers are indicated (called out) in the photos, as their location is obvious.</p> <p>2) "Various" means any type, from any manufacturer that complies with the "Technical data and securement means" and meets the "Mark(s) of conformity" can be used.</p> <p>3) Indicates specific marks to be verified, which assures the agreed level of surveillance for the component. "NR" - indicates Unlisted and only visual examination is necessary. "See 5.0" indicates Unlisted components or assemblies to be evaluated periodically refer to section 5.0 for details.</p>						

Power Input Test

Power Input Test							Pass / Fail / N/A
Requirement	The input current to a vehicle with an on board charging unit that is directly plugged into a NEMA 5-20R receptacle is to be measured with the unit operating while charging a fully discharged battery. The current input shall not be more than 110 percent of the rated value.						
Ambient temperature (°C):		23.5					
Equipment: E-BIKE					Sample No.: 001		
Acceptance criteria		The current input to a power bank shall not exceed 110% of the marked input current rating of the power bank?					
Measurement Record							
U (V)	F(Hz)	I (A)	Irated (A)	P (W)	Fuse#	Ifuse(A)	Condition/status
DC54.6	==	2.59	3.0	141.41	F1	2.59	P
Remark:							

Conclusion:

This result (complied /~~did not comply~~) with the requirements.

Leakage Current Test N/A

Method:

One "as received" sample was placed on an insulated surface and a suitable meter having an input impedance equal to that of a 1500 ohm resistor shunted by a 0.15 uF capacitor was connected between the grounded supply conductor and accessible metal parts and/or metal foil wrapped tightly around the enclosure. Leakage current readings were then taken under the following conditions:

- Sample connected to a ☒ 120 V or ☐ 240 V ac source.
- Same as (A) with plug reversed.
- Sample operated as intended with periodic readings taken for a time period approximately equal to that used for the Normal Temperature Test. Each reading was taken with the plug inserted in both possible positions and the maximum value recorded.
- if the appliance uses a single pole switch or a thermostat with an off position, monitoring of leakage current is to continue until the leakage current stabilizes or decrease after the appliance is turned off.

Results:

- [] Test result: Fail, fail comment: _____
- [] Sample revision record: _____
- [] Test result: Pass

For UL2849:

- [] 0.5 mA for an ungrounded (two wire) portable, stationary, or fixed appliance. .
- [] 0.5 mA for a grounded (3-wire) appliance that is easily carried or conveyed by hand.
- [] 0.5 mA for a grounded (3-wire) permanently connected appliance, or a cord connected appliance that is intended to be fastened in place or located in a dedicated space and employing a standard attachment plug rated 20A or less.

Test Record:

Condition	S1	S2	Measured maximum leakage current (mA)
a. - Unit ON	OFF OFF	P1 P2	0.05
b. - Unit ON (0 - 5 seconds)	ON ON	P1 P2	0.05
c. - Unit ON (Thermal equilibrium)	ON ON	P1 P2	0.05
d.- Unit OFF (Leakage current stabilised or decreases)	ON ON	P1 P2	0.05

Conclusion:

This result (complied / did not comply) with the requirements.

Capacitor Discharge Test N/A

Method:

30.1 A cord connected on board charging unit that is provided with filtering capacitors, or other primary capacitors, shall comply with this test.

30.2 The device shall be connected to a supply source of rated voltage at 60 Hz. The output shall be connected to a suitable load such that rated current is drawn from the output of the device. A storage oscilloscope shall be connected across the point of disconnection of the supply.

30.3 The device shall be connected to the source of supply and energized with the output open circuit condition. The power shall then be removed and the resulting discharge curve for the stored charge on capacitors shall be measured and captured on the oscilloscope.

30.4 The test shall be repeated with all switches in all possible positions and combinations.

Result:

- [] Test result: Fail, fail comment: _____
- [] Sample revision record: _____
- [] Test result: Pass

Conclusion:

This result (complied / did not comply) with the requirements.

Normal Temperature Test

Method:

31.1 The Temperature test shall be conducted to determine whether or not the temperature sensitive safety critical components and temperature sensitive materials in the vehicle components are being maintained within their temperature ratings and that temperatures on accessible surfaces, which may be contacted by the user are within acceptable limits. Additionally, this test is conducted to determine whether or not the component cells are being maintained within their specified operating limits during maximum charge and discharge conditions of the vehicle.

