Test Report issued under the responsibility of:

TEST REPORT
IEC 62841-2-1
Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery - Safety - Part 2-1: Particular requirements for hand-held drills and impact drills

ISO 12100

Safety of machinery — General principles for design — Risk assessment and risk reduction

Report Number.....:	AOC250711004S
Date of issue.....:	2025-07-11
Total number of pages.....:	153
Name of Testing Laboratory preparing the Report.....:	Shenzhen AOCE Electronic Technology Service Co., Ltd Room 202, 2nd Floor, No.12th Building of Xinhe Tongfuyu Industrial Park, Fuhai Street, Baoan District, Shenzhen, Guangdong, China
Applicant's name.....:	GUANGDONG JCTC POWER CO.,LTD
Address.....:	6F, Building 5, Dongsheng Industrial Park, No. 100 Taxin Road, Dongkeng Town, Dongguan, Guangdong, China
Test specification:	
Standard.....:	☒ IEC 62841-1:2015 ☒ IEC 62841-2-1:2018+A11:2019 ☒ EN ISO 12100:2010 ☒ European Group Differences and National Differences
Test procedure.....:	CE-MD
Non-standard test method.....:	N/A
TRF template used.....:	IECEE OD-2020-F1:2020, Ed.1.3
Test Report Form No.....:	IEC62841_2_1C
Test Report Form(s) Originator.....:	TÜV Rheinland Intercert Kft., MEEI Division
Master TRF.....:	2020-12-04

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description.....:	CAR WASH WASHER
Trade Mark(s).....:	JCTC® TERMINAL & CONNECTORS
Manufacturer.....:	GUANGDONG JCTC POWER CO.,LTD 6F, Building 5, Dongsheng Industrial Park, No. 100 Taxin Road, Dongkeng Town, Dongguan, Guangdong, China
Model/Type reference.....:	CP003
Ratings.....:	DC 21V, 0.7A, 14.7W

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	Shenzhen AOCE Electronic Technology Service Co., Ltd	
Testing location/ address.....:		Room 202, 2nd Floor, No.12th Building of Xinhe Tongfuyu Industrial Park, Fuhai Street, Baoan District, Shenzhen, Guangdong, China	
Tested by (name, function, signature).....:		WanYang Ye Technical Engineer	WanYang
Approved by (name, function, signature)...:		Robin Liu Technical Manager	Robin Liu
☐	**Testing procedure: CTF Stage 1:**	N/A	
Testing location/ address.....:			
Tested by (name, function, signature).....:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 2:**	N/A	
Testing location/ address.....:			
Tested by (name + signature).....:			
Witnessed by (name, function, signature)..:			
Approved by (name, function, signature)...:			
☐	**Testing procedure: CTF Stage 3:**	N/A	
☐	**Testing procedure: CTF Stage 4:**	N/A	
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 No.1: European Group Differences and National Differences.
Attachment No.2: Photo document.

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
- EN 62841-1:2015 - EN 62841-2-1:2018+A11:2019 - EN ISO 12100:2010	Shenzhen AOCE Electronic Technology Service Co., Ltd Room 202, 2nd Floor, No.12th Building of Xinhe Tongfuyu Industrial Park, Fuhai Street, Baoan District, Shenzhen, Guangdong, China

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

European Group Differences and National Differences.

☒ **The product fulfils the requirements of** EN 62841-1:2015 & EN 62841-2-1:2018+A11:2019 & EN ISO 12100:2010

Statement concerning the uncertainty of the measurement systems used for the tests
(may be required by the product standard or client)

☒ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title: N/A

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

☐ **Statement not required by the standard used for type testing**

(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

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.

CAR WASH WASHER
Model: CP003
Rating: DC 21V, 0.7A, 14.7W

ta: 45℃

GUANGDONG JCTC POWER CO.,LTD
MADE IN CHINA

Test item particulars..... :	
Classification of installation and use.....:	Hand-held appliance
Supply Connection.....:	DC inlet
.....:	
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.....:	2025-06-27
Date (s) of performance of tests.....:	2025-06-27 to 2025-07-11

General remarks:

The tested sample(s) and the sample information are provided by the client.

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.
Note: EN Group Differences together with National Differences and Special National Conditions, if any, are in the Appendix to the main body of this TRF.
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

The test report only allows to be revised only within the report defined retention period unless standard or regulation was withdrawn or invalid.

When determining for test conclusion, measurement uncertainty of tests has been considered.

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)..... :	GUANGDONG JCTC POWER CO.,LTD 6F, Building 5, Dongsheng Industrial Park, No. 100 Taxin Road, Dongkeng Town, Dongguan, Guangdong, China

General product information and other remarks:

The max. ambient temperature is 45℃.

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
5	**GENERAL CONDITIONS FOR THE TESTS**		-
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		P
	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		P
	Electronic speed control devices set at their highest speed..... :		P
	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

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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
5.7.3	Tools where there is no marked Rated current not marked, 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		N/A
5.9	Tools are tested with the specified flexible supply cord connected to the tool.		N/A
5.10	Class I tool has 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, such parts are checked on requirements for class II construction.		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		N/A
5.12	When testing electronic circuits, supply is free from perturbations from external sources that can influence the results of the tests		P
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.		N/A
	Additional loads necessary for the correct operation of the tool considered.....:		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
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 tools has more accessories, equipment or attachments heaviest configuration shall be used to determine mass.		P
5.17 A	The mass of the tool includes the drill chuck and the auxiliary handle, if any.		P
5.18	For linear and angular dimensions, ISO 2768-1, class “c” applicable, unless tolerances are specified.		N/A
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 ≥ 25 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		N/A
	Induction motor, measurement time of 1 hour is considered sufficient.		P

6	**RADIATION, TOXICITY AND SIMILAR HAZARDS**		-
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..... :		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
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.		N/A
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
	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**		-
7.1	Tool is Class I, II, or III with respect to protection against electric shock.....:		P
7.2	Degree of protection against harmful ingress of water per IEC 60529.....:		P
	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**		-
8.1	Tool marked with rated voltage(s) or rated voltage range(s) (V).....:		P

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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)..... :		P
	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		P
	Class II symbol for class II tools ..... :		P
	IP number other than IPX0.....:		P
8.1 A	Drills and impact drills are marked with the following:		P
	Rated no-load speed ..... :		P
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 these 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[8]), or - appropriate symbol, see relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4		N/A
	"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

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Additional symbols in accordance with ISO 7010 or designed in accordance with ISO 3864-2/3864-3... :		N/A
	Cautionary statements having the same signal word such as “WARNING” may be combined into one paragraph under one signal word.		P
	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..... :		P
	Business name and address of authorized representative, at least country or state, city and postal code.....:		P
	Designation of the tool (may be coded).....:		P
	Designation coded, code explained in the instructions		P
	Designation of series or type..... :		P
	Year of manufacture and a date code identifying at least the month of manufacture.....:		P
	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		P
8.3 A	Chucks of drills and impact drills are marked with the maximum capacity of the chuck..... :		P
8.4	Markings of 8.1 to 8.3 not on detachable part of the tool		P
	Markings of 8.2 and 8.3 clearly discernible from outside the tool		P
	Markings other than symbols, fold-over label on power cords used (Y or Z attachments only).		P
	Other markings may be visible after removing cover		P
	Indications for switches and controls placed on or in vicinity of components		P
	Not placed on parts which can be repositioned		N/A
	Not positioned such that making the marking is misleading		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
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		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:		—
	- Terminal exclusively for neutral connection marked with “N”		N/A
	- 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.....:		N/A
8.10	“Off” position of multi stable power switch indicated by figure O (symbol of IEC 60417-5008 [2002-10])		P
	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		P
	Transportable tools, power switch actuator or cover not coloured yellow and red as specified for emergency stop according to ISO 13850.		P

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Flap/cover covers only the start button, colour of the flap/cover not black, red or yellow		N/A
8.11	Control devices adjusted during operation and the like provided with markings as specified, unless…		P
	… 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…		N/A
	… withstands specified tests		N/A
8.13	Thermal link or fuse-link, reference number or other means for identifying the link marked		N/A
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..... :		P
	- are legible and contrast with the background.		P
	- include business name and address of the manufacturer and, where applicable, his authorised representative.....:		N/A
	- include the designation of the tool and series or type as required by 8.3, including description of machine such as “drill”, “planer” etc. ..... :		P
8.14.1	Safety instructions in English are verbatim and in any other official language are equivalent..... :		P

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The general power tool safety warnings may be separate from the instruction manual.		P
	Term “tool” or “power tool” not used for garden machinery; use term such as “machine”		N/A
	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 A	The additional safety instructions as specified in 8.14.1.101 are given. This part may be printed separately from the “General Power Tool Safety Warnings”.		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		N/A
	5) Service		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 …		P
	… order of the Safety Instructions in accordance with 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
	Order of the Safety Instructions in accordance with C): Any additional warnings deemed necessary by the manufacturer, not inserted within any of the IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings		N/A
8.14.1.3	Instruction manual and safety instructions in one common document, or		N/A
	Warning as specified included in manual		P
8.14.1.10 A	**Drill safety warnings.**		P
	1) Safety instructions for all operations:		—
	a) Wear ear protectors when impact drilling. Exposure to noise can cause hearing loss.		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) Use the auxiliary handle(s). Loss of control can cause personal injury.		N/A
	c) Brace the tool properly before use. This tool produces a high output torque and without properly bracing the tool during operation, loss of control may occur resulting in personal injury.		N/A
	d) Hold the power tool by insulated gripping surfaces, when performing an operation where the cutting accessory may contact hidden wiring or its own cord.		N/A
	2) Safety instructions when using long drill bits:		—
	a) Never operate at higher speed than the maximum speed rating of the drill bit.		P
	b) Always start drilling at low speed and with the bit tip in contact with the workpiece.		P
	c) Apply pressure only in direct line with the bit and do not apply excessive pressure		P
8.14.2	Additional instructions and information		P
	a) Instructions for putting into use		P
8.14.2 A	101) For diamond core drills: maximum diamond core bit diameter ..... :		P
	102) For tools with a maximum output torque greater than 100 Nm measured in accordance with 19.102: instructions on how to brace the tool.		N/A
	103) For applications which produce a considerable amount of dust, such as impact and diamond core drilling: instruction on how to collect the dust.		N/A
	b) Operating instructions		N/A
	c) Maintenance and servicing instructions		N/A
	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.		N/A
9	**PROTECTION AGAINST ACCESS TO LIVE PARTS**		-
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		N/A
9.2	Accessible part not considered live if it is:		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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		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
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		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.		N/A
	Parts not separated from live parts by double 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

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
10	**STARTING**		-
10.1	Motors start under normal voltage conditions		N/A
	Starting ten times at 0,85 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…		N/A
	… or 4 times the rated current of the tool		N/A
11	**INPUT AND CURRENT**		-
	Marked power input or current is at least 110% of measured no-load input or current..... :		P
	Tool marked with more than one rated voltage, test made at each rated voltage..... :		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
	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..... :		P
12	**HEATING**		-
12.1	No excessive temperatures attained at rated input or rated current..... :		P
	Temperature rise determined according to Clauses 12.2 to 12.5		P
	Test of Clause C.3 at 1,06 times the rated voltage under heated conditions	See Table C.3A	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		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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		P
	Temperatures are measured at the most unfavourable of the voltage settings used		P
	Temperatures measured by means of thermocouples are taken while the tool is operating		P
12.2.1 R	Drills and impact drills are operated continuously until thermal equilibrium is reached with the impact mechanism, if any, disengaged, while the torque applied to the spindle is 80 % of the torque necessary to attain rated input or rated current.		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		P
12.3.2	Tool provided with automatic cord reel, one third of the total length of the cord was unreeled		N/A
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		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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		P
	Protective devices did not operate		P
	Sealing compounds did not flow		N/A
12.5 A	For impact drills, the temperature-rise limit specified for the external enclosure does not apply to the enclosure of the impact mechanism.		N/A
12.6	When winding temperatures exceeded values in Table 1, three additional samples successfully subjected to following tests:		N/A
	a) Heat treatment for 240 h at the specified cabinet temperature (°C):.....:		N/A
	b) No inter turn short circuit after oven treatment		N/A
	c) Humidity treatment in accordance with 14.1		N/A
	d) Tests of Annex D..... :	See Table D.2	N/A
13	**RESISTANCE TO HEAT AND FIRE**		-
13.1	Relevant parts sufficiently resistant to distortion due to heat		P
	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		P
	Relevant parts subjected to ball-pressure test acc. to IEC 60695-10-2	See Table 13.1	P
13.2	Part of non-metallic material, except as listed in this clause, resistant to ignition and spread of fire		P
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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**		P
14.1	Tools are proof against likely humid conditions		P
	Tool subjected to humidity treatment test for 48 h		P
	Relative humidity (93 ± 2) %.....:		P
	Temperature (20…30 °C) maintained at ± 1K.....:		P
	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).....:		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
	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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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)		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

15	**RESISTANCE TO RUSTING**		-
15.1	Ferrous parts adequately protected against rusting		N/A
	Parts used to conduct electricity subjected to test.. :		—
	Mechanical parts mechanical parts specified in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 subjected to test.....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	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**		-
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		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**		-
17.1	Construction prevents electrical or mechanical failures that might impair compliance with this standard.		P
	Insulation not damaged		P
	Connections did not work loose		P
	Overload protection devices did not activate		P
	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
17.2	No load intermittent operation (2 x 24 h) for hand-held tools		P
	No load intermittent operation (2 x 12 h) for transportable tools		N/A
	Test voltage at each operation (V).....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	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
17.2 R	For Impact drills: The impact mechanism remains disengaged for 12h at 1.1x the highest rated voltage or 1,1x the upper limit rated voltage range		N/A
	and then 12h at 0,9x the lowest rated voltage or 0,9x the lower limit rated voltage range		N/A
	Number of operations..... :		N/A
	Number of hours for each operation..... :		N/A
	Test voltage at each operation (V)..... :		N/A
	Rate of operation (100s “on”, 20s “off”)..... :		N/A
	Test positions selected..... :		N/A
	Operation time for each position..... :		N/A
	During the test, an axial force was applied to the impact drill through a resilient medium		N/A
	The tool is then operated at rated voltage for 4x6h in test apparatus (Figure 101)		N/A
	If the impact mechanism can be engaged and disengaged at will, the impact mechanism remains engaged.		N/A
	The tool may be switched on and off by means of a switch other than that incorporated in the tool.		N/A
	No electrical or mechanical failure		N/A
	Forced cooling or rest periods if temperature exceeded values in Table 12.1		N/A
	No operation of overload protection devices		N/A
17.3	Tools with Centrifugal switches operated for 10,000 cycles		P
	Number of operations under normal load.....:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Rate of operations (s “on”, s “off”)..... :		N/A
	Test voltage 0,9 x rated Voltage (V)..... :		N/A

18	**ABNORMAL OPERATION**		-
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.		P
18.1.1	Tool did not emit flames or molten metal		P
	Compliance with Clause 9 maintained		P
	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	P
	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		N/A
	Electronic circuits relied upon for protection evaluated for this safety critical function as in clause 18.8.		N/A
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)..... :		—
	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..... :		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

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Clause	Requirement + Test	Result - Remark	Verdict
	Max winding temperature recorded (°C)..... :		—
18.5	Class I tool with class II construction and class II tool subjected to running overload conditions		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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	Tool operated at rated voltage (V)..... :		—
	No charring or burning of the gauze or tissue paper occurred		N/A
	Protection against electric shock as in Clause 9 maintained		N/A
	Protection against accessibility to moving parts as in 19.1 maintained		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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	N/A
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
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		N/A
	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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test voltage was rated voltage or the mean value of the rated voltage range.....:		N/A
	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.		N/A
	Concept of 18.6.1 not appropriate, reliability evaluated using ISO 13849-1.		N/A
18.8.1 R	Required performance levels.....:	See Table 18.8.1	N/A
	If only $MTTF_d$ is applied to achieve the required PL: $MTTF_d$ is 5/20/50 years for PL = a/b/c		N/A
	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		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		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
	Frequency ranges 80 MHz to 1 000 MHz tested		N/A
19	**MECHANICAL HAZARDS**		-
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		N/A
	Adjustable guard used as protection of the working element has easily accessible means of accurate adjustment		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		N/A
	Any soft materials removed prior to the test		N/A
19.1 A	The test with probe B of IEC 61032:1997 does not apply to the chuck and any accessory that may be inserted.		N/A
19.2	No hazardous ragged or sharp edges, other than necessary for the functioning of the tool		N/A
19.3	No contact with dangerous moving parts through dust collection openings, using probe B of IEC 61032:1997, test force ≤5N		N/A
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		P
	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		N/A

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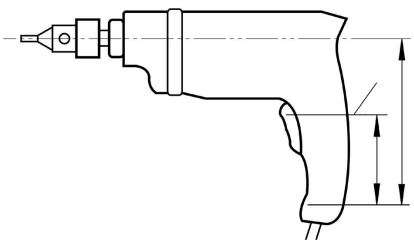
Clause	Requirement + Test	Result - Remark	Verdict
19.6	Marking with rated no-load speed required, measured no-load speed of the spindle did not exceed 110 % of the rated no-load speed		P
19.7	Transportable tool or lawn and garden machinery intended to be used on a surface such as the floor or a table has adequate stability		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		P
	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		N/A
	Fastening not completely removed and considered as still attached		N/A
19.101 A	Chuck keys so designed that they drop out of position when released.		N/A
	Metal clips are not fixed to the flexible cable or cord.		N/A
	The key fell out within 2 sec when inserted into the chuck, without tightening, and after the tool was turned such that the key was facing down.		N/A
19.102 A	**Handles**		P
19.102.1	**General**		P
	The design of the handle(s) is such that the operator can control the static stalling torque during the operation of the tool. (Fig 104-107)		N/A
	Single handle tool		—
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A

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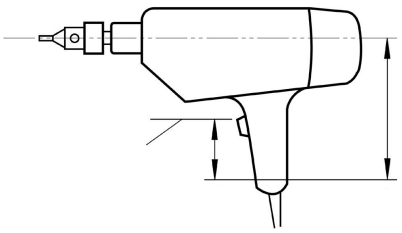
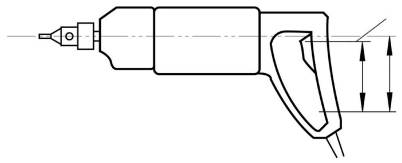
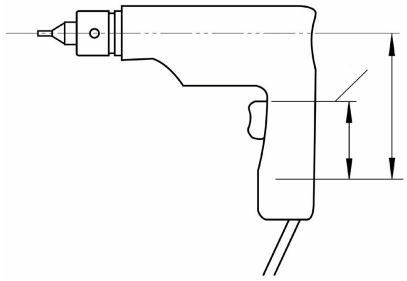
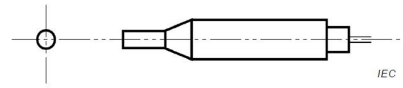
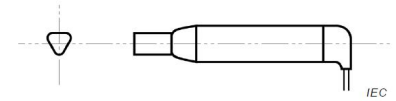
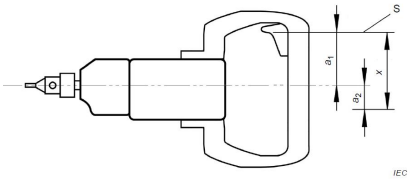
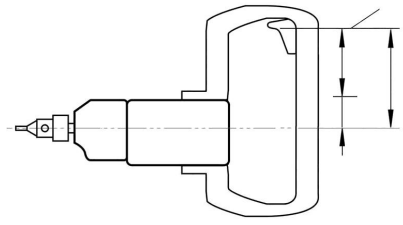
Clause	Requirement + Test	Result - Remark	Verdict
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 8 Nm $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 10 Nm $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
	Multi handle tool		—

