

Produkte
Products

Prüfbericht - Nr.: <i>Test Report No.:</i>	DSP24030865-1	Seite 1 von 68 <i>Page 1 of 68</i>
Auftraggeber: <i>Client:</i>	SHENZHEN GREPOW BATTERY CO., LTD. Complex building (1st to 3rd floor), 2nd building (1st to 4th floor), 1st building (1st to 4th floor), Huarong Road Gaofeng Community, Dalang Street, Longhua District, Shenzhen City, China	
Gegenstand der Prüfung: <i>Test item:</i>	Jump Starter	
Bezeichnung: <i>Identification:</i>	The Zeus Air	Serien-Nr.: <i>Serial No.:</i> Engineering samples
Wareneingangs-Nr.: <i>Receipt No.:</i>	DSP24030865	Eingangsdatum: <i>Date of receipt:</i> 2024-03-27
Zustand des Prüfgegenstandes bei Anlieferung: Condition of test item at delivery:	Good for testing and checking	
Prüfort: <i>Testing location:</i>	Dongguan ZRLK Testing Technology Co., Ltd. Building 2, No.1, Technology 10th Road, Songshan Lake Park, Dongguan City, Guangdong, China	
Prüfgrundlage: <i>Test specification:</i>	CAN/UL 2743: 2020	
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>	
Prüflaboratorium: <i>Testing Laboratory:</i>	Dongguan ZRLK Testing Technology Co., Ltd. Building 2, No.1, Technology 10th Road, Songshan Lake Park, Dongguan City, Guangdong, China	
geprüft/ tested by:	kontrolliert/ reviewed by:	
<i>Jason Sun</i> Jason Sun 2024-07-02 / Project Engineer	<i>Ailis Ma</i> Ailis Ma 2024-07-02 / Reviewer	
Datum <i>Date</i>	Name <i>Name</i>	Unterschrift <i>Signature</i>
Datum <i>Date</i>	Name <i>Name</i>	Unterschrift <i>Signature</i>
Sonstiges/ Other Aspects:		
<ol style="list-style-type: none"> This report is issued for test report only; This report contains 68 pages including this cover page and attachment 1: photo document (14 pages) 		
Abkürzungen:	<i>P(ass) = entspricht Prüfgrundlage</i> <i>F(ail) = entspricht nicht Prüfgrundlage</i> <i>N/A = nicht anwendbar</i> <i>N/T = nicht getestet</i>	Abbreviations: <i>P(ass) = passed</i> <i>F(ail) = failed</i> <i>N/A = not applicable</i> <i>N/T = not tested</i>
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.		
<i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>		

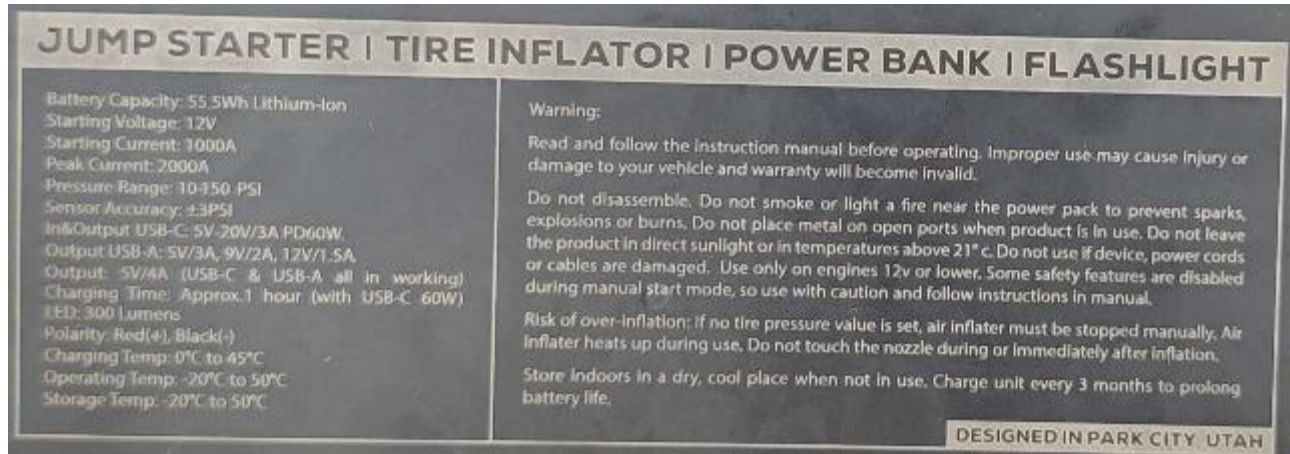


Dongguan ZRLK Testing Technology Co., Ltd.
Building 2, No.1, Technology 10th Road, Songshan Lake Park, Dongguan City, Guangdong, China



TEST REPORT ANSI/CAN/UL 2743:2020 Portable Power Packs	
Report Reference No	See cover page
Date of issue	See cover page
Testing Laboratory Name	See cover page
Address	See cover page
Testing location	See cover page
Address	See cover page
Applicant's Name	See cover page
Address	See cover page
Test specification	
Standards.....	See cover page
Test procedure	Safety report
Non-standard test method	N/A
Test Report Form No : N/A	
TRF originator	Dongguan ZRLK Testing Technology Co., Ltd.
Master TRF	Dated April 2020
Test item description	
Jump Starter	
Trademark	GREPOW
Manufacturer	SHENZHEN GREPOW BATTERY CO., LTD. Complex building (1st to 3rd floor), 2nd building (1st to 4th floor), 1st building (1st to 4th floor), Huarong Road Gaofeng Community, Dalang Street, Longhua District, Shenzhen City, China
Factory	Same as manufacturer
Model and/or type reference	The Zeus Air
Rating(s).....	Refer to Electrical rating table

Copy of marking plate:



Note:

- The signal word "Warning" shall be in letters not less than 3/32 inch (2.4 mm) high. Other cautionary markings intended to instruct the operator shall be legible and visible from the position normally assumed by the operator when starting the product or from the position normally assumed or the specific operation involved.

Summary of testing:

The tested model The Zeus Air was complied with the test standard ANSI/CAN/UL 2743:2020.
 The report is only evaluated the device intended to use in non-hazard location. Additional evaluation relating to hazard location shall be considered according to National Electrical Code when fire or explosion hazards may exist due to the accumulation of combustible dusts under abnormal operating conditions.

Particulars: test item vs. test requirements:

Equipment mobility: Portable
 Operating condition.....: Continuous
 Mass of equipment (kg).....: 2.18kg (Tested with all accessories)

Test case verdicts

Test case does not apply to the test object .: N/A
 Test item does meet the requirement: P(ass)
 Test item does not meet the requirement ...: F(ail)

Testing

Date of receipt of test item: 2024-03-27
 Date(s) of performance of test: 2024-03-27 to 2024-05-07

General remarks

The test result presented in this report relate only to the object(s) 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 point is used as the decimal separator.



History of amendments and modifications:

Ref. No. DSP22080803-1, dated 2022-11-23 (original test report)

Description of change(s):

1. Updated product model.

General product information:

1. The product covered by this report is a Jump Starter, which supplied by DC Input, DC terminal USB-C Input 5-20VDC 60W Max.; and supplied by internal rechargeable battery pack three li-ion cells(3S1P); The product include Display circuit, Jump starter circuit, Key circuit, LED circuit and MCU circuit and one built-in rechargeable battery pack, The rechargeable battery pack with Independent protection circuit;
2. The product is intended to be used outdoor temporary use.

Electrical Rating	<p>Battery Capacity: 5000mAh(55.5Wh)</p> <p>Starting Voltage: 12V</p> <p>Starting Current:1000A</p> <p>Pressure Range: 10-150PSI</p> <p>Sensor Accuracy: ±3PSI</p> <p>Input & Output USB-C: 5V~20V/3A PD60W</p> <p>Output: USB-A: 5V=== 3A, 9V=== 2A, 12V=== 1.5A</p> <p>Output: 5V=== 4A (USB-C&USB-A all in working)</p> <p>Polarity: Red(+) Black(-)</p> <p>Charging Temp.: 0°C~45°C</p> <p>Opertaing Temp.: -20°C~50°C</p> <p>Storage Temp.: -20°C~50°C</p>
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ANSI/CAN/UL 2743:2020			
Clause	Requirement – Test	Result – Remark	Verdict
1	Scope		P
1.1	1.1 These requirements cover portable and movable power packs provided with one or more batteries, electrochemical capacitors, or electrochemical capacitor modules. If provided with a battery, the battery shall be either a lead acid or lithium ion battery. The power packs are provided with one or more inputs and one or more outputs. For power packs provided with a booster function, the power packs are used for providing a temporary power source to a depleted land vehicle battery, rated 24 V dc maximum, to provide emergency starting power.	Portable power packs	P
1.2	These requirements cover power packs suitable for outdoor use, temporary outdoor use, or indoor use only. Outdoor use packs are intended to be used outdoors with no restrictions. Temporary outdoor use packs are intended to be used outdoors in limited wet conditions and always stored indoors. Indoor use only packs are intended to be stored indoors and used indoors and are not intended to be used outdoors at any time. A power pack with a booster function is not considered indoor use only under any conditions.	temporary outdoor use.	P
1.3	These requirements cover power packs provided with additional systems such as an air compressor (tankless type) for inflating tires or other inflatable items, or with a light to act as warning lights to oncoming traffic, as a flashlight, or the like. These functions are also powered by the internal battery.		N/A
1.4	These requirements cover the power pack options such as lights, voltmeters, internal air compressor assemblies, associated gauges, inverters, vehicle adapters, and internal batteries, as well as the charging of the internal batteries, when these options are integral to the power pack.		P
1.5	These requirements do not cover wiring or cabling used in the recharging function of electric vehicle recharging equipment.		N/A
2	Units of Measurement		Info.
3	Components		Info.
4	Undated References		Info.
5	Glossary		Info.

CONSTRUCTION			
6	General		P
6.1	If the operation and maintenance of a power pack by the user involves a risk of injury to persons, a risk of electric shock, or a risk of fire, means shall be provided to reduce the risk. When evaluating a power pack, consideration shall be given to reasonably foreseeable misuse of the product.		P
6.2	Power packs intended for use within a repair facility, and marked as such as indicated in 69.4, shall be provided with instructions containing the statement in 74.3 and shall be marked as shown in 70.17. Power packs that are not intended for use in a repair facility shall be marked in accordance with 70.18.	Not intended for use within a repair facility	N/A

ANSI/CAN/UL 2743:2020			
Clause	Requirement – Test	Result – Remark	Verdict
6.3	Outdoor use power packs shall be evaluated for all environmental considerations addressed by this Standard and are intended to be used and stored either outdoors or indoors. Temporary outdoor use power packs shall be evaluated for exposure to rain, shall be marked in accordance with 70.19 and 70.20, and shall be provided with instructions in accordance with 74.5. Indoor use only power packs shall be marked in accordance with 70.21 and shall be provided with instructions in accordance with 74.6. Indoor use only packs need not comply with the environmental considerations in 7.5.	Temporary outdoor use. The cautionary markings on the enclosure.	P
6.4	For power packs not marked in accordance with 70.22, the device shall be subjected to the Vibration Test, Section 51.	Section 51 Vibration tests are performed.	P
7	Frame and Enclosure		P
7.1	General		P
7.1.1	An enclosure of a power pack shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it may be subjected, without increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other serious defects.		P
7.1.2	A power pack shall be provided with an enclosure suitable for the application. The enclosure shall house all live parts that may increase the risk of fire, electric shock, or injury to persons under any condition of use. This requirement does not apply to the power supply cord, the output leads, or output terminals.		P
7.1.3	If an electrical instrument, such as a meter, forms part of the enclosure, the face or the back of the meter, or both together, shall comply with the requirements for enclosures.	No such parts	N/A
7.1.4	The enclosure for a power pack provided with an internal lead acid battery shall be ventilated to permit dispersion of gases from the internal battery during normal use and charging. See 7.4.	Internal Rechargeable Lithium ion Battery pack used.	N/A
7.1.5	Enclosures for power packs shall comply with the requirements for environmental considerations in 7.5.		P
7.2	Metallic enclosures	Nonmetallic enclosures used	N/A
7.2.1	Enclosures constructed of metallic materials shall be subjected to the Strength of Enclosure Tests, Section 55		N/A
7.2.2	A metallic enclosure shall have a thickness not less than that specified in Tables 7.1 and 7.2		N/A
7.2.3	Metallic enclosures, if not constructed of a material that is corrosion resistant, shall be provided with corrosion protection in accordance with Corrosion Protection, Section 10.		N/A
7.3	Nonmetallic enclosures		P
7.3.1	In addition to the performance tests specified in this Standard, the factors to be considered when evaluating the suitability of a polymeric enclosure include the requirements in 7.3.2 through 7.3.4.		P
7.3.2	The enclosure material shall have a minimum flame rating of V-1 in accordance with 8.1.	V-0 material used	P

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.3	The enclosure material shall have a minimum Relative Thermal Index (RTI) value that exceeds the maximum temperature observed on the material during operation but no less than 80°C (176°F) for packs intended to be stored in the trunk or passenger compartment of a vehicle. If an RTI value that exceeds the maximum temperature observed on the material during operation, but is lower than 80°C (176°F), is used, the power pack shall be marked in accordance with 70.22 and provided with instructions as shown in 74.7.	RTI: 85°C	P
7.3.4	A conductive coating applied to a nonmetallic surface such as the inside surface of an enclosure, shall be evaluated in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, and Evaluation of Properties of Polymeric Materials, CAN/CSA C22.2 No. 0.17, unless it can be determined that flaking or peeling of the coating does not result in a reduction of spacings or the bridging of live parts that may result in a risk of fire, electric shock, or injury to persons.	No such coating	N/A
7.3.5	An adhesive used to secure parts of an enclosure shall comply with the requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, and Evaluation of Properties of Polymeric Materials, CAN/CSA C22.2 No. 0.17.	No such adhesive used, screws used to secure all the enclosure together	N/A
7.3.6	Enclosures of molded or formed nonmetallic materials shall be constructed so that any shrinkage or distortion of the material over time will not allow for the user to contact live parts at hazardous voltage or hazardous energy levels. Compliance is determined by the Mold Stress Test, Section 56.	Tested and complied	P
7.3.7	Enclosures constructed of nonmetallic materials shall be subjected to the Strength of Enclosure Tests, Section 55.	Tested and complied	P
7.4	Openings in enclosures		P
7.4.1	Power pack enclosures shall not allow the entrance of water in accordance with 7.5		P
7.4.2	A probe as illustrated in Figure 7.1, when inserted through an opening, shall not touch any uninsulated live part that can cause electric shock	Test pin cannot get into the product. The product without openings in enclosures.	P
7.4.3	Thermoplastic covering an opening for user servicing, such as replacement of a pilot lamp, and that reduces the risk of unintentional contact with a live part involving a risk of electric shock shall be evaluated as an enclosure It shall be reliably retained in place	No user servicing parts	N/A
7.4.4	An uninsulated live part at hazardous voltage or hazardous energy levels shall be located or enclosed so that protection against unintentional contact is provided.	No such parts	N/A
7.4.5	A door or cover that provides access to a live part at hazardous voltage or hazardous energy levels shall be securely held in place so that it can be opened or removed only by using a tool		P

ANSI/CAN/UL 2743:2020			
Clause	Requirement – Test	Result – Remark	Verdict
	Exception: A door or cover that provides access to a live part that is not at hazardous voltage or hazardous energy levels shall be securely held in place, but need not be secured so that it is necessary to use a tool to open or remove it		N/A
7.4.6	The door or cover of an enclosure shall be hinged or attached in an equivalent manner if it provides access to an overload-protective device, the functioning of which requires renewal, or if it is necessary to open the cover in connection with the operation of the protective device. A door or cover providing access to a fuseholder shall be tight-fitting and shall be positively held closed		N/A
	Exception: A hinged cover is not required if the only overload-protective devices enclosed are:		N/A
	a) Connected in control circuits, provided the protective devices and the circuit loads are within the same enclosure;		N/A
	b) Rated 2 amperes or less for loads not exceeding 100 volt-amperes;		N/A
	c) Extractor fuses having an integral enclosure; or		N/A
	d) Fuses connected in a low-voltage limited energy circuit.		N/A
7.4.7	The operating handle of a circuit breaker, an operating button of a manually operable protector, the capped portion of an extractor-type fuseholder, or a similar part may project outside the enclosure.	No such parts	N/A
7.5	Environmental considerations	temporary outdoor use	P
7.5.1	The enclosure of an outdoor use or temporary outdoor use power pack shall be constructed to exclude a beating rain in accordance with 7.5.2.		P
7.5.2	All outdoor use or temporary outdoor use power packs shall be subjected to the Rain Test, Section 60.		P
7.5.3	A gasket employed in a power pack in order to comply with 7.5.1 shall be tested in accordance with Accelerated Aging of Gaskets, Sealing Compounds, and Adhesives, Section 62.		P
7.5.4	A nonmetallic enclosure for an outdoor use power pack shall be judged on the basis of the effect of exposure to ultraviolet light and water in accordance with the applicable tests in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, Evaluation of Properties of Polymeric Materials, CAN/CSA C22.2 No. 0.17. Temporary outdoor use power packs need not comply with this requirement.		N/A
8	Flammability of materials		P