31.2 The test is to be performed under two methods. The battery charging circuit and battery are tested in accordance with 31.3 – 31.7, and the vehicle system and battery pack are tested in accordance with 31.8 and 31.9.

31.3 First, a fully discharged battery pack is to be conditioned within a chamber set to the upper limit charging temperature specifications of the vehicle manufacturer. After thermal stabilization in the chamber, the battery pack is to be connected to a charging circuit input representative of anticipated maximum charging parameters provided by the specified charger. The battery pack shall then be subjected to maximum normal charging while monitoring voltages and currents on cells until it reaches the manufacturer's specified fully charged condition. Temperatures shall be monitored on temperature sensitive components including cells, enclosure, and all parts within the charging circuit that are temperature sensitive, including any user accessible surfaces.

31.4 While still in the conditioning chamber, and after allowing temperatures to stabilize, the fully charged battery pack shall then be discharged in accordance with the manufacturer's specifications representative of maximum weight and operating conditions for loading down to the manufacturer's specified end of discharge condition while monitoring voltage and current on cells until the battery pack reaches its specified end of discharge voltage (EODV). Temperatures shall be monitored on temperature sensitive safety critical components including cells, enclosure, and all parts within the charging circuit that are temperature sensitive, including any user accessible surfaces.

31.5 The charge and discharge cycles are then repeated for a total of 2 complete cycles of charge and discharge. The test is then repeated with the representative unit in a chamber set to the vehicle manufacturer's lowest specified operating ambient for 2 complete cycles of charge and discharge.

Results:

[] Test result: Fail, fail comment: _____

[] Sample revision record: _____

[X] Test result: Pass, and

[X] The appliance, when tested under the normal condition (~~did~~ / did not) attain a temperature at any point exceed the specified limits.

[X] The temperature limit device (~~did~~ / did not) operate during this test.

Conclusion:

This result (complied / ~~did not comply~~) with the requirements.

Normal Temperature Test – Cont'd

Test Record:

Ch.	Location	Temperature Rise, K		Rise Limit , K
		120V	--	
1	Ambient (°C):	25.0°C	-	-
2	Battery charger body	20.7	-	95
3	Battery body	20.7	-	Ref.
4	Metal enclosure near battery	13.4	-	70
5	PCB near U1	21.0		130
6	PCB near U2	21.2		130
7	PCB near U3	26.6	-	130
8	PCB near IC1	36.6	-	130
9	PCB near Q1	91.4	-	130
10	Switch knob surface	6.7	-	75
11	Handle surface (easily touch by person)	7.8	-	75
Note:				

Dielectric Voltage-Withstand Test N/A**Method:**

A sample was well heated to its operating temperature, a 60Hz sinusoidal potential was applied between current-carrying parts and dead metal parts, including metal foil was tightly wrapped around polymeric enclosure. Starting from zero, the potential was gradually increased to the potential as below table and maintained at the maximum value for a period of one minute. During this test, all circuits energizing live parts were in a closed position.

Results:

☐ Test result: Fail, fail comment: _____

☐ Sample revision record: _____

☒ Test result: Pass

☒ There (~~was~~ /was no) indication of dielectric breakdown or arc-over.

Test Between	Test Voltage (V)
Accessible dead metal parts and Metal foil wrapped around the power-supply cord inside the inlet bushing, cord guards, strain-relief clamps, and the like	2000+2U
Live parts and accessible dead metal parts	3500+2U
Between two individual conductors of swivel plug	1250
between conductors of swivel plug and metal foil tightly wrapped onto surface of molded-on swivel plug (other than fitting face)	1250

Conclusion:

This result (complied / did not comply) with the requirements.

Isolation Resistance Test N/A**Method:**

33.1 This test is intended to determine that insulation of the vehicle system provides adequate isolation of hazardous voltage circuits from accessible conductive parts of the vehicle system and that the insulation is non-hygroscopic.

33.2 A vehicle system with accessible parts shall be subjected to an insulation resistance test between the positive terminal and accessible dead metal parts of an vehicle system. If the accessible parts of the vehicle system are covered with insulating material that may become live in the event of an insulation fault, then the test voltages are applied between each of the live parts and metal foil in contact with the accessible parts as shown in 32.5 and Figure 32.1.

33.3 The insulation resistance shall be measured after a 60-s application with a high resistance voltmeter using a 500 Vdc potential applied for at least 1 min to the locations under test.