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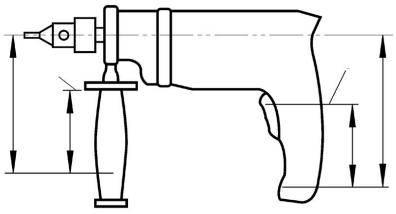
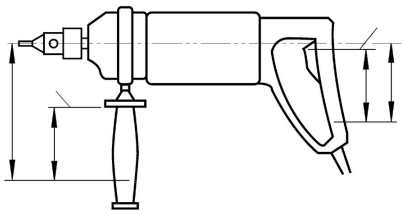
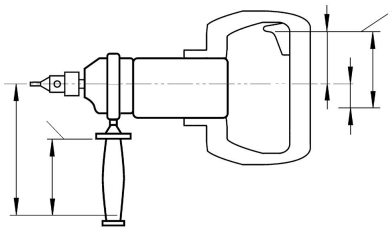
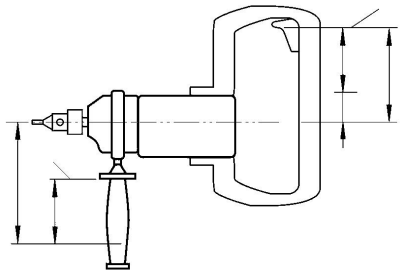
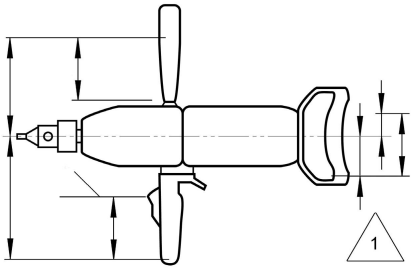
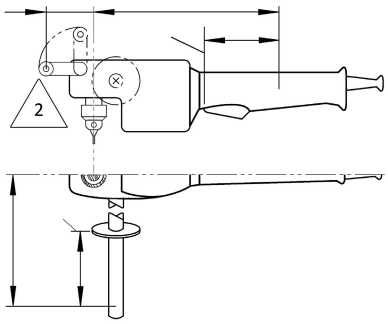
Clause	Requirement + Test	Result - Remark	Verdict
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
		$M_{R,max}$ = 400 N x a $M_{meas.}$ = Nm	N/A
19.102.2 A	**Test equipment**		P
	a) The torque transducer and the rotational angle sensor continuously monitors the torque and the rotation produced by the output spindle of the tool during the test of 19.102.3.		N/A
	b) The output of the torque transducer is connected to an oscilloscope or other data acquisition equipment capable of displaying the torque vs. time graph of the tool's output during the test of 19.102.3.		N/A
	c) The torque transducer is rated to measure a torque of at least 150 % of the static stalling torque of the tool or slip torque of an overload clutch (MR) with a measurement accuracy of ±1 %.		N/A
	d) The rotational angle is measured with an accuracy of ±2°.		N/A
	e) The data acquisition equipment used for measuring the torque signal during the test has a sampling rate of at least 15 kHz, but the bandwidth is limited by a first order low pass filter with a cut-off frequency of (1 ± 0,1) kHz.		N/A
	f) The joint that is connected to the tool during the test is capable of stalling the tool over a rotational angle of 30° to 60°. The joint that fulfils this requirement is a torsional element or other such device that remains in equilibrium during the test.		N/A
	g) A regulated power supply that is connected to the tool during the test is capable of providing the rated voltage and rated frequency provided on the tool's nameplate (e.g. 120 V AC, 60 Hz). It is also suitably sized such that the voltage drop during the test is not deviate from the rated voltage or the upper limit of the rated voltage range by more than 7 %.		N/A
19.102.3 A	**Test procedure**		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The measurement is conducted by using seven trial measurements of the same sample, each trial conducted as follows:		—
	1) Energize the tool to the full “on” position as quickly as possible and allow the joint to be tightened until it comes to a complete stop.		N/A
	2) Record the measured output torque.		N/A
	a) For tools without a mechanical overload clutch, the output torque is determined by either i) or ii):		N/A
	i) For signals that are stable for a minimum of 2 ms after the initial peak, the output torque value is determined by measuring over the stable region for an interval T not exceeding 100 ms. (Fig 108)		N/A
	ii) For signals that are not stable for a minimum of 2 ms after the initial peak, the output torque value shall be the r.m.s. value of the signal over the rotation from off until peak torque is achieved. (Fig 109)		N/A
	The tool employs an electric circuit(s), the output torque is either:		—
	- all functions affecting the output torque are considered SCFs and are evaluated according to 18.8, the applicable value of i) or ii) above with all functions affecting the output torque enabled; or		N/A
	- all functions affecting the output torque are not evaluated as SCFs according to 18.8, the greatest applicable value of i) or ii) above with:		N/A
	• all functions affecting the output torque enabled;		N/A
	• each function affecting the output torque disabled, tested for one trial. If the output torque is greater than the value with all functions enabled, the test resulting in the greatest output torque value is conducted for an additional two trials, where each trial may use a new sample.		N/A
	b) For tools with a mechanical overload clutch: The output torque is determined by the peak value of the first peak that occurs after starting the trial. Later peaks, even if they appear to have greater values, are not taken into account. (Fig 110)		N/A N/A
	3) Before the next trial, disconnect the spindle from the test fixture and operate the tool under no-load for a minimum of 3 s. Allow the tool to cool for a minimum of 2 min before the next trial.		

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	M_R is computed as the average of five of the measurements from each of the seven trials, with the highest and lowest measurement eliminated. The standard deviation of the five measurements shall also be computed and shall be less than 5 %.		N/A
	If it is not, then the fixture shall be adjusted to achieve the required repeatability. In cases where an electronic circuit that affects the torque is disabled, M_R is computed as an average of the three trials in 19.102.3, item 2) a), last bullet.		N/A
20	**MECHANICAL STRENGTH**		-
20.1	Adequate mechanical strength to withstand rough handling		P
	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	P
	No live parts became accessible		P
	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		P
	Inner cover withstood test after removal of the decorative cover		N/A
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		N/A
	Brush cap impact energy (Nm).....:		—
	Other part impact energy (Nm).....:		—
	Blows applied each point of the enclosure likely to be weak.....:		P
	Blows applied to guards, covers, handles, levers, knobs and the like as necessary..... :		N/A
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		N/A
	Separable accessories were not mounted		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Any attachments provided as specified in instructions, test repeated with each attachment or combination of attachments mounted to a separate tool sample		P
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.		P
	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		P
	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		N/A
	A separate sample subjected to a single impact from 1m onto a concrete surface on each handle and each recommended grasping surface		N/A
	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**		
21.1	Hazardous accidental changing of settings to suit different voltages or speeds unlikely to occur		
21.2	Accidental changing of settings of control devices unlikely to occur		

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
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		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		N/A
21.7	Ordinary driving belts not relied upon to provide required insulation		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:		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:		N/A
	- 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		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		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		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..... :	See Table D.2	N/A
	Rubber parts tested..... :		—
	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		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		P
	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		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		N/A
	Switch actuator easily visible and accessible		N/A
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		N/A
21.17.1.1	Relevant tool housing is kept for 1 h in a heating cabinet at 80 °C..... :		N/A
21.17.1.2	Additional test of 21.17.1.2 for lock-off devices that are self-restoring to the lock-off position		N/A
	Number of cycles as per 23.1.10.2..... :		N/A
21.17.1.3	Push force of Table 7 applied to most unfavourable point of the switch actuating member..... :		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	The switch did not actuate		N/A
	The switch and its lock-off system operated as designed after the applied force was terminated		N/A
21.18	Requirements of 21.18.1, 21.18.2 or the relevant part of IEC 62841-4 observed, as applicable		N/A
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)		N/A
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		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
21.18.1.1 A	Tools with a maximum output torque greater than 100 Nm are not provided with a lock-on device.		P
	For tools with a maximum output torque of 100 Nm or less, a power switch lock-on device, if any, is located outside the grasping area, or so designed that it is not likely to be unintentionally locked on by the user’s hand during intended left- or right-handed operation.		N/A
	This grasping area is the contact area between either hand and the tool while the index finger of that hand is resting on the power switch actuator of the tool.		N/A
	With the power switch in the “on” position, the lock-on device is actuated by a straight edge 25 mm long when the straight edge is pushed down on the lock-on device.		N/A
	The straight edge is oriented in any direction and is applied to bridge the surface of the lock-on device and any surface adjacent to the lock-on device.		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
21.18.1.2	Switch was locked in “off” position when a risk associated with inadvertent starting is defined by the relevant part of IEC 62841-2		N/A
	Power switch triggers and lock-off devices so located, designed or guarded that inadvertent operation is unlikely to occur		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	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		P
	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		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..... :		N/A
21.21	No risk of electrical shock from charged capacitors when touching pins of the plug		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	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		N/A
	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		N/A
	Weak areas of the covers or parts subjected during 10 s to - 50 N push force		N/A
	- 50 N pull force if the shape of the part prevents easy slippage of fingertips		N/A
	- 30 N pull force if projection of the gripped part is less than 10 mm in the direction of removal		N/A
	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		N/A
	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		N/A
	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		N/A
	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		N/A
21.23	Handles, knobs, grips, levers etc., withstood axial force of 30 N for 1 minute		N/A

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
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		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		P
21.27	Insulation between parts separated by protective impedance comply with requirements for double or reinforced insulation		N/A
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		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		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	P
21.30	Tool likely to cut into concealed wiring or own cord, handles and grasping surfaces - made of insulating material, or		N/A
	- 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

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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		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		N/A
21.33	Lamp holders used only for connection of lamps		N/A
21.34	Protective impedance consists of at least two separate components with impedance unlikely to change significantly during lifetime of tool		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
	Single Y1 capacitor acc. to IEC 60384-14 used instead of two separate components.....:		N/A
22	**INTERNAL WIRING**		**-**
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		P
	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		P
	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)		P
22.3	Use of green or green/yellow conductors for earthing terminals only		N/A
22.4	Aluminium wires not used for internal wiring		P

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
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
	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		P
23	**COMPONENTS**		-
23.1	Components comply with relevant IEC standards	See Table 23.1	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.....:		N/A
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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	Switch mode power supply units and transformers for such units comply with IEC 61558-2-16		P
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
	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		P
	Component, marked and used per its markings		P
	Components not mentioned in Table 1 of Clause 12 tested as part of the tool		N/A
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		N/A
	No IEC standard referenced in 23.1, no additional tests		N/A
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).....:		N/A
23.1.10	Switches constructed to prevent failure that might impair compliance with this standard		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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
	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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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 R	Protection devices or circuits are of the non-self-resetting type unless the tool is equipped with a momentary power switch with no provision for being locked in the “on” position.		N/A
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**		**-**
24.1	Tool provided with a supply cord ≥1,8 m and with a plug; cord length (m).....:		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

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Clause	Requirement + Test	Result - Remark	Verdict
24.2	Supply cord assembled to the tool by attachment type (specify X, Y, or Z)....:		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		N/A
24.4	Supply cord not lighter than ordinary tough rubber sheathed flexible cord or ordinary PVC sheathed flexible cord		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)....:		N/A
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		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		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		N/A
24.9	Supply cord protected against damage at its entry by flexible cord guard, or cord inlet, or bushing....:		N/A
24.10	Cord inlets and bushings shaped to prevent damage to supply cord		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....:		N/A
	Flexing test performed in apparatus shown in Fig. 2		N/A
	Weight attached to cable or cord (kg)....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	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.....:		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
24.13	Tool provided with cord anchorage to relieve conductors of cord from strain, twisting, and protect them from abrasion.		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		N/A
24.15	Cord anchorages properly designed and located		N/A
	Cord cannot touch clamping screws of the cord anchorage that not separated from accessible metal parts by supplementary insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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
	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		N/A
24.18	For type X attachment, space for supply cord provided inside or as a part of tool		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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		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		N/A
25	**TERMINALS FOR EXTERNAL CONDUCTORS**		-
25.1	Tool provided with terminals or equally effective devices for connection to external conductors		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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)..... :		N/A
25.6	For type X attachment, terminals clearly recognizable and accessible after opening the tool		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		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

26	**PROVISION FOR EARTHING**		-
26.1	Accessible metal parts of class I tool permanently connected to an earthing terminal or termination within the tool		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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		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		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
	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.....:	See also 15.1	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
26.5	Resistance of earthing circuit (max. 0,1 Ω).....:		N/A
	Test current (A).....:		—
	Voltage drop between the earthing terminal and accessible metal part (V).....:		—
27	**SCREWS AND CONNECTIONS**		-
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		N/A
	Diameter of screws of insulating material not used for electrical or earthing connection, diameter (mm)....:		P
	Screws transmitting electrical contact pressure screw into metal		P
	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		N/A
	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		N/A
	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
	Test using a suitable test screwdriver, spanner or key, torque as in Table 11 and the relevant column		N/A
	Column I for metal screw without head, flush with surface (Nm).....:		N/A
	Column II for other metal screws and nuts (Nm).....:		N/A
	Column II for screws of insulating material, having a hexagonal head with a width across flats exceeding overall thread diameter (Nm).....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
27.2	Contact pressure not transmitted through insulating material other than ceramic, unless compensated for shrinkage or distortion		N/A
27.3	Space-threaded screws not used for connection of current-carrying parts, unless direct clamping and suitable locking provided		N/A
	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
	Only one means of securing, test with detached conductors		N/A
	Clearances not reduced below 50 % of values in 28.1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
28	**CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION**		-
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		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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	-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**		-
B.1.1	Motors with working voltage ≤ 42 V		P
B.9.2	Metal parts of motor considered bare live parts		P
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**		-
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.2D	N/A
ANNEX D	**ELECTRIC STRENGTH**		-
D.1	Any protective impedance were disconnected		P
	The tools were not connected to the supply		N/A
	Electric strength is checked by the tests of D.2		N/A
	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		N/A
	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**		-
	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**		-
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		P
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		N/A
K.5.204	Discharging and charging as specified		N/A
K.5.205	Thermocouples for lithium-ion cell temperature measurement located as specified		N/A
K.5.206	Currents measured during battery charging are average currents		N/A
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		N/A
K.5.210	End-of-discharge voltages for common cell chemistries observed.....:		N/A
K.8.3	Battery 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.....:		—
	Battery tools also marked with additional information		N/A
	- Year 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
K.8.14.1.1	5) Battery tool use and care		N/A
	6) Service		N/A
K.8.14.1. .101 R	Replacement of item 1) d) Hold the power tool by insulated gripping surfaces, when performing an operation where the cutting accessory may contact hidden wiring.		N/A
K.8.14.2	e) Instructions for battery tools		N/A
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
	Conductive, simultaneously accessible parts provided with protective impedance		N/A
	Short circuit current between two simultaneously accessible parts (mA).....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.....:		N/A
	No operation of protective devices during heating test		N/A
	Temperature rises met values in Table 2		N/A
K.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		N/A
	Test repeated with imbalanced battery		N/A
K.13.1	Thermoplastic materials of relevant enclosure parts sufficiently resistant to heat		N/A
	Ball-pressure test of IEC 60695-10-2:2003	See Table 13.1	N/A
K.13.2	Glow-wire test applicable only to external enclosure enclosing the current-carrying parts		N/A
	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
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).		N/A
K.18.1	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 K.18.1	N/A
	No explosion during or after the test		N/A
	Adequate protection against electric shock		N/A
	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	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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
K.18.8 R	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		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 K.18.201	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
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		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 ..... :		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
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.19.102.1 A	**General**		—
	The design of the handle(s) is such that the operator can control the static stalling torque during the operation of the tool. (Fig 104-107)		N/A
K.19.102.2 A	**Test equipment**		—
	a) The torque transducer and the rotational angle sensor continuously monitors the torque and the rotation produced by the output spindle of the tool during the test of 19.102.3.		N/A
	b) The output of the torque transducer is connected to an oscilloscope or other data acquisition equipment capable of displaying the torque vs. time graph of the tool's output during the test of 19.102.3.		N/A
	c) The torque transducer is rated to measure a torque of at least 150 % of the static stalling torque of the tool or slip torque of an overload clutch (MR) with a measurement accuracy of ±1 %.		N/A
	d) The rotational angle is measured with an accuracy of ±2°.		N/A
	e) The data acquisition equipment used for measuring the torque signal during the test has a sampling rate of at least 15 kHz, but the bandwidth is limited by a first order low pass filter with a cut-off frequency of (1 ± 0,1) kHz.		N/A
	f) The joint that is connected to the tool during the test is capable of stalling the tool over a rotational angle of 30° to 60°. The joint that fulfils this requirement is a torsional element or other such device that remains in equilibrium during the test.		N/A
K.19.102.3 A	**Test procedure**		—

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Clause	Requirement + Test	Result - Remark	Verdict
	More than one battery is specified for use with the tool, so the battery with the highest short-circuit current shall be used.		N/A
	The measurement is conducted by using seven trial measurements of the same sample, each trial conducted as follows:		—
	1) Energizing the tool to the full “on” position as quickly as possible and allowing the joint to be tightened until it comes to a complete stop.		N/A
	2) Recording the measured output torque.		N/A
	a) For tools without a mechanical overload clutch, the output torque is determined by either i) or ii):		N/A
	i) For signals that are stable for a minimum of 2 ms after the initial peak, the output torque value is determined by measuring over the stable region for an interval T not exceeding 100 ms. (Fig 108)		N/A
	ii) For signals that are not stable for a minimum of 2 ms after the initial peak, the output torque value shall be the r.m.s. value of the signal over the rotation from off until peak torque is achieved. (Fig 109)		N/A
	The tool employs an electric circuit(s), the output torque is either:		—
	- all functions affecting the output torque are considered SCFs and are evaluated according to 18.8, the applicable value of i) or ii) above with all functions affecting the output torque enabled; or		N/A
	- all functions affecting the output torque are not evaluated as SCFs according to 18.8, the greatest applicable value of i) or ii) above with:		N/A
	• all functions affecting the output torque enabled;		N/A
	• each function affecting the output torque disabled, tested for one trial. If the output torque is greater than the value with all functions enabled, the test resulting in the greatest output torque value is conducted for an additional two trials, where each trial may use a new sample.		N/A
	b) For tools with a mechanical overload clutch: The output torque is determined by the peak value of the first peak that occurs after starting the trial. Later peaks, even if they appear to have greater values, are not taken into account. (Fig 110)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	3) Before the next trial, disconnect the spindle from the test fixture and operate the tool under no-load for a minimum of 3 s. Allow the tool to cool for a minimum of 2 min before the next trial.		N/A
	M_R is computed as the average of five of the measurements from each of the seven trials, with the highest and lowest measurement eliminated. The standard deviation of the five measurements shall also be computed and shall be less than 5 %.		N/A
	If it is not, then the fixture shall be adjusted to achieve the required repeatability. In cases where an electronic circuit that affects the torque is disabled, M_R is computed as an average of the three trials in 19.102.3, item 2) a), last bullet.		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		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		N/A
K.19.202	Li-ion battery enclosure designed to safely release gases generated as a result of venting		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
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.20.2 and		N/A
	- did not catch fire or explode		N/A
	- met requirements of clauses K.9, K.19 and either K.18.1 (f) or K.28.1 after tests of 20.2 and K.20.3.1 or K.20.3.2		N/A
	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		N/A
	- demonstrated normal discharging and recharging after the test		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- showed no damage to the cell vent impairing compliance with K.21.202		N/A
K.20.3.1	Adequate mechanical strength after drop tests on a concrete surface from a height of 1 m		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
K.20.3.2	Impact test with 50 mm, 0,55 kg smooth steel sphere for battery-operated transportable tools..... :		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		N/A
K.21.201	Tool will not accept general purpose batteries as an energy source for their primary function		N/A
K.21.202	Venting of lithium-ion cells, if relied on for safety, not adversely obstructed		N/A
K.21.203	Unsuitable connector types not used for user accessible interfaces between elements of a Li-ion battery system		N/A
K.23.1.10	Power switches have adequate breaking capacity and present no electrical or mechanical failure		N/A
	50 cycles of making and breaking the locked output mechanism current		N/A
K.23.1.201	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
K.23.201	Battery cells comply with IEC 62133		N/A
K.23.202	Rechargeable battery cells not of lithium-metal type		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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	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 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) .....:		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 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