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Clause	Requirement – Test	Result – Remark	Verdict
8.1	Nonmetallic materials used for enclosures shall have a minimum flammability rating of V-1 in accordance with the requirements in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, and Evaluation of Properties of Polymeric Materials, CAN/CSA C22.2 No. 0.17. As an alternative, finished enclosures may be tested in accordance with the 20 mm end-product flame test in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, and Evaluation of Properties of Polymeric Materials, CAN/CSA C22.2 No. 0.17. Metallic materials used for enclosures are considered to comply without further evaluation, except magnesium shall not be used for enclosure materials.	V-0 material	P
8.2	Nonmetallic materials used for internal parts within the overall enclosure shall be rated V-2 minimum	V-0 material	P
	Exception No. 1: The internal insulating system of components where component requirements exist need not comply with this requirement		N/A
	Exception No. 2: A small part, gasket, or other nonmetallic part that is located such that it cannot propagate flame from one area to another within the equipment, and is not located in close proximity to uninsulated live parts, is not required to comply with this requirement		N/A
8.3	Nonmetallic materials located outside the enclosure, and not used to complete the enclosure, are considered decorative parts. These parts shall be rated HB minimum.		N/A
8.4	Printed wiring board materials shall be rated V-1 minimum.	V-0 PCB used	P
8.5	For the requirements outlined in 8.2 – 8.4, the flammability rating of the material shall be provided as part of the material rating or the flammability rating may be determined in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, and Evaluation of Properties of Polymeric Materials, CAN/CSA C22.2 No. 0.17.		P
9	Assembly		P
9.1	An uninsulated live part shall be secured to the base or surface so that it is prevented from rotating or shifting in position as the result of normal stresses, if such movement results in a reduction of spacings below the minimum values indicated in Spacings, Section 29.	No such uninsulated live part	N/A
9.2	A component such as a control switch, lampholder, or connector, shall be mounted securely and shall be prevented from turning by means other than friction between surfaces.		P
9.3	With reference to 9.2, a switch is not required to be mounted as described in 9.2, if all of the following conditions are met:		N/A
	a) The switch is a plunger or other type that does not tend to rotate when operated. A toggle switch is considered to be subject to forces that tend to turn the switch;		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	b) The means for mounting the switch makes it unlikely that operation of the switch will loosen it;		N/A
	c) Spacings are not reduced below the minimum values indicated in Spacings, Section 29, if the switch rotates; and		N/A
	d) Operation of the switch is by mechanical means rather than by direct contact by persons.		N/A
9.4	With reference to 9.2, a lampholder of the type in which the lamp cannot be replaced, such as a sealed neon pilot or indicator light, is not required to be mounted in accordance with 9.2, if rotation cannot reduce spacings below the minimum values indicated in Spacings, Section 29	No such parts	N/A
9.5	A small stem mounted device having a single hole mounting means may be prevented from rotating by a properly applied lock washer		N/A
10	Corrosion protection		P
11	Supply connections		P
11.1	General		P
11.1.1	Power packs are intended to be connected to the power supply circuit in order to recharge the internal battery, electrochemical capacitors, or electrochemical capacitor modules. Additionally, outputs of the power pack may be powered when the pack is connected to the supply circuit.		P
11.1.2	Power packs shall be provided with one or more of the following input options:	See below	P
	a) Cord and plug connection, rated at 240 V ac maximum, 60 Hz;		N/A
	b) Photovoltaic panel or device with inverter;	Without inverter.	N/A
	c) Vehicle adapter, rated 12 V dc maximum;		N/A
	d) USB input port (can also act as output port); or	Type-c, USB-A terminals used.	P
	e) Cables for charging from a vehicle battery rated up to 24 V dc maximum.		P
11.2	Flexible cord connection		N/A
11.2.1	General		N/A
11.2.1.1	For flexible cord connections, the power pack shall be connected to the power supply circuit by means of a flexible cord and an attachment plug. The flexible power cord shall be either a detachable or non-detachable type. For devices intended for use with a detachable cord set, the cord set need not be provided with the device when the power pack is marked in accordance with 70.17 and the instructions are in accordance with 73.2.		N/A
11.2.1.2	For power packs intended for use in a repair facility, a detachable flexible cord shall be provided with a means to insure that the flexible cord cannot be inadvertently detached during use		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	Exception: A device intended for use in a repair facility that is provided with a means to insure that the appliance inlet on the device is inherently located at a height above 457 mm (18 inches) may also be provided with a detachable cord set without a means to insure inadvertent detachment, when the power pack is marked in accordance with 70.17 and the instructions are in accordance with 73.2.		N/A
11.2.1.3	A flexible cord shall have a voltage rating not less than the rated voltage of the equipment, and shall have an ampacity not less than the current rating of the equipment		N/A
11.2.1.4	The attachment plug shall have an ampacity not less than the rated current of the product or the actual current measured during the Power Input Test, Section 42, whichever is greater, and a voltage rating equal to the rated voltage of the product. If a product is adaptable for use on two or more different values of voltage by field alteration of internal connections, the attachment plug provided with the product shall be rated for the voltage for which the product is connected when leaving the factory		N/A
11.2.1.5	A flexible cord shall be Type G, SO, SJO, SJEO, SJTO, STO, or W, or a type at least equally serviceable for the particular application		N/A
11.2.1.6	The length of a flexible cord, including the attachment plug, shall not be less than 6 feet (1.8 m).		N/A
11.2.1.7	If a product incorporates a disconnecting means, such as an appliance inlet, the arrangement shall be such that no live parts will be exposed under any normal conditions		N/A
11.2.1.8	A permanently attached flexible cord shall exit the enclosure in an area that is not in close proximity to a hot spot or moving part		N/A
11.2.2	Strain Relief		N/A
11.2.2.1	Strain relief shall be provided on a non-detachable flexible cord to reduce the risk of mechanical stress being transmitted to terminals, splices, or interior wiring. See Strain Relief Test, Section 54. A knot in the flexible cord is not considered a form of strain relief.		N/A
11.2.2.2	A metal strain relief clamp or band provided in accordance with 11.2.2.1 shall be provided with auxiliary insulation over the cord if damage to the cord insulation results when the strain relief test is conducted without auxiliary insulation		N/A
11.2.2.3	Means shall be provided to prevent a flexible cord from being pushed into the equipment through the cord entry hole if such displacement would:		N/A
	a) Result in mechanical damage to the cord;		N/A
	b) Expose the cord to a temperature than that for which it is rated; or		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	c) Reduce spacings, such as to a metal strain relief clamp, below the minimum values indicated in Spacings, Section 29.		N/A
	To determine compliance, the flexible cord shall be tested in accordance with the Push-Back Strain Relief Test, Section 54.2.		N/A
11.2.3	Bushings		N/A
11.2.3.1	At the point where a non-detachable flexible cord passes through an opening in the enclosure, there shall be a bushing or the equivalent that is secured in place, and that has a smooth, well rounded surface against which the cord may bear. An insulating bushing shall be provided, if the enclosure is of metal, or if the construction is such that the cord may be subjected to strain or motion. A bushing that complies with the applicable requirements in the Standard for Insulating Bushings, UL 635, is considered to comply with this requirement		N/A
11.2.3.2	A hole in porcelain, phenolic composition, or other non-conducting material, having a smooth, rounded surface, is considered to be equivalent to a bushing		N/A
11.2.3.3	A bushing of the same material as, and molded integrally with, a supply cord is acceptable if the built-up section is not less than 1/16 inch (1.6 mm) thick at the point where the flexible cord passes through the enclosure.		N/A
11.2.3.4	At a point of flexure, no additional flexible cords or wires shall be routed through a bushing or opening with the power supply cord.		N/A
11.3	External power supplies		N/A
11.3.1	As an alternative to flexible cord connections, the power pack may be provided with a DC voltage rated input connector intended for connection to the output of an external power supply		N/A
11.3.2	The output rating of the external power supply shall be equal to or greater than the input rating of the power pack; and the output of the external power supply shall be a power source in accordance with the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1 and CAN/CSA C22.2 No. 60950-1, a Class 2 power source in accordance with the Standard for Class 2 Power Units, UL 1310, and Power Supplies With Extra Low Voltage Class 2 Outputs – General Instruction No. 1, CAN/CSA C22.2 No. 223, or a power source other than Class 2 in accordance with the Standard for Power Units Other Than Class 2, UL 1012, and CSA-C22.2 No. 107.2-01.		N/A
11.4	Vehicle adapters		N/A


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Clause	Requirement – Test	Result – Remark	Verdict
11.4.1	A power pack intended for connection to an automobile cigar lighter receptacle shall be provided with a vehicle adapter that complies with the enclosure and input contacts requirements in the Standard for Vehicle Battery Adapters, UL 2089, and Power Supplies, CAN/CSA C22.2 No. 107.1. The connector plug shall incorporate a fuse or other protective device having a current rating not greater than 15 A.		N/A
	Exception: The protective device may be provided in the output cord of the vehicle adapter not more than 5 inches (127 mm) from the vehicle adapter enclosure		N/A
11.4.2	With reference to 11.4.1, if the fuse is user replaceable, the vehicle adapter shall be marked in accordance with 70.10. This marking shall appear adjacent to the fuseholder		N/A
11.5	Photovoltaic panels	No such devices	N/A
11.5.1	Power packs provided with a photovoltaic panel as an input for charging the internal battery shall be provided with an inverter and/or a charge controller and shall be in accordance with the applicable requirements in the Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources, UL 1741; or with the applicable requirements in the Standard for Power Converters for Use in Photovoltaic Power Systems – Part 1: General Requirements, UL 62109-1.		N/A
12	Output connections		P
12.1	General		P
12.1.1	Power packs shall be provided with one or more outputs that terminate in a suitable connector or other connection means in accordance with the requirements in this Standard.		P
12.1.2	The output of the power pack shall include at least one of the output options shown in (a) – (d). Additional outputs are not restricted.	See below	P
	a) Booster cable assemblies, see 12.2;		P
	b) Receptacles, see 12.3;		N/A
	c) DC Connectors, see 12.4;		N/A
	d) Vehicle adapter sockets, see 12.5;		N/A
	e) USB Connectors, see 12.4.	Type-c, USB-A terminals used.	P
12.2	Booster cables assemblies		P
12.2.1	General		P
12.2.1.1	Booster cable assemblies shall be detachable or non-detachable assemblies. Detachable assemblies shall comply with 12.2.1.2 and the applicable requirements in 12.2.2 and 12.2.3. Non-detachable assemblies shall comply with 12.2.1.3 and the applicable requirements in 12.2.2 and 12.2.3.		P

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Clause	Requirement – Test	Result – Remark	Verdict
12.2.1.2	For detachable booster cable assemblies, the connector shall be in accordance with the Standard for Component Connectors for Use in Data, Signal, Control and Power Applications, UL 1977, and Special Use Attachment Plugs, Receptacles and Connectors, CAN/CSA C22.2 No. 182.3, or the connector shall be in accordance with the Standard for Automotive Battery Booster Cables, UL 1839 (middle connectors). The connector shall have a voltage and current rating that is the same as or higher than the output rating of the booster cable assembly.		P
12.2.1.3	For non-detachable booster cable assemblies, the cable shall be provided with strain relief in accordance with Section 11.2.2 and bushings shall be provided in accordance with Section 11.2.3.		N/A
12.2.2	Cables		P
12.2.2.1	The cable provided with the booster cable assembly shall comply with the applicable requirements for cables in the Standard for Automotive Battery Booster Cables, UL 1839		P
12.2.2.2	As an alternative to 12.2.2.1, the cable can be shown to comply with the requirements in 12.2.2.3 – 12.2.2.7, when the power pack is provided with a protection system for the cable assembly. The protection system shall provide output limiting such that a maximum current cannot be exceeded under normal or abnormal conditions and the maximum temperature of the cable insulation shall not be exceeded during the Normal Temperature Test, Section 47.		N/A
12.2.2.3	The conductors used within the cables shall:		N/A
	a) Comply with the requirements in the Standard for Appliance Wiring Material, UL 758, and either Equipment and Lead Wires, CAN/CSA C22.2 No. 127, or Appliance Wiring Material Products, CAN/CSA C22.2 No. 210; and		N/A
	b) Be suitably sized based on the rating of the output current associated with the booster function.		N/A
12.2.2.4	The final cable assembly shall be subjected to the Cold Bend Test, Section 67.		N/A
12.2.2.5	At all points where the cable enters the enclosure of the device or any other enclosure, excluding the cable connection to the clamp, the connection shall be subjected to a strain relief test as described in Section 54.		N/A
12.2.2.6	The conductors of a booster cable set employing parallel conductors shall be separated at each end to allow the jaw ends of the clamps to span a minimum distance of 920 mm (3 feet). For power packs provided with a safety circuit that prevents energy from being available at the booster clamps prior to connection and immediately upon disconnection, such that arcing and sparking is prevented at the battery terminals, the 920-mm minimum distance can be reduced. The safety circuit shall be subject to the requirements in Section 40, Safety Circuits and Control Circuits.		N/A
12.2.2.7	The cable shall be subjected to the Ampacity Test in Section 65		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
12.2.3	Clamps		P
12.2.3.1	The clamp provided with the booster cable assembly shall comply with the applicable requirements for clamps in the Standard for Automotive Battery Booster Cables, UL 1839		P
12.2.3.2	As an alternative to 12.2.3.1, the cable can be shown to comply with the requirements in 12.2.3.3 – 12.2.3.6, when the power pack is provided with a protection system for the cable assembly. The protection system shall provide output limiting such that a maximum current cannot be exceeded under normal or abnormal conditions and the maximum temperature of the cable insulation shall not be exceeded during the Normal Temperature Test, Section 47		N/A
12.2.3.3	The clamp bodies shall be fabricated from nonmetallic materials and these materials shall have a flame rating of HB minimum		N/A
12.2.3.4	The clamps shall be subjected to the Cold Drop Test using a conditioning temperature equal to the manufacturer's lower ambient temperature rating. See 68.2.		N/A
12.2.3.5	The clamps shall be subjected to the Dielectric voltage-withstand test, Section 68.3		N/A
12.2.3.6	The clamp shall be subjected to the Secureness test , Section 68.4		N/A
12.3	Receptacles		N/A
12.3.1	Receptacles provided as an output on power packs shall be rated 120 Vac, 20 A maximum, and shall consist of a double blade, ungrounded configuration, and shall be of a NEMA type receptacle that is in accordance with the Standard for Attachment Plugs and Receptacles, UL 498, and General Use Receptacles, Attachment Plugs and Similar Wiring Devices, CAN/CSA C22.2 No. 42.		N/A
	Exception: Polarized receptacles rated 120 Vac, 20 A maximum, and consist of grounding configuration may be acceptable provided the power source (integrated battery pack, etc) has no conductive connections to AC output circuit or any other branch circuit, and potential involving risk of electrical shock shall not exist between ground and the grounded circuit contact, terminal, or lead. Compliance shall be checked by inspection and by neutral-to-ground potential and leakage current measurement. The potential shall not exceed 42.4 Vpk at no-load and full-load conditions, or the leakage current determined in accordance with Section 46, Leakage Current Test, shall not exceed 0.5 mA.		N/A
12.3.2	Markings shall be provided that indicate the maximum rating of the receptacle to the user. This marking shall be permanent		N/A
12.4	DC output connectors and USB connectors		P

