TEST REPORT

UL 2056

Outline of Investigation for Safety of Power Banks

Report Number	ZKT-241115L15563S
Date of issue	Oct. 24, 2024
Total number of pages	29
Testing Laboratory	**Shenzhen ZKT Technology Co., Ltd.**
Address	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name	Shenzhen Jufu Energy Technology Co. , Ltd.
Address	Plant No. 5 Foxda Industrial Park, No. 4 Lanjing North Road, Zhukeng Community, Longtian Street, Pingshan District, Shenzhen, China.
Test specification:	
Standard	UL 2056 Edition 3
Test procedure	UL Scheme
Non-standard test method	N/A
Test Report Form No.	TRF-EL-070_V0
Test Report Form(s) Originator	ZKT Testing
Master TRF	Dated: 2022-07-01
This test report is specially limited to the above client company and product model only. It may not be duplicated without prior written consent of ZKT Test.	
Test item description	Xiaofu Series Mobile Power Source
Trademark	N/A
Manufacturer	Shenzhen Jufu Energy Technology Co. , Ltd. Plant No. 5 Foxda Industrial Park, No. 4 Lanjing North Road, Zhukeng Community, Longtian Street, Pingshan District, Shenzhen, China.
Model/Type reference	FU7
Rating(s)	Battery Capacity:5000mAh(3.87V/19.35Wh) Frontal volume:3000 mAh(5V 2A) TYPE-C output:5 V-3A/9V-2.22A/12V-1.67A TYPE-C inputs:5 V-3A/9V-2A Wireless charging:5W/7.5W/10W/15W(max) Total Output: 5 V-2A Max

Testing procedure and testing location:

Testing Laboratory.....:	**Shenzhen ZKT Technology Co., Ltd.**
Address.....:	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Date of Test.....:	Oct. 14, 2024-Oct. 24, 2024
Tested by (name + signature).....:	Achen He
Reviewed by (name + signature).....:	Simon Gong
Approved by (name + signature).....:	Awen He

List of Attachments (including a total number of pages in each attachment):

-- Attachment I: 4 pages for Photo documentation.

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
cl.6.2 Electrical insulation; cl.6.7 Housings; cl.7.2.1 Rated capacity; cl.7.2.2 Specified operating region and temperature tests; cl.7.2.3 Limited power source; cl.7.2.4 Vibration and mechanical shock; cl.7.3.1 External short-circuit and overload; cl.7.3.2 Overcharge. The submitted samples were found to comply with the requirements of above specification.	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

Copy of marking plate

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

(Additional requirements for markings. See 1.7 NOTE)

Xiaofu Series Mobile Power Source

Model: FU7

Battery Capacity:5000mAh(3.87V/19.35Wh)

Frontal volume:3000 mAh(5V 2A)

TYPE-C output:5 V-3A/9V-2.22A/12V-1.67A

TYPE-C inputs:5 V-3A/9V-2A

Wireless charging:5W/7.5W/10W/15W(max)

Total Output: 5 V-2A Max

YY-MM-DD

Expliation for date code:

YY-MM-DD

“YY” indicate year;

“MM” indicate month;

“DD” indicate day

Test item particulars..... :	
Classification of installation and use..... :	Portable applications
Supply connection..... :	Type-C
Recommend charging method declaired by the manufacturer..... :	Charging input port: 5Vdc, 2.0A, until all battery indicators are on.
Specified final discharge..... :	Discharge output port: 5Vdc, 3.0A, until all battery indicators are off.
Maximum charging current for cell..... :	3000mA for the cell
Maximum discharging current for cell..... :	3000mA for the cell
Maximum Ambient Temperature (T_{max})..... :	45°C
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..... :	Oct. 14, 2024
Date (s) of performance of tests..... :	Oct. 14, 2024-Oct. 24, 2024

General remarks:

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Name and address of factory (ies)..... :	Shenzhen Jufu Energy Technology Co. , Ltd. Plant No. 5 Foxda Industrial Park, No. 4 Lanjing North Road, Zhukeng Community, Longtian Street, Pingshan District, Shenzhen, China.

General product information and other remarks:

1. The equipment under test (EUT) is a Power Bank which contains 1 certified cells complied UL 1642 and the report issued by UL No. ZKT-241115L15563S
2. The Power Bank maximum ambient temperature is specified as 10~45°C for Charging and -10~ 60 °C for Discharging.

Power bank electrical parameter:

Model	Nominal capacity	Nominal voltage	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
FU7	5000mAh	5.0V	2000mA	3000mA	5.25V	--

Built-in cell electrical parameter:

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
105460	5000mAh	3.87V	1000mA	1000mA	5000mAh	5000mAh	4.45V	3.0V

Test condition:

Temperature: 20±5 °C
Relative humidity: 60%
Air pressure: 950 mbar
The test samples were pre-production samples without serial number.