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Clause	Requirement + Test	Result - Remark	Verdict
ANNEX L	**BATTERY TOOLS AND BATTERY PACKS PROVIDED WITH MAINS CONNECTION OR NON-ISOLATED SOURCES**		-
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
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 .....:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	- Designation of series or type.....:		—
	Tools also marked with additional information		N/A
	- Year 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
	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
K.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

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Clause	Requirement + Test	Result - Remark	Verdict
	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.....:		N/A
	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		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

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Clause	Requirement + Test	Result - Remark	Verdict
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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
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..... :		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.18.204	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.19.102.1 A	**General**		—
	The design of the handle(s) is such that the operator can control the static stalling torque during the operation of the tool. (Fig 104-107)		N/A
	Compliance is checked by the tests specified in:		—
	– 19.102.2 and 19.102.3 under conditions for mains operation; and		N/A
	– K.19.102.2 and K.19.102.3 under conditions for battery operation		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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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..... :		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
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

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Clause	Requirement + Test	Result - Remark	Verdict
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
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

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Clause	Requirement + Test	Result - Remark	Verdict
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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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

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				P
Input deviation of/at:	**Rated P (W) or I (A)**	**Measured P (W) or I (A)**	**Ratio (%)**	**Required ratio (%)**	**Remark**
21 V	14.7 W	14.6	-0.5%	110	pass
				110	
				110	
Supplementary information:					

12.1A	TABLE: Temperature rise measurements under the conditions of 12.2 to 12.5		P
	Test voltage (V)..... :	21 Vdc	—
	Ambient temperature, t_1 (°C)..... :	24.2	—
	Ambient temperature, t_2 (°C)..... :	24.1	—
	Operating time (min, s)..... :		—
	No Load Speed (min^{-1})..... :		—
	Input Wattage (W) ..... :		—
	Input current (A) ..... :		—
	Torque (Nm) ..... :		—

Thermocouple Locations	Temperature rise measured (K)	Temperature rise limit (K)
Stator winding (thermocouple)	38.5	55
Stator winding (S_1)R-R	-	-
Stator winding (S_2)R-R	-	-

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Clause	Requirement + Test	Result - Remark	Verdict

Rotor winding R-R	-	-
Stator Laminations(Motor body)	-	-
Enclosure inside	24.9	35
Enclosure outside	-	-
Grip area (i.e. Handle, gear housing)	-	-
Brushholder	-	-
Brushholder lead	-	-
Power supply lead	8.3	25
Internal wiring	11.6	25
Capacitor	-	-
Printed circuit board	-	-
Switch	4.5	5
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	—

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Clause	Requirement + Test	Result - Remark	Verdict

Object/ Part No.	Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)
Enclosure	plastic	-	75	0.8
Switch button	plastic	-	75	0.8
Brush holder	plastic	-	125	0.5
Supplementary information:				

13.2	TABLE: Resistance to heat and fire - Glow wire tests	P

Object/ Part No./ Material	Manufacturer / trademark	Glow wire test (GWT); (°C)						Verdict
		550	650		750		850	
			te	ti	te	ti		
Enclosure	-	-	0	0	-	-	-	pass
Switch button	-	-	0	0	-	-	-	Pass
Brush holder	-	-	0	0	-	-	-	pass

Object/ Part No./ Material	Manufacturer / trademark	Glow-wire flammability index (GWFI), °C				GW ignition temp. (GWIT), °C		Verdict
		550	650	750	850	675	775	

The test specimen passed the glow wire test (GWT) with no ignition [(t_e – t_i) ≤ 2s] (Yes/No):	
If no, then surrounding parts passed the needle-flame test of annex E (Yes/No)..... :	
The test specimen passed the test by virtue of most of the flaming material being withdrawn with the glow-wire (Yes/No)?.....:	
Ignition of the specified layer placed underneath the test specimen (Yes/No).....:	

Supplementary information:

550 °C GWT not relevant (or applicable) to parts of material classified at least HB40 or if relevant HBF
The GWIT pre-selection option, the 850 °C GWFI pre-selection option, and the 850 °C GWT are not relevant (or applicable) for attended appliances.

16	TABLE: Overload Protection of Transformers and Associated Circuits	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

Test voltage..... :		—
Ambient temperature (°C) ..... :		—
Input current (A) / Input Wattage (W)..... :		—
Applied short-circuit or overload..... :		—

Measurement at:	Temperature rise (K)	Allowed 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**				N/A
	Ambient temperature (°C)..... :				—
	Fuse-link Current (A) ..... :				—
Component	Fault Condition	Test Voltage (V)	Test Duration*	Comment/Result Test repeated Yes/No**	

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Clause	Requirement + Test	Result - Remark	Verdict

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.

18.8.1 R	**TABLE: Performance levels of Safety Critical Functions**		N/A
Type and purpose of SCF	Min. PL determined based on:[1,2]	Min. PL	Actual PL
Power switch – prevent unwanted switch-on for tools with $M_{R,max} \leq 25$ Nm measured in accordance with 19.102		a	
Power switch – prevent unwanted switch-on for tools with $M_{R,max} > 25$ Nm measured in accordance with 19.102		b	
Power switch – provide desired switch-off for tools with $M_{R,max} \leq 25$ Nm measured in accordance with 19.102		b	
Power switch – provide desired switch-off for tools with $M_{R,max} > 25$ Nm measured in accordance with 19.102		c	
Power switch – provide desired switch-off for tools that require bracing in accordance with 8.14.1.101.		Shall be evaluated using the fault conditions of 18.6.1 without the loss of this SCF	
Provide desired direction of rotation for tools that do not require bracing in accordance with 8.14.1.101		Not an SCF	
Provide desired direction of rotation for tools that require bracing in accordance with 8.14.1.101		c	
Any electronic control to pass the test of 18.3		a	
Prevent output speed from exceeding 130 % of rated no-load speed without accessories mounted		a	
Prevent exceeding thermal limits as in 18.4		a	

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Clause	Requirement + Test	Result - Remark	Verdict

Prevent self-resetting as required in 23.3 for tools with $M_{R,max} \leq 25$ Nm measured in accordance with 19.102		a	
Prevent self-resetting as required in 23.3 for tools with $M_{R,max} > 25$ Nm measured in accordance with 19.102		b	
Limit the torque to comply with 19.102		c	
Prevent unwanted lock-on of the power switch function for tools with $M_{R,max} \leq 25$ Nm measured in accordance with 19.102		b	
Prevent unwanted lock-on of the power switch function for tools with $M_{R,max} > 25$ Nm measured in accordance with 19.102		c	

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.

23.1	**TABLE: Critical components information**				**P**
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Power plug	LEONI Kabel Holding GmbH	285	AC250V, 16A	BS 1363	BSI
Power cord	Wuxi Wire Factory	H07RN-F	2x1,0mm2	60245 IEC 57	VDE
Alt-	Wenling Antong Electric Appliance Co., Ltd	H07RN-F	2x1,0mm2	60245 IEC 57	VDE
Alt-	Shanghai Chuangqi Cable Co., Ltd	H07RN-F	2x1,0mm2	60245 IEC 57	VDE
Switch	Zhejiang Changlong Electric Ltd	FA2-4/1BEK-5	250V AC, 6(6)A, 5E4	IEC 61058-1	TUV Rheinland
Alt-	Ruian Angu Electrical Equipment Co., Ltd	RG18	250V AC, 4(4)A, 5E4	IEC 61058-1	TUV Rheinland

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Clause	Requirement + Test	Result - Remark	Verdict

23.1	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Alt-	Yueqing City Feihong Electronics Co.,Ltd.	FA12-6/E-K11	250V AC, 6(6)A, 5E4	IEC 61058-1	TUV Rheinland
Capacitor	Aid Electronic Corporation	MEX	AC 250V or 275V, 0,22μF	IEC 60384-14	VDE
Alt-	Wujiang Taixing Electronic Co., Ltd.	TNS-2TH	AC 275V, 0,22μF	IEC 60384-14	VDE
Internal wire	Zhengjiang Xinda Electric Cable Co., Ltd	227IEC08 (RV-90)	300/500V, 0,5mm2	IEC60745-1, IEC60745-2-3	Test with unit
Inductor	Aid Electronic Co.,Ltd	--	22-44μH 2pcs	IEC60745-1, IEC60745-2-3	Test with unit
[1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

27.1	TABLE: Torque Test for screws and nuts			
Threaded part identification	**Thread diameter (mm)**	**Column number (I, II, or III)**	**Applied torque (Nm)**	**Number of cycles (5 or 10)**
Supplementary information:				

28.1	TABLE: Clearance And Creepage Distance Measurements					
clearance cl and creepage distance dcr at/of:	**Up (V)**	**U r.m.s. (V)**	**Required cl (mm)**	**cl (mm)**	**required dcr (mm)**	**dcr (mm)**
Supplementary information:						

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

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Clause	Requirement + Test	Result - Remark	Verdict

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
Points of application	Test voltage (1.06 X rated V)	Freq. (Hz)	Selector Switch Position (ON /OFF[1])	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 (ON /OFF[1])	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

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Clause	Requirement + Test	Result - Remark	Verdict

Points of application	Test voltage (rated V)	Freq. (Hz)	Selector Switch Position (ON /OFF[1])	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 (ON /OFF[1])	Allowed leakage current (mA)	Measured leakage (mA)
Supplementary Information:					

D.2	TABLE: Dielectric Strength		N/A
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	
- commutator and metal core of the motor armature over **basic insulation**	12.6	1250	
- metal core and motor armature spindle of the motor armature over **supplementary insulation**	12.6	2500	
- commutator and motor armature spindle over **reinforced insulation**	12.6	3750	
- between live parts and other metal parts over **basic insulation**	14.1	1250	
- between inaccessible metal parts and accessible parts over **supplementary insulation**	14.1	2500	
- between live parts and accessible parts over **reinforced insulation**	14.1	3750	
- accessible metal parts in class I tools and the supply cord wrapped with metal foil	14.1	1250	
- accessible metal parts in class II tools and the supply cord wrapped with metal foil	14.1	1750	
- between live parts and other metal parts over **basic insulation**	14.2.2	1250	

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Clause	Requirement + Test	Result - Remark	Verdict

- between inaccessible metal parts and accessible parts over **supplementary insulation**	14.2.2	2500	
- between live parts and accessible parts over **reinforced insulation**	14.2.2	3750	
- live parts and accessible parts over **basic insulation**	14.3	1250	
- live parts and accessible parts over **reinforced insulation**	14.3	3750	
- live parts and accessible parts over **basic insulation**	14.4	1250	
- live parts and accessible parts over **reinforced insulation**	14.4	3750	
- between live parts and other metal parts over **basic insulation**	17.2 and 17.3	937,5	
- between inaccessible metal parts and accessible parts over **supplementary insulation**	17.2 and 17.3	1875	
- between live parts and accessible parts over **reinforced insulation**	17.2 and 17.3	2812,5	
- live parts and accessible parts over **basic insulation**	18.3 and 18.4	1250	
- live parts and accessible parts over **reinforced insulation**	18.3 and 18.4	3750	
- live parts and accessible parts not grounded, if the tool does not operate anymore	18.5.1	1500	
- live parts and accessible parts not grounded, if the tool still operates	18.5.1	2500	
- commutator segments and armature shaft in series motors with class II armature construction	18.5.2	1500	
- live parts and accessible parts not grounded, if any winding is open circuited	18.5.4	1500	
- live parts and accessible parts not grounded, if no windings are open circuited	18.5.4	2500	
- live parts and accessible parts over **basic insulation**	20.2 to 20.4	1250	
- live parts and accessible parts over **reinforced insulation**	20.2 to 20.4	3750	
- between the handles and grasping surfaces in contact with foil and the output shaft of the tool	20.5	1250	
- between live parts and other metal parts over **basic insulation**	21.12	937,5	
- between inaccessible metal parts and accessible parts over **supplementary insulation**	21.12	1875	

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Clause	Requirement + Test	Result - Remark	Verdict

- between live parts and accessible parts over **reinforced insulation**	21.12	2812,5	
- shafts of operating knobs, handles, levers etc. and their insulating covering wrapped in metal foil	21.29	1250	
- live parts and accessible parts over **basic insulation**	22.6	1250	
- live parts and accessible parts over **reinforced insulation**	22.6	3750	
- basic insulation	28.2.b)	1250	
- supplementary insulation	28.2.b)	2500	
- reinforced insulation	28.2.b)	3750	
- over insulation protecting from electric shock	K.9.5	750	
Supplementary information:			

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Clause	Requirement + Test	Result - Remark	Verdict

K.12.1	TABLE: Normal Temperature Test for Battery Tool		N/A
Ambient temperature (°C) ..... :			—
Measurement at:		Temperature rise (K)	Allowed 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			

K.18.1	TABLE: Battery Tool Abnormal Operation				N/A
Abnormal conditions		Explosion occurred?	Charring or burning of test materials?	Protector Operated?	Test repeated 3 more times?
a) Terminals of detachable battery pack with exposed terminals shorted					
b) Motor terminals shorted					
c) Motor rotor locked					
d) Cord between battery tool and separable battery pack shorted					
e) Cord provided the tool and the charger shorted					
f) Any two uninsulated parts of opposite polarity in battery tools shorted					
Supplementary Information:					

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Clause	Requirement + Test	Result - Remark	Verdict

K.18.8.1 R	TABLE: Performance levels of Safety Critical Functions		N/A
Type and purpose of SCF	Min. PL determined based on:[1,2]	Min. PL	Actual PL
Power switch – prevent unwanted switch-on for tools with $M_{R,max} \leq 25$ Nm measured in accordance with 19.102		a	
Power switch – prevent unwanted switch-on for tools with $M_{R,max} > 25$ Nm measured in accordance with 19.102		b	
Power switch – provide desired switch-off for tools with $M_{R,max} \leq 25$ Nm measured in accordance with 19.102		a	
Power switch – provide desired switch-off for tools with $M_{R,max} > 25$ Nm measured in accordance with 19.102		c	
Power switch – provide desired switch-off for tools that require bracing in accordance with 8.14.1.101.		c	
Provide desired direction of rotation for tools that do not require bracing in accordance with 8.14.1.101		Not an SCF	
Provide desired direction of rotation for tools that require bracing in accordance with 8.14.1.101		b	
Prevent output speed from exceeding 130 % of rated no-load speed without accessories mounted		a	
Prevent self-resetting as required in 23.3 for tools with $M_{R,max} \leq 25$ Nm measured in accordance with 19.102		a	
Prevent self-resetting as required in 23.3 for tools with $M_{R,max} > 25$ Nm measured in accordance with 19.102		b	
Limit the torque to comply with 19.102		c	
Prevent unwanted lock-on of the power switch function for tools with $M_{R,max} \leq 25$ Nm measured in accordance with 19.102		a	
Prevent unwanted lock-on of the power switch function for tools with $M_{R,max} > 25$ Nm measured in accordance with 19.102		c	

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

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.

K.18.201	**TABLE: Lithium-ion charging systems – Abnormal Operation**					N/A
Abnormal conditions	Explosion occurred?	Charring or burning of test materials?	Upper limit charging voltage not exceeded by >150 mV[1)]	Charging system permanently disabled?[2)]	Cell vent damaged?	
a) Components in the charging system faulted as in 18.6.1 b) to f)						
b) One cell 50% charged in a fully discharged battery						
c) Charging of a series configured battery with all cells 50% charged, one cell shorted						
d) Short across a component or between adjacent PCB tracks						
Supplementary Information: One of conditions [1)] or [2)] is sufficient to achieve compliance with this subclause.						

L.18.201	**TABLE: Battery Tool Abnormal Operation**				N/A
Abnormal conditions	Explosion occurred?	Charring or burning of test materials?	Protector Operated?	Test repeated 3 more times?	
a) Terminals of detachable battery pack with exposed terminals shorted					
b) Motor terminals shorted					
c) Motor rotor locked					
d) Cord between battery tool and separable battery pack shorted					
e) Cord provided the tool and the charger shorted					
f) Any two uninsulated parts of opposite polarity in battery tools shorted					
Supplementary Information:					

IEC 62841-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

L.18.202	TABLE: Lithium-ion charging systems – Abnormal Operation					N/A
Abnormal conditions		Explosion occurred?	Charring or burning of test materials?	Upper limit charging voltage not exceeded by >150 mV[1)]	Charging system permanently disabled?[2)]	Cell vent damaged?
a) Components in the charging system faulted as in 18.6.1 b) to f)						
b) One cell 50% charged in a fully discharged battery						
c) Charging of a series configured battery with all cells 50% charged, one cell shorted						
d) Short across a component or between adjacent PCB tracks						
Supplementary Information: One of conditions [1)] or [2)] is sufficient to achieve compliance with this subclause.						

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

1. Risk assessment

This risk assessment report is based on the methods in the EN ISO 12100:2010 and EN ISO 14121-2 standards, and the 4 factors S-A-G-W have been used for evaluating the level of risks.

