Test report No.:	**CN24KIHU 001**	**Order no.:**	180287141	*Page 1 of 102*
Client reference no.:	N/A	**Order date:**	2024.02.20	
Client:	Nemo Power Tools Limited 21st Floor, CMA Building 64 Connaught Road CENTRAL HONG KONG			
Test item:	Cordless lifting tool			
Identification / Type no.:	DCE592			
Order content:	Type test			
Test specification:	UL 62841-1:2015 R6.22 CAN/CSA-C22.2 No. 62841-1-15+GI1+GI2+GI3+GI4+GI5			

Date of sample receipt:	2024.01.15/2024.01.18
Test sample no:	A003643496-001~034
Testing period:	2024.01.26 – 2024.02.23
Place of testing:	TUV Rheinland / CCIC (Ningbo) Co., Ltd.
Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.
Test result*:	Pass

Tested by: x Eason Shi
Signed by: Eason Shi

Date: 2024.06.17

Position: PE

Authorized by: X

Ausstellungsdatum:
Issue date: 2024.06.17
Signed by: Don Zhang

Position: Authorizer

Sonstiges / *Other*:

Test procedure: [X] cTUVus [ ] cTUV [ ] TUVus [ ] TU approval. X

Client contact: iris@grabo.com
Sample obtaining method: Sending by customer.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* *Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Anmerkungen
Remarks

1	The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.
2	As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature
3	Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.
4	The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the “Zero Guard Band Rule” and “Simple Acceptance” in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.

Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 62841-1
Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery – Safety

Report Number..... :	**See cover page**
Date of issue ..... :	**See cover page**
Total number of pages ..... :	**See cover page**
Name of Testing Laboratory preparing the Report ..... :	**TÜV Rheinland (Shanghai) Co., Ltd.** **No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China**
Applicant's name..... :	**Nemo Power Tools Limited**
Address ..... :	**21st Floor, CMA Building 64 Connaught Road CENTRAL HONG KONG**
Test specification:	
Standard ..... :	IEC 62841-1:2014
Test procedure..... :	Type test
Non-standard test method..... :	N/A
TRF template used ..... :	IECEE OD-2020-F1:2022, Ed.1.5
Test Report Form No. ..... :	IEC62841_1F
Test Report Form(s) Originator.... :	DEKRA Certification B.V.
Master TRF ..... :	2023-05-30

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved IECEE Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

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 NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description ..... :		Cordless lifting tool	
Trademark(s) ..... :		N/A	
Manufacturer ..... :		Same as applicant	
Model/Type reference ..... :		DCE592	
Ratings ..... :		20V d.c.	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	TÜV Rheinland (Shanghai) Co., Ltd. No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China	
Testing location/ address ..... :		TÜV Rheinland / CCIC (Ningbo) Co., Ltd. 3F Building C13, R&D Park, No. 32, Lane 299 Guanghua Road, National Hi-Tech Zone, Ningbo, 315048, China	
Tested by (name, function, signature) ..... :		See cover page	
Approved by (name, function, signature) ... :		See cover page	
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) ... :			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address ..... :			
Tested by (name + signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) ... :			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) ... :			
Supervised by (name, function, signature) :			

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

Attachment 1: SCF performance level analysis report (relevant test report No. CN24MR0D 001, 12 pages)

Attachment 2: Copy of CDF (4 pages)

Summary of testing:

The product tested passed all the examinations of the applied standards mentioned in section General remarks of this report.

The conformity verdict is ‚Pass' if the measured value is less or equal to the limit.

Information in critical components list (see table CRITICAL COMPONENTS INFORMATION) as well as used plastic materials provided by applicant.

History of testing

Date of issue	CBTR	Project-Task
N/A	N/A	N/A

Tests performed (name of test, test clause and date test performed):	Testing location (CBTL, SPTL, CTF, Subcontractor):
All tests according with UL 62841-1:2015 R6.22 and CAN/CSA-C22.2 No. 62841-1-15+GI1+GI2+GI3+GI4+GI5 were performed on provided samples. Tests of Lithium-ion charging system were performed and passed in UL File No.: E472543. The SCF performance level analysis of controller was performed in the test report CN24MR0D 001 according with ISO 13849-1:2015. The part requirements of ASME B30.20 (reference) have been considered, details refer to CN24OA2T 001.	TÜV Rheinland / CCIC (Ningbo) Co., Ltd. 3F Building C13, R&D Park, No. 32, Lane 299 Guanghua Road, National Hi-Tech Zone, Ningbo, 315048, China

Summary of compliance with National Differences (List of countries addressed):

National difference of
UL 62841-1:2015 R6.22
CAN/CSA-C22.2 No. 62841-1-15+GI1+GI2+GI3+GI4+GI5
were considered.

Use of uncertainty of measurement for decisions on conformity (decision rule):

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

☐ Other: … (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

Information on uncertainty of measurement:

The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.

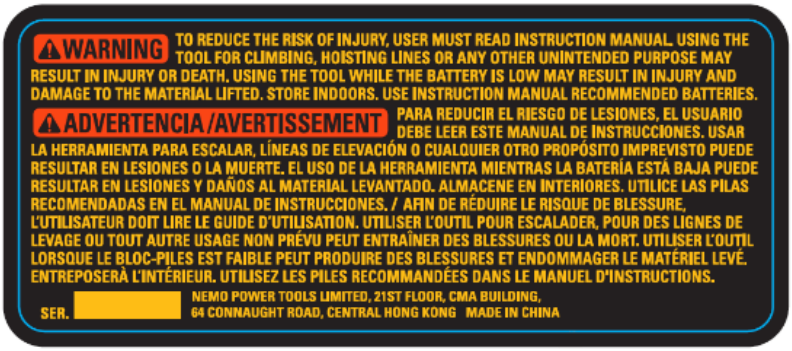
IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Copy of marking plate:

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

For tool:



Remark: The manufacture date is marked on the battery pack connection construction of the tool. Details refer to photo documentation.

Test item particulars.....:	
Category of equipment .....:	Hand held
Protection Class of tool .....:	Battery tool
Method of supply cord attachment .....:	N/A
Duty conditions.....:	Normal
Type of operation.....:	Normal
Degree of protection.....:	IPX0
Accessories and detachable parts included .....:	N/A
Other options included .....:	N/A
Classification of installation and use.....:	Hand held
Supply Connection.....:	Battery tool
.....:	
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 .....:	See cover page
Date (s) of performance of tests.....:	See cover page
General remarks:	
"(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.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) .....:	Nemo Power tools (Huizhou) Limited / 2/F, 4th Industrial Area, Luokeng Village, Xiaotie Zone, Xiaojinkou Town, Huicheng District, Huizhou City, GUANGDONG P.R. CHINA

General product information and other remarks:

The product is a battery-powered lifting tool, used for professional lifting, moving, and placing objects like stone pavers, tiles, drywall, furniture and large appliances. The product is powered by detachable Li-ion battery pack.

The Lithium-ion charging system was compliance with UL2595, refer to UL File No.: E472543.

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
5	**GENERAL CONDITIONS FOR THE TESTS**		P
5.1	General test conditions in this clause apply unless otherwise specified in this standard		P
5.2	Tests made on separate samples		P
	At manufacturer's discretion, fewer samples used		N/A
	Cumulative stress from successive tests on electronic circuits avoided		P
	Several tests conducted on a single sample, results not affected by previous tests.		P
5.3	Evident from construction of the tool that a particular test(s) not applicable, test(s) not made.....:		P
5.4	Tests carried out with the tool and/or any movable part of it		P
	Tool placed in the most unfavourable position that may occur in normal use.		P
5.5	Tools provided with controls or switching devices and setting can be altered by the user, controls or devices adjusted to their most unfavourable settings		N/A
	Electronic speed control devices set at their highest speed.....:	No electronic speed control device	N/A
	Adjusting means accessible without the aid of a tool, this subclause applies whether the setting can be altered by hand or with the aid of a tool. Adjusting means not accessible without the aid of a tool and setting is not intended to be altered by the user, this subclause does not apply.		N/A
	Adequate sealing prevents alteration of setting by user		N/A
5.6	Tests conducted in a draught-free location, and unless otherwise specified, in (20 ± 5) °C		P
	Tests conducted at (23 ± 2) °C due to temperature limited temperature sensitive device		N/A
5.7.1	Tools for a.c. only, tested with a.c. at rated frequency, if marked		N/A
	Tools marked for a.c./d.c., tested with the most unfavourable supply.....:		N/A
	Tools for a.c. not marked with rated frequency, or marked 50 - 60 Hz or 50/60 Hz, tested with either 50 Hz or 60 Hz, whichever is the most unfavourable		N/A
	Tools with series motors only, either frequency may be used		N/A
5.7.2	Tool rated for more than one rated voltage or a voltage range, tested at the highest voltage (V) .....:		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.7.3	Tools where there is no marked rated current, tests that require a value for rated current conducted at current measured rated input at the lowest rated voltage or the lower value of the rated voltage range		N/A
5.8	Alternative heating elements or attachments which are made available for the tool by manufacturer, tool is tested with those heating elements or attachments which give the most unfavourable results	No such part.	N/A
5.9	Tools are tested with the specified flexible supply cord connected to the tool.		N/A
5.10	Parts of class I tool having accessible parts not connected to an earthing terminal or earthing contact, and not separated from live parts by an intermediate metal part connected to an earthing terminal/contact, were checked on class II construction requirements.	Not applicable in Annex K	N/A
5.11	Class I tool or class II tool having parts operating at safety extra-low voltage, such parts on requirements specified for class III tools	Not applicable in Annex K	N/A
5.12	When testing electronic circuits, supply is free from perturbations from external sources that can influence the results of the tests		N/A
5.13	Heating element, if any, cannot be operated unless the motor is running, element is tested with the motor running		N/A
	Heating element, if any, can be operated without the motor running, element is tested with or without the motor running, whichever is the more unfavourable		N/A
	Heating elements incorporated in the tool connected to a separate supply unless otherwise specified		N/A
5.14	For attachments performing a function within the scope of IEC 62841-2, IEC 62841-3 or IEC 62841-4, tests made in accordance with IEC 62841-2, IEC 62841-3 or IEC 62841-4.		P
5.15	Method of torque loading chosen so as to avoid additional stresses, such as by side thrust.	Not applicable in Annex K	N/A
	Additional loads necessary for the correct operation of the tool considered .....:		N/A
	Brake used for loading, load applied gradually		N/A
	Modification of output means for purpose of loading permitted to allow connection to brake		N/A
5.16	Tools intended for SELV tested using a supply transformer intended to be used with the tool.	Not applicable in Annex K	N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.17	For requirements based on the mass of the tool, the mass is determined without supply cord and without tool bits or accessories, but with all equipment and attachments needed for normal use		P
	Required accessories, equipment and attachments as given in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.		P
	If tool has more accessories, equipment or attachments heaviest configuration shall be used to determine mass.		N/A
5.18	For linear and angular dimensions, ISO 2768-1, class “c” applicable, unless tolerances are specified		P
5.19	All electrical measurements made with a maximum measurement error of 5 %.		P
	Instruments for measuring voltage have input resistance ≥ 1 MΩ and parallel capacitance ≤ 150 pF.		P
5.20	Thermal equilibrium considered achieved when the total deviation of three successive temperature readings, taken at 3 min intervals, is ≤ 4 K		P
	Induction motor, measurement time of 1 hour is considered sufficient.		N/A
6	**RADIATION, TOXICITY AND SIMILAR HAZARDS**		P
6.1	No harmful radiation, no toxic or similar hazard		P
6.2	For tool with laser to indicate a cutting line or the like, laser class 2M or lower according to IEC 60825-1:2007.		N/A
	Tool marked with symbol(s) as in of IEC 60825-1: 2007 for the relevant laser class.		N/A
6.3	Tool fitted with non-coherent light sources, users of tools are cautioned as to the risk of potential photo-biological harm, if such harm exist .....:	Considered	P
6.3.1	Visible light indicators (pilot lamps) and Infrared sources used for signalling and communication considered to have no risk of photo-biological harm, no marking required.	Battery power indicators	P
6.3.2	Tools emitting visible light from electroluminescent, incandescent or LED sources, considered to be for short term, non-general light services use where exposure is both incidental and intermittent		N/A
	Marked with either: – “CAUTION Do not stare at operating lamp”, or – symbol 60417-6041(2010-08)		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	If no reasonable risk of harm, markings may be omitted		N/A
	No reasonable risk of harm considered, as either a) light emission at a distance of 200 mm along any direction of the tool < 500 Lux; or b) luminance light emission < 10 000 cd/m² in the range of visible light; or c) light source (if not focused by external optics) is in Risk Group 1 or lower evaluated by the methods of IEC 62471; or d) tool itself evaluated by the methods of IEC 62471 and found to be in Risk Group 1 or lower.		N/A
6.3.3	For light derived by sources other than those mentioned in 6.3.2, product evaluated by the methods of IEC 62471, markings guided by 5.4 of IEC/TR 62471-2:2009.		N/A
7	**CLASSIFICATION**		N/A
7.1	Tool is Class I, II, or III with respect to protection against electric shock .....:	Not applicable in Annex K	N/A
7.2	Degree of protection against harmful ingress of water per IEC 60529.....:	Not applicable in Annex K	N/A
	Required degree of protection other than IPX0 specified in relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 .....:		N/A
8	**MARKINGS AND INSTRUCTIONS**		P
8.1	Tool marked with rated voltage(s) or rated voltage range(s) (V) .....:	Not applicable in Annex K	N/A
	Tool for star-delta connection clearly marked with the two rated voltages (e.g. 230 Δ / 400 Y V) .....:		N/A
	Tool complying with this standard for a voltage range, may be marked with any single voltage or smaller voltage range within that range (V) .....:		N/A
	Symbol for nature of supply or rated frequency or frequency range. The symbol for nature of supply placed next to rated voltage (Hz).....:		N/A
	Rated input or current marked (W or A).....:		N/A
	Tool has alternative components to be selected by a control device, rated input or rated current is that corresponding to the highest rated input or rated current		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Class II symbol for class II tools .....:		N/A
	IP number other than IPX0 .....:		N/A
8.1.1	Tools with range of rated values (e.g. voltage, frequency) can be operated without adjustment over the range, marked with the lower and upper limits of the range separated by a hyphen, e.g. 115-230 V .:		N/A
	Different rated values to be adjusted by the user / installer, tool marked with the values separated by an oblique stroke, e.g. 115/230 V .....:		N/A
8.1.2	Upper and lower limits of rated power input marked,		N/A
	unless difference between upper and lower limits of rated voltage range do not exceed 20 % of the mean value, in which case the rated input is related to mean value of voltage range.		N/A
8.2	Tool marked with - "WARNING – To reduce the risk of injury, user must read instruction manual", or - sign M002 of ISO 7010, or - appropriate symbol, see relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4	See marking plate	P
	"WARNING" in capital letters not less than 2,4 mm high, not separated from either the cautionary statement or the symbol ISO 7000-0434A or ISO 7000-0434B		N/A
	Statement verbatim except that "operator's manual" or "user guide" may replace "instruction manual".		N/A
	Additional symbols in accordance with ISO 7010 or designed in accordance with ISO 3864-2/3864-3. .:	See marking plate	P
	Cautionary statements having the same signal word such as "WARNING" may be combined into one paragraph under one signal word		N/A
	Order of statements: markings required by Part 1, markings required by part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 and then any optional markings		P
8.3	Business name and address of manufacturer, at least country or state, city and postal code.....:	Replaced by Annex K	N/A
	Business name and address of authorized representative, at least country or state, city and postal code.....:		N/A
	Designation of the tool (may be coded) .....:		N/A
	Designation coded: code explained in the instructions		N/A
	Designation of series or type.....:		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Year of manufacture and a date code identifying at least the month of manufacture.....:		N/A
	Tools parts shipped separately for assembly by the end user, each part marked for identification on the part or the package		N/A
	"> 25 kg" if the mass of the tool is over 25 kg		N/A
	No misunderstanding through additional markings		N/A
8.4	Markings of 8.1 to 8.3 not on detachable part of the tool	Replaced by Annex K	N/A
	Markings of 8.2 and 8.3 clearly discernible from outside the tool		N/A
	Markings other than symbols, fold-over label on power cords used (Y or Z attachments only)		N/A
	Other markings may be visible after removing cover		N/A
	Indications for switches and controls placed on or in vicinity of components		N/A
	Not placed on parts which can be repositioned		N/A
	Not positioned such that the marking is misleading		N/A
8.5	Tool can be adjusted to suit different rated voltages, change in voltage clearly discernible		N/A
	Correct Wiring diagram fixed to tool, may be on inside of a cover but not on a label loosely attached to the tool		N/A
8.6	Use of correct units		P
	Use of correct symbols		P
	Additional symbols explained in the instructions, no misunderstanding		P
	Other units and their symbols belong to the international standardized system.		P
	Other units and their symbols same as international standardised system.....:		N/A
8.7	Connection diagram affixed to tool with more than two supply conductors, unless terminals clearly identified	Not applicable in Annex K	N/A
	The earthing conductor not a supply conductor		N/A
	Wiring diagram indicates how the windings are to be connected for tools for star-delta connection		N/A
8.8	Terminals, except for type Z attachments, marked on non-removable part with specified symbols:	Not applicable in Annex K	N/A
	- Terminal exclusively for neutral connection marked with "N"		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- Earthing terminal marked with symbol IEC 60417-5019 (2006-08)		N/A
	The markings not placed on screws, removable washers or other parts which might be removed		N/A
8.9	Switches which may result in a hazard marked or placed to indicate which part of tool they control....:	Obvious for user	P
8.10	“Off” position of multi stable power switch indicated by figure O (symbol of IEC 60417-5008 [2002-10])		N/A
	A momentary power switch which can be locked in the “on” position is not considered as a multi -stable switch.		N/A
	Push-buttons for "off" function only, figure O used, button coloured red or black.....:		N/A
	Figure O not used for any other indication		N/A
	Transportable tools, power switch actuator or cover not coloured yellow and red as specified for emergency stop according to ISO 13850.		N/A
	Flap/cover covers only the start button, colour of the flap/cover not black, red or yellow.....:		N/A
	Flap/cover covers only the stop button, colour of the flap/cover red or yellow.....:		N/A
8.11	Control devices adjusted during operation and the like provided with markings as specified, unless…		N/A
	… fully “on” position opposite to “off” position		N/A
	Figures used for different positions with O for “off” position, and figures reflecting greater output for other positions.....:		N/A
	Indication for different positions placed on the device itself, or adjacent to the operating means		N/A
8.12	Markings easily legible		P
	Markings withstood durability test: - 15 s with water soaked cloth - 15 s with petroleum spirit soaked cloth		P
	Signs are in contrast to their background, clearly legible from a distance of not less than 500 mm		P
	Effect of normal use taken into account		P
	Adhesive backing durable, meets requirements of UL 969 or…	Approved by UL 969	P
	… withstands specified tests		N/A
8.13	Thermal link or fuse-link, reference number or other means for identifying the link marked		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.14	Instruction manual and safety instructions: - are provided together with the tool		P
	- are noticed by the user when the tool is removed from the packaging		P
	- include an explanation of the symbols		P
	- are written in the official language(s) of the country in which the tool is sold ..... :	English	P
	- are legible and contrast with the background.		P
	- include business name and address of the manufacturer and, where applicable, his authorised representative ..... :	Considered	P
	- include the designation of the tool and series or type as required by 8.3, including description of machine such as “drill”, “planer” etc. ..... :	Considered	P
8.14.1	Safety instructions in English are verbatim and in any other official language are equivalent .....:	Considered	P
	The general power tool safety warnings may be separate from the instruction manual.		N/A
	Term “tool” or “power tool” not used for garden machinery; use term such as “machine”		P
	Format of all Safety Warnings differentiate the context of all clauses by font or similar means and as illustrated in 8.14.1.1		P
8.14.1.1	General Power Tool Safety Warnings		P
	1) Work Area Safety		P
	2) Electrical Safety		P
	3) Personal Safety		P
	4) Power Tool Use and Care		P
	5) Service	Replaced by Annex K	N/A
8.14.1.2	Order of the Safety Instructions in accordance with A): Part 1 warnings are followed by the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings, or …	Considered	P
	B): Part 1 and part 2, 3 or 4 warnings divided into the sections defined by the numbered subtitles and the associated warnings below the numbered subtitle		N/A
	Format of instruction manual section titles for IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings		N/A
	C): Any additional warnings deemed necessary by the manufacturer, not inserted within any of the IEC 62841-1, IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings		P

