



Test Report issued under the responsibility of:

TEST REPORT

UL 62841-1

Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery - Safety - Part 1: General Requirements

UL 62841-2-2

Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery-Part 2-2: Hand-Held Screwdrivers and Impact

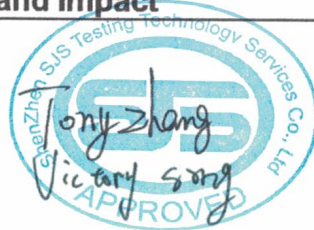
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Testing Laboratory.....: **ShenZhen SJS Testing Technology Services Co., Ltd**

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Applicant's name.....: **Qidong Shili Electromechanical Co., Ltd.**

Address.....: No. 1 Industrial Park, Lusigang Town, Qidong City, Jiangsu Province

Manufacturer's name.....: **Qidong Shili Electromechanical Co., Ltd.**

Address.....: No. 1 Industrial Park, Lusigang Town, Qidong City, Jiangsu Province

Test specification:

Standard.....: UL 62841-1, UL 62841-2-2

Test procedure.....: UL 62841-1, UL 62841-2-2

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

Test Report Form No.....: TR_UL62841-1, UL 62841-2-2

Non-standard test method.....: UL

Test Report Form(s) Originator.....: Dated 2017-04

Test item

Description.....: electric screw driver

Trade Mark.....: N/A

Model/Type reference.....: LSD005, LSD001, LSD002, LSD003, LSD004, LSD006, LSD007, LSD008

Model differences.....: All models are identical except for model No and enclosure Colour . After comparison, tests carried out on model LSD005 were considered

Ratings.....: 5V $\overline{=}$, 1A



Test item particulars	: Electric screwdriver
Classification of installation and use	: Portable appliance, Class III appliance
Supply Connection	: DC connector
Possible test case verdicts:	
- test case does not apply to the test object.....	: N/A
- test object does meet the requirement.....	: P (Pass)
- test object does not meet the requirement.....	: F (Fail)
Testing	
Date of receipt of test item.....	: 2022-09-09
Date (s) of performance of tests.....	: 2022-09-09 to 2022-09-21
General remarks:	
The test results presented in this report relate only to the object tested.	
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.	
"(see Enclosure #)" refers to additional information appended to the report.	
"(see appended table)" refers to a table appended to the report.	
Throughout this report a comma (point) is used as the decimal separator.	
Copy of Marking plate (<i>marking will be the one finally provided on product for selling</i>)	
electric screw driver Model: LSD005 Rating: 5V $\equiv$, 1A Qidong Shili Electromechanical Co., Ltd. No. 1 Industrial Park, Lusigang Town, Qidong City, Jiangsu Province DD/MM/YYYY S/N: Made in China	
Remarks	
<i>The use of certification marks on a product must be authorized by the respective certification bodies that own these marks.</i>	

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
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7	Classification		--
7.1	Tools shall be of one of the following classes with respect to protection against electric shock: class I, class II, class III.	Class III	P
7.2	Tools shall have the appropriate degree of protection against harmful ingress of water according to IEC 60529:2013. If a degree other than IPX0 is required this shall be specified in the relevant part of IEC 62841 -2, IEC 62841-3 or IEC 62841-4..	IPX0	P
8	MARKING AND INSTRUCTIONS		--
8.1	Tool also marked with the following:		--
	– rated voltage(s) or rated voltage range(s), in volts. Tools for star-delta connection shall be clearly marked with the two rated voltages (for example 230 Δ/ 400 Y);	5Vdc	P
	– symbol for nature of supply, unless the rated frequency is marked. The symbol for nature of supply shall be placed next to the marking for rated voltage;	===	P
	– rated input, in watts or rated current, in amperes. The rated input or current to be marked on the tool is the total maximum input or current that can be on circuit at the same time. If a tool has alternative components which can be selected by a control device, the rated input or rated current is that corresponding to the highest loading possible;	1A	P
	– name or trade mark or identification mark and address of the manufacturer or any other agent responsible for placing the tool on the market;	Qidong Shili Electromechanical Co., Ltd.	P
	– model or type reference;	LSD005, LSD001, LSD002, LSD003, LSD004, LSD006, LSD007, LSD008	P
	– symbol for class II construction, for class II tools only;		N/A
	– IP number according to degree of protection against ingress of water other than IPX0. If the first numeral for the IP numbering is omitted, the omitted numeral shall be replaced by the letter X, for example IPX5;	IPX0	N/A
	– “WARNING – To reduce the risk of injury, user must read instruction manual” or the sign M002 of ISO 7010 ⁸ .		P
8.1.1	Tools having a range of rated values such as for voltage and frequency and which can be operated without adjustment throughout the range shall be marked with the lower and upper limits of the range separated by a hyphen.		P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
8.1.2	For tools marked with more than one RATED VOLTAGE , a RATED VOLTAGE RANGE or with more than one RATED VOLTAGE RANGE , the RATED INPUT for each of these voltages shall be marked.		P
	The upper and lower limits of the rated power input shall be marked on the tool so that the relation between input and voltage appears distinctly, unless the difference between the upper and lower limits of a RATED VOLTAGE RANGE does not exceed 20 % of the mean value of the range, in which case the marking for RATED INPUT may be related to the mean value of the range.		P
8.2	Tools shall be marked with a safety warning in one of the following versions: – "⚠WARNING – To reduce the risk of injury, user must read instruction manual", or – symbol M002 of ISO 7010, or – the appropriate symbol stated in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.		P
	If used, the word "WARNING" shall be in capital letters not less than 2,4 mm high and shall not be separated from either the cautionary statement or the symbol ISO 7000-0434A or ISO 7000-0434B (2004-01).		P
	If used, the statement shall be verbatim except the term "operator's manual" or "user guide" may be used for the term "instruction manual".		P
	If additional symbols are used, they shall be in accordance with ISO 7010 or be designed in accordance with ISO 3864-2 or ISO 3864-3.		P
	Cautionary statements having the same signal word such as "⚠WARNING" may be combined into one paragraph under one signal word. The order of statements shall be markings required by IEC 62841 -1, markings required by the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841 - 4 and then any optional markings. Compliance is checked by inspection and by measurement.		P
	For tools sold in Canada, instruction manuals and safety instructions / warnings marked on the product shall be written in both English and French. For tools sold in the United States of America, instruction manuals and safety instructions/warnings marked on the product shall be written in English.		N/A
8.3	Tools shall be marked with additional information as follows:(voltage, frequency, etc.) shall be – the business name and address of the	5Vdc	P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	manufacturer and, where applicable, his authorised representative. Any address shall be sufficient to ensure contact. Country or state, city and postal code (if any) are deemed sufficient for this purpose; – designation of the tool, designation of the tool may be achieved by a code that is any combination of letters, numbers or symbols, providing that this code is explained by giving the explicit designation such as "drill", "planer" etc. in the instructions supplied with the tool; – designation of series or type,		
8.4	Markings specified in 8.1 to 8.3 shall not be on a DETACHABLE PART of the tool. Markings specified in 8.2 and 8.3 shall be clearly discernible from the outside of the tool. For markings other than symbols, this may be achieved by the use of a fold-over label on power cords of tools with TYPE Y ATTACHMENT or TYPE Z ATTACHMENT . Other markings on the tool may be visible after removal of a cover, if necessary. Indications for switches and controls shall be placed on or in the vicinity of these components; they shall not be placed on parts which can be repositioned, or positioned in such a way that the marking is misleading. Compliance is checked by inspection.		P
8.5	If the tool can be adjusted to suit different RATED VOLTAGES , the voltage to which the tool is adjusted shall be clearly discernible. This requirement does not apply to tools for star-delta connection. For tools where frequent changes in voltage setting are not required, this requirement is considered to be met if the RATED VOLTAGE to which the tool is adjusted can be determined from a wiring diagram fixed to the tool. The wiring diagram may be on the inside of a cover which has to be removed to connect the supply conductors. It shall not be on a label loosely attached to the tool. Compliance is checked by inspection.		P
8.6	If units or technical data are expressed by symbols, the following symbols shall be used:		P
8.7	Tools to be connected to more than two supply conductors shall be provided with a connection diagram, Fixed to the tool, unless the correct mode of connection is obvious. The correct mode of connection is deemed to be obvious if the terminals for the supply conductors are indicated by arrows pointing towards the terminals. The earthing conductor is not a supply conductor. For		P