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Clause	Requirement – Test	Result – Remark	Verdict
12.4.1	Power packs provided with USB connections as an output shall incorporate connectors that are in accordance with the Standard for Component Connectors for Use in Data, Signal, Control, and Power Applications, UL 1977, and Special Use Attachment Plugs, Receptacles and Connectors, CAN/CSA C22.2 No. 182.3.	USB connectors used;	P
12.4.2	DC output connectors provided as an output shall incorporate connectors that are in accordance with the Standard for Component Connectors for Use in Data, Signal, Control, and Power Applications, UL 1977, and Special Use Attachment Plugs, Receptacles and Connectors, CAN/CSA C22.2 No. 182.3.		N/A
12.4.3	A circuit supplied by a single source of supply, consisting of a battery or power supply with an isolating transformer, need not be investigated if:		P
	a) The open circuit potential or no-load output of the source is not more than 30 volts DC or 21.2 volts peak;		P
	b) The current available to the circuit is limited so that the current under any condition of load, including short circuit, is not more than 8 amperes; and		P
	c) The power available is not more than 240 VA.		P
12.5	Vehicle adapter sockets		N/A
12.5.1	Adapter sockets provided as an output on a power pack, for connecting products with a standardized vehicle adapter connector, shall comply with 12.5.2		N/A
12.5.2	The cable, if provided, shall be suitable for the voltage and ampacity of the output rating. The cable shall be in accordance with the Standard for Appliance Wiring Materials, UL 758, and either Equipment and Lead wires, CAN/CSA C22.2 No. 127, or Appliance Wiring Material Products, CAN/CSA C22.2 No. 210.		N/A
12.5.3	A circuit supplied by a single source of supply, consisting of a battery or power supply with an isolating transformer, need not be investigated if:		N/A
	a) The open circuit potential or no-load output of the source is not more than 30 volts DC or 21.2 volts peak;		N/A
	b) The current available to the circuit is limited so that the current under any condition of load, including short circuit, is not more than 8 amperes; and		N/A
	c) The power available is not more than 240 VA		N/A
13	Grounding		N/A
13.1	General		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
13.1.1	A product shall have a provision for grounding in accordance with 13.1.2 – 13.2.2 that is reliably connected when the unit is connected to the mains power source. The means for grounding may be contained within a separate or integral power supply that has been shown to comply with the applicable requirements for power supplies. In this case, no further evaluation of grounding is needed		N/A
	Exception: Double insulated products are not required to comply with Section 13. See Double Insulated Products, Section 14		N/A
13.1.2	All exposed dead metal parts, that are likely to become energized, shall be reliably connected to the means for grounding.		N/A
13.1.3	The equipment grounding conductor of the power supply cord may be used for grounding		N/A
13.1.4	The grounding conductor of a supply cord shall be secured to the metallic enclosure of the product by means of a separate screw or other equivalent means, intended for that purpose only, that is not likely to be removed during any servicing operation not involving the power supply cord. Solder alone shall not be used for securing the grounding conductor. Servicing as mentioned in this requirement include repair of the product by a qualified service person.		N/A
	Exception: Products with no exposed dead metal parts need not comply with 13.1.4.		N/A
13.1.5	The grounding conductor and the dead metal parts shall be conductively connected to the grounding member of an attachment plug. The grounding member shall be fixed.		N/A
13.1.6	A separable connection, such as that provided by an attachment plug and a mating connector or receptacle, shall be such that the equipment grounding connection is made before and broken after the supply conductors		N/A
13.1.7	The grounding terminal, intended solely for the connection of an equipment grounding conductor, shall be capable of securing a conductor of the size necessary for the application. A connection device that depends on solder alone shall not be provided for connecting the equipment grounding conductor		N/A
13.1.8	A wire binding screw or pressure wire connector intended for the connection of an equipment grounding conductor shall be located so that it is unlikely to be removed during servicing of the power pack.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
13.1.9	A screw used to secure the grounding conductor to the frame shall engage the metal by at least two full threads. The metal thickness shall not be less than 0.050 inch (1.27 mm) thick. The metal may be extruded to increase the effective thickness. Only the supply cord grounding conductor shall be secured by the grounding screw.		N/A
13.1.10	A stud and nut combination used to secure the grounding conductor to the frame shall be secured to the frame by welding the stud in place. The ground conductor shall be connected first and be in contact with the frame and secured in place by a dedicated nut and lock washer. Other bonding jumpers may be connected to the stud, but they shall be connected above the main ground connection and secured by separate nut and lock washers		N/A
13.1.11	With reference to the requirement in 13.1.2, the following dead metal parts are not considered likely to become energized:		N/A
	a) A small metal part, such as an adhesive attached foil marking, a screw, a handle, and the like, that is:		N/A
	1) On the exterior of the enclosure and separated from all electrical components by grounded metal, or 2) Electrically isolated from all electrical components.		N/A
	b) A panel, cover, or other metal part that is isolated from all electrical components by a barrier of vulcanized fiber, varnished cloth, phenolic composition, or other moisture resistant insulating material not less than 1/32 inch (0.80 mm) thick and securely mounted in place, and		N/A
	c) A panel, cover, or other metal part that does not enclose uninsulated live parts and is electrically isolated from other electrical components.		N/A
13.1.12	The main grounding path shall not include a trace on a printed wiring board.		N/A
13.2	Grounding identification		N/A
13.2.1	The surface of the insulation on a grounding conductor of a flexible cord shall be green with or without one or more yellow stripes, and no other lead shall be so identified		N/A
13.2.2	The unit shall be marked at the point of grounding connection to the enclosure or frame with the Symbol  (IEC 60417 No.5019).		N/A
14	Double insulated products		N/A
14.1	A device may be provided with a system of double insulation that complies with the requirements in the Standard for Double Insulation Systems for Use in Electrical Equipment, UL 1097, in lieu of a means for grounding.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
14.2	In addition to complying with 14.1, the system of double insulation shall comply with the requirements in this outline		N/A
14.3	A product shall be marked as being a suitable double insulated product, see Figure 14.1. All such products shall not be provided with a means for grounding		N/A
15	Current Carrying Parts		P
15.1	A current carrying part shall be of silver, copper, a copper alloy, stainless steel, or other material suitable for the application. Ordinary unplated iron or steel shall not be used for current carrying parts	All the current carrying parts are use suitable material for the application	P
16	Internal Wires		P
16.1	Mechanical protection		P
16.1.1	Wiring and connections between parts of equipment shall be protected or enclosed so that the conductor insulation is not exposed to contact with any rough, sharp, or moving part	Internal wires were well secured and routed so that not touch rough or sharp parts.	P
16.1.2	Insulated wiring accessible through an opening in an enclosure is considered to be protected as required in 16.1.1 if the opening complies with Openings in enclosures, 7.4. Internal wiring not so protected may be acceptable if it is so secured within the enclosure that it is not likely to be subjected to stress or mechanical damage.	No such wires	N/A
16.1.3	An opening in the frame or enclosure through which insulated wires pass shall be provided with a smooth, well rounded bushing or shall have smooth, well rounded surfaces upon which the wires may lie	No wires through openings or enclosures	N/A
16.1.4	Insulated wires, complying with the requirements for Separation of Circuits, Section 17, may be bunched and passed through a single smooth opening in a wall within the enclosure		P
16.2	Wiring insulation		P
16.2.1	The internal wiring of power packs shall be of a type rated for the application, when considered with respect to the temperature and voltage involved, with respect to its exposure to oil and grease, and with respect to other conditions of service to which it is subjected		P
16.2.2	The insulation of wiring used in a high voltage circuit shall have a flame retardant rating of VW-1 in accordance with the requirements in the Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581		P
16.2.3	Sleeving, tape, and tubing used for insulation on wires shall be rated for the voltage and temperature involved		P
16.3	Splices and connections		P

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Clause	Requirement – Test	Result – Remark	Verdict
16.3.1	Splices and connections shall be mechanically secure and provide electrical contact. A soldered connection shall be made mechanically secure before being soldered		P
16.3.2	Equipment subjected to vibration shall be provided with lock washers or other means to mechanically secure wire binding screws and nuts. A twist on type connector shall be additionally secured to the wires by means of at least two layers of tape. Tape used for this means shall be evaluated for its intended application and comply with the Standard for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape, UL 510, and PVC Insulating Tape, CAN/CSA C22.2 No. 197.		P
16.3.3	A splice shall be provided with insulation equivalent to that of the wires connected if spacing between the splice and other metal parts is not maintained		P
16.3.4	The insulation on a splice may consist of a minimum of two layers of tape when the voltage involved is less than 250 volts. When evaluating the splice insulation consideration is to be given to such factors as its dielectric properties, heat resistance, and moisture resistance. Tape shall not be wrapped over a sharp edge		P
16.3.5	If internal wiring is stranded, loose strands of wire shall not contact other uninsulated live parts of opposite polarity or dead metal parts. At a wire binding screw, this may be accomplished by using upturned lugs, a cupped washer, barriers, or other means to hold the wires under the head of the screw. Other means of retaining the loose stranded internal wiring in position are use of a pressure terminal connector, soldering lug, or crimped eyelet		P
16.3.6	Aluminum conductors, insulated or uninsulated, used as internal wiring, such as for interconnection between current carrying parts, shall be terminated at each end by a method that is acceptable for the combination of metals involved at the connection point	Not Aluminum conductors	N/A
16.3.7	With reference to 16.3.6, a wire binding screw or a pressure terminal connector used as a terminating device shall be rated for use with aluminum under the condition involved – for example, temperature, heat cycling, vibration, and the like		N/A
16.3.8	Insulation of internal wiring consisting of coated fabric, thermoplastic, or other types of tubing is to be considered with respect to electrical, mechanical, and flammability properties of the material		P
17	Separation of circuits		P
17.1	Conductors of different circuits operating at different potentials shall be separated or segregated from each other unless each conductor is provided with insulation rated for the highest potential involved		P

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Clause	Requirement – Test	Result – Remark	Verdict
17.2	An insulated conductor shall be positioned so that it cannot contact an uninsulated live part of a different circuit		P
17.3	Segregation of insulated conductors may be accomplished by clamping, routing, or a means that maintains permanent separation from insulated and uninsulated live parts and from conductor of a different circuit.		P
17.4	A barrier used to separate or segregate internal wiring shall have the mechanical strength for the application, and it shall be reliably held in place.		P
18	Insulating Materials		P
18.1	Insulating materials, used in circuits other than low-voltage, limited-energy circuits, shall be porcelain, phenolic composition, or other similar material, and shall be evaluated in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, and Evaluation of Properties of Polymeric Materials, CAN/CSA C22.2 No. 0.17.		P
18.2	Ordinary vulcanized fiber may be used for insulating bushings, washers, separators, and barriers, but shall not be used as the sole support for uninsulated live parts if shrinkage, current leakage, or warpage is likely to result in a risk of fire, electric shock, or injury to persons	Not used	N/A
18.3	A thermoplastic material shall not be used for the sole support of live parts unless it complies with all of the following:		P
	a) Mechanical strength; b) Rigidity; c) Resistance to heat; d) Resistance to flame propagation; e) Dielectric withstand; and f) Resistance to abnormal heat.		P
19	Compressors	No Compressors	N/A
19.1	General		N/A
19.1.1	Air compressor assemblies provided with power packs, and housed within the overall power pack enclosure, shall comply with the requirements in 19.2 and 19.3. Air compressors supplied with the power pack, but as a separate unit shall be evaluated in accordance with the Standard for Motor-Operated Air Compressors, Vacuum Pumps, and Painting Equipment, UL 1450, and Motor Operated Appliances (Household and Commercial), CAN/CSA C22.2 No. 68.		N/A
19.2	Motors and thermal protection		N/A
19.2.1	A motor shall be acceptable for the application, and shall be capable of handling the maximum normal load of the power pack without creating a risk of fire, electric shock, or injury to persons		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
19.2.2	A motor winding shall resist the absorption of moisture. Film coated wire used for motor windings is not required to be additionally treated to prevent moisture absorption. Fiber slot liners, cloth coil wraps, and similar moisture absorptive materials are to be provided with impregnation or otherwise treated to prevent moisture absorption		N/A
19.2.3	A motor shall be provided with a thermal protector as described in 19.2.4		N/A
19.2.4	With reference to 19.2.3, thermal protection shall be evaluated in accordance with the Standard for Thermally Protected Motors, UL 1004-3, and Motors With Inherent Overheating Protection, CAN/CSA C22.2 No. 77.		N/A
	Exception No. 1: A thermally protected motor which drives a fully enclosed oil-less and tankless air compressor, or inflator, evaluated in accordance with the Standard for Motor-Operated Air Compressors, Vacuum Pumps, and Painting Equipment, UL 1450, and Motor Operated Appliances (Household and Commercial), CAN/CSA C22.2 No. 68.		N/A
	Exception No. 2: A motor intended to move air only, by means of an air moving fan that is integrally attached, keyed, or otherwise fixed to the motor, is required to have locked rotor protection only.		N/A
	Exception No. 3: A linear style pump is required to have locked rotor protection only.		N/A
19.2.5	The thermal protector shall have a current and voltage rating not less than the load that it controls		N/A
19.3	Parts subject to pressure	No such parts	N/A
19.3.1	A part of the power pack that is subject to pressure during normal or anticipated abnormal operation shall withstand, without rupture, a pressure corresponding to five times the maximum pressure that can be developed by the system.		N/A
19.3.2	In the event that a test is required to determine whether a part complies with the requirement in 19.3.1, two samples of the power pack are to be subjected to the Hydrostatic Strength Test, Section 59. Prior to the test, parts molded of polymeric material are to be conditioned in an air circulating oven for 7 hours at a temperature of 70°C (158°F) or 10°C (18°F) higher than the maximum temperature measured on the part under normal load, whichever is greater. The samples are to be removed from the oven and allowed to cool to room temperature prior to the test.		N/A
20	Capacitors and Electrochemical Capacitor Modules		N/A
20.1	Capacitors		N/A
20.1.1	A capacitor connected from one side of the line to the enclosure of a product shall have a capacitance rating of not more than 0.10 μ F, or the power pack shall be subjected to the Capacitor Discharge Test, Section 45.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
20.1.2	If a product employs a combination consisting of a rectifier and an electrolytic capacitor, no risk of fire, electric shock, or injury to persons shall result when either the rectifier or the capacitor is short-circuited.		N/A
20.1.3	Under both normal and abnormal conditions of use, a capacitor employing a liquid dielectric medium more flammable than askarel shall not expel the dielectric medium when tested in accordance with the performance requirements of this Standard.		N/A
20.2	Electrochemical capacitor modules		N/A
20.2.1	Electrochemical capacitor modules are allowed in power packs to provide the booster cable output. The electrochemical capacitor module shall comply with the requirements in the Standard for Electrochemical Capacitors, UL 810A, as well as the requirements in 20.2.2 – 20.2.4		N/A
20.2.2	Electrochemical capacitor modules shall be provided with a means to monitor the voltage at the input of the module and shall shut down the power to the module if the voltage exceeds the voltage rating of the module. Any appropriate means is allowed, but any software or programmable components associated with this protection means shall be evaluated for reliability		N/A
20.2.3	Electrochemical capacitor modules shall have temperatures of the module continuously monitored during any defined operating condition and the module shall be shut down if the temperature exceed the rated temperature of the module or individual capacitor in the module. Any appropriate means is allowed, but any software or programmable components associated with this protection means shall be evaluated for reliability		N/A
20.2.4	Means shall be provided such that the capacitor module shall not be allowed to discharge while the charging voltage is applied. Any attempt to jump start a vehicle while the power pack is plugged in shall be prohibited by the power pack itself. Any appropriate means is allowed, but any software or programmable components associated with this protection means shall be evaluated for reliability		N/A
21	Resistors	No such resistor used	N/A
21.1	The assembly of a power resistor, such as a wire wound type requiring a separate support, shall be reliable. The resistor shall be prevented from loosening or rotating by a means other than friction between surfaces.		N/A
21.2	An assembly employing lock washers may be considered to comply with 21.1		N/A
22	Lampholders	No lampholders	N/A
22.1	The screw shell of a lampholder shall be connected to a conductor that is intended to be connected to the grounded conductor of the power supply circuit		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
22.2	A lampholder shall be designed or installed so that uninsulated live parts, other than a screw shell, are not exposed to inadvertent contact by persons removing or replacing the lamp in normal service		N/A
22.3	If the lampholder is supplied from an LVLE circuit, the requirements in 22.1 and 22.2 do not apply		N/A
23	Transformers		N/A
23.1	Transformers provided as part of a power pack, shall comply with one of the following:		N/A
	a) Standard for Specialty Transformers, UL 506;		N/A
	b) Standard for Dry-Type General Purpose and Power Transformers, UL 1561; or		N/A
	c) Standard for Low Voltage Transformers – Part 1: General Requirements, UL 5085-1 and CAN/CSA C22.2 No. 66.1, and one of the following:: 1) Standard for Low Voltage Transformers – Part 2: General Purpose Transformers, UL 5085-2 and CAN/CSA C22.2 No. 66.2; or 2) Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3 and CAN/CSA C22.2 No. 66.3.		N/A
24	Switches and Controls		P
24.1	A switch or other control device shall be suitable for the application and shall have current and voltage ratings not less than those of the circuit that it controls when the power pack is operated as intended.		P
24.2	A primary circuit switch that controls an inductive load having a power factor less than 75 percent, such as a transformer, and that does not have an inductive rating, shall be rated not less than twice the full load current rating of the load, or the switch shall be investigated for this application		N/A
24.3	A switch or other control device not having an inductive rating that is connected in a transformer secondary circuit shall comply with the Normal Temperature Test, Section 47, and with the Overload of switches and controls test, Section 53.2.		N/A
24.4	Unless rated for the application, a switch or other device that controls a motor and is not interlocked so that it will not break the locked rotor motor current shall be subjected to the Overload of switches and controls test, Section 53.2, based on the locked rotor current of the motor.		N/A
24.5	A switch that controls a tungsten-filament lamp shall have a tungsten-filament lamp current rating not less than the maximum current it will control		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	Exception: A switch having a tungsten-filament lamp current rating less than the maximum current it will control but rated 3 amperes or more may be used to control a 15-watt or smaller lamp		N/A
24.6	A switch shall not disconnect the ground conductor of a circuit unless the switch simultaneously disconnects all other conductors.		P
24.7	If unintentional operation of a switch results in a risk of injury to persons, the actuator of the switch shall be located or guarded so that such operation is unlikely. The actuator of a switch may be guarded by recessing, ribs, barriers, or the like		N/A
25	Printed Wiring Boards		P
25.1	A printed wiring board shall comply with the requirements in the Standard for Printed Wiring Boards, UL 796, and have a minimum flammability classification of V-1.	V-0, complied with UL 796	P
25.2	A resistor, capacitor, inductor, or other part that is mounted on a printed wiring board to form a printed wiring assembly shall be secured so that it cannot be displaced to cause a risk of fire or electric shock by a force likely to be exerted on it during assembly, normal operation, or servicing of the power pack.		P
25.3	Consideration is to be given to a barrier or partition that is part of the power pack assembly and that provided mechanical protection and electrical insulation for a component connected to a printed wiring board.		P
26	Interlocks	No interlocks	N/A
26.1	An interlock required to reduce the risk of electric shock or injury to persons shall comply with 26.2 – 26.6.		N/A
26.2	The interlock device shall not be defeated readily without:		N/A
	a) Damaging the equipment; b) Making wiring connections or alterations; c) Using other than ordinary tools; or d) Using materials other than those readily available. Adhesive tape, string, or conventional extension cord sets are identified as readily available.		N/A
26.3	The interlock device shall be such that during normal operation and user servicing:		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	<p>a) The interlock is not defeated by improper disassembly, for example removal of the wrong screws during removal of the cover;</p> <p>b) The cover in which the interlock is mounted shall not be rotated by its own weight about the interlock axis perpendicular to the cover during any stage of its removal or replacement, if such rotation gives access to a live part, or damages the interlock or cover;</p> <p>c) The act of removal or replacement of the interlocked cover shall not subject the user to unintentional contact with live parts;</p> <p>d) The interlocked cover is not capable of being readily misapplied to result in a risk of electric shock; and</p> <p>e) The equipment is marked in accordance with 70.16.</p>		N/A
26.4	If two momentary contact switches must be operated to energize the power pack, the arrangement shall be spaced from each other and from live parts so that, if the means are operated simultaneously by one individual, contact with live parts shall not occur		N/A
26.5	With reference to 26.3(c), parts that are recessed more than 2-1/2 inches (64 mm) from the edge of the cabinet opening, normally in the plane of the cover, are excluded when determining that the act of removal or replacement of a cover will subject the user to unintentional contact with live parts		N/A
26.6	An interlock shall comply with Overload of Interlocks, Section 53.4		N/A
27	Overload Protection Devices		P
27.1	An overcurrent or thermal protective device shall be suitable for the application	Approved current fuse used	P
27.2	An automatic reset device used to comply with 27.1 shall be cycled through 200 operations. At the end of the 200 operations, the device shall be able to perform its intended function with no additional risk of fire, electric shock, or injury to persons. See Overload of protection devices, Section 53.3	No such device	N/A
27.3	A fuse involving a risk of electric shock shall be inaccessible:		P
	<p>a) To the user from outside the enclosure, and</p> <p>b) To the user during any user servicing.</p>		P
27.4	A fuse that can be serviced by the user shall be secured in a fuseholder that is constructed and installed such that no uninsulated live parts will be accessible to contact by persons removing or replacing the fuse. The power pack shall be marked in accordance with 70.10. This marking shall be adjacent to the fuse	No such fuse	N/A