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
8.14.1.3	Instruction manual and safety instructions in one common document, or		P
	Warning as specified included in manual		N/A
8.14.2	Additional instructions and information		P
	a) Instructions for putting into use		P
	b) Operating instructions		P
	c) Maintenance and servicing instructions		P
	d) Warnings and instructions for tools with a liquid system		N/A
8.14.3	Information about the mass or weight of the tool, if any, is the mass specified in 5.17.		P
9	**PROTECTION AGAINST ACCESS TO LIVE PARTS**		N/A
9.1	Tools so constructed and enclosed that there is adequate protection against accidental contact with live parts, even after removal of detachable parts and soft materials	Replaced by Annex K	N/A
9.2	Accessible part not considered live if it is:	Not applicable in Annex K	N/A
	- supplied with SELV		N/A
	- or separated from live parts by protective impedance, d.c. current not exceeding 2 mA		N/A
	- or separated from live parts by protective impedance, a.c. peak value not exceeding 0.7 mA		N/A
	- for peak value 42.4 V up to and including 450 V capacitance not exceeding 0.1 μF		N/A
	- for peak value 450 V up to and including 15 kV discharge not exceeding 45 μF		N/A
9.3	Lamps located behind a detachable cover are not removed	Replaced by Annex K	N/A
	Protection against contact with live parts of the lamp cap ensured during insertion or removal of lamps located behind a detachable cover		N/A
	Test probe B of IEC 61032:1997 applied with a force of ≤5 N		N/A
	Opening does not allow entry of test probe B of IEC 61032:1997, rigid test probe applied with a force of 20 N		N/A
	Test with probe B of IEC 61032:1997 repeated		N/A
	Test probe does not touch live parts or live parts protected only by lacquer, enamel, ordinary paper, cotton, oxide film, beads or sealing compound		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
9.4	Test probe 13 of IEC 61032:1997 applied with a force ≤5 N through openings in class II tools and class II constructions	Not applicable in Annex K	N/A
	Exception: openings giving access to lamp caps and live parts in socket-outlets		N/A
	Test probe is also applied through openings in earthed metal enclosures having a non-conductive coating such as enamel or lacquer.		N/A
	Not be possible to touch live parts with the test probe		N/A
9.5	Class II tools and class II constructions, adequate protection against accidental contact with basic insulation and metal parts separated from live parts by basic insulation only	Replaced by Annex K	N/A
	Parts not separated from live parts by double or reinforced insulation are not accessible		N/A
	Probe B of IEC 61032:1997 cannot contact basic insulation through openings in Class II tools or Class II constructions		N/A
10	**STARTING**		N/A
10.1	Motors start under normal voltage conditions	Not applicable in Annex K	N/A
	Starting ten times at 0.85 times rated voltage without load (V) ..... :		N/A
	Starting ten times at 1.1 times rated voltage without load (V) ..... :		N/A
	Tool operated and overload protection devices incorporated in the tool did not activate.		N/A
	Centrifugal and other automatic starting switches operate reliably and without contact chattering		N/A
10.2	Input current drawn at (2,0 ±0,2) s after starting does not exceed 30 A…	Not applicable in Annex K	N/A
	… or 4 times the rated current of the tool		N/A
11	**INPUT AND CURRENT**		N/A
	Marked power input or current is at least 110% of measured no-load input or current ..... :	Not applicable in Annex K	N/A
	Tool marked with more than one rated voltage, test made at each rated voltage ..... :	Not applicable in Annex K	N/A
	Tools marked with one or more rated voltage ranges, test made at both the upper and lower limits of the ranges ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Marking of the rated input is related to the mean value of the relevant voltage range, test is made at a voltage equal to the mean value of that range.....:		N/A
12	**HEATING**		N/A
12.1	No excessive temperatures attained at rated input or rated current.....:	Replaced by Annex K	N/A
	Temperature rise determined according to Clauses 12.2 to 12.5		N/A
	Test of Clause C.3 at 1,06 times the rated voltage under heated conditions		N/A
12.2	Tool is operated at each rated voltage; load conditions as specified in 12.2.1; torque applied is measured and maintained; voltage is then adjusted to 0,94 times and 1,06 times the rated voltage	Not applicable in Annex K	N/A
	Tool with a rated voltage range is operated at - the lower limit of the rated voltage range; conditions as specified in 12.2.1; torque applied is measured and maintained; voltage is then adjusted to 0,94 times the lower limit of the rated voltage range - the upper limit of the rated voltage range; conditions as specified in 12.2.1; torque applied is measured and maintained; voltage is then adjusted to 1,06 times the upper limit of the rated voltage range		N/A
	Temperatures are measured at the most unfavourable of the voltage settings used		N/A
	Temperatures measured by means of thermocouples are taken while the tool is operating		N/A
12.2.1	Loading conditions during temperature test.....:	Not applicable in Annex K	N/A
	Tool without inherent operating cycle is operated with a torque load to draw rated input or rated current until thermal equilibrium is reached		N/A
	Tool with an inherent operating cycle is operated with a torque load to draw rated input or rated current during each operating cycle; tool was cycled consecutively for 30 min		N/A
12.3.1	Heating elements, if any, are operated under the conditions specified in Clause 11 of IEC 60335-1:2010; tool was operated at 1,06 times the rated voltage	Not applicable in Annex K	N/A
12.3.2	Tool provided with automatic cord reel, one third of the total length of the cord was unreeled	Not applicable in Annex K	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
12.3.2	Temperature rise was determined near to the hub of the reel and between the two outermost layers of the cord on the reel	Not applicable in Annex K	N/A
	Cord storage devices, other than automatic cord reels, intended to accommodate the supply cord partially while the tool is in operation, 50 cm of the cord is unwound		N/A
	The temperature rise of the stored part of the cord is determined at the most unfavourable place.		N/A
12.4	Temperature rises, other than those of windings, determined using thermocouples chosen and positioned to have the minimum effect on the temperature of the part tested	Not applicable in Annex K	N/A
	Temperature rise of electrical insulation, other than windings, measured on surface of insulation		N/A
	When possible, temperature rises of windings determined by resistance method		N/A
	For handles, knobs, grips and the like, all parts considered which are gripped in normal use, and, if of insulating material, to those parts in contact with hot metal		N/A
12.5	Temperature rises did not exceed values in Tables 1a and 1b, except as allowed by 12.6	Not applicable in Annex K	N/A
	Protective devices did not operate		N/A
	Sealing compounds did not flow		N/A
12.6	When winding temperatures exceeded values in Table 1, three additional samples successfully subjected to following tests:	Not applicable in Annex K	N/A
	a) Heat treatment for 240 h at the specified cabinet temperature (°C): .....:		N/A
	b) No interturn short circuit after oven treatment		N/A
	c) Humidity treatment in accordance with 14.1		N/A
	d) Tests of Annex D .....:		N/A
13	**RESISTANCE TO HEAT AND FIRE**		N/A
13.1	Relevant parts sufficiently resistant to distortion due to heat	Replaced by Annex K	N/A
	Parts of thermoplastic material: - provided as enclosure to comply with Clause 9, - supporting current carrying parts, - providing supplementary or reinforced insulation, sufficiently resistant to distortion due to heat		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Relevant parts subjected to ball-pressure test acc. to IEC 60695-10-2	See Table 13.1	N/A
13.2	Part of non-metallic material, except as listed in this clause, resistant to ignition and spread of fire	Replaced by Annex K	N/A
	Parts of non-metallic material other than - material classified at least HB40 per IEC 60695-11-10:2013, provided test sample not thicker than relevant part, - material with a glow wire ignition temperature of at least 575 °C per IEC 60695-2-13:2010, provided that the test sample was no thicker than the relevant part, comply with glow-wire test of IEC 60695-2-11:2000 at 550 °C	See Table 13.2	N/A
	Soft, foamy, and similar materials which cannot be subjected to glow wire test complies with ISO 9772:2012 for category HBF material with test sample not thicker than relevant part		N/A
14	**MOISTURE RESISTANCE**		N/A
14.1	Tools are proof against likely humid conditions	Not applicable in Annex K	N/A
	Tool subjected to humidity treatment test for 48 h		N/A
	Relative humidity (93 ± 2) %.....:		N/A
	Temperature (20…30 °C) maintained at ± 1K.....:		N/A
	Samples pre-conditioned to between t and t + 4 °C:		N/A
	No excessive leakage after humidity treatment.....:	See Table C.2A	N/A
	No flashover or breakdown occurred during test of Annex D after humidity treatment.....:	See Table D.2	N/A
	No flashover or breakdown occurred during additional test of D.2 between accessible metal parts and supply cord wrapped with metal foil.....:	See Table D.2	N/A
14.2	Degree of protection for tool enclosure according to tool classification (IP Code).....:	Not applicable in Annex K	N/A
14.2.1	Tool not connected to the supply and turned continuously through most unfavourable positions		N/A
	Removable parts are removed and subjected to the relevant treatment with the main part.....:		N/A
14.2.2	Tool rated IPX1 through IPX7 subjected to applicable tests of IEC 60529:2013		N/A
	For IPX7 test, tool immersed in water containing 1,0 % NaCl		N/A
	Tool withstood electric strength test of Annex D after moisture treatment	See Table D.2	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	No trace of water on insulation causing reduction of creepage and clearance below values in 28.1		N/A
14.3	No increased risk of electrical shock from liquid systems or spillage of liquid	Not applicable in Annex K	N/A
	Residual current device is disabled		N/A
	Removable parts, except those fulfilling the test of 21.22., are removed		N/A
	Tool prepared as described in 8.14.2		N/A
	Liquid container filled, then 15% or 0,25 l added.....:		N/A
	Detachable liquid container mounted and dismounted 10 times		N/A
	No excessive leakage.....:	See Table C.3B	N/A
	No flashover or breakdown occurred during test of D.2 between live parts and accessible parts after drying for 24 h at ambient temperature.....:	See Table D.2A	N/A
14.4	No increased risk of electrical shock from liquid systems under pressure during operation	Not applicable in Annex K	N/A
	Residual current device is disabled		N/A
	Liquid system is subject to a hydrostatic pressure equal to twice the pressure stated in 8.14.2 d) 1) is applied for 1 h with 1,0 % NaCl solution		N/A
	Tool did not exceed maximum allowable leakage current during pressure application	See Table C.2B	N/A
	No flashover or breakdown occurred during test of D.2 between live parts and accessible parts after drying for 24 h at ambient temperature.....:	See Table D.2	N/A
14.5	Residual current devices complied with IEC 61540:1999 and met requirements a) to c)	Not applicable in Annex K	N/A
	a) RCD disconnected only both mains conductors when leakage exceeded 10 mA with a maximum response of 300 ms		N/A
	Test conducted according to 9.9.2 of IEC 61540:1999, and earthing conductor stayed connected		N/A
	b) RCD operated correctly for all 50 cycles		N/A
	c) RCD cannot be removed during use or routine normal maintenance (i.e., residual current device fixed to tool or power supply cord connected to tool)		N/A
	RCD fitted in supply cord provided with Type Y or Z attachment for connection to supply cord and interconnection cord		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
15	**RESISTANCE TO RUSTING**		P
15.1	Ferrous parts adequately protected against rusting		P
	Parts used to conduct electricity subjected to test..:	Not applicable	—
	Mechanical parts mechanical parts specified in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 subjected to test .....:	Not applicable	—
	All grease removed from the parts to be tested by immersing them in a degreasing agent for 10 min		N/A
	Parts were immersed for 10 min in a 10 % solution of ammonium chloride in water at (20 ± 5) °C		N/A
	Without drying, all drops shaken off, and parts placed for 10 min in a box containing air saturated with moisture at (20 ± 5) °C		N/A
	After parts dried for 10 min in a heating cabinet at (100 ± 5) °C, no evidence of rust on surfaces		N/A
	Small helical springs and the like and parts exposed to abrasion covered by a layer of grease		N/A
16	**OVERLOAD PROTECTION OF TRANSFORMERS AND ASSOCIATED CIRCUITS**		N/A
16.1	No excessive temperatures occurred during short circuit in transformer or circuits associated with it for a tool supplied from a transformer.....:	See Table 16.1	N/A
	Insulation on conductors of SELV circuits was within 15 K of Table 1	Not applicable in Annex K	N/A
	Temperature of transformer windings did not exceed values in Table 3		N/A
	Transformer complies with IEC 61558-1		N/A
	Power limited by (short-circuit protective device) ...:		—
17	**ENDURANCE**		N/A
17.1	Construction prevents electrical or mechanical failures that might impair compliance with this standard.	Not applicable in Annex K	N/A
	Insulation not damaged		N/A
	Connections did not work loose		N/A
	Overload protection devices did not activate		N/A
	No flashover or breakdown occurred during test of Annex D, test voltages reduced to 75 per cent, after tests of 17.2 and 17.3	See Table D.2	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
17.2	No load intermittent operation (2 x 24 h) for hand-held tools	Not applicable in Annex K	N/A
	No load intermittent operation (2 x 12 h) for transportable tools		N/A
	Test voltage at each operation (V) .....:		—
	Rate of operation (100s “on”, 20s “off”).....:		—
	Three test positions selected for hand-held tools ...:		—
	Normal working position(s) for transportable tools .:		—
	Operation time for each position .....:		—
	Servicing of carbon brushes and lubricant.....:		N/A
	Replacement of parts due to mechanical failure ....:		N/A
	Forced cooling or rest periods if temperature exceeded values in Table 1.....:		N/A
	No operation of overload protection devices		N/A
17.3	Tools with Centrifugal switches operated for 10,000 cycles	Not applicable in Annex K	N/A
	Number of operations under normal load .....:		N/A
	Rate of operations (s “on”, s “off”) .....:		N/A
	Test voltage 0.9 x rated Voltage (V).....:		N/A
18	**ABNORMAL OPERATION**		P
18.1	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.	Replaced by Annex K	N/A
18.1.1	Tool did not emit flames or molten metal		N/A
	Compliance with Clause 9 maintained		N/A
	No flashover or breakdown occurred during test of Annex D between live parts and accessible parts after tests of clause 18	See Table D.2	N/A
	Tool still operable and continues to comply with 19.1 but without repeating the tests of Clause 20		N/A
18.2	Fuses, thermal cut-outs, overcurrent protection devices used to provide the necessary protection	Not applicable in Annex K	N/A
	Electronic circuits relied upon for protection evaluated for this safety critical function as in clause 18.8.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
18.3	Tool with series motor operated without accessories at no load for 1 min at 1,3 times rated voltage, or upper limit of voltage range (V) .....:	Not applicable in Annex K	—
	No parts were ejected from the tool		N/A
	Speed limiting device operated		—
18.4	Tools with multiphase motor tested, started from cold, with one phase disconnected, and under the torque produced while operated at rated voltage or the mean value of the rated voltage range with rated input or rated current - for 30 s tests for tool kept switched on by hand or continuously loaded by hand - for 5 min test for other tools.....:	Not applicable in Annex K	N/A
	30 s tests for tool kept switched on by hand or continuously loaded by hand		N/A
	5 min test for other tools .....:		N/A
	After the test, or at the instant of operation of fuses, thermal cut-outs, motor protection devices and the like, the temperature of the windings complied with the limits in Table 3		N/A
	Max winding temperature recorded (°C).....:		—
18.5	Class I tool with class II construction and class II tool subjected to running overload conditions	Not applicable in Annex K	N/A
	Tools with series motor, test of 18.5.1		N/A
	Class I tool with class II armature test of 18.5.2 instead of 18.5.1		N/A
	Tool with electronically commutated stator windings, test 18.5.4		N/A
	Tool with other motor, test of 18.5.3		N/A
	Lawn and garden machinery, test as specified in relevant part of IEC 62841-4 .....:		N/A
18.5.1	All fuses, thermal cut-outs, overload protectors and the like that are accessible or can be reset by the user without the aid of a tool and any self-resetting protective devices were shorted		N/A
	Functions of electronic circuits that prevent the tool from operating at 160 % rated current disabled ....:		N/A
	Functions of electronic circuits that prevent the tool from operating at 160 % rated evaluated as safety critical functions as in 18.8. .....:		N/A
	Test circuit minimum 12 kVA.....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Leakage current between live parts and accessible parts measured as in Clause C.3 did not exceed 2 mA throughout the test and until stabilization afterwards.....:	See Table C.3C	N/A
	Tool operated for 15 min, or until the tool open-circuited, or flame appeared.....:		N/A
	160% rated test current (A) .....:		—
	Tool operated at rated voltage (V) .....:		—
	Overload condition existed for (_min, _sec) .....:		—
	Condition continued until the tool open-circuited, or flame appeared or 15 minutes expired .....:		N/A
	Elements that opened in case an open circuit occurred .....:		N/A
	When flames appeared, extinguished by CO_2 extinguisher		N/A
	Tool did not operate after 15 min, cooled to ambient temperature and subjected to test of D.2 at 1500 V between live parts and accessible parts	See Table D.2	N/A
	Tool still operated after 15 min, cooled to ambient temperature and subjected to test of D.2 at 2500 V between live parts and accessible parts	See Table D.2	N/A
	Tool permanently open-circuited due to over temperature condition (except opening of a motor winding), test repeated.		N/A
	Non-self-resetting thermal limit function of an electronic circuit bypassed or evaluated as a safety critical function in 18.8.		N/A
	Tool permanently open-circuited for reasons other than above, the cause is determined and bypassed in a new sample, test repeated		N/A
18.5.2	Test circuit minimum 12 kVA applied to armature..:		N/A
	Leakage current between commutator segments and the armature shaft measured did not exceed 2 mA throughout the test and until stabilization afterwards.....:		N/A
	1,06 times rated voltage (V) applied between opposite commutator segments .....:		—
	160% rated test current (A) .....:		—
	Current applied for 15 min, or until the armature open-circuited, or flame appeared .....:		N/A
	When flames appeared, extinguished by CO_2 extinguisher		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Armature cooled to ambient temperature and subjected to test of D.2 at 1500 V between commutator segments and the armature shaft	See Table D.2	N/A
18.5.3	Test circuit minimum 12 kVA.....:		N/A
	Tool stalled, capacitors in circuit of auxiliary windings are open-circuited		N/A
	Test repeated with capacitors short-circuited one at a time unless they are of class P2 of IEC 60252-1		N/A
	Operated at rated voltage (V).....:		—
	Test duration (min, s).....:		—
	Temperature of the windings did not exceed the relevant value specified in Table 3		N/A
	Conditions of 18.1.1 fulfilled		N/A
18.5.4	Motors with electronically commutated stator windings, all possible static faults of the outputs of the motor drive circuitry considered		N/A
	Protective function prevent these faults evaluated as an SCF according to 18.8 with minimum PL = a ....:		N/A
	All fuses, thermal cut-outs, overload protectors and the like that are accessible or can be reset by the user without the aid of a tool and any self-resetting protective devices were shorted		N/A
	Leakage current between live parts and accessible parts measured as in Clause C.3 did not exceed 2 mA throughout the test and until stabilization afterwards.....:	See Table C.3D	N/A
	Voltage applied for 15 min, or until the armature open-circuited, or flame appeared .....:		N/A
	Source voltage of the motor drive circuitry.....:		N/A
	When flames appeared, extinguished by CO_2 extinguisher		N/A
	Any motor windings open-circuited after 15 min, motor cooled to ambient temperature and subjected to test of D.2 at 1500 V between live parts and accessible parts	See Table D.2	N/A
	No motor windings open-circuited after 15 min, motor cooled to ambient temperature and subjected to test of D.2 at 2500 V between live parts and accessible parts	See Table D.2	N/A
18.6	No hazards from electric shock, fire or accessible moving parts occurred under fault conditions of 18.6.1		P
	Tool operated at rated voltage (V) .....:	Fully-charged battery pack	—

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Clause	Requirement + Test	Result - Remark	Verdict
	No charring or burning of the gauze or tissue paper occurred		P
	Protection against electric shock as in Clause 9 maintained	No hazardous voltage	N/A
	Protection against accessibility to moving parts as in 19.1 maintained		P
	Evaluation not performed for low power circuits as in Annex H if no SCF can be lost .....:		N/A
	Circuit encapsulated with an insulating material with a minimum thickness of 0,5 mm and no SCF can be lost, circuit evaluated by open-circuiting and short-circuiting within the encapsulated circuit.....:		N/A
	Fuses, thermal cut-outs, thermal links, temperature limiters, electronic devices or any components or conductors operated, and		N/A
	– test repeated twice, using two more samples; or		N/A
	– tool withstands test of 18.6.1 with the fuse, thermal cut-out or thermal link bridged; or		N/A
	–miniature fuse link complying with IEC 60127 operates and tool withstands test of 18.6.2		N/A
	Tool withstood the particular test as a conductor of a PCB open-circuited, and		N/A
	– creepage or clearances between live parts and accessible metal parts not reduced below values in 28 due to loosened conductors, and		N/A
	– tool withstood repeated tests with the open-circuited conductor bridged, or		N/A
	– test repeated twice, using two more samples		N/A
18.6.1	Fault conditions a) to f) conducted as applicable	See Table 18.6.1	P
18.6.2	Tests repeated with fuse-link replaced by an ammeter when during fault conditions of 18.6.1, safety of the tool depended on operation of a miniature fuse-link complying with IEC 60127-3,		N/A
	– Circuit not considered to be adequately protected when current measured was ≤ 2.1 times the rated current of fuse-link, and test conducted with fuse-link short-circuited (A).....:		N/A
	– Circuit considered adequately protected when current measured was ≥ 2.75 times the rated current of fuse-link (A) .....:		N/A
	– Fuse-link short-circuited when current measured was 2.1-2.75 times the rated current of fuse-link, and test conducted as follows (A).....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
18.7	Switches and devices for motor reversal withstood stresses occurring when rotation reversed 25 times under running conditions at rated voltage at no-load (V) ..... :		N/A
18.8	**Electronic circuits providing safety critical functions (SCF)**		—
18.8.1	Electronic circuits providing SCF are reliable and not susceptible to loss of SCF due to electro-magnetic environmental stresses	Details see attachment 1	P
	No SCF lost after tests of 18.8.2 to 18.8.6 for circuits with no internal clock frequency or oscillator frequency > 15 MHz		N/A
	No SCF lost after tests of 18.8.2 to 18.8.7 for other electronic circuits		P
	Test voltage was rated voltage or the mean value of the rated voltage range ..... :	Fully charged battery pack	P
	Difference between upper and lower limit of rated voltage range > 20 % of its mean value, test at both upper and lower limits of the rated voltage range... :		N/A
	After evaluation using 18.6.1, no loss of any SCF or tool in a safe state under any present fault condition.		P
	Concept of 18.6.1 not appropriate, reliability evaluated using ISO 13849-1.		P
	Required performance levels ..... :	See Table 18.8.1A	P
	If only $MTTF_d$ is applied to achieve the required PL: $MTTF_d$ is 5/20/50 years for PL = a/b/c		P
	Software used in circuits of programmable devices whose failure would create loss of safety critical function, complied with software class B requirements as in H.11.12.3 of IEC 60730-1:2010	See Table 18.8.1B	N/A
	In the case where software class B is realized by single channel with periodic self-test, an acceptable period is regarded as either after each activation of the power switch or a maximum of 5 min.		N/A
	Class B realized by single channel, periodic self-test either after each activation of the power switch or at least every maximum 5 min		N/A
	H.11.12.3.4.1 applicable for SCF with a PL ≥ c		N/A
18.8.2	Electrostatic discharges as in IEC 61000-4-2:2008 applied to tool, test level 4 used for air discharge and test level 3 for contact discharge, ten / ten discharges having a positive / negative polarity applied		P