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	tools for star-delta connection, the wiring diagram should show how the windings are to be connected. Compliance is checked by inspection.		
8.8	Except for type Z attachments, terminals shall be indicated as follows: – Terminals intended exclusively for the neutral conductor shall be indicated by the letter N. – Earthing terminals shall be indicated by the symbol These indications shall not be placed on screws, removable washers or other parts which might be removed when conductors are being connected. Compliance is checked by inspection.		N/A
8.9	Switches which may give rise to a hazard when operated shall be marked or so placed as to indicate clearly which part of the tool they control. Compliance is checked by inspection.		N/A
8.10	For tools which might cause danger when started unexpectedly, the "off" position of the mains switch shall be indicated, unless this position is obvious; the indication, if required, shall be the figure O, as given by symbol IEC 60417-5008 (DB:2002-10). The figure O shall not be used for any other indication. The position of the moving contacts of the mains switch shall correspond to the indications for the different positions of its operating means.		N/A
8.11	Regulating devices and the like, intended to be adjusted during operation, shall be provided with an indication for the direction of adjustment to increase or to decrease the value of the characteristic being adjusted. An indication of + and - is considered to be sufficient. The requirement does not apply to regulating devices provided with an adjusting means, if its fully "on" position is opposite to its "off" position.If Figures are used for indicating the different positions, the "off" position shall be indicated by the figure O and the other position shall be indicated by figures reflecting the greater output, input, speed, etc.The indication for the different positions of the operating means of a control device need not to be placed on the device itself. Compliance is checked by inspection.		N/A
8.12	Markings required by the standard shall be legible and durable. Signs shall be in contrast such as colour, texture, or relief, to their background such that the information or instructions provided by the signs are clearly legible when viewed with normal vision from a distance of (500 + 50) mm. Signs need not be in accordance with the blue colour requirements of ISO 3864-2. Compliance is checked by		P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.		
8.13	If compliance with this standard depends upon the operation of a replaceable THERMAL LINK or fuse-link, the reference number or other means for identifying the link shall be marked on the link, or in a place that it is clearly visible after the link has failed, when the tool has been dismantled to the extent necessary for replacing the link. This requirement does not apply to links which can only be replaced together with a part of the tool. Compliance is checked by inspection.		P
8.14	An instruction manual and safety instructions shall be provided with the tool and packaged in such a way that is noticed by the user when the tool is removed from the packaging. An explanation of the symbols required by this standard and used on the tool shall be provided in either the instruction manual or the safety instructions. They shall be written in the official language(s) of the country in which the tool is sold.		P
9	Protection against access to live parts	Class III	N/A
9.1	Tools shall be so constructed and enclosed that there is adequate protection against accidental contact with LIVE PARTS . The requirement applies for all positions of the tool, even after removal of DETACHABLE PARTS and soft materials (elastomers), such as soft grip coverings. Compliance is checked by inspection, and by the tests of 9.2 to 9.4, as applicable.		N/A
9.2	An ACCESSIBLE PART is not considered to be live if: – the part is supplied with SAFETY EXTRA - LOW VOLTAGE or – the part is separated from LIVE PARTS by PROTECTIVE IMPEDANCE . In the case of PROTECTIVE IMPEDANCE , the current between the part and the supply source shall not exceed 2 mA for d.c., and its peak value shall not exceed 0,7 mA for a.c., and moreover: – for voltages having a peak value over 42,4 V up to and including 450 V, the capacitance shall not exceed 0,1 µF; – for voltages having a peak value over 450 V up to and including 15 kV, the discharge shall not exceed 45 µC. Compliance is checked by operating the tool at		N/A

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	RATED VOLTAGE . Voltages and currents are measured between the relevant parts and each pole of the supply source. Discharges are measured immediately after the interruption of the supply. The quantity of electricity in the discharge is measured using a resistor having a nominal noninductive resistance of 2 000 Ω. The quantity of electricity is calculated from the sum of all areas recorded on the voltage/time graph without taking voltage polarity into account.		
9.3	Lamps located behind a detachable cover are not removed, provided the tool can be isolated from the supply by means of a plug or an ALL - POLE DISCONNECTION . However, during insertion or removal of lamps which are located behind a detachable cover, protection against contact with LIVE PARTS of the lamp cap shall be ensured. This excludes the use of screw type fuses and screw-type miniature circuit breakers which are accessible without the aid of a tool. Test probe B of IEC 61032:1997 is applied with a force not exceeding 5 N, the tool being in every possible position except that tools normally used on the floor and having a mass exceeding 40 kg are not tilted. Through openings, the test probe is applied to any depth that the probe will permit, and it is rotated or angled before, during, and after insertion to any position. If the opening does not allow the entry of the probe, a rigid test probe with the dimensions of the test probe B of IEC 61032:1997, but without any articulation, is used, the force on the probe is increased to 20 N and the test with the articulated test probe B of IEC 61032:1997 repeated. It shall not be possible to touch with the test probe LIVE PARTS or LIVE PARTS protected only by lacquer, enamel, ordinary paper, cotton, oxide film, beads or sealing compound.		N/A
9.4	Test probe 1 3 of IEC 61032:1997 is applied with a force not exceeding 5 N through openings in CLASS II TOOLS and CLASS II CONSTRUCTIONS , except for those giving access to lamp caps and LIVE PARTS in socket-outlets. The test probe is also applied through openings in earthed metal enclosures having a nonconductive coating such as enamel or lacquer. It shall not be possible to touch LIVE PARTS with the test probe.		N/A
9.5	CLASS II TOOLS and CLASS II CONSTRUCTIONS shall be so constructed and enclosed that there is adequate protection against accidental contact with BASIC		N/A



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	INSULATION , and metal parts separated from LIVE PARTS by BASIC INSULATION only. Parts which are not separated from LIVE PARTS by DOUBLE INSULATION or REINFORCED INSULATION shall not be accessible. This requirement applies for all positions of the tool, even after removal of DETACHABLE PARTS . Compliance is checked by inspection and by applying the test probe B of IEC 61032:1997, as described in 9.3.		
10	Starting		P
10.1	Tools shall start under all normal voltage conditions which may occur in use. Compliance is checked by starting the tool 10 times at no-load in succession at a voltage equal to 0,85 times the lowest RATED VOLTAGE or 0,85 times the lower limit of the RATED VOLTAGE RANGE , CONTROL DEVICES other than speed controls, if any, being set as in NORMAL USE . Tools shall in addition be started 10 times in succession at a voltage equal to 1,1 times RATED VOLTAGE . The interval between consecutive starts is made sufficiently long enough to prevent undue heating. In all cases, the tool shall operate and overload protection devices incorporated in the tool shall not activate. Centrifugal and other automatic starting switches, if any, shall operate reliably, and without contact chattering. 10.2 Tools shall not draw excessive input current during starting that could lead to nuisance operation of facility mains over-current protection devices. Compliance is checked by starting the tool once at RATED VOLTAGE and no-load with any speed controls set for maximum speed and all other CONTROL DEVICES set as in NORMAL USE . The current drawn by the tool at $(2,0 \pm 0,2)$ s after starting shall not exceed the greater of 30 A or 4 times the RATED CURRENT of the tool.		P
11	Input and current		P
	The RATED INPUT or RATED CURRENT shall be at least 110 % of the measured no-load input or current. Compliance is checked by measuring the power input or current of the tool when stabilized while all circuits which can operate simultaneously are in operation. The test shall be conducted without ACCESSORIES attached or external load. For tools marked with one or more RATED VOLTAGES , the test is		P