S：Severity of possible harm

- S1：Slight（normally reversible）
- S2：Serious（normally irreversible）
- S3：Cause a few men die
- S4：Calamity or cause many men die

A：Frequency any duration of exposure

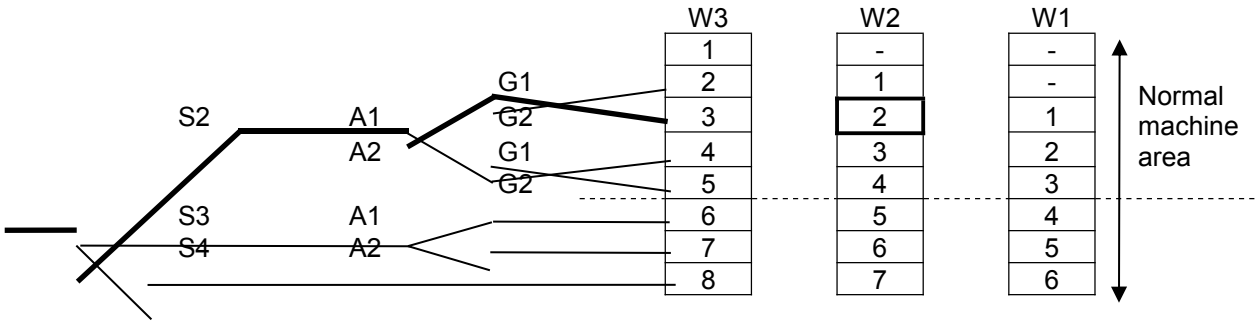
- A1：Seldom to very often
- A2：Frequent to continuous

G：Possibilities of avoidance

- G1：Possible
- G2：Impossible

W：Probability of occurrence of harm

- W1：Low
- W2：Medium
- W3：High



SOLUTIONS FOR THE LEVEL OF HAZARDS

1：Protected by warning sign
2：Protected by guard and warning sign
3：Consider the other design, choose the best one, add both guard and warning sign
4：Consider another two design, choose the best one, add both guard and warning sign
5：Consider another three design, choose the best one, add both guard and warning sign

NO.	Hazards source	S	A	G	W	Level
	Mechanical hazards					
1.0-1	Mechanical hazards due to machine parts or work pieces					
1.0-2	Mechanical hazards due to accumulation of energy inside the machinery					
1.1	Crushing					
1.2	Shearing					

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

1.3	Cutting or severing	***2***	***1***	***1***	***2***	***1***	
1.4	Entanglement	***2***	***1***	***1***	***2***	***1***	
1.5	Drawing-in or trapping						
1.6	Impact						
1.7	Stabbing or puncture						
1.8	Friction or abrasion						
1.9	High pressure fluid injection or ejection						
Electrical hazards							
2.1	Contact with live parts	***1***	***1***	***1***	***1***	**-**	
2.2	Contact with parts which have become live under faulty conditions	***1***	***1***	***1***	***1***	**-**	
2.3	Approach to live part under high voltage						
2.4	Electrostatic phenomena						
2.5	Thermal radiation or other phenomena such as projection of molten particles and chemical effects form short-circuits, overloads etc.						
Thermal hazards							
3.1	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	***1***	***1***	***1***	***1***	**-**	
3.2	Damage to health by hot or cold working environment						
Hazards generated by noise							
4.1	Hearing loss (deafness), other physiological disorders						
4.2	Interference with speech communication, acoustic signals, etc.						
Hazards generated by vibration							
5.1	Use of hand-help machines resulting in a variety of neurological and vascular disorder						
5.2	Whole body vibration, particular when combined with poor postures						
Hazards generated by radiation							
6.1	Low frequency, radio frequency radiation, microwaves						
6.2	Infrared, visible and ultraviolet light						
6.3	X and gamma rays						
6.4	Alpha, beta rays, electron or ion beams, neutrons						
6.5	Lasers						
Hazards generated by materials and substances processed or used by the machinery							
7.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts						
7.2	Fire and explosion hazard						
7.3	Biological and micro-biological (viral or bacterial) hazards						
Hazards generated by neglecting ergonomic principles in machine design							
8.1	Unhealthy postures or excessive effort						
8.2	Inadequate consideration of hand-arm or foot-leg anatomy						
8.3	Neglected use of personal protection equipment						
8.4	Inadequate local lighting						
8.5	Mental overload or underload, stress						
8.6	Human error, human behavior	***1***	***1***	***1***	***1***	**-**	
8.7	Inadequate design, location or identification of manual controls						
8.8	Inadequate design, location or identification of manual controls						
Combination of hazards							

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

9	Combination of hazards					
Unexpected start-up, unexpected overrun/over-speed						
10.1	Failure/disorder of the control system	***1***	***1***	***1***	***1***	**-**
10.2	Restoration of energy on supply after an interruption					
10.3	External influences on electrical equipment	***1***	***1***	***1***	***1***	**-**
10.4	Other external influences (gravity, wind, etc.)					
10.5	Errors in the software					
10.6	Error made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)					
Impossibility of stopping the machine in the best possible conditions						
11	Impossibility of stopping the machine in the best possible conditions					
Variations in the rotational speed of tools						
12	Variations in the rotational speed of tools					
Failure of the power supply						
13	Failure of the power supply					
Failure of the control circuit						
14	Failure of the control circuit	***1***	***1***	***1***	***1***	**-**
Errors of fitting						
15	Errors of fitting	***1***	***1***	***1***	***1***	**-**
Break-up during operation						
16	Break-up during operation					
Falling or ejected objects or fluids						
17	Falling or ejected objects or fluids					
Loss of stability / overturning of machinery						
18	Loss of stability / overturning of machinery					
Slip, trip and fall of persons (related to machinery)						
19	Slip, trip and fall of persons(related to machinery)					
Additional hazards, hazardous situations and hazardous events due to mobility						
20	Relating to the traveling function					
20.1	Movement when starting the engine					
20.2	Movement without a driver at the driving position					
20.3	Movement without all parts in a safe position					
20.4	Excessive speed of pedestrian controlled machinery					
20.5	Excessive oscillations when moving					
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilisated					
Linked to the work position (including driving station) on the machine						
21.1	Fall of persons during access to (or at/from) the work position					
21.2	Exhaust gases/lack of oxygen at the work position					
21.3	Fire（flammability of the cab, lack of extinguishing means）					
21.4	Mechanical hazards at the work position： contact with the wheels； rollover； fall of objects, penetration by objects； break-up of parts rotation at high speed； contact of persons with machine parts or tools（pedestrian controlled machines）					

EN ISO 12100							
Clause	Requirement + Test	Result - Remark					Verdict
21.5	Insufficient visibility form the work positions						
21.6	Inadequate lighting						
21.7	Inadequate seating						
21.8	Noise at the work position						
21.9	Vibration at the work position						
21.10	Insufficient means for evacuation/emergency exit						
Due to the control system							
22.1	Inadequate location of manual controls						
22.2	Inadequate design of manual controls and their mode of operation						
Form handling the machine（lack of stability）							
23	Form handling the machine（lack of stability）						
Due to the power source and to the transmission of power							
24.1	Hazards form the engine and the batteries						
24.2	Hazards form the transmission of power between machines						
24.3	Hazards form coupling and towing						
Form/to third persons							
25.1	Unauthorized start-up/use		***1***	***1***	***1***	***2***	**-**
25.2	Drift of a part away from its stopping position						
25.3	Lack or inadequacy of visual or acoustic warning means						
Insufficient instructions for the driver/operator							
26	Insufficient instructions for the driver/operator		***1***	***1***	***1***	***1***	**-**
Additional hazards, hazardous situations and hazardous events due to lifting							
27	Mechanical hazards and hazardous events						
27.1	Form load falls, collisions, machine tipping caused by：						
27.1.1	Lack of stability						
27.1.2	Uncontrolled loading-overloading-overturning moments exceeded						
27.1.3	Uncontrolled amplitude of movements						
27.1.4	Unexpected/unintended movement of loads						
27.1.5	Inadequate holding devices/accessories						
27.1.6	Collision of more then one machine						
27.2	Form access of persons to load support						
27.3	Form derailment						
27.4	Form insufficient mechanical strength of parts						
27.5	Form inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine						
27.6	Form inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine						
27.7	Form lowering of the load under the control of friction brake						
27.8	Form abnormal conditions of assembly/testing/use/maintenance						
27.9	Form the effect of load on persons（impact by load or counterweight）						
Electrical hazards							
28.1	Form lightning						
Hazards generated by neglecting ergonomic principles							
29.1	Insufficient visibility from the driving position						
Additional hazards, hazardous and situations and hazardous events due to underground work							

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

30	Mechanical hazards and hazardous events due to:						
30.1	Lack of stability of powered roof supports						
30.2	Failing accelerator or brake control of machinery running on rails						
30.3	Failing or lack of dead man's control of machinery running on rails						
31	Restricted movement of persons						
32	Fire and explosion						
33	Emission of dust, gases etc.						
Additional hazards, hazardous situations and hazardous events due to the lifting or moving of persons							
34	Mechanical hazards and hazardous events due to:						
34.1	Inadequate mechanical strength-inadequate working coefficients						
34.2	Failing of loading control						
34.3	Failing of controls in person carrier (function, priority)						
34.4	Over speed of person carrier						
35	Falling of person from person carrier						
36	Falling or overturning of person carrier						
37	Human error, human behavior						

NO.	**Hazards source**	**S**	**A**	**G**	**W**	**Level**
1.2	Shearing	***2***	***1***	***1***	***2***	***1***
1.3	Cutting or severing	***2***	***1***	***1***	***2***	***1***
Where	*moving parts*					
When	*Worker access to the moving parts during operation*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Affixing suitable warning signs. *2. Only operation by training/authorized persons.* *3. Operation of the machine shall conform to the instructions of the instruction manual.* *4. Check and inspection according to the specified durations of the instruction manual.* *5.All moving parts shall be enclosed within the permanent compressor casing or compressor unit cover,*		***1***	***1***	***1***	***1***	**-**

NO.	**Hazards source**	**S**	**A**	**G**	**W**	**Level**
2.1	Contact with live parts	***1***	***1***	***1***	***1***	**-**
Where	**Whole power and control systems**					
When	*The machine is power on*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

1. Only operation by training/authorized persons. *2. Operation of the machine shall conform to the instructions of the instruction manual.* *3. Check and inspection according to the specified durations of the instruction manual.* *4. Using safety components in accordance with those relevant international standards.* *5. Use of warning label.*	***1***	***1***	***1***	***1***	**-**
NO.	**Hazards source**	**S**	**A**	**G**	**W**	**Level**
2.2	Contact with parts which have become live under faulty conditions	***1***	***1***	***1***	***1***	**-**
Where	**Whole power and control systems**					
When	*The machine is power on*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Only operation by training/authorized persons. *2. Operation of the machine shall conform to the instructions of the instruction manual.* *3. Check and inspection according to the specified durations of the instruction manual.* *4. Using safety components in accordance with those relevant international standards.* *5.Use of warning label.*		***1***	***1***	***1***	***1***	**-**

NO.	Hazards source	S	A	G	W	Level
3.1	**Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources**	***1***	***1***	***1***	***1***	**-**
Where	**Thermal conversion part**					
When	**Contact the thermal conversion part when working.**					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Only operation by training/authorized persons. *2. Operation of the machine shall conform to the instructions of the instruction manual.* *3.Use of warning label.*		***1***	***1***	***1***	***1***	**-**

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

NO.	Hazards source	S	A	G	W	Level
8.6	Human error, human behavior	*2*	*1*	*1*	*1*	*1*
Where	**Whole machine**					
When	*Operation, adjustment or maintenance of the machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Only authorized person can use the machine. *2. Training before using this machine.* *3. Make reference to the instruction manual before using this machine.*		*1*	*1*	*1*	*1*	*-*

NO.	Hazards source	S	A	G	W	Level
10.1	Failure/disorder of the control system	*1*	*1*	*1*	*1*	*-*
Where	**Control circuit/control components**					
When	*During operation of the machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Only authorized person can use the machine. *2. Make reference to the instruction manual before using this machine.* *3. Check before operation.* *4. Periodic maintenance.*		*1*	*1*	*1*	*1*	*-*

NO.	Hazards source	S	A	G	W	Level
10.3	External influences on electrical equipment	*1*	*1*	*1*	*1*	*-*
Where	**All electrical equipments equipped on the machine**					
When	*Working of the electrical equipments*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Connection of protective earthing indeed. *2. Excellent electrical shielded housing.*		*1*	*1*	*1*	*1*	*-*

NO.	Hazards source	S	A	G	W	Level
14	Failure of the control circuit	*1*	*1*	*1*	*1*	*-*

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Where	**Control circuit/control components**					
When	*During operation of the machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Checking before operation. *2. Make reference to the instruction manual before operate this machine.* 3. *Daily/periodic inspection and maintenance.*		***1***	***1***	***1***	***1***	**-**
NO.	**Hazards source**	**S**	**A**	**G**	**W**	**Level**
15	Errors of fitting	***1***	***1***	***1***	***1***	**-**
Where	**Electric control parts**					
When	*Change the electric power.*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Checking before operation. *2. Make reference to the instruction manual before operate this machine.*		***1***	***1***	***1***	***1***	**-**

NO.	**Hazards source**	**S**	**A**	**G**	**W**	**Level**
25.1	Unauthorized start-up/use	***1***	***1***	***1***	***1***	**-**
Where	**Control system**					
When	*Operation, adjustment or maintenance of the machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Always starting the machine by training/authorized persons. *2. During adjustment or maintenance, put a warning nameplate near the working area.* *3. Lock the power switch of the machine.*		***1***	***1***	***1***	***1***	**-**

NO.	**Hazards source**	**S**	**A**	**G**	**W**	**Level**
26	Insufficient instructions for the driver/operator	***1***	***1***	***1***	***1***	**-**

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Where	**Whole machine**
When	*Installation, assembly/disassembly, operation, adjustment or maintenance of the machine*

Improvement result

Method	**S**	**A**	**G**	**W**	**Level**
1. Edit the instruction manual in conformity with those requirement of Machinery Directive and EN ISO 12100：2010 standard. *2. Each machine accompanied with a complete instruction manual.*	***1***	***1***	***1***	***1***	**-**

2. EN ISO 12100:2010 part 6-7 checklist

Clause	Requirement-Test	Verdict and Result-Remark
EN ISO 12100:2010 General principles for design — Risk assessment and risk reduction		Pass
6	Risk reduction	-
6.1	**General**	-
	The objective of risk reduction can be achieved by the elimination of hazards, or by separately or simultaneously reducing each of the two elements that determine the associated risk: _ severity of harm from the hazard under consideration; _ probability of occurrence of that harm. All protective measures intended for reaching this objective shall be applied in the following sequence, referred to as the three-step method (see also Figures 1 and 2).	Pass. This requirement is complied with.
6.2	Inherently safe design measures	
6.2.1	General	-
	Inherently safe design measures are the first and most important step in the risk reduction process because protective measures inherent to the characteristics of the machine are likely to remain effective, whereas experience has shown that even well-designed safeguarding may fail or be violated and information for use may not be followed.	Pass. Appropriate machine design has been performed by the manufacturer.
	Inherently safe design measures are achieved by avoiding hazards or reducing risks by a suitable choice of design features of the machine itself and/or interaction between the	Pass. Appropriate machine design has been performed by the manufacturer.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	exposed persons and the machine. NOTE See 6.3 for safeguarding and complementary measures that can be used to achieve the risk reduction objectives in the case where inherently safe design measures are not sufficient (see 6.1 for the three-step method).	
6.2.2	Consideration of geometrical factors and physical aspects	-
6.2.2.1	Geometrical factors	-
	Such factors include the following.	-
	a) The form of machinery is designed to maximize direct visibility of the working areas and hazard zones from the control position — reducing blind spots, for example — and choosing and locating means of indirect vision where necessary (mirrors, etc.) so as to take into account the characteristics of human vision, particularly when safe operation requires permanent direct control by the operator, for example: _ the travelling and working area of mobile machines; _ the zone of movement of lifted loads or of the carrier of machinery for lifting persons; _ the area of contact of the tool of a hand-held or hand-guided machine with the material being worked. The design of the machine shall be such that, from the main control position, the operator is able to ensure that there are no exposed persons in the danger zones.	Pass. Appropriate machine design has been performed by the manufacturer.
	b) The form and the relative location of the mechanical components parts: for instance, crushing and shearing hazards are avoided by increasing the minimum gap between the moving parts, such that the part of the body under consideration can enter the gap safely, or by reducing the gap so that no part of the body can enter it (see ISO 13854 and ISO 13857).	Pass. Appropriate machine design has been performed by the manufacturer.
	c) Avoiding sharp edges and corners, protruding parts: in so far as their purpose allows, accessible parts of the machinery shall have no sharp edges, no sharp angles, no rough surfaces, no protruding parts likely to cause injury, and no openings which can “trap” parts of the body or clothing. In particular, sheet metal edges shall be deburred, flanged or trimmed, and open ends of tubes which can cause a “trap” shall be capped.	Pass. Appropriate machine design has been performed by the manufacturer.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	d) The form of the machine is designed so as to achieve a suitable working position and provide accessible manual controls (actuators).	Pass. Appropriate machine design has been performed by the manufacturer.
6.2.2.2	Physical aspects	-
	Such aspects include the following:	-
	a) limiting the actuating force to a sufficiently low value so that the actuated part does not generate a mechanical hazard;	Pass. The actuating force has been limited to be a sufficiently low value so that the actuated part does not generate a mechanical hazard.
	b)limiting the mass and/or velocity of the movable elements, and hence their kinetic energy;	Pass. The mass and/or velocity of the movable elements, and hence their kinetic energy have been limited.
	c) limiting the emissions by acting on the characteristics of the source using measures for reducing 1) noise emission at source (see ISO/TR 11688-1), 2) the emission of vibration at source, such as redistribution or addition of mass and changes of process parameters [for example, frequency and/or amplitude of movements (for hand-held and hand-guided machinery, see CR 1030-1)], 3) the emission of hazardous substances, including the use of less hazardous substances or dust-reducing processes (granules instead of powders, milling instead of grinding), and 4) radiation emissions, including, for example, avoiding the use of hazardous radiation sources, limiting the power of radiation to the lowest level sufficient for the proper functioning of the machine, designing the source so that the beam is concentrated on the target, increasing the distance between the source and the operator or providing for remote operation of the machinery [measures for reducing emission of non-ionizing radiation are given in 6.3.4.5 (see also EN 12198-1 and EN 12198-3)].	Pass. The emissions by acting on the characteristics of the source have been limited.
6.2.3	Taking into account the general technical knowledge regarding machine design	-
	This general technical knowledge can be derived from technical specifications for design (e.g. standards, design codes, calculation rules).These should be used to cover :	-
	a) mechanical stresses such as	-
	- stress limitation by implementation of correct calculation, construction and fastening methods as regards,	Pass. The appropriate technical knowledge of mechanical has been taken into account.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	e.g. bolted assemblies, welded assemblies	
	- stress limitation by overload prevention, (e.g. “fusible” plugs, pressure-limiting valve, breakage points, torque-limiting devices);	Pass. The appropriate technical knowledge of mechanical has been taken into account.
	- avoiding fatigue in elements under variable stresses (notably cyclic stresses);	Pass. The appropriate technical knowledge of mechanical has been taken into account.
	- static and dynamic balancing of rotating elements;	Pass. The appropriate technical knowledge of mechanical has been taken into account.
	b) materials and their properties such as	-
	- resistance to corrosion, ageing, abrasion and wear;	Pass. The materials have been treated by appropriate methods.
	- hardness, ductility, brittleness;	Pass. The materials have been treated by appropriate methods.
	- homogeneity;	Pass. The materials have been treated by appropriate methods.
	- toxicity;	Pass. The materials have been treated by appropriate methods.
	- flammability.	Pass. The materials have been treated by appropriate methods.
	- flammability.	Pass. The materials have been treated by appropriate methods.
	c) emission values for :	-
	- noise;	Pass. No noise will result in hazard in this machine.
	- vibration;	Pass. No vibration will result in hazard in this machine.
	- hazardous substances;	Pass. No hazardous substances will result in hazard in this machine.
	- radiation.	Pass. No radiation will result in hazard in this machine.
	When the reliability of particular components or assemblies is critical for safety (e.g. ropes, chains, lifting accessories for lifting loads or persons), stress values shall be multiplied by appropriate working coefficients.	Pass. Appropriate working coefficients have been taken into account during design and calculation.
6.2.4	Choice of an appropriate technology	-
	One or more hazards can be eliminated or risks reduced by the choice of the technology to be used in certain applications, e.g. :	-
	a) on machines intended for use in explosive atmospheres:	Not applicable.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	- fully pneumatic or hydraulic control system and machine actuators; - “intrinsically safe” electrical equipment (see IEC 60079-11)	
	b) for particular products to be processed such as a solvent: equipment assuring that the temperature will remain far below the flash point.	Not applicable.
	c) alternative equipment to avoid high noise level, e.g.: - electrical instead of pneumatic equipment - in certain conditions, water cutting instead of mechanical equipment.	Pass. The appropriate technology has been chosen.
6.2.5	Applying the principle of the positive mechanical action	-
	Positive mechanical action is achieved when a moving mechanical component inevitably moves another component along with it, either by direct contact or via rigid elements. An example of this is positive opening operation of switching devices in an electrical circuit (see IEC 60947-5-1 and ISO 14119).	Pass. The principle of the positive mechanical action of a component on another component has been applied.
6.2.6	Provisions for stability	-
	Machines shall be designed to have sufficient stability to allow them to be used safely in their specified conditions of use.	Pass. These machines have been designed to have sufficient stability to allow them to be used safely in their specified conditions of use.
	Factors to be taken into account include	-
	- geometry of the base;	Pass. The factor has been taken into account during design.
	- weight distribution, including loading;	Pass. The factor has been taken into account during design.
	- dynamic forces due to movements of parts of the machine, of the machine itself, or of elements held by the machine which may result in an overturning moment;	Pass. The factor has been taken into account during design.
	- vibration	Pass. The factor has been taken into account during design.
	- oscillations of the centre of gravity;	Not applicable
	- characteristics of the supporting surface in case of traveling or installation on different sites (e.g. ground conditions, slope);	Pass. The factor has been taken into account during design.
	- external forces (e.g. wind pressure, manual forces)	Pass. The factor has been taken into account during design.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	Stability shall be considered in all phases of the life of the machine, including handling, traveling, installation, use, de-commissioning and dismantling.	Pass. The factor has been taken into account during design.
	Other protective measures for stability relevant to safeguarding are given in 6.3.2.6	Pass. Please see the related clause.
6.2.7	Provision for maintainability	-
	When designing a machine, the following maintainability factors shall be taken into account:	-
	- accessibility, taking into account the environment and the human body measurements, including the dimensions of the working clothes and tools used;	Pass. These factors have been taken into account during design.
	- ease of handling, taking into account human capabilities;	Pass. The factor has been taken into account during design.
	- limitation of the number of special tools and equipment;	Pass. The factor has been taken into account during design.
6.2.8	Observing ergonomic principles	-
	Ergonomic principles shall be taken into account in designing machinery to reduce mental or physical stress and strain of the operator.	Pass. Appropriate ergonomic principles have been taken into account in designing machinery to reduce mental or physical stress and strain of the operator.
	These principles shall be considered when allocating functions to operator and machine (degree of automation) in the basic design.	Pass. These principles have been taken into account during allocating functions to operator and machine.
	Account shall be taken of body sizes likely to be found in the intended user population, strengths and postures, movement amplitudes, frequency of cyclic actions (see ISO 10075 and ISO 10075-2)	Pass. All these factors have been taken into account during design.
	All elements of the “operator-machine” interface such as controls, signaling or data display elements, shall be designed to be easily understood so that clear and unambiguous interaction between the operator and the machine is possible.(see EN 614-1, ISO 6385, EN 13861 and IEC 61310-1)	Pass. All arrangement and design of manual controls have been checked in compliance with.
	Designer’s attention is especially drawn to following ergonomic aspects of machine design	-
	a) Avoiding stressful postures and movements during use of	Pass. Stressful postures and