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Clause	Requirement + Test	Result - Remark	Verdict
18.8.3	Fast transient bursts as in IEC 61000-4-4:2012 applied to tool, test level 3 used. Repetition frequency 5 kHz for 2 min / 2 min with a positive / negative polarity		N/A
18.8.4	Voltage surges as in IEC 61000-4-5:2005 applied to power supply terminals, five positive impulses and five negative impulses applied at the selected points		N/A
	Test level 3 applied for line-to-line coupling mode, a generator with 2 Ω source impedance being		N/A
	Test level 4 applied for line-to-earth coupling mode, a generator with 12 Ω source impedance being		N/A
	Tools has surge arresters incorporating spark gaps, test was repeated at 95 % of the flashover voltage		N/A
18.8.5	Injected currents as in IEC 61000-4-6:2008 applied to tool, test level 3 applicable, all frequencies between 0,15 MHz to 230 MHz covered		N/A
18.8.6	Class 3 voltage dips and interruptions in accordance with IEC 61000-4-11:2004 applied to tool		N/A
	Values of Tables 1 and 2 of IEC 61000-4-11:2004 were applied at zero crossing of the supply voltage		N/A
18.8.7	Radiated fields in accordance with IEC 61000-4-3:2010 applied to tool, test level 3 applicable		P
	Frequency ranges 80 MHz to 1 000 MHz tested		P
19	**MECHANICAL HAZARDS**		P
19.1	Adequate protection against injury provided against moving and other dangerous parts		P
	Protective enclosures, covers, and the like have adequate mechanical strength and cannot be removed without the aid of a tool		P
	Adjustable guard used as protection of the working element has easily accessible means of accurate adjustment	No adjustable guard	N/A
	No dangers from adjusting the guards		N/A
	No contact with dangerous moving parts using probe B of IEC 61032:1997, test force ≤ 5N		P
	Any soft materials removed prior to the test		P
19.2	No hazardous ragged or sharp edges, other than necessary for the functioning of the tool		P
19.3	No contact with dangerous moving parts through dust collection openings, using probe B of IEC 61032:1997, test force ≤5N	No dust collection	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.4	Hand-held tool has at least one handle or grasping surface for safe handling during use		P
	Transportable tools provided with at least one handle, grasping surface or the like for safe transportation		N/A
	Lawn and garden machinery has adequate grasping surfaces for safe handling during use		N/A
19.5	Tool allows visual check of the contact of cutting tool with workpiece		P
19.6	Marking with rated no-load speed required, measured no-load speed of the spindle did not exceed 110 % of the rated no-load speed	Not applicable	N/A
19.7	Transportable tool or lawn and garden machinery intended to be used on a surface such as the floor or a table has adequate stability	Not applicable	N/A
	10° tilting test, tool or machinery did not tip over		N/A
	Tested with doors open and closed		N/A
	Filled with most unfavourable quantity of water or the recommended liquid		N/A
19.8	Transportable tool provided with wheels identified in the relevant part of IEC 62841-3 has adequate stability during transportation	Not applicable	N/A
	10° tilting test, tool did not tip over		N/A
19.9	Fixed guards to be removed to convert the tool or to change the accessory, fastenings remains attached to the guard or to the machinery	No such guards	N/A
	Fastening not completely removed and considered as still attached		N/A
20	**MECHANICAL STRENGTH**		P
20.1	Adequate mechanical strength to withstand rough handling	Replaced by Annex K	N/A
	No flashover or breakdown occurred during test of Annex D between live parts and accessible parts after tests of clause 20.2-20.4	See Table D.2	N/A
	No live parts became accessible		N/A
	No creepage distances or clearances below the values of 28.1		N/A
	Mechanical safety of the tool as required by this standard not impaired		N/A
	Inner cover withstood test after removal of the decorative cover		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
20.2	Three blows applied to every weak point of enclosure by spring-operated impact test apparatus in Clause 5 of IEC 60068-2-75:1997		P
	Brush cap impact energy (Nm)..... :	No such part	—
	Other part impact energy (Nm)..... :	1.0	—
	Blows applied each point of the enclosure likely to be weak ..... :	Applied to enclosure	P
	Blows applied to guards, covers, handles, levers, knobs and the like as necessary ..... :	Applied to switch trigger	P
20.3	Test of 20.3.1, 20.3.2 or the relevant part of IEC 62841-4 applied, as applicable		P
20.3.1	Hand-held tool withstood impact of 3 varied drops on a concrete surface from 1 m	Replaced by Annex K	N/A
	Separable accessories were not mounted		N/A
	Any attachments provided as specified in instructions, test repeated with each attachment or combination of attachments mounted to a separate tool sample		N/A
20.3.2	Transportable tool withstood impact with Ø (50 ± 2) mm, (0,55 ± 0,03) kg steel sphere, travelling vertically by (1,3 ± 0,1) m.		N/A
	Drop test applied to part of the tool that can be impacted from above		N/A
	Pendulum test applied to part of the tool that cannot be impacted from above		N/A
	Guard became disassembled but could be reassembled to function properly.		N/A
	Guard became deformed but could be restored to its original shape		N/A
	Other damage, except to guard, accepted, as tool was incapable of normal operation		N/A
20.4	Adequate mechanical strength of brush holder and their caps		N/A
	Brush cap removed and replace 10 times applying specified tightening torque		N/A
	Tightening torque (Nm)..... :		—
	No damage to brush holders impairing its further use, thread not damaged, cap shows no cracks		N/A
20.5	Handles and grasping surfaces have adequate mechanical strength to provide insulation between grasping area and output shaft		P

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	A separate sample subjected to a single impact from 1m onto a concrete surface on each handle and each recommended grasping surface		P
	No flashover or breakdown occurred during test of D.2 at 1250 V a.c. between handles and grasping surfaces in contact with foil and the output shaft of the tool	See Table D.2	P
21	**CONSTRUCTION**		P
21.1	Hazardous accidental changing of settings to suit different voltages or speeds unlikely to occur		P
21.2	Accidental changing of settings of control devices unlikely to occur		P
21.3	Removal of parts ensuring required degree of protection against moisture not possible without aid of a tool		N/A
21.4	Fixing of handles, knobs and the like, used to indicate position of switches or similar components in a hazardous wrong position, was not possible		N/A
21.5	Replacement of a flexible cable or cord requiring displacement of a switch was possible without subjecting internal wiring to undue stress	Not applicable in Annex K	N/A
	After repositioning of the switch and before reassembling the tool, verification of correct positioning of internal wiring was possible		N/A
21.6	Wood, cotton, silk, paper and similar fibrous or hygroscopic material not used as insulation, unless impregnated or chemically rendered non-fibrous	Not applicable in Annex K	N/A
21.7	Ordinary driving belts not relied upon to provide required insulation	Not applicable in Annex K	N/A
	Special belt design employed to allow use as electrical insulation		N/A
21.8	Insulating barriers of Class II tools, and parts of Class II tools serving as supplementary or reinforced insulation are:	Not applicable in Annex K	N/A
	- fixed such that they cannot be removed without being seriously damaged; or		N/A
	- so designed that they cannot be replaced in an incorrect position, and when omitted, the tool will be inoperable or manifestly incomplete		N/A
21.9	Inner conductors of a flexible cable or cord are used as wiring within class II construction and insulated from accessible metal parts by:	Not applicable in Annex K	N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- the sheath of the supply cord itself, this sheath not being exposed to undue thermal stress, clamping against accessible metal or other mechanical stress that could cause damage to it; or		N/A
	- a sleeve, tubing or barrier complying with the requirements of supplementary insulation.		N/A
21.10	Air-intake of motor enclosures not excessively large	Not applicable in Annex K	N/A
	6 mm steel ball test applied to air-intake openings other than those adjacent to fan		N/A
21.11	No hazards from parts of Class I tool such as wire, screw, nut, washer or spring becoming loose or falling out of position, and accessible metal not made live	Not applicable in Annex K	N/A
	Clearance and creepage distances of Class II tool or class II construction not reduced to less than 50% of values shown specified in 28.1		N/A
	Class II tool or Class II construction, other than those of the all-insulated type, provided with an insulating barrier between accessible metal and motor parts and other live parts		N/A
	Class I tool with adequately fixed parts, barriers, and sufficiently large creepage and clearances		N/A
	All wires secured in place independent of terminal connection or solder		N/A
21.12	Supplementary and reinforced insulation not impaired by deposition of dirt, or dust resulting from wear of parts within the tool to the extent that creepage and clearances would be reduced	Not applicable in Annex K	N/A
	Ceramic material not tightly sintered and similar materials, and beads alone, not used as supplementary or reinforced insulation		N/A
	Parts of Elastomer, natural or synthetic rubber used as supplementary insulation are resistant to aging		N/A
	Rubber parts so arranged and dimensioned that creepage distances not reduced below values in 28.1, even when cracks occurred		N/A
	Insulated material for embedded heating conductors serves only as basic insulation		N/A
	Ageing test for Elastomer and rubber parts for 70 h at 100±2°C		N/A
	No flashover or breakdown occurred during test of D.2, test voltages reduced to 75 per cent .....:		N/A
	Rubber parts tested .....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Immersion test for ceramic material on tight sintering in specified fuchsine solution under no less than 15 MPa		N/A
	Test pressure applied (MPa) .....:		N/A
	Test duration (h).....:		N/A
	After the test, freshly broken surfaces did not show any trace of dye visible with normal vision		N/A
	Ceramic parts tested.....:		—
21.13	Internal wiring, windings, commutators, slip rings and the like, and insulation in general, not exposed to oil, grease, and similar substances	Not applicable in Annex K	N/A
	Adequate insulation properties of oil, grease, and similar substances used for lubrication of gears and the like with no effect on insulation		N/A
21.14	No access to brushes without aid of a tool	Not applicable in Annex K	N/A
	When tightening screw-type brush-caps, two surfaces clamped together		N/A
	Locking device retaining brushes in position do not depend upon brush spring tension		N/A
	Screw-type brush-caps accessible from the outside of the tool made of or covered with insulating material of adequate strength, and not projecting beyond surrounding surface of the tool		N/A
21.15	Tool employing a liquid system protects the user against increased risk of shock due to presence of liquid under normal use and faults of liquid system	Not applicable in Annex K	N/A
	Tools employing liquid system constructed as Class III tools, or		N/A
	- class I or II and provided with a residual current device, and complying with 14.3-14.5, or		N/A
	- class I or class II and designed for use in combination with an isolating transformer and complying with 14.3 and 14.4		N/A
21.16	Tool with compartment accessible without the aid of a tool and likely to be cleaned in normal use, the electrical connections are not subject to pulling during cleaning		N/A
21.17	Tool is fitted with a power switch to control the motor		P
	Switch actuator easily visible and accessible		P

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
21.17.1	For tools incorporating a switch with a lock-off device, and switch trigger is operated by squeezing action closing the fingers towards the palm of the hand, lock-off system designed to ensure sufficient durability against abuse and environmental conditions to prevent start by the switch trigger alone	Switch with lock-off device	P
21.17.1.1	Relevant tool housing is kept for 1 h in a heating cabinet at 80 °C .....:	80°C, 1h	P
21.17.1.2	Additional test of 21.17.1.2 for lock-off devices that are self-restoring to the lock-off position		P
	Number of cycles as per 23.1.10.2 .....:	Modified by Annex K	N/A
21.17.1.3	Push force of Table 7 applied to most unfavourable point of the switch actuating member.....:	Single finger trigger length: 20.2 mm Applied force: 100N	P
	The switch did not actuate		P
	The switch and its lock-off system operated as designed after the applied force was terminated		P
21.18	Requirements of 21.18.1, 21.18.2 or the relevant part of IEC 62841-4 observed, as applicable		P
21.18.1	Hand-held tool fitted with momentary power switch, unless without a relevant part of IEC 62841-2 and without a substantial risk from continued operation		P
	Switch can be switched on and off by the user without releasing any of the required handle(s) or grasping surface(s)		P
21.18.1.1	A momentary switch locking in “on” position unlocks automatically upon a single actuation motion without releasing the grasp on the tool	No lock-on device	N/A
	More than one switch, the lock-on switch(es), if any, is (are) within the grasping zone necessary to control the tool		N/A
	Any one of these switches automatically unlocks or makes ineffective all remaining lock-on devices with a single actuation motion without releasing the grasp on the tool		N/A
	Switch cannot be locked in “on” position when a risk with continued operation is defined by the relevant part of IEC 62841-2		N/A
21.18.1.2	Power switch triggers and lock-off devices so located, designed or guarded that inadvertent operation is unlikely to occur		P
	Tool did not start when 100 mm sphere is applied to the power switch, or		P
	Two separate and dissimilar actions necessary before the motor is switched		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
21.18.2	Transportable tool fitted with power switch easily actuated “on” or “off” without any reasonably foreseeable hazard		N/A
21.18.2.1	Power switch in transportable tools is of momentary type, or		N/A
	Voltage recovery following an interruption of the supply gives rise to a hazard		N/A
	Relevant part of IEC 62841-3.....:		—
21.18.2.2	“On”/”off” control capable of being turned off by the operator with a single straight-line motion		N/A
	Flap cover covers the stop button so that pushing the flap actuates the stop		N/A
21.18.2.3	Power switch so located, designed or guarded that unintentional movement to the “on” position is unlikely		N/A
	Tool did not start when 100 mm sphere is applied to the power switch, or		N/A
	Two separate and dissimilar actions necessary before the motor is switched		N/A
21.18.2.4	Push-pull switch is turned off by an inward push		N/A
21.19	Protection against electric shock not affected when screws removed during user maintenance are incorrectly replaced during reassembly	No hazardous voltage	N/A
	Creepage and clearances between live parts and accessible metal parts not reduced below values in 28.1 when screws are installed at improper screw locations		N/A
21.20	Tool marked with the first numeral of IP system complies with IEC 60529:2013.....:	IPX0	N/A
21.21	No risk of electrical shock from charged capacitors when touching pins of the plug	Not applicable in Annex K	N/A
	Max. voltage measured between pins of the plug is ≤ 34 V after 1 s after each disconnection (V) .....:		N/A
	Capacitors rated ≤ 0.1 μF		N/A
	Capacitors complying with the requirements for protective impedance specified in 9.2 and 21.34		N/A
21.22	Non-detachable protective parts either removable with the aid of a tool or reliably fixed		P
	Snap-in devices have an obvious locked position and have fixing properties that do not deteriorate		N/A
	Parts disassembled and assembled 10 times prior to test		P

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Parts affected by temperature tested immediately after conditions of Clause 12		N/A
	Test applied to all parts likely to be detached, whether or not fixed by screws, rivets, or similar parts		P
	Weak areas of the covers or parts subjected during 10 s to - 50 N push force		P
	- 50 N pull force if the shape of the part prevents easy slippage of fingertips		P
	- 30 N pull force if projection of the gripped part is less than 10 mm in the direction of removal		P
	Test fingernail of Fig. 1 inserted in apertures and joints with a force of 10 N and then slid sideways with a force of 10 N		P
	Axial pull unlikely, test fingernail of Fig. 1 inserted in apertures and joints with a force of 10 N to enable a force of 30 N for 10 s by means of a loop		P
	A torque of 2 Nm applied at the same time as pull or push force on parts 50 mm or smaller and likely to be subjected to twisting		N/A
	A torque of 4 Nm applied at the same time as pull or push force on parts larger than 50 mm and likely to be subjected to twisting		P
	Projection was less than 10 mm and required a torque of (Nm), test torque reduced .....:		N/A
	Parts not detached, and remained in locked position		P
21.23	Handles, knobs, grips, levers etc., withstood axial force of 30 N for 1 minute		P
21.24	Storage hooks and similar devices for flexible cords are smooth and well rounded		N/A
21.25	Current-carrying parts and other parts resistant to corrosion under normal use	Not applicable in Annex K	N/A
	After tests of Clause 15, no sign of corrosion on relevant parts		N/A
	Stainless steel and similar corrosion-resistant alloys and plated steel considered satisfactory		N/A
21.26	Insulation between parts operating at SELV and other live parts complies with the requirements for double insulation or reinforced insulation	Not applicable in Annex K	N/A
21.27	Insulation between parts separated by protective impedance comply with requirements for double or reinforced insulation	Not applicable in Annex K	N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
21.28	Shafts of operating knobs, handles, levers etc. not live unless their removal does not make the shaft accessible to test probe B of IEC 61032:1997	Not applicable in Annex K	N/A
21.29	Handles, levers, and knobs of non-class III tool held or actuated in normal use do not become live during an insulation fault	Not applicable in Annex K	N/A
	Metallic handles, levers, and knobs with shaft or fixings likely to become live due to basic insulation fault, either adequately covered by insulating material or their accessible parts separated from their shafts or fixings by insulation		N/A
	Exception for handles, levers, and knobs of transportable tools and lawn and garden machinery of class I .....:		N/A
	Covering or insulating material complies with Electric Strength test in D.2 at 1250 V	See Table D.2	N/A
21.30	Tool likely to cut into concealed wiring or own cord, handles and grasping surfaces - made of insulating material, or		P
	- metal covered by insulating material, or		N/A
	- their accessible parts are separated by insulating barrier(s) from accessible metal parts that may become live by the output shaft		N/A
	Insulated, stick type, auxiliary handle is provided with a flange ≥ 12 mm high above grasping surface between grasping area and accessible parts that may become live by the output shaft		N/A
	21.30 not applicable as per relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 .....:		N/A
21.31	Capacitors in class II tools not connected to accessible metal parts, and their metallic casings are separated from accessible metal parts by supplementary insulation	Not applicable in Annex K	N/A
	Capacitors tied to accessible metal parts comply with Clauses 9.2 and 21.34		N/A
21.32	Capacitors not connected between contacts of the thermal cut-outs	Not applicable in Annex K	N/A
21.33	Lamp holders used only for connection of lamps	Not applicable in Annex K	N/A
21.34	Protective impedance consists of at least two separate components with impedance unlikely to change significantly during lifetime of tool	Not applicable in Annex K	N/A
	When a component short or open-circuited, values in Clause 9.2 were not exceeded .....:		N/A
	Resistors comply with 14.1 of IEC 60065:2011 and capacitors comply with 14.2 of IEC 60065:2011 ....:		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Single Y1 capacitor acc. to IEC 60384-14 used instead of two separate components .....:		N/A
21.35	Tools is identified in the relevant part of IEC 62841-2 or IEC 62841-3 to produce a considerable amount of dust and has either integral dust collection/suction device or dust outlet(s)		N/A
	Dust discharge directed away from the operator		N/A
	Dust outlet with external suction device(s) does not impede the normal use of the tool		N/A
22	**INTERNAL WIRING**		**P**
22.1	Wireways smooth and free from sharp edges, cooling fins, etc		P
	Holes in metal through which insulated wires pass provided with bushings or, except as required by relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4, have smooth edges with radius ≥1,5 mm		N/A
	Wiring prevented from coming into contact with moving parts		P
22.2	Internal wiring adequately rigid, fixed or insulated such that creepage and clearances cannot be reduced below values in 28.1	No hazardous voltage	N/A
	Sleeving used as supplementary insulation on internal wiring, retained in position by positive means (removable only by breaking or cutting, or clamped at both ends)		N/A
22.3	Use of green or green/yellow conductors for earthing terminals only	Not applicable in Annex K	N/A
22.4	Aluminium wires not used for internal wiring		P
22.5	Stranded conductors with lead-tin soldering are only used with spring terminals with constant contact pressure, except when clamping means pose no risk of bad contact		P
22.6	No undue stress to electrical connections and internal conductors from tool parts movable to each other in normal use, during adjustment or user maintenance		N/A
	Flexible metallic tubes do not damage insulation of the conductors contained within them		N/A
	Open-coil springs not used to protect the wiring		N/A
	Adequate additional insulating lining when coiled spring is used		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Flexing test at a rate of ≤ 6/min, through the largest angle allowed by the construction		N/A
	Number of flexings 10 000 for conductors/ connections flexed during normal use; 2 000 for those flexed during adjustments; 100, for those flexed during user maintenance .....:		—
	Tool withstands test of Annex D between live parts and accessible parts	See Table D.2	N/A
	Live parts not accessible after test		N/A
23	**COMPONENTS**		P
23.1	Components comply with relevant IEC standards	See Critical Components Table	P
	Batteries are regarded as part of the tool and comply with Annexes K and/or L		P
	Components used in accordance with their markings		P
	Applied exceptions.....:		N/A
	Components not previously tested and found to comply with the relevant IEC standard for the number of cycles specified, tested to 23.1.1 … 23.1.11 .....:	Considered	P
23.1.1	Capacitors in auxiliary windings of motors marked with their rated voltage and rated capacitance .....:		N/A
23.1.2	Fixed capacitors for radio interference suppression comply with IEC 60384-14	Not applicable in Annex K	N/A
23.1.3	Small lamp holders similar to E10 lamp holders meet requirements for E10 lamp holders in IEC 60238		N/A
23.1.4	Isolating and safety isolating transformers comply with IEC 61558-1 and IEC 61558-2-4 or IEC 61558-2-6, as applicable		N/A
	Switch mode power supply units and transformers for such units comply with IEC 61558-2-16		N/A
23.1.5	Appliance couplers comply with IEC 60320, or		N/A
	Instructions provided to inform user to connect the tool with non-IEC appliance couplers		N/A
23.1.6	Automatic temperature controls with electromechanical contacts that cycle in normal use have suitable endurance		N/A
	Tests to IEC 60730-1:2010, Cl. 17, conducted under conditions occurring in the tool		N/A
	Type of controls used and number of cycles per Cl. 17 of IEC 60730-1:2010 (cycles).....:		N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Automatic controls comply with IEC 60730-1:2010, and are used in accordance with their marking		N/A
	Tests of Clause 17 of IEC 60730-1:2010 were not conducted on automatic controls because tool complies with this standard when protective device short-circuited		N/A
	Thermostats and temperature limiters tested in accordance with a specific exception in Note b) of Table 1 of Clause 12		N/A
23.1.7	Unless otherwise specified, tests on components per other standards conducted separately according to the relevant standard		N/A
	Component, marked and used per its markings		N/A
	Components not mentioned in Table 1 of Clause 12 tested as part of the tool		P
23.1.8	Components not separately tested and found to comply with the component standards as references in 23.1 or components not marked or not used in accordance with their marking, tested in accordance with the referenced relevant standard under the conditions occurring in the tool		P
	No IEC standard referenced in 23.1, no additional tests		P
23.1.9	Tool operated at 1,1 times rated voltage at no-load, capacitor voltage did not exceed 1.1 times its rated voltage (V) ..... :	Not applicable in Annex K	N/A
23.1.10	Switches constructed to prevent failure that might impair compliance with this standard	Replaced by Annex K	N/A
	Switches, separately tested and found to comply with IEC 61058-1:2008, comply with 23.1.10.1		N/A
	Switches, not separately tested and found to comply with IEC 61058-1:2008, or not complying with 23.1.10.1, tested as in 23.1.10.2 to 23.1.10.3		N/A
23.1.10.1	Power switches rated for a voltage and current not less than respective ratings of the tool	Not applicable in Annex K	N/A
	Power switches rated for a.c. in a.c. tools and d.c. in d.c. tools		N/A
	Electronic power switches are at least classified for Continuous Duty as in IEC 61058-1:2008		N/A
	Switches for motor-operated tools and lawn and garden machinery classified for resistive and motor load as in 7.1.2.2 of IEC 61058-1:2008, if this load occurs in normal use		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Switches for magnetically driven tools and lawn and garden machinery classified for inductive load as in 7.1.2.8 of IEC 61058-1:2008, if this load occurs in normal use		N/A
	Switches alternatively regarded as switches for a declared specific load as in 7.1.2.5 of IEC 61058-1:2008 and classified based on the load conditions of the tool in normal use		N/A
	Ratings and load classifications for switches other than power switches are based on the conditions encountered in the tool		N/A
	Power switches for hand-held tools classified for min. 50K operating cycles .....:		N/A
	Power switches for transportable tools and lawn and garden machinery classified for min. 10K operating cycles.....:		N/A
	Power switches with series electronics also endure 1000 operating cycles, electronics bypassed .....:		N/A
	Switches other than power switches, if likely to be switched under electrical load, endure 1 000 operating cycles, unless the requirements of this standard are met with the switch short-circuited		N/A
	Exception for switches other than power switches that cannot be operated under electrical load		N/A
	Exception for motor reversing switches		N/A
	Exception for switches other than power switches, classified for 20 mA load as in 7.1.2.6 of IEC 61058-1:2008		N/A
23.1.10.2	Adequate endurance properties of switches	Not applicable in Annex K	N/A
	Test of 17.2.4.4 of IEC 61058-1:2008 conducted at load specified in 23.1.10.2.1 or 23.1.10.2.2.....:		N/A
	Power switches for hand-held tools tested for 50K cycles.		N/A
	Power switches for transportable tools and lawn and garden machinery tested for 10K cycles		N/A
	Power switch contains mechanical contacts in series with electronic circuitry with one or more SSD and circuitry provides a protective function by reducing the current during switch operation, then test repeated on 3 samples for ≥ 1000 cycles with the electronics bypassed; or		N/A
	Protective function considered SCF and complies with the greater PL levels for power switches in 18.8		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Switches other than power switches, if likely to be switched while energized, tested for 1000 cycles under load conditions of normal use		N/A
	After tests all switches were able to be turned on and off and complied with the insulating compliance (TE3) of 17.2.5.3 of IEC 61058-1:2008 for basic insulation		N/A
23.1.10.2.1	Power switches for motor-operated tools and lawn and garden machinery classified to 7.1.2.2 of IEC 61058-1:2008 and tested with external load as specified		N/A
	Power switches for magnetically driven tools and lawn and garden machinery classified to 7.1.2.8 of IEC 61058-1:2008 and tested with external load as specified		N/A
	Switches other than power switches, but which would encounter the same load conditions as power switches in normal use, tested as specified		N/A
23.1.10.2.2	For switches tested using the motor or magnetic load encountered in the tool, tested at rated voltage for the required number of cycles; tool is switched on at no-load and switched off at rated current or rated input		N/A
23.1.10.3	Power switches of motor-operated tools and lawn and garden machinery have adequate breaking capacity	Not applicable in Annex K	N/A
	Locked-rotor test (TC9) of 17.2.4.9 of IEC 61058-1: 2008 at 6 times I-M or with locked motor, each period ≤ 0,5 s “on” and ≥ 10 s “off”		N/A
	Power switch showed no electrical or mechanical failure after test		N/A
23.1.11	Electronic power switches comply with 18.6 and 18.8		N/A
23.2	Tool not fitted with switches or automatic controls in flexible cords, except for protective devices such as RCDs		N/A
	Tool not fitted with devices causing the protection device in the fixed wiring to operate		N/A
	Tool not fitted with thermal cut-outs which can be reset by a soldering operation		N/A
23.3	Protection devices or circuits that switch off the tool are non-self-resetting where a risk associated with inadvertent starting is specified		P