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	made at each of the RATED VOLTAGES . For tools marked with one or more RATED VOLTAGE RANGES , the test is made at both the upper and lower limits of the ranges, unless the marking of the RATED INPUT is related to the mean value of the relevant voltage range, in which case the test is made at a voltage equal to the mean value of that range.		
12	Heating		P
12.1	Tools shall not attain excessive temperatures with RATED INPUT or RATED CURRENT . Compliance is checked by determining the temperature rise of the various parts under the conditions specified in 12.2 to 12.5. Then the test of Clause C.3 at 1,06 times the RATED VOLTAGE is made under heated conditions.		P
12.2	For tools with one or more RATED VOLTAGES : The tool is operated at each RATED VOLTAGE , under the load conditions specified in 12.2.1, the torque being applied is measured. While maintaining the previously measured torque, the voltage is then adjusted to 0,94 times the RATED VOLTAGE and 1,06 times the RATED VOLTAGE . The temperatures are measured at the most unfavourable of the two voltage settings. The temperatures that are measured by means of thermocouples are taken while the tool is operating. For tools with a RATED VOLTAGE RANGE : The tool is operated – at the lower limit of the RATED VOLTAGE RANGE , under the load conditions specified in 12.2.1, the torque being applied is measured. While maintaining the previously measured torque, the voltage is then adjusted to 0,94 times the lower limit of the RATED VOLTAGE RANGE ; and – at the upper limit of the RATED VOLTAGE RANGE , under the load conditions specified in 12.2.1, the torque being applied is measured. While maintaining the previously measured torque, the voltage is then adjusted to 1,06 times the upper limit of the RATED VOLTAGE RANGE . The temperatures are measured at the most unfavourable of the two voltage settings. The temperatures that are measured by means of thermocouples are taken while the tool is operating.		P
12.3	This subclause provides specific test conditions for heating elements and cord storage devices.		P
12.4	Temperature rises, other than those of windings, are determined by means of fine-wire thermocouples so chosen and positioned that they have the minimum effect on the temperature of the part under test.		P

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	The temperature rise of electrical insulation, other than that of windings, is determined on the surface of insulation, at places where failure could cause a short circuit, contact between LIVE PARTS and ACCESSIBLE PARTS , bridging of insulation, or reduction of CREEPAGE DISTANCES or CLEARANCES below the values specified in 28.1. Temperature rises of windings are determined by the resistance method, unless the windings are non-uniform, or the method involves severe complications to make the necessary connections for the resistance measurement. In that case, the measurement is made by thermocouples. In determining the temperature rises of handles, knobs, grips and the like, consideration is given to all parts which are gripped in NORMAL USE , and, if of insulating material, to those parts in contact with hot metal.		
12.5	During the test, PROTECTIVE DEVICES shall not operate and sealing compound, if any, shall not flow out. The temperature rises shall not exceed the values shown in Tables 1a and 1b, except as allowed by 12.6.		P
12.6	The following tests shall be conducted when the temperature rises of the armature and/or field windings exceed the values in Table 1 or when there is doubt with regards to the temperature classification of the insulation system. Three samples of the armature and/or field are subjected to the following tests. a) Windings are kept for 10 days (240 h) in a heating cabinet, the temperature of which is $(80 \pm 2) ^\circ\text{C}$ in excess of the temperature rise of the windings determined according to 12.4. Then the samples shall be gradually cooled to ambient temperature without introducing thermal shock. b) After this treatment, no interturn short circuit shall occur. c) The samples are then subjected to a humidity treatment as specified in 14.1. d) Immediately after this treatment, they shall withstand the tests of Annex D.		P
13	Resistance to heat and fire		P
13.1	The following parts shall be sufficiently resistant to distortion due to heat, if this could cause the tool to fail to comply with this standard: – parts of thermoplastic material provided as an enclosure to comply with Clause 9; – parts of thermoplastic material supporting current carrying parts; – parts of thermoplastic material providing		P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	SUPPLEMENTARY INSULATION or REINFORCED INSULATION . For the purpose of 13.1, "supporting" means that the retention of the current carrying part by the insulating material is relied upon to fulfil 28.1. Contact alone does not constitute support. This requirement does not apply to: – insulation and sheath of flexible SUPPLY CORDS or internal wiring; – cord guards; – ceramic materials; – insulating parts of motors: e.g. shaft insulation, end spiders, slot liners, wedges, commutators.		
	Compliance is checked by subjecting the relevant part of thermoplastic material to the ball pressure test of IEC 60695-10-2:2003. Any soft materials (elastomers), such as soft grip coverings, shall be removed. The required thickness may be obtained by using two or more sections of the part. The test is carried out at a temperature of $(40 \pm 2) ^\circ\text{C}$ plus the maximum temperature rise determined during the test of Clause 12, but it shall be at least – $(75 \pm 2) ^\circ\text{C}$, for parts provided as an enclosure to comply with Clause 9 and for parts providing SUPPLEMENTARY INSULATION or REINFORCED INSULATION ; – $(125 \pm 2) ^\circ\text{C}$, for parts supporting current carrying parts.		P
13.2	Parts of non-metallic material shall be adequately resistant to ignition and to spread of fire. This requirement does not apply to – internal parts that are more than 1,3 mm from an arcing part such as a commutator, unenclosed switch contacts, and the like; – internal parts that are more than 1,0 mm from a non-arcing uninsulated LIVE PART , such as a bus bar, a connecting strap, a terminal, enamelled wire, and the like; – internal parts that are 1,0 mm or less from connections or conductors carrying 0,2 A or less during NORMAL OPERATION or from a low power-circuit as described in Annex H; – the insulation of wires; – gears, cams, belts, bearings, fans, decorative trims, knobs which would contribute negligible fuel to fire;		P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	– ceramic materials; – insulating parts of motors: e.g. shaft insulation, end spiders, slot liners, wedges, commutators; – small parts, the plastic content of which is less than 5 g; – other external parts not likely to be ignited or to propagate flames originating from inside the tool. Compliance is checked by one of the following: – subjecting parts of non-metallic material, or representative specimens no thicker than the relevant parts, to the glow-wire test of IEC 60695-2-11:2000, which is carried out at 550 °C; – the material is classified at least HB according to IEC 60695-11-10:2013 provided that the test sample was no thicker than the relevant part; – the material has a glow wire ignition temperature of at least 575 °C according to IEC 60695-2-13:2010 provided that the test sample was no thicker than the relevant part. Parts for which the above cannot be carried out, such as those made of soft foam material, shall meet the requirements specified in ISO 9772:2012 for category HBF material, the test sample being no thicker than the relevant part.		
14	Moisture resistance		N/A
14.1	Tools shall be proof against humid conditions which may occur. Compliance is checked by the following humidity test. Cable entries, if any, are left open; if knock-outs are provided, one of them is opened. Electrical components, covers, and other parts which can be removed without the aid of a tool are removed and subjected, if necessary, to the humidity test with the main part. The humidity treatment is carried out in a humidity cabinet containing air with a relative humidity of (93±3) %, obtained e.g. by placing in the humidity cabinet a saturated solution of Na₂SO₄ or KNO₃ in water, having a sufficiently large contact surface with the air. The temperature of the air, at all places where samples can be located, is maintained within 2 K of any convenient value t between 20 °C and 30 °C. In order to achieve the specified conditions within the cabinet, it is necessary to ensure constant circulation of the air within and, in general, to use a cabinet which is thermally insulated. Before being placed in the humidity cabinet, the sample is brought to a temperature between t and (t +4)°C. The tool is considered		N/A