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Clause	Requirement – Test	Result – Remark	Verdict
27.5	The screw shell of a plug fuseholder and the accessible contact of an extractor type fuseholder shall be connected to the load.	No such device	N/A
28	Internal battery		P
28.1	General		P
28.1.1	Connections to the terminals of the internal battery shall be secure. The connection means shall not allow the connection to loosen during normal operation to the point where the connection is lost, or where arcing or overheating may occur		P
28.1.2	Internal batteries provided as part of power packs shall be lead acid, in accordance with 28.2, or lithium-ion, in accordance with 28.3	Rechargeable lithium-ion Cell used. See below clause 28.3.	P
28.1.3	If the internal battery is removable by the user, the battery pack shall be keyed or provided with a means to prevent inadvertent reverse polarity connections when replacing the battery pack. If the battery pack is not provided with this means of prevention, then the power pack is subjected to the test in 50.10	Not removable by the user	N/A
28.2	Lead acid batteries	Not such battery	N/A
28.2.1	A lead acid battery shall comply with the requirements in the Standard for Standby Batteries, UL1989.		N/A
28.2.2	The power pack shall provide a means of reverse polarity protection or the test of 50.3 shall be performed.		N/A
28.2.3	The power pack shall provide short circuit protection for the battery or the test of 50.2 shall be performed		N/A
28.2.4	The power pack shall provide a means to prevent overcharge of the battery or the test of 50.9 shall be performed		N/A
28.2.5	The battery shall be subjected to the Normal Operation Charging Test, Section 43		N/A
28.3	Lithium-ion batteries		P
28.3.1	A lithium-ion battery cell shall comply with the requirements in the Standard for Lithium Batteries, UL 1642, or the Standard for Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made From Them, for Use in Portable Applications, UL 62133 and CAN/CSA E62133.	Rechargeable lithium-ion cell complied with UL1642.	P
28.3.2	The power pack shall provide a means of reverse polarity protection or the test of 50.3 shall be performed.	The construction of the battery pack provide the reverse protection	P
28.3.3	The power pack shall provide short circuit protection for the battery or the test of 50.2 shall be performed.	Test performed, no hazards after short test	P
28.3.4	The power pack shall provide a means to prevent overcharge of the battery or the test of 50.9 shall be performed	Test performed, no hazards after short test	P

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Clause	Requirement – Test	Result – Remark	Verdict
28.3.5	The battery shall be subjected to the Normal Operation Charging Test, Section 43.	Tested and complied	P
28.3.6	The power pack shall be subjected to the Lithium-Ion Charging System Test, Section 44	Tested and complied	P
29	Spacings		N/A
29.1	Spacings between hazardous live parts of opposite polarity, and between hazardous live and dead metal parts shall not be less than specified in Table 29.1. If an uninsulated hazardous live part is not rigidly secured in position by means other than friction between surfaces, or if a movable dead metal part is in proximity to an uninsulated hazardous live part, the construction shall be such that at least the minimum spacings are maintained. See 29.2.		N/A
	Exception No.1, No.2 or No.3		N/A
29.2	The spacing requirements in Table 29.1 do not necessarily apply to the inherent spacings of a component or assembly of a power pack. This includes switches, fuses, transformers, attachment plugs, and similar components or assemblies. Such spacings shall comply with the requirements for that component or assembly in question, where actual spacing requirements exist.		N/A
29.3	In a low voltage, limited energy secondary circuits, spacings of live parts in-between or live parts to grounded dead metal are not specified		N/A
29.4	Epoxy or equivalent material may be used to reduce spacings when all of the following are met:		N/A
	a) Spacings of a minimum 0.8 mm (1/32 inch) are maintained prior to application of the encapsulant;		N/A
	b) There are no significant voids in the encapsulant;		N/A
	c) The encapsulant is a minimum 0.8 mm (1/32 inch) thick;		N/A
	d) The area of reduced spacing, with the encapsulant applied, complies with the Dielectric Voltage Withstand Test, Section 48; and		N/A
	e) The encapsulant temperature during the Normal Temperature Test, Section 47, does not exceed 65°C (117°F) rise [based on an assumed operating ambient rating of 25°C (77°F)] or 90°C (194°F) limit (when tested at an ambient rating of greater than 25°C).		N/A
	Exception: When the encapsulant is suitable for use at a higher operating temperature, the temperature shall not exceed the material temperature rating.		N/A
29.5	As an alternative to the spacing requirements of Table 29.1, the spacing requirements in the Standard for Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment, UL 840, and Insulation Coordination, CAN/CSA C22.2 No. 0.2, may be used. The spacing requirements of UL 840 and CAN/CSA C22.2 No. 0.2 are not to be used for spacings to a dead metal enclosure. In determining the pollution degree and overvoltage category, the end use application is to be considered and may modify those characteristics given in 29.6 and 29.7.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
29.6	Power packs are considered to be used in a pollution degree 3 environment. Hermetically sealed or encapsulated enclosures, or coated printing-wiring boards in compliance with the Printed Wiring Board Coating Performance Test of the Standard for Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment, UL 840, and Insulation Coordination, CAN/CSA C22.2 No. 0.2, are considered pollution degree 1.		N/A
29.7	It is anticipated the equipment will be rated overvoltage category II or overvoltage category I as defined in the Standard for Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment, UL 840, and Insulation Coordination, CAN/CSA C22.2 No. 0.2.		N/A
29.8	In order to apply clearance B spacings, control of overvoltage shall be achieved by providing an overvoltage device or system as an integral part of the product		N/A
29.9	For the purpose of power packs covered by these requirements, all printed-wiring boards are considered to have a minimum comparative tracking index of 100 without further evaluation.		N/A
29.10	An insulating liner or barrier of material such as vulcanized fiber or thermoplastic employed in lieu of required spacings shall not be less than 0.71 mm (0.028 inch) thick and shall be so located or of such material that it is not adversely affected by arcing.		N/A
	Exception: Vulcanized fiber not less than 0.33 mm (0.013 inch) thick or mica not less than 0.165 mm (0.0065 inch) thick may be used:		N/A
	a) In conjunction with an air spacing of not less than 50 percent of the minimum through air spacing;		N/A
	b) Between a heat sink and a metal mounting surface, including the enclosure, of an isolated secondary circuit rated 50 Vrms or less.		N/A
29.11	Insulating material having a thickness less than that specified in 29.10 may be used if, upon evaluation, it is found to comply with the requirements for the application, and has a dielectric breakdown strength of not less than 5000 volts in the thickness used for 29.10 – 2500 volts in the thickness used for the Exception to 29.10 – as determined by Tests on Insulating Materials, Section 61.		N/A
29.12	Film coated wire is regarded as an uninsulated live part when spacings are being considered		N/A
30	Inverters		N/A
30.1	Inverters provided as part of the power bank shall be shown to comply with the applicable requirements in this outline. See 30.2		N/A
	Exception: Inverters that comply with the Standard for Power Units Other Than Class 2, UL 1012, and Power Supplies, CAN/CSA C22.2 No. 107.1, comply without further evaluation.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
30.2	With reference to 30.1, specific attention should be given to: a) Printed-Wiring Boards, Section 25; b) Spacings, Section 29; c) Normal Temperature Test, Section 47; d) Dielectric Voltage Withstand Test, Section 48; and e) Abnormal Operation Tests, Section 50. Other requirements shall also apply as applicable.		N/A
31	Charging functions		N/A
31.1	Specialized packs that provide a charging function while connected to the source of supply that is intended to charge the external battery through the pack's booster cable assembly, or other output connection, shall have the charging circuits evaluated in accordance with the applicable requirements in the Standard for Battery Chargers for Charging Engine-Starter Batteries, UL 1236, and Battery Chargers, CAN/CSA C22.2 No. 107.2.	Not that type	N/A
32	Protection Against Injury to Persons		P
	General		P
32.1	If the operation and maintenance of a power pack by the user involves a risk of injury to persons, means shall be provided to reduce the risk		P
32.2	When judging a power pack with respect to the requirement in 32.1, consideration shall be given to reasonably foreseeable misuse of the power pack		P
32.3	Whether a guard, a release, an interlock, or the like is required, and whether such a device meets the intent of the requirement, shall be determined from an evaluation of the complete power pack, its operating characteristics, and the likelihood of a risk of injury to persons resulting from a cause other than gross negligence. The evaluation shall include consideration of the results of breakdown or malfunction of any component, but not more than one component at a time, unless one event contributes to another. If the evaluation shows that breakdown or malfunction of a particular component can result in a risk of injury to persons, that component is to be investigated for reliability.		P
33	Back Feed Protection		N/A
33.1	Power packs shall be provided with back feed protection such that no current is passed through the device from the internal battery to the power supply input connections. Constructional features shall be provided to prevent this under normal operation and single fault condition. As an alternate means of determining compliance, the measurements in the Back Feed Test, Clause 66, can be performed.		N/A
34	Sharp edges		P
34.1	An enclosure, an opening, a frame, a guard, a knob, a handle, or the like, shall not be sufficiently sharp to cause a risk of injury to persons in normal maintenance or use	No such edges	P
35	Strength of enclosure		P

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Clause	Requirement – Test	Result – Remark	Verdict
35.1	The enclosure shall be tested in accordance with the strength of enclosure test in Section 55	Tested and complied	P
36	Attachments		P
36.1	The functional attachments shall be evaluated together with the power pack	Tested and complied	P
37	Stability		P
37.1	A power pack shall be tested as described in Stability Test, Section 58. No overturn, or any risk/injury posed on persons as result of the test	Tested and complied	P
38	Strength of handles		N/A
38.1	A handle used to support or carry a product shall be subjected to the Strength of Handles Test, Section 57.		N/A
39	Surface temperatures		P
39.1	During the Normal Temperature Test, Section 47, the temperature of a surface that may be contacted by the user shall not be more than the value specified in Table 39.1. If the test is conducted at a room temperature of other than 25°C (77°F), the results are to be corrected to that temperature.	Tested and complied	P
40	Safety circuits and Control Circuits	No such circuits and control	N/A
40.1	Circuits that are provided to limit outputs, switch outputs, control operational functions and the like, are considered safety circuits or control circuits, if their failure to provide their intended function will result in a hazardous condition or a risk of fire, shock, or injury to the user. Circuits that are classified as safety circuits or control circuits shall be evaluated to the applicable requirements in the Standard for Automatic Electrical Controls – Part 1: General Requirements, UL 60730-1 and CAN/CSA C22.2 E60730-1.		N/A

Performance			
41	General		P
42	Power Input Test	Tested and complied	P
43	Normal Charging Operation Test	Tested and complied	P
44	Lithium Charging System Test	Tested and complied	P
45	Capacitor Discharge Test	Tested and complied	P
46	Leakage current Test	Tested and complied	P
47	Normal Temperature Test	Tested and complied	P
47.1	General		P
47.2	Maximum normal load		P
47.3	Power pack ampacity temperature test		N/A
48	Dielectric Voltage Withstand Test	Tested and complied	P
49	Leakage current following humidity conditioning		N/A
50	Abnormal operation test	Tested and complied	P



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Clause	Requirement – Test	Result – Remark	Verdict
50.1	General		P
50.2	Output short test	Tested and complied	P
50.3	Reverse polarity of booster cables	Tested and complied	P
50.4	Component faults	Tested and complied	P
50.5	Relay and solenoid burnout	Tested and complied	P
50.6	Printed wiring board abnormal test	Tested and complied	P
50.7	Disconnected fan test		N/A
50.8	Blocked ventilation test	Tested and complied	P
50.9	Overcharging test	Tested and complied	P
50.10	Internal battery reverse polarity test	Tested and complied	P
51	Vibration test	Tested and complied	P
52	Ground continuity		N/A
53	Overload tests		N/A
53.1	General		N/A
53.2	Overload of switches and controls test		N/A
53.3	Overload of protection devices		N/A
53.4	Overload of interlocks		N/A
54	Strain Relief Test		N/A
55	Strength of enclosure tests	Tested and complied	P
55.1	General		P
55.2	Impact test		P
55.3	Drop test		P
56	Mold stress test	Tested and complied	P
57	Strength of handles test		N/A
58	Stability test		N/A
59	Hydrostatic strength test		N/A
60	Rain test	Tested and complied	P
61	Tests on insulation material		N/A
62	Accelerated aging of gaskets, sealing compound, and adhesive test	Tested and complied	P
63	Metallic coating thickness test		N/A
64	Permanency of wrapping hang tag marking	No such marking	N/A
65	Power pack ampacity test		N/A
66	Back feed test		N/A
67	Cold bend test		N/A
68	Clamp tests		N/A

MARKING



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Clause	Requirement – Test	Result – Remark	Verdict
69	General		P
69.1	A product shall be legibly and permanently marked with:		P
	a) The manufacturer’s name, trade name, trademark, or other descriptive marking by which the organization responsible for the product may be identified; b) A distinctive model number or the equivalent; c) The electrical rating; d) The operating temperature range as specified by the manufacturer; and e) The date or other dating period of manufacture not exceeding any three consecutive months	See copy of marking plate	P
	Exception: The date of manufacture may be abbreviated; or may be in a nationally accepted conventional code or in a code affirmed by the manufacturer, provided that the code: a) Does not repeat in less than 10 years; and b) Does not require reference to the production records of the manufacturer to determine when the product was manufactured.		P
69.2	When a manufacturer produces or assembles a power pack at more than one factory, each finished power pack shall have a distinctive marking, to identify it as the product of a particular factory.		N/A
69.3	With reference to 69.1 and the Cautionary Markings, Section 70, the markings shall be legible and permanent. These markings shall be:	See copy of marking plate	P
	a) Molded, die-stamped, paint stenciled, stamped or etched metal that is permanently secured; b) Pressure sensitive label complying with the applicable requirements for indoor and outdoor use labels in the Standard for Marking and Labeling Systems, UL 969, at the indicated temperature rating, up to 70°C (158°F) on the specified surface; or c) A hang tag applied to a hose or cord, provided the hang tag complies with the requirements in the Permanency of Wrapped Hang Tag Marking Test, Section 64.		P
69.4	Power packs intended to be used or marketed for use in repair facilities, the power pack shall be marked “suitable for use in a repair facility.”	Not for that purpose	N/A
70	Cautionary markings		P
70.1	A product having a hidden or unexpected risk of injury to persons shall be marked to inform the user of the risk.	See copy of marking plate	P
70.2	A cautionary marking shall be permanent and legible, in accordance with 69.3, and shall be located on a permanent part of the product		P

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Clause	Requirement – Test	Result – Remark	Verdict
70.3	A cautionary marking intended to instruct the operator shall be legible and visible from the position normally assumed by the operator when starting the product or from the position normally assumed or the specific operation involved. Other such markings for servicing or making settings and adjustments shall be legible and visible to the individual when such work is being done		P
70.4	A marking intended to inform the user of a risk of injury to persons shall be prefixed by a signal word “CAUTION,” “WARNING,” or “DANGER.” The marking shall be in letters not less than 3/32 inch (2.4mm) high. The signal word shall be more prominent than any other required marking on the product	See copy of marking plate Measured height: 2.7mm.	P
70.5	The literature accompanying a package containing a basic product and attachments intended to be marketed as a complete unit shall indicate what attachments are intended for use with the basic product if use of such attachments may expose the user to a risk of injury		P
70.6	An attachment that is packaged and marketed separately from the basic product and recommended by the manufacturer for use on the basic product shall be marked to identify the basic product with which it is intended to be used. The identification shall appear in at least one of the following locations:	Not separately	N/A
	a) On the attachment; b) On the package housing the attachment; c) In the instruction book for the basic product; or d) In information furnished with the attachment.		N/A
70.7	For components or assemblies used in power packs, such as air compressors, internal batteries, and the like, specific cautionary markings may exist on the enclosure or body of these components are assemblies and which may not be visible to the user once installed in the power pack. If the risk is not removed or reduced due to the installation of this component or assembly in the power pack, then the cautionary marking appearing on the component or assembly shall be repeated on the power pack		N/A
70.8	A compartment involving a risk of electric shock and housing no user serviceable parts shall be marked where readily visible during any approach to servicing. The marking shall consist of the word “CAUTION” and the following or equivalent: “Risk Of Electric Shock, Do Not Remove Cover. No User Serviceable Parts Inside. Refer Servicing to Qualified Service Personnel.”		P