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Clause	Requirement – Test	Result - Remark	Verdict
6	**Construction**		**P**
6.1	**General**		**P**
	Power banks shall be so designed and constructed so as to reduce the risk of fire, electric shock or injury hazards. Compliance is checked by the requirements of 6.2 to 6.8.	Complied.	P
	For removeable power banks integrated into luggage, carrying cases, bags, packs, etc., the power bank shall also be designed and constructed to allow for installation and removal from the luggage, carrying case, bag, pack, etc. without the use of a tool and without damaging the power bank. Appropriate means of securing the power bank shall be provided in the luggage, carrying case, bag, pack, etc. without damaging the power bank or interfering with the safe operation of the power bank.	Complied.	P
6.2	**Electrical insulation**		N/A
	Electrical insulation shall withstand the electrical stress likely to occur during intended use.		N/A
	Compliance is checked by the following tests:		N/A
	The insulation resistance of a power bank electrical housing shall not be less than 5 MΩ when measured 60 s after application of DC voltage of approximately 500 V applied between any terminal and		N/A
	− Externally accessible metal surfaces of the housing, excluding electrical contact surfaces;		N/A
	− Metal foil which is in contact with accessible surfaces of insulating materials, having the largest area possible on the housing under test without exceeding the housing dimensions.		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	The insulation shall withstand without breakdown an AC voltage having a frequency of 50 Hz or 60 Hz or DC voltage applied between current carrying parts and accessible parts, non-metallic parts being covered with metal foil. The values of the test voltages are specified in Table 6.1.		N/A
	The insulation voltage rating of cable(s) supplied with the power bank and of internal wiring shall not be less than 60 V as evidenced by a marking on the insulation or in the cable / wiring manufacturer's specification.		N/A
	Electrical insulation shall not exceed its marked temperature rating or, if not marked, the Relative Thermal Index (RTI) for the material in question. Compliance is checked by the test of 7.2.2.		N/A
6.3	**Electrical conductors**		**P**
	Wires within a power bank housing, or those integral with luggage, carrying cases, etc., and not in a low power circuit shall be protected so that they do not come into contact with burrs or similar edges which may cause damage to their insulation.	Complied.	P
	A low power circuit is considered to be points closest to the battery or any power input source at which the maximum power delivered to an adjustable resistor, connected between the point to be investigated and the opposite pole of the battery or power input source, does not exceed 15 W at the end of 5 s. The part of the circuit farther from the battery or power input source than a low-power point is considered to be a low-power circuit.	Complied.	P
	Wireways shall be smooth and free from sharp edges	Complied.	P
	Holes in metal through which insulated wires pass shall have smooth well-rounded surfaces or be provided with bushings.	Complied.	P
	Wiring shall be effectively prevented from coming into contact with moving parts.	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Bare internal wiring or other current-carrying parts shall be rigid and fixed so that, in normal use, electrical short-circuit is unlikely to occur. Except for integral traces of a printed circuit or terminals forming an integral part of a cell or battery, compliance is checked by the following test:	Complied.	P
	Bare current carrying parts are subjected to a steady force of 10 N ±1 N, applied by the test probe 11 of IEC 61032. Such parts shall not come loose, into contact with each other or accessible conductive parts after application of the force.	Complied.	P
6.4	**Internal electrical connections**		**P**
	The mechanical integrity of internal electrical connections shall be sufficient to accommodate conditions of intended use.	Complied.	P
	Solder alone is not considered a reliable means of connection.	Complied.	P
	Screws used for electrical connections shall screw into metal.	Complied.	P
	Screws and nuts that make a mechanical connection between different parts of a power bank shall be secured against loosening if they also make electrical connections. Compliance is checked by inspection and manual test.	Complied.	P
6.5	**External electrical connections**		**P**
	External electrical connectors shall comply with the physical specification for one of the types of USB connectors (USB types A, B, micro A, micro B, or C) as described in the IEC 62680 series of standards.	Complied. Type-C	P
6.6	**Terminal contacts and other electrical connections**		