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	to be brought to the specified temperature by keeping it at this temperature for at least 4 h before the humidity treatment. The tool is kept in the cabinet for 48 h. Immediately after this test, the tool shall withstand the tests of Clause C.2 at RATED VOLTAGE . Then the tool shall withstand the test of Annex D in the humidity cabinet, or in the room in which the tool was brought to the prescribed temperature after reassembly of those parts which may have been removed. In addition a test of Clause D.2 is applied between accessible metal parts and the SUPPLY CORD which is wrapped with metal foil where it is located in an inlet bushing, a cord guard or a cord anchorage, any clamping screws being tightened to the torque specified in Table 11. The test voltage is 1 250 V for CLASS I TOOLS and 1 750 V for CLASS II TOOLS		
14.2	The enclosure of the tool shall provide the degree of protection against moisture in accordance with the classification of the tool.		N/A
14.3	LIQUID SYSTEMS or spillage of liquid shall not subject the user to an increased risk of electrical shock. Compliance is checked by the following test: The RESIDUAL CURRENT DEVICE , if any, shall be disabled during the test. Electrical components, covers and other parts which can be removed without the aid of a tool are removed, except those fulfilling the test of 21.22. The tool is prepared with approximately 1,0 % NaCl solution in the following modes if applicable: – as described in 8.14.2; – the liquid container of the tool is completely filled, and a further quantity, equal to 15 % of the capacity of the container, or 0,25 l, whichever is the greater, is poured in steadily over a period of 60±10 s, while the tool is resting in its filling position according to 8.14.2 d); – a detachable liquid container is filled completely and mounted and dismounted 10 times on the tool. In each applicable preparation, the tool is operated at RATED VOLTAGE in each position consistent with the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 and the instructions according to 8.14.2 b) for 1 min while monitoring the leakage current as in Clause C.3. During the test the leakage current shall not exceed: – 2 mA for a CLASS II TOOL ; – 5 mA for a CLASS I TOOL . Following this test, the tool shall meet the		N/A

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	electric strength test of D.2 between LIVE PARTS and ACCESSIBLE PARTS after being allowed to dry for 24 h at ambient temperature.		
14.4	LIQUID SYSTEMS shall not subject the user to an increased risk of electrical shock by components not capable of withstanding the pressure during operation. Compliance is checked by the following test. The RESIDUAL CURRENT DEVICE, if any, shall be disabled during the test. The LIQUID SYSTEM is closed and an approximately 1,0 % NaCl solution at a hydrostatic pressure equal to twice the pressure stated in 8.14.2 d) 1) is applied for 1 h. The tool is then placed for 1 min, in all positions consistent with the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 and the instructions according to 8.14.2 b) while monitoring the leakage current as in Clause C.2. During the test the leakage current shall not exceed: – 2 mA for a CLASS II TOOL ; – 2 mA for a CLASS II TOOL ; Following this test, the tool shall meet the electric strength test of Clause D.2 between LIVE PARTS and ACCESSIBLE PARTS after being allowed to dry for 24 h at ambient temperature.		N/A
14.5	RESIDUAL CURRENT DEVICES used to provide protection from shock in the case of failure of the LIQUID SYSTEM shall comply with IEC 61540:1 999 and shall meet the following requirements a) to c): a) The RCD shall disconnect both mains conductor, but not the earth conductor if provided, when the leakage exceeds 10 mA and with a maximum response of 300 ms. Compliance is checked by inspection and the test of 9.9.2 of IEC 61540:1999. In addition, during the test, the earthing conductor shall not become disconnected. b) The RCD shall be reliable for its intended use. Compliance is checked at RATED VOLTAGE by operating the RESIDUAL CURRENT DEVICE under conditions of simulated leakage as in a) above during conditions of locked rotor of the tool for 50 cycles. The RESIDUAL CURRENT DEVICE shall operate correctly for all cycles. c) The RCD shall be installed such that it is unlikely to be removed during use or normal maintenance. This requirement is considered fulfilled if the RESIDUAL CURRENT DEVICE is		N/A



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	fixed to the tool or the power SUPPLY CORD connected to the tool. Where fitted in the SUPPLY CORD the RESIDUAL CURRENT DEVICE shall be provided with TYPE Y ATTACHMENT or TYPE Z ATTACHMENT for connection with the SUPPLY CORD and INTERCONNECTION CORD		
15	Resistance to rusting		N/A
	Ferrous parts used to conduct electricity and those mechanical parts specified in the relevant part of IEC 62841-2, IEC 62841 -3 or IEC 62841-4 shall be adequately protected against rusting. Compliance is checked by the following test. All grease is removed from the parts to be tested by immersing them in a suitable degreasing agent for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water at a temperature of $(20 \pm 5) ^\circ\text{C}$. Without drying, but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of $(20 \pm 5) ^\circ\text{C}$. When using the liquids specified for the test, adequate precautions must be taken to prevent the inhalation of their vapours. After the parts have been dried for 10 min in a heating cabinet at a temperature of $(100 \pm 5) ^\circ\text{C}$, their surfaces shall show no signs of rust when viewed with normal vision from a distance of (500 ± 50) mm. Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored. For small helical springs and the like, and for parts exposed to abrasion, a layer of grease may provide sufficient protection against rusting. Such parts are only subjected to the test if there is doubt about the effectiveness of the grease film, and the test is then made without previous removal of the grease.		N/A
16	Overload protection of transformers and associated circuits		N/A
	Tools incorporating circuits supplied from a transformer shall be so constructed that, in the event of short circuits which are likely to occur, excessive temperatures do not occur in the transformer, or in the circuits associated to the transformer. Examples of short-circuits which are likely to occur are the short-circuiting of bare or inadequately insulated conductors of SAFETY EXTRA - LOW VOLTAGE circuits which are accessible, and the internal short-circuiting of lamp filaments. A failure of insulation complying with the requirements specified for BASIC INSULATION of CLASS I or CLASS II CONSTRUCTION is not, for the purpose of this requirement, considered as		N/A

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	likely to occur. Compliance is checked by applying the most unfavourable short circuit overload which is likely to occur in NORMAL USE, the tool being operated as follows: – for tools with RATED VOLTAGE (S), the tool is operated at a voltage equal to 1,06 times or 0,94 times RATED VOLTAGE, whichever is the more unfavourable; – for tools with a RATED VOLTAGE RANGE, the tool is operated at a voltage equal to 1,06 times the upper limit of the RATED VOLTAGE RANGE or at a voltage equal to 0,94 times the lower limit of the RATED VOLTAGE RANGE, whichever is the more unfavourable. The temperature rise of the insulation of the conductors of SAFETY EXTRA - LOW VOLTAGE circuits is determined, and shall not exceed the relevant value specified in Table 1 by more than 15 K.		
17	Endurance		N/A
17.1	Tools shall be so constructed that, in extended normal use, there will be no electrical or mechanical failure that might impair compliance with this standard. The insulation shall not be damaged and contacts and connections shall not work loose as a result of heating, vibrations, etc. Moreover, overload protection devices shall not operate under normal running conditions. Compliance is checked by the test of 17.2 and, for tools provided with a centrifugal or other starting switch, also by the test of 17.3. Immediately after these tests, the tool shall withstand an electric strength test as specified in clause 15, the test voltages being, however, reduced to 75% of the specified values. Connections shall not have worked loose, and there shall be no deterioration impairing safety in normal use.		N/A
17.2	Hand-held tools and transportable tools are operated intermittently at no-load.		P
	Each cycle of operation comprises an "on" period of 100 s and an "off" period of 20 s, the "off" periods being included in the specified operating time. If the cycle of operation limited by the construction is less than 100 s "on" and 20 s "off", then this cycle may be used. The tool may be switched on and off by means of a switch other than that incorporated in the tool unless this disables a functionality of the tool switch. HAND - HELD TOOLS are operated for 24 h at a voltage equal to 1,1 times the highest RATED VOLTAGE or 1,1 times the upper limit of the		N/A



