| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.*: | **50050508 003** | **Auftrags-Nr.:** *Order no.*: | 180217404 | Seite 1 von 127 *Page 1 of 127* |
| **Kunden-Referenz-Nr.:** *Client reference no.*: | N/A | **Auftragsdatum:** *Order date:* | 2021-11-09 | |
| **Auftraggeber:** *Client*: | Zhejiang Zomax Garden Machinery Co., Ltd. / No. 48 Aodihu Road, Taiping District, Wenling City, Zhejiang Province 317500, P. R. China | | | |
| **Prüfgegenstand:** *Test item*: | Cordless chain saw | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type no.*: | ZMDC501 | | | |
| **Auftrags-Inhalt:** *Order content*: | Type test | | | |
| **Prüfgrundlage:** *Test specification*: | EN 62841-1:2015 + A11<br>EN 62841-4-1:2020 | | | |

| | |
|---|---|
| **Wareneingangsdatum:** *Date of sample receipt*: | 2022-12-09 |
| **Prüfmuster-Nr.:** *Test sample no:* | A003387148-001~003 |
| **Prüfzeitraum:** *Testing period*: | 2022-12-12 - 2022-12-23 |
| **Ort der Prüfung:** *Place of testing*: | TÜV Rheinland Shanghai Co., Ltd. |
| **Prüflaboratorium:** *Testing laboratory:* | TÜV Rheinland Shanghai Co., Ltd. |
| **Prüfergebnis*:** *Test result**: | Pass |

| | | | |
|---|---|---|---|
| **geprüft von:** *tested by:* | X<br>Signed by: Dong Xu | **genehmigt von:** *authorized by*: | X<br>Signed by: Bingwen Zhang |
| **Datum:** *Date:* 2023-04-07 | | **Ausstellungsdatum:** *Issue date:* 2023-04-07 | |
| **Stellung** / Position: | Dong Xu / PE | **Stellung** / Position: | Bingwen Zhang / Authorizor |

**Sonstiges /** *Other*: See "General product information".

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

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

| **Absatz** *Clause* | **Anforderungen - Prüfungen /** *Requirements - Tests* | **Messergebnisse – Bemerkungen/** *Measuring results - Remarks* | **Ergebnis** *Result* |
|---|---|---|---|
| **1** | Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.<br>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.<br><br>*The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.*<br>*Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.* | | |
| **2** | Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.<br><br>*As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.* | | |
| **3** | Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.<br><br>*Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.* | | |
| **4** | Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.<br><br>*The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.* | | |

**Test Report issued under the responsibility of:**

TÜVRheinland®

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

| | |
|---|---|
| **Report Number. ..... :** | 50050508 003 |
| **Date of issue ..... :** | See cover page |
| **Total number of pages ..... :** | See cover page |
| **Name of Testing Laboratory preparing the Report ..... :** | TÜV Rheinland Shanghai Co., Ltd. |
| **Applicant's name ..... :** | Zhejiang Zomax Garden Machinery Co., Ltd. |
| **Address ..... :** | No. 48 Aodihu Road, Taiping District, Wenling City, Zhejiang Province 317500, P. R. China |
| **Test specification:** | |
| **Standard ..... :** | IEC 62841-1: 2014, COR1:2014, COR2:2015 |
| **Test procedure ..... :** | Type test |
| **Non-standard test method ..... :** | N/A |
| **TRF template used ..... :** | IECEE OD-2020-F1:2020, Ed.1.3 |
| **Test Report Form No. ..... :** | IEC62841_1E |
| **Test Report Form(s) Originator .... :** | DEKRA Certification B.V. |
| **Master TRF ..... :** | 2020-12-03 |



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

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

**General disclaimer:**

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

| | |
|---|---|
| **Test item description .....:** | Cordless chain saw |
| **Trade Mark .....:** | See copy of marking plate |
| **Manufacturer.....:** | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No. 48 Aodihu Road, Taiping District, Wenling City, Zhejiang Province 317500, P. R. China |
| **Model/Type reference.....:** | ZMDC501 |
| **Ratings.....:** | 58 V d.c. |

| | | | |
|---|---|---|---|
| **Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):** | | | |
| ☒ | **Testing Laboratory:** | TÜV Rheinland Shanghai Co., Ltd. | |
| **Testing location/ address ..... :** | | No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China | |
| **Tested by (name, function, signature) ..... :** | | See cover page | |
| **Approved by (name, function, signature) .. :** | | See cover page | |
| ☐ | **Testing procedure: CTF Stage 1:** | | |
| **Testing location/ address ..... :** | | | |
| **Tested by (name, function, signature) ..... :** | | | |
| **Approved by (name, function, signature) .. :** | | | |
| ☐ | **Testing procedure: CTF Stage 2:** | | |
| **Testing location/ address ..... :** | | | |
| **Tested by (name + signature)..... :** | | | |
| **Witnessed by (name, function, signature) . :** | | | |
| **Approved by (name, function, signature) .. :** | | | |
| ☐ | **Testing procedure: CTF Stage 3:** | | |
| ☐ | **Testing procedure: CTF Stage 4:** | | |
| **Testing location/ address ..... :** | | | |
| **Tested by (name, function, signature) ..... :** | | | |
| **Witnessed by (name, function, signature) . :** | | | |
| **Approved by (name, function, signature) .. :** | | | |
| **Supervised by (name, function, signature) :** | | | |

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

Attachment 1: Test report of safety critical function of software (relevant test report No. 50205904 002, 21 pages)

Attachment 2: Critical component list (6 pages)

**Summary of testing:**

| **Tests performed (name of test and test clause):** | **Testing location:** |
|---|---|
| Tests of Cl. 8.12, K.12.1, K.13.1, K.13.2, K.18.1 b) & c), 18.6.1, 19.107.1.2, 19.112, 21.17 and Annex I were performed on the provided samples.<br>For tests of Cl. K.12.201, K.18.1a), K.18.201, K.18.202 and K.19.202, the tests were perviously performed and passed in test report No. CN21D3HP 001.<br>Other test data not mentioned above were cited from report No. 50050508 001-002. | TÜV Rheinland Shanghai Co., Ltd.<br>No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China |

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

EU group difference

**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:**

The decision rule for statements of conformity in this test report is based on the “Zero Guard Band Rule” and “Simple Acceptance” in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report.

Decision rule is the rule that describes how measurement uncertainty is accounted for when stating conformity with a specified requirement.
When decision rule is applicable, please refer to the current version announced in our website https://www.tuv.com/landingpage/en/qm-gcn/.

☐ **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.**

**Tool label:**


**Battery pack label:**






| | |
|---|---|
| **Test item particulars.....:** | Cordless chain saw |
| **Category of equipment .....:** | Garden |
| **Protection Class of tool .....:** | Battery tool |
| **Method of supply cord attachment .....:** | N/A |
| **Duty conditions.....:** | Normal |
| **Type of operation.....:** | Normal |
| **Degree of protection.....:** | IPX0 |
| **Accessories and detachable parts included .....:** | Chain, guide bar |
| **Other options included .....:** | N/A |
| **Classification of installation and use.....:** | Hand-held |
| **Supply Connection.....:** | N/A |
| **.....:** | |
| **Possible test case verdicts:** | |
| **- test case does not apply to the test object.....:** | N/A |
| **- test object does meet the requirement.....:** | P (Pass) |
| **- test object does not meet the requirement.....:** | F (Fail) |
| **Testing.....:** | |
| **Date of receipt of test item .....:** | See cover page |
| **Date (s) of performance of tests.....:** | See cover page |

**General remarks:**

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

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

**Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:**

| | |
|---|---|
| The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... : | ☐ **Yes**<br>☒ **Not applicable** |

**When differences exist, they shall be identified in the General product information section.**

| | |
|---|---|
| **Name and address of factory (ies) .....:** | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No. 48 Aodihu Road, Taiping District, Wenling City, Zhejiang Province 317500, P. R. China |

**General product information and other remarks:**

The product is cordless chain saw driven by brushless DC motor. Detachable Li-ion battery pack is used as its power source.

As required by the client, below modifications were made:

- The standards were updated from

  EN 60745-1:2009+A11

  EN 60745-2-13:2009+A1

  to

  EN 62841-1:2015

  EN 62841-4-1:2020
- The brushless controller was changed.
- The critical components of the charging system were changed and was previously evaluated according to Cl. K.12.201, K.18.1a), K.18.201, K.18.202 and K.19.202 of EN 62841-1. Refer to report No. CN21D3HP 001.
- The original GS certificate was cancelled and issue CE-MD certificate.

**General information of the Li-ion battery charging system:**

| Components | Manufacturer | Type | Technical data |
|---|---|---|---|
| Battery pack | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMLB5140 | 58 V, 4000 mAh |
| Alternative | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMLB5150 | 58 V, 5000 mAh |
| Li-ion battery cell (Used for battery pack ZMLB5140) | JIANGSU HIGHSTAR BATTERY MANUFACTURING CO., LTD. | ISR18650-2000 | 3,7 V, 2000 mAh |
| Li-ion battery cell (Used for battery pack ZMLB5150) | Samsung SDI Co., Ltd. | INR18650-25R++(INR19/65) | 3,7 V, 2500 mAh |
| Alternative | EVE Energy Co., Ltd. | INR18650/25P | 3,6 V, 2500 mAh |
| Battery charger | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMLC5120E | Input: 220-240 V~, 50 Hz, 1 A;<br>Output: 58 V d.c., 2 A |
| Alternative | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMLC5150E | Input: 220-240 V~, 50/60 Hz, 2 A;<br>Output: 58 V d.c., 5,5 A MAX. |

**Description of Safety Critical Functions (SCF), if any:**

The requirements of safety critical function were considered, details see attachment 1.

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **5** | **GENERAL CONDITIONS FOR THE TESTS** | | P |
| 5.1 | General test conditions in this clause apply unless otherwise specified in this standard | | P |
| 5.2 | Tests made on separate samples | | P |
| | At manufacturer's discretion, fewer samples used | | 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.<br>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. | | P |
| | 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 | Replaced in Annex K | N/A |
| | Tools marked for a.c./d.c., tested with the most unfavourable supply ..... : | | N/A |
| | Tools for a.c. not marked with rated frequency, or marked 50-60 Hz or 50/60 Hz, tested with either 50 Hz or 60 Hz, whichever is the most unfavourable | | N/A |
| | Tools with series motors only, either frequency may be used | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 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 , 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 | Parts of class I tool having accessible parts not connected to an earthing terminal or earthing contact, and not separated from live parts by an intermediate metal part connected to an earthing terminal/contact, were checked on class II construction requirements. | Not applicable in Annex K | N/A |
| 5.11 | Class I tool or class II tool having parts operating at safety extra-low voltage, such parts on requirements specified for class III tools | Not applicable in Annex K | N/A |
| 5.12 | When testing electronic circuits, supply is free from perturbations from external sources that can influence the results of the tests | | 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. | Not applicable in Annex K | N/A |
| | Additional loads necessary for the correct operation of the tool considered..... : | | N/A |
| | Brake used for loading, load applied gradually | | N/A |
| | Modification of output means for purpose of loading permitted to allow connection to brake | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 5.16 | Tools intended for SELV tested using a supply transformer intended to be used with the tool. | Not applicable in Annex K | N/A |
| 5.17 | For requirements based on the mass of the tool, the mass is determined without supply cord and without tool bits or accessories, but with all equipment and attachments needed for normal use | | P |
| | Required accessories, equipment and attachments as given in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| | If tool has more accessories, equipment or attachments heaviest configuration shall be used to determine mass. | | P |
| 5.18 | For linear and angular dimensions, ISO 2768-1, class “c” applicable, unless tolerances are specified | | P |
| 5.19 | All electrical measurements made with a maximum measurement error of 5 %. | | P |
| | Instruments for measuring voltage have input resistance ≥ 1 MΩ and parallel capacitance ≤ 150 pF. | | P |
| 5.20 | Thermal equilibrium considered achieved when the total deviation of three successive temperature readings, taken at 3 min intervals, is ≤ 4 K | | P |
| | Induction motor, measurement time of 1 hour is considered sufficient. | | N/A |
| | | | |
| **6** | **RADIATION, TOXICITY AND SIMILAR HAZARDS** | | P |
| 6.1 | No harmful radiation, no toxic or similar hazard | | P |
| 6.2 | For tool with laser to indicate a cutting line or the like, laser class 2M or lower according to IEC 60825-1:2007. | | N/A |
| | Tool marked with symbol(s) as in of IEC 60825-1: 2007 for the relevant laser class. | | N/A |
| 6.3 | Tool fitted with non-coherent light sources, users of tools are cautioned as to the risk of potential photo-biological harm, if such harm exist..... : | | N/A |
| 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 |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Marked with either:<br>– “CAUTION Do not stare at operating lamp”, or<br>– 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<br>a) light emission at a distance of 200 mm along any direction of the tool < 500 Lux; or<br>b) luminance light emission < 10 000 cd/m² in the range of visible light; or<br>c) light source (if not focused by external optics) is in Risk Group 1 or lower evaluated by the methods of IEC 62471; or<br>d) tool itself evaluated by the methods of IEC 62471 and found to be in Risk Group 1 or lower. | | N/A |
| 6.3.3 | For light derived by sources other than those mentioned in 6.3.2, product evaluated by the methods of IEC 62471, markings guided by 5.4 of IEC/TR 62471-2:2009. | | N/A |
| | | | |
| **7** | **CLASSIFICATION** | | N/A |
| 7.1 | Tool is Class I, II, or III with respect to protection against electric shock.....: | Not applicable in Annex K | N/A |
| 7.2 | Degree of protection against harmful ingress of water per IEC 60529 .....: | Not applicable in Annex K | N/A |
| | Required degree of protection other than IPX0 specified in relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.....: | | N/A |
| | | | |
| **8** | **MARKINGS AND INSTRUCTIONS** | | P |
| 8.1 | Tool marked with rated voltage(s) or rated voltage range(s) (V)..... : | Not applicable in Annex K | N/A |
| | Tool for star-delta connection clearly marked with the two rated voltages (e.g. 230 Δ / 400 Y V)..... : | | N/A |
| | Tool complying with this standard for a voltage range, may be marked with any single voltage or smaller voltage range within that range (V)..... : | | N/A |
| | Symbol for nature of supply or rated frequency or frequency range.<br>The symbol for nature of supply placed next to rated voltage (Hz) ..... : | | N/A |
| | Rated input or current marked (W or A) ..... : | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Tool has alternative components to be selected by a control device, rated input or rated current is that corresponding to the highest rated input or rated current | | N/A |
| | Class II symbol for class II tools..... : | | N/A |
| | IP number other than IPX0 ..... : | | N/A |
| 8.1.1 | Tools with range of rated values (e.g. voltage, frequency) can be operated without adjustment over the range, marked with the lower and upper limits of the range separated by a hyphen, e.g. 115-230 V. : | | N/A |
| | Different rated values to be adjusted by the user / installer, tool marked with the 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<br>- "WARNING – To reduce the risk of injury, user must read instruction manual", or<br>- sign M002 of ISO 7010, or<br>- appropriate symbol, see relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 | Sign M002 of ISO 7010 used | P |
| | "WARNING" in capital letters not less than 2,4 mm high, not separated from either the cautionary statement or the symbol ISO 7000-0434A or ISO 7000-0434B | | N/A |
| | Statement verbatim except that "operator's manual" or "user guide" may replace "instruction manual". | | P |
| | Additional symbols in accordance with ISO 7010 or designed in accordance with ISO 3864-2/3864-3.. : | | P |
| | 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 ..... : | Replaced in Annex K | N/A |
| | Business name and address of authorized representative, at least country or state, city and postal code ..... : | | N/A |