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Clause	Requirement – Test	Result – Remark	Verdict
70.9	The locations and type designations of user serviceable components shall be marked on the power pack where the marking will be readily visible during servicing of the components, unless replacement of the component by a different type cannot result in a risk of fire, electric shock, or injury to persons	No user serviceable components	N/A
70.10	There shall be a replacement marking adjacent to a user accessible fuse or fuseholder if the fuse is used to reduce the risk of fire or electric shock. The marking shall be located where it will be readily visible during replacement of the fuse, and shall consist of the word “CAUTION” and the following or equivalent: “For Continued Protection Against Risk Of Fire, Replace Only With Same and rating of fuse.” If the fuse is soldered in place and is perceptible during user servicing, the marking shall, in addition to the above, include the following wording or the equivalent: “Refer Replacement To Qualified Service Personnel”.		N/A
70.11	A power pack that contains an internal battery that is to be charged shall be marked with the word “WARNING” and the following or equivalent:		P
	<ul style="list-style-type: none"> a) Do not overcharge the internal battery – See Instruction Manual. b) Do not smoke, strike a match, or cause a spark in the vicinity of the power pack. c) Only charge the internal battery in a well ventilated area. 		P
70.12	A power pack shall be plainly marked with the word “CAUTION” and the following or the equivalent: “Risk of Electric Shock. Connect only to properly grounded outlets.”		N/A
70.13	A power pack shall be plainly marked with the word “CAUTION” and the following or the equivalent: “Risk of Injury To Persons. Do not use this product if the power cord or the battery cables are damaged in any way.		N/A
70.14	For polarity identification, one clamp shall be black and the other clamp shall be a contrasting color, other than white at each end of the battery booster cable set. In addition, the contrasting color clamps shall be marked “+” and “POS” or “POSITIVE”, the black clamps shall be marked “-” and “NEG” or “NEGATIVE.”		N/A
70.15	Instructions pertaining to the proper use and connection of the battery cables shall appear on the power pack and as written instructions in the Operating Instructions provided with the product		P

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Clause	Requirement – Test	Result – Remark	Verdict
70.16	Power packs which incorporate an interlock device complying with Section 26, Interlocks, shall be marked where readily visible by any personnel attempting to defeat the interlock. The marking shall include the word “WARNING” and the following or the equivalent: “Risk of Electric Shock. This cover is provided with an interlock. Do not defeat its purpose or attempt to service without removing cover completely.” The general location of the interlock shall also be indicated.		N/A
70.17	With reference to 6.2, the power pack shall be marked with the word “WARNING” and the following or the equivalent: “Risk of Explosion. This equipment has arcing or sparking parts which should not be exposed to flammable vapors. This equipment should be located at least 457 mm (18 inches) above the floor when used in a repair facility.”	According to clause 11.2.1, See copy of marking plate	P
70.18	With reference to 6.2, a power pack that is not intended to be used in a repair facility shall be marked with the word “CAUTION” and the following or the equivalent: “This device is not intended for use in a commercial repair facility.”	See copy of marking plate	P
70.19	With reference to 6.3, temporary outdoor use power packs shall be marked with the word “CAUTION” and the following or the equivalent: “This device is intended to be stored indoors when not in use. This device shall not be stored or left outdoors when not in use.”	See copy of marking plate	P
70.20	With reference to 6.3, temporary outdoor use power packs shall be marked with the word “CAUTION” and the following or the equivalent: “This device is intended for temporary use outdoors and reasonable care should be exercised when using this device in wet conditions.”	See copy of marking plate	P
70.21	With reference to 6.3, indoor use only devices shall be marked “DANGER” and the following or the equivalent: “This device is intended to be used indoors only. Do not use outdoors.”		N/A
70.22	With reference to 6.4 and 7.3.3, products with an enclosure RTI rating less than 80°C shall be marked with the word “WARNING” and the following or the equivalent: “Risk of Electric Shock and Risk of Fire. This device is not to be stored in a vehicle.		N/A

INSTRUCTIONS			
71	General		P
71.1	A product shall be provided with legible installation instructions, operation instructions, and instructions pertaining to a risk of fire, electric shock, or injury to persons associated with the use of the product. Also, user maintenance instructions and moving and storage instructions associated with the use of the product by the end user shall be included	Provided	P
71.2	The instructions mentioned in 71.1 shall be:		P
	a) In separate manuals, or b) Combined in one or more manuals when the instructions pertaining to a risk of fire, electrical shock, or injury to persons are separated in format and emphasized to distinguish them from the rest of the text.	Combined in one manual	P

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Clause	Requirement – Test	Result – Remark	Verdict
71.3	An illustration is allowed with a required instruction to clarify the intent but shall not replace the written instruction.		P
71.4	The following items shall be entirely in upper case letters or shall be emphasized to distinguish them from the rest of the text:		P
	a) The headings for the installation, operation, user maintenance, and moving and storage instructions; b) The heading for the instructions pertaining to a risk of fire, electric shock, or injury to persons; and c) The opening and closing statements of the instructions specified in 72.3 – “IMPORTANT SAFETY INSTRUCTIONS” and “SAVE THESE INSTRUCTIONS,” or the equivalent.		P
71.5	Unless otherwise indicated, the text of the instructions in 72.3 and 72.4 shall be in the words specified or words that are equivalent, clear, and understandable. Substitution of the signal word “DANGER” for “WARNING” is allowed when the risk associated with the product is such that a situation exists which, if not avoided, will result in death or serious injury.		P
72	Instructions Pertaining to Risk of Fire, Electric Shock, or Injury to Persons		P
72.1	Instructions pertaining to a risk of fire, electric shock, or injury to persons shall warn the user of reasonably foreseeable risks and state the precautions to be taken to reduce such risks. Such instructions shall be preceded by the heading “INSTRUCTIONS PERTAINING TO RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS” or the equivalent		P
72.2	Numbering of the items in the list in 72.3 and including other instructions pertaining to a risk of fire, electric shock, or injury to persons that the manufacturer determines to be necessary and that do not conflict with the intent of the instructions are acceptable		P
72.3	The instructions pertaining to a risk of fire, electric shock, or injury to persons shall include those items in the following list that are applicable to the product. The statement “IMPORTANT SAFETY INSTRUCTIONS” or the equivalent shall precede the list, and the statement “SAVE THESE INSTRUCTIONS” or the equivalent shall either precede or follow the list. The word “WARNING” shall be entirely in upper case letters or shall be emphasized to distinguish it from the rest of the text		P
	IMPORTANT SAFETY INSTRUCTIONS		P
	WARNING – When using this product, basic precautions should always be followed, including the following:		P



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Clause	Requirement – Test	Result – Remark	Verdict
	<p>a) Read all the instructions before using the product.</p> <p>b) To reduce the risk of injury, close supervision is necessary when the product is used near children.</p> <p>c) Do not put fingers or hands into the product.</p> <p>d) Use of an attachment not recommended or sold by power pack manufacturer may result in a risk of fire, electric shock, or injury to persons.</p> <p>e) To reduce risk of damage to the electric plug and cord, pull the plug rather than the cord when disconnecting the power pack.</p> <p>f) Do not use a battery pack or appliance that is damaged or modified. Damaged or modified batteries may exhibit unpredictable behavior resulting in fire, explosion or risk of injury.</p> <p>h) Do not operate the power pack with a damaged cord or plug, or a damaged output cable.</p> <p>h) Do not disassemble the power pack, take it to a qualified service person when service or repair is required. Incorrect reassembly may result in a risk of fire or electric shock.</p> <p>i) To reduce the risk of electric shock, unplug the power pack form the outlet before attempting any instructed servicing.</p> <p>j) WARNING – RISK OF EXPLOSIVE GASES.</p> <p>1) WORKING IN VICINITY OF A LEAD ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF THE UTMOST IMPORTANCE THAT YOU FOLLOW THE INSTRUCTIONS EACH TIME YOU USE THE POWER PACK.</p> <p>2) To reduce risk of battery explosion, follow these instructions and those published by battery manufacturer and manufacturer of any equipment you intend to use in vicinity of the battery. Review cautionary marking on these products and on engine.</p>		P

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Clause	Requirement – Test	Result – Remark	Verdict
	<p>k) PERSONAL PRECAUTIONS</p> <p>1) Consider having someone close enough by to come to your aid when you work near a lead-acid battery.</p> <p>2) Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.</p> <p>3) Wear complete eye protection and clothing protection. Avoid touching eyes while working near battery.</p> <p>4) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately.</p> <p>5) NEVER smoke or allow a spark or flame in vicinity of battery or engine.</p> <p>6) Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit battery or other electrical part that may cause explosion.</p> <p>7) Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.</p>		P
	<p>l) When charging the internal battery, work in a well ventilated area and do not restrict ventilation in any way.</p> <p>m) Under abusive conditions, liquid may be ejected from the battery; avoid contact. If contact accidentally occurs, flush with water. If liquid contacts eyes, additionally seek medical help. Liquid ejected from the battery may cause irritation or burns.</p> <p>n) Do not expose a power pack to fire or excessive temperature. Exposure to fire or temperature above 130°C may cause explosion. The temperature of 130°C can be replaced by the temperature of 265°F.</p> <p>o) Have servicing performed by a qualified repair person using only identical replacement parts. This will ensure that the safety of the product is maintained.</p> <p>p) Attach output cables to a battery and chassis as indicated below. Never allow the output clamps to touch one another.</p> <p>1) Instructions shall include step by step directions for the proper use of the booster function detailing the correct steps to connect and disconnect the booster cables to the battery.</p> <p>2) Each step shall be a different numbered item.</p> <p>SAVE THESE INSTRUCTIONS</p>		P
72.4	The instructions pertaining to a risk of fire, electric shock, or injury to persons, or the installation instructions shall include the appropriate items if applicable.		P
73	Installation instructions		P
74	Operating Instructions		P



ANSI/CAN/UL 2743:2020			
Clause	Requirement – Test	Result – Remark	Verdict
75	User Maintenance Instructions		P
76	Moving and Storage Instructions		P
Appendix A	Safety Marking Translations		Info.

ANSI/CAN/UL 2743:2020						
Clause	Requirement – Test				Result – Remark	Verdict
12.4	DC output connectors and USB connectors					P
Both under normal operating conditions and after any single fault in the regulating network (open-circuit or short-circuit)						
under normal load condition						
Type-C rated output: 5~20V $\overline{=}$ 3A 60W						
Only Type-C output load 5~20V$\overline{=}$ 3A 60W						
Output Voltage (Voc)			Output Current (Isc)		VA	
V peak	V DC	Measured	Max Allowed	Measured	Max Allowed	Measured
<21.2	<30	5.04	<8A	3.40	<240	14.21
<21.2	<30	9.05	<8A	3.35	<240	27.12
<21.2	<30	12.04	<8A	3.39	<240	36.27
<21.2	<30	15.04	<8A	3.40	<240	47.35
<21.2	<30	20.37	<8A	3.42	<240	64.01
Sample No. #2						
(fault condition with M2 Short-circuit)						
Output Voltage (Voc)			Output Current (Isc)		VA	
V peak	V DC	Measured	Max Allowed	Measured	Max Allowed	Measured
<21.2	<30	5.04	<8A	3.43	<240	14.26
M2 and M4 short-circuit same as results.						
Sample No. #2						
(fault condition with U3 Pin 15-32 Short-circuit)						
Output Voltage (Voc)			Output Current (Isc)		VA	
V peak	V DC	Measured	Max Allowed	Measured	Max Allowed	Measured
<21.2	<30	5.04	<8A	3.43	<240	14.26
U3 Pin 15-32, U3 Pin 14-32 and U3 Pin 13-32 short-circuit same as results.						
Only USB-A output load 5V$\overline{=}$ 3A, 9V$\overline{=}$ 2A, 12V$\overline{=}$ 1.5A						
Output Voltage (Voc)			Output Current (Isc)		VA	
V peak	V DC	Measured	Max Allowed	Measured	Max Allowed	Measured
<21.2	<30	5.09	<8A	3.40	<240	16.32
<21.2	<30	9.17	<8A	3.00	<240	25.16
<21.2	<30	12.04	<8A	2.31	<240	25.08
Sample No. #2						
(fault condition with M1 Short-circuit)						
Output Voltage (Voc)			Output Current (Isc)		VA	
V peak	V DC	Measured	Max Allowed	Measured	Max Allowed	Measured

ANSI/CAN/UL 2743:2020						
Clause	Requirement – Test				Result – Remark	Verdict
<21.2	<30	5.09	<8A	3.40	<240	16.32
M2 and M4 short-circuit same as results.						
Sample No. #2						
(fault condition with U3 Pin 15-32 Short-circuit)						
Output Voltage (Voc)		Output Current (Isc)			VA	
V peak	V DC	Measured	Max Allowed	Measured	Max Allowed	Measured
<21.2	<30	5.09	<8A	3.66	<240	15.20
(fault condition with U3 Pin 14-32 Short-circuit)						
Output Voltage (Voc)		Output Current (Isc)			VA	
V peak	V DC	Measured	Max Allowed	Measured	Max Allowed	Measured
<21.2	<30	5.01	<8A	3.56	<240	15.17
(fault condition with U3 Pin 13-32 Short-circuit)						
Output Voltage (Voc)		Output Current (Isc)			VA	
V peak	V DC	Measured	Max Allowed	Measured	Max Allowed	Measured
<21.2	<30	5.04	<8A	3.48	<240	14.36
Supplementary information: ---						

29.1	TABLE: Minimum Clearances/Creepage distance						N/A
Clearance (cl) and creepage distance (cr) at/of/between:	Up (V)	U r.m.s. (V)	Frequency (kHz)	Required cl (mm)	cl (mm) ²	Required ³ cr (mm)	cr (mm)
---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---
Supplementary information: ---							

42	TABLE: Power Input Test					P
fuse #	Irated (A)	U (V)	P (W)	I (A)	Ifuse (A)	condition/status
Supplied by Type-C input terminal						
--	3A	20Vdc	56.1	2.80	2.80	Charging the internal Lithium-ion battery pack (fully discharged battery pack) the inside battery pack charging current: 5.35A Tested with DC power sources. DC load: none Cannot load when charging? <input checked="" type="checkbox"/> yes? <input type="checkbox"/> no?
Note: <=10% of Rated current under the conditions of max. normal load (max. current draw while the device is operating in all possible modes at the same time)						

43	TABLE: Normal Charge Operation Test	P
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Battery charging test						
Type-C Input 20Vdc, 3A Max. charging the internal battery;						
Charge battery (at 25°C)						
Charging voltage (V)		Charging Current (A)		Battery temperature		Remark
Cell		Cell		Cell		
Cell 1	4.191	Cell 1	4.84	Cell 1	30.5	No fire, no explosion. No hazard. not exceed the specified operating region for charging of the cell.
Cell 2	4.191			Cell 2	30.5	
Cell 3	4.191			Cell 3	30.5	
Charge battery (at -5°C)						
Charging voltage (V)		Charging Current (A)		Battery temperature		Remark
Cell		Cell		Cell		
Cell 1	4.192	Cell 1	4.84	Cell 1	-4.3	No fire, no explosion. No hazard. not exceed the specified operating region for charging of the cell.
Cell 2	4.192			Cell 2	-4.4	
Cell 3	4.191			Cell 3	-4.4	
Charge battery (at 50°C)						
Charging voltage (V)		Charging Current (A)		Battery temperature		Remark
Cell		Cell		Cell		
Cell 1	4.192	Cell 1	4.84	Cell 1	59.1	No fire, no explosion. No hazard. not exceed the specified operating region for charging of the cell.
Cell 2	4.192			Cell 2	59.2	
Cell 3	4.193			Cell 3	59.2	
Note: Charging a Rechargeable Lithium ion Cell under normal conditions shall not exceed the specified operating region for charging of the cell. Charging the internal battery (fully discharged battery) with type-C input 20Vdc 3A charging the internal battery;						

43	TABLE: Normal Charge Operation Test				P	
Battery imbalance test (if series configuration) at 25°C						
Type-C Input 20Vdc, 3A Max. charging the internal battery;						
Charge battery (at 25°C)						
Charging voltage (V)		Charging Current (A)		Battery temperature		Remark
Cell		Cell		Cell		
Cell 1	4.191	Cell 1	4.84	Cell 1	30.5	No fire, no explosion. No hazard. not exceed the specified operating region for charging of the cell.
Cell 2	4.191			Cell 2	30.5	
Cell 3	4.195			Cell 3	31.9	
Charge battery (at -5°C)						



Charging voltage (V)		Charging Current (A)		Battery temperature		Remark
Cell		Cell		Cell		No fire, no explosion. No hazard. not exceed the specified operating region for charging of the cell.
Cell 1	4.192	Cell 1	4.84	Cell 1	-4.3	
Cell 2	4.192			Cell 2	-4.1	
Cell 3	4.195			Cell 3	-3.6	

Charge battery (at 50°C)

Charging voltage (V)		Charging Current (A)		Battery temperature		Remark
Cell		Cell		Cell		No fire, no explosion. No hazard. not exceed the specified operating region for charging of the cell.
Cell 1	4.192	Cell 1	4.84	Cell 1	59.1	
Cell 2	4.192			Cell 2	60.2	
Cell 3	4.193			Cell 3	60.5	

Note: at first fully discharge the battery, and subsequently charged one of the cells to 50% SOC;

Charging a Rechargeable Lithium ion Cell under normal conditions shall not exceed the specified operating region for charging of the cell.