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	the machine (e.g. by providing facilities to adjust the machine to suit the various operators).	movements during use of the machine have been avoided.
	b) Designing machines, and more especially hand-held and mobile machines to enable them to be operated easily taking into account human effort, actuation of controls and hand, arm and leg anatomy.	Pass. This machine has been adjusted to the human strength and convenient movement.
	c) Limit as far as possible noise, vibration and thermal effects such as extreme temperatures.	Pass. This machine has been designed with low noise, vibration.
	d) Avoid linking the operator's working rhythm to an automatic succession of cycles.	Pass. This situation has been avoided.
	e) Providing local lighting on or in the machine for the illumination of the working area and of adjusting, setting-up, and frequent maintenance zones when the design features of the machine and /or its guards render the ambient lighting inadequate. Flicker, dazzling, shadows and stroboscopic effects shall be avoided if they can cause a risk. If the position of the lighting source has to be adjusted, its location shall be such that it does not cause any risk to persons making the djustment.	Pass. All these factors have been taken into account during design.
	f) Select, locate and identify manual controls (actuators) so that	-
	- they are clearly visible and identifiable and appropriately marked where necessary (see6.4.4)	Pass. All design and arrangement of the control logic have been checked in compliance with this requirement.
	- they can be safely operated without hesitation or loss of time and without ambiguity (e.g. a standard layout of controls reduces the possibility of error when an operator changes from a machine to another one of similar type having the same pattern of operation)	Pass. All design and arrangement of the control logic have been checked in compliance with this requirement.
	- their location(for push-buttons) and their movement (for levers and handwheels) are consistent with their effect (see IEC 61310-3)	Pass. All the function has been checked in compliance with this requirement.
	- their operation cannot cause additional risk	Pass.
	Where a control is designed and constructed to perform	Not applicable.

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	several different actions, namely where there is no one-to-one correspondence (e.g. keyboards), the action to be performed shall be clearly displayed and subject to confirmation where necessary.	
	Controls shall be so arranged that their layout, travel and resistance to operation are compatible with the action to be performed, taking account of ergonomic principles.	Pass. All the arrangement of the control logic have been checked in compliance with this requirement.
	Constraints due to the necessary or foreseeable use of personal protective equipment(such as footwear, gloves)shall be taken into account.	Not applicable.
	g) Select, design and locate indicators, dials and visual display units so that	-
	- they fit within the parameters and characteristics of human perception	Pass.
	- information displayed can be detected, identified and interpreted conveniently, i.e. long lasting, distinct, unambiguous and understandable with respect to the operator's requirements and the intended use;	Pass. All the information displayed comply with this requirement.
	- the operator is able to perceive them form the control position	Pass.
6.2.9	Preventing electrical hazard	-
	For the design of the electrical equipment of machines IEC 60204-1 gives general provisions, especially in clause 6 for protection against electric shock.	Pass. Please also make reference to EN 60204-1 test report.
	For requirements related to specific machines, see corresponding IEC standards (e.g. series of IEC 61029, IEC 60745, IEC 60335).	Not applicable.
6.2.10	Preventing and hydraulic hazards	-
	Pneumatic and hydraulic equipment of machinery shall be designed so that :	-
	- the maximum rated pressure cannot be exceeded in the circuits (e.g. by means of pressure limiting devices)	Pass. This requirement is complied with.
	- no hazard results from pressure surges or rises, pressure losses or drops or losses of vacuum;	Pass. This requirement is complied with.
	- no hazardous fluid jet or sudden hazardous movement of	Pass.

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	the hose (whiplash)results from leakage or component failures;	This requirement is complied with.
	- air receivers, air reservoirs or similar vessels (e.g. in gas loaded accumulators) comply with the design rules for these elements;	Pass. This requirement is complied with.
	- air elements of the equipment, and especially pipes and hoses, be protected against harmful external effects;	Pass. This requirement is complied with.
	- as far as possible, reservoirs and similar vessels (e.g. in gas loaded accumulators)are automatically depressurized when isolating the machine from its power supply (see 6.3.5.4) and, if it is not possible, means are provided for their isolation, local depressurizing and pressure indication (see also ISO 14118:2000, clause 5)	Pass. This requirement is complied with.
	- all elements which remain under pressure after isolation of the machine from its power supply be provided with clearly identified exhaust devices, and a warning label drawing attention to the necessity of depressurizing those elements before any setting or maintenance activity on the machine. See also ISO 4413 and ISO4414	Pass. This requirement is complied with.
6.2.11	Applying inherently safe design measures to control system	-
6.2.11.1	General	-
	The design measures of the control system shall be chosen so that their safety-related performance provides a sufficient amount of risk reduction (see ISO 13849-1 or IEC 62061)	Pass. Inherently safe design measures to control system have applied.
	The correct design of machine control systems can avoid unforeseen and potentially hazardous machine behaviour.	Pass. Inherently safe design measures to control system have applied.
	Typical causes of hazardous machine behavior are :	-
	- an unsuitable design or modification (accidental or deliberate) of the control system logic;	Pass. No this kind of hazard in this machine
	- a temporary or permanent defect or a failure of one or several components of the control system;	Pass.
	- a variation or a failure in the power supply of the control system;	Pass. No this kind of hazard in this machine
	- inappropriate selection, design and location of the control devices;	Pass. No this kind of hazard in this machine

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	Typical examples of hazardous machine behaviour are :	-
	- unintended/unexpected start-up(see ISO 14118)	Pass. No this kind of hazard in this machine
	- uncontrolled speed change;	Pass. No this kind of hazard in this machine
	- failure to stop moving parts;	Pass. No this kind of hazard in this machine
	- dropping or ejection of a mobile part of the machine or of a workpiece clamped by the machine;	Pass. No this kind of hazard in this machine
	- machine action resulting from inhibition (defeating or failure) of protective devices	Pass. No this kind of hazard in this machine
	In order to prevent hazardous machine behaviour and to achieve safety functions, the design of control systems shall comply with the principles and methods presented in this subclause 6.2.11 and in 6.2.12.	Pass. the design of control systems comply with the related principles and methods
	These principles and methods shall be applied singly or in combination as appropriate to the circumstances (see ISO 13849-1 and IEC 60204-1and IEC 62061).	Pass. Please see the related clause.
	Control systems shall be designed to enable the operator to interact with the machine safely and easily; this requires one or several of the following solutions;	-
	- systematic analysis of start and stop conditions;	Pass. Systematic analysis have been applied.
	- provision for specific operating modes (e.g. start-up after normal stop, restart after cycle interruption or after emergency stop, removal of the workpieces contained in the machine, operation of a part of the machine in case of a failure of a machine element)	Pass. Enough provisions have been provided.
	- clear display of the faults;	Pass.
	- measures to prevent accidental generation of unexpected start commands (e.g. shrouded start device) likely to cause dangerous machine behaviour (see ISO 14118:2000, figure 1)	Pass. Main switch with lock and related devices are provided.
	- maintained stop commands(e.g. interlock) to prevent restarting that could result in dangerous machine behaviour (see ISO 14118:2000, figure 1)	Pass. This requirement is complied with.
	An assembly of machines may be divided into several zones for emergency stopping, for stopping as a result of protective	Not applicable

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	devices and/or for isolation and energy dissipation.	
	The different zones shall be clearly defined and it shall be obvious which parts of the machine belong to which zone.	Not applicable
	Likewise it shall be obvious which control devices (e.g. emergency stop devices, supply disconnecting devices)and/or protective devices belong to which zone.	Not applicable
	The interfaces between zones shall be designed such that no function in one zone creates hazards in another zone which has been stopped for an intervention.	Not applicable
	Control systems shall be designed to limit the movements of parts of the machinery, the machine itself, or workpieces and/or loads held by the machinery, to the safe design parameters(e.g. range, speed, acceleration, deceleration, load capacity). Allowance shall be made for dynamic effects (e.g. the swinging of loads).	Pass. This requirement is complied with.
	For example:	-
	- the traveling speed of mobile pedestrian controlled machinery other than remote-controlled shall be compatible with walking speed.	Not applicable
	- the range, speed, acceleration and deceleration of movements of the person-carrier and carrying vehicle for lifting persons shall be limited to non-hazardous values, taking into account the total reaction time of the operator and the machine.	Pass. This requirement is complied with.
	- the range of movements of parts of machinery for lifting loads shall be kept within specified limits.	Not applicable
	When machinery is designed to use synchronously different elements which can also be used independently the control system shall be designed to prevent risks due to lack of synchronization.	Not applicable
6.2.11.2	Starting of internal power source/switching on an external power supply	-
	The starting of an internal power source or switching-on of an external power supply shall not result in a hazardous situation. For example: _ starting the internal combustion engine shall not lead to movement of a mobile machine; _ connection to mains electricity supply shall not result in the	Pass. Please also make reference to EN 60204-1 test report.

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	starting of working parts of a machine. See IEC 60204-1:2005, 7.5 (see also Annexes A and B).	
6.2.11.3	Starting/stopping of a mechanism	-
	The primary action for starting or accelerating the movement of a mechanism should be performed by application or increase of voltage or fluid pressure, or, if binary logic elements are considered, by passage from state 0 to state 1(if state 1 represents the highest energy state)	Pass. This requirement has been taken into account during design.
	The primary action for stopping or slowing down should be performed by removal or reduction of voltage or fluid pressure, or, if binary logic elements are considered, by passage from state 1 to state 0 (if state 1 represents the highest energy state).	Pass. The type of stopping of this machine belongs to state 1 and state 0.
	When, in order for the operator to maintain permanent control of deceleration, this principle is not observed (e.g. a hydraulic braking device of a self-propelled mobile machine), the machine shall be equipped with a means of slowing and stopping in case of failure of the main braking system	Pass. No such situation exist.
6.2.11.4	Restart after power interruption	-
	If it may generate a hazard, the spontaneous restart of a machine when it is re-energized after power interruption shall be prevented (e.g. by use of a self-maintained relay, contactor or valve).	Pass. The spontaneous restart of a machine when it is re-energized after power interruption has been prevented by contactor.
6.2.11.5	Interruption of power supply	-
	Machinery shall be designed to prevent hazardous situations resulting from interruption or excessive fluctuation of the power supply. At least the following requirements shall be met:	Pass. The hazardous situations resulting from interruption or excessive fluctuation of the power supply has been prevented.
	- the stopping function of the machinery shall remain;	Pass.
	- all devices whose permanent operation is required for safety shall operation an effective way to maintain safety (e.g. locking, clamping devices, cooling or heating devices, power-assisted steering of self-propelled mobile machinery);	Pass.
	- parts of machinery or workpieces and/or loads held by machinery which are liable to move as a result of potential energy shall be retained for the time necessary to allow them to be safely lowered.	Pass. No such situation exists.
6.2.11.6	Use of automatic monitoring	-

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	Automatic monitoring is intended to ensure that a safety function(s) implemented by a protective measure do(es) not fail to be performed if the ability of a component or an element to perform its function is diminished, or if the process conditions are changed in such a way that hazards are generated.	Pass. Appropriate automatic monitoring has been used.
	Automatic monitoring either detects a fault immediately or carries out periodic checks so that a fault is detected before the next demand upon the safety function.	Pass. Appropriate automatic monitoring has been used.
	In either case, the protective measure can be initiated immediately or delayed until a specific event occurs (e.g. the beginning of the machine cycle.) The protective measures may be , e.g.:	Pass. Appropriate automatic monitoring has been used.
	- the stopping of the hazardous process;	Pass. The stop is provided.
	- preventing the re-start of this process after the first stop following the failure;	Pass. Reset before restart is necessary.
	- the triggering of an alarm	Pass. An alarm is provided.
6.2.11.7	Safety functions implemented by programmable electronic control systems	-
6.2.11.7.1	General	-
	A control system including programmable electronic equipment (e.g. programmable controllers) can be used to implement safety functions t machinery.	Not applicable
	Where a programmable electronic control system is used it is necessary to consider its performance requirements in relation to the requirements for the safety functions.	Not applicable
	The design of the programmable electronic control system shall be such that the probability of random hardware failures and the likelihood of systematic failures that can adversely affect the performance of the safety-related control function(s) are sufficiently low.	Not applicable
	Where a programmable electronic control system performs a monitoring function, the system behaviour on detection of a fault shall be considered (see also IEC 61508 series for further guidance)	Not applicable.
	The programmable electronic control system should be installed and validated to ensure that the specified	Not applicable.

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	performance (e.g. safety integrity level (SIL) in IEC 61508 series) for each safety function has been achieved.	
	Validation comprises testing an analysis (e.g. static, dynamic or failure analysis) to show that all parts interact correctly to perform the safety function and that unintended functions do not occur.	Not applicable.
6.2.11.7.2	Hardware aspects	-
	The hardware (including e.g. sensors, actuators, logic solvers) shall be selected (and/or designed) and installed to meet both the functional and performance requirements of the safety function(s) to be performed, in particular, by means of :	Pass. The hardware has been selected and installed to meet both the functional and performance requirements of the safety functions to be performed.
	- architectural constraints (e.g. the configuration of the system, its ability to tolerate faults, its behaviour on detection of a fault);	Pass. Appropriate devices are provided.
	- selecting (and/or designing) equipment and devices with an appropriate probability of dangerous random hardware failure;	Pass. Appropriate devices are provided.
	-Incorporating measures and techniques within the hardware to avoid systematic failures and control systematic faults.	Pass. Appropriate devices are provided.
6.2.11.7.3	Software aspects	-
	The software (including internal operating software (or system software) and application software) shall be designed so as to satisfy the performance specification for the safety functions (see also IEC 61508-3)	Not applicable.
	Application software	-
	Application software should not be re-programmable by the user.	Not applicable.
	This may be achieved by use of embedded software in a non re-programmable memory (e.g. micro-controller, application specific integrated circuit (ASIC)	Not applicable
	When the application requires reprogramming by the user, the access o the software dealing with safety functions should be restricted e.g. by : - locks; - passwords for the authorized persons	Not applicable
6.2.11.8	Principles relating to manual control	-
	a) Manual control devices shall be designed and located according to the relevant ergonomic principles given in 6.2.8	Pass. Manual control devices have been designed and located according to the relevant ergonomic principles given in 4.8.7.
	b) A stop control device shall be placed near each start control device. Where the start/stop function is performed by	Pass. A stop control device has been

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	means of a hold-to-run control, a separate stop control device shall be provided when a risk can result from the hold-to-run control device failing to deliver a stop command when released.	placed near each start control device.
	c) Manual controls shall be located out of reach of the danger zones (see IEC 61310-3), except for certain controls where, of necessity, they are located within a danger zone, such as emergency stop or teach pendant.	Pass. Manual controls have been located out of reach of the danger zones.
	d) Whenever possible, control devices and control positions shall be located so that the operator is able to observe the working area or hazard zone.	Pass. The control devices and control positions have been located so that the operator is able to observe the working area or hazard zone.
	The driver of a ride-on mobile machine shall be able to actuate all control devices required to operate the machine from the driving position, except for functions which can be controlled more safely from other positions.	Not applicable.
	On machinery intended for lifting persons, controls for lifting and lowering and, if appropriate, for moving the carrier, shall generally be located in the carrier. If safe operation requires controls to be situated outside the carrier, the operator in the carrier shall be provided with the means of preventing hazardous movements.	Not applicable.
	e) if it is possible to start the same hazardous element by means of several controls, the control circuit shall be so arranged that only one control is effective at a given time. This applies especially to machines which can be manually controlled by means among others of a portable control unit (teach pendant, for instance), with which the operator may enter danger zones.	Not applicable.
	f) Control actuators shall be designed or guarded so that their effect, where a risk is involved, cannot occur without intentional operation (see ISO 9355-1 and ISO 447)	Pass. Control actuators have been designed or guarded so that their effect, where a risk is involved, cannot occur without intentional operation.
	g) For machine functions whose safe operation depends on permanent, direct control by the operator, measures shall be taken to ensure the presence of the operator at the control position , e.g. by the design and location of control devices.	Pass. This requirement is complied with.
	h) For cableless control an automatic stop shall be performed when correct control signals are not received, including loss of communication (see IEC 60204-1)	Not applicable.
6.2.11.9	Control mode for setting, teaching, process changeover, fault-finding, cleaning or maintenance	-

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	Where, for setting, teaching, process changeover, fault-finding, cleaning or maintenance of machinery, a guard has to displaced or removed and/or a protective device has to be disabled, and where it is necessary for the purpose of these operations for the machinery or part of the machinery to be put in operation, safety of the operator shall be achieved using a specific control mode which simultaneously:	Not applicable.
	- disables all other control modes;	Not applicable.
	- permits operation of the hazardous elements only by continuous actuation of an enabling device, a hold-to-run control device or a two-hand control device;	Not applicable.
	- permits operation of the hazardous elements only in reduced risk conditions (e.g. reduced speed, reduced power/force, step-by-step operation, e.g. with a limited movement control device)	Not applicable.
	prevents any operation of hazardous functions by voluntary or involuntary action on the machine's sensors.	Not applicable.
	This control mode shall be associated with one or more of following measures:	Not applicable.
	- restriction of access to the danger zone as far as possible.	Not applicable.
	- emergency stop control within immediate reach of the operator;	Not applicable.
	- portable control unit (teach pendant) and/or local controls allowing sight of the controlled elements.(see IEC 60204-1:1997, 9.2.4)	Not applicable.
6.2.11.10	Selection of control and operating modes	-
	If machinery has been designed and built to allow for its use in several control or operating modes requiring different protective measures and/or work procedures (e.g. to allow for adjustment , setting, maintenance, inspection), it shall be fitted with a mode selector which can be locked in each position.	Pass. This requirement is complied with.
	Each position of the selector shall be clearly identifiable and shall exclusively allow one control or operating mode.	Pass. This requirement is complied with.
	The selector may be replaced by another selection means which restricts the use of certain functions of the machinery to certain categories of operators (e.g. access codes for certain numerically controlled functions).	Pass. This requirement is complied with.
6.2.11.11	Applying measures achieve electromagnetic compatibility (EMC)	-
	For guidance on electromagnetic compatibility, see IEC 60204-1, and IEC 61000-6 series.	Not applicable.
6.2.11.12	Provision of diagnostic systems to aid fault-finding	-
	Diagnostic systems to aid fault finding should be included in the control system so that there is no need to disable any protective measures.	Pass. Diagnostic systems are provided.