33.4 The test shall be repeated on a representative unit subjected to humidity conditioning in accordance with the Standard for Information Technology Equipment - Safety - Part 1: General Requirements, UL 60950-1, Clause 2.9.2. Measurements shall be made with the unit still in the chamber.

33.5 The measured insulation resistance between the positive terminals and accessible parts of the DUT shall be at least 50,000 Ω .

Result:

- [] Test result: Fail, fail comment: _____
- [] Sample revision record: _____
- [] Test result: Pass

Conclusion:

This result (complied / did not comply) with the requirements.

Leakage Current Test Following Humidity Conditioning N/A**Method:**

The appliance was placed in a humidity chamber maintained at a relative humidity of $88 \pm 2\%$ at a temperature of $32.0 \pm 2.0\text{ }^{\circ}\text{C}$ for a period of 48 hours. Following this, the leakage current was measured using the method outlined in the leakage current test above.

Results:

[] Test result: Fail, fail comment: _____

[] Sample revision record: _____

[X] Test result: Pass

The maximum leakage current was less than:

[X] 0.5 mA for an ungrounded (two wire) portable, stationary, or fixed appliance. .

[] 0.5 mA for a grounded (3-wire) appliance that is easily carried or conveyed by hand.

[] 0.5 mA for a grounded (3-wire) permanently connected appliance, or a cord connected appliance that is intended to be fastened in place or located in a dedicated space and employing a standard attachment plug rated 20A or less.

Test Record:

Condition	S1	S2	Measured maximum leakage current (mA)
a. - Unit ON	OFF OFF	P1 P2	
b. - Unit ON (0 - 5 seconds)	ON ON	P1 P2	
c. - Unit ON (Thermal equilibrium)	ON ON	P1 P2	

Conclusion:

This result (complied / did not comply) with the requirements.

Abnormal Operations Tests

Method:

35.1.1 A unit shall not emit flame or molten metal or become a risk of fire, electric shock, or injury to persons when subjected to the tests specified in 35.2 – 35.8. Separate representative units are to be used for conducting these tests, unless requested otherwise by the manufacturer.

35.1.2 Following each test, any hazardous voltage circuits shall be subjected to an Isolation Resistance Test, Section 33, (without humidity conditioning) or a Dielectric Strength Test, Section 32.

35.1.3 A risk of fire, electric shock, or injury to persons exists when:

- a) Flame, burning oil, or molten metal is emitted from the enclosure of the unit as evidenced by ignition, glowing, or charring of the cheesecloth or tissue paper;
- b) The insulation breaks down when tested in accordance with 35.1.2 or live parts are made accessible to the probe in Figure 17.1;
- c) Cracking, rupturing, or bursting of the battery case or cover, where such damage results in user contact with battery electrolyte; or
- d) Explosion of the battery supply where such explosion results in a risk of injury to persons.

35.1.4 During these tests the unit is to be placed on a softwood surface covered with a white tissue paper and a single layer of cheesecloth is to be draped loosely over the entire enclosure. The cheesecloth is to be untreated cotton cloth running 14 - 15 yards per pound (26 - 28 m²/kg), and having, for any square inch, a count of 32 threads in one direction and 28 in the other direction.

Result:

- [] Test result: Fail, fail comment: _____
- [] Sample revision record: _____
- [X] Test result: Pass

Conclusion:

This result (complied / ~~did not comply~~) with the requirements.

Vibration Test

Method:

36.1 A vehicle system, or parts of the system, intended to be permanently mounted on a vehicle shall be subjected to a vibration test. After the unit is subjected to the vibration test described in 36.2:

- a) The vehicle system shall not emit flame or molten metal or become a risk of fire, electric shock, or injury to persons;
- b) There shall be no loosening of parts; and
- c) The unit shall operate normally.

36.2 The vibration test shall consist of vibration for one hour at a frequency of 10 to 55 Hz and back to 10 Hz, with a linear sweep having a sweep time of two minutes per sweep cycle. The amplitude shall be 1.0 +0.1, -0 mm (0.040 +0.004, -0 inch) p-p displacement limit in a vertical plane.

36.3 After this test, the representative unit shall be subjected to a minimum of one charge/discharge cycle at the manufacturer's maximum specified values. After this charge/discharge cycle, the unit shall be subjected to an observation period per 27.8.