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
23.4	Plugs and socket-outlets for ELV circuits and those used as terminal devices for heating elements not interchangeable with mains plugs and socket-outlets in IEC 60884, IEC/TR 60083 or IEC 60906-1 or with connectors and appliance inlets complying with IEC 60320-1		N/A
23.5	Motors connected to the supply mains with insulation inadequate for the rated voltage comply with Annex B		N/A
24	**SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CORDS**		**N/A**
24.1	Tool provided with a supply cord ≥1,8 m and with a plug; cord length (m) ..... :	Not applicable in Annex K	N/A
	Tool provided with a supply cord at least 1,8 m long and without a plug; cord length (m) ..... :		N/A
	Information for connection given in the instructions		N/A
	Tool provided with appliance inlet having at least same degree of protection against moisture as required for the tool		N/A
	Tool provided with a supply cord ≥ 0,2 m and ≤ 0,5 m and with a plug or other connector having at least same degree of protection against moisture as required for the tool; cord length (m) ..... :		N/A
	Plugs, connectors and inlets suitable for the ratings of the tool		N/A
24.2	Supply cord assembled to the tool by attachment type (specify X, Y, or Z) ..... :	Not applicable in Annex K	N/A
	Supply cord with type Z attachment is allowed as per relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 ..... :		N/A
	Supply cords with type X attachment are specially prepared cords only available from the manufacturer or its service agent ..... :		N/A
	Special cord includes part of the tool		N/A
24.3	Plugs fitted with only one flexible cord	Not applicable in Annex K	N/A
24.4	Supply cord not lighter than ordinary tough rubber sheathed flexible cord or ordinary PVC sheathed flexible cord	Not applicable in Annex K	N/A
	PVC cords not used if external metal parts exceed 75 K temperature rise during test of Clause 12		N/A
24.5	Nominal cross-section area of supply cord per Table 8 (mm2) ..... :	Not applicable in Annex K	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
24.6	Supply cord of class I tool has green or green/yellow core connected to internal earthing terminal of the tool, and to earthing contact of plug	Not applicable in Annex K	N/A
24.7	Lead-tin solder not used to consolidate leads under contact pressure, except when clamping means used prevents risk of a bad contact	Not applicable in Annex K	N/A
	Clamping screws alone not used for securing soldered leads		N/A
24.8	Moulding supply cord to any part has no effect on the insulation of the cord	Not applicable in Annex K	N/A
24.9	Supply cord protected against damage at its entry by flexible cord guard, or cord inlet, or bushing.....:	Not applicable in Annex K	N/A
24.10	Cord inlets and bushings shaped to prevent damage to supply cord	Not applicable in Annex K	N/A
	Cord inlet and bushings reliably fixed and not removable without the aid of a tool		N/A
24.11	In tools other than transportable tools, supply cord being flexed during operation is protected against excessive flexing at its entry.....:	Not applicable in Annex K	N/A
	Flexing test performed in apparatus shown in Fig. 2		N/A
	Weight attached to cable or cord (kg) .....:		—
	Oscillating member moved back and forth through an angle of 90° (45° on either side of the vertical) with rate of 60 flexings per minute		N/A
	After 10,000 flexings, sample turned through 90° about the centre of the cord entry		N/A
	Cord guard did not slip out from its location after completion of ten 1 sec lifts over 500 mm		N/A
	After the test, no conductor disconnected from terminal		N/A
	Number of strands versus number of broken strands of each conductor ≤ 10%.....:		N/A
24.12	In tools other than transportable tools, supply cord being flexed during operation is protected against excessive bending at its entry .....:	Not applicable in Annex K	N/A
	Cord guard fixed reliably and projects outside tool for a distance beyond inlet opening of at least 5 times the overall diameter of cord		N/A
	Mass attached to the free end of cord (g).....:		—
	Curvature of cable or cord is nowhere less than 1,5 times the external diameter of cord		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
24.13	Tool provided with cord anchorage to relieve conductors of cord from strain, twisting, and protect them from abrasion.	Not applicable in Annex K	N/A
	Pushing cord into the tool not possible		N/A
	Pull force was applied 25 times at the force shown in Table 9 (N) .....:		—
	After pull test, cord, unless on an automatic cord reel, subjected to torque in Table 9 for 1 min (Nm) :		N/A
	The cord was not damaged during the tests		N/A
	No appreciable strain at the terminals		N/A
	Cord longitudinal displacement (mm) .....:		N/A
	No appreciable strain at the connection		N/A
24.14	Cord anchorage either accessible only with the aid of a tool, or the cord can only be fitted using a tool	Not applicable in Annex K	N/A
24.15	Cord anchorages properly designed and located	Not applicable in Annex K	N/A
	Cord cannot touch clamping screws of the cord anchorage that not separated from accessible metal parts by supplementary insulation		N/A
	Cord not clamped by metal screw bearing directly on the cord		N/A
	Glands are not used as cord anchorages		N/A
	Class I tool, cord anchorage of insulating material or with insulating lining fulfilling basic insulation, if an insulation fault on the cord could make accessible metal parts live		N/A
	Class I tool, sheath of the cord considered adequate		N/A
	Class II tool, cord anchorage of insulating material or insulated by supplementary insulation (sheath of the cord alone not sufficient)		N/A
24.16	Cord anchorages for type X attachment properly designed and located	Not applicable in Annex K	N/A
	Cord anchorage allows easy replacement of cord		N/A
	Clear method of relief from strain and prevention of twisting		N/A
	Screws operated during cord replacement are not used to fix any other part		N/A
	Screws operated during cord replacement are used to fix other parts and, if omitted or incorrectly mounted, make the tool inoperative or clearly incomplete		N/A
	Parts fastened to the cord anchorage by the same screw could not be removed without the aid of a tool		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Conductors inserted into terminals, terminal screws tightened sufficiently to prevent conductors from easily changing their position, torque set at (Nm) ..:		N/A
24.17	Knots and tying strings for type X attachment are not used	Not applicable in Annex K	N/A
24.18	For type X attachment, space for supply cord provided inside or as a part of tool	Not applicable in Annex K	N/A
	- permits verification of correct connection and positioning of conductors		N/A
	- permits covers to be fitted without risk of damage to supply conductors or their insulation		N/A
	- ensures that uninsulated end of conductor, when detached from a terminal, cannot come into contact with accessible metal parts, or terminations are unlikely to slip free of the conductor		N/A
	For pillar terminals (with conductors that are not separately clamped ≤ 30 mm from terminal), and for other terminals with screw clamping, a force of 2 N applied to the wire in any direction and adjacent to the terminal, screw or stud		N/A
	The uninsulated end of the conductor did not come into contact with accessible metal parts		N/A
24.19	Appliance inlet prevents access to live parts during insertion or removal of the connector	Not applicable in Annex K	N/A
	Easy insertion of connector		N/A
	After insertion of connector, tool not supported by the connector in any position of normal use on a flat horizontal surface		N/A
	Test probe B of IEC 61032:1997 applied to tool inlet other than appliance inlet per IEC 60320		N/A
	Appliance inlet complies with IEC 60320		N/A
24.20	Interconnection cords meet the requirements for the supply cord, exceptions as follows	Not applicable in Annex K	N/A
	Cross-sectional area is based on maximum current through conductor during test of Clause 12		N/A
	Insulation adequate for conductor’s working voltage		N/A
	Test of 24.11 restricted to range of motion during normal use.		N/A
24.21	Interconnection cords not detachable without tool if compliance with this standard is impaired when they are disconnected	Not applicable in Annex K	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
25	**TERMINALS FOR EXTERNAL CONDUCTORS**		N/A
25.1	Tool provided with terminals or equally effective devices for connection to external conductors	Not applicable in Annex K	N/A
	Terminals only accessible with the aid of a tool		N/A
	Screws and nuts allowed to also clamp internal conductors when they are unlikely to be displaced when fitting supply conductors		N/A
	Screws and nuts do not fix other components		N/A
	For tool with type X attachment, soldered connections allowed for connection of external conductors, when soldering alone is not used to maintain conductor in position		N/A
	When provided, barriers prevent creepages and clearances between live parts and other metal parts from being reduced to < 50% of values in 28.1, the conductor can be fixed by soldering alone		N/A
	For type Y and Z attachments, soldered, welded, crimped and similar connections allowed for the connection of external conductors		N/A
	Class II tools, conductor so positioned or fixed that soldering, crimping, or welding alone not relied upon to maintain the conductor in the position		N/A
	Barriers prevent creepages and clearances between live parts and other metal parts from being reduced to < 50% of values in 28.1 for the Class of tool using Type Y or Z attachments		N/A
	Conductors connected by soldering are held in place near termination independent of solder		N/A
	Conductor is “hooked in” before soldering and the hole through which it passes is not too large		N/A
	Terminals of a component built into the tool used to secure external conductors		N/A
	Conductors connected by other means, leads additionally fixed near terminations		N/A
	Stranded conductors secured at insulation and conductor		N/A
25.2	Terminals for supply cords suitable for their purpose	Not applicable in Annex K	N/A
	Supply cord terminals withstood pull force of 5 N		N/A
25.3	For type X attachment, when clamping means tightened or loosened, terminal did work loose, no stress on internal wiring, and creepage and clearances not reduced below values in 28.1	Not applicable in Annex K	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test per Clause 9.6, using 2/3 torque of that in Table 4, of IEC 60999-1:1999 (Nm) .....:		N/A
	Terminals secured by two screws to prevent loosening, or by one screw in a recess, or by other suitable means		N/A
	Correct position of supply terminals maintained by switches and similar devices with recesses and verified after connection of supply cord and repositioning of device		N/A
	Sealing compound without other means of locking not used		N/A
	Self-hardening resins used only on terminals that are not subject to torsion in normal use		N/A
25.4	Type X attachment using terminals to clamp the conductor between metal surfaces do so without damage to conductor after torque test per Cl. 25.3	Not applicable in Annex K	N/A
25.5	End of conductor inserted in the hole of pillar type terminals is visible, or can pass beyond threaded hole for a distance of half nominal diameter of screw, or 2,5 mm, the greater of the two (mm) .....:	Not applicable in Annex K	N/A
25.6	For type X attachment, terminals clearly recognizable and accessible after opening the tool	Not applicable in Annex K	N/A
	All terminals located behind one cover, or one part of the enclosure		N/A
25.7	For tool with type X attachment, terminal devices located or shielded to prevent a strand of wire from escaping	Not applicable in Annex K	N/A
	No risk of accidental connection between live parts and accessible metal parts		N/A
	For class II tool, no risk of accidental connection between live parts and metal parts with supplementary insulation only		N/A
	8 mm long free wire of the stranded supply conductor did not touch any accessible metal part		N/A
	8 mm long free wire of the stranded supply conductor did not touch any metal parts with supplementary insulation only		N/A
	8 mm long free wire of stranded conductor connected to an earthing terminal did not touch any live part		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
26	**PROVISION FOR EARTHING**		N/A
26.1	Accessible metal parts of class I tool permanently connected to an earthing terminal or termination within the tool	Not applicable in Annex K	N/A
	Accessible metal parts of class I tool permanently connected to the earthing contact of the tool inlet		N/A
	Printed circuit boards are not used to provide continuity of protective earthing circuit		N/A
	No electrical connection between earthing terminals or contacts and neutral terminal		N/A
	No provision for earthing in Class II and III tools		N/A
	Rotating motor components with metal-to-metal bearing surfaces considered electrically bonded		N/A
	Metal parts behind a decorative cover that do not withstand test of Clause 20 considered accessible metal parts		N/A
26.2	Clamping means of earthing terminals adequately locked against accidental loosening	Not applicable in Annex K	N/A
	Earthing connections not possible to loosen without the aid of a tool		N/A
	Terminals with screw clamping comply with the relevant requirements of Clause 25, and screwless terminals comply with IEC 60998-2-2		N/A
	For specially prepared cords, terminals comply with IEC 61210 and table 10		N/A
	Screwless terminals tested per IEC 60998-2-2		N/A
26.3	Earth connection of detachable parts was made before the current-carrying connections established when placing the part in position, and the current carrying connections separated before earth connection was broken when removing the part	Not applicable in Annex K	N/A
	If cord slips out of cord anchorage, current-carrying conductors become taut before earthing conductor		N/A
26.4	No risk of corrosion between metal parts of earthing terminals and copper of earthing conductor	Not applicable in Annex K	N/A
	Parts transmitting current in case of an insulation fault, other than parts of metal frame or enclosure, are coated or uncoated metal with adequate resistance to corrosion		N/A
	Thickness of electroplated coating (μm) .....:		N/A
	Parts of coated or uncoated metal providing or transmitting contact pressure only, adequately protected against rusting		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Protection provided against risk of corrosion resulting from contact between copper and aluminium (or aluminium alloy)		N/A
	Parts subjected to a treatment such as chromate conversion coating are used only to provide or transmit contact pressure		N/A
	Thickness of coating of steel measured in accordance with ISO 2178 or ISO 1463 (μm).....:		N/A
	Resistance to rusting test .....:		N/A
26.5	Resistance of earthing circuit (max. 0.1 Ω).....:	Not applicable in Annex K	N/A
	Test current (A) .....:		—
	Voltage drop between the earthing terminal and accessible metal part (V) .....:		—
27	**SCREWS AND CONNECTIONS**		P
27.1	Fixings and electrical connections (earthing connections included) withstand mechanical stresses occurring in normal use		P
	Screws not made of soft metal such as zinc or aluminium		P
	Diameter of screws of insulating material not used for electrical or earthing connection, diameter (mm). .....:	No insulating material used	N/A
	Screws transmitting electrical contact pressure screw into metal		N/A
	Screws of insulating material not used if their replacement by a metal screw could impair supplementary or reinforced insulation		N/A
	Screws removed when replacing the supply cord with type X attachment, or during maintenance, are not of insulating material where their replacement by a metal screw could impair basic insulation		N/A
	Screws and nuts tightened and loosened 10 times for screw engaged with a thread of insulating material		P
	Nuts and other screws tightened and loosened five times		N/A
	Screws engaging with a thread of insulating material completely removed and reinserted each time		P
	When testing terminal screws and nuts, a flexible conductor of the largest cross-sectional area per Clause 24.5 placed, and each time repositioned, in the terminal (mm^2) .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test using a suitable test screwdriver, spanner or key, torque as in Table 11 and the relevant column		P
	Column I for metal screw without head, flush with surface (Nm) .....:		N/A
	Column II for other metal screws and nuts (Nm) ....:	See Table 27.1	P
	Column II for screws of insulating material, having a hexagonal head with a width across flats exceeding overall thread diameter (Nm).....:		N/A
	Column II for screws of insulating material, having a cylindrical head and a key socket with a width across corners exceeding overall thread diameter (Nm) ...:		N/A
	Column II for screws of insulating material, with a head having a slot or cross-slots longer than 1,5 times the overall thread diameter (Nm).....:		N/A
	Column III applied to other screws of insulating material (Nm) .....:		N/A
	No damage impairing further use of fixing or electrical connections		P
27.2	Contact pressure not transmitted through insulating material other than ceramic, unless compensated for shrinkage or distortion		P
27.3	Space-threaded screws not used for connection of current-carrying parts, unless direct clamping and suitable locking provided		P
	No thread-cutting screws used for connection of current-carrying parts		N/A
	Use of two space-threaded or thread-cutting screws in earthing circuits		N/A
27.4	Screws making both mechanical and electrical connections are locked against loosening		N/A
	Rivets for current-carrying connections subjected to torsion in normal use locked against loosening		N/A
27.5	Screwless connectors not intended for disconnection in normal use prevent disconnection in normal use		N/A
	Connectors withstood 5 N pull through the wire		N/A
	Neither the connector nor the wire became disconnected		N/A
	Directions of the application and exit of the wire not in line, force applied in both directions, one at a time		N/A
	Connectors fulfilled relevant IEC standards and were considered to fulfil requirements of 27.5.		N/A
27.5.1	Conductors secured by more than one means, unless their detachment does not impair safety		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Only one means of securing, test with detached conductors		N/A
	Clearances not reduced below 50 % of values in 28.1		N/A
28	**CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION**		N/A
28.1	Creepage and clearances not less than the values in Table 12, except for cross-over points of motor windings .....:	See Table 28.1	N/A
	When a resonance voltage occurs, creepage and clearance are not less than specified for the voltage imposed by the resonance; these values increased by 4 mm in case of reinforced insulation	Replaced in Annex K	N/A
	Creepage and clearances for a tool with an appliance inlet measured with an appropriate connector inserted		N/A
	Creepage and clearances on a tool with other attachment measured on the tool as delivered		N/A
	Measurements on tool with belt made with the belt in place and belt tension adjusted to the most unfavourable position within its adjustment range		N/A
	Measurements repeated with the belt removed		N/A
	Movable parts placed in the most unfavourable position		N/A
	Nuts and screws with non-circular heads tightened in the most unfavourable position		N/A
	Clearances between terminals and accessible metal parts also measured with screws and nuts unscrewed as far as possible and they were not less than 50% of Table 12 .....:	See Table 28.1	N/A
	Distances through slots or openings in external parts of insulating material measured to metal foil in contact with accessible surface with the foil pushed into corners using test probe B of IEC 61032:1997 :	See Table 28.1	N/A
	2 N force applied to internal wiring, bare conductors and uninsulated capillary tubes of thermostats and similar devices during measurement		N/A
	30 N force applied to enclosure		N/A
	Measurements made according to Annex A	See Table 28.1	N/A
	Creepage and clearances on a tool having parts with double insulation and no metal between basic insulation and supplementary insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	PWB with peak voltage stresses ≤ 150 V per mm between parts of different potential provided with a min. distance of 0.2 mm, when protected against deposition of dirt	See Table 28.1	N/A
	-PWB with 100 V per mm provided with a min. distance of 0.5 mm, when not protected against deposition of dirt	See Table 28.1	N/A
	Values of the table applied when limits mentioned above resulted in higher values than in the table	See Table 28.1	N/A
	Distances reduced further since the tool complied with the requirements of Clause 18 distances short-circuited one at a time.....:	See Table 28.1	N/A
	Creepage and clearances within optocouplers not measured when individual insulation adequately sealed, with air excluded between material layers		N/A
	For live parts of different polarity separated by basic insulation only, creepage and clearances reduced as tool complied with Clause 18 when creepage and clearances short-circuited.....:	See Table 28.1	N/A
28.2	Distance through insulation between metal parts was ≥1.0 mm for working voltages ≤130 V when separated by supplementary insulation	See Table 28.2	N/A
	Distance through insulation between metal parts was ≥1.5 mm for working voltages ≤130 V when separated by reinforced insulation	See Table 28.2	N/A
	Distance through insulation between metal parts was ≥1.0 mm for working voltages > 130V ≤ 280V when separated by supplementary insulation, and ≥2.0 mm when separated by reinforced insulation	See Table 28.2	N/A
	Distance through reinforced insulation between windings and accessible metal parts was ≥1.0 mm for working voltages ≤ 280V	See Table 28.2	N/A
	Requirement waived as insulation applied was in thin sheet form, other than mica or similar, and for supplementary insulation consisting of at least two layers, one layer having withstood electrical strength test for supplementary insulation		N/A
	Requirement waived as insulation applied was in thin sheet form, other than mica or similar, and for reinforced insulation consisting of at least three layers, two layers having withstood electrical strength test for reinforced insulation		N/A
	Requirement waived as max. temperature rise determined during test of Cl. 12 did not exceed values in 12.5 for inaccessible supplementary or reinforced insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Requirement waived as inaccessible reinforced or supplementary insulation, after conditioning for 168h at 50 K above max. temperature rise determined per Cl. 12, withstood test of Annex D at the oven temperature and room temperature (°C) .....:	See Table D.2	N/A
	For optocouplers, 168 h of conditioning at 50 K above the max. temperature rise measured on optocouplers during tests of Clauses 12 and 18, while operating under most difficult conditions		N/A
ANNEX B	**MOTORS NOT ISOLATED FROM THE SUPPLY MAINS AND HAVING BASIC INSULATION NOT DESIGNED FOR THE RATED VOLTAGE OF THE TOOL**		N/A
B.1.1	Motors with working voltage ≤ 42 V		N/A
B.9.2	Metal parts of motor considered bare live parts		N/A
B.12.4	Temperature rise of body of motor determined instead of the temperature rise of the windings		N/A
B.12.5	Temperature rise of the body of the motor in contact with insulating materials did not exceed values in Table 1 for the relevant insulting material	See Table 12.1	N/A
B.18. 201	Tool operated at rated voltage with the terminals of motor and its capacitors short circuited		N/A
	Tool operated at rated voltage with the supply to the motor open circuited		N/A
	Tool operated at rated voltage with shunt resistor open circuited during operation of motor		N/A
B.21.101	For class I tools with a motor supplied by a rectifier circuit, dc circuit insulated from accessible parts of the tool by double or reinforced insulation		N/A
ANNEX C	**LEAKAGE CURRENT**		N/A
C.2	Leakage current measurement of non-operating tool	See Tables C.2A and C.2B	N/A
C.3	Leakage current measurement of operating tool	See Tables C.3A to C.3D	N/A
ANNEX D	**ELECTRIC STRENGTH**		P
D.1	Any protective impedance were disconnected		N/A
	The tools were not connected to the supply		P
	Electric strength is checked by the tests of D.2		P
	For tools with heating elements, test voltages of IEC 60335-1:2010 apply to the heating elements only		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Insulation between live parts of motor in accordance with Annex B and its other metal parts not subjected to this test		N/A
	Tool in accordance with Annex L, tool is directly connected to the mains or to a non-isolated source		N/A
	Electronic devices bypassed to enable the test to be conducted		N/A
D.2	Test duration 1 min		P
	Voltage of substantially sinusoidal waveform, frequency 50 Hz or 60 Hz		P
	Electric strength test, voltages applied.....:	See Table D.2	P
	To distinguish between capacitor reactance current and unacceptable performance, d.c. potential 1,414 times the that for a.c. was used.....:		N/A
	No flashover or breakdown occurred during the test	See Table D.2	P
ANNEX H	**LOW-POWER CIRCUITS**		N/A
	Any points closest to the supply at which the maximum power delivered to the variable resistor does not exceed 15 W at the end of 5 s identified as called a low power points .....:		N/A
ANNEX K	**BATTERY TOOLS AND BATTERY PACKS**		P
K.1	Rated voltage for tools and battery packs ≤75 V d.c.		P
K.5.7	Tests to be done at rated voltage were done with a fully charged battery		P
K.5.201	Peak voltage of any superimposed ripple exceeding 10 % of the average value was included		N/A
K.5.202	Measurements of lithium-ion cell voltages were made using a filter as specified		P
K.5.203	Test area protected against fire and explosion, and well ventilated		P
K.5.204	Discharging and charging as specified		P
K.5.205	Thermocouples for lithium-ion cell temperature measurement located as specified		P
K.5.206	Currents measured during battery charging are average currents		P
K.5.207	Fully charged batteries used, after resting for ≥ 2 h but ≤ 6 h at an ambient temperature of (20 ± 5) °C		P