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6.2.12	Minimizing the probability of failure of safety functions	-
6.2.12.1	General	
	Safety of machinery is not only dependent on the reliability of the control systems but also on the reliability of all parts of the machine.The continued operation of the safety functions is essential for the safe use of the machine. This can be achieved by :	Pass.
6.2.12.2	Use of reliable components	-
	“Reliable components” means components which are capable of withstanding all disturbances and stresses associated with the usage of the equipment in the conditions of intended use (including the environmental conditions), for the period of time or the number of operations fixed for the use, with a low probability of failures generating a hazardous malfunctioning of the machine. Components shall be selected taking into account all factors mentioned above(see also 6.213)	Pass. Reliable components have been used.
6.2.12.3	Use of “oriented failure mode” components	-
	“Oriented failure mode” components or systems are those in which the predominant failure mode is known in advance and which can be used so that such a failure leads to a non-hazardous alteration of the machine function.	Not applicable.
	The use of such components should always be considered, particularly in cases where redundancy is (see 6.2.12.4) not employed.	Not applicable.
6.2.12.4	Duplication (or redundancy) of components or subsystems	-
	In the design of safety-related parts of the machine, duplication (or redundancy) of components may be used so that, if one component fails, another component (or other components) continue(s) to perform its (their) function, thereby ensuring that the safety function remains available.	Not applicable.
	In order to allow the proper action to be initiated, component failure shall be preferably detected by automatic monitoring (see 6.2.11.6) or in some circumstances by regular inspection,	Not applicable.
	provided that the inspection interval is shorter than the expected lifetime of the components.	Not applicable.
	Diversity of design and/or technology can be used to avoid common cause failures (e.g. from electromagnetic disturbance) or common mode failures.	Not applicable.
6.2.13	Limiting exposure to hazards through reliability of equipment	-
	Increased reliability of all component parts of machinery reduces the frequency of incidents requiring rectification, thereby reducing exposure to hazards.	Pass. This requirement is complied with.
	This applies to power systems (operative part) as well as to control systems, to safety functions as well as to other	Pass. This requirement is complied

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	functions of machinery.	with.
	Safety-critical components (as e.g. certain sensors) with a known reliability shall be used.	Pass. Safety-critical components are used in this machine.
	The elements of guards and of protective services shall be particularly reliable, as their failure can expose persons to hazards, and also as poor reliability would encourage attempts to defeat them.	Pass. This requirement is complied with.
6.2.14	Limiting exposure to hazards through mechanization or automation of loading(feeding) /unloading (removal) operations	-
	Mechanization and automation of machine loading/unloading operations and more generally of handling operations (of workpieces, materials, substances) limit the risk generated by these operations by reducing the exposure of persons to hazards at the operating points.	Pass. This requirement is complied with.
	Automation can be achieved e.g. by robots, handling devices, transfer mechanisms, air blast equipment.	Pass. This requirement has been complied with by design.
	Mechanization can be achieved, e.g. by feeding slides, push rods, hand-operated indexing tables.	Pass. This requirement has been complied with by design.
	While automatic feeding and removal devices have much to offer in preventing accidents to machine operators, they can create danger when any faults are being rectified.	Pass. Appropriate provisions have been provided.
	Care shall be taken to ensure that the use of these devices does not introduce further hazards (e.g. trapping, crushing) between the devices and parts of the machine or workpieces/materials being processed.	Pass. These devices will not introduce further hazards
	Suitable safeguards (see 6.3) shall be provided if this cannot be ensured.	Pass. Please see the related clause.
	Automatic feeding and removal devices with their own control systems and the control systems of the associated machine shall be interconnected after thoroughly studying how all safety functions are performed in all control and operation modes of the whole equipment.	Pass. This requirement has been complied with by design.
6.2.15	Limiting exposure to hazards through location of the setting and maintenance points outside of danger zones.	Pass.
	The need for access to danger zones shall be minimized by locating maintenance, lubrication and setting points outside these zones.	Pass.
6.3	Safeguarding and complementary protective measures	-
6.3.1	General	-
	Guards and protective devices shall be used to protect persons whenever inherently safe design does not reasonably make it possible either to remove hazards or to sufficiently reduce risks. Complementary protective measures involving additional equipment (e.g. emergency stop equipment)may have to be implemented.	Pass. Appropriate guards and protective devices have been used to protect persons whenever inherently safe design does not reasonably make it possible either to remove hazards

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		or to sufficiently reduce risks.
	The different kinds of guards and protective devices are defined in 3.27 and 3.28.	Pass. Please see the related clause.
	Certain safeguards may be used to avoid exposure to more than one hazard (e.g. a fixed guard preventing access to a zone where a mechanical hazard is present being used to reduce noise level and collect toxic emissions)	Pass. Such safeguards exist.
6.3.2	Selection and implementation of guards and protective devices	-
6.3.2.1	General	-
	This subclause gives guidelines for the selection and the implementation of guards and protective devices the primary purpose of which is to protect persons against hazard generated by moving parts, according to the nature of those parts (see figure 4) and to the need for access to the danger zone(s).	Pass. Please see the related clause.
	The exact choice of a safeguard for a particular machine shall be made on the basis of the risk assessment for that machine.	Pass.
	In selecting an appropriate safeguard for a particular type of machinery or hazard zone, it shall be borne in mind that a fixed guard is simple and shall be used where access of an operator to the danger zone is not required during normal operation (operation without any malfunction) of the machinery.	Pass.
	As the need for frequency of access increase this inevitably leads to the fixed guard not being replaced.	Pass. This requirement is complied with.
	This requires the use of an alternative protective measure (movable interlocking guard, sensitive protective equipment.)	Pass. Sensitive protective equipmentis used.
	A combination of safeguards may sometimes be required. For example , where, in conjunction with a fixed guard, a mechanical loading (feeding) device is used to feed a workpiece into a machine, thereby removing the need for access to the primary hazard zone, a trip device may be required to protect against the secondary drawing-in or shearing hazard between the mechanical loading (feeding) device, when reachable, and the fixed guard.	Not applicable.
	Consideration shall be given to the enclosure of control positions or intervention zones to provide combined protection against several hazards which may include:	Pass. This requirement has been taken in to consideration.
	- hazards from falling or ejected objects (e.g. falling object protection structure)	Pass. No such hazards exist in this machine.
	- emission hazards (e.g. protection against noise, vibration, radiation , harmful substances)	Pass. No such hazards exist in this machine.
	- hazards due to the environment (e.g. protection against heat, cold, foul weather)	Pass. No such hazards exist in this machine.
	- hazards due to tipping over or rolling over of machinery (e.g. roll-over or tip-over protection structure)	Pass. No such hazards exist in this

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		machine.
	The design of such enclosed work stations (e.g. cabs and cabins) shall take into account ergonomic principles concerning visibility, lighting, atmospheric conditions, access, posture.	Pass. Ergonomic principles have been taken into account during design.
6.3.2.2	Where access to the hazard zone is not required during normal operation	-
	Where access to the hazard zone is not required during normal operation of the machinery, safeguard should be selected from the following:	-
	a) fixed guard (see also ISO 14120)	Pass. Fixed guards are provided.
	b) interlocking guard with or without guard locking (see also 6.3.3.2.3, ISO 14119, ISO 14120);	Pass.
	c) self-closing guard (see ISO 14120:2002, 3.3.2)	Not applicable.
	d) sensitive protective equipment, e.g. electro-sensitive protective equipment (see IEC 61496) or pressure sensitive mat (see ISO 13856)	Not applicable.
6.3.2.3	Where access to the hazard zone is required during normal operation	-
	Where access to the hazard zone is required during normal operation of the machinery , safeguards should be selected from the following:	-
	a) interlocking guard with or without guard locking (see also ISO 14119, ISO 14120 and 6.3.3.2.3 of this standard);	Not applicable.
	b) sensitive protective equipment, e.g electro-sensitive protective equipment (see IEC 61496)	Not applicable.
	c) adjustable guard;	Not applicable.
	d) self-closing guard (see ISO 14120:2002, 3.3.2)	Not applicable.
	e) two-hand control device (see ISO 13851)	Not applicable.
	f) interlocking guard with a start function (control guard) (see 6.3.3.2.5 of this standard)	Pass.
6.3.2.4	Where access to the hazard zone is required for machine setting, teaching, process changeover, fault finding, cleaning or maintenance.	-
	As far as possible, machines shall be designed so that the safeguards provided for the protection of the production operator may ensure also the protection of personnel in charge of setting, teaching, process changeover, fault finding, cleaning or maintenance without hindering them in performing their task.	Not applicable.
	Such tasks shall be identified and considered in the risk assessment as parts of the use of the machine (see 5.2)	Not applicable.
6.3.2.5	Selection and implementation of sensitive protective equipment	-
6.3.2.5.1	Selection	-

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Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	Due to the great diversity of the technologies on which their detection function is based, all types of sensitive protective equipment are far from being equally suitable for safety applications.	Not applicable.
	The following provisions are intended to provide the designer with criteria for selecting , for each application , the most suitable device(s).	Not applicable.
	Types of sensitive protective equipment include, e.g.:	-
	- light curtains;	Not applicable.
	- scanning devices as, e.g. laser scanners;	Not applicable.
	- pressure sensitive mats;	Not applicable.
	- trip bars, trip wires.	Not applicable.
	Sensitive protective equipment can be used:	-
	- for tripping purposes;	Not applicable.
	- for presence sensing;	Not applicable.
	- for both tripping and presence sensing	Not applicable.
	- to re-initiate machine operation, a practice which is subject to stringent conditions.	Not applicable.
	The following characteristics of the machinery, among others, can preclude the sole use of sensitive protective equipment:	-
	- tendency for the machinery to eject materials or component parts;	Not applicable.
	- necessity to guard against emissions (noise, radiation, dust, etc.)	Not applicable.
	- erratic or excessive machine stopping time;	Not applicable.
	- inability of a machine to stop part-way through a cycle.	Not applicable.
6.3.2.5.2	Implementation	-
	consideration should be given to :	-
	a) - size, characteristics and positioning of the detection zone (see ISO 13855, which deals with the positioning of some types of sensitive protective equipment)	Not applicable.
	b) - reaction of the device to fault conditions (see IEC 61496for electro-sensitive protective equipment)	
	c)- possibility of circumvention	Not applicable.
	d)- detection capability and its variation over the course of time (e.g. as a result of its susceptibility to different environmental conditions such as the presence of reflecting surfaces, other artificial light sources, sunlight or impurities in the air.	Not applicable.
	sensitive protective equipment shall be integrated in the operative part and associated with the control system of the machine so that:	Not applicable.

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Clause	Requirement-Test	Verdict and Result-Remark
	- a command is given as soon as a person or part of a person is detected;	Not applicable.
	- the withdrawal of the person or part of a person detected does not, by itself, restart the hazardous machine function (s); therefore, the command given by the sensitive protective equipment shall be maintained by the control system until a new command is given;	Not applicable.
	- restarting the hazardous machine function(s) results from the voluntary actuation , by the operator, of a control device placed outside the hazard zone, where this zone can be observed by the operator;	Not applicable.
	- he machine cannot operate during interruption of the detection function of the sensitive protective equipment, except during muting phases,;	Not applicable.
	- the position and the shape of detection field prevents, ,possibly together with fixed guards, a person or part of a person from entering the hazard zone, or being present in it, without being detected.	Not applicable.
6.3.2.5.3	Additional requirements for sensitive protective equipment when used for cycle initiation.	-
	In this exceptional application, starting of the machine cycle is initiated by the withdrawal of a person or of the detected part of a person from the sensing field of the sensitive protective equipment, without any additional start command, hence deviating from the general requirement given in the second point of the dashed list in 6.3.2.5.2, above. After switching on the power supply, or when the machine has been stopped by the tripping function of the sensitive protective equipment, the machine cycle shall be initiated only by voluntary actuation of a start control.	Not applicable.
	Cycle initiation by sensitive protective equipment shall be subject to the following conditions:	
	a) only active optoelectronic protective devices (AOPDs) complying with IEC 61496 series shall be used;	Not applicable.
	b) the requirements for an AOPD used as a tripping and presence-sensing device (see IEC 61496) are satisfied — in particular, location, minimum distance (see ISO 13855), detection capability, reliability and monitoring of control and braking systems;	Not applicable.
	c) the cycle time of the machine is short and the facility to re-initiate the machine upon clearing of the sensing field is limited to a period commensurate with a single normal cycle;	Not applicable.
	d) entering the sensing field of the AOPD(s) or opening interlocking guards is the only way to enter the hazard zone;	Not applicable.
	e) if there is more than one AOPD safeguarding the machine, only one of the AOPD（s） is capable of cycle re-initiation;	Not applicable.
	f) with regard to the higher risk resulting from automatic cycle initiation, the AOPD and the associated control system	Not applicable.

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Clause	Requirement-Test	Verdict and Result-Remark
	comply with a higher safety-related performance than under normal conditions.	
6.3.2.6	Protective measures for stability	-
	If stability cannot be achieved by inherently safe design measures such as weight distribution (see 4.6), it will be necessary to maintain it by protective measures such as the use of :	-
	- anchorage bolts;	Not applicable.
	- locking devices;	Pass
	- movement limiters or mechanical stops;	Pass
	- acceleration or deceleration limiters;	Not applicable.
	- load limiters;	Pass.
	- alarms warning of the approach to stability or tipping limits;	Not applicable.
6.3.2.7	Other protective devices	-
	When a machine requires continuous control by the operator(e.g. mobile machines, cranes) and an error of the operator can generate a hazardous situation, this machine shall be equipped with the necessary devices to enable the operation to remain within specified limits , in particular:	Not applicable.
	- when the operator has insufficient visibility of the hazard zone;	Not applicable.
	- when the operator lacks knowledge of the actual value of a safety –related parameter (e.g. .a distance, a speed, the mass of a load, the angle of a slope)	Not applicable.
	- when hazards may result from operations other than those controlled by the operator;	Not applicable.
	The necessary devices include:	-
	- devices for limiting parameters of movement (distance, angle, velocity , acceleration)	Not applicable.
	- overloading and moment limiting devices:	Not applicable.
	- devices to prevent collisions or interference with other machines;	Not applicable.
	-device for preventing hazards to pedestrian operators of mobile machinery or other pedestrians;	Not applicable.
	- torque limiting devices, breakage points to prevent excessive stress of components and assemblies;	Not applicable.
	- devices for limiting pressure, temperature;	Not applicable.
	- devices for monitoring emissions;	Not applicable.
	- devices prevent operation in the absence of the operator at the control position;	Not applicable.
	- device to prevent lifting operations unless stabilizers are in place;	Not applicable.
	- devices to limit inclination of the machine on a slope;	Not applicable.

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	- devices to ensure that components are in a safe position before traveling;	Not applicable.
	Automatic protective measures triggered by such devices which take operation of the machinery out of the control of the operator (e.g. automatic stop of hazardous movement) should be preceded or accompanied by a warning signal to enable the operator to take appropriate action (see 6.4.3)	Not applicable.
6.3.3	Requirements for the design of guards and protective devices	-
6.3.3.1	General requirements	-
	Guards and protective devices shall be designed to be suitable for the intended use, taking into account mechanical and other hazards involved. Guards and protective devices shall be compatible with the working environment of the machine and designed so that they cannot be easily defeated. They shall provide the minimum possible interference with activities during operation and other phases of machine life, in order to reduce any incentive to defeat them.	Pass. Guards and protective devices have been appropriately designed.
	Guards and protective devices shall :	-
	- be of robust construction.	Pass. This requirement has been taken into account during design.
	- not give rise to any additional hazard;	Pass. This requirement has been taken into account during design.
	- not be easy to by-pass or render non-operational;	Pass. This requirement has been taken into account during design.
	- be located at an adequate distance from the danger zone (see ISO 13857 and ISO 13855).	Pass. This requirement has been taken into account during design.
	- cause minimum obstruction to the view of the production process;	Pass. This requirement has been taken into account during design.
	- enable essential work to be carried out on installation and/or replacement of tools and also for maintenance by allowing access only to the area where the work has to be done, if possible without the guard or protective device having to be moved;	Pass. This requirement has been taken into account during design.
	For openings in the guards see ISO 13857	Pass. This requirement has been taken into account during design.
6.3.3.2	Requirements for fixed guards	-
6.3.3.2.1	Functions of guards	-
	The functions that guards can achieve are:	-
	- prevention of access to the space enclosed by guard and/or - containment/capture of materials, workpieces, chips, liquids which may be ejected or dropped by the machine and reduction	Pass These functions are achieved by fixed guards .