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

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Wiring diagram indicates how the windings are to be connected for tools for star-delta connection | | N/A |
| 8.8 | Terminals, except for type Z attachments, marked on non-removable part with specified symbols: | Not applicable in Annex K | N/A |
| | - Terminal exclusively for neutral connection marked with “N” | | N/A |
| | - 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 ... : | | P |
| 8.10 | “Off” position of multi stable power switch indicated by figure O (symbol of IEC 60417-5008 [2002-10]) | | N/A |
| | A momentary power switch which can be locked in the “on” position is not considered as a multi -stable switch. | | N/A |
| | Push-buttons for "off" function only, figure O used, button coloured red or black ..... : | | N/A |
| | Figure O not used for any other indication | | P |
| | Transportable tools, power switch actuator or cover not coloured yellow and red as specified for emergency stop according to ISO 13850. | | N/A |
| | Flap/cover covers only the start button, colour of the flap/cover not black, red or yellow ..... : | | N/A |
| | Flap/cover covers only the stop button, colour of the flap/cover red or yellow ..... : | | N/A |
| 8.11 | Control devices adjusted during operation and the like provided with markings as specified, unless… | | N/A |
| | … fully “on” position opposite to “off” position | | N/A |
| | Figures used for different positions with O for “off” position, and figures reflecting greater output for other positions ..... : | | N/A |
| | Indication for different positions placed on the device itself, or adjacent to the operating means | | N/A |
| 8.12 | Markings easily legible | | P |
| | Markings withstood durability test:<br>- 15 s with water soaked cloth<br>- 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 |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Effect of normal use taken into account | | P |
| | Adhesive backing durable, meets requirements of UL 969 or… | | P |
| | … withstands specified tests | See tables 8.12 A - D | 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:<br>- 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.....: | | P |
| | - include the designation of the tool and series or type as required by 8.3, including description of machine such as “drill”, “planer” etc. .....: | | P |
| 8.14.1 | Safety instructions in English are verbatim and in any other official language are equivalent..... : | | P |
| | The general power tool safety warnings may be separate from the instruction manual. | | N/A |
| | Term “tool” or “power tool” not used for garden machinery; use term such as “machine” | | P |
| | Format of all Safety Warnings differentiate the context of all clauses by font or similar means and as illustrated in 8.14.1.1 | | P |
| 8.14.1.1 | General Power Tool Safety Warnings | | P |
| | 1) Work Area Safety | | P |
| | 2) Electrical Safety | | P |
| | 3) Personal Safety | | P |
| | 4) Power Tool Use and Care | | P |
| | 5) Service | | P |
| 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 |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 | | P |
| | C): Any additional warnings deemed necessary by the manufacturer, not inserted within any of the IEC 62841-1, IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings | | P |
| 8.14.1.3 | Instruction manual and safety instructions in one common document, or | | P |
| | Warning as specified included in manual | | N/A |
| 8.14.2 | Additional instructions and information | | P |
| | a) Instructions for putting into use | | P |
| | b) Operating instructions | | P |
| | c) Maintenance and servicing instructions | | P |
| | d) Warnings and instructions for tools with a liquid system | | P |
| 8.14.3 | Information about the mass or weight of the tool, if any, is the mass specified in 5.17. | | P |
| | | | |
| **9** | **PROTECTION AGAINST ACCESS TO LIVE PARTS** | | N/A |
| 9.1 | Tools so constructed and enclosed that there is adequate protection against accidental contact with live parts, even after removal of detachable parts and soft materials | Replaced in Annex K | N/A |
| 9.2 | Accessible part not considered live if it is: | Not applicable in Annex K | N/A |
| | - supplied with SELV | | N/A |
| | - or separated from live parts by protective impedance, d.c. current not exceeding 2 mA | | N/A |
| | - or separated from live parts by protective impedance, a.c. peak value not exceeding 0.7 mA | | N/A |
| | - for peak value 42.4 V up to and including 450 V capacitance not exceeding 0.1 μF | | N/A |
| | - for peak value 450 V up to and including 15 kV discharge not exceeding 45 μF | | N/A |
| 9.3 | Lamps located behind a detachable cover are not removed | Replaced in Annex K | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 | Not applicable in Annex K | N/A |
| | Exception: openings giving access to lamp caps and live parts in socket-outlets | | N/A |
| | Test probe is also applied through openings in earthed metal enclosures having a non-conductive coating such as enamel or lacquer. | | N/A |
| | Not be possible to touch live parts with the test probe | | N/A |
| 9.5 | Class II tools and class II constructions, adequate protection against accidental contact with basic insulation and metal parts separated from live parts by basic insulation only | Replaced in Annex K | N/A |
| | Parts not separated from live parts by double or reinforced insulation are not accessible | | N/A |
| | Probe B of IEC 61032:1997 cannot contact basic insulation through openings in Class II tools or Class II constructions | | N/A |
| | | | |
| **10** | **STARTING** | | N/A |
| 10.1 | Motors start under normal voltage conditions | Not applicable in Annex K | N/A |
| | Starting ten times at 0.85 times rated voltage without load (V) ..... : | | N/A |
| | Starting ten times at 1.1 times rated voltage without load (V) ..... : | | N/A |
| | Tool operated and overload protection devices incorporated in the tool did not activate. | | N/A |
| | Centrifugal and other automatic starting switches operate reliably and without contact chattering | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 10.2 | Input current drawn at (2,0 ±0,2) s after starting does not exceed 30 A… | Not applicable in Annex K | N/A |
| | … or 4 times the rated current of the tool | | N/A |
| | | | |
| **11** | **INPUT AND CURRENT** | | N/A |
| | Marked power input or current is at least 110% of measured no-load input or current ..... : | Not applicable in Annex K | N/A |
| | Tool marked with more than one rated voltage, test made at each rated voltage ..... : | | 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..... : | | N/A |
| | | | |
| **12** | **HEATING** | | N/A |
| 12.1 | No excessive temperatures attained at rated input or rated current ..... : | Replaced in Annex K | N/A |
| | Temperature rise determined according to Clauses 12.2 to 12.5 | | N/A |
| | Test of Clause C.3 at 1,06 times the rated voltage under heated conditions | 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 | Not applicable in Annex K | N/A |
| | Tool with a rated voltage range is operated at<br>- 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<br>- the upper limit of the rated voltage range; conditions as specified in 12.2.1; torque applied is measured and maintained; voltage is then adjusted to 1,06 times the upper limit of the rated voltage range | | N/A |
| | Temperatures are measured at the most unfavourable of the voltage settings used | | N/A |
| | Temperatures measured by means of thermocouples are taken while the tool is operating | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 12.2.1 | Loading conditions during temperature test ..... : | Replaced in EN 62841-4-1 | N/A |
| | Tool without inherent operating cycle is operated with a torque load to draw rated input or rated current until thermal equilibrium is reached | | N/A |
| | Tool with an inherent operating cycle is operated with a torque load to draw rated input or rated current during each operating cycle; tool was cycled consecutively for 30 min | | N/A |
| 12.3.1 | Heating elements, if any, are operated under the conditions specified in Clause 11 of IEC 60335-1:2010; tool was operated at 1,06 times the rated voltage | Not applicable in Annex K | N/A |
| 12.3.2 | Tool provided with automatic cord reel, one third of the total length of the cord was unreeled | Not applicable in Annex K | N/A |
| 12.3.2 | Temperature rise was determined near to the hub of the reel and between the two outermost layers of the cord on the reel | Not applicable in Annex K | N/A |
| | Cord storage devices, other than automatic cord reels, intended to accommodate the supply cord partially while the tool is in operation, 50 cm of the cord is unwound | | N/A |
| | The temperature rise of the stored part of the cord is determined at the most unfavourable place. | | N/A |
| 12.4 | Temperature rises, other than those of windings, determined using thermocouples chosen and positioned to have the minimum effect on the temperature of the part tested | Not applicable in Annex K | N/A |
| | Temperature rise of electrical insulation, other than windings, measured on surface of insulation | | N/A |
| | When possible, temperature rises of windings determined by resistance method | | N/A |
| | For handles, knobs, grips and the like, all parts considered which are gripped in normal use, and, if of insulating material, to those parts in contact with hot metal | | N/A |
| 12.5 | Temperature rises did not exceed values in Tables 1a and 1b, except as allowed by 12.6 | Not applicable in Annex K | N/A |
| | Protective devices did not operate | | N/A |
| | Sealing compounds did not flow | | N/A |
| 12.6 | When winding temperatures exceeded values in Table 1, three additional samples successfully subjected to following tests: | Not applicable in Annex K | N/A |
| | a) Heat treatment for 240 h at the specified cabinet temperature (°C):..... : | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | b) No interturn short circuit after oven treatment | | N/A |
| | c) Humidity treatment in accordance with 14.1 | | N/A |
| | d) Tests of Annex D..... : | See Table D.2 | N/A |
| | | | |
| **13** | **RESISTANCE TO HEAT AND FIRE** | | P |
| 13.1 | Relevant parts sufficiently resistant to distortion due to heat | Replaced in Annex K | N/A |
| | Parts of thermoplastic material:<br>- provided as enclosure to comply with Clause 9,<br>- supporting current carrying parts,<br>- providing supplementary or reinforced insulation,<br>sufficiently resistant to distortion due to heat | | N/A |
| | Relevant parts subjected to ball-pressure test acc. to IEC 60695-10-2 | See Table 13.1 | N/A |
| 13.2 | Part of non-metallic material, except as listed in this clause, resistant to ignition and spread of fire | | P |
| | Parts of non-metallic material other than<br>- material classified at least HB40 per IEC 60695-11-10:2013, provided test sample not thicker than relevant part,<br>- 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,<br>comply with glow-wire test of IEC 60695-2-11:2000 at 550 °C | See Table 13.2 | P |
| | Soft, foamy, and similar materials which cannot be subjected to glow wire test complies with ISO 9772:2012 for category HBF material with test sample not thicker than relevant part | | N/A |
| | | | |
| **14** | **MOISTURE RESISTANCE** | | N/A |
| 14.1 | Tools are proof against likely humid conditions | Not applicable in Annex K | N/A |
| | Tool subjected to humidity treatment test for 48 h | | N/A |
| | Relative humidity (93 ± 2) % ..... : | | N/A |
| | Temperature (20…30 °C) maintained at ± 1K ..... : | | N/A |
| | Samples pre-conditioned to between t and t + 4 °C: | | N/A |
| | No excessive leakage after humidity treatment ..... : | See Table C.2A | N/A |
| | No flashover or breakdown occurred during test of Annex D after humidity treatment ..... : | See Table D.2 | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | No flashover or breakdown occurred during additional test of D.2 between accessible metal parts and supply cord wrapped with metal foil ..... : | See Table D.2 | N/A |
| 14.2 | Degree of protection for tool enclosure according to tool classification (IP Code) .....: | Not applicable in Annex K | N/A |
| 14.2.1 | Tool not connected to the supply and turned continuously through most unfavourable positions | Not applicable in Annex K | 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 | Not applicable in Annex K | 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 | Not applicable in Annex K | N/A |
| | Residual current device is disabled | | N/A |
| | Removable parts, except those fulfilling the test of 21.22., are removed | | N/A |
| | Tool prepared as described in 8.14.2 | | N/A |
| | Liquid container filled, then 15% or 0,25 l added .....: | | N/A |
| | Detachable liquid container mounted and dismounted 10 times | | N/A |
| | No excessive leakage ..... : | See Table C.3B | N/A |
| | No flashover or breakdown occurred during test of D.2 between live parts and accessible parts after drying for 24 h at ambient temperature ..... : | See Table D.2A | N/A |
| 14.4 | No increased risk of electrical shock from liquid systems under pressure during operation | Not applicable in Annex K | N/A |
| | Residual current device is disabled | | N/A |
| | Liquid system is subject to a hydrostatic pressure equal to twice the pressure stated in 8.14.2 d) 1) is applied for 1 h with 1,0 % NaCl solution | | N/A |
| | Tool did not exceed maximum allowable leakage current during pressure application | See Table C.2B | N/A |
| | No flashover or breakdown occurred during test of D.2 between live parts and accessible parts after drying for 24 h at ambient temperature ..... : | See Table D.2 | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 14.5 | Residual current devices complied with IEC 61540:1999 and met requirements a) to c) | Not applicable in Annex K | N/A |
| | a) RCD disconnected only both mains conductors when leakage exceeded 10 mA with a maximum response of 300 ms | | N/A |
| | Test conducted according to 9.9.2 of IEC 61540:1999, and earthing conductor stayed connected | | N/A |
| | b) RCD operated correctly for all 50 cycles | | N/A |
| | c) RCD cannot be removed during use or routine normal maintenance (i.e., residual current device fixed to tool or power supply cord connected to tool) | | N/A |
| | RCD fitted in supply cord provided with Type Y or Z attachment for connection to supply cord and interconnection cord | | N/A |
| | | | |
| **15** | **RESISTANCE TO RUSTING** | | P |
| 15.1 | Ferrous parts adequately protected against rusting | | P |
| | 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..... : | | — |
| | All grease removed from the parts to be tested by immersing them in a degreasing agent for 10 min | | N/A |
| | Parts were immersed for 10 min in a 10 % solution of ammonium chloride in water at (20 ± 5) °C | | N/A |
| | Without drying, all drops shaken off, and parts placed for 10 min in a box containing air saturated with moisture at (20 ± 5) °C | | N/A |
| | After parts dried for 10 min in a heating cabinet at (100 ± 5) °C, no evidence of rust on surfaces | | N/A |
| | Small helical springs and the like and parts exposed to abrasion covered by a layer of grease | | N/A |
| | | | |
| **16** | **OVERLOAD PROTECTION OF TRANSFORMERS AND ASSOCIATED CIRCUITS** | | N/A |
| 16.1 | No excessive temperatures occurred during short circuit in transformer or circuits associated with it for a tool supplied from a transformer ..... : | Not applicable in Annex K | N/A |
| | Insulation on conductors of SELV circuits was within 15 K of Table 1 | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Temperature of transformer windings did not exceed values in Table 3 | | N/A |
| | Transformer complies with IEC 61558-1 | | N/A |
| | Power limited by (short-circuit protective device)... : | | — |
| | | | |
| **17** | **ENDURANCE** | | N/A |
| 17.1 | Construction prevents electrical or mechanical failures that might impair compliance with this standard. | Not applicable in Annex K | N/A |
| | Insulation not damaged | | N/A |
| | Connections did not work loose | | N/A |
| | Overload protection devices did not activate | | N/A |
| | No flashover or breakdown occurred during test of Annex D, test voltages reduced to 75 per cent, after tests of 17.2 and 17.3 | See Table D.2 | N/A |
| 17.2 | No load intermittent operation (2 x 24 h) for hand-held tools | Not applicable in Annex K | N/A |
| | No load intermittent operation (2 x 12 h) for transportable tools | | N/A |
| | Test voltage at each operation (V)..... : | | — |
| | Rate of operation (100s “on”, 20s “off”) ..... : | | — |
| | Three test positions selected for hand-held tools... : | | — |
| | Normal working position(s) for transportable tools. : | | — |
| | Operation time for each position..... : | | — |
| | Servicing of carbon brushes and lubricant ..... : | | N/A |
| | Replacement of parts due to mechanical failure .... : | | N/A |
| | Forced cooling or rest periods if temperature exceeded values in Table 1 ..... : | | N/A |
| | No operation of overload protection devices | | N/A |
| 17.3 | Tools with Centrifugal switches operated for 10,000 cycles | Not applicable in Annex K | N/A |
| | Number of operations under normal load..... : | | N/A |
| | Rate of operations (s “on”, s “off”)..... : | | N/A |
| | Test voltage 0.9 x rated Voltage (V) ..... : | | N/A |
| | | | |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **18** | **ABNORMAL OPERATION** | | P |
| 18.1 | Risk of fire and mechanical damage impairing<br>- safety and<br>- the protection against electric shock<br>as a result of abnormal operation is obviated as far as is practicable. | Replaced in Annex K | N/A |
| 18.1.1 | Tool did not emit flames or molten metal | | N/A |
| | Compliance with Clause 9 maintained | | N/A |
| | No flashover or breakdown occurred during test of Annex D between live parts and accessible parts after tests of clause 18 | See Table D.2 | N/A |
| | Tool still operable and continues to comply with 19.1 but without repeating the tests of Clause 20 | | N/A |
| 18.2 | Fuses, thermal cut-outs, overcurrent protection devices used to provide the necessary protection | Not applicable in Annex K | N/A |
| | Electronic circuits relied upon for protection evaluated for this safety critical function as in clause 18.8. | | N/A |
| 18.3 | Tool with series motor operated without accessories at no load for 1 min at 1,3 times rated voltage, or upper limit of voltage range (V)..... : | Not applicable in Annex K | N/A |
| | 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<br>- for 30 s tests for tool kept switched on by hand or continuously loaded by hand<br>- for 5 min test for other tools ..... : | Not applicable in Annex K | N/A |
| | 30 s tests for tool kept switched on by hand or continuously loaded by hand | | N/A |
| | 5 min test for other tools..... : | | N/A |
| | After the test, or at the instant of operation of fuses, thermal cut-outs, motor protection devices and the like, the temperature of the windings complied with the limits in Table 3 | | N/A |
| | Max winding temperature recorded (°C) ..... : | | — |
| 18.5 | Class I tool with class II construction and class II tool subjected to running overload conditions | Not applicable in Annex K | N/A |
| | Tools with series motor, test of 18.5.1 | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 | Not applicable in Annex K | 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 |
| | 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 |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 . : | Not applicable in Annex K | 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 ..... : | Not applicable in Annex K | 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 | Not applicable in Annex K | N/A |
| | Protective function prevent these faults evaluated as an SCF according to 18.8 with minimum PL = a.... : | | N/A |
| | All fuses, thermal cut-outs, overload protectors and the like that are accessible or can be reset by the user without the aid of a tool and any self-resetting protective devices were shorted | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Leakage current between live parts and accessible parts measured as in Clause C.3 did not exceed 2 mA throughout the test and until stabilization afterwards ..... : | See Table C.3D | N/A |
| | Voltage applied for 15 min, or until the armature open-circuited, or flame appeared ..... : | | N/A |
| | Source voltage of the motor drive circuitry ..... : | | N/A |
| | When flames appeared, extinguished by $CO_2$ extinguisher | | N/A |
| | Any motor windings open-circuited after 15 min, motor cooled to ambient temperature and subjected to test of D.2 at 1500 V between live parts and accessible parts | See Table D.2 | N/A |
| | No motor windings open-circuited after 15 min, motor cooled to ambient temperature and subjected to test of D.2 at 2500 V between live parts and accessible parts | See Table D.2 | N/A |
| 18.6 | No hazards from electric shock, fire or accessible moving parts occurred under fault conditions of 18.6.1 | | P |
| | Tool operated at rated voltage (V) ..... : | Fully charged battery pack | — |
| | No charring or burning of the gauze or tissue paper occurred | | P |
| | Protection against electric shock as in Clause 9 maintained | | P |
| | Protection against accessibility to moving parts as in 19.1 maintained | | P |
| | Evaluation not performed for low power circuits as in Annex H if no SCF can be lost..... : | | N/A |
| | Circuit encapsulated with an insulating material with a minimum thickness of 0,5 mm and no SCF can be lost, circuit evaluated by open-circuiting and short-circuiting within the encapsulated circuit ..... : | | N/A |
| | Fuses, thermal cut-outs, thermal links, temperature limiters, electronic devices or any components or conductors operated, and | | N/A |
| | – test repeated twice, using two more samples; or | | N/A |
| | – tool withstands test of 18.6.1 with the fuse, thermal cut-out or thermal link bridged; or | | N/A |
| | –miniature fuse link complying with IEC 60127 operates and tool withstands test of 18.6.2 | | N/A |
| | Tool withstood the particular test as a conductor of a PCB open-circuited, and | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | – creepage or clearances between live parts and accessible metal parts not reduced below values in 28 due to loosened conductors, and | | N/A |
| | – tool withstood repeated tests with the open-circuited conductor bridged, or | | N/A |
| | – test repeated twice, using two more samples | | N/A |
| 18.6.1 | Fault conditions a) to f) conducted as applicable | See Table 18.6.1 | P |
| 18.6.2 | Tests repeated with fuse-link replaced by an ammeter when during fault conditions of 18.6.1, safety of the tool depended on operation of a miniature fuse-link complying with IEC 60127-3, | | N/A |
| | – Circuit not considered to be adequately protected when current measured was ≤ 2.1 times the rated current of fuse-link, and test conducted with fuse-link short-circuited (A) ..... : | | N/A |
| | – Circuit considered adequately protected when current measured was ≥ 2.75 times the rated current of fuse-link (A) ..... : | | N/A |
| | – Fuse-link short-circuited when current measured was 2.1-2.75 times the rated current of fuse-link, and test conducted as follows (A)..... : | | N/A |
| 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 | | P |
| | No SCF lost after tests of 18.8.2 to 18.8.6 for circuits with no internal clock frequency or oscillator frequency > 15 MHz | | P |
| | No SCF lost after tests of 18.8.2 to 18.8.7 for other electronic circuits | | P |
| | Test voltage was rated voltage or the mean value of the rated voltage range ..... : | Fully charged battery pack | P |
| | Difference between upper and lower limit of rated voltage range > 20 % of its mean value, test at both upper and lower limits of the rated voltage range .. : | | N/A |
| | After evaluation using 18.6.1, no loss of any SCF or tool in a safe state under any present fault condition. | | P |
| | Concept of 18.6.1 not appropriate, reliability evaluated using ISO 13849-1. | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Required performance levels ..... : | See Table 18.8.1A | 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 | See Table 18.8.1B | P |
| | 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. | | P |
| | Class B realized by single channel, periodic self-test either after each activation of the power switch or at least every maximum 5 min | | P |
| | H.11.12.3.4.1 applicable for SCF with a PL ≥ c | | N/A |
| 18.8.2 | Electrostatic discharges as in IEC 61000-4-2:2008 applied to tool, test level 4 used for air discharge and test level 3 for contact discharge, ten / ten discharges having a positive / negative polarity applied | | P |
| 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 | Not applicable in Annex K | 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 | Not applicable in Annex K | N/A |
| | Test level 3 applied for line-to-line coupling mode, a generator with 2 Ω source impedance being | | N/A |
| | Test level 4 applied for line-to-earth coupling mode, a generator with 12 Ω source impedance being | | N/A |
| | Tools has surge arresters incorporating spark gaps, test was repeated at 95 % of the flashover voltage | | N/A |
| 18.8.5 | Injected currents as in IEC 61000-4-6:2008 applied to tool, test level 3 applicable, all frequencies between 0,15 MHz to 230 MHz covered | Not applicable in Annex K | N/A |
| 18.8.6 | Class 3 voltage dips and interruptions in accordance with IEC 61000-4-11:2004 applied to tool | Not applicable in Annex K | N/A |
| | Values of Tables 1 and 2 of IEC 61000-4-11:2004 were applied at zero crossing of the supply voltage | | N/A |
| 18.8.7 | Radiated fields in accordance with IEC 61000-4-3:2010 applied to tool, test level 3 applicable | | P |
| | Frequency ranges 80 MHz to 1 000 MHz tested | | P |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | | | |
| **19** | **MECHANICAL HAZARDS** | | P |
| 19.1 | Adequate protection against injury provided against moving and other dangerous parts | | P |
| | Protective enclosures, covers, and the like have adequate mechanical strength and cannot be removed without the aid of a tool | | P |
| | Adjustable guard used as protection of the working element has easily accessible means of accurate adjustment | | N/A |
| | No dangers from adjusting the guards | | N/A |
| | No contact with dangerous moving parts using probe B of IEC 61032:1997, test force ≤ 5N | | P |
| | Any soft materials removed prior to the test | | P |
| 19.2 | No hazardous ragged or sharp edges, other than necessary for the functioning of the tool | | P |
| 19.3 | No contact with dangerous moving parts through dust collection openings, using probe B of IEC 61032:1997, test force ≤5N | | P |
| 19.4 | Hand-held tool has at least one handle or grasping surface for safe handling during use | | P |
| | Transportable tools provided with at least one handle, grasping surface or the like for safe transportation | | N/A |
| | Lawn and garden machinery has adequate grasping surfaces for safe handling during use | | P |
| 19.5 | Tool allows visual check of the contact of cutting tool with workpiece | | P |
| 19.6 | Marking with rated no-load speed required, measured no-load speed of the spindle did not exceed 110 % of the rated no-load speed | Replaced in Annex K | N/A |
| 19.7 | Transportable tool or lawn and garden machinery intended to be used on a surface such as the floor or a table has adequate stability | Not applicable in IEC 62841-4-1 | N/A |
| | 10° tilting test, tool or machinery did not tip over | | N/A |
| | Tested with doors open and closed | | N/A |
| | Filled with most unfavourable quantity of water or the recommended liquid | | N/A |
| 19.8 | Transportable tool provided with wheels identified in the relevant part of IEC 62841-3 has adequate stability during transportation | Not applicable in IEC 62841-4-1 | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 | Replaced in IEC 62841-4-1 | N/A |
| | Fastening not completely removed and considered as still attached | | N/A |
| | | | |
| **20** | **MECHANICAL STRENGTH** | | P |
| 20.1 | Adequate mechanical strength to withstand rough handling | Replaced in Annex K | N/A |
| | No flashover or breakdown occurred during test of Annex D between live parts and accessible parts after tests of clause 20.2-20.4 | See Table D.2 | N/A |
| | No live parts became accessible | | N/A |
| | No creepage distances or clearances below the values of 28.1 | | N/A |
| | Mechanical safety of the tool as required by this standard not impaired | | N/A |
| | Inner cover withstood test after removal of the decorative cover | | N/A |
| 20.2 | Three blows applied to every weak point of enclosure by spring-operated impact test apparatus in Clause 5 of IEC 60068-2-75:1997 | | P |
| | Brush cap impact energy (Nm) ..... : | | — |
| | Other part impact energy (Nm) ..... : | 1 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..... : | | P |
| 20.3 | Test of 20.3.1, 20.3.2 or the relevant part of IEC 62841-4 applied, as applicable | | P |
| 20.3.1 | Hand-held tool withstood impact of 3 varied drops on a concrete surface from 1 m | Replaced in IEC 62841-4-1 | N/A |
| | Separable accessories were not mounted | | N/A |
| | Any attachments provided as specified in instructions, test repeated with each attachment or combination of attachments mounted to a separate tool sample | | N/A |
| 20.3.2 | Transportable tool withstood impact with Ø (50 ± 2) mm, (0,55 ± 0,03) kg steel sphere, travelling vertically by (1,3 ± 0,1) m. | Replaced in Annex K | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 | Not applicable in Annex K | N/A |
| | Brush cap removed and replace 10 times applying specified tightening torque | | N/A |
| | Tightening torque (Nm) ..... : | | — |
| | No damage to brush holders impairing its further use, thread not damaged, cap shows no cracks | | N/A |
| 20.5 | Handles and grasping surfaces have adequate mechanical strength to provide insulation between grasping area and output shaft | | P |
| | A separate sample subjected to a single impact from 1m onto a concrete surface on each handle and each recommended grasping surface | | P |
| | No flashover or breakdown occurred during test of D.2 at 1250 V a.c. between handles and grasping surfaces in contact with foil and the output shaft of the tool | See Table D.2 | P |
| | | | |
| **21** | **CONSTRUCTION** | | P |
| 21.1 | Hazardous accidental changing of settings to suit different voltages or speeds unlikely to occur | | N/A |
| 21.2 | Accidental changing of settings of control devices unlikely to occur | | N/A |
| 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 | | P |
| 21.5 | Replacement of a flexible cable or cord requiring displacement of a switch was possible without subjecting internal wiring to undue stress | Not applicable in Annex K | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | After repositioning of the switch and before reassembling the tool, verification of correct positioning of internal wiring was possible | | N/A |
| 21.6 | Wood, cotton, silk, paper and similar fibrous or hygroscopic material not used as insulation, unless impregnated or chemically rendered non-fibrous | Not applicable in Annex K | N/A |
| 21.7 | Ordinary driving belts not relied upon to provide required insulation | Not applicable in Annex K | N/A |
| | Special belt design employed to allow use as electrical insulation | | N/A |
| 21.8 | Insulating barriers of Class II tools, and parts of Class II tools serving as supplementary or reinforced insulation are: | Not applicable in Annex K | N/A |
| | - fixed such that they cannot be removed without being seriously damaged; or | | N/A |
| | - so designed that they cannot be replaced in an incorrect position, and when omitted, the tool will be inoperable or manifestly incomplete | | N/A |
| 21.9 | Inner conductors of a flexible cable or cord are used as wiring within class II construction and insulated from accessible metal parts by: | Not applicable in Annex K | N/A |
| | - the sheath of the supply cord itself, this sheath not being exposed to undue thermal stress, clamping against accessible metal or other mechanical stress that could cause damage to it; or | | N/A |
| | - a sleeve, tubing or barrier complying with the requirements of supplementary insulation. | | N/A |
| 21.10 | Air-intake of motor enclosures not excessively large | Not applicable in Annex K | N/A |
| | 6 mm steel ball test applied to air-intake openings other than those adjacent to fan | | N/A |
| 21.11 | No hazards from parts of Class I tool such as wire, screw, nut, washer or spring becoming loose or falling out of position, and accessible metal not made live | Not applicable in Annex K | N/A |
| | Clearance and creepage distances of Class II tool or class II construction not reduced to less than 50% of values shown specified in 28.1 | | N/A |
| | Class II tool or Class II construction, other than those of the all-insulated type, provided with an insulating barrier between accessible metal and motor parts and other live parts | | N/A |
| | Class I tool with adequately fixed parts, barriers, and sufficiently large creepage and clearances | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | All wires secured in place independent of terminal connection or solder | | N/A |