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Clause	Requirement + Test	Result - Remark	Verdict
K.5.208	Battery consisting of a single cell not subject to special preparations of a cell in a series configuration		N/A
K.5.209	For series arrangement of parallel clusters of cells, the cluster is treated as single cell for specified tests		P
K.5.210	End-of-discharge voltages for common cell chemistries observed.....:	Considered	P
K.8.3	Battery tools and detachable or separable battery packs marked with additional information		P
	- Business name and address of the manufacturer and, where applicable, its authorised representative .....:	See marking plate	—
	- Designation of series or type.....:	See marking plate	—
	Battery tools also marked with additional information		P
	- Year of manufacture and a date code identifying at least the month of manufacture.....:	See marking plate	—
	- Designation of the tool.....:	See marking plate	—
	- identification for parts shipped separately for assembly by the end user	See marking plate	—
	Detachable or separable battery packs marked with additional information	See marking plate	P
	- capacity in Ah or mAh..... :	See marking plate	—
	- type of battery ..... :	See marking plate	—
	No misunderstanding by additional markings		P
K.8.4	Markings specified in K.8.1, 8.2 and K.8.3 not on a detachable part of the tool		P
	Markings specified in 8.2 clearly discernible from the outside of the tool		P
	Markings specified in K.8.3 visible with any separable battery pack or detachable battery pack removed		P
	Other markings on the tool visible after removal of a cover	No cover	N/A
K.8.14.1.1	5) Battery tool use and care		P
	6) Service		P
K.8.14.2	e) Instructions for battery tools		P
K.9.1	Construction and enclosure provide adequate protection against electric shock		N/A
K.9.3	No two conductive, simultaneously accessible parts where the voltage between them is hazardous		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Conductive, simultaneously accessible parts provided with protective impedance		N/A
	Short circuit current between two simultaneously accessible parts (mA) .....:		N/A
	Capacitance between two simultaneously accessible parts (μF).....:		N/A
K.9.5	Electric strength test of D.2 with 750 V applied to insulating material protecting from electric shock	See Table D.2	N/A
K.12.1	Tool operated at no-load until maximum temperature reached or battery discharged.....:	See table K.12.1	P
	No operation of protective devices during heating test		N/A
	Temperature rises met values in Table 2		P
K.12.201	Charging of lithium-ion battery under normal conditions did not exceed specified operating region for charging of the cell		P
	Charging procedure as specified		P
	Voltage, temperature and charging current monitored for all individual cells	See table K.12.201	P
	Test repeated with imbalanced battery	See table K.12.201	N/A
K.13.1	Thermoplastic materials of relevant enclosure parts sufficiently resistant to heat		P
	Ball-pressure test of IEC 60695-10-2:2003	See Table 13.1	P
K.13.2	Glow-wire test applicable only to external enclosure enclosing the current-carrying parts		P
	Non-metallic parts in of detachable or separable battery pack supporting connections that carry ≥0,2 A during charging and those within a distance of 3 mm, subjected to the glow-wire test at 850 °C	See Table 13.2	P
K.13.2.2101	Polymeric battery enclosure material around current-carrying parts at least classified V according to IEC 60695-11-10:2013, unless …		N/A
	… battery pack was tested to K.18.1 a).		P
K.18.1	Risk of fire or electric shock as a result of abnormal operation obviated as far as is practical		P
	No charring or burning of gauze or tissue paper resulted when battery tool and battery pack were subjected to any abnormal operations, tests a) to f)	See Table K.18.1	P
	No explosion during or after the test		P
	Adequate protection against electric shock		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Component(s) or conductors(s) that interrupt or limit the discharge current that operated operate during the above tests a) to f) .....:	See Table K.18.1	P
	Test repeated two more times for devices relied upon to pass the test; devices opened the circuit in the same manner		P
	Test repeated with the open-circuited device bridged for devices not relied upon to pass the test		N/A
	Protective electronic circuits whose function is relied on to pass a test regarded as providing a SCF and comply with 18.8 with a PL = a	See Table 18.8	N/A
K.18.8	Li-ion charging systems are covered by K.18.201		N/A
K.18.201	Risk of fire and explosion as a result of abnormal operation during charging of a lithium-ion battery is obviated as far as is practical		P
	No charring or burning of gauze or tissue paper, no explosion resulted when battery tool and battery pack were subjected to any abnormal conditions a) to d)	See Table K.18.201	P
	The cells did not exceed the upper limit charging voltage by more than 150 mV unless…		P
	…charging system permanently was disabled from recharging the battery		N/A
	No evident damage to the cell vent to impair compliance with Subclause K.21.202.		P
K.18.202	No risk of fire or explosion when main discharge connections of a series configured, integral Li-ion battery, detachable or separable Li-ion battery pack were shorted under extreme imbalance		P
	All cells fully charged, one cell fully discharged		P
	Main discharge connections of the battery were shorted, resistance ≤10 mΩ		P
	No explosion during or after the test		P
	No charring or burning of the gauze or tissue paper		P
	Component(s) or conductors(s) that interrupt or limit the discharge current that operated operate during the above tests.....:	See Table K.18.202	P
	Test repeated two more times for devices relied upon to pass the test; devices opened the circuit in the same manner		P
	Test repeated with the open-circuited device bridged		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Protective electronic circuits whose function is relied on to pass a test regarded as providing a SCF and comply with 18.8 with a PL = a	See Table 18.8	N/A
K.18.203	No risk of fire or explosion during abusive overcharging of batteries comprised of cells other than the Li-ion type		N/A
	Battery was charged during 1,25 h at a rate of 10 times the C5 rate for the battery		N/A
	No explosion during or after the test		N/A
	No charring or burning of the gauze or tissue paper		N/A
K.19.6	Marking with rated no-load speed required, measured no-load speed of the spindle did not exceed 110 % of the rated no-load speed	Not applicable	N/A
	No-load speed measured after - operated for 5 min at no-load - replacing the battery with a fully charged battery - operating for 1 min at no-load		N/A
K.19.201	Not possible to install a detachable or separable battery pack in reverse polarity		P
K.19.202	Li-ion battery enclosure designed to safely release gases generated as a result of venting	See Table K.19.202	P
	Total area of the openings in the enclosure allowing gases to pass without obstruction is ≥ 20 mm²; or…		N/A
	… pressure drop within enclosure was tested, no rupture occurred		P
K.20.1	Battery tools and battery packs have adequate mechanical strength and withstand tests of 20.2 and K.20.3.1 or K.20.3.2 and		P
	- did not catch fire or explode		P
	- met requirements of clauses K.9, K.19 and either K.18.1 (f) or K.28.1 after tests of 20.2 and 28.1		P
	Li-ion battery tools and battery packs, after the test of K.20.3.1 or K.20.3.2, - did not have an open circuit voltage below 90 % of the voltage measured immediately prior to the test		P
	- demonstrated normal discharging and recharging after the test		P
	- showed no damage to the cell vent impairing compliance with K.21.202		P
K.20.3.1	Adequate mechanical strength after drop tests on a concrete surface from a height of 1 m	See Table K.20.3.1	P
	Test repeated with the battery pack removed from the tool		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test repeated on the battery pack by itself		P
	The test was repeated with each attachment or combination of attachments		N/A
K.20.3.2	Impact test with 50 mm, 0,55 kg smooth steel sphere for battery-operated transportable tools.....	See Table K.20.3.2	N/A
	travel of the sphere was 1,3 m		N/A
	Damage (except to a guard) accepted, tool became incapable of normal operation		N/A
	Test repeated separately on detachable or separable battery packs with a mass ≥3 kg		N/A
	Additional drop test on detachable or separable battery packs with a mass <3 kg		N/A
K.21.17.1.2	The number of cycles is 6 000		P
K.21.201	Tool will not accept general purpose batteries as an energy source for their primary function		P
K.21.202	Venting of lithium-ion cells, if relied on for safety, not adversely obstructed		P
K.21.203	Unsuitable connector types not used for user accessible interfaces between elements of a Li-ion battery system		P
K.23.1.10	Power switches have adequate breaking capacity and present no electrical or mechanical failure		P
	50 cycles of making and breaking the locked output mechanism current		P
K.23.1.201	Power switches withstood, without excessive wear or other harmful effect, the mechanical, electrical, and thermal stresses occurring in normal use		P
	6000 cycles of operation making and breaking the no-load of the tool at a fully charged battery		P
K.23.201	Battery cells comply with IEC 62133		P
K.23.202	Rechargeable battery cells not of lithium-metal type		P
K.24.201	External flexible cable or cord of battery tools with separable battery packs have anchorages such that the conductors are relieved from strain, including twisting, where they are connected within the tool, and protected from abrasion		N/A
K.28.1	Creepage distances and clearances not less than the values in millimetres shown in Table K.1.....:	See Table 28.1	P
	Smaller clearance and creepage distances for parts of different polarity accepted, shorting of the two parts did not result in the tool starting		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For parts with a hazardous voltage between them, the sum total of the measured distances between each of these parts and their nearest accessible surface is not less than 1,5 mm clearance and 2,0 mm creepage (Fig. K.1) .....:	No hazardous voltage	N/A
	Creepage distances and clearances measured as indicated in Annex A		P
	Distances through slots or openings in external parts of insulating material measured to metal foil in contact with the accessible surface		P
	Foil pushed into corners and the like by means of test probe B of IEC 61032:1997, except not pressed into openings		P
	The sum total of distances measured between parts operating at hazardous voltage and accessible surfaces determined by measuring the distance from each part to the accessible surface		N/A
	Distances added together to determine the sum total (see Figure K.1)		N/A
	One of the distances was 1,0 mm or greater (see Annex A, cases 1 to 10)		N/A
	Force applied by means of test probe B of IEC 61032:1997 at the following values:		N/A
	– 2 N for bare conductors		N/A
	– 30 N for enclosures		N/A
	Means provided for securing the tool to a support considered to be accessible		N/A
ANNEX L	**BATTERY TOOLS AND BATTERY PACKS PROVIDED WITH MAINS CONNECTION OR NON-ISOLATED SOURCES**		N/A
L.1	Rated voltage for battery pack ≤250 V a.c. (single phase) or d.c. mains source and ≤75 V d.c. battery source		N/A
	Rated voltage for battery pack ≤75 V d.c.		N/A
L.5.7	Tests to be done at rated voltage were done with a fully charged battery		N/A
L.5.201	Peak voltage of any superimposed ripple exceeding 10 % of the average value was included		N/A
L.5.202	Measurements of lithium-ion cell voltages were made using a filter as specified		N/A
L.5.203	Test area protected against fire and explosion, and well ventilated		N/A
L.5.204	Discharging and charging as specified		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
L.5.205	Thermocouples for lithium-ion cell temperature measurement located as specified		N/A
L.5.206	Currents measured during battery charging are average currents		N/A
L.5.207	Fully charged batteries used, after resting for ≥ 2 h but ≤ 6 h at an ambient temperature of (20 ± 5) °C		N/A
L.5.208	Battery consisting of a single cell not subject to special preparations of a cell in a series configuration		N/A
L.5.209	For series arrangement of parallel clusters of cells, the cluster is treated as single cell for specified tests		N/A
L.5.210	End-of-discharge voltages for common cell chemistries observed.....:		N/A
L.8.1	Non-isolated sources that can supply a tool, or tool that can be supplied directly from the mains, marked with as required by the standard:		N/A
	Rated voltage(s) or voltage range(s), (V).....:		—
	Symbol for nature of supply or frequency (Hz) .....:		—
	Rated input, (W) or rated current (A).....:		—
	Symbol for class II.....:		—
L.8.3	Tools and detachable or separable battery packs marked with additional information		N/A
	- Business name and address of the manufacturer and, where applicable, its authorised representative .....:		—
	- Designation of series or type.....:		—
	Tools also marked with additional information		N/A
	- Year of manufacture and a date code identifying at least the month of manufacture.....:		—
	- Designation of the tool.....:		—
	- identification for parts shipped separately for assembly by the end user		—
	Detachable or separable battery packs marked with additional information		N/A
	- capacity in Ah or mAh..... :		—
	- type of battery ..... :		—
	No misunderstanding by additional markings		N/A
L.8.4	Markings of L.8.1, 8.2 and L.8.3 not on a detachable part of the tool		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Markings of 8.2 clearly discernible from outside the tool		N/A
	Markings of L.8.3 visible with any separable or detachable battery pack removed		N/A
	Other markings may be visible after removing cover		N/A
	Indications for switches and controls placed on or in vicinity of components		N/A
	Not placed on parts which can be repositioned		N/A
	Not positioned such that making the marking is misleading		N/A
L.8.14.1.1	5) Battery tool use and care		N/A
	6) Service		N/A
L.8.14.2	e) Instructions for battery tools		N/A
L.9	Construction and enclosure provide adequate protection against electric shock		N/A
	Tools connected to the mains or supplied by a non-isolated source.		N/A
	Tool also evaluated with the battery pack removed when removal without the use of a tool was possible		N/A
L.9.201	There are no two conductive simultaneously accessible parts where the voltage between them is hazardous, except when provided with protective impedance		N/A
	Short circuit current between two simultaneously accessible parts (mA) .....:		N/A
	Capacitance between two simultaneously accessible parts (μF).....:		N/A
L.10	Applied only when tool is directly connected to mains, or to a non-isolated source		N/A
L.11	Applied only when tool is directly connected to mains, or to a non-isolated source		N/A
	Test on tool capable of charging the battery while performing its function conducted while charging a discharged battery pack		N/A
L.12	Applied only when tool directly connected to mains, or to a non-isolated source		N/A
	Test on tool capable of charging the battery while performing its function conducted while charging a previously discharged battery pack with the charger connected		N/A
	Tool operated at no-load until maximum temperature reached or battery discharged.....:	See Table L.12	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test repeated, allowing the battery pack to charge while the tool was not operating		N/A
L.12.201	Charging of lithium-ion battery under normal conditions did not exceed specified operating region for charging of the cell		N/A
	Charging procedure as specified		N/A
	Voltage, temperature and charging current monitored for all individual cells	See Table L.12.201	N/A
	Test repeated with imbalanced battery		N/A
L.13.1	Applied only when tool directly connected to mains, or to a non-isolated source	See Table 13.1	N/A
	Tool capable of charging the battery while performing its function also evaluated with charger connected to the mains		N/A
	Tool also evaluated with battery power alone when more unfavourable temperatures may result		N/A
L.13.2	Non-metallic parts in of detachable or separable battery pack supporting connections that carry ≥0,2 A during charging and those within a distance of 3 mm, subjected to the glow-wire test at 850 °C	See Table 13.2	N/A
L.14	Applied only when tool directly connected to mains, or to a non-isolated source		N/A
L.16	Applied only when tool directly connected to mains, or to a non-isolated source		N/A
L.17	Applied only when tool directly connected to mains, or to a non-isolated source		N/A
	Tools not capable of continuous operation operated under battery power for the duration of the test, except evaluated for electric strength with their charger connected		N/A
L.18	Applied only when tool directly connected to mains, or to a non-isolated source, except L.18.8 and L.18.201 to L.18.204,		N/A
L.18.8	Applied only to charging systems other than Li-ion		N/A
L.18.201	Risk of fire or electric shock as a result of abnormal operation obviated as far as is practical		N/A
	No charring or burning of gauze or tissue paper resulted when battery tool and battery pack were subjected to any abnormal operations, tests a) to f)	See Table L.18.201	N/A
	No explosion during or after the test		N/A
	Adequate protection against electric shock		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Component(s) or conductors(s) that interrupt or limit the discharge current that operated operate during the above tests a) to f) .....:	See Table L.18.201	N/A
	Test repeated two more times for devices relied upon to pass the test; devices opened the circuit in the same manner		N/A
	Test repeated with the open-circuited device bridged		N/A
	Protective electronic circuits whose function is relied on to pass a test regarded as providing a SCF and comply with 18.8 with a PL = a	See Table 18.8	N/A
L.18.202	Risk of fire and explosion as a result of abnormal operation during charging of a lithium-ion battery is obviated as far as is practical		N/A
	No charring or burning of gauze or tissue paper, no explosion resulted when battery tool and battery pack were subjected to any abnormal conditions a) to d)	See Table L.18.202	N/A
	The cells did not exceed the upper limit charging voltage by more than 150 mV unless…		N/A
	…charging system permanently was disabled from recharging the battery		N/A
	No evident damage to the cell vent to impair compliance with Subclause K.21.202.		N/A
L.18.203	No risk of fire or explosion when main discharge connections of a series configured, integral Li-ion battery, detachable or separable Li-ion battery pack were shorted under extreme imbalance		N/A
	All cells fully charged, one cell fully discharged		N/A
	Main discharge connections of the battery were shorted, resistance ≤10 mΩ		N/A
	No explosion during or after the test		N/A
	No charring or burning of the gauze or tissue paper		N/A
	Component(s) or conductors(s) that interrupt or limit the discharge current that operated operate during the above tests.....:	See Table L.18.203	N/A
	Test repeated two more times for devices relied upon to pass the test; devices opened the circuit in the same manner		N/A
	Test repeated with the open-circuited device bridged		N/A
	Protective electronic circuits whose function is relied on to pass a test regarded as providing a SCF and comply with 18.8 with a PL = a	See Table 18.8	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
L.18.204	No risk of fire or explosion during abusive overcharging of batteries comprised of cells other than the Li-ion type		N/A
	Battery was charged during 1,25 h at a rate of 10 times the C5 rate for the battery		N/A
	No explosion during or after the test		N/A
	No charring or burning of the gauze or tissue paper		N/A
L.19.201	Not possible to connect a battery pack in reverse polarity		N/A
L.19.202	Li-ion battery enclosure designed to safely release gases generated as a result of venting	See table L.19.202	N/A
	Total area of the openings in the enclosure allowing gases to pass without obstruction is ≥ 20 mm²; or…		N/A
	… pressure drop within enclosure was tested, no rupture occurred		N/A
L.20	Applied only when tool directly connected to mains, or to a non-isolated source, except L.20.201 and L.20.202		N/A
L.20.201	Battery tools with its battery pack attached have adequate mechanical strength and withstand tests of L.9, L.19, L.28.1 and either L.18.201 f) or L.28.201, and		N/A
	- did not catch fire or explode		N/A
	- demonstrated normal discharging and recharging after the test		N/A
	- showed no damage to the cell vent impairing compliance with L.21.202		N/A
L.20.202	For hand-held battery tools, L.20.202.1 applies; for transportable battery tools, L.20.202.2 applies		N/A
L.20.202.1	Adequate mechanical strength after drop tests on a concrete surface from a height of 1 m	See Table L.20.202.1	N/A
	Test repeated with the battery pack removed from the tool		N/A
	Test repeated on the battery pack by itself		N/A
	The test was repeated with each attachment or combination of attachments		N/A
L.20.202.2	Impact test with 50 mm, 0,55 kg smooth steel sphere for battery-operated transportable tools.....:	See Table L.20.202.2	N/A
	travel of the sphere was 1,3 m		N/A
	Damage (except to a guard) accepted, tool became incapable of normal operation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test repeated separately on detachable or separable battery packs with a mass ≥3 kg		N/A
	Additional drop test on detachable or separable battery packs with a mass <3 kg		N/A
L.21	Applied only when tool directly connected to mains, or to a non-isolated source, except L.21.201 and L.21.202		N/A
L.21.201	Tool will not accept general purpose batteries as an energy source for their primary function		N/A
L.21.202	Venting of lithium-ion cells, if relied on for safety, not adversely obstructed		N/A
L.21.203	Unsuitable connector types not used for user accessible interfaces between elements of a Li-ion battery system		N/A
L.22	Applied only when tool directly connected to mains, or to a non-isolated source		N/A
L.23	Components		N/A
L.23.1.10	Applied only to power switches of tools capable of performing their intended operation when connected to the mains or to a non-isolated source		N/A
L.23.1.10.201	Switches controlling the primary operating means of the tool, except as indicated in L.23.1.10, have adequate breaking capacity and presented no electrical or mechanical failure		N/A
L.23.1.10.202	Power switches withstood, without excessive wear or other harmful effect, the mechanical, electrical, and thermal stresses occurring in normal use		N/A
	6000 cycles of operation making and breaking the no-load of the tool at a fully charged battery		N/A
L.23.201	Battery cells comply with IEC 62133		N/A
L.23.202	Rechargeable battery cells not of lithium-metal type		N/A
L.24.1	Also applied to the flexible cord between a non-isolated power source and the tool		N/A
L.24.3	Also applied to the flexible cord between a non-isolated power source and the tool		N/A
L.24.4	This subclause applied, except flexible cord provided between a non-isolated power source and the tool not provided with a plug that can be connected directly to the mains		N/A
L.24.5	Not applied to flexible cord provided between a non-isolated power source and the tool		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
L.24.20	Requirements of this Subclause applied, except the flexible cord between a non-isolated power source and the tool not provided with an appliance inlet that can allow direct connection to mains		N/A
L.24.201	External flexible cable and cord have anchorages such that the conductors are relieved from strain, including twisting, where they are connected within the tool, and protected from abrasion		N/A
L.25	Not applied to interconnecting cords		N/A
L.26	Applied to the tool directly connected to the mains or to a non-isolated source		N/A
L.28.1	Applied when tool is directly connected to the mains or to a non-isolated source		N/A
	Battery packs connected to the tool during the evaluation		N/A
	Tool also evaluated with the battery pack removed when the removal could be accomplished without the use of a tool		N/A
	Creepage distances and clearances of IEC 60335-1: 2010 applied as applicable		N/A
L.28.201	Creepage distances and clearances not less than the values in millimetres shown in Table L.1		N/A
	Smaller clearance and creepage distances for parts of different polarity accepted, shorting of the two parts did not result in the tool starting		N/A
	For parts having a hazardous voltage between them, the sum of the measured distances between each of these parts and their nearest accessible surface is not less than 1.5 mm clearance and 2.0 mm creepage (Fig. L.1)		N/A
	Creepage distances and clearances measured as indicated in Annex A		N/A
	Distances through slots or openings in external parts of insulating material measured to metal foil in contact with the accessible surface		N/A
	Foil pushed into corners and the like by means of test probe B of IEC 61032:1997, except not pressed into openings		N/A
	The sum total of distances measured between parts operating at hazardous voltage and accessible surfaces determined by measuring the distance from each part to the accessible surface		N/A
	Distances added together to determine the sum total (see Figure L.1)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	One of the distances was 1,0 mm or greater (see Annex A, cases 1 to 10)		N/A
	Force applied by means of test probe B of IEC 61032:1997 at the following values:		N/A
	– 2 N for bare conductors		N/A
	– 30 N for enclosures		N/A
	Means provided for securing the tool to a support considered to be accessible		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