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	of emissions(noise, radiation, hazardous substances such as dust, fumes, gases) which may be generated by the machine.	
	Additionally, they may need to have particular propertied relating to electricity, temperature, fire, explosion, vibration, visibility(see ISO 14120) and operator position ergonomics(e.g. usability, operator's movements, posture, repetitive movements).	Pass These functions are achieved by fixed guards.
6.3.3.2.2	Requirements for fixed guards	-
	Fixed guards shall be securely held in place:	-
	- either permanently (e.g. by welding) - or by means of fasteners (screws, nuts) making removal/opening impossible without using tools; they should not remain closed without their fasteners (see ISO 14120)	Pass All the fixed guards are securely held in place by appropriate fasteners.
6.3.3.2.3	Requirements for movable guards	-
	a) movable guards which provide protection against hazards generated by moving transmission parts shall :	-
	- as far as possible remain fixed to the machinery or other structure (generally by means of hinges or guides) when open;	Not applicable.
	- be interlocking guards (with guard locking when necessary) (see ISO 14119)	Not applicable.
	b) movable guards against hazards generated by non-transmission moving parts shall be designed and associated with the machine control system so that:	-
	- moving parts cannot start up while they are within the operator's reach and the operator cannot reach moving parts once they have started up ; this can be achieved by interlocking guards, with guard locking when necessary.	Not applicable.
	- they can be adjusted only by an intentional action , such as the use of a tool or a key;	Not applicable.
	- the absence or failure of one of their components prevents starting of the moving parts or stops them; this can be achieved by automatic monitoring (see 4.11.6)	Not applicable.
6.3.3.2.4	Requirements for adjustable guards	-
	Adjustable guards may only be used where the hazard zone cannot for operational reasons be completely enclosed;	Not applicable.
	They shall :	-
	- be designed so that the adjustment remains fixed during a given operation;	Not applicable.
	- be readily adjustable without the use of tools;	Not applicable.
6.3.3.2.5	Requirements for interlocking guards with a start function (control guards)	-
	An interlocking guard with a start function may be used provided that	-

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	- all requirements for interlocking guards are satisfied (see ISO 14119)	Not applicable.
	- the cycle time of the machine is short	Not applicable.
	- the maximum opening time of the guard is present to a low value (e.g. equal to the cycle time). When this time is exceeded, the hazardous function(s) cannot be initiated by the closing of the interlocking guard with a start function and resetting is necessary before restarting the machine.	Not applicable.
	- the dimensions or shape of the machine do not allow a person, or part of a person, to stay in the hazard zone or between the hazard zone and the guard while the guard is closed (see ISO 14120)	Not applicable.
	- all other guards whether fixed (removable type) or movable are interlocking guards;	Not applicable.
	- the interlocking device associated with the interlocking guard with a start function is designed in such a way – e.g. by duplication of position detectors and use of automatic monitoring (see 4.11.6)- that its failure cannot lead to an unintended/unexpected start-up;	Not applicable.
	- the guard is securely held open (e.g. by a spring or counterweight)such that it cannot initiate a start while falling by its own weight;	Not applicable.
6.3.3.2.6	Hazards from guards	-
	Care shall be taken to prevent hazards which might be generated by :	-
	- the guard construction (e.g. sharp edges or corners, material);	Pass. No such hazards exist in this machine.
	- the movements of the guards (shearing or crushing zones generated by power-operated guards and by heavy guards which are liable to fall)	Pass. No such hazards exist in this machine.
6.3.3.3	Technical characteristics of protective devices	-
	Protective devices shall be selected or designed and connected to the control system so as to ensure correct implementation of their safety function (s) is ensured.	Pass. This requirement has been taken into account during design.
	Protective devices shall be selected on the basis of their having met the appropriate product standard (for example, IEC 61496 for active optoelectronic protective devices) or shall be designed according to one or several of the principles formulated in ISO 13849-1 or IEC 62061.	Pass. This requirement has been taken into account during design.
	Protective devices shall be installed and connected to the control system so that they cannot be easily defeated.	Pass. This requirement has been taken into account during design.
6.3.3.4	Provisions for alternative types of safeguards.	-
	Provisions should be made to facilitate the fitting of alternative types of safeguards on machinery where it s known that this fitting will be necessary because the work to	Not applicable.

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	be done on it will vary.	
6.3.4	Safeguarding for reducing emissions	-
6.3.4.1	General	-
	If the measures for the reduction of emissions at source mentioned in 6.2.2.2 are not adequate, the machine shall be provided with additional protective measures (see 6.3.4.2 to 6.3.4.5).	Pass. No such hazard exists.
6.3.4.2	Noise	-
	Additional protective measures include, for example: - enclosures (see ISO 15667) - screens fitted to the machine; - silencers (see ISO 14163)	Pass. No such hazard exists.
6.3.4.3	Vibration	-
	Additional protective measures include, for example, damping devices for vibration isolation between the source and the exposed person such as resilient mounting or suspended seats.	Pass. No such hazard exists.
	For measures for vibration isolation of stationary industrial machinery see EN 1299	Pass. No such hazard exists.
6.3.4.4	Hazardous substances	-
	Additional protective measures include, for example:	-
	- encapsulation of the machine (enclosure with negative pressure);	Not applicable.
	- local exhaust ventilation with filtration.	Not applicable.
	- wetting with liquids;	Not applicable.
	- special ventilation in the area of the machine (air curtains , cabins for operators)	Not applicable.
6.3.4.5	Radiation	-
	Additional protective measures include, for example:	-
	- use of filtering and absorption;	Not applicable.
	- use of attenuating screens or guards	Not applicable.
6.3.5	Complementary protective measures	-
6.3.5.1	General	-
	Protective measures which are neither inherently safe design measures, nor safeguarding (implementation of guards and/or protective devices), nor information for use may have to be implemented as required by the intended use and the reasonably foreseeable misuse of the machine.Such measures include, but are not limited to , the ones dealt with in 6.3.5.2 to 6.3.5.6	Pass.
6.3.5.2	Components and elements to achieve the emergency stop	-

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Clause	Requirement-Test	Verdict and Result-Remark
	function	
	If following a risk assessment, a machine needs to be fitted with components and elements to achieve an emergency stop function to enable actual or impending emergency situations to be averted, the following requirements apply:	-
	- the actuators shall be clearly identifiable, clearly visible and readily accessible	Pass. The actuators can be clearly identifiable, clearly visible and readily accessible
	- the hazardous process shall be stopped as quickly as possible without creating additional hazards . If this is not possible or the risk cannot be reduced, it should be questioned whether implementation of an emergency stop function is the best solution;	Pass. The hazardous process can be stopped as quickly as possible without creating additional hazards
	- the emergency stop control shall trigger or permit the triggering of certain safeguard movements where necessary.	Pass No this situation exists.
	Once active operation of the emergency stop device has ceased following an emergency stop command, the effect of this command shall be sustained until it is reset.	Pass. Reset is necessary before re-start.
	This reset shall be possible only at that location where the emergency stop command has been initiated.The reset of the device shall not restart the machinery , but only permit restarting.	Pass. This requirement is complyied with by appropriate design of the emergency stop.
	More details for the design and selection of electrical components and elements to achieve the emergency stop function are provided in IEC 60204 series.	Pass. Please see the related clauses.
6.3.5.3	Measures for the escape and rescue of trapped persons	-
	Measures for the escape and rescue of trapped persons may consist e.g. of :	-
	- escape routes and shelters in installations generating operator-trapping hazards’	Not applicable.
	- arrangements for moving some elements by hand, after an emergency stop	Not applicable.
	- arrangements for reversing the movement of some elements	Not applicable.
	- anchorage points for descender devices;	Not applicable.
	- means of communication to enable trapped operators to call for help	Not applicable.
6.3.5.4	Measures for isolation and energy dissipation	-
	Especially with regard to their maintenance and repair , machines shall be equipped with the technical means to achieve the isolation from power supply(ies) and dissipation of stored energy as a result of following actions:	-
	a) isolating (disconnecting, separating) the machine (or defined parts of the machine) from all power supplies;	Pass. A main switch with lock is provided.
	b) locking (or otherwise securing) all the isolating units in the isolating position;	Pass. Please see the report for IEC 60204

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Clause	Requirement-Test	Verdict and Result-Remark
	c) dissipating or , if this is not possible or practicable, restraining (containing) any stored energy which may give rise to a hazard;	Pass. Please see the report for IEC 60204
	d) verifying, by means of a safe working procedure, that the actions taken according to a), b) and c) above have produced the desired effect.	Pass. Please see the report for IEC 60204
	See ISO 14118:2000, clause 5 and IEC 60204-1:2005, 5.5 and 5.6	
6.3.5.5	Provisions for easy and safe handling of machines and their heavy component parts	-
	Machines and their component parts which cannot be moved or transported by hand shall be provided or capable of being provided with suitable attachment devices for transport by means of lifting gear.	Pass. Appropriate attachments are provided.
	These attachments may be, among others,	-
	- standardized lifting appliances with slings, hooks, eyebolts, or tapped holes for appliance fixing;	Pass. Such devices are used.
	- appliances for automatic grabbing with a lifting hook when attachment is not possible from the ground.	Not applicable.
	- guiding grooves for machines to be transported by a fork truck;	Pass. Such devices are used.
	- lifting gear and appliances integrated into the machine.	Not applicable.
	Parts of machinery which can be removed manually in operation shall be provided with means for their safe removal and replacement; See also 6.4.4c)（item 3).	Pass
6.3.5.6	Measures for safe access to machinery	-
	Machinery shall be so designed as to enable operation and all routine tasks relating to setting and/or maintenance, to be carried out, as far as possible, by a person remaining at ground level.	Pass. These requirements have been taken into account during design.
	Where this is not possible, machines shall have built-in platforms, stairs or other facilities to provide safe access for those tasks, but care should be taken to ensure that such platforms or stairs do not give access to danger zones of machinery.	Not applicable.
	The walking areas shall be made from materials which remain as slip resistant as practicable under working conditions and, depending on the height from the ground, suitable guard-rails (see ISO 14122-3) shall be provided.	Not applicable.
	In large automated installations, particular attention shall be given to safe means of access such as walkways, conveyor bridges or crossover points.	Not applicable.
	Means of access to parts of machinery located at a height shall be provided with collective means of protection against falls (e.g. guard-rails for stairways, stepladders and platforms and/or safety cages for ladders)	Not applicable.

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Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	As necessary , anchorage points for personal protective equipment against falls from a height shall also be provided (e.g. in carriers of machinery for lifting persons or with elevating control sations)	Not applicable.
	Openings shall whenever possible open towards a safe position. They shall be designed to prevent hazards due to unintended opening.	Not applicable.
	The necessary aids for access shall be provided (e.g. steps, handholds). Control devices shall be designed and located to prevent their being used as aids for access.	Not applicable.
	When machinery for lifting goods and/or persons includes landings at fixed levels, these shall be equipped with interlocking guards preventing falls when the platform is not present at the level.	Not applicable.
	Movement of the lifting platform shall be prevented while the guards are open.	Not applicable.
	For detailed provisions see ISO 14122.	Not applicable.
6.4	Information for use	
6.4.1	General requirements	-
	Drafting information for use is an integral part of the design of a machine (see figure 2).	Pass. Please see the related clause.
	Information of use consists of communication links, such as texts, words, signs, signals, symbols or diagrams, used separately or in combination to convey information to the user. It is directed to professional and/or non-professional users.	Pass. All the information is stated in the appropriate place.
6.4.1.2	Information shall be provided to the user about the intended use of the machine, taking into account, notably, all its operating modes.	-
	The information shall contain all directions required to ensure safe and correct use of the machine. With this in view, it shall inform and warn the user about residual risk.	Pass. All the information is stated in the appropriate place.
	The information shall indicate, as appropriate,	-
	- the need for training,	Pass. All the information is stated in the appropriate place.
	- the need for personal protective equipment,	Pass. All the information is stated in the instruction manual.
	- the possible need for additional guards or protective devices (see Figure 2, Footnote d).	Pass. All the information is stated in the appropriate place.
	It shall not exclude uses of the machine that can reasonably be expected from its designation and description and shall also warn about the risk which would result from using the machine in other ways than the ones described in the information, especially considering its reasonably foreseeable misuse.	Pass. All the information is stated in the appropriate place.

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Clause	Requirement-Test	Verdict and Result-Remark
6.4.1.3	Information for use shall cover, separately or in combination, transport, assembly and installation, commissioning, use of the machine (setting, teaching/programming or process changeover, operation, cleaning, fault-finding and maintenance) and, if necessary, dismantling, disabling and scrapping.	Pass. All the information is stated in the appropriate place.
6.4.2	Location and nature of the information for use	-
	Depending on the risk , the time when the information is needed by the user and the machine design , it shall be decided whether the information – or parts thereof – are to be given:	Pass. All the information is stated in the appropriate place.
	- in /on the machine itself (see 6.3 and 6.4.4)	Pass. Adequate information is stated in the machine itself.
	- in accompanying documents (in particular instruction handbook , see 6.4.5)	Pass. Adequate information is stated in the accompanying documents
	- on the packaging	Pass. Adequate information is stated on the packaging
	- by other means such as signals and warnings outside the machine.	Pass. Adequate information is stated
	Standardized phrases shall be considered where important messages such as warnings need to be given (see also IEC 62079)	Pass. This requirement is considered.
6.4.3	Signals and warning devices	-
	Visual signals (e.g. flashing lights) and audible signals (e.g. sirens) may be used to warn of an impending hazardous event such as machine start-up or overspeed.	Pass. Signals and warning devices are provided.
	Such signals may also be used to warn the operator before the triggering of automatic protective measures (see last paragraph of 5.2.70	Pass. Please the related clause.
	It is essential that these signals:	-
	- be emitted before the occurrence of the hazardous event;	Pass. This requirement is taken into account during design and selection of the warning devices.
	- be unambiguous;	Pass. This requirement is taken into account during design and selection of the warning devices.
	- be clearly perceived and differentiated from all other signals used;	Pass. This requirement is taken into account during design and selection of the warning devices.
	- be clearly recognized by the operator and other persons.	Pass. This requirement is taken into account during design and selection of the warning devices.
	The warning devices shall be designed and located such that checking is easy.	Pass. This requirement is taken into account during design and loction of the warning devices.
	The information for use shall prescribe regular checking of	Pass.

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Clause	Requirement-Test	Verdict and Result-Remark
	warning devices.	All the related information is stated in the manual.
	The attention of designers is drawn to the risks from “sensorial saturation” which results from too many visual and/or acoustic signals, which may also lead to defeating the warning devices.	-
6.4.4	Markings, signs (pictograms), written warnings	-
	Machinery shall bear all markings which are necessary:	-
	a) for its unambiguous identification, at least :	-
	- name and address of the manufacturer;	Pass. Adequate information is provided.
	- designation of series or type;	Pass. Adequate information is provided.
	- serial number, if any.	Pass. Adequate information is provided.
	b) in order to indicate its compliance with mandatory requirements;	-
	- marking;	Pass. Adequate marking is provided.
	- written indications (e.g. for machines intended for use in potentially explosive atmosphere)	Pass. Adequate information is provided.
	c) for its safe use, e.g. :	-
	- maximum speed of rotating parts;	Pass. Adequate information is provided.
	- maximum diameter of tools;	Pass. Adequate information is provided.
	- mass (expressed in kilograms) of the machine itself and/or of removable parts’	Pass. Adequate information is provided.
	- maximum working load;	Pass. Adequate information is provided.
	- necessity of wearing personal protective equipment;	Pass. Adequate information is provided.
	- guard adjustment data;	Not applicable.
	- frequency of inspection.	Pass. Adequate information is provided.
	Information printed directly on the machine should be permanent and remain legible throughout the expected life of the machine.	Pass. This requirement is complied with.
	Signs or written warnings only saying “danger” shall not be used.	Pass. This requirement is complied with.
	Markings, signs and written warnings shall be readily understandable and unambiguous, especially as regards the part of the function(s) of the machine which they are related to.	Pass. This requirement is complied with.
	Readily understandable signs (pictograms) should be used in preference to written warnings.	Pass. This requirement is complied with.

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Clause	Requirement-Test	Verdict and Result-Remark
	Signs and pictograms should only be used if the are understood in the culture in which the machinery is to be used.	Pass. This requirement is complied with.
	Markings shall comply with recognized standards (see ISO 2972, ISO 7000, particularly for pictograms, symbols , colours) See IEC 60204 series as regards marking of electrical equipment.	Pass. All the markings are standard.
6.4.5	Accompanying documents (in particular, instruction handbook)	-
6.4.5.1	Contents	-
	The instruction handbook or other written instructions (e.g. on the packaging) shall contain among others:	-
	a) information relating to transport, handling and storage of the machine e.g. :	Pass All the related information is stated in the instruction handbook
	- storage conditions for the machine;	Pass. All the related information is stated in the instruction handbook
	- dimensions , mass value(s), position of the centre (s) of gravity;	Pass. All the related information is stated in the instruction handbook
	- indications for handling (e.g. drawings indicating application points for lifting equipment)	Pass. All the related information is stated in the instruction handbook
	b) information relating to installation and commissioning of the machine, e.g.	-
	- fixing/anchoring and vibration dampening requirements;	Pass. All the related information is stated in the instruction handbook
	- assembly and mounting conditions;	Pass. All the related information is stated in the instruction handbook
	- space needed for use and maintenance;	Pass. All the related information is stated in the instruction handbook
	- permissible environmental conditions (e.g. temperature, moisture, vibration, electromagnetic radiation);	Pass. All the related information is stated in the instruction handbook
	- instructions for connecting the machine to power supply (particularly about protection against electrical overloading);	Pass. All the related information is stated in the instruction handbook
	- advice about waste removal /disposal;	Pass. All the related information is stated in the instruction handbook
	- if necessary, recommendations about protective measures which have to be taken by the user; e.g. additional safeguards (see ISO 12100-1:2003, figure 1, note 4), safety distances, safety signs and signals.	Pass. All the related information is stated in the instruction handbook

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	c) information relating to the machine itself, e.g. :	-
	- detailed description of the machine, its fittings, its guards and/or protective devices;	Pass. All the related information is stated in the instruction handbook
	- comprehensive range of applications for which the machine is intended, including prohibited usages, if any , taking into account variations of the original machine if appropriate.	Pass. All the related information is stated in the instruction handbook
	- diagrams (especially schematic representation of safety functions);	Pass. All the related information is stated in the instruction handbook
	- data about noise and vibration generated by the machine, about radiation , gases, vapours, dust emitted by it, with reference to the measuring methods used.	Pass. All the related information is stated in the instruction handbook
	- technical documentation about electrical equipment (see IEC 60204 series)	Pass. All the related information is stated in the instruction handbook
	- documents attesting that the machine complies with mandatory requirements;	Pass. All the related information is stated in the instruction handbook
	d) information relating to the use of the machine, e.g. about:	-
	- intended use;	Pass. All the related information is stated in the instruction handbook
	- description of manual controls (actuators);	Pass. All the related information is stated in the instruction handbook
	- setting and adjustment;	Pass. All the related information is stated in the instruction handbook
	- modes and means for stopping (especially emergency stop)	Pass. All the related information is stated in the instruction handbook
	- risks which could not be eliminated by the protective measures taken by the designer;	Pass. All the related information is stated in the instruction handbook
	- particular risks which may be generated by certain applications, by the use of certain fittings, and about specific safeguards which are necessary for such applications.	Pass. All the related information is stated in the instruction handbook
	- reasonably foreseeable misuse and prohibited usages;	Pass. All the related information is stated in the instruction handbook
	- fault identification and location , repair, and re-starting after an intervention;	Pass. All the related information is stated in the instruction handbook
	- personal protective equipment which need to be used and training required.	Pass. All the related information is stated in the instruction handbook