Charging the internal battery (fully discharged battery) with type-C input 20Vdc 3A charging the internal battery;

44	TABLE: Lithium Charging System Test			P
Battery charging test at abnormal conditions				
Test a)				
Battery with cells in series configuration				
Test configuration: Fully discharge the battery, afterwards charge one of the cells up to 50% SOC, fault a component on the charger circuit, then charge the battery				
Charge termination: Charge until exploding, catching fire, battery temperature returned to room temperature, 7 hours or twice of the normal charging period (fully) which one is longer (the cells' voltage shall be always monitored during the test)				
Cell1 voltage (V)	Cell 2 voltage (V)	Cell 3 voltage (V)	Remark	
3.513	3.578	3.572	F1 (on battery protective circuits)	
3.512	3.513	3.502	Q5 S-D (on battery protective circuits)	
Test c)				
Battery with cells in series configuration				
Test configuration: Fully discharge the battery, afterwards charge all cells up to 50% SOC except one of the cells is short-circuit, then charge the battery				



<p>Charge termination: Charge until exploding, catching fire, battery temperature returned to room temperature, 7 hours or twice of the normal charging period (fully) which one is longer (the cells' voltage shall be always monitored during the test)</p>			
Cell 1 voltage (V)	Cell 2 voltage (V)	Cell 3 voltage (V)	Remark
3.576	3.564	3.569	One cell s-c
<p>Test d) Battery regardless of its configuration. Evaluate the effect of back-feed by the battery</p>			
<p>Test configuration: Fully charged battery. Short-circuit of a component in the charging system expected to produce the most unfavorable results.</p>			
<p>Charge termination: Charge until exploding, catching fire, battery temperature returned to room temperature, 7 hours or twice of the normal charging period (fully) which one is longer (the cells' voltage shall be always monitored during the test)</p>			
Cell1 voltage (V)	Cell 2 voltage (V)	Cell 3 voltage (V)	Remark
3.571	3.570	3.572	Q5 S-D (on battery protective circuits)
<p>Note:</p>			

47.1	TABLE: maximum temperatures		P
	test voltage (V)	See below	—
	t _{amb1} (°C)	45	—
	t _{amb2} (°C)	45	—
maximum temperature T of part/at:		T (°C)	allowed T _{max} (°C)
Charge fully discharged battery via external DC source			
Type-C Input 20V, 3A Max. charging the internal battery;			
PCB near U1		61.1	130
PCB near M1		78.8	130
PCB near M5		92.2	130
PCB near Q5		89.0	130
PCB near U3		89.7	130
PCB near LED1		45.5	130
relay K2 body		53.0	85
PCB near U10		46.9	130
PCB near Q30		46.7	130
motor body		45.5	Ref.



motor input lead wire	45.7	105
Battery body	49.9	Ref.
Battery wire	46.8	105
Plasitc enclosure inside near U1	53.4	105
Plasitc enclosure outside near U1	51.3	85
Plasitc enclosure inside near U10	45.9	105
Plasitc enclosure outside near U10	46.2	85
Plasitc enclosure inside near motor	45.5	105
Plasitc enclosure outside near motor	45.5	85
Plasitc enclosure inside near Battery	47.4	105
Plasitc enclosure outside near Battery	46.8	85
keypad	46.5	85

47.1	TABLE: maximum temperatures		P
	test voltage (V)	See below	—
	t _{amb1} (°C)	50	—
	t _{amb2} (°C)	50	—
	maximum temperature T of part/at:	T (°C)	allowed T _{max} (°C)
Charge fully charged battery via USB-A Output load			
USB-A Output 12V, 1.5A LED Lighting and air pump normal			
PCB near U1		69.3	130
PCB near M1		71.6	130
PCB near M5		73.7	130
PCB near Q5		71.5	130
PCB near U3		74.4	130
PCB near LED1		63.2	130
relay K2 body		63.0	85
PCB near U10		66.0	130
PCB near Q30		65.9	130
motor body		73.0	Ref.
motor input lead wire		68.6	105
Battery body		64.5	Ref.
Battery wire		66.3	105
Plasitc enclosure inside near U1		62.9	105
Plasitc enclosure outside near U1		59.8	85
Plasitc enclosure inside near U10		61.5	105
Plasitc enclosure outside near U10		61.9	85



Plasitc enclosure inside near motor	62.8	105
Plasitc enclosure outside near motor	60.0	85
Plasitc enclosure inside near Battery	59.5	105
Plasitc enclosure outside near Battery	57.9	85
keypad	63.1	85

47.1	TABLE: maximum temperatures		P
	test voltage (V)	See below	—
	t _{amb1} (°C)	50	—
	t _{amb2} (°C)	50	—
maximum temperature T of part/at:		T (°C)	allowed T _{max} (°C)

Charge fully charged battery via Type-c Output load

Type-C Output 20Vdc, 3A LED Lighting and air pump normal

PCB near U1	73.5	130
PCB near M1	92.1	130
PCB near M5	115.7	130
PCB near Q5	113.4	130
PCB near U3	106.5	130
PCB near LED1	64.6	130
relay K2 body	67.2	85
PCB near U10	67.6	130
PCB near Q30	67.6	130
motor body	73.8	Ref.
motor input lead wire	69.2	105
Battery body	66.6	Ref.
Battery wire	68.2	105
Plasitc enclosure inside near U1	65.0	105
Plasitc enclosure outside near U1	61.3	85
Plasitc enclosure inside near U10	62.0	105
Plasitc enclosure outside near U10	61.3	85
Plasitc enclosure inside near motor	63.0	105
Plasitc enclosure outside near motor	60.3	85
Plasitc enclosure inside near Battery	60.8	105
Plasitc enclosure outside near Battery	59.0	85
keypad	63.5	85



48	Table: Dielectric Voltage Withstand Test		P
test voltage applied between:		test voltage (V)	breakdown Yes / No
Unit DC input to DC output		500Vdc	No
supplementary information			
Note:---			

50	TABLE: Abnormal Operation Tests			P
	ambient temperature (°C)	1) t1: _____; t2: _____	2) t1: _____; t2: _____	—
	model/type of power supply	-	-	—
	manufacturer of power supply	-	-	—
	rated markings of power supply	-	-	—

component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
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50.2 output short test (battery fully charged)

Type-C output (20.0Vdc 3A)	s-c	12.75V for battery pack	10s	---	---	Battery discharging current: 11.8A to 0A; DC output Unit shut down immediately, No fire, no explosion.
USB-A output (20.0Vdc 3A)	s-c	12.75V for battery pack	10s	---	---	Battery discharging current: 11.8A to 0A; DC output Unit shut down immediately, No fire, no explosion.

50.4 components fault (Charging via type Type-C Input, internal battery fully discharged)

Q5 Pin S-D (on DC circuit board)	s-c	20V	10mins	/	/	Unit shut down immediately, input current: 2.80A → 0A; internal battery charge current: 5.35A → 0A. Recoverable, when fault removed. No hazard.
U3 pin 13-32 (on DC circuit board)	s-c	20V	10mins	/	/	Unit shut down immediately, input current: 2.80A → 0A; internal battery charge current: 5.35A → 0A. Recoverable, when fault removed. No hazard.
U3 pin 14-32 (on DC circuit board)	s-c	20V	10mins	/	/	Unit shut down immediately, input current: 2.80A → 0A; internal battery charge current: 5.35A → 0A. Recoverable, when fault removed. No hazard.
U3 pin 15-32 (on DC	s-c	20V	10mins	/	/	Unit shut down immediately, input current: 2.80A → 0A;



circuit board)						internal battery charge current: 5.35A →0A. Recoverable, when fault removed. No hazard.
50.4 components fault (discharging with internal battery fully charged)						
U3 pin 13-32 (Type-C output board)	s-c	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A →3.43A. No hazard.
U3 pin 14-32 (Type-C output board)	s-c	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A →3.43A. No hazard.
U3 pin 15-32 (Type-C output board)	s-c	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A →3.43A. No hazard.
U3 pin 13-32 (USB-A output board)	s-c	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A →3.66A. No hazard.
U3 pin 14-32 (USB-A output board)	s-c	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A →3.66A. No hazard.
U3 pin 15-32 (USB-A output board)	s-c	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A →3.66A. No hazard.
Motor	Locked	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A→0A. No hazard.
L5	s-c	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A→0A. No hazard.
M1 (Type-C output board)	s-c	12.75V for battery pack	3mins	/	/	Unit shut down immediately, ; internal battery discharge current: 5.63A →3.43A. No hazard.
50.4 components fault (discharging with internal battery pack fully charged)						
Type-C(PD) Output terminal	o-l	12.75V for battery pack	1 hours	/	/	Unit operated normally, Battery discharging current: 11.8A; USB-A1 output: 12V, 1.5A load USB-C1 output: 20V, 3.0→3.3A over load LED Lighting ON Air pump normal working PCB near M5: 91.3°C; PCB near Q5: 89.4°C; PCB near U3: 82.0°C; Plastic enclosure near U1:



						39.0°C; Plastic enclosure near Motor: 37.5°C; Cell body: 40.3°C; Plastic enclosure near battery pack: 34.4°C Ambient: 25.0°C. EUT worked normally, No fire, no explosion, No hazard.
USB-A(PD) Output terminal	o-l	12.75V for battery pack	1 hours	/	/	Unit operated normally, Battery discharging current: 8.06A; USB-A1 output: 12V, 1.5A → 2.1A over load USB-C1 output: 20V, 3.0 load LED Lighting ON Air pump normal working PCB near M5: 80.2°C; PCB near Q5: 77.1°C; PCB near U3: 77.3°C; Plastic enclosure near U1: 34.4°C; Plastic enclosure near Motor: 35.4°C; Cell body: 39.1°C; Plastic enclosure near battery pack: 32.7°C Ambient: 24.4°C. EUT worked normally, No fire, no explosion, No hazard.
50.6 PCB abnormal test (Battery fully charged)						
PCB trace under connector for battery	s-c	12.75 for battery pack	1hrs	/	/	Unit shutdown immediately, recoverable, no hazards.
50.7 Disconnected fan test (Battery fully charged)						
--	--	--	--	--	---	-
the unit shall be operated at maximum normal load.						
50.8 Blocked ventilation test						
--	--	--	--	--	---	-
the unit shall be operated at maximum normal load.						
50.9 overcharging test (battery fully discharged), charge with Input 12.75V, 30A*						
Normally overcharging	s-c	12.75	1.25hrs	/	/	Unit shutdown immediately, recoverable, no hazards.
S-C=Short-Circuit, o-l=overload. *charging the battery pack with a current of 2C (C is the rated capacity of the battery pack) for 1.25 hours						





51	Vibration Test		P
Test: 4 hours, 22 cycles / per second, displacement of 6.4mm in vertical.			
Criteria: the cell shall not catch fire or explode			

55.2	TABLE: Impact Test		P
Test: Two samples shall be tested, one is the sample as received, the other sample is that conditioned at 0°C for 4 hours. The enclosure, guard or cover shall be subject to an impact test of 6.78N-m which is produced by a steel sphere with diameter of 50.8mm and weight of 0,535kg drop from a height 1.30m. For surface other than the top, the test is conducted by a suspended steel sphere			
Criteria: After the test the following situations does not happen, a) Uninsulated live part may involve risks of electric shock b) Fail at high-pot test; or c) The spacings are less than needed			

55.3	TABLE: Drop Test		P
Test: Two samples shall be tested, one is the sample as received, the other sample is that conditioned at 0°C for 4 hours. The sample drop three times from a height of 3 feet (0.9m) to a concrete surface.			
Criteria:After the test the following situations does not happen, a) Uninsulated live part may involve risks of electric shock b) Fail at high-pot test; or c) The spacings are less than needed			

56	TABLE: Mould Stress Test 75°C, 7h		P
Test: The sample is placed into an oven at a temperature 70°C or 10 Deg C higher than the max. temperature measured in Section 47, whichever is higher. The samples is conditioned for 7 hours.			
Criteria: After the test the sample shall not show any distortion, deterioration, shrinkage, warping or softening that would allow access to live parts.			

58	TABLE: Stability / 10° Angle Test		N/A
Test: Place the sample on an inclined plane inclined at angle of 10 degree from the horizontal.			
Criteria: During the test the sample does not tip over.			

66	TABLE: Back Feed Test		N/A
Location	V measured	mA measured	Comments
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---	---	---	---

Note: above measurement shall be taken immediately after the power source disconnected from the input connection point. The internal battery shall be fully charged.

Limit: 60Vdc., 3.5mA.

TABLE: List of critical components					
Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition/ year)	Mark(s) of conformity ¹⁾
Power bank SoC U3	INJOINIC	IP5389	Rated Input: 4.5-20VDC max (VIN/VBUS)Pr otection Class: III Degree of Protection: IPX0 Construction: Built-in component	IEC 62368- 1:2018	TÜV SÜD PSB Pte. Ltd. CB Certificate No.: SG PSB-IV- 06556
Protection IC	SINO WEALTH	SH367303	V _{DD} :-0.3V to +30V, I _{op} : 70 μ A, I _{PD} : 1 μ A; Oper. Temperature:- 40°C to 85°C;	UL 2743	Tested with in appliance
30V High Current Boost LED Driver (DC/DC step- up converter IC) U2	Silergy Corp.	SY7200A	Input Voltage: 2.8V to 30Vdc, 2A	UL 2743	Tested with in appliance
Relay K1	Churod Electronics Co., Ltd.	CHAF7P-S- 112DA2	12VDC, 1.7W, 85 \pm 10% Ω , Operate voltage \leq 7.8VD C, Release voltage: \geq 1.2VDC, Class H	UL 2743	Tested with in appliance
Air Pump	AnXin GongMao	AX1200	DC 12V, 10A, 120W, Gas flow: 53L/min	UL 2743	Tested with in appliance
MOSFET (M1, M2, M3)	SEMIONE	PED3011M	V _{DS} =-30V, V _{GS} = \pm 20V, I _D =-35A	UL 2743	Tested with in appliance
MOSFET (Q3, Q4)	SEMIONE	PED3008MA	V _{DS} =-30V, V _{GS} = \pm 25V, I _D =-36A	UL 2743	Tested with in appliance
MOSFET (M4, M5, M6, M7)	Fetek	FKBB3052	V _{DS} =30V, V _{GS} = \pm 20V, I _D =30A	UL 2743	Tested with in appliance

TABLE: List of critical components					
Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition/ year)	Mark(s) of conformity ¹⁾
MCU (U4)	GigaDevice	GD32F130C8T6	2.0V-3.6V	UL 2743	Tested with in appliance
Lithium- Polymer rechargeable battery	Shenzhen Grepow Battery Co., Ltd.	GRP9842126- 30C	3.7Vdc, 5000mAh,	UL 1642	UL1642 Test Report No. DSP22110213
PCB	GOLDENMAX INTERNATION AL TECHNOLOGY (ZHUHAI) LTD	ILM-R1	V-0 or better, min.130°C	UL 94 UL796	UL E330731
Alternative	Interchangeable	Interchangeable	V-0 or better, min.130°C	UL 94 UL796	UL Approved
Plastic Enclosure	FORMOSA CHEMICALS & FIBRE CORP PLASTICS DIV	AC3600, AC361(x)	PC, V-0, 130°C, min. thickness: 1.5mm	UL 94 UL 746C	UL E162823
- (Alternative)	Interchange able	Interchange able	PC, V-0, 130°C, min. thickness: 1.5mm	UL 94 UL 746C	UL approved
Wire	Interchange able	Interchange able	Min. 6AWG for Charge and discharge wire, Min 200°C,min. 22AWG for other internal wires, Min 105°C, Min. 300V	UL 758	UL approved
Type-C Wire	Dongguan Yaofeng Wire & Cable Co., Ltd.	2725	30V, 80 °C, VW- 1	UL 758	UL E495753