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	RATED VOLTAGE RANGE , and then for 24 h at a supply voltage equal to 0,9 times the lowest RATED VOLTAGE or 0,9 times the lower limit of the RATED VOLTAGE RANGE . The 24 h of operation need not be continuous. During the test, the tool is placed in three different positions, the operating time, at each test voltage, being approximately 8 h for each position.		
	TRANSPORTABLE TOOLS are operated for 12 h at a voltage equal to 1,1 times the highest RATED VOLTAGE or 1,1 times the upper limit of the RATED VOLTAGE RANGE , and then for 12 h at a supply voltage equal to 0,9 times the lowest RATED VOLTAGE or 0,9 times the lower limit of the RATED VOLTAGE RANGE . The 12 h of operation need not be continuous. During the test, the tool is placed in its normal operating position according to 8.14.2. During this test, replacement of the carbon brushes is allowed, and the tool is oiled and greased as in NORMAL USE . If mechanical failure occurs and does not impair compliance with this standard, the part that failed may be replaced. If the temperature rise of any part of the tool exceeds the temperature rise determined during the test of 12.1, forced cooling or rest periods may be applied, the rest periods being excluded from the specified operating time. If forced cooling is applied, it shall not alter the air flow of the tool or redistribute carbon deposits. During these tests, overload protection devices incorporated in the tool shall not activate.		N/A
17.3	Tools provided with a centrifugal or other automatic starting switch are started 10 000 times under normal load, and at a voltage equal to 0,9 times rated voltage, the operating cycle being that specified in 17.2.		N/A
18	Abnormal operation		P
18.1	Tools shall be so designed that the risk of fire and mechanical damage impairing safety and the protection against electric shock as a result of abnormal operation is obviated as far as is practicable. Compliance is checked by the tests of 18.3 to 18.4 under the conditions specified in 18.2 applying the acceptance criteria of 18.1.1.		P
18.2	Fuses, NON - SELF - RESETTING - THERMAL CUT - OUTS , overcurrent protection devices or the like, incorporated into the tool, may be used to provide the necessary protection. ELECTRONIC CIRCUITS that are relied upon for protection shall be evaluated for this SAFETY CRITICAL FUNCTION as in 18.8.		P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Unless otherwise specified, the tests are continued until a PROTECTIVE DEVICE operates, or until steady conditions are established or an open circuit occurs. If it is an intentionally weak part that is permanently open-circuited to terminate the test, the relevant test is repeated on a second sample. This second test shall be terminated in the same way, unless the test is otherwise satisfactorily completed. An intentionally weak part is a part intended to fail under conditions of abnormal operation so as to prevent the occurrence of a condition which could impair compliance with this standard. Such a part may be a replaceable component, such as a resistor, a capacitor, or a THERMAL LINK, or a part of a component to be replaced, such as an inaccessible and non-resettable THERMAL CUT - OUT incorporated in a motor.		
18.3	Tools with heating elements are tested under the conditions specified in clause 12, but with restricted heat dissipation. The supply voltage, determined prior to the test, is that required to provide a power input of 0,85 times the rated power input under normal operation, when steady conditions have been established. This voltage is maintained throughout the test. The tool is allowed to cool down to approximately room temperature before being subjected to the test of 18.4.		N/A
18.4	The test of 18.3 is repeated, but with a supply voltage, determined prior to the test, equal to that required to provide a power input of 1,24 times rated power input under normal operation, when steady conditions have been established. This voltage is maintained throughout the test.		N/A
18.5	The tool is tested under the conditions specified in clause 12, under normal operation, the supply voltage being such that the power input is 1,15 times rated power input, but with any control which limits the temperature during the test of clause 12 short-circuited. If the tool is provided with more than one control, these are short-circuited in turn.		P
18.6	Unless an all-pole disconnection occurs during the test of 18.5 for class I tools with tubular sheathed and embedded heating elements, but which are not intended to be permanently connected to fixed wiring, the test of 18.5 is repeated, with the controls which limit the temperature during the test of clause 12 not short-circuited, and one end of the element connected to earth. This test is repeated with the polarity of the supply to the tool reversed		P

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	and with the other end of the element connected to earth.		
18.7	The following test is performed with cutting tools, such as sawblades, grinding wheels, etc., removed. – Tools incorporating a commutator motor are operated at a voltage equal to 1,3 times rated voltage, or the upper limit of the voltage range, for 1 min at no-load. After these tests of 18.2 to 18.7, the safety of the tool shall not have been impaired, in particular windings and connections shall not have worked loose. After these tests, the tool need not be capable of further use.		P
18.8	The following categories of tools incorporating induction motors and: a) with a starting torque less than the full-load torque; or b) started by hand; or c) provided with moving parts which are liable to be jammed, or where the moving parts can be stopped by hand, the motor remaining switched on during this operation; are connected, starting from cold, to their rated voltage or the upper limit of their rated voltage range with the moving parts locked • for 30 s for tools that are operated by hand during use; • for 5 min for tools that are attended during use. At the end of the test period specified, or at the instant of operation of fuses, thermal cut-outs, motor protection devices, and the like, the temperature of the windings shall not exceed the values shown in Table 3.		P
18.9	Tools incorporating three-phase motors are operated, starting from cold, • for 30 s, if they are kept switched on by hand or continuously loaded by hand; • or otherwise, for 5 min, with one phase disconnected, and under the torque producing normal load. At the end of the test period specified, or at the instant of operation of fuses, thermal cut-outs, motor protection devices, and the like, the temperature of the windings shall not exceed the values shown in Table 3.		P
18.10	Electronic circuits shall be so designed and applied so that a fault condition will not render the tool unsafe with regard to electric shock, fire hazard, mechanical hazard or dangerous malfunction.		P
18.11	Switches or other devices for motor reversal shall withstand the stresses occurring when the		P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	sense of rotation is reversed under running conditions where such a reversal is possible in normal use.		
18.12	A class I tool employing class II construction (see 5.10) or a class II tool shall be able to operate under extreme overload conditions without impairing protection against electric shock.		N/A
19	Mechanical hazards		P
19.1	Moving and other dangerous parts shall, as far as is compatible with the use and mode of function of the tool, be so arranged or enclosed that, in normal use, adequate protection against injury is provided.		P
19.2	Accessible parts likely to be touched during normal use shall be free from sharp edges, burrs, flashes and the like.		P
19.3	It shall not be possible to reach the moving parts with the provisions for dust collection removed, if any.		P
19.4	Tools shall have adequate grasping surfaces to ensure safe handling during use.		P
19.5	Tools shall be designed and constructed to allow, where necessary, a visual check of the contact of the cutting tool with the workpiece.		P
19.6	For all tools where the relevant part 2 requires the tool to be marked with the rated no-load speed, the no-load speed of the spindle at rated voltage or at the upper limit of the rated voltage shall not exceed 110% of the rated no-load speed.		P
20	Mechanical strength		P
20.1	Tools shall have adequate mechanical strength, and shall be so constructed that they withstand such rough handling as may be expected in normal use.		P
20.2	Blows are applied to the tool by means of the spring-operated impact test apparatus according to clause 5 of IEC 60068-2-75.		P
20.3	A hand-held tool shall withstand being dropped three times on a concrete surface from a height of 1 m. The sample shall be positioned to vary the point of impact.		P
20.4	Brush holders and their caps shall have adequate mechanical strength.		P
20.5	For all tools that are likely to cut into concealed wiring or their own cord, handles and grasping surfaces, as specified in the instruction manual, shall have adequate mechanical strength in order to provide insulation between the grasping area and the output shaft.		P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
21	Construction		P
21.1	Tools which can be adjusted to suit different voltages, or to different speeds, shall be so constructed that accidental changing of the setting is unlikely to occur, if such a change might result in a hazard.		P
21.2	Tools shall be so constructed that accidental changing of the setting of control devices is unlikely to occur.		P
21.3	It shall not be possible to remove parts which ensure the required degree of protection against moisture without the aid of a tool.		P
21.4	If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this might result in a hazard.		P
21.5	Replacement of a flexible cable or cord requiring the moving of a switch which acts also as a terminal for external conductors shall be possible without subjecting internal wiring to undue stress; after repositioning the switch, and before reassembling the tool, it shall be possible to verify whether the internal wiring is correctly positioned.		P
21.6	Wood, cotton, silk, ordinary paper and similar fibrous or hygroscopic material shall not be used as insulation, unless impregnated.		P
21.7	Asbestos shall not be used in the construction of tools.		P
21.8	Driving belts shall not be relied upon to provide the required level of insulation.		P
21.9	Insulating barriers of class II tools, and parts of class II tools which serve as supplementary insulation or reinforced insulation, and which might be omitted during reassembly after servicing, shall either: – be fixed in such a way that they cannot be removed without being seriously damaged; or – be so designed that they cannot be replaced in an incorrect position, and that, if they are omitted, the tool is rendered inoperable or manifestly incomplete.		P
21.10	Inside the tool, the sheath (jacket) of a flexible cable or cord shall only be used as supplementary insulation where it is not subject to undue mechanical or thermal stresses.		P
21.11	Any assembly gap with a width greater than 0,3 mm in supplementary insulation shall not be coincidental with any such gap in basic insulation, neither shall any such gap in reinforced insulation give direct access to live		P