36.4 At the conclusion of the observation period, the unit shall be subjected to a Dielectric strength Test, Section 32, or an Isolation Resistance Test, Section 33, (without humidity conditioning).

Result:

- ☐ Test result: Fail, fail comment: _____
- ☐ Sample revision record: _____
- ☒ Test result: Pass, there no indication of fire, explosion, rupture, electrolyte leakage, or shock hazard.

Conclusion:

This result (complied / ~~did not comply~~) with the requirements.

Impact Test

Method:

37.1 A unit acting as an enclosure shall be subjected to this test. The enclosure is to be subjected to an impact of 5 foot-pounds (6.8 J) on any surface that is exposed to a blow during normal use. This impact is to be produced by dropping a steel sphere, 2 inches (50.8 mm) in diameter and weighing 1.18 pounds (535 g), from a height of 51 inches (1.29 m) to produce the 5 foot-pound impact. For surfaces other than the top, the steel sphere is to be suspended by a cord and swung as a pendulum, dropping through a vertical distance of 51 inches to strike the surface.

37.2 A unit is to be subjected to the impact test described in 37.1 with or without any attachment specified by the manufacturer so as to result in the most severe test.

37.3 When the part under test is made of polymeric material, the impact test is to be first conducted on a representative unit or units in the as-received condition. The test is then to be repeated on a different unit or units that have been cooled to room temperature after being conditioned for 7 hours in an air oven operating at 10°C (18°F) higher than the maximum operating temperature of the material, and not less than 70°C (158°F). While being conditioned, a part is to be supported in the same manner in which it is supported on the unit.

37.4 Upon being removed from the oven mentioned in 37.3 and before being subjected to the impact test, no units shall show signs of cracking or other deleterious effects from the oven conditioning, and no unit shall be distorted so as to result in a risk of injury to persons.

37.5 After the impact test, any openings resulting from the test shall be evaluated for access to hazardous live parts using the accessibility probe shown in Figure 17.1.

Result:

[] Test result: Fail, fail comment: _____

[] Sample revision record: _____

[X] Test result: Pass, there no indication of fire, explosion, rupture, electrolyte leakage, or shock hazard.

Conclusion:

This result (complied / ~~did not comply~~) with the requirements.

Environmental Tests

Method:

38.1.1 This test is intended to evaluate the vehicle's ability to withstand potential water exposure in its intended use and is conducted in accordance with the test method outlined in 38.1.2.

38.1.2 A fully charged vehicle system, including any off board charging devices, shall be subjected to a water exposure test in accordance with the Standard for Degrees of Protection Provided by Enclosures (IP Code), IEC 60529, Tests for Protection Against Water Indicated by the Second Characteristic Numeral 4 (IPX4), unless the vehicle system is provided with a higher IP Code rating by the manufacturer, in which case the vehicle system shall be tested in accordance with its rating.

38.1.3 If the vehicle system is operational after the test, it shall be subjected to a minimum of one charge/discharge cycle at the manufacturer's maximum specified values. The test shall be followed by an observation period per 27.8.

38.1.4 At the conclusion of the observation period, the units shall be subjected to a Dielectric Strength Test, Section 32, or an Isolation Resistance Test, Section 33, (without humidity conditioning).

38.1.5 As a result of the test, there shall be no indication of fire, explosion, rupture, electrolyte leakage, or shock hazard.

Result:

☐ Test result: Fail, fail comment: _____

☐ Sample revision record: _____

☒ Test result: Pass, there no indication of fire, explosion, rupture, electrolyte leakage, or shock hazard.

Conclusion:

This result (complied / ~~did not comply~~) with the requirements.

Mold Stress Test

Method:

42.1 This test is intended to evaluate whether any shrinkage or distortion exists on a molded or formed thermoplastic enclosure due to release of internal stresses caused by the molding or forming operation and result in the exposure of hazardous parts or reduction of electrical spacings.

42.2 The representative units are to be placed in a full-draft circulating-air oven maintained at a uniform temperature of 70°C (158°F) or 10°C (18°F) higher than the maximum temperature observed on the part during the Temperature Test, Section 31. The units are to remain in the oven for 7 hours.

42.3 To inhibit hazards from overheating energized cells, units shall be fully discharged prior to conditioning.

42.4 After careful removal from the oven, the units shall be allowed to cool to room temperature and then examined. After the examination, the units shall be subjected to a Dielectric Strength Test, Section 32, or Isolation Resistance Test, Section 33, (without humidity conditioning).