| 21.12 | Supplementary and reinforced insulation not impaired by deposition of dirt, or dust resulting from wear of parts within the tool to the extent that creepage and clearances would be reduced | Not applicable in Annex K | N/A |
| | Ceramic material not tightly sintered and similar materials, and beads alone, not used as supplementary or reinforced insulation | | N/A |
| | Parts of Elastomer, natural or synthetic rubber used as supplementary insulation are resistant to aging | | N/A |
| | Rubber parts so arranged and dimensioned that creepage distances not reduced below values in 28.1, even when cracks occurred | | N/A |
| | Insulated material for embedded heating conductors serves only as basic insulation | | N/A |
| | Ageing test for Elastomer and rubber parts for 70 h at 100±2°C | | N/A |
| | No flashover or breakdown occurred during test of D.2, test voltages reduced to 75 per cent..... : | 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 | Not applicable in Annex K | N/A |
| | Adequate insulation properties of oil, grease, and similar substances used for lubrication of gears and the like with no effect on insulation | | N/A |
| 21.14 | No access to brushes without aid of a tool | Not applicable in Annex K | N/A |
| | When tightening screw-type brush-caps, two surfaces clamped together | | N/A |
| | Locking device retaining brushes in position do not depend upon brush spring tension | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Screw-type brush-caps accessible from the outside of the tool made of or covered with insulating material of adequate strength, and not projecting beyond surrounding surface of the tool | | N/A |
| 21.15 | Tool employing a liquid system protects the user against increased risk of shock due to presence of liquid under normal use and faults of liquid system | Not applicable in Annex K | N/A |
| | Tools employing liquid system constructed as Class III tools, or | | N/A |
| | - class I or II and provided with a residual current device, and complying with 14.3-14.5, or | | N/A |
| | - class I or class II and designed for use in combination with an isolating transformer and complying with 14.3 and 14.4 | | N/A |
| 21.16 | Tool with compartment accessible without the aid of a tool and likely to be cleaned in normal use, the electrical connections are not subject to pulling during cleaning | | P |
| 21.17 | Tool is fitted with a power switch to control the motor | | P |
| | Switch actuator easily visible and accessible | | P |
| 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 | | P |
| 21.17.1.1 | Relevant tool housing is kept for 1 h in a heating cabinet at 80 °C ..... : | | P |
| 21.17.1.2 | Additional test of 21.17.1.2 for lock-off devices that are self-restoring to the lock-off position | | P |
| | Number of cycles as per 23.1.10.2 ..... : | 6000 | P |
| 21.17.1.3 | Push force of Table 7 applied to most unfavourable point of the switch actuating member ..... : | 150 N | P |
| | The switch did not actuate | | P |
| | The switch and its lock-off system operated as designed after the applied force was terminated | | P |
| 21.18 | Requirements of 21.18.1, 21.18.2 or the relevant part of IEC 62841-4 observed, as applicable | Replaced in IEC 62841-4-1 | 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 | Replaced in IEC 62841-4-1 | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 | Replaced in IEC 62841-4-1 | N/A |
| | More than one switch, the lock-on switch(es), if any, is (are) within the grasping zone necessary to control the tool | | N/A |
| | Any one of these switches automatically unlocks or makes ineffective all remaining lock-on devices with a single actuation motion without releasing the grasp on the tool | | N/A |
| | Switch cannot be locked in “on” position when a risk with continued operation is defined by the relevant part of IEC 62841-2 | | N/A |
| 21.18.1.2 | Power switch triggers and lock-off devices so located, designed or guarded that inadvertent operation is unlikely to occur | Replaced in IEC 62841-4-1 | 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 | Replaced in IEC 62841-4-1 | N/A |
| 21.18.2.1 | Power switch in transportable tools is of momentary type, or | Replaced in IEC 62841-4-1 | 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 | Replaced in IEC 62841-4-1 | N/A |
| | Flap cover covers the stop button so that pushing the flap actuates the stop | | N/A |
| 21.18.2.3 | Power switch so located, designed or guarded that unintentional movement to the “on” position is unlikely | Replaced in IEC 62841-4-1 | 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 | Replaced in IEC 62841-4-1 | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 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 | Not applicable in Annex K | N/A |
| | Max. voltage measured between pins of the plug is ≤ 34 V after 1 s after each disconnection (V) ..... : | | N/A |
| | Capacitors rated ≤ 0.1 μF | | N/A |
| | Capacitors complying with the requirements for protective impedance specified in 9.2 and 21.34 | | N/A |
| 21.22 | Non-detachable protective parts either removable with the aid of a tool or reliably fixed | | P |
| | Snap-in devices have an obvious locked position and have fixing properties that do not deteriorate | | N/A |
| | Parts disassembled and assembled 10 times prior to test | | P |
| | Parts affected by temperature tested immediately after conditions of Clause 12 | | N/A |
| | Test applied to all parts likely to be detached, whether or not fixed by screws, rivets, or similar parts | | P |
| | Weak areas of the covers or parts subjected during 10 s to<br>- 50 N push force | | P |
| | - 50 N pull force if the shape of the part prevents easy slippage of fingertips | | P |
| | - 30 N pull force if projection of the gripped part is less than 10 mm in the direction of removal | | P |
| | Test fingernail of Fig. 1 inserted in apertures and joints with a force of 10 N and then slid sideways with a force of 10 N | | P |
| | Axial pull unlikely, test fingernail of Fig. 1 inserted in apertures and joints with a force of 10 N to enable a force of 30 N for 10 s by means of a loop | | P |
| | A torque of 2 Nm applied at the same time as pull or push force on parts 50 mm or smaller and likely to be subjected to twisting | | P |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | A torque of 4 Nm applied at the same time as pull or push force on parts larger than 50 mm and likely to be subjected to twisting | | P |
| | Projection was less than 10 mm and required a torque of (Nm), test torque reduced ..... : | | P |
| | Parts not detached, and remained in locked position | | P |
| 21.23 | Handles, knobs, grips, levers etc., withstood axial force of 30 N for 1 minute | | P |
| 21.24 | Storage hooks and similar devices for flexible cords are smooth and well rounded | | N/A |
| 21.25 | Current-carrying parts and other parts resistant to corrosion under normal use | Not applicable in Annex K | N/A |
| | After tests of Clause 15, no sign of corrosion on relevant parts | | N/A |
| | Stainless steel and similar corrosion-resistant alloys and plated steel considered satisfactory | | N/A |
| 21.26 | Insulation between parts operating at SELV and other live parts complies with the requirements for double insulation or reinforced insulation | Not applicable in Annex K | N/A |
| 21.27 | Insulation between parts separated by protective impedance comply with requirements for double or reinforced insulation | Not applicable in Annex K | N/A |
| 21.28 | Shafts of operating knobs, handles, levers etc. not live unless their removal does not make the shaft accessible to test probe B of IEC 61032:1997 | Not applicable in Annex K | N/A |
| 21.29 | Handles, levers, and knobs of non-class III tool held or actuated in normal use do not become live during an insulation fault | Not applicable in Annex K | N/A |
| | Metallic handles, levers, and knobs with shaft or fixings likely to become live due to basic insulation fault, either adequately covered by insulating material or their accessible parts separated from their shafts or fixings by insulation | | N/A |
| | Exception for handles, levers, and knobs of transportable tools and lawn and garden machinery of class I..... : | | N/A |
| | Covering or insulating material complies with Electric Strength test in D.2 at 1250 V | See Table D.2 | N/A |
| 21.30 | Tool likely to cut into concealed wiring or own cord, handles and grasping surfaces<br>- made of insulating material, or | | P |
| | - metal covered by insulating material, or | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - their accessible parts are separated by insulating barrier(s) from accessible metal parts that may become live by the output shaft | | N/A |
| | Insulated, stick type, auxiliary handle is provided with a flange ≥ 12 mm high above grasping surface between grasping area and accessible parts that may become live by the output shaft | | N/A |
| | 21.30 not applicable as per relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4..... : | | N/A |
| 21.31 | Capacitors in class II tools not connected to accessible metal parts, and their metallic casings are separated from accessible metal parts by supplementary insulation | Not applicable in Annex K | N/A |
| | Capacitors tied to accessible metal parts comply with Clauses 9.2 and 21.34 | | N/A |
| 21.32 | Capacitors not connected between contacts of the thermal cut-outs | Not applicable in Annex K | N/A |
| 21.33 | Lamp holders used only for connection of lamps | Not applicable in Annex K | N/A |
| 21.34 | Protective impedance consists of at least two separate components with impedance unlikely to change significantly during lifetime of tool | Not applicable in Annex K | N/A |
| | When a component short or open-circuited, values in Clause 9.2 were not exceeded ..... : | | N/A |
| | Resistors comply with 14.1 of IEC 60065:2011 and capacitors comply with 14.2 of IEC 60065:2011.... : | | N/A |
| | Single Y1 capacitor acc. to IEC 60384-14 used instead of two separate components..... : | | N/A |
| 21.35 | Tools is identified in the relevant part of IEC 62841-2 or IEC 62841-3 to produce a considerable amount of dust and has either integral dust collection/suction device or dust outlet(s) | | N/A |
| | Dust discharge directed away from the operator | | N/A |
| | Dust outlet with external suction device(s) does not impede the normal use of the tool | | N/A |
| | | | |
| **22** | **INTERNAL WIRING** | | **P** |
| 22.1 | Wireways smooth and free from sharp edges, cooling fins, etc | | P |
| | Holes in metal through which insulated wires pass provided with bushings or, except as required by relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4, have smooth edges with radius ≥1,5 mm | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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) | | N/A |
| 22.3 | Use of green or green/yellow conductors for earthing terminals only | Not applicable in Annex K | N/A |
| 22.4 | Aluminium wires not used for internal wiring | | N/A |
| 22.5 | Stranded conductors with lead-tin soldering are only used with spring terminals with constant contact pressure, except when clamping means pose no risk of bad contact | | P |
| 22.6 | No undue stress to electrical connections and internal conductors from tool parts movable to each other in normal use, during adjustment or user maintenance | | N/A |
| | Flexible metallic tubes do not damage insulation of the conductors contained within them | | N/A |
| | Open-coil springs not used to protect the wiring | | N/A |
| | Adequate additional insulating lining when coiled spring is used | | N/A |
| | Flexing test at a rate of ≤ 6/min, through the largest angle allowed by the construction | | N/A |
| | Number of flexings 10 000 for conductors/ connections flexed during normal use; 2 000 for those flexed during adjustments; 100, for those flexed during user maintenance..... : | | — |
| | Tool withstands test of Annex D between live parts and accessible parts | See Table D.2 | N/A |
| | Live parts not accessible after test | | N/A |
| | | | |
| **23** | **COMPONENTS** | | P |
| 23.1 | Components comply with relevant IEC standards | See 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 ..... : | | P |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 ..... : | | P |
| 23.1.1 | Capacitors in auxiliary windings of motors marked with their rated voltage and rated capacitance..... : | | N/A |
| 23.1.2 | Fixed capacitors for radio interference suppression comply with IEC 60384-14 | Not applicable in Annex K | N/A |
| 23.1.3 | Small lamp holders similar to E10 lamp holders meet requirements for E10 lamp holders in IEC 60238 | | N/A |
| 23.1.4 | Isolating and safety isolating transformers comply with IEC 61558-1 and IEC 61558-2-4 or IEC 61558-2-6, as applicable | | N/A |
| | Switch mode power supply units and transformers for such units comply with IEC 61558-2-16 | | N/A |
| 23.1.5 | Appliance couplers comply with IEC 60320, or | | N/A |
| | Instructions provided to inform user to connect the tool with non-IEC appliance couplers | | N/A |
| 23.1.6 | Automatic temperature controls with electromechanical contacts that cycle in normal use have suitable endurance | | N/A |
| | Tests to IEC 60730-1:2010, Cl. 17, conducted under conditions occurring in the tool | | N/A |
| | Type of controls used and number of cycles per Cl. 17 of IEC 60730-1:2010 (cycles) ..... : | | N/A |
| | 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 | | P |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 23.1.8 | Components not separately tested and found to comply with the component standards as references in 23.1 or components not marked or not used in accordance with their marking, tested in accordance with the referenced relevant standard under the conditions occurring in the tool | | P |
| | No IEC standard referenced in 23.1, no additional tests | | P |
| 23.1.9 | Tool operated at 1,1 times rated voltage at no-load, capacitor voltage did not exceed 1.1 times its rated voltage (V) ..... : | Not applicable in Annex K | N/A |
| 23.1.10 | Switches constructed to prevent failure that might impair compliance with this standard | Replaced in Annex K | N/A |
| | Switches, separately tested and found to comply with IEC 61058-1:2008, comply with 23.1.10.1 | | N/A |
| | Switches, not separately tested and found to comply with IEC 61058-1:2008, or not complying with 23.1.10.1, tested as in 23.1.10.2 to 23.1.10.3 | | N/A |
| 23.1.10.1 | Power switches rated for a voltage and current not less than respective ratings of the tool | Not applicable in Annex K | N/A |
| | Power switches rated for a.c. in a.c. tools and d.c. in d.c. tools | | N/A |
| | Electronic power switches are at least classified for Continuous Duty as in IEC 61058-1:2008 | | N/A |
| | Switches for motor-operated tools and lawn and garden machinery classified for resistive and motor load as in 7.1.2.2 of IEC 61058-1:2008, if this load occurs in normal use | | N/A |
| | 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 |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Power switches with series electronics also endure 1000 operating cycles, electronics bypassed.....: | | N/A |
| | Switches other than power switches, if likely to be switched under electrical load, endure 1 000 operating cycles, unless the requirements of this standard are met with the switch short-circuited | | N/A |
| | Exception for switches other than power switches that cannot be operated under electrical load | | N/A |
| | Exception for motor reversing switches | | N/A |
| | Exception for switches other than power switches, classified for 20 mA load as in 7.1.2.6 of IEC 61058-1:2008 | | N/A |
| 23.1.10.2 | Adequate endurance properties of switches | Not applicable in Annex K | N/A |
| | Test of 17.2.4.4 of IEC 61058-1:2008 conducted at load specified in 23.1.10.2.1 or 23.1.10.2.2 .....: | | N/A |
| | Power switches for hand-held tools tested for 50K cycles. | | N/A |
| | Power switches for transportable tools and lawn and garden machinery tested for 10K cycles | | N/A |
| | Power switch contains mechanical contacts in series with electronic circuitry with one or more SSD and circuitry provides a protective function by reducing the current during switch operation, then test repeated on 3 samples for ≥ 1000 cycles with the electronics bypassed; or | | N/A |
| | Protective function considered SCF and complies with the greater PL levels for power switches in 18.8 | | N/A |
| | 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 | Not applicable in Annex K | 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 |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 | Not applicable in Annex K | N/A |
| 23.1.10.3 | Power switches of motor-operated tools and lawn and garden machinery have adequate breaking capacity | Not applicable in Annex K | N/A |
| | Locked-rotor test (TC9) of 17.2.4.9 of IEC 61058-1: 2008 at 6 times I-M or with locked motor, each period ≤ 0,5 s “on” and ≥ 10 s “off” | | N/A |
| | Power switch showed no electrical or mechanical failure after test | | N/A |
| 23.1.11 | Electronic power switches comply with 18.6 and 18.8 | | N/A |
| 23.2 | Tool not fitted with switches or automatic controls in flexible cords, except for protective devices such as RCDs | | N/A |
| | Tool not fitted with devices causing the protection device in the fixed wiring to operate | | N/A |
| | Tool not fitted with thermal cut-outs which can be reset by a soldering operation | | N/A |
| 23.3 | Protection devices or circuits that switch off the tool are non-self-resetting where a risk associated with inadvertent starting is specified | | P |
| 23.4 | Plugs and socket-outlets for ELV circuits and those used as terminal devices for heating elements not interchangeable with mains plugs and socket-outlets in IEC 60884, IEC/TR 60083 or IEC 60906-1 or with connectors and appliance inlets complying with IEC 60320-1 | | N/A |
| 23.5 | Motors connected to the supply mains with insulation inadequate for the rated voltage comply with Annex B | | N/A |
| | | | |
| **24** | **SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CORDS** | | **N/A** |
| 24.1 | Tool provided with a supply cord ≥1,8 m and with a plug; cord length (m) ..... : | Not applicable in Annex K | N/A |
| | Tool provided with a supply cord at least 1,8 m long and without a plug; cord length (m) ..... : | | N/A |
| | Information for connection given in the instructions | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Tool provided with appliance inlet having at least same degree of protection against moisture as required for the tool | | N/A |
| | Tool provided with a supply cord ≥ 0,2 m and ≤ 0,5 m and with a plug or other connector having at least same degree of protection against moisture as required for the tool; cord length (m) ..... : | | N/A |
| | Plugs, connectors and inlets suitable for the ratings of the tool | | N/A |
| 24.2 | Supply cord assembled to the tool by attachment type (specify X, Y, or Z)..... : | Not applicable in Annex K | N/A |
| | Supply cord with type Z attachment is allowed as per relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 ..... : | | N/A |
| | Supply cords with type X attachment are specially prepared cords only available from the manufacturer or its service agent ..... : | | N/A |
| | Special cord includes part of the tool | | N/A |
| 24.3 | Plugs fitted with only one flexible cord | Not applicable in Annex K | N/A |
| 24.4 | Supply cord not lighter than ordinary tough rubber sheathed flexible cord or ordinary PVC sheathed flexible cord | Not applicable in Annex K | N/A |
| | PVC cords not used if external metal parts exceed 75 K temperature rise during test of Clause 12 | | N/A |
| 24.5 | Nominal cross-section area of supply cord per Table 8 (mm2) ..... : | Not applicable in Annex K | N/A |
| 24.6 | Supply cord of class I tool has green or green/yellow core connected to internal earthing terminal of the tool, and to earthing contact of plug | Not applicable in Annex K | N/A |
| 24.7 | Lead-tin solder not used to consolidate leads under contact pressure, except when clamping means used prevents risk of a bad contact | Not applicable in Annex K | N/A |
| | Clamping screws alone not used for securing soldered leads | | N/A |
| 24.8 | Moulding supply cord to any part has no effect on the insulation of the cord | Not applicable in Annex K | N/A |
| 24.9 | Supply cord protected against damage at its entry by flexible cord guard, or cord inlet, or bushing ..... : | Not applicable in Annex K | N/A |
| 24.10 | Cord inlets and bushings shaped to prevent damage to supply cord | Not applicable in Annex K | N/A |
| | Cord inlet and bushings reliably fixed and not removable without the aid of a tool | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 24.11 | In tools other than transportable tools, supply cord being flexed during operation is protected against excessive flexing at its entry ..... : | Not applicable in Annex K | N/A |
| | Flexing test performed in apparatus shown in Fig. 2 | | N/A |
| | Weight attached to cable or cord (kg)..... : | | N/A |
| | Oscillating member moved back and forth through an angle of 90° (45° on either side of the vertical) with rate of 60 flexings per minute | | N/A |
| | After 10,000 flexings, sample turned through 90° about the centre of the cord entry | | N/A |
| | Cord guard did not slip out from its location after completion of ten 1 sec lifts over 500 mm | | N/A |
| | After the test, no conductor disconnected from terminal | | N/A |
| | Number of strands versus number of broken strands of each conductor ≤ 10% ..... : | | N/A |
| 24.12 | In tools other than transportable tools, supply cord being flexed during operation is protected against excessive bending at its entry..... : | Not applicable in Annex K | N/A |
| | Cord guard fixed reliably and projects outside tool for a distance beyond inlet opening of at least 5 times the overall diameter of cord | | N/A |
| | Mass attached to the free end of cord (g) ..... : | | N/A |
| | 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. | Not applicable in Annex K | N/A |
| | Pushing cord into the tool not possible | | N/A |
| | Pull force was applied 25 times at the force shown in Table 9 (N)..... : | | N/A |
| | After pull test, cord, unless on an automatic cord reel, subjected to torque in Table 9 for 1 min (Nm) : | | N/A |
| | The cord was not damaged during the tests | | N/A |
| | No appreciable strain at the terminals | | N/A |
| | Cord longitudinal displacement (mm)..... : | | N/A |
| | No appreciable strain at the connection | | N/A |
| 24.14 | Cord anchorage either accessible only with the aid of a tool, or the cord can only be fitted using a tool | Not applicable in Annex K | N/A |
| 24.15 | Cord anchorages properly designed and located | Not applicable in Annex K | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Cord cannot touch clamping screws of the cord anchorage that not separated from accessible metal parts by supplementary insulation | | N/A |
| | Cord not clamped by metal screw bearing directly on the cord | | N/A |
| | Glands are not used as cord anchorages | | N/A |
| | Class I tool, cord anchorage of insulating material or with insulating lining fulfilling basic insulation, if an insulation fault on the cord could make accessible metal parts live | | N/A |
| | Class I tool, sheath of the cord considered adequate | | N/A |
| | Class II tool, cord anchorage of insulating material or insulated by supplementary insulation (sheath of the cord alone not sufficient) | | N/A |
| 24.16 | Cord anchorages for type X attachment properly designed and located | Not applicable in Annex K | N/A |
| | Cord anchorage allows easy replacement of cord | | N/A |
| | Clear method of relief from strain and prevention of twisting | | N/A |
| | Screws operated during cord replacement are not used to fix any other part | | N/A |
| | Screws operated during cord replacement are used to fix other parts and, if omitted or incorrectly mounted, make the tool inoperative or clearly incomplete | | N/A |
| | Parts fastened to the cord anchorage by the same screw could not be removed without the aid of a tool | | N/A |
| | Conductors inserted into terminals, terminal screws tightened sufficiently to prevent conductors from easily changing their position, torque set at (Nm) .. : | | N/A |
| 24.17 | Knots and tying strings for type X attachment are not used | Not applicable in Annex K | N/A |
| 24.18 | For type X attachment, space for supply cord provided inside or as a part of tool | Not applicable in Annex K | N/A |
| | - permits verification of correct connection and positioning of conductors | | N/A |
| | - permits covers to be fitted without risk of damage to supply conductors or their insulation | | N/A |
| | - ensures that uninsulated end of conductor, when detached from a terminal, cannot come into contact with accessible metal parts, or terminations are unlikely to slip free of the conductor | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| 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 | Not applicable in Annex K | N/A |
| | Easy insertion of connector | | N/A |
| | After insertion of connector, tool not supported by the connector in any position of normal use on a flat horizontal surface | | N/A |
| | Test probe B of IEC 61032:1997 applied to tool inlet other than appliance inlet per IEC 60320 | | N/A |
| | Appliance inlet complies with IEC 60320 | | N/A |
| 24.20 | Interconnection cords meet the requirements for the supply cord, exceptions as follows | Not applicable in Annex K | N/A |
| | Cross-sectional area is based on maximum current through conductor during test of Clause 12 | | N/A |
| | Insulation adequate for conductor's working voltage | | N/A |
| | Test of 24.11 restricted to range of motion during normal use. | | N/A |
| 24.21 | Interconnection cords not detachable without tool if compliance with this standard is impaired when they are disconnected | | N/A |
| | | | |
| **25** | **TERMINALS FOR EXTERNAL CONDUCTORS** | | N/A |
| 25.1 | Tool provided with terminals or equally effective devices for connection to external conductors | Not applicable in Annex K | N/A |
| | Terminals only accessible with the aid of a tool | | N/A |
| | Screws and nuts allowed to also clamp internal conductors when they are unlikely to be displaced when fitting supply conductors | | N/A |
| | Screws and nuts do not fix other components | | N/A |
| | For tool with type X attachment, soldered connections allowed for connection of external conductors, when soldering alone is not used to maintain conductor in position | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| 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 | Not applicable in Annex K | N/A |
| | Supply cord terminals withstood pull force of 5 N | | N/A |
| 25.3 | For type X attachment, when clamping means tightened or loosened, terminal did work loose, no stress on internal wiring, and creepage and clearances not reduced below values in 28.1 | Not applicable in Annex K | N/A |
| | Test per Clause 9.6, using 2/3 torque of that in Table 4, of IEC 60999-1:1999 (Nm) ..... : | | N/A |
| | Terminals secured by two screws to prevent loosening, or by one screw in a recess, or by other suitable means | | N/A |
| | Correct position of supply terminals maintained by switches and similar devices with recesses and verified after connection of supply cord and repositioning of device | | N/A |
| | Sealing compound without other means of locking not used | | N/A |
| | Self-hardening resins used only on terminals that are not subject to torsion in normal use | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 25.4 | Type X attachment using terminals to clamp the conductor between metal surfaces do so without damage to conductor after torque test per Cl. 25.3 | Not applicable in Annex K | N/A |
| 25.5 | End of conductor inserted in the hole of pillar type terminals is visible, or can pass beyond threaded hole for a distance of half nominal diameter of screw, or 2,5 mm, the greater of the two (mm) ..... : | Not applicable in Annex K | N/A |
| 25.6 | For type X attachment, terminals clearly recognizable and accessible after opening the tool | Not applicable in Annex K | N/A |
| | All terminals located behind one cover, or one part of the enclosure | | N/A |
| 25.7 | For tool with type X attachment, terminal devices located or shielded to prevent a strand of wire from escaping | Not applicable in Annex K | N/A |
| | No risk of accidental connection between live parts and accessible metal parts | | N/A |
| | For class II tool, no risk of accidental connection between live parts and metal parts with supplementary insulation only | | N/A |
| | 8 mm long free wire of the stranded supply conductor did not touch any accessible metal part | | N/A |
| | 8 mm long free wire of the stranded supply conductor did not touch any metal parts with supplementary insulation only | | N/A |
| | 8 mm long free wire of stranded conductor connected to an earthing terminal did not touch any live part | | N/A |
| | | | |
| **26** | **PROVISION FOR EARTHING** | | N/A |
| 26.1 | Accessible metal parts of class I tool permanently connected to an earthing terminal or termination within the tool | Not applicable in Annex K | N/A |
| | Accessible metal parts of class I tool permanently connected to the earthing contact of the tool inlet | | N/A |
| | Printed circuit boards are not used to provide continuity of protective earthing circuit | | N/A |
| | No electrical connection between earthing terminals or contacts and neutral terminal | | N/A |
| | No provision for earthing in Class II and III tools | | N/A |
| | Rotating motor components with metal-to-metal bearing surfaces considered electrically bonded | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Metal parts behind a decorative cover that do not withstand test of Clause 20 considered accessible metal parts | | N/A |
| 26.2 | Clamping means of earthing terminals adequately locked against accidental loosening | Not applicable in Annex K | N/A |
| | Earthing connections not possible to loosen without the aid of a tool | | N/A |
| | Terminals with screw clamping comply with the relevant requirements of Clause 25, and screwless terminals comply with IEC 60998-2-2 | | N/A |
| | For specially prepared cords, terminals comply with IEC 61210 and table 10 | | N/A |
| | Screwless terminals tested per IEC 60998-2-2 | | N/A |
| 26.3 | Earth connection of detachable parts was made before the current-carrying connections established when placing the part in position, and the current carrying connections separated before earth connection was broken when removing the part | Not applicable in Annex K | N/A |
| | If cord slips out of cord anchorage, current-carrying conductors become taut before earthing conductor | | N/A |
| 26.4 | No risk of corrosion between metal parts of earthing terminals and copper of earthing conductor | Not applicable in Annex K | N/A |
| | Parts transmitting current in case of an insulation fault, other than parts of metal frame or enclosure, are coated or uncoated metal with adequate resistance to corrosion | | N/A |
| | Thickness of electroplated coating (μm)..... : | | N/A |
| | Parts of coated or uncoated metal providing or transmitting contact pressure only, adequately protected against rusting | | N/A |
| | 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 |
| 26.5 | Resistance of earthing circuit (max. 0.1 Ω) ..... : | Not applicable in Annex K | N/A |
| | Test current (A)..... : | | — |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Voltage drop between the earthing terminal and accessible metal part (V)..... : | | — |
| | | | |
| **27** | **SCREWS AND CONNECTIONS** | | P |
| 27.1 | Fixings and electrical connections (earthing connections included) withstand mechanical stresses occurring in normal use | | P |
| | Screws not made of soft metal such as zinc or aluminium | | P |
| | Diameter of screws of insulating material not used for electrical or earthing connection, diameter (mm). ..... : | | N/A |
| | Screws transmitting electrical contact pressure screw into metal | | N/A |
| | Screws of insulating material not used if their replacement by a metal screw could impair supplementary or reinforced insulation | | N/A |
| | Screws removed when replacing the supply cord with type X attachment, or during maintenance, are not of insulating material where their replacement by a metal screw could impair basic insulation | | N/A |
| | Screws and nuts tightened and loosened 10 times for screw engaged with a thread of insulating material | | P |
| | Nuts and other screws tightened and loosened five times | | N/A |
| | Screws engaging with a thread of insulating material completely removed and reinserted each time | | 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) ... : | | P |
| | Column II for screws of insulating material, having a hexagonal head with a width across flats exceeding overall thread diameter (Nm) ..... : | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| 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 | | P |
| 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 |
| | | | |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **28** | **CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION** | | N/A |
| 28.1 | Creepage and clearances not less than the values in Table 12, except for cross-over points of motor windings..... : | Replaced in Annex K | 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 |