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	parts.		
21.12	Class I tools shall be so constructed that, should any wire, screw, nut, washer, spring or similar part become loose or fall out of position, it cannot become so disposed that accessible metal is made live. Class II tools or class II constructions shall be so constructed that, should any such part become loose or fall out of position, it cannot become so disposed that creepage distances or clearances over supplementary insulation or reinforced insulation are reduced to less than 50% of the values specified in 28.1.		N/A
21.13	Supplementary insulation and reinforced insulation shall be so designed or protected that they are not likely to be impaired by deposition of dirt, or by dust resulting from wear of parts within the tool, to such an extent that creepage distances or clearance are reduced below the values specified in 28.1.		N/A
21.14	Tools shall be so constructed that internal wiring, windings, commutators, slip rings and the like, and insulation in general, are not exposed to oil, grease or similar substances.		N/A
21.15	It shall not be possible to gain access to brushes without the aid of a tool.		N/A
21.16	Tools employing liquid systems shall protect the user against the increased risk of shock due to the presence of liquid under conditions of normal use and the faults of the liquid system.		N/A
21.17	Switches and reset buttons on non-self-resetting controls shall be so located that accidental operation is unlikely to occur.		N/A
21.18	Tools, other than those provided with a flexible shaft, shall be fitted with a mains switch which can be switched off by the user without releasing his grasp on the tool. When a switch has a locking arrangement to lock it in the "on" position, the requirement in 21.18 is considered as being met provided the switch unlocks automatically when the trigger or actuating member is actuated.		N/A
21.19	Tools shall be so designed that the protection against electric shock is not affected when screws intended for replacement from the outside during routine servicing are replaced by screws having a greater length		N/A
21.20	If the tool is marked with the first numeral of the IP system, the relevant requirements of IEC 60529 shall be fulfilled.		N/A
21.21	Tools shall be so designed that in normal use there is no risk of electric shock from charged capacitors when touching the pins of the plug.		N/A



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Capacitors, having a rated capacitance less than or equal to 0,1 μ F, are not considered to entail a risk of electric shock. This requirement does not apply to capacitors complying with the requirements for protective impedance specified in 9.1 and 21.36.		
21.22	Non-detached parts, which provide the necessary degree of protection against electric shock, moisture, or contact with moving parts, shall be fixed in a reliable manner, and shall withstand the mechanical stress occurring in normal use.		N/A
21.23	Handles, knobs, grips, levers and the like shall be fixed in a reliable manner so that they will not work loose in normal use, if loosening might result in a hazard		N/A
21.24	Storage hooks and similar devices for flexible cords shall be smooth and well rounded.		N/A
21.25	Current-carrying parts and other parts, the corrosion of which might result in a hazard, shall be resistant to corrosion under normal conditions of use.		N/A
21.26	Void		-
21.27	Tools other than class II, having parts where reliance is placed upon safety extra-low voltage to provide the necessary degree of protection against electric shock, shall be so designed that the insulation between parts operating at safety extra-low voltage and other live parts complies with the requirements for double insulation or reinforced insulation.		N/A
21.28	Parts separated by protection impedance shall comply with the requirements for double insulation or reinforced insulation.		N/A
21.29	Void		N/A
21.30	Shafts of operating knobs, handles, levers and the like shall not be live unless the shaft is not accessible when the knob, handle, lever and the like is removed.		N/A
21.31	For constructions other than those of class III, handles, levers and knobs which are held or actuated in normal use shall not become live in the event of an insulation fault. If these handles, levers or knobs are of metal, and if their shafts or fixings are likely to become live in the event of a basic insulation fault, they shall either be adequately covered by insulating material, or their accessible parts shall be separated from their shafts or fixings by insulation.		N/A
21.32	For all tools that are likely to cut into concealed wiring or their own cord, handles and grasping surfaces, as specified in the instruction manual,		P

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	shall be formed of insulating material or, when of metal, shall be either adequately covered by insulating material or their accessible parts shall be separated by insulating barrier(s) from accessible metal parts that may become live by the output shaft. These insulating barriers are not to be regarded as basic, supplementary or reinforced insulation.		
21.33	For class II tools, capacitors shall not be connected to accessible metal parts, and their casings, if of metal, shall be separated from accessible metal parts by supplementary insulation.		N/A
21.34	Capacitors shall not be connected between the contacts of a thermal cut-out.		N/A
21.35	Lampholders shall be used only for the connection of lamps.		N/A
21.36	Protective impedance shall consist of at least two separate components, the impedance of which is unlikely to change significantly during the lifetime of the tool. If any one of the components is short-circuited or open-circuited, the values specified in 9.1 shall not be exceeded.		N/A
21.37	Air intake shall not enable the ingress of foreign bodies that could impair the safety.		N/A
22	Internal wiring		P
22.1	Wireways shall be smooth and free from sharp edges.		P
22.2	Internal wiring and electrical connections between different parts of the tool shall be adequately protected or enclosed.		N/A
22.3	Internal wiring shall be either so rigid and so fixed or insulated that, in normal use, creepage distances and clearances cannot be reduced below the values specified in 28.1. The insulation, if any shall be such that it cannot be damaged in normal use.		N/A
22.4	Conductors identified by the colour combination green/yellow shall not be connected to terminals other than earthing terminals.		N/A
22.5	Aluminium wires shall not be used for internal wiring. Windings of a motor are not considered as internal wiring.		P
22.6	Stranded conductors shall not be consolidated by lead-tin soldering where they are subjected to contact pressure, unless the clamping means is so designed that there is no risk of bad contact due to cold Flow of the solder.		P
23	Components		P
23.1	Components shall comply with the safety requirements specified in the relevant IEC		P



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	standards, as far as they reasonably apply.		
23.3	Overload protection devices shall be of the non-self-resetting type.		N/A
	Overload protection devices shall be of the non-self resetting type unless the tool is equipped with a momentary switch with no provision for being locked in the "on" position. Compliance is checked by inspection.		N/A
23.4	Plugs and socket-outlets used as terminal devices for heating elements, and plugs and socket-outlets for extra-low voltage circuits, shall not be interchangeable with plugs and socket-outlets listed in IEC 60884, and with connectors and tool inlets complying with the standard sheets of IEC 60320.		N/A
23.5	Motors connected to the supply mains, and having basic insulation which is inadequate for the rated voltage of the tool, shall comply with the requirements of Annex B.		N/A
24	Supply connection and external flexible cords		N/A
24.1	Tools shall be provided with one of the following means of connection to the supply: – a supply cord with a plug, for tools rated in voltage or frequency for connection to public supplies; – a supply cord without a plug, if the tool is intended to be connected to non-public power supplies; – an appliance inlet having at least the same degree of protection against moisture as required for the tool, and having a locking device preventing inadvertent disconnection; – a supply cord not exceeding 0,5 m and fixed with an in-line connector (cable coupler) and its mating counterpart. The in-line connector shall have at least the same degree of protection against moisture as required for the tool.		N/A
24.2	Supply cords shall be assembled to the tool by one of the following methods: – type X attachment; – type Y attachment; – type Z attachment, only for exchange-type tools, as allowed in part 2. Supply cords with type X and type Y attachment may be either ordinary flexible cords or special cords and only available from the manufacturer or his service agent. A special cord may also include a part of the tool.		N/A
24.3	Plugs shall not be fitted with more than one		N/A