Attachment 1

Photo Documentation



Figure 1 Front view



Figure 2 Side view



Figure 3 Front view



Figure 4 Back view



Figure 5 Jump starter terminal and USB terminals view



Figure 6 Air pump terminal view

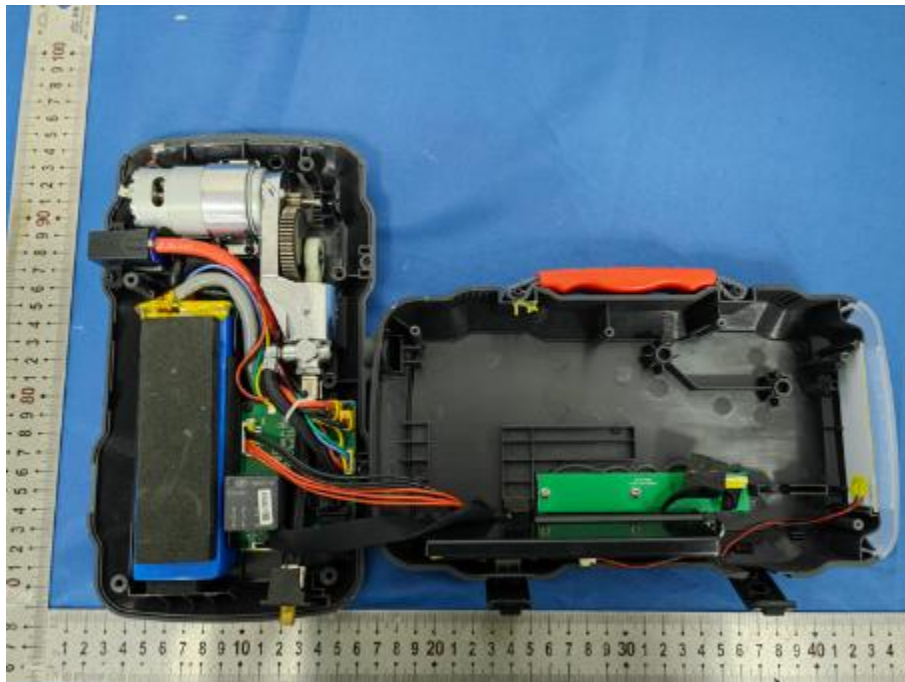


Figure 7 Inside view of EUT

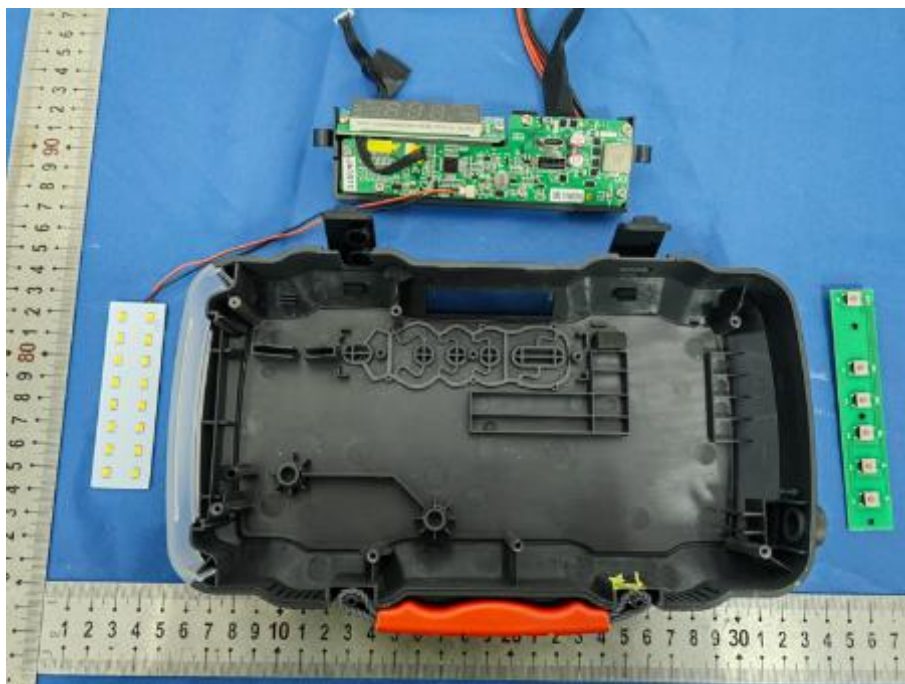


Figure 8 Inside view of EUT

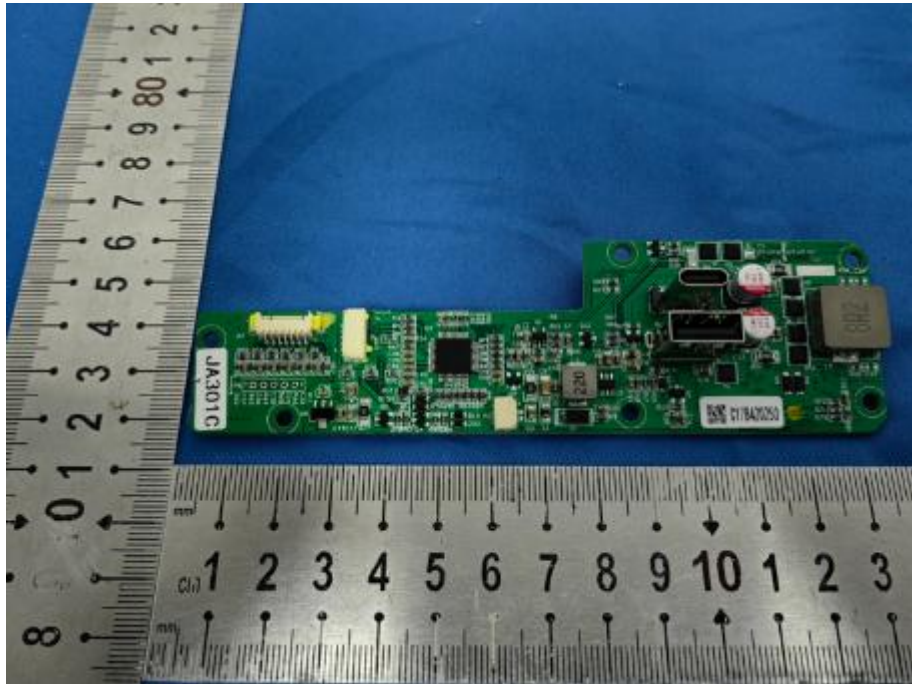


Figure 9 DC Board view of EUT

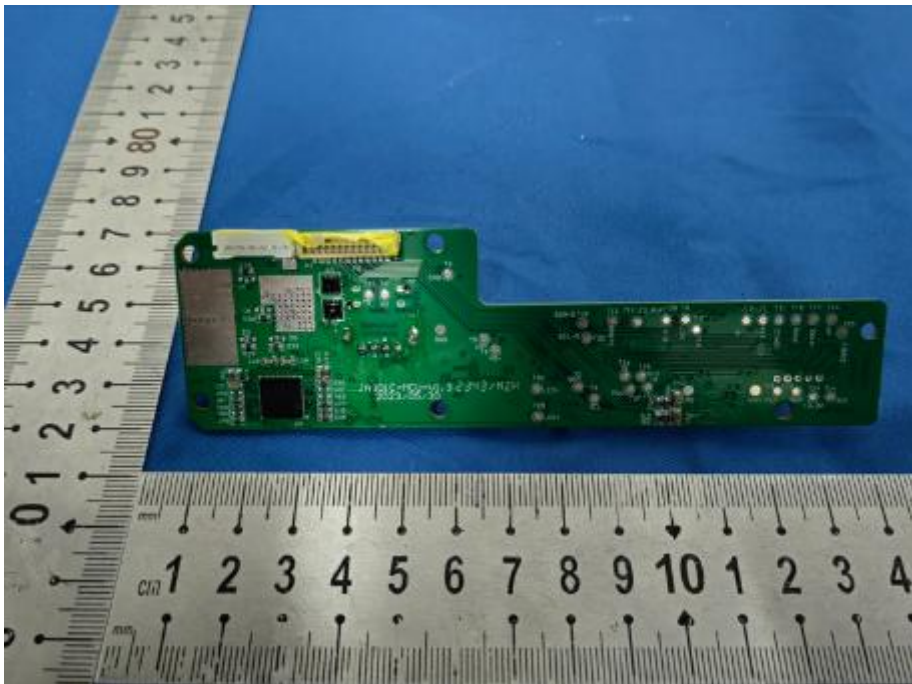


Figure 10 DC Board view of EUT

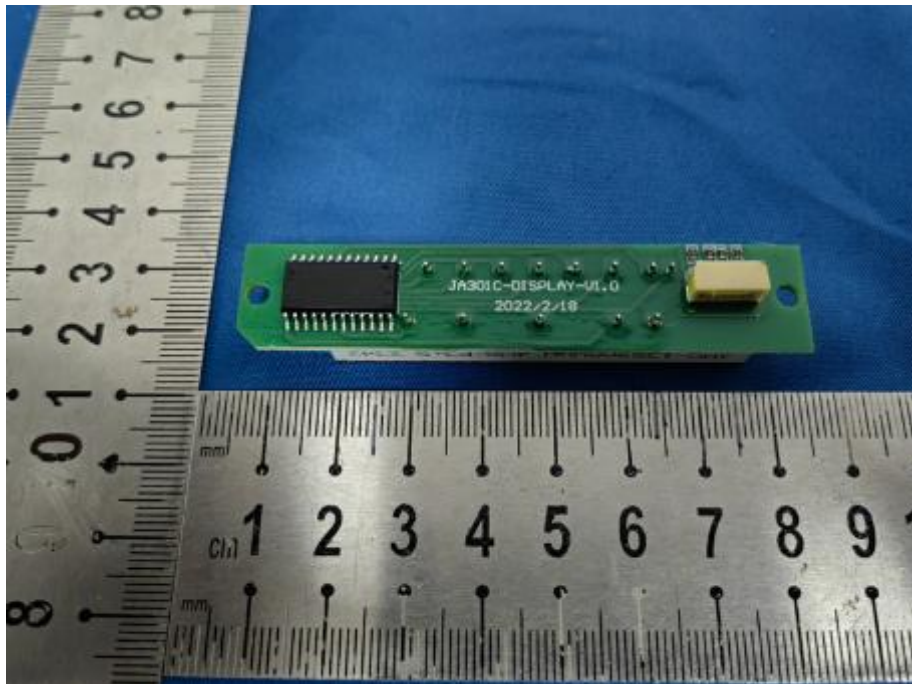


Figure 11 Display board view of EUT

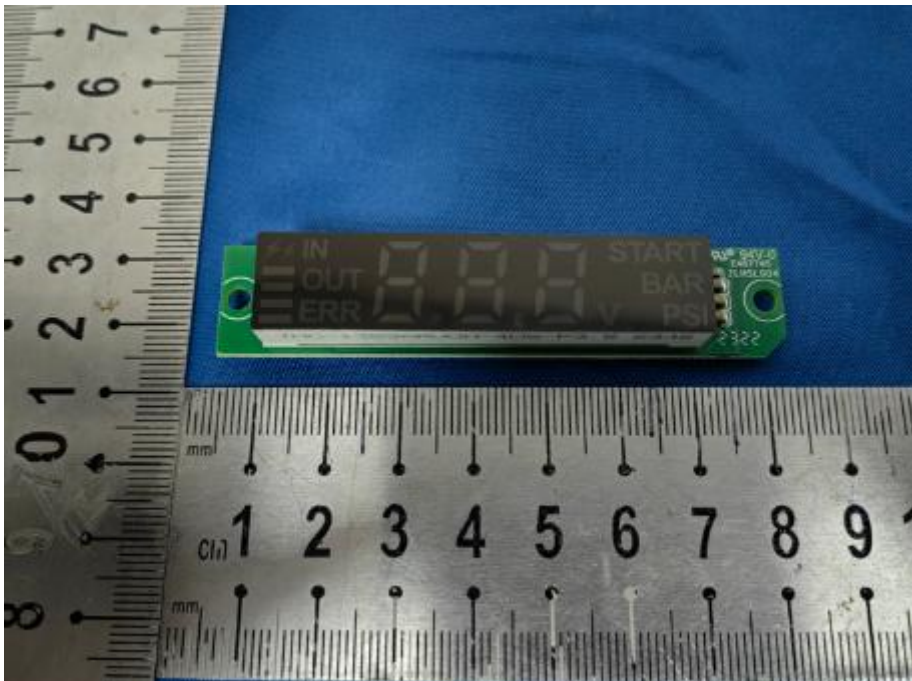


Figure 12 Display board view of EUT

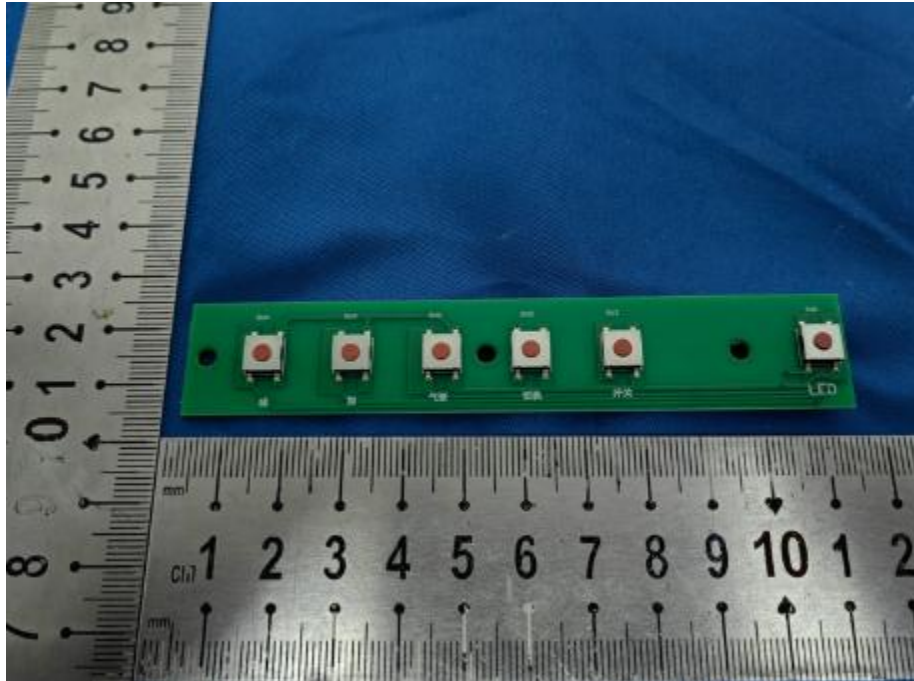


Figure 13 Front view of switch board

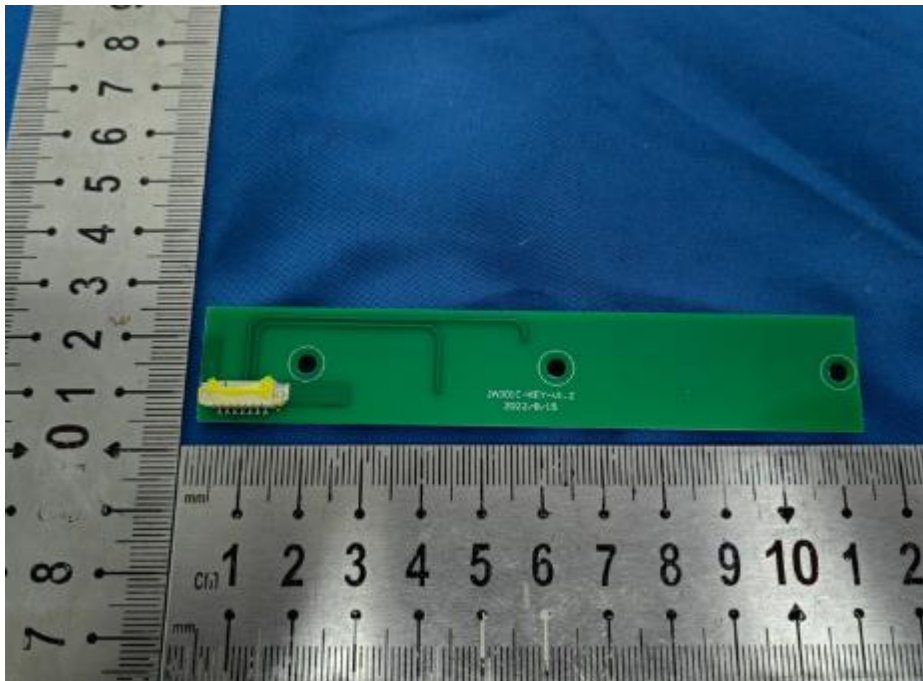


Figure 14 Back view of switch board

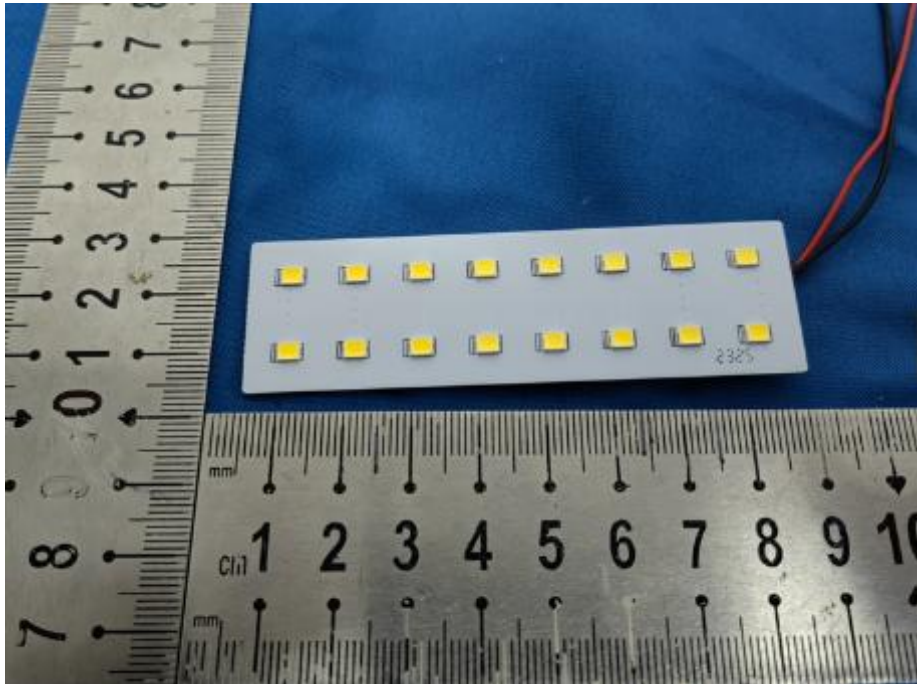