| IEC 62841-1 | | | |
|---|---|---|---|
| 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 | Not applicable in Annex K | 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 |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Requirement waived as inaccessible reinforced or supplementary insulation, after conditioning for 168h at 50 K above max. temperature rise determined per Cl. 12, withstood test of Annex D at the oven temperature and room temperature (°C) ..... : | See Table D.2 | N/A |
| | For optocouplers, 168 h of conditioning at 50 K above the max. temperature rise measured on optocouplers during tests of Clauses 12 and 18, while operating under most difficult conditions | | N/A |
| **ANNEX B** | **MOTORS NOT ISOLATED FROM THE SUPPLY MAINS AND HAVING BASIC INSULATION NOT DESIGNED FOR THE RATED VOLTAGE OF THE TOOL** | | N/A |
| B.1.1 | Motors with working voltage ≤ 42 V | | N/A |
| B.9.2 | Metal parts of motor considered bare live parts | | N/A |
| B.12.4 | Temperature rise of body of motor determined instead of the temperature rise of the windings | | N/A |
| B.12.5 | Temperature rise of the body of the motor in contact with insulating materials did not exceed values in Table 1 for the relevant insulting material | See Table 12.1 | N/A |
| B.18. 201 | Tool operated at rated voltage with the terminals of motor and its capacitors short circuited | | N/A |
| | Tool operated at rated voltage with the supply to the motor open circuited | | N/A |
| | Tool operated at rated voltage with shunt resistor open circuited during operation of motor | | N/A |
| B.21.101 | For class I tools with a motor supplied by a rectifier circuit, dc circuit insulated from accessible parts of the tool by double or reinforced insulation | | N/A |
| **ANNEX C** | **LEAKAGE CURRENT** | | N/A |
| C.2 | Leakage current measurement of non-operating tool | See Tables C.2A and C.2B | N/A |
| C.3 | Leakage current measurement of operating tool | See Tables C.3A to C.3D | N/A |
| **ANNEX D** | **ELECTRIC STRENGTH** | | P |
| D.1 | Any protective impedance were disconnected | | P |
| | The tools were not connected to the supply | | P |
| | Electric strength is checked by the tests of D.2 | | P |
| | For tools with heating elements, test voltages of IEC 60335-1:2010 apply to the heating elements only | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| 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 | | P |
| D.2 | Test duration 1 min | | P |
| | Voltage of substantially sinusoidal waveform, frequency 50 Hz or 60 Hz | | P |
| | Electric strength test, voltages applied.....: | See Table D.2 | P |
| | To distinguish between capacitor reactance current and unacceptable performance, d.c. potential 1,414 times the that for a.c. was used.....: | | P |
| | No flashover or breakdown occurred during the test | See Table D.2 | P |
| **ANNEX H** | **LOW-POWER CIRCUITS** | | N/A |
| | Any points closest to the supply at which the maximum power delivered to the variable resistor does not exceed 15 W at the end of 5 s identified as called a low power points .....: | | N/A |
| **ANNEX K** | **BATTERY TOOLS AND BATTERY PACKS** | | P |
| K.1 | Rated voltage for tools and battery packs ≤75 V d.c. | | P |
| K.5.7 | Tests to be done at rated voltage were done with a fully charged battery | | P |
| K.5.201 | Peak voltage of any superimposed ripple exceeding 10 % of the average value was included | | 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 | | P |
| K.5.204 | Discharging and charging as specified | | P |
| K.5.205 | Thermocouples for lithium-ion cell temperature measurement located as specified | | P |
| K.5.206 | Currents measured during battery charging are average currents | | P |
| K.5.207 | Fully charged batteries used, after resting for ≥ 2 h but ≤ 6 h at an ambient temperature of (20 ± 5) °C | | P |