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	flexible cord.		
24.4	Supply cords shall be not lighter than: – ordinary tough rubber sheathed flexible cord (code designation 60245 IEC 53); – ordinary polyvinyl chloride sheathed flexible cord (code designation 60227 IEC 53). Polyvinyl chloride insulated flexible cords shall not be used for tools having external metal parts, the temperature rise of which exceeds 75 K during the test of clause 12.		N/A
	For impact wrenches, the lightest cable which can be used is: – heavy polychloroprene sheathed flexible cable (60245 IEC 66 or equivalent).		N/A
24.5	Supply cords shall have a nominal cross-sectional area not less than those shown in Table 6.		N/A
24.6	For class I tools, the supply cord shall be provided with a green/yellow core; it shall be connected to the internal earthing terminal of the tool, and to the earthing contact of the plug.		N/A
24.7	Conductors of supply cords shall not be consolidated by lead-tin soldering where they are subject to contact pressure, unless the clamping means is so designed that there is no risk of a bad contact due to cold flow of the solder.		N/A
24.8	For all types of attachment, moulding together the supply cord to the enclosure or part of it shall not affect the insulation of the cord.		N/A
24.9	Inlet openings shall be provided with a bushing, or shall be so constructed that the protective covering of the supply cord can be introduced without risk of damage.		N/A
24.10	Inlet bushings shall: – be so shaped as to prevent damage to the supply cord; – be reliably fixed; – not be removable without the aid of a tool.		N/A
24.11	Void		-
24.12	Cord guards shall have adequate mechanical strength and shall retain these properties throughout extended normal use.		N/A
24.13	Flexible cables or cords of tools shall be protected against excessive bending at the inlet opening of the tool by means of a cord guard of insulating material.		N/A
24.14	Tools provided with a supply cord shall have cord anchorages so that the conductors are relieved from strain, including twisting, where they are connected within the tool, and that the		N/A

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	insulation of the conductors is protected from abrasion.		
24.15	Cord anchorages shall either be so arranged that they are only accessible with the aid of a tool, or be so designed that the cord can only be fitted with the aid of a tool.		N/A
24.16	For type X attachments, cord anchorages shall be so designed or located that: – replacement of the cord is easily possible; – it is clear how the relief from strain and the prevention of twisting are to be obtained; – they are suitable for the different types of cord which may be connected, unless the tool is so designed that only one type of cord can be fitted; – the cord cannot touch the clamping screws of the cord anchorage, if these screws are accessible, or at least not separate from accessible metal parts by supplementary insulation; – the cord is not clamped by a metal screw which bears directly on the cord; – at least one part of the cord anchorage is securely fixed to the tool, unless it is part of the specially prepared cord; – screws, if any, which have to be operated when replacing the cord, do not serve to fix any other component, unless, when omitted or incorrectly mounted, they render the tool inoperative or clearly incomplete, or unless the parts intended to be fastened by them cannot be removed without the aid of a tool during the replacement of the cord; – in the case of labyrinths, these labyrinths cannot be bypassed in such a way that the test of 24.14 is not withstood; – glands shall not be used as cord anchorages for power supply cords; – for class I tools, they are of insulating material or are provided with an insulating lining, if otherwise an insulation fault on the cord could make accessible metal parts live; – for class II tools, they are of insulating material, or, if of metal, are insulated from accessible metal parts by insulation complying with the requirements for supplementary insulation.		N/A
24.17	For type Y and Z attachments, cord anchorage shall be adequate.		P
24.18	For type X attachment, production methods such as tying the cord into a knot, or tying the ends with string, are not allowed		N/A



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
24.19	The insulated conductors of the supply cord shall be insulated from accessible metal parts by insulation complying with the requirements for basic insulation for class I tools, and complying with the requirements for supplementary insulation for class II tools. This insulation shall consist of: – a separate insulating lining fixed to the cord anchorage; – a sleeve or grommet fixed to the cord; or – for class I tools, the sheath of the sheathed cord.		N/A
24.20	The space for the supply cables or the supply cord provided inside, or as a part of the tool for type X attachment: – shall be so designed as to permit checking, before fitting the cover, if any, that the conductors are correctly connected and positioned; – shall be so designed that covers, if any, can be fitted without risk of damage to the supply conductors or their insulation; – shall be so designed that the uninsulated end of the conductor, should it become free from a terminal, cannot come into contact with accessible metal parts, unless the cord is provided with terminations that are unlikely to slip free of the conductor.		N/A
24.21	Appliance inlets shall: – be so located or enclosed that live parts are not accessible during insertion or removal of the connector; – be so placed that the connector can be inserted without difficulty; – be so placed that, after insertion of the connector, the tool is not supported by the connector when in any position of normal use on a flat surface.		N/A
25	Terminals for external conductors		N/A
25.1	Tools with type X attachments, except those with specially prepared cord, shall be provided with terminals in which connection is made by means of screws, nuts, or equally effective devices. Screw type terminals in accordance with IEC 60998-2-1, screwless terminals in accordance with IEC 60998-2-2 and clamping units in accordance with IEC 60999-1 are considered to be equally effective devices.		N/A
25.2	Terminals for type X attachment, except those with specially prepared cords, shall allow the connection of conductors having nominal cross-sectional areas as shown in Table 8, unless the		N/A



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	tool is so designed that only one type of cord can be fitted, in which case the terminals shall be suitable for the connection of that cord.		
25.3	For tools with type X attachments, terminals shall be so fixed that, when the clamping means is tightened or loosened, the terminal does not work loose, internal wiring is not subjected to stress, and creepage distances and clearances are not reduced below the values specified in 28.1.		N/A
25.4	For tools with type X attachments, terminals shall be so designed that they clamp the conductor between metal surfaces with sufficient contact pressure, and without damage to the conductor.		N/A
25.5	For tools with type X attachments, except those with specially prepared cords, terminals shall not require special preparation of the conductor in order to effect correct connection, and they shall be so designed or placed that the conductor cannot slip out when clamping screws or nuts are tightened.		N/A
25.6	Terminals of the pillar type shall be so located that the end of a conductor introduced into the hole is visible, or can pass beyond the threaded hole for a distance at least equal to half the nominal diameter of the screw, or 2,5 mm, whichever is the greater.		N/A
25.7	For type X attachments, the terminals shall be clearly recognizable and accessible after opening the tool. All terminals shall be located behind one cover, or one part of the enclosure.		N/A
25.8	Terminal devices shall not be accessible without the aid of a tool, even if their live parts are not accessible.		N/A
25.9	Terminal devices of tools with type X attachment shall be so located or shielded that should a wire of a stranded conductor escape when the conductors are fitted, there is no risk of accidental connection between live parts and accessible metal parts and, in the case of class II tools, between live parts and metal parts separated from accessible metal parts by supplementary insulation only.		N/A
26	Provision for earthing		N/A
26.1	Accessible metal parts of class I tools, which may become live in the event of an insulation fault, shall be permanently and reliably connected to an earthing terminal or termination within the tool, or to the earthing contact of the tool inlet.		N/A
26.2	The clamping means of earthing terminals shall be adequately locked against accidental		N/A



UL 62841-1&UL 62841-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	loosening, and it shall not be possible to loosen them without the aid of a tool. Screw clamping terminals complying with clause 25 or screwless terminals in accordance with IEC 60998-2-2 are considered to comply with the requirements of this clause.		
26.3	If detachable parts have an earth connection, this connection shall be made before the current-carrying connections are established when placing the part in position, and the current-carrying connections shall be separated before the earth connection is broken when removing the part.		N/A
26.4	All parts of the earthing terminal intended for the connection of external conductors shall be such that there is no risk of corrosion resulting from contact between these parts and the copper of the earthing conductor, or any other metal in contact with these parts.		N/A
26.5	The connection between the earthing terminal or earthing contact, and parts required to be connected thereto, shall be of low resistance.		N/A
27	Screws and connections		P
27.1	Fixings, and electrical connections, the failure of which may impair compliance with this standard, shall withstand the mechanical stresses occurring in normal use.		P
27.2	Electrical connections shall be so designed that contact pressure is not transmitted through insulating material which is liable to shrink or to distort, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage or distortion of the insulating material. Ceramic material is not liable to shrink or to distort.		P
27.3	Space-threaded (sheet metal) screws shall not be used for the connection of current-carrying parts, unless they clamp these parts directly in contact with each other, and are provided with a suitable means of locking.		N/A
27.4	Screws, which make a mechanical connection between different parts of the tool, shall be secured against loosening, if they also make electrical connections.		N/A
28	Creepage distances, clearances and distances through insulation		N/A
28.1	Creepage distances and clearances shall not be less than the values in millimetres shown in Table 10. The values specified in the table do not apply to cross-over points of motor windings		N/A
28.2	For working voltages up to and including 130 V, the distance through insulation between metal		N/A