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Clause	Requirement – Test	Result - Remark	Verdict
	Terminal contacts and other electrical connections shall be arranged so as to minimize the risk of shortcircuits, such as using keyed connectors. Compliance is checked by inspection, and if necessary, by applying a steady force of 10 ±1 N, by the test probe 11 of IEC 61032.	Complied.	P
6.7	**Housings**		
	The housing of a power bank shall have adequate mechanical strength and be constructed to provide mechanical protection for cells, cell connections and electronic circuits. It shall additionally withstand such rough handling that may be expected in normal use without exposing sharp edges of broken glass or otherwise impairing compliance with the requirements of this outline of investigation.	Complied.	P
	The housing shall not be capable of being opened by simple tools, such as a screwdriver. It shall be ultrasonically welded, secured by single use or tamper-proof screws, or secured by adhesives complying with the adhesive requirements of UL 746C. Compliance is checked by inspection and the tests of 7.2.4 and as follows.	Complied.	P
	Each of five fully charged power banks is dropped three times from a height of 1.0 m onto a flat concrete floor or metal floor. The test samples are dropped so as to obtain impacts in random orientations. Each sample is then placed on a flat horizontal surface for a minimum of 1 h.	Complied.	P
	If the power bank is still operational, one charge and discharge cycle is conducted on the operational sample in accordance with the method declared by manufacturer.	Complied.	P
	The power bank housing and any internal compartments for the cells shall be designed to accommodate cell dimensional tolerances during charging and discharging as specified by the cell manufacturer.	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	The non-metallic housing of a power bank shall be resistant to heat. Compliance is checked by inspection, and for polymeric materials, the following test.	Complied.	P
	Fully charged power banks are placed for 7 h in an air circulating oven at a temperature of +70°C ±2°C, according to the procedure in 7.1. After conditioning, the samples are removed from the oven and allowed to return to room temperature when the housings are examined for evidence of distortion, separation of sections or openings that impair compliance with this outline of investigation.	Complied.	P
	The non-metallic housing of a power bank shall be resistant to fire. Compliance is checked by the 20 mm (3/4 inch) Flame Test in UL 746C.	Complied.	P
	The 20 mm (3/4 inch) Flame Test is not carried out if the housing is comprised of material classified for flammability as minimum V-1 according to UL 94.	Complied.	P
6.8	**Temperature/voltage/current management**		**P**
	Power banks shall be designed to operate such that the temperature, voltage and current limits as specified by cell manufacturer (specified operating region) are not exceeded. See the definition for cell operating region (lithium ion systems) of UL 1642, or the operating region requirements and examples in the Annex for Charging and Discharging Range of Secondary Lithium Ion Cells for Safe Use of UL 62133-2.	Complied.	P
	Batteries shall have an independent control and protection for current, voltage, temperature and any other parameter required for safety and shall maintain the cells within their operating region.	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Batteries designed for the selective discharge of a portion of their series connected cells shall incorporate circuitry to prevent operation of cells outside the limits specified by the cell manufacturer. Compliance is checked by reviewing the protection circuit module (PCM) of the battery and the test of 7.2.2.	Complied.	P
	The voltage of each cell or each cell block, shall not exceed the upper limit of the charging voltage specified by cell manufacturer, excepting the case where the portable electronic devices or similar devices have the equivalent function.	Complied.	P
	The protection circuit module shall function, under intended use conditions of charging and discharging, as follows:	Complied.	P
	-The charging voltage of a cell or cell block shall not exceed the upper limit of the charging voltage specified by cell manufacturer. Charging shall be stopped before the upper limit of the charging voltage is exceeded;	Complied.	P
	-The cells or cell blocks of batteries shall not be discharged beyond the cell manufacturer's specified final voltage;	Complied.	P
	– For batteries consisting of series-connected cells or cell blocks, the cells shall have: •closely matched capacities; •the same design; •the same chemistry; and •the same manufacturer.	Complied.	P
	-For the battery consisting of series-connected cells or cell blocks, the battery management system shall incorporate cell balancing circuitry;	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	-For power banks with an integral photovoltaic (PV) feature, charge control shall be incorporated such that battery backfeed to the PV circuit components is prevented. Compliance is checked by reviewing the protection circuit module (PCM) of battery, and by the test of 7.2.2.	Complied.	P
	The power bank shall not exhibit a risk of fire, electric shock or mechanical hazard when subjected to foreseeable misuse conditions. Compliance is checked by the test of 7.3.	Complied.	P
	Electronic circuits shall be designed and applied so that a fault condition will not render the power bank unsafe with regard to electric shock, fire hazard, or mechanical hazard.	Complied.	P
	If a thermal cutout functions to interrupt charging or discharging, or if its functioning is necessary for the power bank to comply with the requirements of 7.3, the thermal cutout shall comply with UL 60730-1.	Complied.	P
	Electronic circuits are checked by evaluation of the fault conditions that are likely to occur and result in electric shock, fire hazard, or mechanical hazard, such as short circuit or open circuit of MOSFET (metal oxide semiconductor field-effect transistor), fuse, thermostat or positive temperature coefficient (PTC) thermistor.	Complied.	P
7	**Performance**		**P**
7.1	**General**		**P**
	Some lithium batteries are capable of exploding when the tests described in this outline of investigation are conducted. It is important that personnel be protected from the flying fragments, explosive force, sudden release of heat, and noise that results from such explosions. The test area shall be well ventilated to protect personnel from possible harmful fumes or gases.	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Unless otherwise specified, tests are carried out under the most unfavorable conditions of intended use in an ambient temperature of 20 ±5°C. However, if the manufacturer recommends charging at temperatures outside the range of 10 – 40°C, the ambient temperature for testing is as follows:	Complied.	P
	-If the battery is recommended to be charged at a minimum ambient temperature lower than 10°C, the test is also conducted at that minimum temperature +0/-5°C;	Complied.	P
	-If the battery is recommended to be charged at a maximum ambient temperature greater than 40°C, the test is also conducted at that maximum temperature +0/-5°C.	Complied.	P
	Unless otherwise specified, samples of power banks shall be fully discharged and then charged in accordance with the manufacturer's instructions prior to any testing. The sequence shall be repeated at least two hours after the battery was charged.	Complied.	P
	The charging procedure is the method declared by the manufacturer to charge the battery to the maximum state of charge permitted by the battery management system.	Complied.	P
	The discharging procedure is to discharge the power bank at a steady rate of current to attain the end of discharge condition specified by the power bank manufacturer.	Complied.	P
7.2	**Operating conditions**		**P**
7.2.1	Rated capacity	Complied.	P
	The capacity of power bank shall not be less than 90% or exceed 110% of the marked capacity rating. Compliance is checked by the following test:	See table 7.2.1.	P
	A sample of a fully charged power bank is stored for not less than 1 h and not more than 4 h.	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	The power bank is then discharged, at a constant current equal to the rated current of the output port, until its voltage reaches to the end-of-discharge voltage of the output port specified by the manufacturer.	Complied.	P
	The test may be repeated up to 4 additional times, as necessary to satisfy this requirement.	Complied.	P
7.2.2	Specified operating region and temperature tests	Complied.	P
	Power banks shall operate within the specified operating region of the batteries / cells. For each cell:	Complied.	P
	-The upper limit of charging voltage:	Complied.	P
	-The upper limit of charging voltage:	Complied.	P
	-The surface temperature:	Complied.	P
	shall not exceed that specified by the cell manufacturer, and the power bank components and materials shall not exceed the temperatures for which they are suitable. Compliance is checked by tests consisting of two full discharge – charge cycles under the following conditions (as applicable):	See table 7.2.2a/7.2.2b	P
	-Charging and discharging while placed in the most unfavorable stable position on a softwood surface and covered by two plies of loosely draped cheesecloth that overlap the supporting surface by minimum 25 mm in each direction.	Complied.	P
	-Charging while placed in associated luggage, carrying case, etc. according to the luggage manufacturer's instructions:	Complied.	P
	•with no electrical load; and	Complied.	P
	•with all electrical loads of the associated luggage connected, or a portion of the electrical loads if such a condition represents a worse case.	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	During charging and discharging, the voltage, the temperature and the charging current are monitored for all individual cells. Currents measured during battery charging shall be the average current over a period of between one and five seconds.	Complied.	P
	The location of thermocouples for cell temperature measurements shall be on the outer surface, near the terminal of the cell.	Complied.	P
	For batteries where the cells are configured in series, the test shall be repeated with the charge in one battery deliberately imbalanced. The imbalance is introduced by having all cells with the exception of one cell/cell block discharged from fully charged condition to the specified fully discharged condition. The undischarged cell is discharged to approximately 50% of its specified state of charge (SOC).	Complied.	P
	The measured temperatures shall not exceed the values in Table 7.1.	Complied.	P
	External touchable surfaces of power banks shall not present a risk of thermal burn injury. Compliance is checked by determining the temperature rise of touchable surfaces during two full discharge – charge cycles under the following conditions:	Complied.	P
	-Charging and discharging while placed on a softwood surface.	Complied.	P
	During charging and discharging, the measured temperatures shall not exceed the values in Table 7.2.	Complied.	P
7.2.3	Limited power source	Complied.	P
	The output available from any port shall comply with the limits of limited power output as noted in Table 7.3 or Table 7.4. Compliance is checked by the following test:	See table 7.2.3	P