| IEC 62841-1 | | | |
|---|---|---|---|
| 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 | | P |
| K.5.209 | For series arrangement of parallel clusters of cells, the cluster is treated as single cell for specified tests | | P |
| K.5.210 | End-of-discharge voltages for common cell chemistries observed.....: | Considered | P |
| K.8.3 | Battery tools and detachable or separable battery packs marked with additional information | | P |
| | - Business name and address of the manufacturer and, where applicable, its authorised representative .....: | See label | — |
| | - Designation of series or type.....: | See label | — |
| | Battery tools also marked with additional information | | P |
| | - Year of manufacture and a date code identifying at least the month of manufacture.....: | See label | — |
| | - Designation of the tool.....: | See label | — |
| | - identification for parts shipped separately for assembly by the end user | See label | — |
| | Detachable or separable battery packs marked with additional information | | P |
| | - capacity in Ah or mAh..... : | See label | — |
| | - type of battery ..... : | See label | — |
| | No misunderstanding by additional markings | | P |
| K.8.4 | Markings specified in K.8.1, 8.2 and K.8.3 not on a **detachable part** of the tool | | P |
| | Markings specified in 8.2 clearly discernible from the outside of the tool | | P |
| | Markings specified in K.8.3 visible with any separable battery pack or detachable battery pack removed | | P |
| | Other markings on the tool visible after removal of a cover | | P |
| K.8.14.1.1 | 5) Battery tool use and care | | P |
| | 6) Service | | P |
| K.8.14.2 | e) Instructions for battery tools | | P |
| K.9.1 | Construction and enclosure provide adequate protection against electric shock | | N/A |
| K.9.3 | No two conductive, simultaneously accessible parts where the voltage between them is hazardous | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Conductive, simultaneously accessible parts provided with protective impedance | | N/A |
| | Short circuit current between two simultaneously accessible parts (mA) .....: | | N/A |
| | Capacitance between two simultaneously accessible parts (μF).....: | | N/A |
| K.9.5 | Electric strength test of D.2 with 750 V applied to insulating material protecting from electric shock | See Table D.2 | N/A |
| K.12.1 | Tool operated at no-load until maximum temperature reached or battery discharged.....: | | P |
| | No operation of protective devices during heating test | | P |
| | Temperature rises met values in Table 2 | | P |
| K.12.201 | Charging of lithium-ion battery under normal conditions did not exceed specified operating region for charging of the cell | | P |
| | Charging procedure as specified | | P |
| | Voltage, temperature and charging current monitored for all individual cells | | P |
| | Test repeated with imbalanced battery | | P |
| K.13.1 | Thermoplastic materials of relevant enclosure parts sufficiently resistant to heat | | P |
| | Ball-pressure test of IEC 60695-10-2:2003 | See Table 13.1 | P |
| K.13.2 | Glow-wire test applicable only to external enclosure enclosing the current-carrying parts | | P |
| | Non-metallic parts in of detachable or separable battery pack supporting connections that carry ≥0,2 A during charging and those within a distance of 3 mm, subjected to the glow-wire test at 850 °C | See Table 13.2 | P |
| K.13.2.2101 | Polymeric battery enclosure material around current-carrying parts at least classified V according to IEC 60695-11-10:2013, unless … | | N/A |
| | … battery pack was tested to K.18.1 a). | | P |
| K.18.1 | Risk of fire or electric shock as a result of abnormal operation obviated as far as is practical | | P |
| | No charring or burning of gauze or tissue paper resulted when battery tool and battery pack were subjected to any abnormal operations, tests a) to f) | See Table K.18.1 | P |
| | No explosion during or after the test | | P |
| | Adequate protection against electric shock | | P |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Component(s) or conductors(s) that interrupt or limit the discharge current that operated operate during the above tests a) to f) .....: | See Table K.18.1 | P |
| | Test repeated two more times for devices relied upon to pass the test; devices opened the circuit in the same manner | | P |
| | Test repeated with the open-circuited device bridged for devices not relied upon to pass the test | | N/A |
| | Protective electronic circuits whose function is relied on to pass a test regarded as providing a SCF and comply with 18.8 with a PL = a | See Table 18.8 | P |
| K.18.8 | Li-ion charging systems are covered by K.18.201 | | P |
| K.18.201 | Risk of fire and explosion as a result of abnormal operation during charging of a lithium-ion battery is obviated as far as is practical | | P |
| | No charring or burning of gauze or tissue paper, no explosion resulted when battery tool and battery pack were subjected to any abnormal conditions a) to d) | See Table K.18.201 | P |
| | The cells did not exceed the upper limit charging voltage by more than 150 mV unless… | | P |
| | …charging system permanently was disabled from recharging the battery | | N/A |
| | No evident damage to the cell vent to impair compliance with Subclause K.21.202. | | P |
| K.18.202 | No risk of fire or explosion when main discharge connections of a series configured, integral Li-ion battery, detachable or separable Li-ion battery pack were shorted under extreme imbalance | | P |
| | All cells fully charged, one cell fully discharged | | P |
| | Main discharge connections of the battery were shorted, resistance ≤10 mΩ | | P |
| | No explosion during or after the test | | P |
| | No charring or burning of the gauze or tissue paper | | P |
| | Component(s) or conductors(s) that interrupt or limit the discharge current that operated operate during the above tests .....: | | P |
| | Test repeated two more times for devices relied upon to pass the test; devices opened the circuit in the same manner | | P |
| | Test repeated with the open-circuited device bridged | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Protective electronic circuits whose function is relied on to pass a test regarded as providing a SCF and comply with 18.8 with a PL = a | See Table 18.8 | N/A |
| K.18.203 | No risk of fire or explosion during abusive overcharging of batteries comprised of cells other than the Li-ion type | | N/A |
| | Battery was charged during 1,25 h at a rate of 10 times the C5 rate for the battery | | N/A |
| | No explosion during or after the test | | N/A |
| | No charring or burning of the gauze or tissue paper | | N/A |
| K.19.6 | Marking with rated no-load speed required, measured no-load speed of the spindle did not exceed 110 % of the rated no-load speed | | N/A |
| | No-load speed measured after<br>- operated for 5 min at no-load<br>- replacing the battery with a fully charged battery<br>- operating for 1 min at no-load | | N/A |
| K.19.201 | Not possible to install a detachable or separable battery pack in reverse polarity | | P |
| K.19.202 | Li-ion battery enclosure designed to safely release gases generated as a result of venting | | P |
| | Total area of the openings in the enclosure allowing gases to pass without obstruction is ≥ 20 mm²; or… | | N/A |
| | … pressure drop within enclosure was tested , no rupture occurred | | P |
| K.20.1 | Battery tools and battery packs have adequate mechanical strength and withstand tests of 20.2 and K.20.3.1 or K.20.3.2 and | | P |
| | - did not catch fire or explode | | P |
| | - met requirements of clauses K.9, K.19 and either K.18.1 (f) or K.28.1 after tests of 20.2 and 28.1 | | P |
| | Li-ion battery tools and battery packs, after the test of K.20.3.1 or K.20.3.2,<br>- did not have an open circuit voltage below 90 % of the voltage measured immediately prior to the test | | P |
| | - demonstrated normal discharging and recharging after the test | | P |
| | - showed no damage to the cell vent impairing compliance with K.21.202 | | P |
| K.20.3.1 | Adequate mechanical strength after drop tests on a concrete surface from a height of 1 m | | P |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Test repeated with the battery pack removed from the tool | | P |
| | Test repeated on the battery pack by itself | | P |
| | The test was repeated with each attachment or combination of attachments | | P |
| 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 | | P |
| K.21.201 | Tool will not accept general purpose batteries as an energy source for their primary function | | P |
| K.21.202 | Venting of lithium-ion cells, if relied on for safety, not adversely obstructed | | P |
| K.21.203 | Unsuitable connector types not used for user accessible interfaces between elements of a Li-ion battery system | | P |
| K.23.1.10 | Power switches have adequate breaking capacity and present no electrical or mechanical failure | | P |
| | 50 cycles of making and breaking the locked output mechanism current | | P |
| K.23.1.201 | Power switches withstood, without excessive wear or other harmful effect, the mechanical, electrical, and thermal stresses occurring in normal use | | P |
| | 6000 cycles of operation making and breaking the no-load of the tool at a fully charged battery | | P |
| K.23.201 | Battery cells comply with IEC 62133 | | P |
| K.23.202 | Rechargeable battery cells not of lithium-metal type | | P |
| K.24.201 | External flexible cable or cord of battery tools with separable battery packs have anchorages such that the conductors are relieved from strain, including twisting, where they are connected within the tool, and protected from abrasion | | N/A |
| K.28.1 | Creepage distances and clearances not less than the values in millimetres shown in Table K.1.....: | See Table 28.1 | P |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Smaller clearance and creepage distances for parts of different polarity accepted, shorting of the two parts did not result in the tool starting | | P |
| | 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 | | P |
| | Distances through slots or openings in external parts of insulating material measured to metal foil in contact with the accessible surface | | P |
| | Foil pushed into corners and the like by means of test probe B of IEC 61032:1997, except not pressed into openings | | P |
| | The sum total of distances measured between parts operating at hazardous voltage and accessible surfaces determined by measuring the distance from each part to the accessible surface | | P |
| | Distances added together to determine the sum total (see Figure K.1) | | P |
| | One of the distances was 1,0 mm or greater (see Annex A, cases 1 to 10) | | P |
| | Force applied by means of test probe B of IEC 61032:1997 at the following values: | | P |
| | – 2 N for bare conductors | | P |
| | – 30 N for enclosures | | P |
| | Means provided for securing the tool to a support considered to be accessible | | P |
| **ANNEX L** | **BATTERY TOOLS AND BATTERY PACKS PROVIDED WITH MAINS CONNECTION OR NON-ISOLATED SOURCES** | | N/A |
| L.1 | Rated voltage for battery pack ≤250 V a.c. (single phase) or d.c. mains source and ≤75 V d.c. battery source | | N/A |
| | Rated voltage for battery pack ≤75 V d.c. | | N/A |
| L.5.7 | Tests to be done at rated voltage were done with a fully charged battery | | N/A |
| L.5.201 | Peak voltage of any superimposed ripple exceeding 10 % of the average value was included | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 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 .....: | | — |
| | - Designation of series or type.....: | | — |
| | Tools also marked with additional information | | N/A |
| | - Year of manufacture and a date code identifying at least the month of manufacture.....: | | — |
| | - Designation of the tool.....: | | — |
| | - identification for parts shipped separately for assembly by the end user | | — |
| | Detachable or separable battery packs marked with additional information | | N/A |
| | - capacity in Ah or mAh..... : | | — |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - 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 |
| L.8.14.2 | e) Instructions for battery tools | | N/A |
| L.9 | Construction and enclosure provide adequate protection against electric shock | | N/A |
| | Tools connected to the mains or supplied by a non-isolated source. | | N/A |
| | Tool also evaluated with the battery pack removed when removal without the use of a tool was possible | | N/A |
| L.9.201 | There are no two conductive simultaneously accessible parts where the voltage between them is hazardous, except when provided with protective impedance | | N/A |
| | Short circuit current between two simultaneously accessible parts (mA) ..... : | | N/A |
| | Capacitance between two simultaneously accessible parts (μF)..... : | | N/A |
| L.10 | Applied only when tool is directly connected to mains, or to a non-isolated source | | N/A |
| L.11 | Applied only when tool is directly connected to mains, or to a non-isolated source | | N/A |
| | Test on tool capable of charging the battery while performing its function conducted while charging a discharged battery pack | | N/A |
| L.12 | Applied only when tool directly connected to mains, or to a non-isolated source | | N/A |

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

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

| IEC 62841-1 | | | |
|---|---|---|---|
| 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 |
| L.18.204 | No risk of fire or explosion during abusive overcharging of batteries comprised of cells other than the Li-ion type | | N/A |
| | Battery was charged during 1,25 h at a rate of 10 times the C5 rate for the battery | | N/A |
| | No explosion during or after the test | | N/A |
| | No charring or burning of the gauze or tissue paper | | N/A |
| L.19.201 | Not possible to connect a battery pack in reverse polarity | | N/A |
| L.19.202 | Li-ion battery enclosure designed to safely release gases generated as a result of venting | | N/A |
| | Total area of the openings in the enclosure allowing gases to pass without obstruction is ≥ 20 mm²; or… | | N/A |
| | … pressure drop within enclosure was tested , no rupture occurred | | N/A |
| L.20 | Applied only when tool directly connected to mains, or to a non-isolated source, except L.20.201 and L.20.202 | | N/A |
| L.20.201 | Battery tools with its battery pack attached have adequate mechanical strength and withstand tests of L.9, L.19, L.28.1 and either L.18.201 f) or L.28.201, and | | N/A |
| | - did not catch fire or explode | | N/A |
| | - demonstrated normal discharging and recharging after the test | | N/A |
| | - showed no damage to the cell vent impairing compliance with L.21.202 | | N/A |
| L.20.202 | For hand-held battery tools, L.20.202.1 applies; for transportable battery tools, L.20.202.2 applies | | N/A |
| L.20.202.1 | Adequate mechanical strength after drop tests on a concrete surface from a height of 1 m | | N/A |
| | Test repeated with the battery pack removed from the tool | | N/A |
| | Test repeated on the battery pack by itself | | N/A |

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

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

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 |
| | Means provided for securing the tool to a support considered to be accessible | | N/A |

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

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

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

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

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

| 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) | |
| — | — | — | — | — | |

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

| Supplementary information: |
|---|

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

| 12.1A | TABLE: Temperature rise measurements under the conditions of 12.2 to 12.5 | | | | | N/A |
|---|---|---|---|---|---|---|
| Test voltage (V) ..... : | — | | | | | — |
| Ambient temperature, $t_1$ (°C) : | — | | | | | — |
| Ambient temperature, $t_2$ (°C) : | — | | | | | |
| Operating time (min, s) ..... : | — | | | | | — |
| Speed ($min^{-1}$) ..... : | — | | | | | — |
| Input Wattage (W) ..... : | — | | | | | — |
| Input current (A) ..... : | — | | | | | — |
| Torque (Nm) ..... : | — | | | | | — |
| **Thermocouple Locations** | **Temperature rise measured (K)** | | **Temperature rise limit (K)** | | | |
| — | — | | — | | | |
| 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** | |
| — | — | — | — | — | — | |
| Supplementary information: | | | | | | |

| 13.1 | TABLE: Ball Pressure Test of Thermoplastics | | | | P |
|---|---|---|---|---|---|
| **Allowed impression diameter (mm) ..... :** | | | 2,0 | | — |
| Object/ Part No. | Material | Manufacturer/ trademark | Test temperature (°C) | Impression diameter (mm) | |
| Tool enclosure | PA6+GF30 | Zomax | 75 | 0,9 | |

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

| | | | | |
|---|---|---|---|---|
| Battery pack enclosure | PC+ABS | Zomax | 75 | 0,8 |
| Supplementary information: | | | | |

| 13.2 | TABLE: Glow Wire Test | | | | | P |
|---|---|---|---|---|---|---|
| Object/ Part No. | Material | Manufacturer/ trademark | Test temperature (ºC) | Material ignited, Yes/No | Layer under Test Sample ignited, Yes/No | Verdict |
| Tool enclosure | PA6+GF30 | Zomax | 550 | No | No | P |
| Polar plate of tool | PA6+GF30 | Zomax | 550 | No | No | P |
| Battery pack enclosure | PC+ABS | Zomax | 850 | Yes | No | P |
| Polar plate of battery pack | PA6+GF30 | Zomax | 850 | Yes | No | P |
| Supplementary information: | | | | | | |

| 16 | TABLE: Overload Protection of Transformers and Associated Circuits | | N/A |
|---|---|---|---|
| Test voltage : | | — | — |
| Ambient temperature (°C) : | | — | — |
| Input current (A) / Input Wattage (W) : | | — | — |
| Applied short-circuit or overload : | | — | — |
| Measurement at: | | Temperature rise (K) | Allowed Limit (K) |
| — | | — | — |
| Supplementary Information: | | | |

| 18.6.1 | TABLE: Fault Condition Tests | | | | P |
|---|---|---|---|---|---|
| | Ambient temperature (°C) .....: | | 20,8 | | — |
| | Fuse-link Current (A) | | — | | — |
| Component | Fault Condition | Test Voltage (V) | Test Duration* | Comment/Result Test repeated Yes/No** | |
| CO1 | Short circuit | Fully charged battery pack | Until steady | Stop working, no hazards | |
| V7 | Short circuit | | | Stop working, no hazards | |
| QL2(e-c) | Short circuit | | | Working, no hazards | |
| DP1 | Short circuit | | | Stop working, no hazards | |

| IEC 62841-1 | | | |
|---|---|---|---|
| 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.

| 18.8.1A | 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 |
| — | — | — | — |