**UL 62841-1&UL 62841-2-2**

Clause	Requirement + Test	Result - Remark	Verdict
	parts shall not be less than 1,0 mm, if they are separated by supplementary insulation, and not be less than 1,5mm, if they are separated by reinforced insulation. For reinforced insulation used between windings and accessible metal, the distance through the insulation shall not be less than 1,0 mm. For working voltages over 130 V up to and including 250 V, the distance through insulation between metal parts shall not be less than 1,0 mm, if they are separated by supplementary insulation, and not be less than 2,0 mm, if they are separated by reinforced insulation. This requirement does not apply if the insulation is applied in thin sheet form, other than mica or similar scaly material, and consists:		



TABLE: Components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity
Plastic	CHI MEI CORPORATION	D-1000	V-0, 60°C	UL94	UL E56070
PCB	Various	Various	V-0, 130°C	UL	UL
Battery	Various	Various	3.7Vdc	UL	UL
¹⁾ An asterisk indicates a mark which assures the agreed level of surveillance					

Input Test				
Test voltage(V)	Rating Power(W)	Test Power(W)	Deviation(%)	Description
5	5	4.99	-0.2	Pass

Table	Temperature measurements					P	
	Supply voltage (V) :	5 V	--	--	--	—	
	Ambient T _{min} (°C) :	25.0	--	--	--	—	
	Ambient T _{max} (°C) :	25.0	--	--	--	—	
Maximum measured temperature T of part/at:		T (°C)				Allowed T _{max} (°C)	
DC wire		31.6	--	--	--	90	
Battery		37.9	--	--	--	60	
PCB near main IC		58.5	--	--	--	130	
Internal wire		32.2	--	--	--	105	
Motor winding		41.3	--	--	--	110	
Enclosure		29.9	--	--	--	60	
Supplementary information:							
Temperature T of winding:	t ₁ (°C)	R ₁ (Ω)	t ₂ (°C)	R ₂ (Ω)	T (°C)	Allowed T _{max} (°C)	Insulation class
--	--	--	--	--	--	--	--
Supplementary information:							

Appendix: Photos

Fig.1



Fig.2



Fig.3



Fig.4



Fig.5

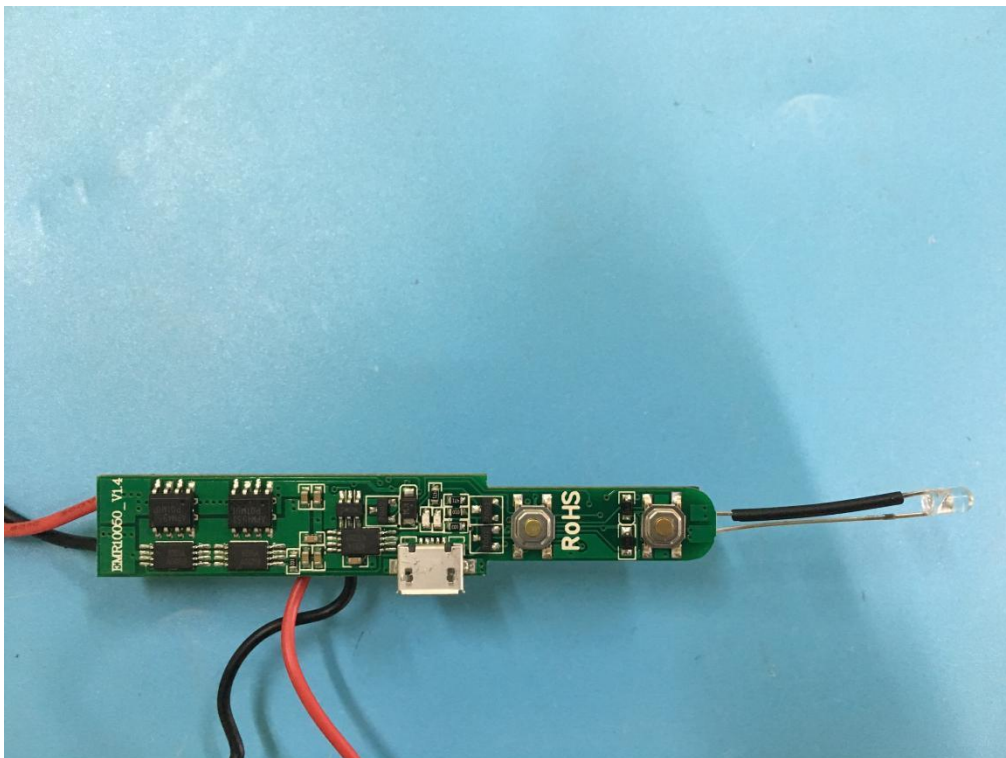


Fig.6

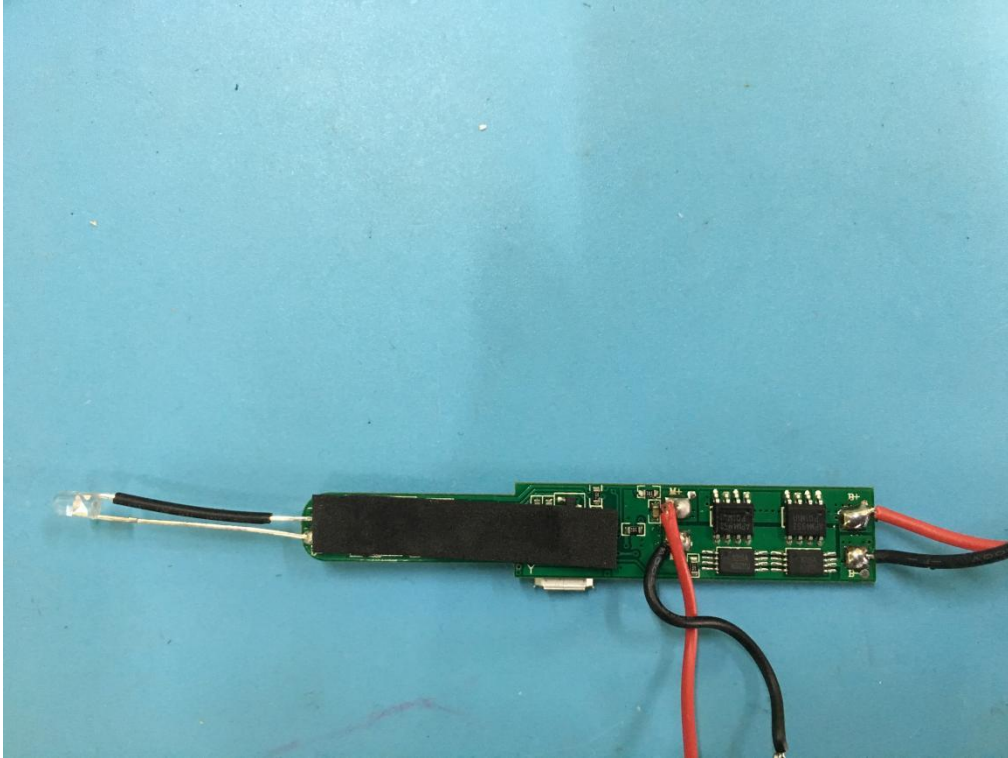


Fig.7