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Clause	Requirement – Test	Result - Remark	Verdict
	The open circuit output voltage and short-circuit output current from a fully charged power bank shall be measured. If more than one port is provided, the output from each port shall be measured one at a time with the others unloaded.	Complied.	P
	The output is considered to be limited power source if complying with one of the following:	Complied.	P
	-The output is inherently limited in compliance with Table 7.3;	Complied.	P
	-A linear or non-linear impedance limits the output in compliance with Table 7.3. If a positive temperature coefficient (PTC) device is relied upon, it shall:	Complied.	P
	•be tested in accordance with UL 60730-1, Manufacturing Deviation and Drift tests of Clause 15, Endurance tests of Clause 17, additional Manufacturing and Deviation tests of Clause J.15, and additional Endurance tests of Clause J.17; or	Complied.	P
	•meet the requirements in UL 60730-1 for a device for Type 2.AL action;	Complied.	P
	-A regulating network or an integrated circuit (IC) current limiter, limits the output in compliance with Table 7.3, both with and without a simulated single fault in the regulating network or the IC current limiter (open circuit or short circuit). A single fault between the input and output is not conducted if the IC current limiter meets a suitable test program as given in the Annex for Integrated Circuit (IC) Current Limiters of UL 60950-1 or the Clause for Integrated Circuit (IC) Current Limiters of UL 62368-1;	Complied.	P
	-An overcurrent protective device is used and the output is limited in compliance with Table 7.4.	Complied.	P
	Where an overcurrent protective device is used, it shall be a fuse or a non-adjustable, non-auto-reset, electromechanical device.	Complied.	P
7.2.4	Vibration and mechanical shock	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Vibration and mechanical shock encountered during transportation and use shall not cause fire, explosion, rupture, leakage or venting. Compliance is checked by the following tests:	See table 7.2.4	P
	Three fully charged power bank samples are firmly secured to the platform of a vibration machine without distorting them in such a manner as to faithfully transmit the vibration. Each sample is then subjected to sinusoidal vibration sweep cycle according to the conditions of Table 7.5. The sweep cycle shall be repeated 11 additional times for each of three mutually perpendicular mounting positions. One of the directions shall be perpendicular to the power bank face with the most ports or where an adjustable control is located.	Complied.	P
	Three additional fully charged power banks are firmly secured to a shock testing machine by means of a rigid mount of sufficient size and contact area to support the test sample. Each sample is subjected to 3 shocks in each direction of three mutually perpendicular mounting positions of the sample for a total of 18 shocks. For each shock, the parameters given in Table 7.6 shall be applied.	Complied.	P
	After the aforementioned tests, if the power bank is still operational, one charge and discharge cycle is conducted on each operational sample using the method declared by manufacturer.	Complied.	P
7.3	**Abnormal operation**		**P**
7.3.1	External short-circuit and overload	Complied.	P
	Short-circuiting of positive and negative terminals of the power bank shall not cause fire or explosion from the power bank or ignite the external fire indicators. Compliance is checked by the following tests:	See table 7.3.1	P

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Clause	Requirement – Test	Result - Remark	Verdict
	Two samples of a fully charged power bank are short-circuited for a period of 24 h by connecting the positive and negative terminals of a port with a total external resistance of 80 ±20 mΩ. If the enclosure temperature of power bank declines by 20% of the maximum temperature rise measured after the manufacturer's recommended charging period or 3 h if no charging period is specified, the test may terminated sooner. However, in case of a rapid decline in the short-circuit current, the power bank shall remain on test for an additional one hour after the current reaches a low-end steady state condition.	Complied.	P
	The test is repeated on two additional samples after a fault is introduced in the discharge protection circuit. The faults of 6.8 shall be applied, one at a time and as appropriate.	Complied.	P
	Two additional samples are placed on a softwood surface covered by a single layer of white tissue paper. Each power output port is then simultaneously loaded to continuously draw a maximum attainable current for at least 1 h. If a protective circuit operates to limit the current from one or more simultaneously loaded ports, the test is repeated on two additional samples after a fault is introduced in the protection circuit. The faults of 6.8 shall be applied, one at a time and as appropriate.	Complied.	P
	After the aforementioned tests, if the power bank is still operational, one charge and discharge cycle shall be conducted for each operational sample using the method declared by manufacturer.	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	For a power bank integrated in luggage, a nominal 1 m length of USB cable, having 0.3211 mm diameter conductors and mating connector, shall be attached to one sample of the power bank port providing the maximum output current. The cable shall have a short circuit made by any convenient means at approximately its mid-point and shall then be placed on a softwood surface that is covered by a single layer of white tissue paper and the cable draped with a single layer of cheesecloth. The test is conducted until ultimate results are observed.	Complied.	P
7.3.2	Overcharge	Complied.	P
	A power bank shall tolerate without fire or explosion an overcharging condition outside the cell manufacturer's specified operating region. Compliance is checked by the following test:	See table 7.3.2	
	Two power bank samples are discharged to fully discharged state. They are then charged at a constant current of 2.0 It A, using a steady supply voltage which is:	Complied.	P
	-1.4 times the upper limit charging voltage of the cell (but not to exceed 6.0 V), for single cell/cell block construction; or	charging voltage: 6.0V	P
	-1.2 times the upper limit charging voltage per cell, for series connected multi-cell batteries	single cell/cell block construction	N/A
	NOTE The DC-DC converter circuitry of power bank will need to be bypassed in order to make it possible to apply the specified overcharge.	Complied.	P
	The test shall continue until the temperature of the housing reaches steady state or peaks and returns to ambient.	Complied.	P
	The test is repeated on two additional samples after a fault is introduced in the charge protection circuit. The faults of 6.8 shall be applied, one at a time and as appropriate.	Complied.	P