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

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

| 18.8.1B | TABLE: Software in Safety Critical Functions (refer to report No. 50205904 002) | | P |
|---|---|---|---|
| H.11.12.3 from IEC 60730-1:2010 | | | |
| H.11.12.3 | Measures to avoid errors | | — |
| H.11.12.3.1 | For controls with software Class B or C the V-model for the software life cycle was applied | | N/A |
| | Measures used for software class C are inherently acceptable for software class B | | N/A |
| | Other methods applied if they incorporate disciplined and structured processes including design and test phases .....: | | N/A |
| H.11.12.3.2 | Specification | | — |
| H.11.12.3.2 .1 | Software safety requirements | | — |
| H.11.12.3.2 .1.1 | The specification of the software safety requirements includes: | | — |
| | • A description of each safety related function to be implemented, including its response time(s):<br>  ○ functions related to the application including their related software classes<br>  ○ functions related to the detection, annunciation and management of software or hardware faults | | N/A |
| | • A description of interfaces between software and hardware | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | • A description of interfaces between any safety and non-safety related functions | | N/A |
| H.11.12.3.2.2 | Software architecture | | — |
| H.11.12.3.2.2.1 | The description of software architecture shall include the following aspects: | | — |
| | • Techniques and measures to control software faults/errors (refer to H.11.12.2) | | N/A |
| | • Interactions between hardware and software | | N/A |
| | • Partitioning into modules and their allocation to the specified safety functions | | N/A |
| | • Hierarchy and call structure of the modules (control flow) | | N/A |
| | • Interrupt handling | | N/A |
| | • Data flow and restrictions on data access | | N/A |
| | • Architecture and storage of data | | N/A |
| | • Time based dependencies of sequences and data | | N/A |
| H.11.12.3.2.2.2 | The architecture specification was verified against the specification of the software safety requirements by static analysis. Acceptable methods are: | | — |
| | • Control flow analysis | | N/A |
| | • Data flow analysis | | N/A |
| | • Walk-throughs / design reviews | | N/A |
| H.11.12.3.2.3.1 | Based on the architecture design, software is suitably refined into modules. Software module design and coding are implemented in a way that is traceable to the software architecture and requirements | | N/A |
| H.11.12.3.2.3.2 | Software code is structured | | N/A |
| H.11.12.3.2.3.3 | Coded software is verified against the module specification, and the module specification is verified against the architecture specification by static analysis | | N/A |
| H.11.12.3.2.4 | Design and coding standards | | — |
| | Program design and coding standards is consequently used during software design and maintenance | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Coding standards specify programming practice, proscribe unsafe language features, and specify procedures for source code documentation as well as for data naming conventions | | N/A |
| H.11.12.3.3 | Testing | | — |
| H.11.12.3.3.1 | Module design (software system design, software module design and coding) | | — |
| H.11.12.3.3.1.1 | A test concept with suitable test cases is defined based on the module design specification. | | N/A |
| H.11.12.3.3.1.2 | Each software module is tested as specified within the test concept | | N/A |
| H.11.12.3.3.1.3 | Test cases, test data and test results are documented | | N/A |
| H.11.12.3.3.1.4 | Code verification of a software module by static means includes such techniques as software inspections, walk-throughs, static analysis and formal proof | | N/A |
| | Code verification of a software module by dynamic means includes functional testing, white-box testing and statistical testing | | N/A |
| H.11.12.3.3.2 | Software integration testing | | N/A |
| H.11.12.3.3.2.1 | A test concept with suitable test cases is defined based on the architecture design specification | | N/A |
| H.11.12.3.3.2.2 | The software is tested as specified within the test concept | | N/A |
| H.11.12.3.3.2.3 | Test cases, test data and test results are documented | | N/A |
| H.11.12.3.3.3 | Software validation | | — |
| H.11.12.3.3.3.1 | A validation concept with suitable test cases is defined based on the software safety requirements specification | | N/A |
| H.11.12.3.3.3.2 | The software is validated with reference to the requirements of the software safety requirements specification as specified within the validation concept. | | N/A |
| | The software is exercised by simulation or stimulation of: | | N/A |
| | • input signals present during normal operation | | N/A |
| | • anticipated occurrences | | N/A |
| | • undesired conditions requiring system action | | N/A |

| IEC 62841-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H.11.12.3.3.3.4 | Test cases, test data and test results are documented | | N/A |
| H.11.12.3.4 | Other Items | | — |
| H.11.12.3.4.1 | Tools, programming languages are assumed to be suitable if they comply with "increased confidence from use" according to IEC 61508-7, C.4.4 | Only applicable for SCF with PL ≥ c | N/A |
| H.11.12.3.4.2 | Management of software versions: All versions are uniquely identified for traceability | | N/A |
| H.11.12.3.4.3 | Software modification | | — |
| H.11.12.3.4.3.1 | Software modifications are based on a modification request which details the following: | | — |
| | • the hazards which may be affected | | N/A |
| | • the proposed change | | N/A |
| | • the reasons for change | | N/A |
| H.11.12.3.4.3.2 | An analysis is carried out to determine the impact of the proposed modification on functional safety. | | N/A |
| H.11.12.3.4.3.3 | A detailed specification for the modification is generated including the necessary activities for verification and validation, such as a definition of suitable test cases | | N/A |
| H.11.12.3.4.3.4 | The modification are carried out as planned | | N/A |
| H.11.12.3.4.3.5 | The assessment of the modification is carried out based on the specified verification and validation activities. This may include: | | N/A |
| | • a reverification of changed software modules | | N/A |
| | • a reverification of affected software modules | | N/A |
| | • a revalidation of the complete system | | N/A |
| H.11.12.3.4.3.6 | All details of modification activities are documented | | N/A |
| H.11.12.3.5 | For class C control functions: One of the combinations (a–p) of analytical measures given in the columns of table H.9 is used during hardware development ..... : | Measures to avoid errors for class C not required | N/A |

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

| 23.1 | TABLE: Critical components information (see attachment 2) | | | | P |
|---|---|---|---|---|---|
| **Object / part No.** | **Manufacturer/ trademark** | **Type / model** | **Technical data** | **Standard** | **Mark(s) of conformity[1)]** |
| — | — | — | — | — | — |
| Supplementary information: License available upon request.<br>[1]) Provided evidence ensures the agreed level of compliance. See OD-CB2039. | | | | | |

| 24.1 | TABLE: Length of supply cord | | | N/A |
|---|---|---|---|---|
| Manufacturer of Cable | Cable type | Nominal cross-section used (mm²) | Length of supply cord measured (m) | |
| — | — | — | — | |
| Supplementary information: | | | | |

| 24.5 | TABLE: Nominal cross-section area of supply cord | | | | N/A |
|---|---|---|---|---|---|
| Rated current (A)[1]: | | Current measured during clause 12ff. (A): | | Nominal cross-section required per table 6: | |
| **Manufacturer of Cable** | | **Cable Type** | **Nominal cross-section used** | | |
| — | | — | — | | |
| Supplementary information:<br>[1] Current measured during test of clause 12.1, if no current rating marked. | | | | | |

| 24.11 | TABLE: Flexing and lifting | | | N/A |
|---|---|---|---|---|
| Weight of tool (kg): | — | > 10 000 flexings, sample turned about 90° (Yes/No): | — | |
| Weight attached to cable or cord (kg): | — | Cord guard slipped out after 10 completed 1 s lifts (Yes/No): | — | |
| Manufacturer of Cable | Cable type | No. of strands (total) | No. of strands (broken) | Deviation in % |
| — | — | — | — | — |
| Supplementary information: | | | | |

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

| 24.13 | TABLE: Cord anchorage | N/A |
|---|---|---|

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

| Manufacturer of Cable | Cable type | Cord is pulled 25 times at (N) | Cord is twisted for 1 min at (Nm) | Cord damaged | Longitudinal displacement | Conductors movement |
|---|---|---|---|---|---|---|
| — | — | — | — | — | — | — |
| Supplementary information: | | | | | | |

| 27.1 | TABLE: Torque Test for screws and nuts | | | | N/A |
|---|---|---|---|---|---|
| **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 | | | | | P |
|---|---|---|---|---|---|---|
| **clearance cl and creepage distance cr at/of:** | **Up (V)** | **U r.m.s. (V)** | **Required cl (mm)** | **cl (mm)** | **required cr (mm)** | **cr (mm)** |
| Between two pole of battery pack | — | 58 V | 2,0 | 5,0 | 1,5 | 5,0 |
| Supplementary information: | | | | | | |

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

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

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

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

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

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

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

| | | | |
|---|---|---|---|
| - accessible metal parts in class I tools and the supply cord wrapped with metal foil | 14.1 | 1250 | N/A |
| - accessible metal parts in class II tools and the supply cord wrapped with metal foil | 14.1 | 1750 | N/A |
| - between live parts and other metal parts over **basic insulation** | 14.2.2 | 1250 | N/A |
| - between inaccessible metal parts and accessible parts over **supplementary insulation** | 14.2.2 | 2500 | N/A |
| - between live parts and accessible parts over **reinforced insulation** | 14.2.2 | 3750 | N/A |
| - live parts and accessible parts over **basic insulation** | 14.3 | 1250 | N/A |
| - live parts and accessible parts over **reinforced insulation** | 14.3 | 3750 | N/A |
| - live parts and accessible parts over **basic insulation** | 14.4 | 1250 | N/A |
| - live parts and accessible parts over **reinforced insulation** | 14.4 | 3750 | N/A |
| - between live parts and other metal parts over **basic insulation** | 17.2 and 17.3 | 937,5 | N/A |
| - between inaccessible metal parts and accessible parts over **supplementary insulation** | 17.2 and 17.3 | 1875 | N/A |
| - between live parts and accessible parts over **reinforced insulation** | 17.2 and 17.3 | 2812,5 | N/A |
| - live parts and accessible parts over **basic insulation** | 18.3 and 18.4 | 1250 | N/A |
| - live parts and accessible parts over **reinforced insulation** | 18.3 and 18.4 | 3750 | N/A |
| - live parts and accessible parts not grounded, if the tool does not operate anymore | 18.5.1 | 1500 | N/A |
| - live parts and accessible parts not grounded, if the tool still operates | 18.5.1 | 2500 | N/A |
| - commutator segments and armature shaft in series motors with class II armature construction | 18.5.2 | 1500 | N/A |
| - live parts and accessible parts not grounded, if any winding is open circuited | 18.5.4 | 1500 | N/A |
| - live parts and accessible parts not grounded, if no windings are open circuited | 18.5.4 | 2500 | N/A |
| - live parts and accessible parts over **basic insulation** | 20.2 to 20.4 | 1250 | N/A |
| - live parts and accessible parts over **reinforced insulation** | 20.2 to 20.4 | 3750 | N/A |
| - between the handles and grasping surfaces in contact with foil and the output shaft of the tool | 20.5 | 1250 | No |

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

| | | | |
|---|---|---|---|
| - between live parts and other metal parts over **basic insulation** | 21.12 | 937,5 | N/A |
| - between inaccessible metal parts and accessible parts over **supplementary insulation** | 21.12 | 1875 | N/A |
| - between live parts and accessible parts over **reinforced insulation** | 21.12 | 2812,5 | N/A |
| - shafts of operating knobs, handles, levers etc. and their insulating covering wrapped in metal foil | 21.29 | 1250 | N/A |
| - live parts and accessible parts over **basic insulation** | 22.6 | 1250 | N/A |
| - live parts and accessible parts over **reinforced insulation** | 22.6 | 3750 | N/A |
| - basic insulation | 28.2.b) | 1250 | N/A |
| - supplementary insulation | 28.2.b) | 2500 | N/A |
| - reinforced insulation | 28.2.b) | 3750 | N/A |
| - over insulation protecting from electric shock | K.9.5 | 750 | N/A |
| Supplementary information: | | | |

| **K12.1** | **TABLE: Normal Temperature Test for Battery Tool** | | P |
|---|---|---|---|
| Ambient temperature (°C) ..... : | 20,1 | | — |
| Measurement at: | Temperature rise (K) | Allowed Limit (K) | |
| Enclosure | 15,2 | 60 | |
| Switch button | 2,5 | 50 | |
| Battery pack enclosure | 8,2 | 50 | |
| Handle | 1,1 | 50 | |
| Supplementary Information:<br>Status of overload protector at end of test [ ] No change [ ] Opened during the Test [ ] N/A | | | |

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

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

| | | | | | |
|---|---|---|---|---|---|
| e) Cord between tool and charger shorted | — | — | — | — | — |
| f) Any two uninsulated parts of opposite polarity in battery tools shorted | — | — | — | — | — |
| Supplementary Information: | | | | | |

| K.18.201 | TABLE: Lithium-ion charging systems – Abnormal Conditions | | | | P |
|---|---|---|---|---|---|
| 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) | No | No | Not exceeded | N/A | No |
| 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 | No | No | Not exceeded | N/A | No |
| d) Short across a component or between adjacent PCB tracks | No | No | Not exceeded | N/A | No |
| Supplementary Information:<br>One of conditions [1)] or [2)] is sufficient to achieve compliance with this subclause. | | | | | |

| L.18.1 | TABLE: Battery Tool Abnormal Operation | | | | N/A |
|---|---|---|---|---|---|
| Abnormal conditions | Resistance applied (max. 10 mΩ) | Protective device operated during first test? | Test repeated 2 more times with device in place? | Test repeated 1 more time with device bridged? | Explosion, charring or burning of test materials? |
| a) Terminals of detachable battery pack with exposed terminals shorted | — | — | — | — | — |
| b) Motor terminals shorted | — | — | — | — | — |
| c) Motor rotor locked | — | — | — | — | — |
| d) Cord between battery tool and separable battery pack shorted | — | — | — | — | — |
| e) Cord between tool and charger shorted | — | — | — | — | — |
| f) Any two uninsulated parts of opposite polarity in battery tools shorted | — | — | — | — | — |
| Supplementary Information: | | | | | |

| L.18.202 | TABLE: Lithium-ion charging systems – Abnormal Conditions | N/A |
|---|---|---|

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

| 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:<br>One of conditions [1)] or [2)] is sufficient to achieve compliance with this subclause. | | | | | |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

**ATTACHMENT TO TEST REPORT IEC 62841-1**

**EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES**
**Electric Motor-Operated Hand-Held, Transportable Tools and Lawn and Garden Machinery - Safety - Part 1: General requirements**

| | |
|---|---|
| **Differences according to** ..... : | EN 62841-1:2015 + AC.2015 + A11:2022 |
| **Attachment Form No**. ..... : | EU_GD_IEC62841_1E |
| **Attachment Originator**..... : | DEKRA Certification B.V. |
| **Master Attachment**..... : | 2022-09-02 |



| | | | |
|---|---|---|---|
| | **CENELEC COMMON MODIFICATIONS (EN)** | | – |
| **8** | **MARKINGS AND INSTRUCTIONS** | | – |
| 8.4 | Replace the 2nd paragraph with the following: | | – |
| | Markings specified in 8.2 and 8.3 are clearly discernible from the outside of the tool. | | P |
| | Other markings on the tool may be visible after removal of a cover, provided that the location of the markings is readily accessible. | | P |
| 8.14 | The words "Original instructions" appear on the language version(s) verified by the manufacturer or his authorised representative. | | P |
| | Where no "Original instructions" exist in the official language(s) of the country where the tool is to be used, a translation into that/those language(s) is provided by the manufacturer or his authorised representative or by the person bringing the tool into the language area in question. | | N/A |
| | The translations bear the words "Translation of the original instructions", and they are accompanied by a copy of the "Original instructions". | | N/A |
| 8.12 | Markings easily legible | | P |
| | Markings withstood durability test:<br>- 15 s with water soaked cloth<br>- 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 Annex ZB or… | Approved label according to UL 969 | P |
| | … withstands specified tests | See tables 8.12 A - D in report covering IEC 62841-1:2014 | N/A |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 8.14.2 Za) | The noise emission, which is measured in accordance with I.2 | | P |
| | A-weighted sound pressure level $L_{pA}$ and its uncertainty $K_{pA}$, where $L_{pA}$ exceeds 70 dB(A)<br>$L_{pA}$ [dB(A)] ..... :<br>$K_{pA}$ [dB(A)] ..... : | $L_{pA}$=97 dB(A), K=3 dB(A) | P |
| | Where $L_{pA}$ does not exceed 70 dB(A), this fact is indicated | | N/A |
| | A-weighted sound power level $L_{WA}$ and its uncertainty $K_{WA}$, where the A-weighted sound pressure level $L_{pA}$ exceeds 80 dB(A);<br>$L_{WA}$ [dB(A)] ..... :<br>$K_{WA}$ [dB(A)] ..... : | $L_{WA}$=105 dB(A), K=3 dB(A) | P |
| | peak C-weighted instantaneous sound pressure value LpCpeak, where this exceeds 63 Pa (130 dB in relation to 20 µPa)<br>$L_{pCpeak}$ (dB) ..... :<br>$K_{pCpeak}$ (dB) ..... : | | N/A |
| | The vibration total value and its uncertainty which is measured in accordance with I.3. | | P |
| | When the vibration total value exceeds 2,5 m/s², its value is given in the instructions.<br>Work mode - vibration emission value a (m/s²)….:<br>Uncertainty K (m/s²)……...: | $a_h$=4,7 m/s², K=1,5 m/s² | P |
| | When the vibration total value does not exceed 2,5 m/s², this is stated. | | N/A |
| | Information that the declared vibration total value has been measured in accordance with a standard test method and may be used for comparing one tool with another | | P |
| | Information that the declared vibration total value may also be used in a preliminary assessment of exposure. | | P |
| | A warning that the vibration emission during actual use of the power tool can differ from the declared total value depending on the ways in which the tool is used | | P |
| | A warning of the need to identify safety measures to protect the operator that are based on an estimation of exposure in the actual conditions of use (taking account of all parts of the operating cycle such as the times when the tool is switched off and when it is running idle in addition to the trigger time). | | P |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **18** | **ABNORMAL OPERATION** | | P |
| 18.8.1 | In Table 4, replace the table footnote by the following:<br>* Performance levels are to be specified in the relevant part of EN 62841-2, EN 62841-3 or EN 62841-4. | | N/A |
| | Delete the 5th paragraph and the subsequent NOTE 3. | | N/A |
| **21** | **CONSTRUCTION** | | – |
| 21.18.1 | delete the 2nd paragraph. | | P |
| 21.18.1.Z1 | Unless hand-held tools are equipped with a momentary power switch without lock-on device, voltage recovery following an interruption of the supply do not give rise to a hazard. | | P |
| | The relevant part of EN 62841-2 specifies if this subclause applies and gives specific requirements. | | N/A |
| 21.18.2.1 | Unless transportable tools are equipped with a momentary power switch without lock-on device, voltage recovery following an interruption of the supply do not give rise to a hazard. | | N/A |
| | The relevant part of EN 62841-3 specifies if this subclause applies and gives specific requirements. | | N/A |
| 21.Z1 | Noise reduction of tools as an integral part of the design process achieved by particularly applying measures at source to control noise, such as example EN ISO 11688-1:2009 | | P |
| | Success of the applied noise reduction measures assessed based on the actual noise emission values, measured in accordance with I.2, in relation to other machines of the same type with comparable non acoustical technical data | | P |
| 21.Z2 | Vibration at the handles kept as low as possible without unduly affecting the performance or the ergonomics (weight, handling, etc.) of the tool. | | P |
| | Vibration reduced by the application of engineering measures as given in CR 1030-1:1995 | | P |
| | Success of the applied vibration measures is assessed by comparing the vibration levels for the tool, measured in accordance with I.3, with those for other tools of the same type and with a comparable specification and performance. | | P |
| **ANNEX E** | **METHODS OF APPLYING ISO 13849-1 TO POWER TOOLS** | | – |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | (Void) | | N/A |
| **ANNEX I** | **MEASUREMENT OF NOISE AND VIBRATION EMISSIONS** | | **–** |
| | Replace the title of Annex I by the following<br>**ANNEX I – (NORMATIVE)** | | P |
| I.2 | Noise test code (grade 2) | | |
| I.2.Z1 | Noise reduction | See 21.Z1 | – |
| I.2.1 | General | | – |
| | The noise emission determined by using a machine which has design and technical specifications replicating the machine concerned. | | P |
| | The overall noise can be divided into the pure machine noise and the noise generated from the processed workpiece. | | P |
| | The load conditions for particular tools are therefore specified in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| I.2.2 | Sound power level measured according to ISO 3744 | | P |
| I.2.2.2 | Hand-held power tools | | N/A |
| | For all hand-held power tools, the sound power level is determined by using a hemispherical / cylindrical measurement surface according to Figure I.2. | | N/A |
| I.2.2.3 | For all transportable power tools, the sound power level is determined by using a cubic measurement surface according to Figure I.3. | | N/A |
| I.2.2.4 | The sound power level of lawn and garden machinery is determined as specified in the relevant part of IEC 62841-4. | | P |
| I.2.3 | Emission sound pressure level determination | | – |
| I.2.3.1 | The A-weighted emission sound pressure level of hand-held tools at the work station LpA according to ISO 11203:2009 with<br>LpA = $L_{WA}$ −Q , in dB<br>where Q = 8, in dB. | | P |
| | If required, LpCpeak is measured at each of the five measurement positions specified in I.2.2 | | N/A |
| I.2.3.2 | The A-weighted emission sound pressure level of transportable tools at the work station, LpA, is determined according to ISO 11201, grade 2. | | N/A |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | If required, the C-weighted peak emission sound pressure level LpCpeak is measured at the same operator's position as the A-weighted sound pressure level LpA. | | N/A |
| I.2.3.3 | The emission sound pressure level of lawn and garden machinery is determined as specified in the relevant part of IEC 62841-4. | | N/A |
| I.2.4 | Installation and mounting conditions of the power tools during noise tests | | – |
| | The power tool under test is new and equipped with accessories which affect the acoustic properties, as recommended by the manufacturer. | | P |
| | Prior to commencing testing, the power tool (including any required ancillary equipment) is set up in a stable condition in accordance with the manufacturer's instructions for safe use. | | P |
| | A hand-held tool is held by the operator or suspended in such a way as to correspond to normal use, as specified in the relevant part of IEC 62841-2 | | N/A |
| | A transportable tool is so positioned, either placed on the test bench of Figure I.1 | | N/A |
| | Lawn and garden machinery is used and positioned as specified in the relevant part of IEC 62841-4. | | P |
| I.2.5 | Operating conditions | | – |
| | Tools are tested under the two operating conditions "no-load" or "load" as appropriate for the type of tool and specified in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| I.2.6 | Measurement uncertainties | | – |
| | Uncertainties according to standard determined, recorded and reported | | P |
| I.2.7 | Information and deviations are recorded. | | P |
| I.2.8 | Information to be reported | | P |
| | - reference to this noise test code / basic standard | | P |
| | - description of the power tool; | | P |
| | - description of mounting and operating conditions | | P |
| | Sound power level $L_{WA}$ (dB(A))….....: | $L_{WA}$=104,2 dB(A), K=3 dB(A) | P |
| | Sound pressure level $L_{PA}$ (dB(A))….....: | $L_{pA}$=96,2 dB(A), K=3 dB(A) | P |
| | C-weighted peak emission sound pressure level $L_{pCpeak}$ (dB).....: | | N/A |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| I.2.9 | Declaration and verification of noise emission values | | P |
| | Sound power level $L_{WA}$ (dB(A)).....: | $L_{WA}$=105 dB(A), K=3 dB(A) | P |
| | Sound pressure level $L_{pA}$ (dB(A)).....: | $L_{pA}$=97 dB(A), K=3 dB(A) | P |
| | C-weighted peak emission sound pressure level $L_{pCpeak}$ (dB).....: | | N/A |
| I.3 | Vibration | | – |
| I.3.Z1 | Vibration reduction | See 21.Z2 | P |
| I.3.1 | Vibration measurement – General | | P |
| | Details for particular types of tools are given in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| | The vibration total value may be determined by using the measurements from a machine which has design and technical specifications replicating the machine concerned. | | P |
| I.3.2 | Symbols | | P |
| I.3.3 | Characterization of vibration | | P |
| I.3.3.1 | Direction of measurement | | P |
| | Directions may be defined in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| | If not defined the three orthogonal directions X, Y and Z as shown in Figure I.4. are related | | P |
| I.3.3.2 | Location of measurement | | P |
| | The measurement positions for particular types of tools are specified in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| I.3.3.3 | Magnitude of vibration | | P |
| I.3.3.4 | Combination of vibration directions | | P |
| I.3.4 | Instrumentation requirements | | P |
| | The vibration measurement equipment is in accordance with ISO 8041. | | P |
| | Instrumentation for measuring other parameters whose characteristics are not covered by ISO 8041, is specified in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| I.3.4.2 | Transducers | | P |
| I.3.5 | Testing and operating conditions of the tool | | P |
| I.3.5.1 | Replace the 4th paragraph with the following: | | P |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | When the test procedure is not provided in a relevant part of EN 62841-2, EN 62841-3 or EN 62841-4, an operating condition is specified that is reproducible and representative of the noisiest operation in typical usage of the machine. | | P |
| | The vibration test may simulate a single phase of a task or a working cycle, consisting of a set of operations where the operator is being exposed to vibration. | | P |
| | However, the operating condition for the noise emission test is, if practicable, also used for the vibration test. | | P |
| I.3.5.2 | Attachment, workpiece and task | | P |
| | Details for task and workpiece are given in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| I.3.5.3 | Operating conditions | | P |
| | The relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 describes the modes of operation and the calculation of the declared emission value. | | P |
| I.3.5.4 | Operator | | P |
| I.3.6 | Measurement procedure and validity | | P |
| I.3.6.1 | Reported vibration values | | P |
| | Details are specified in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. | | P |
| | Work mode - vibration emission value a (m/s²)….: | $a_h$=4,7 m/s$^2$ | P |
| | Uncertainty K (m/s²)……...: | K=1,5 m/s$^2$ | P |
| I.3.6.2 | Declaration of the vibration total value | | P |
| | If required by the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4, the work mode description corresponding to the vibration emission is stated next to each declared value. | | P |
| | Work mode - vibration emission value a (m/s²)….: | $a_h$=4,7 m/s$^2$ | P |
| | Uncertainty K (m/s²)……..…...: | K=1,5 m/s$^2$ | P |
| I.3.7 | Measurement report | | P |
| | The report includes the following information: | | P |
| | a) reference to this standard | | P |
| | b) specification of the machine | | P |
| | c) attachments or accessories; | | P |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | d) operating and testing conditions | | P |
| | e) measuring institution | | P |
| | f) date of measurement | | P |
| | g) instrumentation | | P |
| | h) position and fastening of transducers, measuring directions and individual vibration values when relevant | | P |
| | i) the arithmetic mean total vibration ah, for each operator the total vibration value ahv and the three single axes weighted acceleration values ahw. It is good practice to report all the measured values | | P |
| | j) the uncertainty K of the vibration total value ah. | | P |
| | Any deviations from the vibration test code in this standard is reported together with the technical justification for such deviations. | | P |
| **ANNEX K** | **BATTERY TOOLS AND BATTERY PACKS** | | **P** |
| K8.14.2 Z1 | For battery tools with integral battery: instruction, how the integral battery can be removed safely from the tool after the tool's end of life, and information about the type of battery such as Li-Ion, NiCd and NiMH. | | N/A |
| **ANNEX L** | **BATTERY TOOLS AND BATTERY PACKS PROVIDED WITH MAINS CONNECTION OR NON-ISOLATED SOURCES** | | **N/A** |
| K8.14.2 Z1 | For battery tools with integral battery: instruction, how the integral battery can be removed safely from the tool after the tool's end of life, and information about the type of battery such as Li-Ion, NiCd and NiMH. | | N/A |
| | | | |
| **ANNEX ZB** | **DURABILITY REQUIREMENTS FOR ADHESIVE LABELS** | | **–** |
| ZB.1 | This annex covers adhesive-attached labels for use as permanent nameplates or markers | | N/A |
| ZB.2 | Performance | | – |
| ZB.2.1 | Labels applied or bonded to representative test surfaces and exposed to the applicable conditions described in ZB.5 show permanence and legibility as per Table ZB.1. | | N/A |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Visual examination<br>The labels are viewed with normal vision from a distance of (500 ± 50) mm | | N/A |
| | A label shall adhere to the test surface without any significant curling or loosening around the perimeter greater than 10 % of the label area, or other indication of loss of adhesion such as wrinkles or bubbles. It shall not excessively craze, shrink more than 10 % of the label area or slip from its original position on the test panel more than 5 mm. | | N/A |
| | Overlamination, if present, shows no separation, excessive darkening or shrinkage of more than 10 % of the label area | | N/A |
| | Printing legible, no significant deterioration of legibility such as fading or bleeding; significant change in print colours to be noted | | N/A |
| | Legibility test<br>Printed surfaces of labels are rubbed with thumb or finger back and forth ten times with a downward force of approximately 18 N and then examined for legibility as in the visual examination. | | N/A |
| | Subsurface printed labels and labels in which printing is protected by an overlamination are not subject to the legibility test | | N/A |
| | Printing legible, no significant deterioration or blurring of legibility | | N/A |
| | Defacement test<br>Labels are scraped back and forth ten times across printed areas and edges, with a downward force of between 7,2 N and 9 N using the edge of a 1,65 mm to 2,5 mm thick steel blade held at a right angle to the test surface, the portion of the blade contacting the test surface having a radius of curvature of 25 mm to 33 mm and the edges of the blade being rounded to a radius of 0,41 mm ± 0.08 mm | | N/A |
| | Label, including overlamination or overprint coating, if present, remains in place and is not torn, uplifted, or otherwise damage | | N/A |
| | Scratching or defacement of unprotected printing, either text or background, is not considered a noncompliance. | | N/A |
| | Adhesion test (see ZB.6)<br>Test conducted if it is possible to remove test strips from surfaces | | N/A |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | If removal as described in ZB.6 is not possible because of breaking, tearing, or excessive rigidity of the label material, adhesion is determined by attempting to remove the entire sample by hand. | | N/A |
| | Average quantitative adhesion value not less than 0,088 N/mm width at any point | | N/A |
| | Adhesion not less than 0,0175 N/mm at any point | | N/A |
| | In case it is not possible to separate test strips from the surface, sample shows good adhesion to the surface when removal by hand is attempted | | N/A |
| ZB.2.2 | If after any exposure condition the test surface excessively warps, bubbles, deteriorates, melts, chips, or otherwise renders it impossible to determine compliance of the label with the requirements of this Annex, the evaluation of the sample applied to the test surface is considered to be inconclusive. | | N/A |
| ZB.2.3 | Samples are representative of the construction of the label to be tested. Significant construction variables such as top-surface or subsurface printing; top coating; face stock; overlamination or adhesive thickness range; partial adhesive coverage; differing types or colours of similar face stock or adhesive (for example, clear, pigmented, or metallized); and alternative printing processes and inks (including floodcoating for subsurface printed constructions) are represented in the samples provided. | | N/A |
| ZB.2.4 | The minimum recommended sample size is 50 mm × 50 mm | | N/A |
| ZB.3 | Test surfaces | | N/A |
| ZB.3.1 | Test surface panels provided for each material on which the samples are to be tested | | N/A |
| | Panels are essentially flat, smooth, and rigid, and measure approximately 75 mm x 280 mm | | N/A |
| | Larger panels that can be cut, or smaller panels, if sufficient in number, may be used. | | N/A |
| | If samples are investigated for use on a curved surface, curved surfaces or tubing of representative radius are provided. | | N/A |
| | When samples are investigated for use on a textured surface, panels of the specific textured surface are provided. | | N/A |
| ZB.3.2 | Test surfaces is cleaned as described in ZB.3.3 to ZB.3.4, before the samples are applied | | N/A |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| ZB.3.3 | Test panel is repeatedly wiped with cheesecloth (bleached cotton gauze) dampened with denatured ethyl alcohol or isopropanol until it appears clean; surface then wiped once more, with the dampened cheesecloth turned to expose a clean area, and then allowed to dry in air for at least 1 min | | N/A |
| ZB.3.4 | If alcohol affects the surface or is not considered the solvent of choice for a particular test surface: | | N/A |
| | – An alternative solvent that does not affect the surface or leave a film is used; or | | N/A |
| | – A detergent and water solution is used, after which the surface is thoroughly rinsed with demineralized water, wiped with clean dry cheesecloth, and allowed to dry in air for 1 h | | N/A |
| ZB.4 | Application of labels to surfaces | | N/A |
| ZB.4.1 | Two or more samples of a particular construction are applied to one or more panels of a test surface material for each exposure. | | N/A |
| | Separate panels used for each exposure; number of samples applied to a panel may vary, depending upon sample size, and panel size | | N/A |
| ZB.4.2 | Samples applied to the test surface panels are stored at (23 ± 5) °C and a relative humidity of 50 % ± 20 % until they are subjected to the applicable exposure conditions. | | N/A |
| ZB.5 | Exposure conditions | | N/A |
| ZB.5.1 | Labels subjected to each of the conditions given in Table ZB.2:<br>– 72 h in a standard atmosphere (as received);<br>– 24 h in a standard atmosphere followed by immersion in demineralized water for (48 ± 0,5) h at (23 ± 2) °C (water immersion);<br>– 24 h in a standard atmosphere followed by (240 ± 1) h in an air-circulating oven at the test temperature corresponding to the maximum temperature rating (elevated temperature);<br>– 24 h in a standard atmosphere followed by (7 ± 0,25) h in a cold box maintained at the temperature (±2) °C corresponding to the minimum temperature rating (low temperature) | | N/A |
| ZB.5.2 | Test temperatures applicable to the maximum temperature rating are given in Table ZB.3 ..... : | | N/A |
| ZB.5.3 | Labels are conditioned for at least 24 h in a standard atmosphere of (23 ± 2) °C and a relative humidity of 50 % ± 10 % | | N/A |