8.12 A	TABLE: Label Heating Test		N/A
Test Conditions .....:	Conditioned in oven for 24 h at (120 ± 2) °C Y/N Conditioned in oven for 200 h at: °C Y/N Amount of samples: 3		
Test Specimen	Material type	Good adhesion and no curling of edges	Label resists defacement and removal when scraped
Supplementary information:			

8.12 B	TABLE: Label immersion tests – Water		N/A
Test Conditions.....:	Pre Treating for 24 h at relative humidity of 45 % and temperature: °C Time of labels in water: 48 h Amount of samples: 3		
Test Specimen	Material type	Good adhesion and no curling of edges	Label resists defacement and removal when scraped
Supplementary information:			

8.12 C	TABLE: Label immersion tests - Oil (IRM 903)		N/A
Test Conditions.....:	Pre Treating for 24 h at relative humidity of 45 % and temperature: °C Time of labels in oil: 48 h Amount of samples: 3		
Test Specimen	Material type	Good adhesion and no curling of edges	Label resists defacement and removal when scraped
Supplementary information:			

8.12 D	TABLE: Label Standard atmosphere tests		N/A
Test Conditions.....:	Time of labels in controlled atmosphere at relative humidity of 45%: 72h Controlled atmosphere temperature: °C Amount of samples: 3		
Test Specimen	Material type	Good adhesion and no curling of edges	Label resists defacement and removal when scraped
Supplementary information:			

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Clause	Requirement + Test	Result - Remark	Verdict

9.1	TABLE: Protection against access to live parts				N/A
Measurement between relevant parts and poles of supply source		Rated voltage U (V)	Measured voltage (V)	Measured current (A)	Measured capacitance (μF)
Supplementary information:					

11	TABLE: Input data under no-load conditions				N/A
Input deviation of/at:	**Rated P (W) or I (A)**	**Measured P (W) or I (A)**	**Ratio (%)**	**Required ratio (%)**	**Remark**
				110	
				110	
				110	
Supplementary information:					

12.1A	TABLE: Temperature rise measurements under the conditions of 12.2 to 12.5		N/A
Test voltage (V) ..... :			—
Ambient temperature, t_1 (°C) :			—
Ambient temperature, t_2 (°C) :			—
Operating time (min, s)..... :			—
Speed (min^{-1})..... :			—
Input Wattage (W) ..... :			—
Input current (A) ..... :			—
Torque (Nm) ..... :			—
Thermocouple Locations		**ΔT measured (K)**	**ΔT Limit (K)**
Stator winding (thermocouple)			
Stator winding (S_1)R-R			
Stator winding (S_2)R-R			
Rotor winding R-R			
Stator Laminations(Motor body)			

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Clause	Requirement + Test	Result - Remark	Verdict

Enclosure inside		
Enclosure outside		
Grip area (i.e. Handle, gear housing)		
Brushholder		
Brushholder lead		
Power supply lead		
Internal wiring		
Capacitor		
Printed circuit board		
Switch		
Supplementary information:		

12.1B	**TABLE: Heating test, resistance method**					N/A
	Test voltage (V) .....:					—
	Ambient, t_1 (°C) .....:					—
	Ambient, t_2 (°C) .....:					—
Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT measured (K)**	**ΔT Limit (K)**	**Insulation class**	
Stator (1)						
Stator (2)						
Rotor (2)						
Supplementary information:						

13.1	**TABLE: Ball Pressure Test of Thermoplastics**			P
Allowed impression diameter (mm) .....:	2.0			—
Object/ Part No.	**Manufacturer/ trademark**	**Material**	**Test temperature (°C)**	**Impression diameter (mm)**
Tool Enclosure	Nemo Power Tools Limited	PA6+GF30	80	1.1
Battery pack*	Black & Decker (U.S.) Inc	--	--	--

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information: *For battery pack, refer to UL certificate No. UL-US-L472543-11-62205102-5.

13.2	TABLE: Glow Wire Test					P
Object/ Part No.	**Manufacturer/ trademark**	**Material**	**Test temperature (ºC)**	**Material ignited, Yes/No**	**Layer under Test Sample ignited, Yes/No**	**Verdict**
Tool enclosure	Nemo Power Tools Limited	PA6+GF30	550	No	No	P
Battery pack enclosure*	Black & Decker (U.S.) Inc	--	--	--	--	--
Supplementary information: *For battery pack, refer to UL certificate No. UL-US-L472543-11-62205102-5.						

16	TABLE: Overload Protection of Transformers and Associated Circuits			N/A
Test voltage (V).....:				—
Ambient temperature (°C) .....:				—
Input current (A) / Input Wattage (W) .....:				—
Applied short-circuit or overload .....:				—
Measurement at:			**ΔT measured (K)**	**ΔT Limit (K)**
Transformer winding (thermocouple)				
Transformer winding (T_1)R-R				
Transformer winding (T_2)R-R				
Transformer Lamination				
Internal wiring				
Capacitor				
Printed circuit board				
SELV circuits				
Supplementary Information:				

18.6.1	TABLE: Fault Condition Tests		P
	Ambient temperature (°C) .....:	23.1	—
	Fuse-link Current (A) ..... :	—	—

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Clause	Requirement + Test	Result - Remark	Verdict

Component	Fault Condition	Test Voltage (V)	Test Duration*	Comment/Result Test repeated Yes/No**
Q9	Short circuit	Fully-charged battery pack	Until steady condition is established	Working, no hazards
Q5A				Working, no hazards
Q2				The motor was started up and cannot been switched off. The protective electronic circuit on tool was evaluated and comply with 18.8 PL=a in the report CN24MR0D 001.
U5 Pin3&5				Stop working, no hazards
U5 Pin2	Open circuit			Working, no hazards
R35				Working, no hazards

Supplementary Information:
* Tests were continued until
- a protective device operates, or
- until steady conditions are established or
- an open circuit occurs.

** Test was repeated on a second sample due to an intentionally weak part permanently open-circuited to terminate the test.

18.8.1A	TABLE: Performance levels of Safety Critical Functions			P
Type and purpose of SCF	**Min. PL determined based on:[1,2]**	**Min. PL**	**Actual PL**	
Power switch – prevent unwanted pump switch-on & provide desired pump switch-off	UL 62841-1	a	Single fault not loss this SCF	

Supplementary Information:
[1] Relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 or; if no such part existent, ISO 13849-1 using Annex E as a guide

[2] For safety critical functions not listed in Table 4 of IEC 62841-1 and provided by electronic circuits, PL values were determined using the methods of ISO 13849-1.

18.8.1B	TABLE: Software in Safety Critical Functions	—
H.11.12.3 from IEC 60730-1:2010		
H.11.12.3	Measures to avoid errors	—

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
H.11.12.3.1	For controls with software Class B or C the V-model for the software life cycle was applied	V-Model has been applied to the software life cycle.	N/A
	Measures used for software class C are inherently acceptable for software class B		N/A
	Other methods applied if they incorporate disciplined and structured processes including design and test phases.....:		N/A
H.11.12.3.2	Specification		N/A
H.11.12.3. 2.1	Software safety requirements		N/A
H.11.12.3. 2.1.1	The specification of the software safety requirements includes:		N/A
	• A description of each safety related function to be implemented, including its response time(s): ○ functions related to the application including their related software classes ○ functions related to the detection, annunciation and management of software or hardware faults		N/A
	• A description of interfaces between software and hardware		N/A
	• A description of interfaces between any safety and non-safety related functions		N/A
H.11.12.3. 2.2	Software architecture		—
H.11.12.3. 2.2.1	The description of software architecture shall include the following aspects:		—
	• Techniques and measures to control software faults/errors (refer to H.11.12.2)		N/A
	• Interactions between hardware and software		N/A
	• Partitioning into modules and their allocation to the specified safety functions		N/A
	• Hierarchy and call structure of the modules (control flow)		N/A
	• Interrupt handling		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	• Data flow and restrictions on data access		N/A
	• Architecture and storage of data		N/A
	• Time based dependencies of sequences and data		N/A
H.11.12.3. 2.2.2	The architecture specification was verified against the specification of the software safety requirements by static analysis. Acceptable methods are:		—
	• Control flow analysis		N/A
	• Data flow analysis		N/A
	• Walk-throughs / design reviews		N/A
H.11.12.3. 2.3.1	Based on the architecture design, software is suitably refined into modules. Software module design and coding are implemented in a way that is traceable to the software architecture and requirements		N/A
H.11.12.3. 2.3.2	Software code is structured		N/A
H.11.12.3. 2.3.3	Coded software is verified against the module specification, and the module specification is verified against the architecture specification by static analysis		N/A
H.11.12.3. 2.4	Design and coding standards		—
	Program design and coding standards is consequently used during software design and maintenance		N/A
	Coding standards specify programming practice, proscribe unsafe language features, and specify procedures for source code documentation as well as for data naming conventions		N/A
H.11.12.3.3	Testing		—
H.11.12.3. 3.1	Module design (software system design, software module design and coding)		—
H.11.12.3. 3.1.1	A test concept with suitable test cases is defined based on the module design specification.		N/A
H.11.12.3. 3.1.2	Each software module is tested as specified within the test concept		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
H.11.12.3.3.1.3	Test cases, test data and test results are documented		N/A
H.11.12.3.3.1.4	Code verification of a software module by static means includes such techniques as software inspections, walk-throughs, static analysis and formal proof		N/A
	Code verification of a software module by dynamic means includes functional testing, white-box testing and statistical testing		N/A
H.11.12.3.3.2	Software integration testing		N/A
H.11.12.3.3.2.1	A test concept with suitable test cases is defined based on the architecture design specification		N/A
H.11.12.3.3.2.2	The software is tested as specified within the test concept		N/A
H.11.12.3.3.2.3	Test cases, test data and test results are documented		N/A
H.11.12.3.3.3	Software validation		—
H.11.12.3.3.3.1	A validation concept with suitable test cases is defined based on the software safety requirements specification		N/A
H.11.12.3.3.3.2	The software is validated with reference to the requirements of the software safety requirements specification as specified within the validation concept.		N/A
	The software is exercised by simulation or stimulation of:		N/A
	• input signals present during normal operation		N/A
	• anticipated occurrences		N/A
	• undesired conditions requiring system action		N/A
H.11.12.3.3.3.4	Test cases, test data and test results are documented		N/A
H.11.12.3.4	Other Items		—

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict
H.11.12.3.4.1	Tools, programming languages are assumed to be suitable if they comply with "increased confidence from use" according to IEC 61508-7, C.4.4	Only applicable for SCF with PL ≥ c	N/A
H.11.12.3.4.2	Management of software versions: All versions are uniquely identified for traceability		N/A
H.11.12.3.4.3	Software modification		—
H.11.12.3.4.3.1	Software modifications are based on a modification request which details the following:		—
	• the hazards which may be affected		N/A
	• the proposed change		N/A
	• the reasons for change		N/A
H.11.12.3.4.3.2	An analysis is carried out to determine the impact of the proposed modification on functional safety.		N/A
H.11.12.3.4.3.3	A detailed specification for the modification is generated including the necessary activities for verification and validation, such as a definition of suitable test cases		N/A
H.11.12.3.4.3.4	The modification are carried out as planned		N/A
H.11.12.3.4.3.5	The assessment of the modification is carried out based on the specified verification and validation activities. This may include:		N/A
	• a reverification of changed software modules		N/A
	• a reverification of affected software modules		N/A
	• a revalidation of the complete system		N/A
H.11.12.3.4.3.6	All details of modification activities are documented		N/A
H.11.12.3.5	For class C control functions: One of the combinations (a–p) of analytical measures given in the columns of table H.9 is used during hardware development .....:	Measures to avoid errors for class C not required	N/A

24.1	**TABLE: Length of supply cord**	**N/A**

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Clause	Requirement + Test	Result - Remark	Verdict

Manufacturer of Cable	Cable type	Nominal cross-section used (mm²)	Length of supply cord measured (m)

Supplementary information:

24.5	TABLE: Nominal cross-section area of supply cord				N/A
Rated current (A) [1]:		Current measured during clause 12ff. (A) [1]:		Nominal cross-section required per table 8:	

Manufacturer of Cable	Cable Type	Nominal cross-section used

Supplementary information:

[1] Current measured during test of clause 12.1, if no current rating marked.

24.11	TABLE: Flexing and lifting			N/A
Weight of tool (kg):		> 10 000 flexings, sample turned about 90° (Yes/No):		
Weight attached to cable or cord (kg):		Cord guard slipped out after 10 completed 1 s lifts (Yes/No):		

Manufacturer of Cable	Cable type	No. of strands (total)	No. of strands (broken)	Deviation in %

Supplementary information:

24.12	TABLE: Cord guard						N/A
Cable manufacturer	Cable type	Overall Ø of cord (mm)	Cord guard length min. (mm)	Cord guard length meas. (mm)	Mass attached (g)	Radius of curvature (mm)	

Supplementary information:

24.13	TABLE: Cord anchorage					N/A
Manufacturer of Cable	Cable type	Cord is pulled 25 times at (N)	Cord is twisted for 1 min at (Nm)	Cord damaged	Longitudinal displacement	Conductors movement

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

27.1	TABLE: Torque Test for screws and nuts				P
Threaded part identification	**Thread diameter (mm)**	**Column number (I, II, or III)**	**Applied torque (Nm)**	**Number of cycles (5 or 10)**	
Enclosure of tool	ST 4.1	II	1.2	10	
Battery pack	ST 3.1	II	0.6	10	
Supplementary information:					

28.1	TABLE: Clearance And Creepage Distance Measurements						P
clearance cl and creepage distance cr at/of:	**Up (V)**	**U r.m.s. (V)**	**Required cl (mm)**	**cl (mm)**	**required cr (mm)**	**cr (mm)**	
Two polarity of the switch on the PCB	—	20V d.c.	1.5	15.11	1.5	15.11	
Two polarity of the motor	—	20V d.c.	1.5	5.22	1.5	5.22	
Supplementary information:							

28.2	TABLE: Distance Through Insulation Measurements				N/A
Distance through insulation dti at/of:	**U r.m.s. (V)**	**Test voltage (V)**	**Required dti (mm)**	**dti (mm)**	
—	—	—	—	—	
Supplementary information:					

C.2A	TABLE: Leakage Current of the non-operating tool as per clause 14.1				N/A
Points of application	**Test voltage (rated V)**	**Freq. (Hz)**	**Selector Switch Position**	**Allowed leakage current (mA)**	**Measured leakage (mA)**
Supplementary Information:					

C.2B	TABLE: Leakage Current of the non-operating tool as per clause 14.4				N/A
Points of application	**Test voltage (rated V)**	**Freq. (Hz)**	**Selector Switch Position**	**Allowed leakage current (mA)**	**Measured leakage (mA)**
Supplementary Information:					

C.3A	TABLE: Leakage Current of the operating tool as per clause 12.1	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Points of application	Test voltage (1.06 X rated V)	Freq. (Hz)	Selector Switch Position	Allowed leakage current (mA)	Measured leakage (mA)
Supplementary Information:					

C.3B	TABLE: Leakage Current of the operating tool as per clause 14.3				N/A
Points of application	**Test voltage (rated V)**	**Freq. (Hz)**	**Selector Switch Position**	**Allowed leakage current (mA)**	**Measured leakage (mA)**
Supplementary Information:					

C.3C	TABLE: Leakage Current of the operating tool as per clause 18.5.1				N/A
Points of application	**Test voltage (rated V)**	**Freq. (Hz)**	**Selector Switch Position**	**Allowed leakage current (mA)**	**Measured leakage (mA)**
Supplementary Information:					

C.3D	TABLE: Leakage Current of the operating tool as per clause 18.5.4				N/A
Points of application	**Test voltage (rated V)**	**Freq. (Hz)**	**Selector Switch Position**	**Allowed leakage current (mA)**	**Measured leakage (mA)**
Supplementary Information:					

D.2	TABLE: Dielectric Strength		P
Test voltage applied between:	**Test during or after clause**	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
- windings and metal core of the motor field over **basic insulation**	12.6	1250	N/A
- commutator and metal core of the motor armature over **basic insulation**	12.6	1250	N/A
- metal core and motor armature spindle of the motor armature over **supplementary insulation**	12.6	2500	N/A
- commutator and motor armature spindle over **reinforced insulation**	12.6	3750	N/A
- between live parts and other metal parts over **basic insulation**	14.1	1250	N/A
- between inaccessible metal parts and accessible parts over **supplementary insulation**	14.1	2500	N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

D.2	TABLE: Dielectric Strength		P
Test voltage applied between:		**Test during or after clause**	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
- between live parts and accessible parts over **reinforced insulation**		14.1	3750	N/A
- accessible metal parts in class I tools and the supply cord wrapped with metal foil		14.1	1250	N/A
- accessible metal parts in class II tools and the supply cord wrapped with metal foil		14.1	1750	N/A
- between live parts and other metal parts over **basic insulation**		14.2.2	1250	N/A
- between inaccessible metal parts and accessible parts over **supplementary insulation**		14.2.2	2500	N/A
- between live parts and accessible parts over **reinforced insulation**		14.2.2	3750	N/A
- live parts and accessible parts over **basic insulation**		14.3	1250	N/A
- live parts and accessible parts over **reinforced insulation**		14.3	3750	N/A
- live parts and accessible parts over **basic insulation**		14.4	1250	N/A
- live parts and accessible parts over **reinforced insulation**		14.4	3750	N/A
- between live parts and other metal parts over **basic insulation**		17.2 and 17.3	937,5	N/A
- between inaccessible metal parts and accessible parts over **supplementary insulation**		17.2 and 17.3	1875	N/A
- between live parts and accessible parts over **reinforced insulation**		17.2 and 17.3	2812,5	N/A
- live parts and accessible parts over **basic insulation**		18.3 and 18.4	1250	N/A
- live parts and accessible parts over **reinforced insulation**		18.3 and 18.4	3750	N/A
- live parts and accessible parts not grounded, if the tool does not operate anymore		18.5.1	1500	N/A
- live parts and accessible parts not grounded, if the tool still operates		18.5.1	2500	N/A
- commutator segments and armature shaft in series motors with class II armature construction		18.5.2	1500	N/A
- live parts and accessible parts not grounded, if any winding is open circuited		18.5.4	1500	N/A
- live parts and accessible parts not grounded, if no windings are open circuited		18.5.4	2500	N/A
- live parts and accessible parts over **basic insulation**		20.2 to 20.4	1250	N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

D.2	TABLE: Dielectric Strength		P
Test voltage applied between:		**Test during or after clause**	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
- live parts and accessible parts over **reinforced insulation**		20.2 to 20.4	3750	N/A
- between the handles and grasping surfaces in contact with foil and the output shaft of the tool		20.5	1250	No
- between live parts and other metal parts over **basic insulation**		21.12	937,5	N/A
- between inaccessible metal parts and accessible parts over **supplementary insulation**		21.12	1875	N/A
- between live parts and accessible parts over **reinforced insulation**		21.12	2812,5	N/A
- shafts of operating knobs, handles, levers etc. and their insulating covering wrapped in metal foil		21.29	1250	N/A
- live parts and accessible parts over **basic insulation**		22.6	1250	N/A
- live parts and accessible parts over **reinforced insulation**		22.6	3750	N/A
- basic insulation		28.2.b)	1250	N/A
- supplementary insulation		28.2.b)	2500	N/A
- reinforced insulation		28.2.b)	3750	N/A
- over insulation protecting from electric shock		K.9.5	750	N/A
Supplementary information:				

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

K.12.1	TABLE: Normal Temperature Test for Battery Tool		P
Ambient temperature (°C) .....:		21.5	—

Measurement at:	ΔT measured (K)	ΔT Limit (K)
Enclosure	24.1	60
Handle	8.6	50
Switch button	0.6	50
Battery pack enclosure	14.3	50

Supplementary Information:
Status of overload protector at end of test [ ] No change [ ] Opened during the Test [ ] N/A

K.12.201	TABLE: Lithium-ion charging systems – Normal Temperature Test (Details refer to UL certificate No. UL-US-L472543-11-62205102-5)						P
Measure-ment at:	Temperature normal charging (°C)	Cell-voltage (V)		Temperature imbalanced cells charging (°C)	Cell-voltage (V)		Allowed Limit (°C)
		At start of the test	Max. during test		At start of the test	Max. during test	
BATTERY PACK: —		**CELL:** —			**CHARGER:** —		
Max. allowed cell-charging-current:		—		measured charging-current [1]:		—	
Ambient	—	—		—	—		—
Cell 1	—	—	—	—	—	—	—

Supplementary Information: [1] If multi-layer battery the charging current has to be divided through the number of layers.
All technical information are provided by manufacturer.