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	e) information for maintenance e.g.	-
	- nature and frequency of inspections for safety functions;	Pass. All the related information is stated in the instruction handbook
	- instructions relating to maintenance operations which require a definite technical knowledge or particular skills and hence should be carried out exclusively by skilled persons (e.g. maintenance staff, specialists)	Pass. All the related information is stated in the instruction handbook
	- instructions relating to maintenance actions (e.g. replacement of parts) which do not require specific skills and hence may be carried out by users (e.g. operators)	Pass. All the related information is stated in the instruction handbook
	- drawings and diagrams enabling maintenance personnel to carry out their task rationally (especially fault-finding tasks)	Pass. All the related information is stated in the instruction handbook
	f) information relating to de-commissioning , dismantling and disposal;	Pass. All the related information is stated in the instruction handbook
	g) information for emergency situations , e.g. :	Pass. All the related information is stated in the instruction handbook
	- type of fire-fighting equipment to be used.	Pass. All the related information is stated in the instruction handbook
	- warning about possible emission or leakage of harmful substance(s), and if possible, indication of means to fight their effects.	Pass. All the related information is stated in the instruction handbook
	h) maintenance instructions provided for skilled persons (second dash in e))and maintenance instructions provided for unskilled persons (third dash in e)), that should appear clearly separated from each other.	Pass. All the related information is stated in the instruction handbook
6.4.5.2	Production of the instruction handbook	-
	a) type and size of print shall ensure the best possible legibility. Safety warnings and/or cautions should be emphasized b the use of colours, symbols and/or large print.	Pass. All the related information is stated in the instruction handbook
	b) information for use shall be given in the language(s) of the country in which the machine will be used for the first time and in the original version. If more than one language are to be used, each language should be readily distinguished from the other(s), and efforts should be made to keep the translated text and the relevant illustration together.	Pass. All the related information is stated in the instruction handbook
	c) whenever helpful to the understanding, text should be supplemented with written details enabling , for instance, manual controls (actuators) to be located and identified; they	Pass. All the related information is stated in the instruction handbook

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	should not be separated from the accompanying text and should follow sequential operations.	
	d) consideration should be given to presenting information in tabular form where this will aid understanding. Tables should be adjacent to the relevant text.	Pass. All the related information is stated in the instruction handbook
	e) the use of colours should be considered, particularly in relation to components requiring quick identification.	Pass. All the related information is stated in the instruction handbook
	f) when information for use is lengthy, a table of contents and/or an index should be given.	Pass. All the related information is stated in the instruction handbook
	g) safety-relevant instructions which involve immediate action should be provided in a form readily available to the operator.	Pass. All the related information is stated in the instruction handbook
6.4.5.3	Drafting and editing information for use	-
	a) relationship to model : the information shall clearly relate to the specific model of machine and, if necessary, other appropriate identification (for example, by serial number).	Pass. All the related information is stated in the instruction handbook
	b) communicate principles : when information for use is being prepared, the communication process “see-think-use” should be followed in order to achieve the maximum effect and should follow sequential operations. The questions “how ?” and “why ?” should be anticipated and the answers provided.	Pass. All the related information is stated in the instruction handbook
	c) information for use shall be as simple and as brief as possible, and should be expressed in consistent terms and units with a clear explanation of unusual technical terms.	Pass. All the related information is stated in the instruction handbook
	d) when it is foreseen that a machine will b put to non-professional use, the instructions should be written in a form that is readily understood by the non-professional users. If personal protective equipment is required for the safe use of the machine, clear advice should be given, e.g. on the packaging as well as on the machine, so that this information is prominently displayed at the point of sale.	Pass. All the related information is stated in the instruction handbook
	e) durability and availability of the documents : documents giving instructions for use should be produced in durable form (i.e. they should be able to survive frequent handling by the user). It may be useful to mark them “keep for future reference”. Where information for use is kept in electronic form (e.g. CD, DVD, tape) information on safety-related issues that need immediate action shall always be backed up with a hand copy that is readily available.	Pass. All the related information is stated in the instruction handbook
7	Documentation of risk assessment and risk reduction	

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	The documentation shall demonstrate the procedure that has been followed and the results that have been achieved. This includes, when relevant, documentation of	
	a) the machinery for which the risk assessment has been made (for example, specifications, limits, intended use);	Pass. See the risk assessment report in detail.
	b) any relevant assumptions that have been made (loads, strengths, safety factors, etc.);	Pass. See the risk assessment report in detail.
	c) the hazards and hazardous situations identified and the hazardous events considered in the risk assessment;	Pass. See the risk assessment report in detail.
	d) the information on which risk assessment was based (see 5.2):	Pass. See the risk assessment report in detail.
	1) the data used and the sources (accident histories, experience gained from risk reduction applied to similar machinery, etc.);	Pass. See the risk assessment report in detail.
	2) the uncertainty associated with the data used and its impact on the risk assessment;	Pass. See the risk assessment report in detail.
	e) the risk reduction objectives to be achieved by protective measures;	Pass. See the risk assessment report in detail.
	f) the protective measures implemented to eliminate identified hazards or to reduce risk;	Pass. See the risk assessment report in detail.
	g) residual risks associated with the machinery;	Pass. See the risk assessment report in detail.
	h) the result of the risk assessment (see Figure 1);	Pass. See the risk assessment report in detail.
	i) any forms completed during the risk assessment.	Pass. See the risk assessment report in detail.
	Standards or other specifications used to select protective measures referred to in f) above should be referenced.	Pass. The requirements have been taken into account during design.

3. EN ISO 10821:2005+A1:2009 checklist

Clause	Requirement-Test	Verdict and Result-Remark
EN ISO 10821:2005+A1:2009 Industrial sewing machines - Safety requirements for sewing machines, units and systems		--
5	Safety measures and requirements	--
5.1	General principles	--
5.3.2	Quilting machines	--
5.3.2.1	General	--
	The electrical equipment for quilting machines (sewing units and systems) shall be in accordance with IEC 60204-1.	Pass. It meets the requirements when manufacturing.
5.3.2.2	Multi-needle machines (several needle bars)	--

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	Thread cones shall be arranged on the thread stand in such a way as to allow easy access and exchange of the cones. This requirement is considered to have been met when, for example, the thread stand can be reached from the operator's area, or safe steps are provided at the machine.	Not applicable.
5.3.3	Bag closing sewing machines in the packaging industry	Pass. It meets the requirements after checking.
5.3.3.1	These sewing machines are normally mounted vertically, with the handwheel on top in order to close a bag [see Figure 7 a)], and not horizontally as shown in Figure 1. On bag-closing sewing machines, the area for feeding in the bags or sacks, except for the active operation area, shall be covered by guards.	Pass. It has been taken into account in design.
5.3.3.2	Bag-closing units and systems shall be in accordance with IEC 60204-31. The stop and, respectively, the emergency stop, shall each function as a Category 0 stop according to IEC 60204-1.	Pass. It meets the requirements.
5.3.3.3	The electrical equipment for handheld portable machines up to a weight of 10 kg shall be in accordance with IEC 60745-1.	Pass. It meets the requirements.
5.3.3.4	See 5.2.1.2 for the corresponding requirements for cutter systems.	Pass. It meets the requirements after checking.
5.3.4	Embroidery machines	--
5.3.4.1	Given the type of sewing process and the way in which the design forces the foot, thread wiper and sequin guide to be positioned, there is no need for the embroidery machines to have shields to prevent needle breaks (as defined in Annex D), protective fixtures for the lever to withdraw the needle thread or finger deflectors (as defined in Annex A).	Not applicable.
5.3.4.2	One-head embroidery machines are sewing units and shall conform with the safety requirements for industrial sewing machines according to this International Standard and IEC 60204-31.	Not applicable.
5.3.4.3	Multihead embroidery machines are sewing systems and shall conform with the safety requirements for industrial sewing machines according to this International Standard, and to IEC 60204-31 with the following modified requirements.	Not applicable.
a)	Multihead embroidery machines shall be able to be switched on and off at a main operation panel.	Not applicable.
b)	Irrespective of the main operation panel, it is acceptable that a multihead embroidery machine be also capable of being stopped by a separate switching device of Category 2 according to IEC 60204-1.	Not applicable.
c)	Multihead embroidery machines shall have an emergency stop according to IEC 60204-1. The emergency stop shall function as a Category 0 or Category 1 stop.	Not applicable.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
5.3.5	Glove sewing machines	--
	Owing to the nature of the sewing process, a finger deflecting device as specified in Annex A is not required for glove sewing machines.	Pass. It meets the requirements after checking.
5.3.6	Sewing machines for shoe repair	--
	Owing to the nature of the sewing process, a finger deflecting device as specified in Annex A is not required for sewing machines for shoe repair. The requirements for the thread take-up lever are given in 5.2.1.7.	Pass. It meets the requirements after checking.
5.3.7	Blind stitch sewing machines	--
	Owing to the nature of the sewing process, a finger deflecting device as specified in Annex A is not required for blind stitch sewing machines.	Pass. It meets the requirements after checking.
5.3.8	Linking machines	--
	Owing to the nature of the sewing process, a finger deflecting device as specified in Annex A is not required for linking machines.	Pass. It meets the requirements after checking.
6	Verification of safety requirements or measures	--
	Verification shall be carried out by the manufacturer. The manufacturer may subcontract this verification to a third party, but the manufacturer shall remain the responsible party.	Pass. It meets the requirements after checking.
7	Information on use and maintenance	--
7.1	General	--
	This may be text, signs, signals, symbols or diagrams, used separately or in combination to convey information to the user of the machine.	Pass. It has been explained in themanual.
7.2	Marking	--
	Sewing units and systems shall be marked legibly and indelibly with the following minimum information:	Pass. It has been explained in themanual.
	- business name and full address of the manufacturer and, where applicable, the authorized representative;	Pass. It has been explained in themanual.
	- designation of the machinery;	Pass. It has been explained in themanual.
	- mandatory marking1);	Pass. It has been explained in themanual.
	- designation of series or type, if any;	Pass. It has been explained in themanual.
	- year of construction, that is the year in which the manufacturing process is completed;	Pass. It has been explained in themanual.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	- serial number, if any.	Pass. It has been explained in themanual.
7.3	Warning of residual risk	--
	Where risks remain despite all measures adopted, and where potential risks are not evident (e.g. electrical enclosures, bleeding of a pneumatic circuit, hazard in an unseen area),the manufacturer shall provide warnings.	Pass. It has been explained in the manual.
7.4	Instructions	--
7.4.1	General information	--
	The purpose for which the machine is intended shall be clearly defined in the instructions, which shall contain all directions required to ensure its safe and correct use.	Pass. It has been explained in the manual.
	a) It shall be stated in the instructions that the machine has been designed for	Pass. It has been explained in the manual.
	- foreseeable use,	Pass. It has been explained in the manual.
	- use by trained operators or supervisors, and	Pass. It has been explained in the manual.
	- maintenance.	Pass. It has been explained in the manual.
	b) The instructions shall not compensate for design deficiencies and shall include any drawings and diagrams relevant to safety.	Pass. It has been explained in the manual.
	c) The instructions shall be provided with the machine as an integral part of the supply.	Pass. It has been explained in the manual.
	d) The instructions shall be in accordance, in form and content, with ISO 12100-2:2003, 6.5, except for 6.5.2 b).	Pass. It has been explained in the manual.
	e) The requirements on technical documentation for the electrical equipment in IEC 60204-31 shall be taken into consideration when preparing the instructions.	Pass. It has been explained in the manual.
	f) The instructions shall repeat and explain all the information with which the machine is marked (see 7.2. and 7.3).	Pass. It has been explained in the manual.
	g) Management and operators shall ensure that guards are in place and work properly.	Pass. It has been explained in the manual.
	h) Instructions concerning the periodic maintenance or test of the machine related to safety shall be provided if necessary.	Pass. It has been explained in the manual.
	i) Noise declaration as specified in C.9 shall be included in the instructions and in the technical documentation describing the machine (see Annex I):	Pass. It has been explained in the manual.
	j) Specifications of the spare parts to be used if these impact on the health and safety of operators.	Pass. It has been explained in the manual.
7.4.2	Particular information	
	a) give an indication if none of the requirements on cutter systems will be met, and of the use of a warning label,	Pass. It has been explained in the manual.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Clause	Requirement-Test	Verdict and Result-Remark
	b) give an indication if none of the requirements on the shuttle/hook/looper assembly will be met, and of the use of a warning label,	Pass. It has been explained in the manual.
	c) instruct the operator in how to thread the machine,	Pass. It has been explained in the manual.
	d) give handling instructions for avoiding the overturning or falling back (tilting) of the machine	Pass. It has been explained in the manual.
	e) give an indication of the need to always switch off an industrial sewing machine (e.g. by actuating the ON/OFF switch or by disconnecting the plug from the supply) when	Pass. It has been explained in the manual.
	- a sewing tool exchange and adjustment occurs	Pass. It has been explained in the manual.
	- the workplace is left unattended, or	Pass. It has been explained in the manual.
	- maintenance work has to be performed, and	Pass. It has been explained in the manual.
	f) provide advice that the sieve of the air cooling supply at the sewing machine drive is to be cleaned periodically (to be fixed), and that the industrial sewing unit or system may never be operated with any cooling openings blocked,	Pass. It has been explained in the manual.
	g) provide a warning that an industrial sewing unit or sewing system must always be unplugged from the local lighting of the sewing area before relamping; the marking of maximum rated input of a lamp shall be easily discernible while the lamp is being replaced, indicated on or near the lamp socket by	Pass. It has been explained in the manual.
	h) give an indication if none of the requirements for hot surfaces will be met, and of the use of a warning label, and	Pass. It has been explained in the manual.
	i) give an indication if machines are equipped with laser products (see 5.2.5), and of the use of a warning label,	Pass. It has been explained in the manual.
	j) give an indication of the fact if the cutter opening width exceeds 8 mm (see 5.2.1.2)	Pass. It has been explained in the manual.
	k) give information on the correct use of hazardous feeding elements (see 5.2.1.3).	Pass. It has been explained in the manual.

4. Airborne noise Test result

1. Background

Reading value : 59.1 dB(A)

2. Sound pressure level (machine on “Stand by” and normal load condition)

Position	1	2	3	4	5
Reading (dB (A))	54.2	55.3	54.6	56.6	55.3

3. Sound pressure level (machine on full load condition)

Position	1	2	3	4	5

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict

Reading (dB (A))					

4. Sound power level (where the measuring value of sound pressure level exceeds 85 dB(A))

Position	1	2	3	4	5
Readings (dB (A))	-	-	-	-	-
Position	6	7	8	9	L_W
Readings (dB (A))	-	-	-	-	-

The following is the calculation formula of L_W (Sound power level):

$L_W = L_{pf} + 10 \times \log (S/S_o)$

y	L_{pf} is the A-weighted or frequency bank surface sound pressure level	
y y	S is the area of the measurement surface in square meters S_0 is 1 m^2	20 m^2

Attachment No.1 IEC62841_2_1C - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT

IEC 62841-2-1

EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES

ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY - SAFETY - PART 2-1: PARTICULAR REQUIREMENTS FOR HAND-HELD DRILLS AND IMPACT DRILLS

Differences according to.....: EN 62841-2-1:2018 to be used in conjunction with EN 62841-1:2015

TRF template used.....**:** IECEE OD-2020-F2:2020, Ed. 1.1

Attachment Form No..... : EU_GD_62841_2_1C

Attachment Originator.....: TÜV Rheinland Intercert Kft., MEEI Division

Master Attachment..... : Dated 2021-03-11

	CENELEC COMMON MODIFICATIONS (EN)		-
ANNEX I	**MEASUREMENT OF NOISE AND VIBRATION EMISSIONS**		-
	Replace the title of Annex I by the following **ANNEX I – (NORMATIVE)**		P
I.2	**Noise test code (grade 2)**		-
I.2.4	**Installation and mounting conditions of the power tools during noise tests**		-
A	Drills are suspended.		P
	Impact drills are held by the operator for drilling vertically down in accordance with I.2.5.		P
I.2.5	**Operating conditions**		-
A	Drills are tested at no-load without any accessory mounted, all speed setting devices adjusted to the highest value.		P
	For impact drills, the speed setting is that recommended by the manufacturer for an 8 mm bit for drilling into concrete.		P
	Impact drills are tested under load (I.101/I.102)		P
I.2.9	**Declaration and verification of noise emission values**		**-**

Attachment No.1 IEC62841_2_1C - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
A	For a standard deviation of reproducibility of the method σ_{R0} of 1,5 dB and for a typical standard deviation of production, the values for the uncertainties, K_{pA} and K_{WA} respectively, for drills are 5 dB.		N/A
I.3	**Vibration**		-
I.3.3.2	**Location of measurement**		-
A	Figures I.102 and I.103 show the positions for different types of tools.		N/A
I.3.5.1	**General**		-
A	For battery operated tools, the tests are conducted with the lightest battery in accordance with K.8.14.2 e) 2).		N/A
I.3.5.3	**Operating conditions**		-
A	Impact drills where the impact mechanism can be switched off to have a rotary function only are tested as described under I.3.5.3.101 and I.3.5.3.102.		N/A
	Diamond core drills are tested as described under I.3.5.3.103.		N/A
I.3.5.3.101 A	**Drills**		-
	Drills, except diamond core drills, are tested under load observing the conditions shown in Tables I.103 and I.104, all speed setting devices adjusted to the highest value.		P
I.3.5.3.102 A	**Impact drills**		-
	For impact drills, the speed setting is that recommended by the manufacturer for an 8 mm bit for drilling into concrete.		P
	Impact drills are tested under load (I.101/I.105)		P
I.3.5.3.103 A	**Diamond core drills**		-
	Diamond core drills provided with an impact function are also tested as an impact drill.		N/A
	Diamond core drills are tested under load as described in Table I.106.		N/A
	The machine settings (speed, liquid system, impact, etc.) are correctly adjusted for drilling into the material specified for the test and for the type and diameter of the drill bit specified in Table I.106.		N/A

Attachment No.1 IEC62841_2_1C - ATTACHMENT

Clause	Requirement + Test	Result - Remark	Verdict
	The tool is designed to drill with a dust collection device, the dust collection device is in place during the operation of the tool.		N/A
	The tool is suitable to drill into concrete with a liquid system, the liquid collection device, if any, is in place during the operation of the tool.		N/A
I.3.6.1	**Reported vibration values**		-
A	If more than one operating mode was measured, the result ah for each operating mode applicable shall be reported.		N/A
	$a_{h,D}$ drilling (m/s²) (in accordance with I.3.5.3.101).:		N/A
	$a_{h,ID}$ impact drilling (m/s²) (in accordance with I.3.5.3.102)..... :		N/A
	$a_{h,DD}$ diamond drilling (m/s²) (in accordance with I.3.5.3.103)..... :		N/A
I.3.6.2	**Declaration of the vibration total value**		-
A	The vibration total value of the handle with the highest emission and the uncertainty K is declared:		-
	– for drills the value of $a_{h,D}$, with the work mode description “drilling into metal”;		N/A
	– for impact drills with drill only function the value of $a_{h,ID}$, with the work mode description “impact drilling into concrete” and the value of $a_{h,D}$, with the work mode description “drilling into metal”;		N/A
	– for impact drills without drill only function the value of $a_{h,ID}$, with the work mode description “impact drilling into concrete”;		N/A
	– for diamond core drills without impact mechanism the value of $a_{h,DD}$, with the work mode description “drilling into concrete”;		N/A
	– for diamond core drills with impact mechanism the value of $a_{h,ID}$, with the work mode description “impact drilling into concrete” and the value of $a_{h,DD}$, with the work mode description “drilling into concrete”.		N/A

Attachment No.2 **Product Photos**

Details of: Overview for model CP003

Details of: Overview for model CP003

Attachment No.2 **Product Photos**

Details of: Overview for model CP003

Details of: Overview for model CP003

Attachment No.2 **Product Photos**

Details of: Overview for model CP003

- End of test report -