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Clause	Requirement – Test	Result - Remark	Verdict
	For a power bank with a series configuration battery, an additional sample shall be prepared such that all cells are at approximately 50% charge, except for one which is shorted. The battery is then charged.	Complied.	P
	After the aforementioned tests, if the power bank is still operational, one charge and discharge cycle is conducted on each operational sample using the method declared by manufacturer.	Complied.	P
8	**Markings**		**P**
8.1	**Electrical rating marking**		**P**
	The following electrical rating shall be permanently and legibly marked on the power bank:	Complied.	P
	-Input rating in Vdc or Vac and A for each port;	Complied.	P
	-Output rating in Vdc and A for each port and a combined ampere rating (if not equal to the summation of all ports);	Complied.	P
	-Electrical capacity in Ah or mAh of the power bank. A capacity rating shall additionally be specified for each port if it is not equal to the rating of the power bank.	Complied.	P
8.2	**Identification marking**	Complied.	P
	The following marking shall be permanently and legibly marked on the power bank:	Complied.	P
	-Manufacturer's name or trademark or identification mark;	Complied.	P
	-Manufacturer's model identification or type reference;	Complied.	P
	-Date of manufacture (which may be in code).	Complied.	P
8.3	**Cautionary marking**	Complied.	P
	The following or equivalent wording shall be permanently and legibly marked on the power bank: “CAUTION: Risk of Fire and Burns. Do Not Open, Crush, Heat Above (manufacturer’s specified maximum temperature) or Incinerate. Follow Manufacturer’s Instructions.”	Complied.	P

UL 2056			
Clause	Requirement – Test	Result - Remark	Verdict
	This wording or equivalent shall also be included in the instructions supplied with the power bank.	Complied.	P
	For removeable power banks integrated into luggage, carrying cases, bags, packs, etc., the following or equivalent shall be permanently and legibly marked on the power bank and the luggage, carrying cases, bags, packs, etc.: “For use only with _____”	Complied.	P
	Where the underlined space is completed with the manufacturer’s name or trademark, catalog number, series identification, or the equivalent, of the power bank or of the luggage, carrying case, bag, pack etc. as applicable.	Complied.	P
8.4	**Other information**	Complied.	P
	Compliance is checked by examination of markings and manufacturer's documentation	Complied.	P
9	**Instructions**		**P**
9.1	**General**		**P**
	The following instructions shall be supplied with the power bank in the form of a manual, stuffer sheet or on packaging. The instructions may additionally be repeated via marking provided directly on the power bank. See also Annex A.	Complied.	P
	-Storage and disposal instructions; and	Complied.	P
	-Recommended charging instructions.	Complied.	P
	For removeable power banks integrated into luggage, carrying cases, bags, packs, etc., the following instructions shall also be supplied in the form of a manual, stuffer sheet. These instructions may additionally be repeated via marking provided directly on the power bank and/or the luggage, carrying case, bag, pack etc.:	Complied.	P
	-Installation and removal instructions, including when storing the luggage, carrying case, bag, pack, etc. in a cargo area of an airplane;	Complied.	P

Table 7.2.1	Rated capacity (Output: 5V⎓3.0A)	P

Ambient temperature: 23.4°C

Rated capacity	3000mAh	90%~110% capacity	2700mAh~3300mAh

Sample No.	Cycle No./ Measured Capacity					Results
	1	2	3	4	5	
01#	3102.5	3004.7	3059.6	3028.8	3075.5	P

Supplementary information:
The capacity of power bank not be less than 90% or exceed 110% of the marked capacity rating;

Table 7.2.2 a	Specified operating region and temperature tests (Normal test)	P

Power Bank Component Temperature Test

Sample No.	14#(1st cycle)		14# (2nd cycle)		Limited T	
Testing Process	Charging	Discharging	Charging	Discharging	Charging	Discharging
PCB near U4	58.7	72.2	79.9	91.6	130	130
PCB near Q5	66.3	69.8	87.5	91.5	130	130
PCB near Q2	47.4	65.5	68.6	86.6	130	130
Cell lead wire	34.4	46.3	55.6	74.3	200	200
cell surface	31.6	34.2	52.8	55.5	80	80
Plastic enclosure inside	30.7	32	51.9	53.8	95	95
Plastic enclosure outside	42.3	30.7	63.5	50.3	95	95
Plastic enclosure outside near connector	40.2	41.4	57.8	64.6	95	95
Ambient	23.4	23.6	45	45	--	--

Supplementary information: Charging: 5V, 3.0A; Discharge: 5V, 3.0A						
Cell current & voltage Test						
Sample No.	**14#(1st cycle)**		**14# (2nd cycle)**		**Limited T**	
Testing Process	Charging	Discharging	Charging	Discharging	Charging	Discharging
Cell 1 voltage (extreme value) (V)	4.41	3.3	4.42	3.2	4.4	3.0
Supplementary information: Charging: 4.45V, 5.0A; Discharge: 3.0V, 5.0A						