K.18.1	TABLE: Battery Tool Abnormal Operation					P
	Resistance applied (max. 10 mΩ)	Protective device operated during first test?	Test repeated 2 more times with device in place?	Test repeated 1 more time with device bridged?	Explosion, charring or burning of test materials?	
a) Terminals of detachable battery pack with exposed terminals shorted	8 mΩ	No	N/A	N/A	NO	
	Reaction during test: No danger					
b) Motor terminals shorted	8 mΩ	No	N/A	N/A	NO	
	Reaction during test: No danger					
c) Motor rotor locked	—	No	N/A	N/A	NO	
	Reaction during test: No danger					
d) Cord between battery tool and separable battery pack shorted	—	—	—	—	—	
	Reaction during test:					

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

K.18.1	TABLE: Battery Tool Abnormal Operation					P
		Resistance applied (max. 10 mΩ)	**Protective device operated during first test?**	**Test repeated 2 more times with device in place?**	**Test repeated 1 more time with device bridged?**	**Explosion, charring or burning of test materials?**
e) Cord between tool and charger shorted		—	—	—	—	—
		Reaction during test: No danger				
f) Any two uninsulated parts of opposite polarity in battery tools shorted		—	—	—	—	—
		Reaction during test:				
Supplementary Information:						

IEC/EN 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

K.18.201	TABLE: Lithium-ion charging systems – Abnormal Operation (Details refer to UL certificate No. UL-US-L472543-11-62205102-5)								P
Abnormal condition:	a) Components in the charging system faulted as in 18.6.1 b) to f)								P
Charger	**Battery pack [1)]**	**Affected component**	**Build in failure**	**Reaction during test**	**Explosion occurred? [YES / NO]**	**Charring or burning of test materials? [YES / NO]**	**Upper limit charging voltage exceeded by ≤ 150 mV [2)] [YES / NO]**	**If > 150 mV then charging system permanently disabled? [3)] [YES / NO]**	**Cell vent damaged? [YES / NO]**
Abnormal condition:	b) One cell 50% charged in a fully discharged battery								N/A
Charger	**Battery pack [1)]**	**Affected component**	**Build in failure**	**Reaction during test**	**Explosion occurred? [YES / NO]**	**Charring or burning of test materials? [YES / NO]**	**Upper limit charging voltage exceeded by ≤ 150 mV [2)] [YES / NO]**	**If > 150 mV then charging system permanently disabled? [3)] [YES / NO]**	**Cell vent damaged? [YES / NO]**
Abnormal condition:	c) Charging of a series configured battery with all cells 50% charged, one cell shorted								N/A
Charger	**Battery pack [1)]**	**Affected component**	**Build in failure**	**Reaction during test**	**Explosion occurred? [YES / NO]**	**Charring or burning of test materials? [YES / NO]**	**Upper limit charging voltage exceeded by ≤ 150 mV [2)] [YES / NO]**	**If > 150 mV then charging system permanently disabled? [3)] [YES / NO]**	**Cell vent damaged? [YES / NO]**

IEC/EN 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

K.18.201	TABLE: Lithium-ion charging systems – Abnormal Operation (Details refer to UL certificate No. UL-US-L472543-11-62205102-5)								P
Abnormal condition:	d) Short across a component or between adjacent PCB tracks								P
Charger	**Battery pack [1)]**	**Affected component**	**Build in failure**	**Reaction during test**	**Explosion occurred? [YES / NO]**	**Charring or burning of test materials? [YES / NO]**	**Upper limit charging voltage exceeded by ≤ 150 mV [2)] [YES / NO]**	**If > 150 mV then charging system permanently disabled? [3)] [YES / NO]**	**Cell vent damaged? [YES / NO]**

Supplementary Information:
[1)] Including cell information if necessary
One of conditions [2)] or [3)] is sufficient to achieve compliance with this subclause.

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

K.18.202	TABLE: Lithium-ion battery short circuit (Details refer to UL certificate No. UL-US-L472543-11-62205102-5)				P
Battery pack [1)]	**Sample**	**Explosion occurred? [YES / NO]**	**Charring or burning of gauze or tissue? [YES / NO]**	**Cell vented [2)] [YES / NO]**	**Reaction during test**
	1/3				
	2/3				
	3/3				

Supplementary Information:
[1)] Including cell information if necessary
[2)] Venting of cells is acceptable.

K.19.202	TABLE: Mechanical hazards – Venting (Details refer to UL certificate No. UL-US-L472543-11-62205102-5)	P
Battery pack [1)]	**Total area of openings > 20 mm² [2)] [YES / NO]**	**Pressure test - rupturing of enclosure? [3)] [YES / NO]**

Supplementary information:
[1)] Including cell information if necessary
One of conditions [2)] or [3)] is sufficient to achieve compliance with this subclause.

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

K.20.3.1	TABLE: Mechanical Strength – Drop test	P

Test subject [1]	Drop height [m]	Voltage prior test [V_{DC}]	Voltage after test [V_{DC}]	Deviation [%]	Discharging possible [YES/NO]	Recharging possible [YES/NO]	Damage to the cell vent [YES/ NO]	Meet the requirements of K.9 [YES/ NO]	Meet the requirements of K.19 [YES/ NO]	Meet the requirements of K.18.1f) [2] [YES/ NO]	Meet the requirements of K.28.1 [2] [YES/ NO]
Battery pack-DCB181	1	20.27	20.58	0	YES	YES	NO	N/A	YES	N/A	YES
Battery pack-DCB183	1	20.36	20.36	0	YES	YES	NO	N/A	YES	N/A	YES
Battery pack-DCB184	1	20.73	20.73	0	YES	YES	NO	N/A	YES	N/A	YES
Battery pack-DCB549	1	20.78	20.78	0	YES	YES	NO	N/A	YES	N/A	YES
Tool	1	--	--	--	YES	N/A	N/A	N/A	YES	N/A	YES
Tool & Battery pack - DCB181	1	20.27	20.58	0	YES	YES	NO	N/A	YES	N/A	YES
Tool & Battery pack-DCB183	1	20.36	20.36	0	YES	YES	NO	N/A	YES	N/A	YES
Tool & Battery pack-DCB184	1	20.73	20.73	0	YES	YES	NO	N/A	YES	N/A	YES
Tool & Battery pack-DCB549	1	20.78	20.78	0	YES	YES	NO	N/A	YES	N/A	YES

Supplementary information:
[1] Can be: tool itself, tool with battery, battery itself. Indicate what was tested.
One of conditions [2] is sufficient to achieve compliance with this subclause.

K.20.3.2	TABLE: Mechanical Strength – Impact test	N/A

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

Test subject [1]	Drop height [m] [2]	Voltage prior test [V_{DC}]	Voltage after test [V_{DC}]	Deviation [%]	Discharging possible [YES/NO]	Recharging possible [YES/NO]	Damage to the cell vent [YES/ NO]	Meet the requirements of K.9 [YES/ NO]	Meet the requirements of K.19 [YES/ NO]	Meet the requirements of K.18.1f) [3] [YES/ NO]	Meet the requirements of K.28.1 [3] [YES/ NO]

Supplementary information:
[1] Can be: tool itself, tool with battery, battery itself. Indicate what was tested.
[2] Only relevant for detachable battery packs or separable battery packs with a mass less than 3 kg.
One of conditions [3] is sufficient to achieve compliance with this subclause.

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

L.12	TABLE: Normal Temperature Test for Battery Tool		N/A
Ambient temperature (°C) .....:			—

Measurement at:	ΔT measured (K)	ΔT Limit (K)
Enclosure, outside, gripping surface		
Enclosure, outside, near motor		
Enclosure outside, gear housing		
Enclosure, inside, near motor		
Enclosure, inside, near heat sink		
Internal wiring		
Switch body		
External, metal gear case		
Battery terminal support		
Battery pack		

Supplementary Information:
Status of overload protector at end of test [ ] No change [ ] Opened during the Test [ ] N/A

L.12.201	TABLE: Lithium-ion charging systems – Normal Temperature Test						N/A
Measure-ment at:	Temperature normal charging (°C)	Cell-voltage (V)		Temperature imbalanced cells charging (°C)	Cell-voltage (V)		Allowed Limit (°C)
		At start of the test	Max. during test		At start of the test	Max. during test	
BATTERY PACK:		CELL:			CHARGER:		
Max. allowed cell-charging-current:				measured charging-current 1):			
Ambient		—			—		—
Cell 1							
Cell 2							
Cell 3							
Cell 4							
Cell 5							
Cell X							

Supplementary Information: 1) If multi-layer battery the charging current has to be divided through the number of layers.
All technical information are provided by manufacturer.

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

L.18.201	TABLE: Battery Tool Abnormal Operation					N/A
	Resistance applied (max. 10 mΩ)	Protective device operated during first test? [YES / NO]	Test repeated 2 more times with device in place? [YES / NO]	Test repeated 1 more time with device bridged? [YES / NO]	Explosion, charring or burning of test materials? [YES / NO]	
a) Terminals of detachable battery pack with exposed terminals shorted						
	Reaction during test:					
b) Motor terminals shorted						
	Reaction during test:					
c) Motor rotor locked						
	Reaction during test:					
d) Cord between battery tool and separable battery pack shorted						
	Reaction during test:					
e) Cord between tool and charger shorted						
	Reaction during test:					
f) Any two uninsulated parts of opposite polarity in battery tools shorted						
	Reaction during test:					
Supplementary Information:						

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

L.18.202	TABLE: Lithium-ion charging systems – Abnormal Operation								N/A
Abnormal condition:	a) Components in the charging system faulted as in 18.6.1 b) to f)								
Charger	**Battery pack [1)]**	**Affected component**	**Build in failure**	**Reaction during test**	**Explosion occurred? [YES / NO]**	**Charring or burning of test materials? [YES / NO]**	**Upper limit charging voltage exceeded by ≤ 150 mV [2)] [YES / NO]**	**If > 150 mV then charging system permanently disabled? [3)] [YES / NO]**	**Cell vent damaged? [YES / NO]**
Abnormal condition:	b) One cell 50% charged in a fully discharged battery								
Charger	**Battery pack [1)]**	**Affected component**	**Build in failure**	**Reaction during test**	**Explosion occurred? [YES / NO]**	**Charring or burning of test materials? [YES / NO]**	**Upper limit charging voltage exceeded by ≤ 150 mV [2)] [YES / NO]**	**If > 150 mV then charging system permanently disabled? [3)] [YES / NO]**	**Cell vent damaged? [YES / NO]**
Abnormal condition:	c) Charging of a series configured battery with all cells 50% charged, one cell shorted								
Charger	**Battery pack [1)]**	**Affected component**	**Build in failure**	**Reaction during test**	**Explosion occurred? [YES / NO]**	**Charring or burning of test materials? [YES / NO]**	**Upper limit charging voltage exceeded by ≤ 150 mV [2)] [YES / NO]**	**If > 150 mV then charging system permanently disabled? [3)] [YES / NO]**	**Cell vent damaged? [YES / NO]**

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

L.18.202	TABLE: Lithium-ion charging systems – Abnormal Operation								N/A
Abnormal condition:	d) Short across a component or between adjacent PCB tracks								
Charger	**Battery pack [1)]**	**Affected component**	**Build in failure**	**Reaction during test**	**Explosion occurred? [YES / NO]**	**Charring or burning of test materials? [YES / NO]**	**Upper limit charging voltage exceeded by ≤ 150 mV [2)] [YES / NO]**	**If > 150 mV then charging system permanently disabled? [3)] [YES / NO]**	**Cell vent damaged? [YES / NO]**

Supplementary Information:
[1)] Including cell information if necessary
One of conditions [2)] or [3)] is sufficient to achieve compliance with this subclause.

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

L.18.203	TABLE: Lithium-ion battery short circuit				N/A
Battery pack [1)]	**Sample**	**Explosion occurred? [YES / NO]**	**Charring or burning of gauze or tissue? [YES / NO]**	**Cell vented [2)] [YES / NO]**	**Reaction during test**
	1/3				
	2/3				
	3/3				
Supplementary Information: [1)] Including cell information if necessary [2)] Venting of cells is acceptable.					

L.19.202	TABLE: Mechanical hazards - Venting	N/A
Battery pack [1)]	**Total area of openings > 20 mm² [2)] [YES / NO]**	**Pressure test - rupturing of enclosure? [3)] [YES / NO]**
Supplementary information: [1)] Including cell information if necessary One of conditions [2)] or [3)] is sufficient to achieve compliance with this subclause.		

IEC 62841-1			
Clause	Requirement + Test	Result - Remark	Verdict

L.20.202.1	TABLE: Mechanical Strength – Drop test											N/A
Test subject [1)]	**Drop height [m]**	**Voltage prior test [V_{DC}]**	**Voltage after test [V_{DC}]**	**Deviation [%]**	**Discharging possible [YES/NO]**	**Recharging possible [YES/NO]**	**Damage to the cell vent [YES/ NO]**	**Meet the requirements of L.9 [YES/ NO]**	**Meet the requirements of L.19 [YES/ NO]**	**Meet the requirements of L.28.1 [YES/ NO]**	**Meet the requirements of L.18.201 [2)] [YES/ NO]**	**Meet the requirements of L.28.201 [2)] [YES/ NO]**

Supplementary information:
[1)] Can be: tool itself, tool with battery, battery itself. Indicate what was tested.
One of conditions [2)] is sufficient to achieve compliance with this subclause.

L.20.202.2	TABLE: Mechanical Strength – Impact test											N/A
Test subject [1)]	**Drop height [m] [2)]**	**Voltage prior test [V_{DC}]**	**Voltage after test [V_{DC}]**	**Deviation [%]**	**Discharging possible [YES/NO]**	**Recharging possible [YES/NO]**	**Damage to the cell vent [YES/ NO]**	**Meet the requirements of L.9 [YES/ NO]**	**Meet the requirements of L.19 [YES/ NO]**	**Meet the requirements of L.28.1 [YES/ NO]**	**Meet the requirements of L.18.201 [3)] [YES/ NO]**	**Meet the requirements of L.28.201 [3)] [YES/ NO]**

Supplementary information:
[1)] Can be: tool itself, tool with battery, battery itself. Indicate what was tested.
[2)] Only relevant for detachable battery packs or separable battery packs with a mass less than 3 kg.
One of conditions [3)] is sufficient to achieve compliance with this subclause.

National differences of UL 62841-1:2015 R6.22 and CAN/CSA-C22.2 No. 62841-1-15+GI1+GI2+GI3+GI4+GI5			
Clause	Requirement + Test	Result - Remark	Verdict
8.2DV	**D1 Modification: Add the following to Clause 8.2:**		—
	For tools sold in Canada, safety warnings marked on the product shall be written in both English and French. For tools sold in the United States of America, safety instructions/warnings marked on the product shall be written in English.	English and French	P
8.12DV	**D2 Modification: Add the following after the first sentence of the seventh paragraph of Clause 8.12:**		—
	In Canada, the requirements of UL 969 are replaced with the requirements of CSA C22.2 No.0.15.		P
8.14DV	**D1 Modification: Add the following to Clause 8.14:**		—
	For tools sold in Canada, instruction manuals and safety instructions shall be written in both English and French. For tools sold in the United States of America, instruction manuals and safety instructions shall be written in English.	English and French	P
14.1DV	**D2 Modification: Add the following to the fourth paragraph of Clause 14.1:**		—
	For tools provided with an appliance inlet, the moisture resistance tests shall be made with an appropriate connector inserted.		N/A
24.1DV	**D1 Modification: Replace second dash of Clause 24.1 with the following:**		—
	- a SUPPLY CORD with a minimum length of 1,8 m and without a plug, if the tool is intended to be connected to non-public power supplies, the information for connection of a plug shall be given in the instructions in accordance with 8.14.2 a)		N/A
K.8.2DV	**D2 Addition: Add K.8.2DV.1 to Annex K of the Part 1:**		—
K.8.2DV.1	This subclause is applicable to tools, separable battery packs and detachable battery packs.		P
K.18.1DV.1	**D2 Modification: Replace Item (b) of Clause K.18.1 with the following:**		—
	b) The terminals of each motor are shorted one at a time, except for electronically commutated motors.	Considered	P
K.18.1.DV.2	**D2 Modification: Replace Item (c) of Clause K.18.1 with the following:**		—
	c) The rotor of each motor is locked one at a time, except for electronically commutated motors.	Considered	P
K.21.203DV	**D2 Modification: Replace Clause K.21.203 with the following:**		—
	Except as noted below, user accessible interfaces between elements of a lithium-ion BATTERY SYSTEM shall not employ connectors of the following types:		P
	a) Standard mains appliance couplers;		N/A

National differences of UL 62841-1:2015 R6.22 and CAN/CSA-C22.2 No. 62841-1-15+GI1+GI2+GI3+GI4+GI5			
Clause	Requirement + Test	Result - Remark	Verdict
	A standard mains appliance coupler is acceptable if all of the following are fulfilled: 1) The tool inlet is intended to be connected to the mains; 2) The BATTERY or any element containing the BATTERY cannot be connected to a standard mains appliance inlet; and 3) The system has been evaluated and determined to be suitable for the application as required in BATTERY tools and BATTERY packs provided with mains connection or NON-ISOLATED SOURCES, Annex L.		N/A
	b) Barrel connectors with outside diameters of 6,5 mm or less;		N/A
	c) Phone plugs with a diameter of 3,5 mm or less.		N/A
	For cases where the connector is intended to be supplied by a class 2 power unit and the supply current is used for charging lithium-ion batteries, connectors as specified in (b) and (c) above may be used provided the connection is subject to the following test:		N/A
	1) Starting with a FULLY DISCHARGED BATTERY, apply a sinusoidal input a. c. voltage to the connection starting from 5 V and increasing to 30 V in 5 V increments from a power source capable of suppling 8 A.		N/A
	2) For each voltage increment, the voltage is applied until: i) No current is drawn by the power unit for 5 min; ii) The battery no longer draws charging current) for 5 min; or iii) Until at least 7 h has elapsed.		N/A
	3) The test is repeated without changing the battery sample for each voltage increment, as applicable.		N/A
	4) After the last increment of the a. c. test voltage is completed, the test is then repeated from (1) – (3) starting with another sample of a FULLY DISCHARGED BATTERY applying a d.c. voltage to the connection starting from 10V and increasing to 60 V in 10 V increments. The DC power source shall be capable of suppling 8A and must have less than 10 % ripple (p-p).		N/A

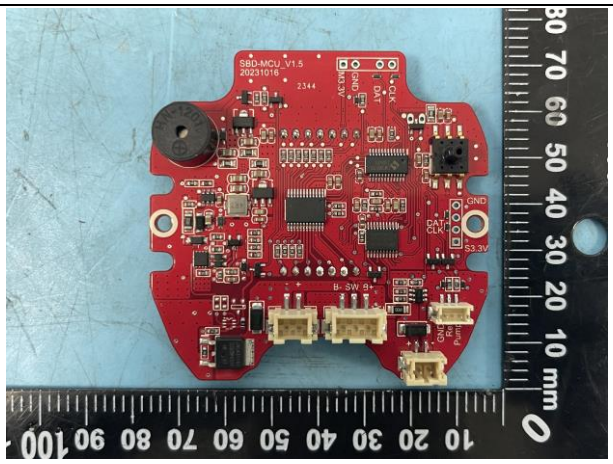
National differences of UL 62841-1:2015 R6.22 and CAN/CSA-C22.2 No. 62841-1-15+GI1+GI2+GI3+GI4+GI5			
Clause	Requirement + Test	Result - Remark	Verdict
	5) After the last increment of the d. c. test voltage is completed, the test is then repeated from (1) – (3) starting with another sample of a FULLY DISCHARGED BATTERY applying a d.c. voltage to the connection starting from 10V and increasing to 60 V in 10 V increments, but with the polarity reversed. The DC power source shall be capable of suppling 8A and must have less than 10 % ripple (p-p).		N/A
	6) If either the a. c. or d. c. test above is terminated due to no current being drawn, the test is repeated with another sample of a fully charged battery at the highest a. c. (30 V) or d. c. (60 V) voltage, as applicable, for the required time period.		N/A
	During the tests: a) There shall be no fire, EXPLOSION or risk of injury to persons; and b) Cells shall not exceed their SPECIFIED OPERATING REGION FOR CHARGING.		N/A
	If (a) or (b) occurs, then the test is considered to be terminated. After the tests, the charging system need not be operable.		N/A
L.18.201DV.1	**D2 Modification: Replace Item (b) of Clause L.18.201 with the following:**		—
	b) The terminals of each motor are shorted one at a time, except for electronically commutated motors.		N/A
L.18.201DV.2	**D2 Modification: Replace Item (c) of Clause L.18.201 with the following:**		—
	c) The rotor of each motor is locked one at a time, except for electronically commutated motors.		N/A
DVA.1	**D2 Addition: Add a new Annex DVA as follows:**		—
	The following is a cross reference of component standards. The requirements of the subject standards listed in Clause 2 shall be applicable, except where they are replaced by the U.S./Canadian standards listed in the table below.		P
	For dated references, only the edition specified applies. For undated references, the latest edition of the referenced document (including any amendments) applies.		P
	Table DVA Standards Cross Reference		P

- END OF TEST REPORT -

Prüfbericht - Produkte
Test Report - Products

TÜVRheinland®

Prüfbericht-Nr.: *Test report no.*:	**CN24MR0D 001**	**Auftrags-Nr.:** *Order no.*:	180287141	Seite 1 von 12 *Page 1 of 12*
Kunden-Referenz-Nr.: *Client reference no.*:	N/A	**Auftragsdatum:** *Order date:*	2024.01.05	
Auftraggeber: *Client*:	Nemo Power Tools Limited 21st Floor, CMA Building 64 Connaught Road CENTRAL HONG KONG			
Prüfgegenstand: *Test item*:	Controller of cordless lifting tool			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	SBD-MCU-V1.5			
Auftrags-Inhalt: *Order content*:	Performance Levels Evaluation			
Prüfgrundlage: *Test specification*:	ISO 13849-1:2015 IEC 62841-1:2014 (as reference) EN 62841-1:2015+A1 (as reference) UL 62841-1:2015 R6.22 (as reference)			
Wareneingangsdatum: *Date of sample receipt*:	2024.01.15			
Prüfmuster-Nr.: *Test sample no:*	A003643496-001			
Prüfzeitraum: *Testing period*:	2024.01.16 – 2024.03.12			
Ort der Prüfung: *Place of testing*:	TÜV Rheinland / CCIC (Ningbo) Co., Ltd.			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland / CCIC (Ningbo) Co., Ltd.			
Prüfergebnis*: *Test result**:	Pass			



geprüft von:
tested by:

X Eason Shi

Signed by: Eason Shi

Datum:
Date: 2024.06.11

genehmigt von:
authorized by:

X Herman Wang

Ausstellungsdatum:
Issue date: 2024.06.11

Signed by: Herman Wang

Stellung / Position: Eason Shi / PE

Stellung / Position: Herman Wang / Authorizer

Sonstiges / *Other*: For details, see page 3.