42.5 There shall be no damage of the vehicle system enclosure that would allow hazardous voltage parts to be accessed by use of the test rod 2.5 mm diameter, 100 mm long, shown in Figure 1 of the Standard for Batteries for Use in Light Electric Vehicle (LEV) Applications, UL 2271, and the articulate probe shown in Figure 17.1.

Result:

☐ Test result: Fail, fail comment: _____

☐ Sample revision record: _____

☒ Test result: Pass, there no indication of fire, explosion, rupture, electrolyte leakage, or shock hazard.

Conclusion:

This result (complied / ~~did not comply~~) with the requirements.

Permanence of Marking

Method:

43.1 The purpose of this test is to evaluate the permanence of an adhesive label that has not been subjected to a previous evaluation program.

43.2 An adhesive label secured to a surface representative of the end use application and is subjected to the following conditioning. The label is rubbed by hand for 15 s with a piece of cloth soaked with water. This is then repeated using petroleum spirit.

43.3 The petroleum spirit to be used for the test is an aliphatic solvent hexane having:

- a) A maximum aromatics content of 0.1 percent by volume;
- b) A kauributenol value of 29;
- c) An initial boiling point of approximately 65°C (149°F);
- d) A dry point of approximately 69°C (156.2°F); and
- e) A mass per unit volume of approximately 0.7 kg/l.

Exception: As an alternative, it is permitted to use a reagent grade hexane with a minimum of 85 percent as n-hexane .

43.4 After the conditioning outlined in 43.2, the unit is to be examined for signs of damage including curing and to determine if the marking is still legible. The unit is also examined to determine if it can be removed easily by hand from the adhered surface.

43.5 As a result of the conditioning, the representative label shall remain legible, show no evidence of damage including curling and shall not be able to be easily removed by hand from the adhered surface.

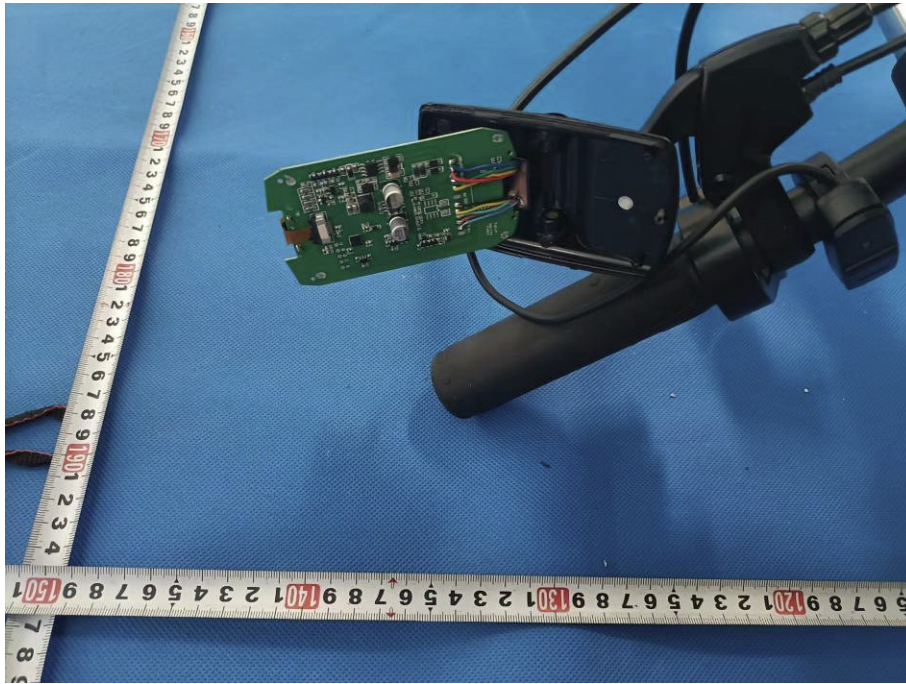
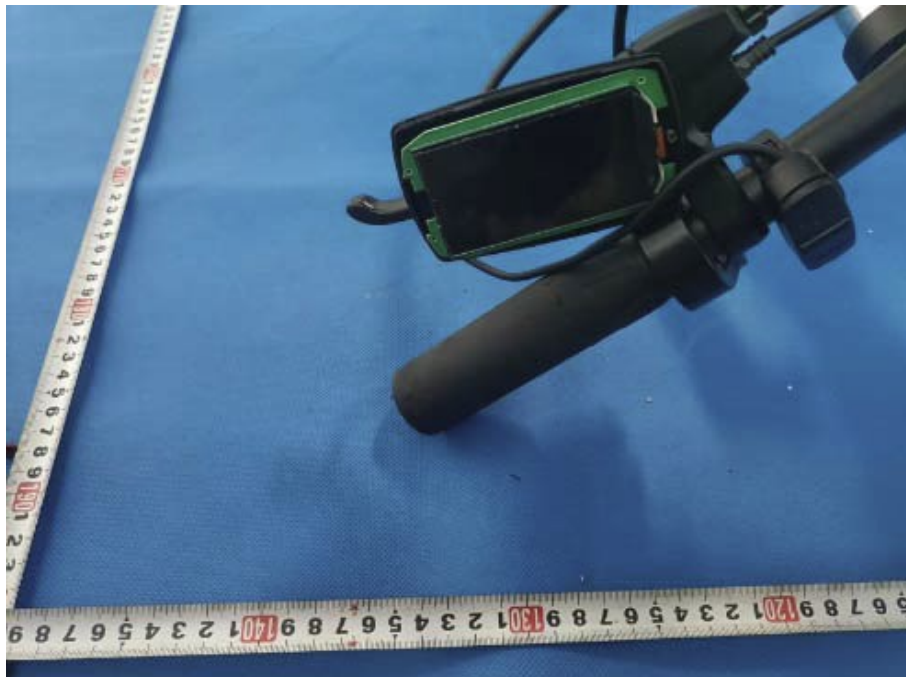
Result:

- ☐ Test result: Fail, fail comment: _____
- ☐ Sample revision record: _____
- ☒ Test result: Pass

Conclusion:

This result (complied / ~~did not comply~~) with the requirements.

Pictures**Photo 1 - External View_1****Photo 2 - External View_2**

Pictures**Photo 3 - Internal View_1****Photo 4 - Internal View_2**

Pictures

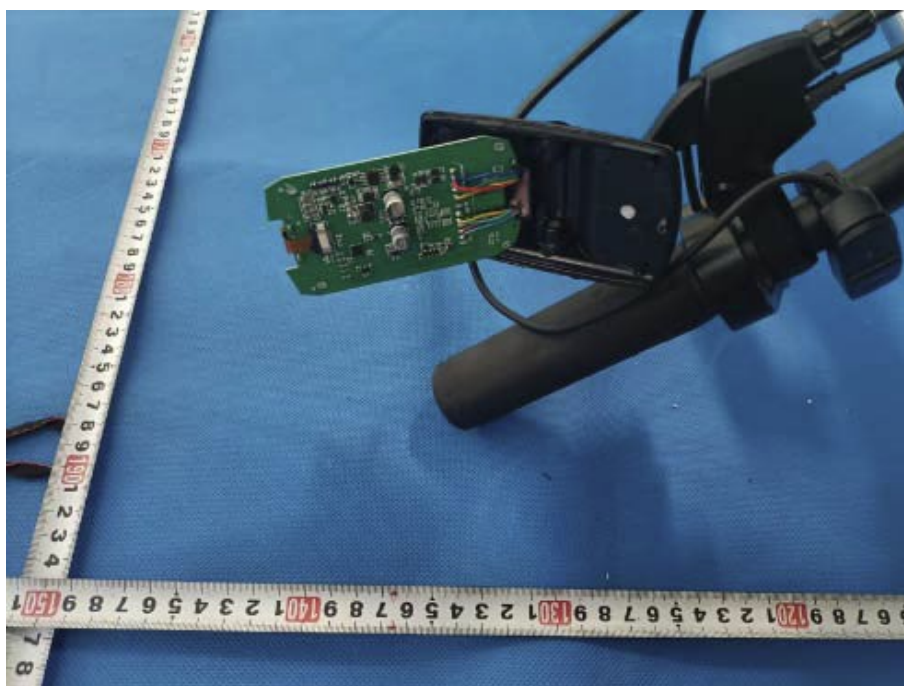


Photo 5 - Internal View_3



Photo 6 –Adapter view

*****End of Report*****