Table 7.2.2 b	**Specified operating region and temperature tests (Imbalanced test)**				**P**	
Power Bank Component Temperature Test						
Sample No.	**15#(1st cycle)**		**15# (2nd cycle)**		**Limited T**	
Testing Process	Charging	Discharging	Charging	Discharging	Charging	Discharging
PCB near U4	59.9	73.8	80.5	93.0	130	130
PCB near Q5	66.1	70.9	87.1	92.1	130	130
PCB near Q2	49.0	66.1	69.8	88.2	130	130
Cell lead wire	36.1	47.5	57.1	76.9	200	200
cell surface	32.8	35.3	53.8	56.6	80	80
Plastic enclosure inside	31.3	33.0	53.0	55.2	95	95
Plastic enclosure outside	42.1	31.9	65.1	52.1	95	95
Plastic enclosure outside near connector	40.4	41.1	58.9	66.1	95	95
Ambient	23.6	23.6	45	45	--	--
Supplementary information: Charging: 5V, 3.0A; Discharge: 5V, 3.0A						

Cell current & voltage Test						
Sample No.	**15#(1st cycle)**		**15# (2nd cycle)**		**Limited T**	
Testing Process	Charging	Discharging	Charging	Discharging	Charging	Discharging
Cell voltage (extreme value) (V)	4.41	3.2	4.41	3.3	4.4	3.0
Supplementary information: Charging: 4.45V, 5.0A; Discharge: 3.0V, 5.0A						

Table 7.2.3	**TABLE: Limited power sources**					**P**
Circuit output tested: Type-C output						
Note: Measured Uoc (V) with all load circuits disconnected:						
Components	**Sample No.**	**Uoc (V)**	**Isc (A)**		**VA**	
			Meas.	**Limit**	**Meas.**	**Limit**
Normal condition	1	5.10	3.04	8	15.6	100
U5 pin 1-5 short	3	5.12	3.10	8	15.8	100
U4 pin 1-5 short	4	5.10	3.07	8	15.6	100
Supplementary information: S-C=Short circuit						

Table 7.2.4	**Vibration and mechanical shock**		**P**
Vibration test			
Sample no.	17#	18#	19#
Mass (before test) (g)	105.913	106.012	105.975
Mass (after test) (g)	105.913	106.012	105.975
Mass loss ratio	0.000%	0.000%	0.000%
Shock test			
Sample no.	20#	21#	22#

Mass (before test) (g)	106.023	106.011	105.963
Mass (after test) (g)	106.023	106.011	105.963
Mass loss ratio	0.000%	0.000%	0.000%
Supplementary information: No fire, explosion, rupture, leakage or venting.			

Table 7.3.1 a	**External short-circuit**					**P**
Sample No.	**Test outport**	**OCV before test (Vdc)**	**Resistance of circuit (mΩ)**	**Maximum case temperature (°C)**	**Component single fault condition**	**Results**
23#	USB-C	5.11	85	25.3	--	P
24#	USB-C	5.10	83	25.5	--	P
25#	USB-C	5.09	88	25.4	(U5 pin 1-5) S-C	P
26#	USB-C	5.12	84	25.3	(U4 pin 1-5) S-C	P
Supplementary information: No fire or explosion from the power bank or ignite the external fire indicators.						

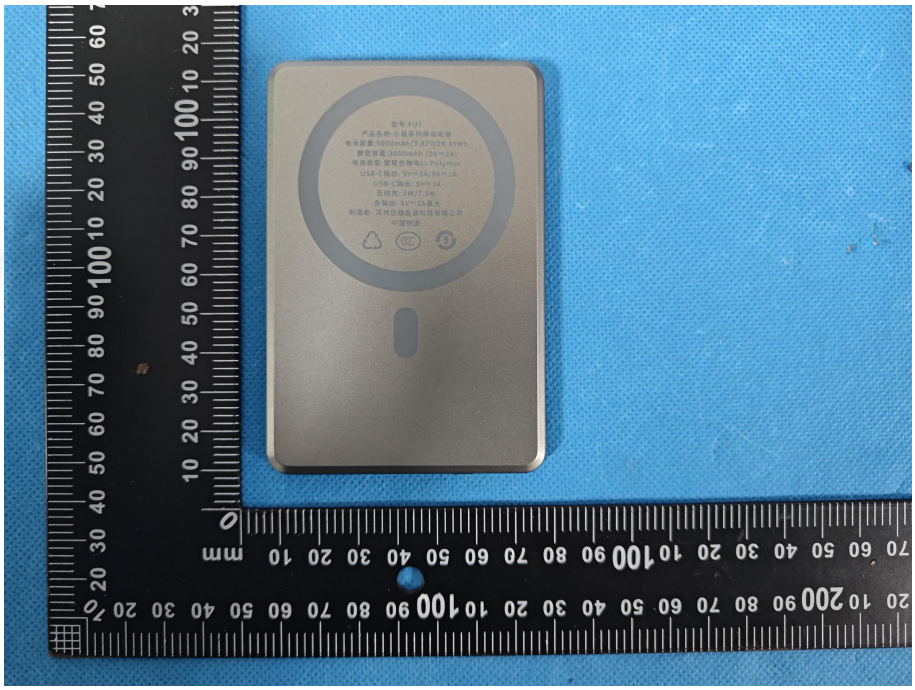
Table 7.3.1 b	**Overload test**					**P**
Sample No.	**OCV before test (Vdc)**	**Test time**	**Current drawn (A)**	**Maximum case temperature (°C)**	**Component single fault condition**	**Observation**
27#	5.08	1h	3.08	32.8	Normal	No fire or explosion
27#	5.11	1h	3.09	33.7	(U5 pin 1-5) S-C	No fire or explosion
28#	5.09	1h	3.08	33.5	Normal	No fire or explosion
28#	5.11	1h	3.10	34.9	(U4 pin 1-5) S-C	No fire or explosion
Supplementary information: No fire or explosion from the power bank or ignite the external fire indicators.						