Figure 15 Front view of LED board



Figure 16 Back view of LED board



Figure 17 Inside view

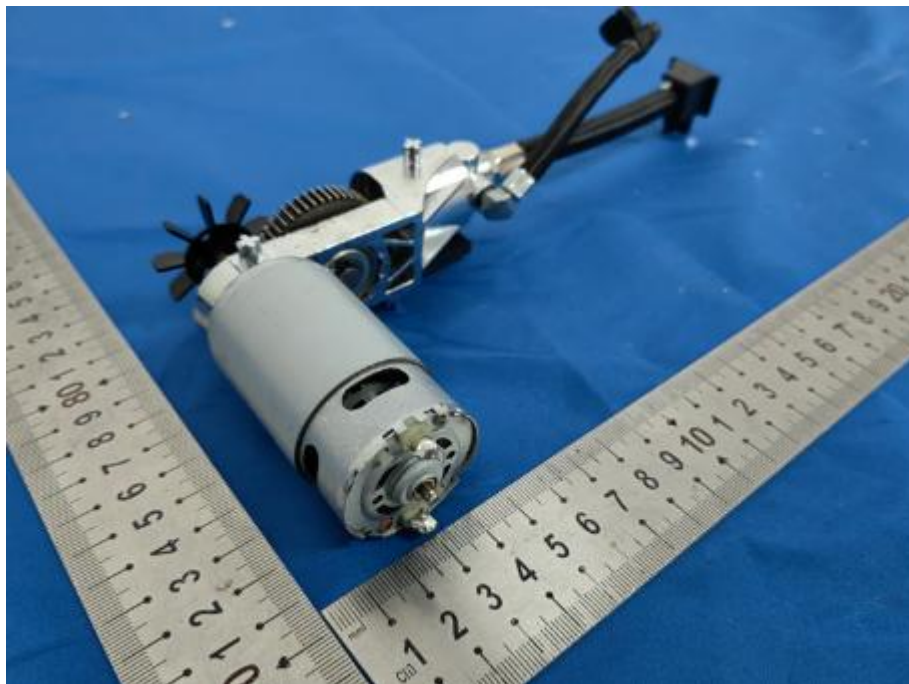


Figure 18 Air pump view 1

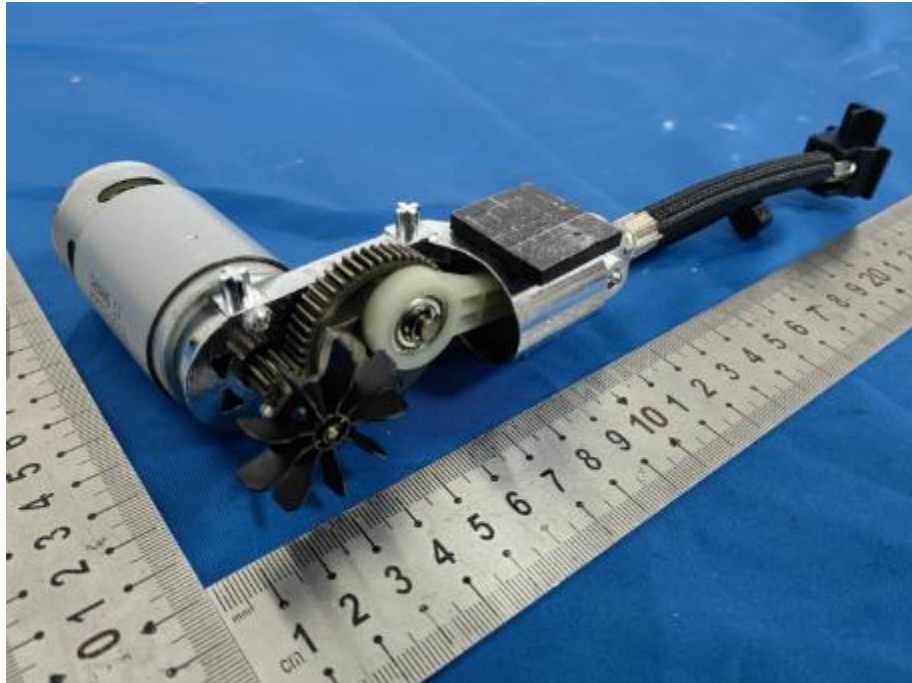


Figure 19 Air pump view 2

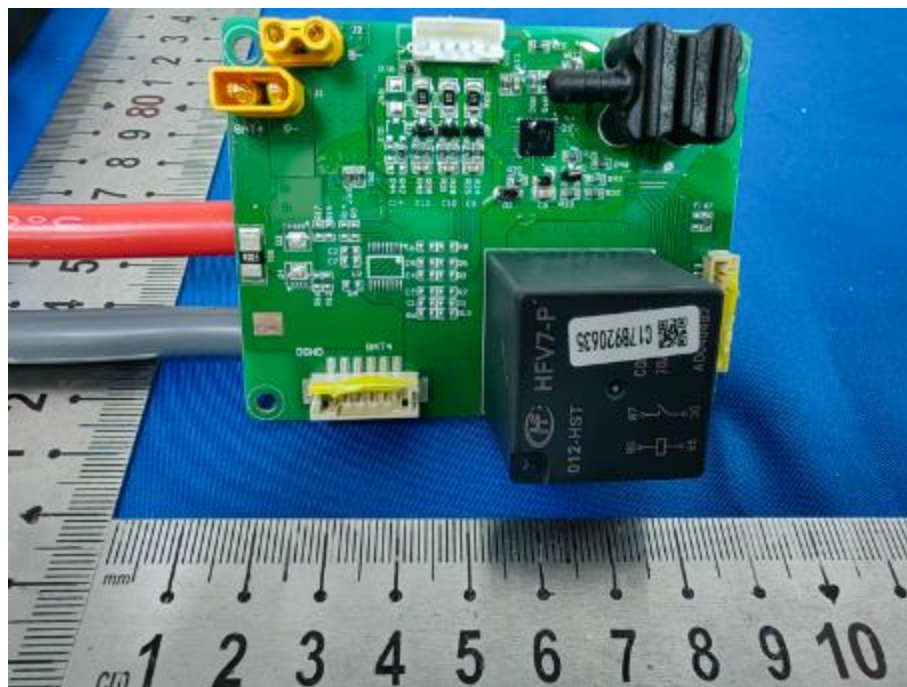


Figure 20 Front view of Jump Starter board

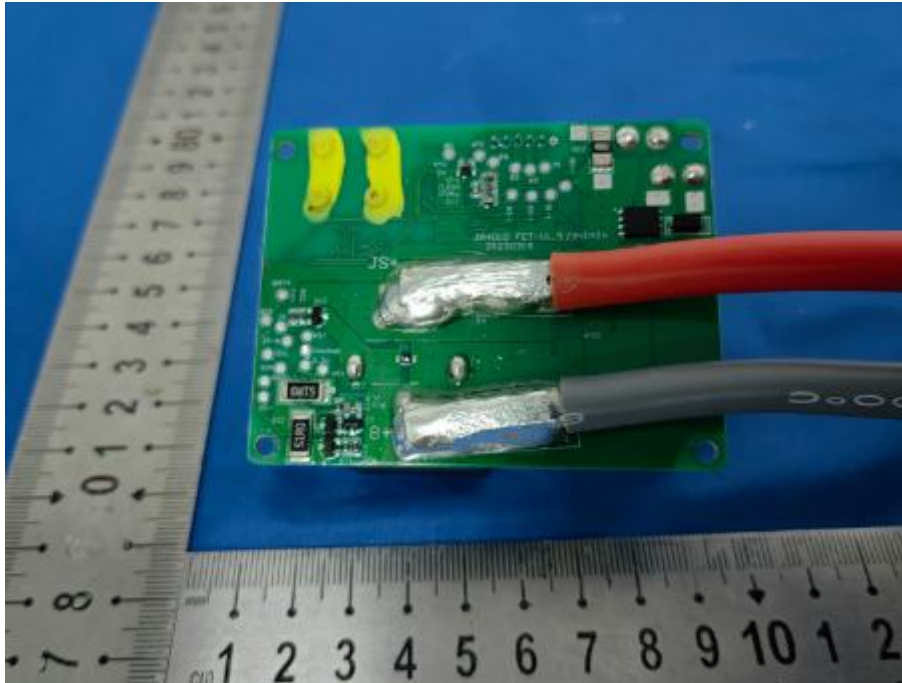


Figure 21 Back view of Jump Starter board

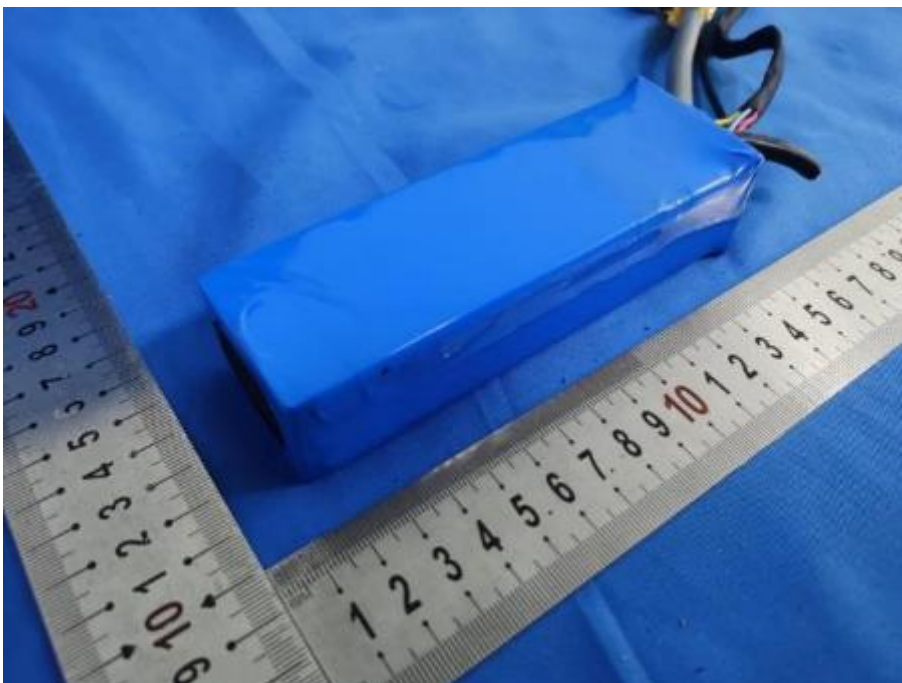


Figure 22 battery pack view 1



Figure 23 battery pack view 2

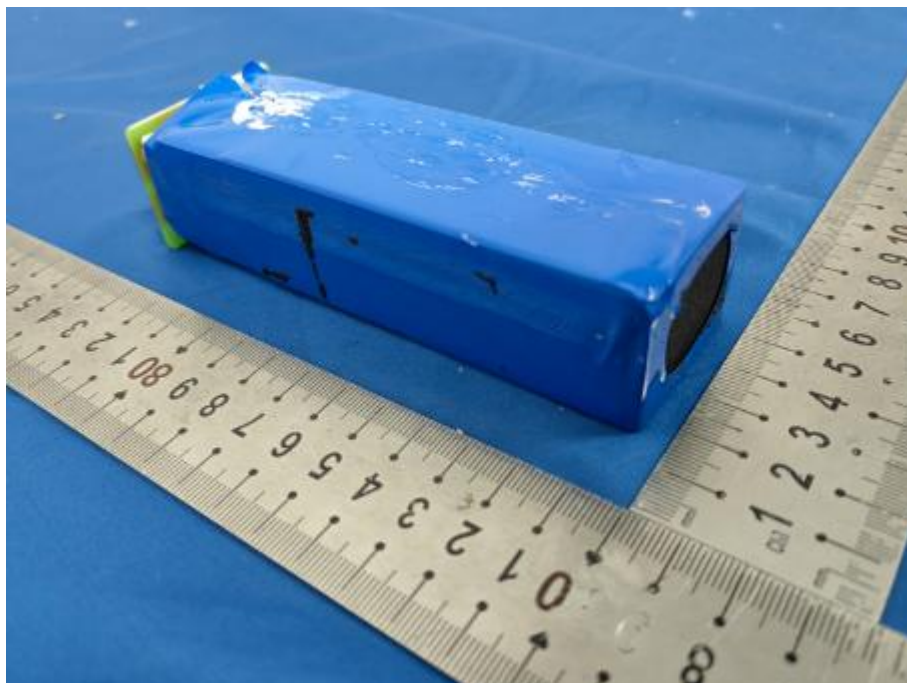


Figure 24 Open view of battery pack

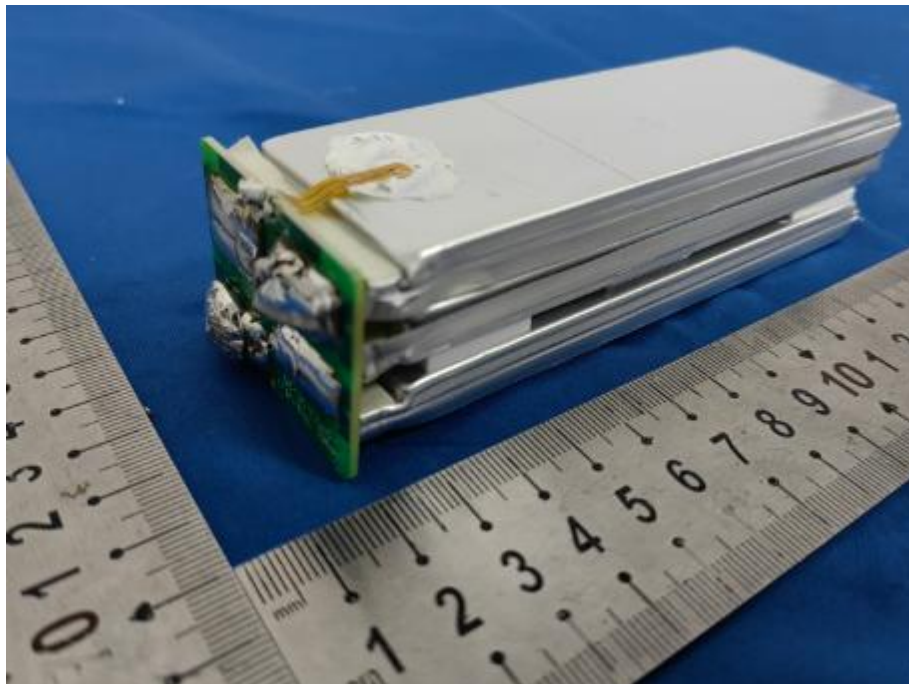


Figure 25 Side view of battery pack

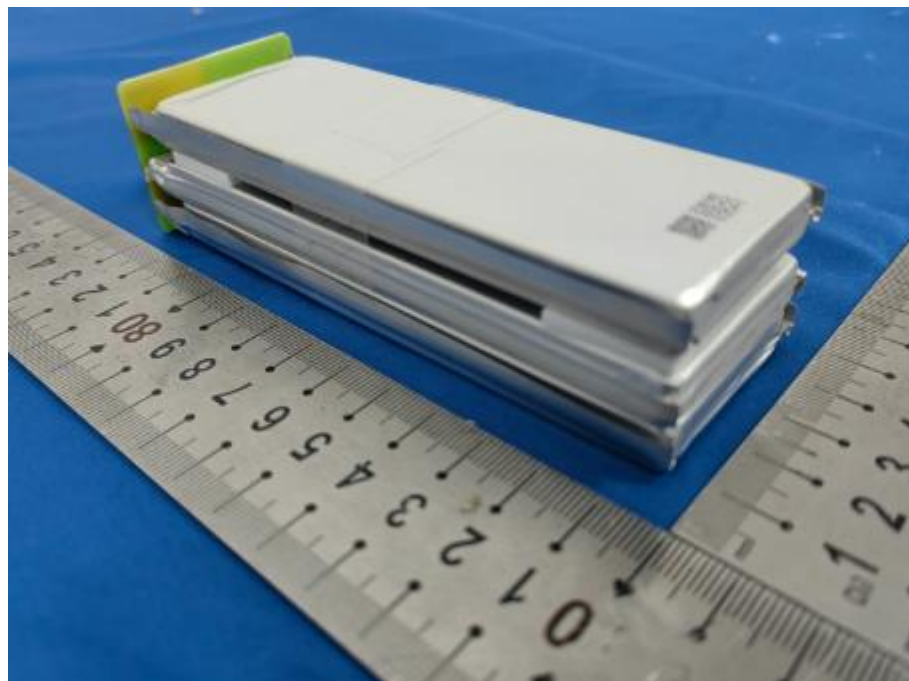


Figure 26 Front view of battery pack



Figure 27 Front view of cell

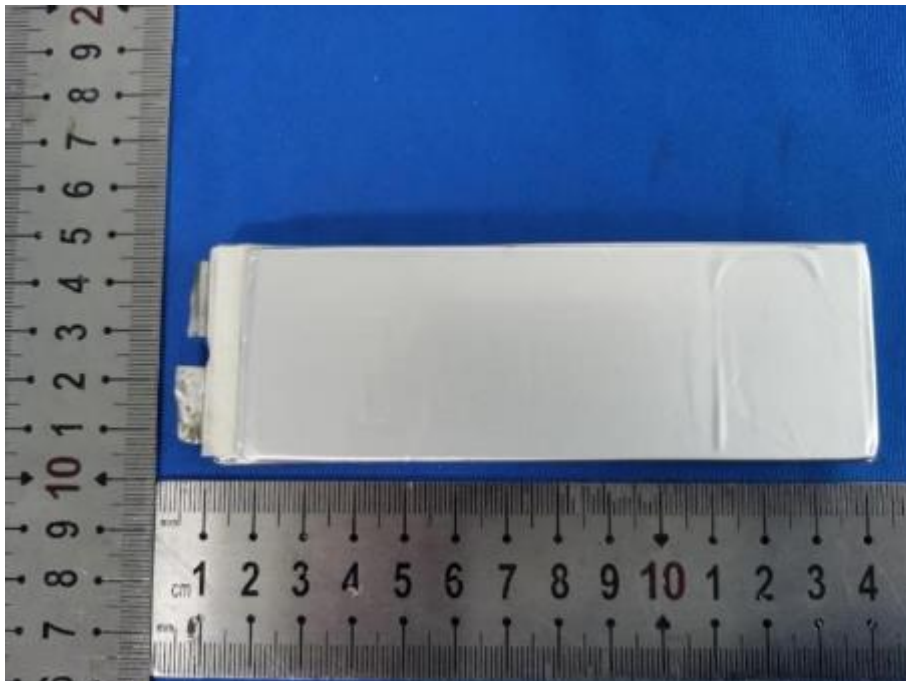


Figure 28 Back view of cell