Client contact: iris@grabo.com

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery*: Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Table of Contents

General Information

This report is for evaluating performance level of SCF (safety critical function) for **Controller of cordless lifting tool.**

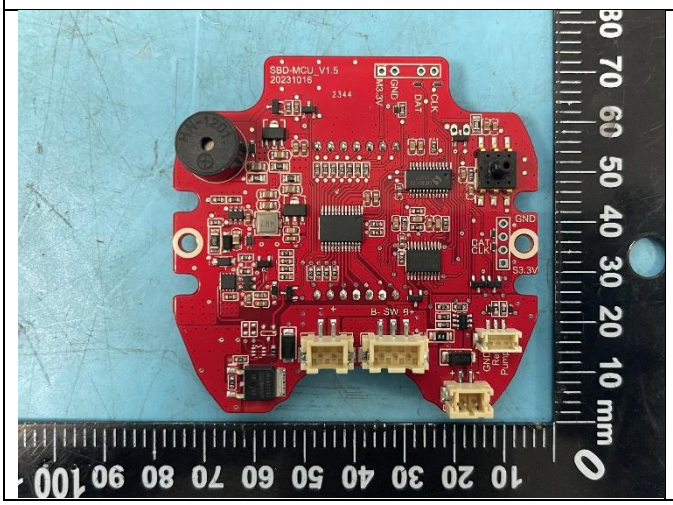
The evaluating method is complied with the requirements of ISO 13849-1:2015 specified in IEC 62841-1:2014, EN 62841-1:2015+A1 and UL 62841-1:2015 R6.22.

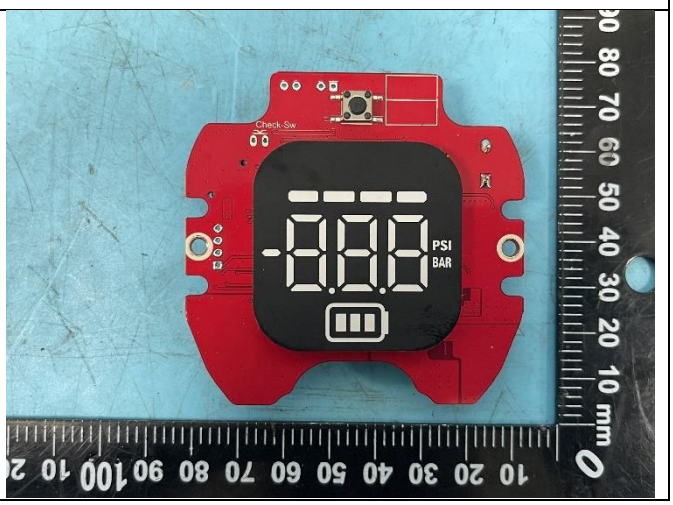
This report is only valid for the conditions as below:

1. The controller hardware version **SBD-MCU-V1.5.**

AND
2. The type of cordless lifter tool: **DCE590, DCE592** and etc**.**

Photo Document for controller SBD-MCU-V1.5:





ISO 13849-1:2015			
Clause	Requirement - Test	Result - Remark	Verdict
1	**Scope**	Informative	--
2	**Normative references**	Informative	--
3	**Terms, definitions, symbols and abbreviated terms**	Informative	--
4	**Design considerations**		
4.1	Safety objectives in design	Informative PL level is referred to Table 4 of IEC 62841-1:2014, EN 62841-1:2015+A1 and UL 62841-1:2015 R6.22 and determination the PL as ISO 13849-1:2015	P
4.2	Strategy for risk reduction	Informative PL level is referred to Table 4 of IEC 62841-1:2014, EN 62841-1:2015+A1 and UL 62841-1:2015 R6.22 and determination the PL as ISO 13849-1:2015	P
4.3	Determination of required performance level (PLr)	Informative PL level is referred to Table 4 of IEC 62841-1:2014, EN 62841-1:2015+A1 and UL 62841-1:2015 R6.22 and determination the PL as ISO 13849-1:2015	P
4.4	Design of SRP/CS	Informative	--
4.5	Evaluation of the achieved performance level PL and relationship with SIL	Informative	--
4.6	Software safety requirements	Failure of software will not create any loss of SCF from A.1	N/A
5	**Safety functions**	Informative	--
6	**Categories and their relation to MTTFD of each channel, DCavg and CCF**		P
6.1	General	Informative	--
6.2	Specifications of categories		P
6.2.1	General		P
	Each SRP/CS shall comply with the requirements of the relevant category, see 6.2.3 to 6.2.7. The following architectures typically meet the requirements of the respective category.	Please refer to Part A & B	P

ISO 13849-1:2015			
Clause	Requirement - Test	Result - Remark	Verdict
	The following figures show not examples but general architectures. A deviation from these architectures is always possible, but any deviation shall be justified, by means of appropriate analytical tools (e.g. Markov modelling, fault tree analysis), such that the system meets the required performance level (PLr). The designated architectures cannot be considered only as circuit diagrams but also as logical diagrams. For categories 3 and 4, this means that not all parts are necessarily physically redundant but that there are redundant means of assuring that a fault cannot lead to the loss of the safety function. The lines and arrows in Figures 8 to 12 represent logical interconnecting means and logical possible diagnostic means.	Please refer to Part A & B	P
6.2.2	Designated architectures		P
	The structure of a SRP/CS is a key characteristic having great influence on the PL. Even if the variety of possible structures is high, the basic concepts are often similar. Thus, most structures which are present in the machinery field can be mapped to one of the categories. For each category, a typical representation as a safety-related block diagram can be made. These typical realizations are called designated architectures and are listed in the context of each of the following categories. It is important that the PL shown in Figure 5, depending on the category, MTTFD of each channel and DCavg, is based on the designated architectures. If Figure 5 is used to estimate the PL the architecture of the SRP/CS should be demonstrated to be equivalent to the designated architecture of the claimed category. Designs fulfilling the characteristics of the respective category in general are equivalent to the respective designated architecture of the category.	Please refer to Part A & B	P
6.2.3	Category B		P
6.2.4	Category 1		N/A

ISO 13849-1:2015			
Clause	Requirement - Test	Result - Remark	Verdict
	For category 1, the same requirements as those according to 6.2.3 for category B shall apply. In addition, the following applies. SRP/CS of category 1 shall be designed and constructed using well-tried components and well-tried safety principles (see ISO 13849‑2). A “well-tried component” for a safety-related application is a component which has been either a) widely used in the past with successful results in similar applications, or b) made and verified using principles which demonstrate its suitability and reliability for safetyrelated applications. Newly developed components and safety principles may be considered as equivalent to “well-tried” if they fulfil the conditions of b). The decision to accept a particular component as being “well-tried” depends on the application. NOTE 1 Complex electronic components (e.g. PLC, microprocessor, application-specific integrated circuit) cannot be considered as equivalent to “well tried”. The MTTFD of each channel shall be high. The maximum PL achievable with category 1 is PL = c. NOTE 2 There is no diagnostic coverage (DCavg = none) within category 1 systems. In such structures (singlechannel systems) the consideration of CCF is not relevant. NOTE 3 When a fault occurs it can lead to the loss of the safety function. However, the MTTFD of each channel in category 1 is higher than in category B. Consequently, the loss of the safety function is less likely. It is important that a clear distinction between “well-tried component” and “fault exclusion” (see Clause 7) be made. The qualification of a component as being well-tried depends on its application. For example, a position switch with positive opening contacts could be considered as being well-tried for a machine tool, while at the same time as being inappropriate for application in a food industry — in the milk industry, for instance, this switch would be destroyed by the milk acid after a few months. A fault exclusion can lead to a very high PL, but the appropriate measures to allow this fault exclusion should be applied during the whole lifetime of the device. In order to ensure this, additional measures outside the control system may be necessary. In the case of a position switch, some examples of these kinds of measures are		N/A

ISO 13849-1:2015			
Clause	Requirement - Test	Result - Remark	Verdict
	— means to secure the fixing of the switch after its adjustment, — means to secure the fixing of the cam, — means to ensure the transverse stability of the cam, — means to avoid overtravel of the position switch, e.g. adequate mounting strength of the shock absorber and any alignment devices, and — means to protect it against damage from outside.		
6.2.5	Category 2		N/A

ISO 13849-1:2015			
Clause	Requirement - Test	Result - Remark	Verdict
	For category 2, the same requirements as those according to 6.2.3 for category B shall apply. "Well–tried safety principles" according to 6.2.4 shall also be followed. In addition, the following applies. SRP/CS of category 2 shall be designed so that their function(s) are checked at suitable intervals by the machine control system. The check of the safety function(s) shall be performed — at the machine start-up, and — prior to the initiation of any hazardous situation, e.g. start of a new cycle, start of other movements, immediately upon on demand of the safety function and/or periodically during operation if the risk assessment and the kind of operation shows that it is necessary. The initiation of this check may be automatic. Any check of the safety function(s) shall either — allow operation if no faults have been detected, or — generate an output (OTE) which initiates appropriate control action, if a fault is detected. For PLr = d the output (OTE) shall initiate a safe state which is maintained until the fault is cleared. For PLr up to and including PLr = c, whenever practicable the output (OTE) shall initiate a safe state which is maintained until the fault is cleared. When this is not practicable (e.g. welding of the contact in the final switching device) it may be sufficient for the output of the test equipment OTE to provide a warning. For the designated architecture of category 2, as shown in Figure 10, the calculation of MTTFD and DCavg should take into account only the blocks of the functional channel (i.e. I, L and O in Figure 10) and not the blocks of the testing channel (i.e. TE and OTE in Figure 10). The diagnostic coverage (DCavg) of the functional channel shall be at least low. The MTTFD of each channel shall be low-to-high, depending on the required performance level (PLr).		N/A

ISO 13849-1:2015			
Clause	Requirement - Test	Result - Remark	Verdict
	Measures against CCF shall be applied (see Annex F). The check itself shall not lead to a hazardous situation (e.g. due to an increase in response time). The test equipment may be integral with, or separate from, the safety-related part(s) providing the safety function. The maximum PL achievable with category 2 is PL = d. NOTE 1 In some cases category 2 is not applicable because the checking of the safety function cannot be applied to all components. NOTE 2 Category 2 system behaviour is characterized by — the occurrence of a fault can lead to the loss of the safety function between checks, — the loss of safety function is detected by the check. NOTE 3 The principle that supports the validity of a category 2 function is that the adopted technical provisions, and, for example, the choice of checking frequency can decrease the probability of occurrence of a dangerous situation. NOTE 4 For applying the simplified approach based on designated architectures, refer to the assumptions in 4.5.4.		N/A
6.2.6	Category 3		N/A
6.2.7	Category 4		N/A
6.3	Combination of SRP/CS to achieve overall PL		N/A
7	**Fault consideration, fault exclusion**	Informative	--
8	**Validation**	Informative	--
9	**Maintenance**	Informative	--
10	**Technical documentation**	Informative	--
11	**Information for use**	Informative	--
G.2	**Measures for the control of systematic failures**		
	The following measures should be applied. — Use of de-energization (see ISO 13849-2) The safety-related parts of the control system (SRP/CS) should be designed so that with loss of its power supply a safe state of the machine can be achieved or maintained.	Loss of power supply will lead to safe state.	P

ISO 13849-1:2015			
Clause	Requirement - Test	Result - Remark	Verdict
	— Measures for controlling the effects of voltage breakdown, voltage variations, overvoltage, undervoltage SRP/CS behaviour in response to voltage breakdown, voltage variations, overvoltage, and undervoltage conditions should be predetermined so that the SRP/CS can achieve or maintain a safe state of the machine (see also IEC 60204‑1 and IEC 61508‑7:2000, A.8).	The power is supplied from a battery pack, the voltage of which is stable. The voltage breakdown by re-moving battery pack and under voltage by low battery will make the system in a safe state.	P
	— Measures for controlling or avoiding the effects of the physical environment (for example, temperature, humidity, water, vibration, dust, corrosive substances, electromagnetic interference and its effects) SRP/CS behaviour in response to the effects of the physical environment should be predetermined so that the SRP/CS can achieve or maintain a safe state of the machine (see also, for example, IEC 60529, IEC 60204‑1).	The package of the PCB protects it from the physical environment.	P
	— Program sequence monitoring shall be used with SRP/CS containing software in order detect defective program sequences A defective program sequence exists if the individual elements of a program (e.g. software modules, subprograms or commands) are processed in the wrong sequence or period of time or if the clock of the processor is faulty (see EN 61508‑7:2001, A.9).		N/A
	— Measures for controlling the effects of errors and other effects arising from any data communication process (see IEC 61508‑2:2000, 7.4.8)		N/A
	In addition, one or more of the following measures should be applied, taking into account the complexity of the SRP/CS and its PL: - failure detection by automatic tests; - tests by redundant hardware; - diverse hardware; - operation in the positive mode; - mechanically linked contacts; - direct opening action; - oriented mode of failure; - over-dimensioning by a suitable factor, where the manufacturer can demonstrate that deraing will improve reliability — where over-dimensioning is appropriate, an over-dimensioning factor of at least 1,5should be used.		P

Part A Requirement for SCF

A.1 Performance level

The SCF is required according to IEC 62841-1:2014(as reference), EN 62841-1+A1(as reference) & UL 62841-1:2015 R6.22 (as reference).

SCF No.	SCF	PL Requirement
SCF 01	Power switch – prevent unwanted pump switch-on & provide desired pump switch-off	a

Part B Details for SCF

B.1 SCF 01 Power switch – prevent unwanted pump switch-on & provide desired pump switch-off

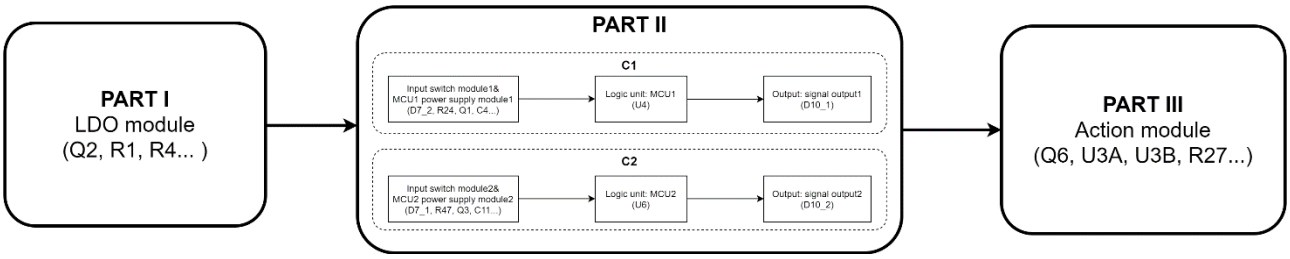


Figure B.1

Part C Calculation of $MTTF_D$

C.1 SCF 01 Power switch – prevent unwanted pump switch-on & provide desired pump switch-off

C.1.1 Calculation of $MTTF_D$ for SCF 01-PART I

$$MTTF_{D\ PART\ I} = \frac{1}{\sum_{j=1}^{N} \frac{n_j}{MTTF_{D\,j}}} = 86.1249438\ years$$

C.1.2 Calculation of MTTFD for SCF 01-PART II

$$MTTF_{D\ C1} = \frac{1}{\sum_{j=1}^{N} \frac{n_j}{MTTF_{D\,j}}} = 46.4933\ \text{years}$$

$$MTTF_{D\ C2} = \frac{1}{\sum_{j=1}^{N} \frac{n_j}{MTTF_{D\,j}}} = 80.87141\ years$$

$$MTTF_{D\ PART\ II} = \frac{2}{3}\left[MTTF_{D\ C1} + MTTF_{D\ C2} - \frac{1}{\frac{1}{MTTF_{D\ C1}} + \frac{1}{MTTF_{D\ C2}}}\right] = 65.22891\ years$$

C.1.3 Calculation of MTTFD for SCF 01-PART III

$$MTTF_{D\ PART\ III} = \frac{1}{\sum_{j=1}^{N} \frac{n_j}{MTTF_{D\,j}}} = 304.4383948\ years$$

C.1.4 Calculation of MTTFD for SCF 01

$$MTTF_{D\ Final} = \frac{1}{\frac{1}{MTTF_{D\ PART\ I}} + \frac{1}{MTTF_{D\ PART\ II}} + \frac{1}{MTTF_{D\ PART\ III}}} = 33.0830041\ years$$

According to cl.18.8 of IEC 62841-1:2014(as reference), EN 62841-1+A1(as reference) & UL 62841-1:2015 R6.22 (as reference), SCF 01 can achieve to PL = a.

---End of Test Report---

Constructional Data Form for Electrical Products

(For TUV Rheinland of N.A., Inc. use only)

Certificate # CU 72405019 0001 File # CN24KIHU 001

License Holder	:	Nemo Power Tools Limited 21st Floor, CMA Building 64 Connaught Road Central Hong Kong
Factory	:	Nemo Power Tools(Huizhou) Co.,Ltd 2/F, 4th Industrial Area, Luokeng Village, Xiaotie Zone, Xiaojinkou Town, Huicheng District, Huizhou City, Guangdong P.R. China
Type of Product	:	Cordless lifter tool
Model Number	:	DCE592
Rating	:	20 V d.c.

List of Critical Components

Object/part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity
Motor assembly	Shenzhen Yanhua Shouxin Technology Co., Ltd.	sn51023V1	Working voltage: DC 18V Vacuum: -80kpa Rated flow: 20L/min Power: 16W	CSA/UL 62841-1	Tested with appliance
Internal wire (For power transmission)	DONGGUAN YIAO ELECTRONICS CO LTD	3239	22-20AWG	UL 758 CSA C22.2 No.210	UL E348933+ Test with appliance
(Alternative)	DONGGUAN ZHONGZHEN NEW ENERGY TECHNOLOGY CO.,LTD	3239	22-20AWG	UL 758 CSA C22.2 No.210	UL E355578+ Test with appliance
Internal wire (For signal transmission)	DONGGUAN YIAO ELECTRONICS CO LTD	3132	28-22AWG	UL 758 CSA C22.2 No.210	UL E348933+ Test with appliance

Bryson Shi Hong Kong Iris Hu 2024.06.04

(Place) (Date)

TÜV Rheinland of North America, Inc. (Stamp and signature of applicant)

NEMO POWER TOOLS LIMITED 香港尼摩電動工具有限公司

Constructional Data Form for Electrical Products

(For TUV Rheinland of N.A., Inc. use only)

Certificate # CU 72405019 0001 File # CN24KIHU 001

List of Critical Components					
Object/part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity
(Alternative)	DONGGUAN WENCHANG ELECTRONIC PRODUCTS CO.,LTD	3132	28-22AWG	UL 758 CSA C22.2 No.210	UL E214500+ Test with appliance
(Alternative)	Shenzhen Longshengda Wire&Cable Co.,Ltd.	3132	28-22AWG	UL 758 CSA C22.2 No.210	UL E472430+ Test with appliance
Vacuum solenoid valve	Foshan weilizi Electronic Technology Co., Ltd	sn52025V1	DC 21.0V	CSA/UL 62841-1	Test with appliance
Power switch	Defond Components Ltd.	SSE-1202	2A, 125VAC; 1A, 250VAC	ANSI/UL 1054 CSA-C22.2 No. 55	UL E72989+ Tested with appliance
(Alternative)	Defond Components Ltd.	SSW-1204	4A, 125VAC; 2A, 250VAC	ANSI/UL 1054 CSA-C22.2 No. 55	UL E72989+ Tested with appliance
Main switch (For pump)	Defond Components Ltd.	BPT-1120-R-AAA21-01R	--	CSA/UL 62841-1	Test with appliance
Main switch (For vacuum)	Defond Components Ltd.	BPT-1115-0-AAA31-06R	--	CSA/UL 62841-1	Test with appliance
Main board	Nemo Power tools (Huizhou) Limited	SBD-MCU_V1.5	Min. thickness 1.6mm	CSA/UL 62841-1	Test with appliance

Bason Shi — Hong Kong — Iris Hu — 2024.06.04

TÜV Rheinland of North America, Inc. (Place) (Date)

(Stamp and signature of applicant)

Constructional Data Form for Electrical Products

(For TUV Rheinland of N.A., Inc. use only)

Certificate # CU 72405019 0001 File # CN24KIHU 001

List of Critical Components					
Object/part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity
-PCB materials	Shenzhen Lutongda Technology Co Ltd	LTD-M	130°C, V-0	CSA/UL 62841-1	UL E486889+ Test with appliance
Keys board	Nemo Power tools (Huizhou) Limited	SBD-KEY_V1.5	Min. thickness 1.6mm	CSA/UL 62841-1	Test with appliance
-PCB materials	Shenzhen Lutongda Technology Co Ltd	LTD-M	130°C, V-0	CSA/UL 62841-1	E486889+ Test with appliance
ON/OFF board	Nemo Power tools (Huizhou) Limited	SBD-ON/OFF_V1.5	Min. thickness 1.2mm	CSA/UL 62841-1	Test with appliance
-PCB materials	Shenzhen Lutongda Technology Co Ltd	LTD-M	130°C, V-0	CSA/UL 62841-1	E486889+ Test with appliance
Tool enclosure material	Jiangsu Boiln Plastics Co Ltd	Pemaron260G6 HI	PA6+GF30, HB Min. thickness 3.0mm	CSA/UL 62841-1	UL E349968+ Test with appliance
Marking label	TOPPAN Leefung Label Printing (Dongguan) Co., Ltd.	WIN-W-80(MP)E	Max. 100°C affixed to PA6+GF30 enclosure	CSA/UL 62841-1 UL 969	UL MH20589+ Test with appliance
Lithium-ion battery system	Black & Decker (U.S.) Inc	--	Including below components	UL2595 CSA C22.2 NO. 0.23	UL E472543
- Li-ion battery pack	Black & Decker (U.S.) Inc	DCB201	20V d.c., 1.5Ah	UL2595 CSA C22.2 NO. 0.23	UL E472543

Bason Shi

Hong Kong Iris Hu 2024.06.04

(Place) (Date)

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Constructional Data Form for Electrical Products

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Certificate # CU 72405019 0001 File # CN24KIHU 001

List of Critical Components					
Object/part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity
- Li-ion battery pack	Black & Decker (U.S.) Inc	DCB203	20V d.c., 2.0Ah	UL2595 CSA C22.2 NO. 0.23	UL E472543
- Li-ion battery pack	Black & Decker (U.S.) Inc	DCB205	20V d.c., 5.0Ah	UL2595 CSA C22.2 NO. 0.23	UL E472543
- Li-ion battery pack	Black & Decker (U.S.) Inc	DCB615	20/60V d.c., 15/5Ah	UL2595 CSA C22.2 NO. 0.23	UL E472543
Battery Charger	Black & Decker (U.S.) Inc	Models listed in E472543 Vol.1 Sec.1 together with battery pack	--	UL2595 CSA C22.2 NO. 0.23	UL E472543

Routine Safety Testing:

Required: ☒ **Not Required:** ☐ ***Reason:*** ***Class III product:*** ☐

Other:

Test Details:	**Test Points:**	**Test Values**
☐**Dielectric Strength:**	**PE – conductors of all circuits**	**1500Vac,1s**
☐**Ground Continuity:**	**PE – protective bonding circuit**	**10A, <0.1V**
☒ **Other:**	**Functional test**	

Bason Shi

Hong Kong Iris Hu 2024.06.04

(Place) (Date)

TÜV Rheinland of North America, Inc. (Stamp and signature of applicant)