Table 7.3.2	Overcharge			P
Constant charging current (A) :		6.0		—
Supply voltage (Vdc) :		6.0		—
Sample no.	**OCV before charging (Vdc)**	**Component single fault condition**	**Maximum outer case temperature (°C)**	**Results**
29#	5.08	--	25.3	P
30#	5.10	--	25.5	P
31#	5.09	(Mosfet U4) S-C	25.7	P
32#	5.11	(Mosfet U5) S-C	25.4	P
33#	5.08	--	25.3	P
Supplementary information: The DC-DC converter circuit (Mosfet Q1) S-C before test. No Fire or explosion,				

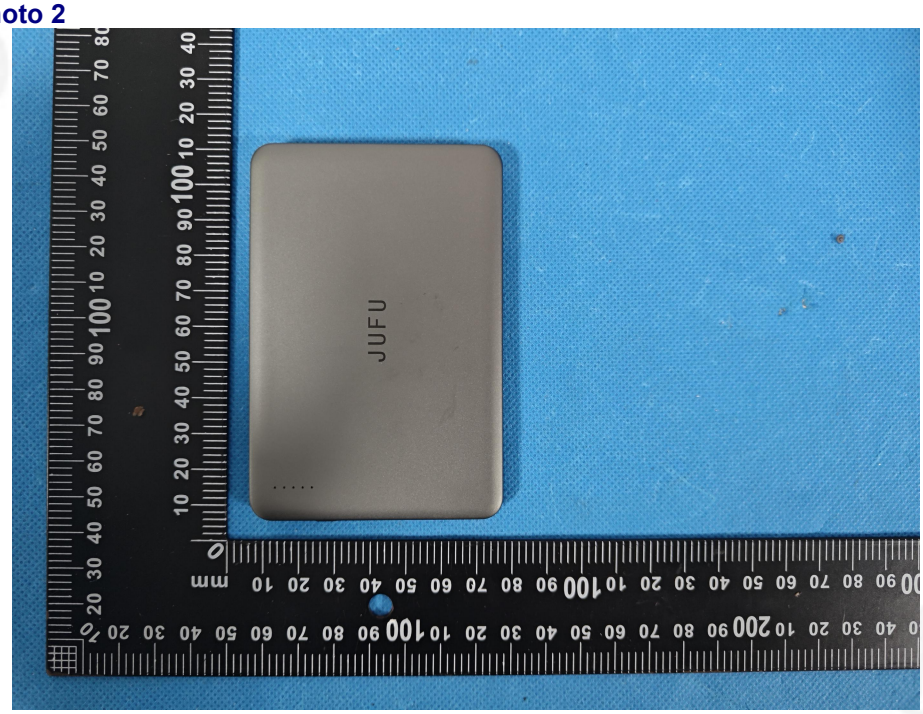
Attachment I:

Photo-documentation

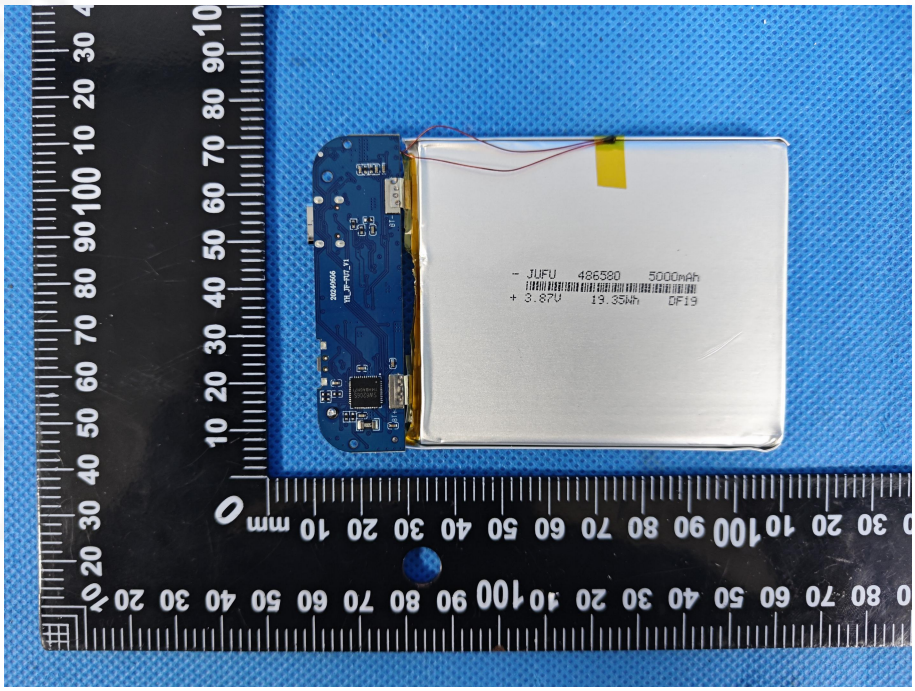
EUT Photo 1



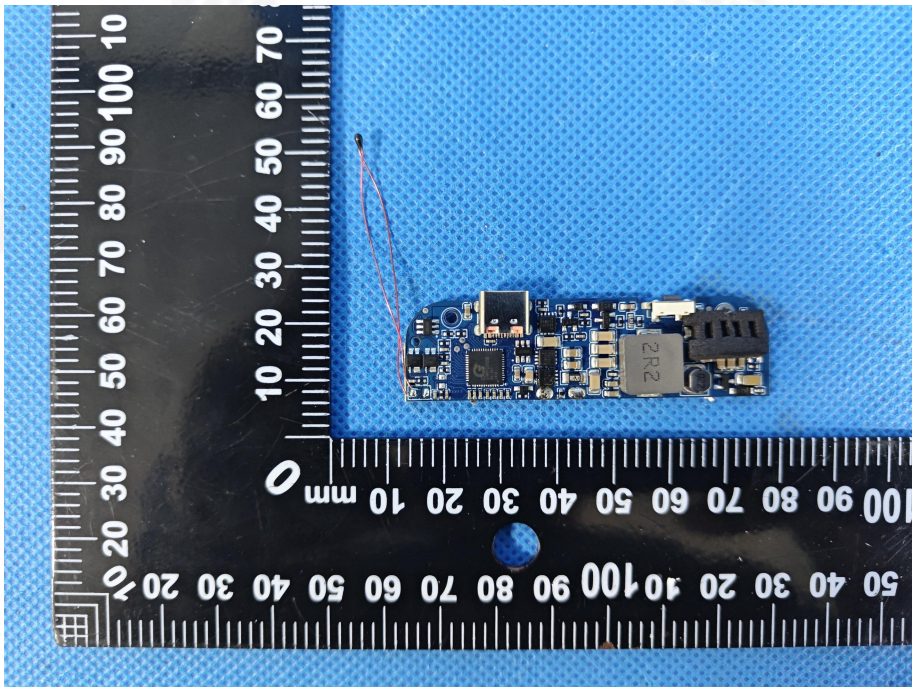
EUT Photo 2



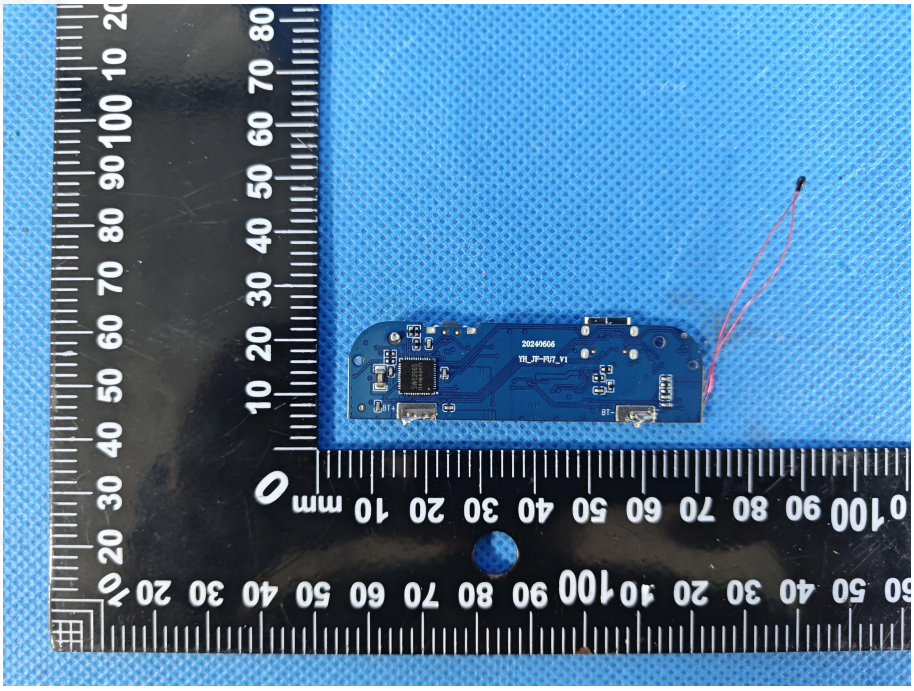
EUT Photo 3



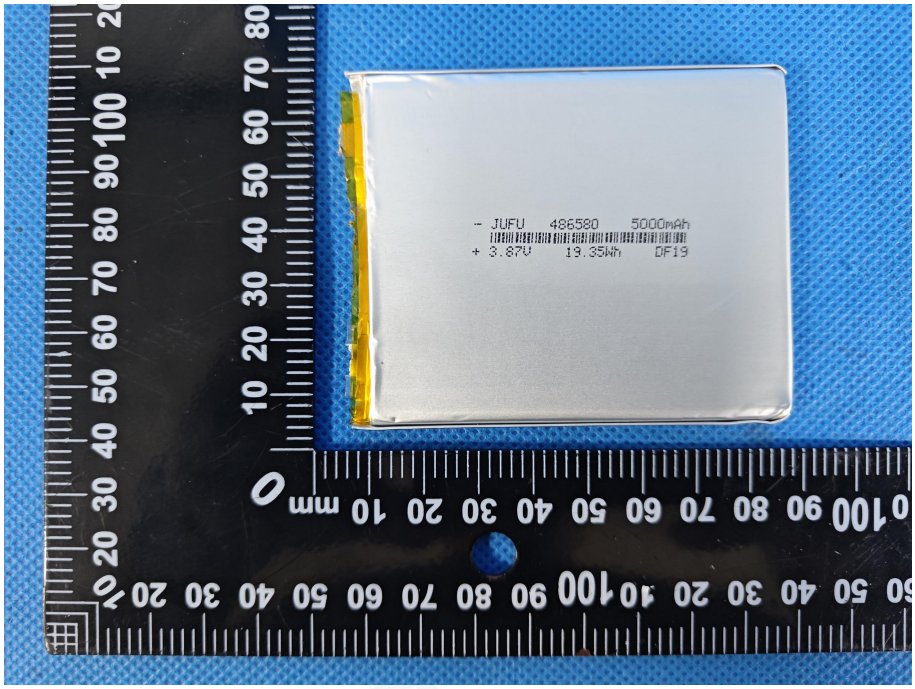
EUT Photo 4



EUT Photo 5



EUT Photo 6



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