| IEC62841_1E - ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Samples are then immersed in IRM903 lubricating oil for (48 ± 0,5) h | | N/A |
| | After being immersed, samples are evaluated in accordance with the water immersion exposure in Table ZB.2 for compliance with the requirements in Table ZB.1 except that label panels removed from the lubricating oil are permitted to drain up to 5 min before being evaluated | | N/A |
| | When exposure to the oil should be avoided, the legibility test (see Table ZB.1) is conducted using a thin, smooth-surfaced latex or nitrile rubber glove | | N/A |
| Z.6 | Adhesion test | | – |
| | Samples tested as specified | | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **5** | **GENERAL CONDITIONS FOR THE TESTS** | | P |
| 5.14 | Addition: | | — |
| | For tests carried out at any percentage of rated input or rated current, except for no-load, the saw chain and the guide bar may be removed and the chain saw loaded by means of a brake. | | N/A |
| 5.17 | Addition: | | — |
| | The mass of the machine includes the heaviest guide bar and saw chain combination in accordance with 8.14.2 c) 101) as well as the lubrication tank, if any, filled to the maximum specified level, but excludes the guide bar cover. | | P |
| 5.101 | For tests that are performed at maximum speed and no-load, the manufacturer may need to provide special hardware and/or software. | | P |
| **8** | **MARKINGS AND INSTRUCTIONS** | | P |
| 8.2 | Addition: | | — |
| | Chain saws shall be marked with safety information which shall be written in one of the official languages of the country in which the machine is to be sold or marked with the appropriate symbol: | | — |
| | – “Wear eye protection” or a relevant safety sign of ISO 7010 or the safety sign specified in Annex AA; | ISO 7010 M004 | P |
| | – “Wear ear protection”, a relevant safety sign of ISO 7010 or the safety sign specified in Annex AA. This marking may be omitted if the measured sound pressure level at the operator’s ear in accordance with Annex I does not exceed 85 dB(A). | ISO 7010 M003 | P |
| | A combination of ISO safety signs, such as eye, ear, dust and head protection, is allowed. In addition, a combination of safety signs as specified in Annex AA is allowed. | | N/A |
| | – “Do not expose to rain” or the safety sign specified in Annex AA, unless the chain saw has a degree of protection of at least IPX4. | According to Annex AA | P |
| | – "Beware of chain saw kickback and avoid contact with bar tip”, or A.1.3 of ISO 17080:2005. | A.1.3 of ISO 17080:2005 | P |
| | – “Always use chain saw two-handed” or A.3.1 of ISO 17080:2005. | A.3.1 of ISO 17080:2005 | P |
| | For mains supplied machines: | | N/A |
| | “Remove plug from the mains immediately if the cable is damaged or cut” or the safety sign specified in Annex AA. | | N/A |
| 8.3 | Addition: | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Chain saws marked with the following: | | P |
| | – specified nominal guide bar size or size range; | | P |
| | – identification of the direction of rotation of the saw chain by a legible and durable mark on the body of the machine. This may be located under the drive sprocket cover. | | P |
| 8.14.1 | Addition: | | — |
| | The additional safety instructions as specified in 8.14.1.101 are given. This part may be printed separately from the “General Machine Safety Warnings”. | | P |
| 8.14.1.101 | Safety instructions for chain saws | | — |
| | 1) General chain saw safety warnings: | | P |
| | a) Keep all parts of the body away from the saw chain when the chain saw is operating. Before you start the chain saw, make sure the saw chain is not contacting anything. A moment of inattention while operating chain saws may cause entanglement of your clothing or body with the saw chain. | | P |
| | b) Always hold the chain saw with your right hand on the rear handle and your left hand on the front handle. Holding the chain saw with a reversed hand configuration increases the risk of personal injury and should never be done. | | P |
| | c) Hold the chain saw by insulated gripping surfaces only, because the saw chain may contact hidden wiring or its own cord. Saw chains contacting a "live" wire may make exposed metal parts of the chain saw "live" and could give the operator an electric shock. | Replaced in Annex K | N/A |
| | d) Wear eye protection. Further protective equipment for hearing, head, hands, legs and feet is recommended. Adequate protective equipment will reduce personal injury from flying debris or accidental contact with the saw chain. | | P |
| | e) Do not operate a chain saw in a tree, on a ladder, from a rooftop, or any unstable support. Operation of a chain saw in this manner could result in serious personal injury. | | P |
| | f) Always keep proper footing and operate the chain saw only when standing on fixed, secure and level surface. Slippery or unstable surfaces may cause a loss of balance or control of the chain saw. | | P |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | g) When cutting a limb that is under tension, be alert for spring back. When the tension in the wood fibres is released, the spring loaded limb may strike the operator and/or throw the chain saw out of control. | | P |
| | h) Use extreme caution when cutting brush and saplings. The slender material may catch the saw chain and be whipped toward you or pull you off balance. | | P |
| | i) Carry the chain saw by the front handle with the chain saw switched off and away from your body. When transporting or storing the chain saw, always fit the guide bar cover. Proper handling of the chain saw will reduce the likelihood of accidental contact with the moving saw chain. | | P |
| | j) Follow instructions for lubricating, chain tensioning and changing the bar and chain. Improperly tensioned or lubricated chain may either break or increase the chance for kickback. | | P |
| | k) Cut wood only. Do not use chain saw for purposes not intended. For example: do not use chain saw for cutting metal, plastic, masonry or non-wood building materials. Use of the chain saw for operations different than intended could result in a hazardous situation. | | P |
| | l) Do not attempt to fell a tree until you have an understanding of the risks and how to avoid them. Serious injury could occur to the operator or bystanders while felling a tree. | | N/A |
| | m) This chain saw is not intended for tree felling. Use of the chain saw for operations different than intended could result in serious injury to the operator or bystanders. | Not intended for tree felling | P |
| | 2) Causes and operator prevention of kickback: | | P |
| | Kickback may occur when the nose or tip of the guide bar touches an object, or when the wood closes in and pinches the saw chain in the cut. | | P |
| | Tip contact in some cases may cause a sudden reverse reaction, kicking the guide bar up and back towards the operator. | | P |
| | Pinching the saw chain along the top of the guide bar may push the guide bar rapidly back towards the operator. | | P |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Either of these reactions may cause you to lose control of the saw which could result in serious personal injury. Do not rely exclusively upon the safety devices built into your saw. As a chain saw user, you should take several steps to keep your cutting jobs free from accident or injury. | | P |
| | Kickback is the result of chain saw misuse and/or incorrect operating procedures or conditions and can be avoided by taking proper precautions as given below: | | P |
| | a) Maintain a firm grip, with thumbs and fingers encircling the chain saw handles, with both hands on the saw and position your body and arm to allow you to resist kickback forces. Kickback forces can be controlled by the operator, if proper precautions are taken. Do not let go of the chain saw. | | P |
| | b) Do not overreach and do not cut above shoulder height. This helps prevent unintended tip contact and enables better control of the chain saw in unexpected situations. | | P |
| | c) Only use replacement guide bars and saw chains specified by the manufacturer. Incorrect replacement guide bars and saw chains may cause chain breakage and/or kickback. | | P |
| | d) Follow the manufacturer's sharpening and maintenance instructions for the saw chain. Decreasing the depth gauge height can lead to increased kickback. | | P |
| 8.14.2 a) | Addition: | | — |
| | 101) Explanation of chain saw safety devices; | | P |
| | 102) Instructions for properly installing and adjusting the guide bar and saw chain; | | P |
| | 103) Instruction for selection and use of protective equipment for eyes, ears, head, hands, legs and feet, as applicable. | | P |
| 8.14.2 b) | Addition: | | — |
| | 101) Recommendation for the use of a residual current device with a tripping current of 30 mA or less; | Not applicable in Annex K | N/A |
| | 102) Statement to position the cord so that it will not be caught on branches and the like, during cutting; | Not applicable in Annex K | N/A |
| | 103) Recommendation that the first-time user should, as a minimum, practise cutting logs on a saw-horse or cradle; | | P |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 104) Information that the chain saw is not suitable for tree felling, if applicable; | | P |
| | 105) Instructions to explain the proper techniques for basic felling, limbing, and crosscutting. Examples for the required instructions are given in Clause BB.1 to BB.5. If the chain saw is not suitable for tree felling as specified by the manufacturer, then instructions for felling techniques may be omitted; | | P |
| | 106) If applicable, instruction on the use of a manual lubrication control; | | N/A |
| | 107) If applicable, instruction not to operate the chain saw without lubrication and to replenish it in due time before the container is empty; | | P |
| | 108) Instruction to use only recommended lubricants; | | P |
| | 109) Information on the maximum speed of the saw chain, or if the maximum speed of the saw chain is less than 20 m/s, this may be stated. | | P |
| 8.14.2 c) | Addition: | | — |
| | 101) Information on recommended guide bar and saw chain combination(s) that can be used and that maintains compliance with this standard; | | P |
| | 102) Instructions on sharpening and maintenance of the saw chain and/or a recommendation to have sharpening and maintenance of the saw chain performed by authorised service centres. | | P |
| 8.14.3 | Replacement: | | — |
| | If information about the mass or weight of the machine is provided, it is the mass of the machine without the saw chain, guide bar, guide bar cover, oil and optional accessories. | Replaced in Annex K | N/A |
| **12** | **HEATING** | | |
| 12.2.1 | Replacement: | | — |
| | The load conditions for the heating test of 12.2 are as follows: | Not applicable in Annex K | N/A |
| | The machine is operated with a torque load applied such that rated input or rated current is drawn. | | N/A |
| | The machine is operated for 30 min. During this period, the torque load is adjusted as necessary to maintain rated input or rated current. | | N/A |
| **14** | **MOISTURE RESISTANCE** | | N/A |
| 14.2.1 | Replacement: | | — |
| | The machine is not connected to the supply. | Not applicable in Annex K | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The machine is placed in its normal rest position on a perforated turntable. | | N/A |
| | The turntable is then turned continuously at approximately 1 rev/min during the test. | | N/A |
| | Electrical components, covers and other detachable parts are removed and subjected, if necessary, to the relevant treatment with the main part. | | N/A |
| | Movable covers that are non-detachable parts and are not self-restoring are placed in the most unfavourable position. | | N/A |
| 14.3 | This subclause of Part 1 is not applicable for saw chain lubrication tanks and lubrication systems intended for use with oil as specified in 8.14.2. | | — |
| **17** | **ENDURANCE** | | N/A |
| 17.2 | Modification: | | — |
| | This subclause is applicable as for hand-held tools. The saw chain is removed for the endurance test. | Not applicable in Annex K | N/A |
| **18** | **ABNORMAL OPERATION** | | P |
| 18.3 | Replacement: | | — |
| | Machines incorporating a series motor are operated without the saw chain at a voltage equal to 1,3 times rated voltage for 1 min at no-load. | Not applicable in Annex K | N/A |
| | During the test, parts not be ejected from the machine. After this test, the machine need not be capable of further use. | | N/A |
| | An additional device incorporated in the machine to limit the speed may operate during the test. | | N/A |
| 18.5 | Modification: | Not applicable in Annex K | N/A |
| | The requirements for tools other than lawn and garden machinery are applicable. | | N/A |
| 18.8.1 | Replacement of Table 4 by the following: | | — |
| | Required performance levels.....: | See Table 18.8.1 | P |
| **19** | **MECHANICAL HAZARDS** | | P |
| 19.1 | Modification: | | P |
| | The requirements of this subclause do not apply to those moving parts and guards which are separately covered by 19.102, 19.103 and 19.104. | | — |
| 19.6 | This subclause of Part 1 is not applicable. | | N/A |
| 19.7 | This subclause of Part 1 is not applicable. | | N/A |
| 19.8 | This subclause of Part 1 is not applicable. | | N/A |
| 19.9 | Replacement: | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | If, in accordance with 8.14.2, the user is instructed to remove a drive sprocket cover, such as for maintenance, to change the saw chain or guide bar, then the fastenings remain attached to the drive sprocket cover or to the machinery, unless the drive sprocket cover fastenings are the only means for retaining the guide bar. If a fastening is not removed for removing the drive sprocket cover, it is considered as still attached. | | P |
| **19.101** | **Handles** | | — |
| | Chain saws is fitted with at least two handles to provide safe control. | | P |
| | The length of the grip area of the front handle is 100 mm. | | P |
| | The handle surfaces is designed and shaped that firm grip may be applied. | | P |
| | Minimum clearances and sizes of the handles is in accordance with ISO 7914 for forest work chain saws, except for the determination of dimension D. | | P |
| | **Front:** | | — |
| | Finger clearance in the grip area<br>- minimum size 35 mm<br>(mm) .....: | Measured 37 mm | P |
| | Handle grip area fulfils the requirement with the gauge A (ISO 6533:2012) | | P |
| | Clearance between the front of the chain-saw body and the handle at the top measured 60 mm to the left of the guide bar plane<br>- minimum size 38 mm<br>(mm) .....: | Measured 70 mm | P |
| | Clearance between the front of the chain-saw body and the handle measured at the centreline of the guide bar<br>- minimum size 25 mm<br>(mm) .....: | Measured 55 mm | P |
| | **Front and rear:** | | — |
| | Perimeter of the cross-section of the handle<br>- minimum size 65 mm<br>(mm) .....: | Measured 83 mm | P |
| | Distance from the rear side of the throttle trigger to the centre of the front handle at the top<br>- minimum size 225 mm<br>(mm) .....: | Measured 270 mm | P |
| | **Rear:** | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Finger clearance at the released throttle trigger<br>- minimum size 30 mm<br>(mm) .....: | Measured 40 mm | P |
| | Clearance below the released throttle trigger | | P |
| | - minimum size 35 mm<br>(mm) .....: | Measured 50 mm | P |
| | Clearance behind the released throttle trigger | | P |
| | - minimum size 4x25 mm<br>(mm) .....: | Checked with probe and ok<br>\|α\|=2°, \|β\|=44° | P |
| | Dimension D is the straight line distance from the rear side of the power switch to a point on the axis of the front handle, 50 mm to the left of X0, where X0 is determined in accordance with ISO 6533. | | P |
| | For chain saws with a maximum speed of the saw chain not exceeding 8 m/s and a maximum cutting length not exceeding 300 mm, however, the dimension D in Table 1 of ISO 7914:2002 may be reduced to a minimum of 125 mm. | | N/A |
| **19.102** | **Front hand guard** | | — |
| | A guard is fitted in the vicinity of the front handle to protect the operator's fingers from injury by contact with the saw chain. | | P |
| | The dimensions and clearances of this front hand guard and the prevention of access from the front handle to the saw chain comply with ISO 6533. | | P |
| | **Front hand-guard width,** *W*1<br>minimum of 100 mm<br>(mm) .....: | Measured 105 mm | P |
| | **Front hand-guard height over front handle,** $H_1$<br>at least 20 mm<br>(mm) .....: | Measured 33 mm | P |
| | $H_{1A}$ minimum height is 0 mm<br>(mm) .....: | Measured 28 mm | P |
| | **Height of front hand-guard openings,** *H*3<br>Type C gauge cannot pass through the openings | | P |
| | **Clearance between hand-guard and saw body,** *H*2<br>type C gauge, held parallel to the front hand-guard, cannot pass through | | P |
| | **Clearances between hand-guard and front handle,** *type A gauge* **and** *type B gauge* | | P |
| | **Type A gauge**<br>a type A gauge can pass the clearance without coming into contact with the hand-guard | | P |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | **Type B gauge**<br>a type B gauge cannot pass the clearance and any part of the gauge centreline will come lower than any part of the centreline of the front handle | | P |
| **19.103** | **Rear hand guard** | | — |
| | A rear hand guard provided along the length of the right side of the bottom of the rear handle to protect the operator's hand from contact in case the saw chain breaks or derails. | | P |
| | The rear hand guard extend from the right edge of the rear handle for at least 30 mm on the guide bar side (see Figure 104) and | | P |
| | Measurement at the guide bar side (mm) .....: | 33 mm | P |
| | – at least 100 mm lengthwise from the inner rear part of the chain saw body (see Figure 104); or | | P |
| | Measurement lengthwise (mm) .....: | 125 mm | P |
| | – at least three times the diameter of 25 mm behind the power switch, as defined by three cylinders pressed against the rear handle and the power switch; | | P |
| | This requirement may also be fulfilled by parts of the machine. | | P |
| **19.104** | **Drive sprocket cover** | | — |
| | The drive sprocket and saw chain is covered within the area of the body of the chain saw. | | P |
| | This cover is not be removable without the aid of a tool unless the drive sprocket cover fastenings are the only means for retaining the guide bar. | | P |
| | There may be openings at the front, the front upper section and the bottom section to allow the ejection of wood chips and to allow passage of the guide bar and saw chain. | | P |
| **19.105** | **Chain catcher** | | — |
| | The chain saw is fitted with a chain catcher device placed under the saw chain as far to the front as practicable. The chain catcher extend sideways at least 5 mm from the centre-plane of the guide bar. | | P |
| | Extension of the chain catcher (mm) .....: | Measured 8 mm | P |
| | Temperature (°C).....: | -10 °C considered | P |
| **19.106** | **Void** | | — |
| **19.107** | **Protection against injury by kickback** | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Chain saws is designed to minimize the risk of injury due to the effect of kickback. | | P |
| 19.107.1 | Chain saws is equipped with a manually activated chain brake, operated by the front hand guard in a direction away from the operator, that stops movement of the saw chain. | | P |
| | A manually activated chain brake is not required if the chain saw is fitted with a non-manually activated chain brake that meets the requirements of 19.107.2 or provided the following requirements are fulfilled: | | — |
| | – the maximum speed of the saw chain does not exceed 5 m/s; and | | N/A |
| | – the cutting length without bar tip guard does not exceed 300 mm. | | N/A |
| | Compliance is checked by inspection and by measurement with the chain saw fitted with a saw chain and guide bar as specified in 8.14.2. | | — |
| 19.107.1.1 | The manually activated chain brake is designed so that the static activation force required is not more than 60 N and not less than 20 N. | | P |
| | Static release force (N) .....: | 42 N | P |
| | With the power switch in the "on" position and the chain saw disconnected from the power source, the force on the front hand guard needed to activate the brake measured at the centre of the top (horizontal) part of the front hand guard and in the direction of 45° forward and downward in relation to the guide bar centreline. | | — |
| 19.107.1.2 | The average braking time not exceed 0,12 s and the maximum braking time not exceed 0,15 s. | | P |
| | average braking time (s) .....: | 0,104 s | P |
| | maximum braking time (s) .....: | 0,114 s | P |
| | Compliance is checked by the following test: | | — |
| | The chain saw shall be run in before starting the test by performing 10 on"/"off" cycles with the power switch. | | P |
| | One cycle consists of 30 s running and 30 s rests. | | P |
| | With the saw chain lubricated as in normal use, and operated at rated voltage and maximum speed, the front hand guard is set in motion by the impact of a pendulum. This pendulum shall have a mass of 0,70 kg, a hammer with a flat strike face of 50 mm diameter and an arm of 700 mm length. The pendulum drop height shall be 200 mm. Any special hardware and/or software used to achieve maximum speed in accordance with 5.101 shall not influence the braking performance provided by the chain brake. The time for the saw chain to stop shall be measured from the moment of impact with the front hand guard. | | — |
| | The chain brake shall be operated a total of 25 times. The maximum stopping time and the average stopping time of the saw chain shall be determined at the first five and the last five braking operations. | | — |
| | The saw chain is considered to be stopped when the time taken for two successive drive links (see dimension a in Figure 108) to pass a fixed point exceeds 5 ms. | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The tests shall be done in 2 min intervals, comprising a no-load running period of 1 min prior to each impact of the pendulum. Immediately after the operation of the chain brake and the saw chain has stopped, the chain saw shall be switched off for the remainder of the interval. The chain brake actuation mechanism shall be reset during this off period. | | — |
| 19.107.2 | Chain saws with a maximum speed of the saw chain above 15 m/s be equipped with a non-manually activated chain brake that is sufficiently sensitive to operate when kickback occurs. | | N/A |
| | Compliance is checked by inspection and by the test of ISO 13772, with the power switch in the "on" position and the chain saw disconnected from the power source. For cutting lengths less than 500 mm, the threshold level of chain saws for forest service with ≤ 40 $cm^3$ engine displacement shall apply. For cutting lengths of 500 mm or greater, the threshold level of chain saws for forest service with > 40 $cm^3$ engine displacement shall apply. | | — |
| 19.107.2.1 | If the actuation of the non–manually activated chain brake is independent of the front hand guard, the stopping time requirements apply as specified in 19.107.1.2. | | N/A |
| | Compliance is checked by the test described by 19.107.1.2. The pendulum, however, is replaced by any arrangement suitable to measure the time from the moment the simulated kickback is detected by the non-manually activated chain brake until the saw chain has stopped. | | — |
| 19.107.2.2 | If the non-manually activated chain brake functions through the activation of the front hand guard, then the stopping time requirements in 19.107.1.2 apply. | | N/A |
| 19.107.3 | After activation of a chain brake, if any, the motion of the saw chain stop and operation of the chain saw not resume without deliberate operator action of either: | | — |
| | – deactivation and reactivation of the power switch; or | | P |
| | – resetting of the front hand guard, if the operational state of the chain brake is recognizable by position or other means. | | N/A |
| 19.107.4 | The computed kickback angle or the chain stop angle, whichever is lower, is determined for the most unfavourable guide bar and saw chain combination specified in 8.14.2. The angle not exceed 45°. | | P |
| | Bar tip guard prevents contact of any part of the saw chain with the workpiece within the angle α between 45° and 135° | | N/A |
| | If the chain saw is provided with a guide bar incorporating a bar tip guard, whether removable or permanently attached, this removed prior to testing. | | N/A |
| | Bar guard with a not removable tip guard (riveted, spot welded, etc.) or | | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Computed kickback angle, or | With saw 91P052X and heaviest battery pack,<br>Max. CKA = 10.09° without chain brake actuating.<br>With chain brake actuating not tested, KA < 20°.<br>With saw 91P052X and lightest battery pack,<br>Max. CKA = 10.75° without chain brake actuating.<br>With chain brake actuating not tested, KA < 20°.<br>With saw 91P062X and lightest battery pack,<br>Max. CKA = 10.40° without chain brake actuating.<br>With chain brake actuating not tested, KA < 20°. | P |
| | Chain stop angle | | N/A |
| | The medium-density fibreboard (MDF) samples be as specified in ISO 9518. | | P |
| **19.108** | **Guide bar cover** | | — |
| | A protective cover is provided with the chain saw to cover the guide bar in order to prevent injuries during transportation. | | P |
| | The guide bar cover is not be displaced by more than 50 mm when the guide bar is in a vertical downward position. | | P |
| | When the guide bar is adjusted to its maximum length and the guide bar cover is fully engaged on the guide bar, no more than 50 mm of the saw chain on the top or bottom of the guide bar is remain exposed. | | P |
| **19.109** | **Saw chain tension** | | — |
| | Chain saws provided with means of tensioning the saw chain. | | P |
| **19.110** | **Saw chain lubrication** | | — |
| | Chain saws with a maximum speed of the saw chain of 5 m/s and above equipped with a provision for lubricating the saw chain. | | P |
| | If the chain saw is fitted with a manual lubrication control, it is so located that it can be operated while holding the chain saw with both hands in a normal operating position. | | N/A |
| **19.111** | **Balance** | | — |
| | Chain saws is in longitudinal balance. | Replaced in Annex K | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Compliance is checked by the following test: | | — |
| | The angle α between the centreline of the guide bar and the horizontal plane as shown in Figure 109 shall not exceed ± 30°. | | N/A |
| **19.112** | **Run down time** | | — |
| | Compliance is checked by the following test: | | — |
| | The chain saw and saw chain tension shall be adjusted as for normal use, as specified in 8.14.2. | | — |
| | The chain saw shall be run in before starting the test by performing 10 “on”/”off” cycles with the power switch. | | P |
| | The test is made under no-load. The test sequence shall consist of a total of 2 500 cycles. | | P |
| | The run down time of chain saws is limited. | | P |
| | for the first 6 cycles of operation run down time of the chain does not exceed 2 s……..(s): | First six cycles:<br>0,281 s, 0,273 s, 0,273 s, 0,281 s, 0,277 s, 0,279 s | P |
| | for the final 6 cycles of the test sequence run down time of the chain does not exceed 3 s (s): | Final six cycles:<br>0,294 s, 0,287 s, 0,279 s, 0,278 s, 0,281 s, 0,281 s | P |
| | The stop time is measured from the moment of release of the power switch actuator until the saw chain is stopped. The saw chain is considered to be stopped when the time taken for two successive drive links (see dimension a in Figure 108) to pass a fixed point exceeds 5 Ms. | | — |
| **20** | **MECHANICAL STRENGTH** | | P |
| 20.1 | Addition: | | — |
| | Damage to the guide bar, saw chain and chain catcher are ignored. | | P |
| 20.3.1 | Replacement: | | — |
| | The chain saw, fully assembled in accordance with 8.14.2 and with the lubrication tank empty, is dropped three times in total on a concrete surface from a height of 1 m. | Replaced in Annex K | N/A |
| | For these three drops, the sample is tested in the three most unfavourable positions with the lowest point of the machine being 1 m above the concrete surface. Secondary impacts is avoided. | | N/A |
| | If attachments are provided as specified and mounted in accordance with 8.14.2, the test is repeated with each attachment or combination of attachments mounted to a separate machine sample. | | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | After the test, the lubrication tank is filled to the maximum level in accordance with 8.14.2. | | N/A |
| **20.101** | **Handles** | | — |
| | The handles of durable construction and capable of withstanding stress sustained under normal working conditions. | | P |
| | Forwards and backwards X1 and X2 700 N | | P |
| | Up and down Y1 and Y2 700 N | | P |
| | Right and left Z1 and Z2 350 N | | P |
| **20.102** | **Front and rear hand guard** | | — |
| | The front hand guard and rear hand guard of durable construction and capable of withstanding impacts sustained in normal working conditions. | | P |
| **20.103** | The chain catcher have sufficient mechanical strength. | | P |
| **21** | **CONSTRUCTION** | | P |
| 21.18 | Replacement: | | — |
| | Additional requirements for power switches for chain saws are given in 21.18.101 and 21.18.102. | | — |
| 21.18.101 | The power switch required by 21.17 is a momentary power switch without a lock-on device, which can be switched on and off by the user without the need to release any of the handle(s) or grasping surface(s) required by 19.101. | | P |
| | When the lock-off function as specified in 21.18.102 is in the unlocked state, the chain saw operate within 1 s after actuation of the power switch. | | P |
| | The chain saw only operate when the chain brake, if any, is deactivated. | | P |
| 21.18.102 | The machine is provided with a power switch having a lock-off device such that at least two separate and dissimilar actions are required before drive to the saw chain is possible. It is not be possible to achieve these actions with a single grasping motion or a straight line motion within any grasping surface identified in accordance with 8.14.2 b) 6). | | P |
| | The lock-off device and the operator presence sensor (if any) is actuated before the power switch can enable drive to the saw chain. | | P |
| | It is not be necessary to sustain the actuation of the lock-off device until the power switch is activated, provided: | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | – the power switch or an operator presence sensor (if any) is activated within 5 s of the release of the lock-off device; and | | N/A |
| | – there is a visual or audible indication as soon as the lock-off actuator is released and continues at least until the power switch is activated, or | | N/A |
| | – an operator presence sensor (if any) is activated prior to the release of the actuator of the lock-off device. | | N/A |
| | The machine return to the original locked state within 1 s when the power switch is released (i.e. at least two separate and dissimilar actions are required before drive to the saw chain is possible), unless: | | — |
| | – an operator presence sensor is provided; and | | N/A |
| | – the hand is not released from the operator presence sensor. | | N/A |
| | The lock-off device shall not be actuated by a 25 mm diameter x 75 mm long rod with a force not exceeding 20 N on the lock-off device in any direction. | | P |
| | The rod shall be applied such that its cylindrical surface bridges the surface of the lock-off device and any surface adjacent to the lock-off device. | | P |
| **21.101** | **Determination of cutting length** | | — |
| | The cutting length L is measured with the guide bar adjusted to its midway point. The measurement is made along the centreline of the guide bar in accordance with a) – d) below. | | P |
| | a) For chain saws without a bar tip guard and where no spiked bumper is provided or the spiked bumper is removable, the cutting length L is determined as L = L1 + L3 as shown in Figure 102 a), where | | P |
| | – L1 is the distance from the chain saw body (A), to the tip end of the guide bar (not including the bar tip sprocket, if any); and | | P |
| | – L3 is 6 mm, which is an approximation for the height of the saw chain cutter. | | P |
| | b) For chain saws without a bar tip guard and where the spiked bumper is permanently attached to the chain saw, the cutting length L is determined as L = L2 + L3 as shown in Figure 102 a), where | | N/A |
| | – L2 is the distance from root of the spike nearest the centreline of the guide bar on the spiked bumper (B); and | | N/A |
| | – L3 is 6 mm, which is an approximation for the height of the saw chain cutter. | | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | c) For chain saws with a bar tip guard and where no spiked bumper is provided or the spiked bumper is removable, the cutting length L is determined as L = L1 as shown in Figure 102 b), where L1 is the distance from the chain saw body (A) and the inside part of the bar tip guard. | | N/A |
| | d) For chain saws with a bar tip guard and where the spiked bumper is permanently attached to the chain saw, the cutting length L is determined as L = L2 as shown in Figure 102 b), where L2 is the distance from the root of the spike nearest the centreline of the guide bar on the spiked bumper (B) and the inside part of the bar tip guard. | | N/A |
| **21.102** | **Operator presence sensor** | | — |
| | The operator presence sensor, if any, is incorporated in the handle or grasping surface associated with the power switch. | | N/A |
| | It is not required that the operator presence sensor is capable of distinguishing between an operator's hand and other objects. | | N/A |
| | The function of the operator presence sensor may be achieved by one or any combination of mechanical, electrical or electronic means. | | N/A |
| **21.103** | **Spiked bumper** | | — |
| | Chain saws: | | P |
| | – be equipped with a spiked bumper (see Figure 101); or | | P |
| | – have provision for mounting one. | | N/A |
| **21.104** | **Bar tip guard** | | — |
| | Chain saws may be equipped with a bar tip guard (see Figure 102 b)). | | N/A |
| **23** | **COMPONENTS** | | P |
| 23.1.10.1 | Modification of the sixth paragraph: | | — |
| | Switches further be classified as follows with respect to endurance: | | — |
| | power switches for chain saws – for 50 000 cycles. | Not applicable in Annex K | N/A |
| | Addition: | | — |
| | Auxiliary switches, if any, associated with the chain brake are considered to be switches other than power switches and is classified as follows with respect to endurance – for 10 000 cycles. | | N/A |
| 23.1.10.2 | Modification of the third paragraph: | | — |
| | Power switches for chain saws are tested for 50 000 cycles. | Not applicable in Annex K | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 23.3 | Addition: | | — |
| | Protection devices (e.g. overload or over-temperature protection devices) or circuits that switch off the chain saw is of the non-self-resetting type. | | P |
| **24** | **SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CORDS** | | N/A |
| 24.1 | Replacement: | | — |
| | Machines is provided with one of the following means of connection to the supply: | | — |
| | – an appliance inlet having at least the same degree of protection against moisture as marked in accordance with 8.1 for the machine; or | Not applicable in Annex K | N/A |
| | – a supply cord with a length between 0,2 m and 0,5 m and fitted with a plug or other connector having at least the same degree of protection against moisture as marked in accordance with 8.1 for the machine. | | N/A |
| | Plugs, connectors and inlets is suitable for the ratings of the machine. | | N/A |
| | The plug shall be withdrawn not more than the distance necessary to permit the test probe to be inserted between the plug body and the extension cord receptacle. | | — |
| | The test probe shall be inserted with a force of 18 N (4,1 lb) or less, until the probe contacts one blade of the plug. | | N/A |
| 24.4 | Modification: | | — |
| | Supply cords not be lighter than heavy polychloroprene sheathed flexible cable (code designation 60245 IEC 66) or equivalent. | Not applicable in Annex K | N/A |
| **ANNEX K** | **BATTERY TOOLS AND BATTERY PACKS** | | P |
| **K.1** | **Scope** | | — |
| | Addition: | | — |
| | This standard applies to chain saws for cutting wood and designed for use by one person. This standard does not cover chain saws designed for use in conjunction with a guide-plate and riving knife or in any other way such as with a support or as a stationary or transportable machine. | | P |
| | This standard does not apply to | | P |
| | – chain saws for tree service as defined in ISO 11681-2; or | | N/A |
| | – pole-mounted pruners. | | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The chain saws covered by this standard are designed only to be operated with the right hand on the rear handle and the left hand on the front handle. | | P |
| **K.8.14.1.101** | **Safety instructions for chain saws** | | — |
| | Replacement of item 1) c): | | — |
| | c) Hold the chain saw by insulated gripping surfaces only, because the saw chain may contact hidden wiring. Saw chains contacting a "live" wire may make exposed metal parts of the chain saw "live'" and could give the operator an electric shock. | | P |
| **K.8.14.1.301** | **General chain saw safety warnings** | | — |
| | a) Follow all instructions when clearing jammed material, storing or servicing the chain saw. Make sure the switch is off and the battery pack is removed. | | P |
| | b) Follow all instructions when clearing jammed material, storing or servicing the chain saw. Make sure the switch is off and the lock-off is in the locked position. | | P |
| K.8.14.2 b) | Items 101) and 102) in Part 4-1 are not applicable. | | P |
| | Addition: | | P |
| 301) | Instructions for the use and adjustment of any means of support for separable battery packs in accordance with K.21.301 and instructions for release or removal. | | N/A |
| K.8.14.2 c) | Addition: | | P |
| 301) | For machines with integral batteries, instructions on how to disable the machine during maintenance or servicing. | | N/A |
| K.8.14.3 | If information about the mass or weight of the machine is provided, it is the mass of the machine without the saw chain, guide bar, guide bar cover, oil, battery (except for integral batteries) and optional accessories. | | P |
| | If information about the mass or weight of the battery(ies) is provided, it cover the range of specified batteries. | | P |
| K.12.2.1 | This subclause of Part 4-1 is not applicable. | | P |
| **K.14** | **Moisture resistance** | | — |
| | This clause of Part 4-1 is not applicable, except as follows: | | — |
| **K.14.301** | **Battery-powered chain saw moisture resistance** | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| K.14.301.1 | The enclosure of the machine provide the degree of protection against moisture in accordance with the classification of the machine. This does not apply to saw chain lubrication tanks and lubrication systems intended for use with oil as specified in 8.14.2. | | N/A |
| K.14.301.2 | The machine is tested with detachable battery pack(s) or separable battery pack(s) fitted. The machine is switched off during the test. | | N/A |
| | The machine is placed in its normal rest position on a perforated turntable. The turntable is then turned continuously at approximately 1 rev/min during the test. | | N/A |
| | Electrical components, covers and other detachable parts are removed and subjected, if necessary, to the relevant treatment with the main part. | | N/A |
| | Movable covers that are non-detachable parts and are not self-restoring are placed in the most unfavourable position. | | N/A |
| | Batteries with a classification greater than IPX0 are tested separately according to their rating. | | N/A |
| K.14.301.3 | Machines other than IPX0 are subjected to tests of IEC 60529 as follows: | | — |
| | – IPX1 machines are subjected to the test described in 14.2.1; | | N/A |
| | – IPX2 machines are subjected to the test described in 14.2.2; | | N/A |
| | – IPX3 machines are subjected to the test described in 14.2.3; | | N/A |
| | – IPX4 machines are subjected to the test described in 14.2.4; | | N/A |
| | – IPX5 machines are subjected to the test described in 14.2.5; | | N/A |
| | – IPX6 machines are subjected to the test described in 14.2.6; | | N/A |
| | – IPX7 machines are subjected to the test described in 14.2.7. For this test, the machine is immersed in water containing approximately 1,0 % Nalco. | | N/A |
| | Immediately after the appropriate treatment, the machine shall show that there is no trace of water on insulation which could result in a reduction of creepage distances and clearances which impairs compliance with K.28.1. | | N/A |
| K.17.2 | This subclause of Part 4-1 is not applicable. | | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| K.18.3 | This subclause of Part 4-1 is not applicable. | | N/A |
| K.18.5 | This subclause of Part 4-1 is not applicable. | | N/A |
| K.19.107.4 | Addition: | | — |
| | The weight of different optional batteries is taken into consideration when conducting the test in order to identify the worst case. | | P |
| K.19.111 | Replacement: | | — |
| | Chain saws is in longitudinal balance. | | P |
| | Compliance is checked by the following test. | | — |
| | The angle α between the centreline of the guide bar and the horizontal plane as shown in Figure 109 shall not exceed ± 30°. | | P |
| K.20.1 | This subclause of Part 1 is applicable, except as follows: | | — |
| | Addition: | | — |
| | Damage to the guide bar, saw chain and chain catcher are ignored. | | P |
| | There is no leakage of lubrication through cracks in lubrication tanks and tank caps while the chain saw is being held in each of the six orthogonal directions for 30 s. Seepage through ventilation systems is not considered a failure. | | P |
| K.20.3.1 | The chain saw, fully assembled in accordance with 8.14.2 and with the lubrication tank empty, with any detachable battery pack attached is dropped three times in total on a concrete surface from a height of 1 m. | | P |
| | For these three drops, the sample is tested in the three most unfavourable positions the lowest point of the tool being 1 m above the concrete surface. Secondary impacts is avoided. | | P |
| | For the test, separable accessories are not mounted. | | P |
| | For battery machines with detachable battery packs, the test is repeated three more times without the battery pack attached to the machine. | | P |
| | New samples may be used for each series of three drops. For the test, separable accessories are not mounted. | | P |
| | In addition for detachable battery packs or separable battery packs, the test is repeated three more times on the battery packs separately. | | P |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | If attachments are provided as specified and mounted in accordance with 8.14.2, the test is repeated with each attachment or combination of attachments mounted to a separate machine sample with a detachable battery pack or separable battery pack installed. | | P |
| K.21.301 | Separable battery packs that are intended to be supported on the body of an operator in accordance with K.8.14.2 b) 301) is provided with a means of support or attachment. | | N/A |
| | This requirement may be fulfilled by providing a shoulder harness, belt harness or other means of support or attachment. | | N/A |
| | Any shoulder or belt harness is adjustable to the size of the operator and its operation is in accordance with K.8.14.2 b) 301). | | N/A |
| | Shoulder or belt harnesses is: | | N/A |
| | – designed in a way for easy removal; or | | N/A |
| | – equipped with a quick release mechanism | | N/A |
| | that ensures that the separable battery pack(s) can be removed or released quickly from the operator. | | N/A |
| | The quick release mechanism is positioned either at the connection between the separable battery pack(s) and harness or between the harness and operator. The quick release mechanism only allow separation by deliberate action of the operator. The quick release mechanism is designed to open while under the weight of the separable battery pack(s). It require the use of only one hand and have no more than two release points. | | N/A |
| | A double shoulder harness is considered to be designed in a way for easy removal, if the left and right shoulder straps are not connected to each other in front of the operator's body. If straps to connect between the left and right shoulder straps are provided, it is also considered to be designed in a way for easy removal when the straps connecting between the left and right shoulder straps can be released under the load of the separable battery pack(s) by using one hand and have no more than two release points. | | N/A |
| | The release mechanism only allow separation by deliberate action of the operator. | | N/A |
| K.23.1.10.1 | This subclause of Part 4-1 is not applicable. | | N/A |
| K.23.1.10.2 | This subclause of Part 4-1 is not applicable. | | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| K.23.301 | Auxiliary switches, if any, associated with the chain brake are considered to be switches other than power switches. They, however, meet the requirements of K.23.1.10 and K.23.1. 201. | | P |
| **K.24** | **Supply connection and external flexible cords** | | — |
| | This clause of Part 4-1 is not applicable, except as follows: | | — |
| K.24.301 | For battery machines with separable battery packs, the external flexible cable or cord have anchorages such that the conductors are relieved from strain, including twisting, where they are connected within the machine, and protected from abrasion. | | N/A |
| K.24.302 | If a machine is supplied with a separable battery pack, it is possible for the operator to disconnect the separable battery pack from the machine without the use of a tool during normal use. | | N/A |
| **ANNEX L** | **BATTERY TOOLS AND BATTERY PACKS PROVIDED WITH MAINS CONNECTION OR NON-ISOLATED SOURCES** | | N/A |
| **L.1** | **Scope** | | — |
| | This clause of Part 1 is applicable, except as follows: | | — |
| | Addition: | | — |
| | This standard applies to chain saws for cutting wood and designed for use by one person. This standard does not cover chain saws designed for use in conjunction with a guide-plate and riving knife or in any other way such as with a support or as a stationary or transportable machine. | | N/A |
| | This standard does not apply to | | N/A |
| | – chain saws for tree service as defined in ISO 11681-2; or | | N/A |
| | – pole-mounted pruners. | | N/A |
| | The chain saws covered by this standard are designed only to be operated with the right hand on the rear handle and the left hand on the front handle. | | N/A |
| **L.8.14.1.101** | **Safety instructions for chain saws** | | — |
| | Replacement of item 1) c): | | — |
| | c) Hold the chain saw by insulated gripping surfaces only, because the saw chain may contact hidden wiring. Saw chains contacting a "live" wire may make exposed metal parts of the chain saw "live" and could give the operator an electric shock. | | N/A |
| **L.8.14.1.301** | **General chain saw safety warnings** | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | a) Follow all instructions when clearing jammed material, storing or servicing the chain saw. Make sure the switch is off and the battery pack is removed. | | N/A |
| | b) Follow all instructions when clearing jammed material, storing or servicing the chain saw. Make sure the switch is off and the lock-off is in the locked position. | | N/A |
| L.8.14.2 b) | Addition: | | — |
| 301) | Instructions for the use and adjustment of any means of support for separable battery packs in accordance with L.21.301 and instructions for release or removal. | | N/A |
| L.8.14.3 | If information about the mass or weight of the machine is provided, it is the mass of the machine without the saw chain, guide bar, guide bar cover, oil, battery (except for integral batteries) and optional accessories. | | N/A |
| L.19.107.4 | Addition: | | — |
| | The weight of different optional batteries, if applicable, is taken into consideration when conducting the test in order to identify the worst case. | | N/A |
| L.19.111 | Replacement: | | — |
| | Chain saws is in longitudinal balance. | | — |
| | Compliance is checked by the following test. | | — |
| | The angle α between the centreline of the guide bar and the horizontal plane as shown in Figure 109 shall not exceed ± 30°. | | N/A |
| L.20.1 | This subclause of Part 1 is applicable, except as follows: | | — |
| | Addition: | | — |
| | Damage to the guide bar, saw chain and chain catcher are ignored. | | N/A |
| L.20.201 | Addition: | | — |
| | Following the test, there is no leakage of lubrication through cracks in lubrication tanks and tank caps while the chain saw is being held in each of the six orthogonal directions for 30 s. Seepage through ventilation systems is not considered a failure. | | N/A |
| L.20.202 | For chain saws, L.20.301 applies. | | — |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| L.20.301 | The chain saw, while not directly connected to the mains or to a non-isolated source, fully assembled in accordance with 8.14.2 and with the lubrication tank empty, with any detachable battery pack attached is dropped three times in total on a concrete surface from a height of 1 m. For these three drops, the sample is tested in the three most unfavourable positions the lowest point of the tool being 1 m above the concrete surface. | | N/A |
| | Secondary impacts is avoided. For the test, separable accessories are not mounted. | | N/A |
| | For battery machines with detachable battery packs, the test is repeated three more times without the battery pack attached to the machine. New samples may be used for each series of three drops. For the test, separable accessories are not mounted. | | N/A |
| | In addition for detachable battery packs or separable battery packs, the test is repeated three more times on the battery packs separately. | | N/A |
| | If attachments are provided as specified and mounted in accordance with 8.14.2, the test is repeated with each attachment or combination of attachments mounted to a separate machine sample with a detachable battery pack or separable battery pack installed. | | N/A |
| L.21.301 | Separable battery packs that are intended to be supported on the body of an operator in accordance with L.8.14.2 b) 301) is provided with a means of support or attachment. | | N/A |
| | This requirement may be fulfilled by providing a shoulder harness, belt harness or other means of support or attachment. | | N/A |
| | Any shoulder or belt harness is adjustable to the size of the operator and its operation is in accordance with L.8.14.2 b) 301). | | N/A |
| | Shoulder or belt harnesses is: | | N/A |
| | – designed in a way for easy removal; or | | N/A |
| | – equipped with a quick release mechanism that ensures that the separable battery pack(s) can be removed or released quickly from the operator. | | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The quick release mechanism is positioned either at the connection between the separable battery pack(s) and harness or between the harness and operator. The quick release mechanism only allow separation by deliberate action of the operator. The quick release mechanism is designed to open while under the weight of the separable battery pack(s). It require the use of only one hand and have no more than two release points. | | N/A |
| | A double shoulder harness is considered to be designed in a way for easy removal, if the left and right shoulder straps are not connected to each other in front of the operator's body. | | N/A |
| | If straps to connect between the left and right shoulder straps are provided, it is also considered to be designed in a way for easy removal when the straps connecting between the left and right shoulder straps can be released under the load of the separable battery pack(s) by using one hand and have no more than two release points. | | N/A |
| L.24.1 | Modification: | | — |
| | This subclause also applies to a flexible cord between a non-isolated source and the machine. | | N/A |
| L.24.4 | Modification: | | — |
| | This subclause applies, except a flexible cord provided between a non-isolated source and the tool not be provided with a plug that can be connected directly to the mains. | | N/A |
| L.24.301 | If a machine is supplied with a separable battery pack, it is possible for the operator to disconnect the separable battery pack from the machine without the use of a tool during normal use. | | N/A |
| **ANNEX AA** | **SAFETY SIGNS** | | N/A |
| | 1) Do not expose to rain. (IEC 60745-2-13:2009, Annex AA) |  | P |
| | 2) Remove plug from the mains immediately if the cable is damaged or cut. (IEC 60745-2-13:2009, Annex AA) |  | N/A |
| | 3) Wear eye protection. (IEC 60745-2-13:2009, Annex AA) |  | N/A |
| | 4) Alternative for wear eye protection: |  | N/A |

| IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 5) Wear ear protection. (IEC 60745-2-13:2009, Annex AA) |  | N/A |
| | 6) Optional symbol for "wear eye protection and wear ear protection". |  | N/A |
| | 7) Optional symbol for "wear eye and head protection". |  | N/A |
| | 8) Optional symbol for "wear eye, ear and head protection". |  | N/A |

| EU Common modifications of IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| **Annex I** (normative) | **Measurement of noise and vibration emissions** | | P |
| | ***Replace*** *I.2.5.3 with the following:* | | P |
| **I.2.5.3** | Battery powered **chain saws** shall be tested with a fully charged battery using a **saw chain** and the longest **guide bar** combination(s) as specified in 8.14.2 c) 101), under both of the following conditions: | | P |
| | – no-load speed, with the highest setting of the speed control, if any; and | | P |
| | – at **maximum speed**, by applying, if necessary, an adjustable load by means of a water brake (or equivalent) as specified in A.2.1 of ISO 22868:2011, which is increased starting from zero (no-load) until the **maximum speed** is achieved. | | N/A |
| | Four consecutive sound power level tests at no-load speed and four at **maximum speed** shall be carried out. The resulting sound power level *L*WA is calculated | | P |
| | During measurements, the machine shall operate under stable conditions. Once the noise emission is steady, the measurement time interval shall be at least 15 s. If measurements are to be made in octave or one-third octave frequency bands, the minimum period of observation shall be 30 s for the frequency bands centred on or below 160 Hz, and 15 s for the frequency bands centred on or above 200 Hz. | | P |
| **Annex K** (normative) | **Battery tools and battery packs** | | P |
| | ***Replace*** *Subclause K.21.18 with the following:* | | N/A |
| **K.21.18.Z101** | **Isolation and disabling device** | | N/A |
| | Machines with an **integral battery** shall either be equipped | | N/A |
| | – with an isolation device to prevent the risk of injury from mechanical hazards during servicing or **user maintenance**; or<br>– with a disabling device that prevents unintentional starting of the machine. | | N/A |
| | An isolation device shall | | N/A |

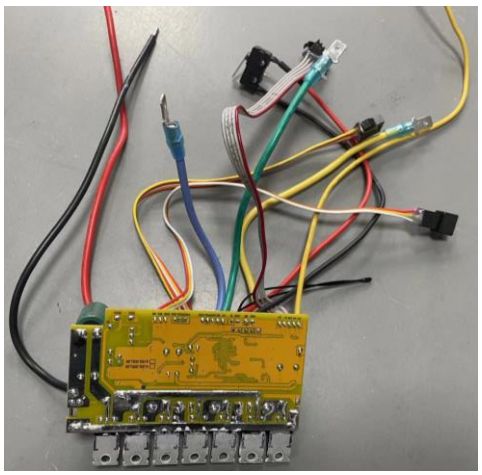
| EU Common modifications of IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | – provide disconnection of all poles of the **battery** from the serviceable region of the machine;<br>– be equipped with an unambiguous indication of the state of the disconnection device which corresponds to each position of its manual control (actuator);<br>– be provided with protection against accidental reconnection. | | N/A |
| | A disabling device may be achieved by any of the following: | | N/A |
| | – a self-restoring or non-self-restoring lock-off device where two separate and dissimilar actions are necessary before the motor is switched on (e.g. a **power switch** which has to be pushed in before it can be moved laterally to close the contacts to start the motor). It shall not be possible to achieve these two actions with a single grasping motion or a straight-line motion;<br>– a removable disabling device provided with the machine where it shall not be possible for the machine to be operated when either applied or removed. | | N/A |
| **Annex L** (normative) | **Battery tools and battery packs provided with mains connection or non-isolated sources** | | N/A |
| | ***Replace*** *Subclause L.21.18 with the following:* | | N/A |
| **L.21.18.Z101** | **Isolation and disabling device** | | N/A |
| | Machines with an **integral battery** shall either be equipped | | N/A |
| | – with an isolation device to prevent the risk of injury from mechanical hazards during servicing or **user maintenance**; or<br>– with a disabling device that prevents unintentional starting of the machine. | | N/A |
| | An isolation device shall | | N/A |
| | – provide disconnection of all poles of the **battery** from the serviceable region of the machine;<br>– be equipped with an unambiguous indication of the state of the disconnection device which corresponds to each position of its manual control (actuator);<br>– be provided with protection against accidental reconnection. | | N/A |
| | A disabling device may be achieved by any of the following: | | N/A |

| EU Common modifications of IEC 62841-4-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | – a self-restoring or non-self-restoring lock-off device where two separate and dissimilar actions are necessary before the motor is switched on (e.g. a **power switch** which has to be pushed in before it can be moved laterally to close the contacts to start the motor). It shall not be possible to achieve these two actions with a single grasping motion or a straight-line motion;<br>– a removable disabling device provided with the machine where it shall not be possible for the machine to be operated when either applied or removed. | | N/A |
| **Annex ZA** (normative) | **Normative references to international publications with their corresponding European publications** | | P |
| **Annex ZZ** (informative) | **Relationship between this European Standard and the essential requirements of Directive 2006/42/EC [2006 OJ L157] aimed to be covered** | | P |

**- End of report -**

| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.:* | **50205904 002** | **Auftrags-Nr.:** *Order no.*: | **244407371** | Seite 1 von 21 *Page 1 of 21* |
| **Kunden-Referenz-Nr.:** *Client reference no.:* | **N/A** | **Auftragsdatum:** *Order date:* | 2022.02.15 | |
| **Auftraggeber:** *Client:* | Zhejiang Zomax Garden Machinery Co., Ltd. / No.48, Aodihu Road, Taiping District, Wenling City, Zhejiang Province 317500, P.R.China | | | |
| **Prüfgegenstand:** *Test item:* | Controller (used in Chain Saw) | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type no.:* | ZMDC501, ZMDC502 | | | |
| **Auftrags-Inhalt:** *Order content*: | Software Evaluation | | | |
| **Prüfgrundlage:** *Test specification:* | IEC 60730-1:2013+A1 Annex H<br>UL 60730-1:2016 Annex H<br>*IEC 62841-4-1:2017 (reference)* | | | |

| | |
|---|---|
| **Wareneingangsdatum:** *Date of sample receipt:* | N/A |
| **Prüfmuster-Nr.:** *Test sample no:* | Engineering Prototype<br>Controller #0001 - #0004 |
| **Prüfzeitraum:** *Testing period:* | 2022.05.16 – 2022.11.25 |
| **Ort der Prüfung:** *Place of testing:* | TÜV Rheinland<br>(Shanghai) Co., Ltd |
| **Prüflaboratorium:** *Testing laboratory:* | TÜV Rheinland<br>(Shanghai) Co., Ltd |
| **Prüfergebnis*:** *Test result*:* | Pass |



| | | | |
|---|---|---|---|
| **geprüft von:** *tested by:* | X Byron Liang<br>Signed by: Byron Liang | **genehmigt von:** *authorized by:* | X Patrick<br>Signed by: Patrick Wang |
| **Datum:** *Date:* 2023.01.03 | | **Ausstellungsdatum:** *Issue date:* 2023.01.03 | |
| **Stellung** / *Position:* | Project Engineer | **Stellung** / *Position:* | Reviewer |

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

Client contact: 382186400@qq.com
Sample obtaining method: engineering prototype supplied from client

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

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhaft |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| ** Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specification(s)* | | *F(ail) = failed a.m. test specification(s)* | *N/A = not applicable* | *N/T = not tested* |

**Table of Contents**

***General Information***

This report is based on test report: 50205904 001 controllers: ZMDC501, ZMDC502

This report is for changing software parameter, safety aspect have been considered.

This report is for evaluating software function about safety for the controller used in **Chain Saw.**

The evaluating method is complied with the requirements for software class B in accordance with sub-clause H.2.16 H.2.24, Requirement 66 72 in H.7, H.11.12 of UL 60730-1:2016

The evaluating method is complied with the requirements for software class B in accordance with sub-clause H.11.12.3 of IEC 60730-1:2013+A1 (as same as IEC 60730-1:2010 in technical requirement)

Safety functions refer to A.2 SCF list.

This report is only valid for the conditions as below:

**1.** The match information is as below:

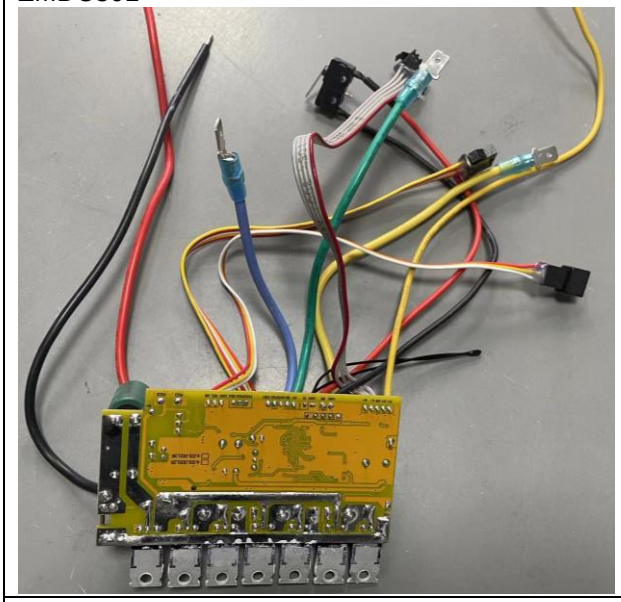
| Product Type | Controller Type | Hardware Version (PCBA) | Software Version | Checksum |
|---|---|---|---|---|
| ZMDC501 | ZMDC501 | GX-PT62-V1.3 | GETL0128_V0_8 | 0x54D0 |
| ZMDC502 | ZMDC502 | GX-PT62-V1.3 | GETL0134_V0_4 | 0xBE25 |

**AND**

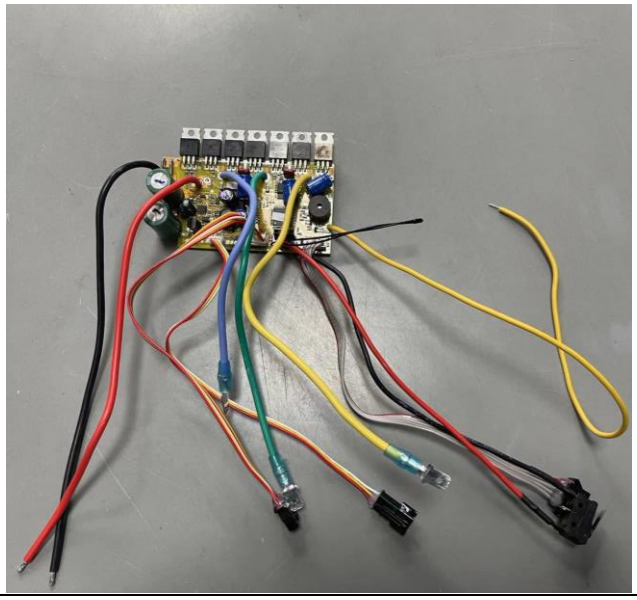
**2.** The fingerprint of the .hex file, has been extracted, refer to the Part C.

***Photo Document:***

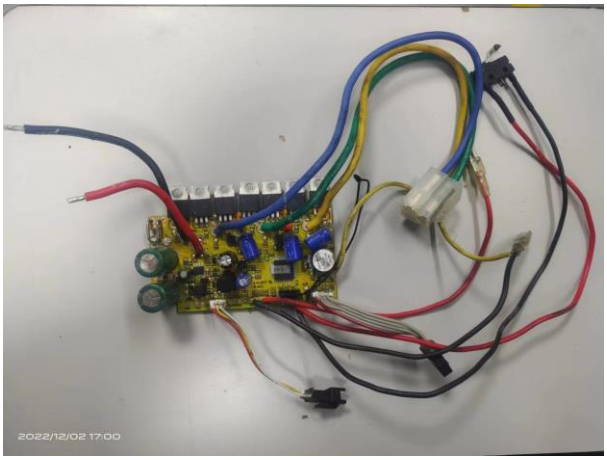
ZMDC501



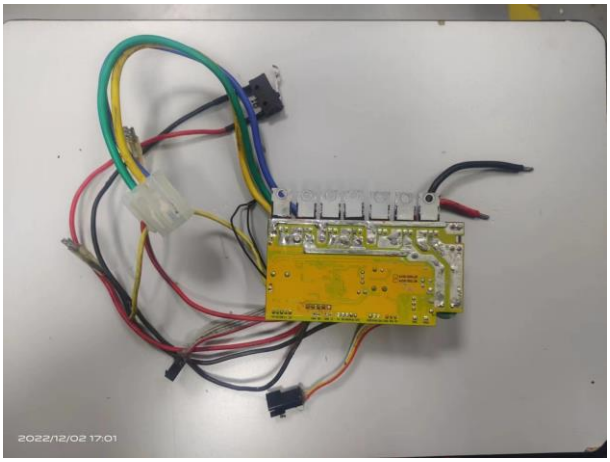
ZMDC501



ZMDC502

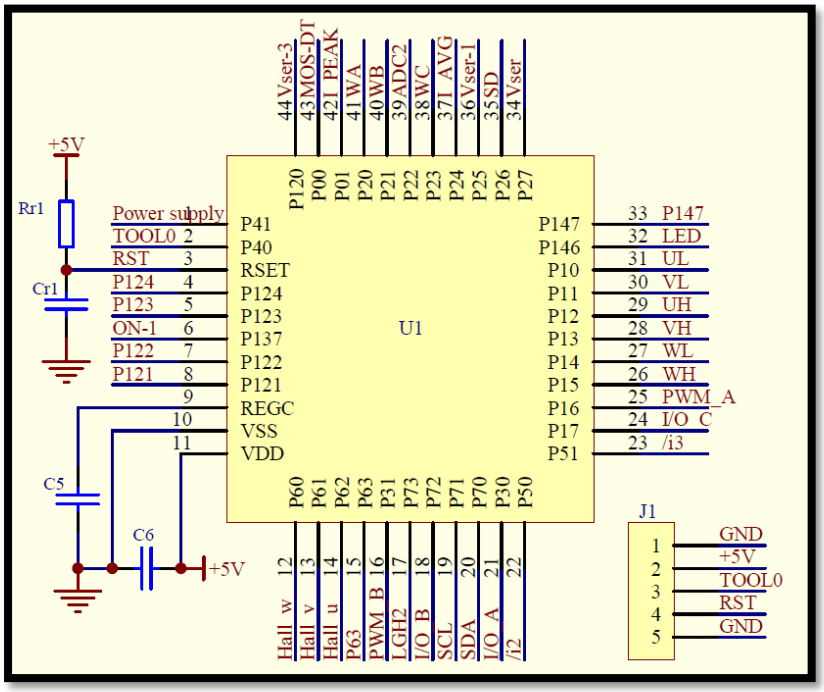



ZMDC502



| ***MCU Information*** | |
|---|---|
| MCU manufacturer | RENESAS |
| MCU type | μPD79F7027 |

Pin configuration



| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| ***H.11*** | **Constructional requirements** | | P |
| H.11.12 | Controls using software | | P |
| | Controls using software shall be so constructed that the software does not impair control compliance with the requirements of this standard.<br>Compliance is checked by the tests for electronic controls in this standard, by inspection according to the requirements of H.11.12 and by examination of the documentation required in requirements 66 to 72 inclusive of Table 1.<br>Subclauses H.11.12.1 to H.11.12.4 inclusive are only applicable to control functions using software class B or class C.<br>Subclause H.11.12.4 contains additional requirements for remotely actuated control functions. | | P |
| H.11.12.1 | Requirements for the architecture | | P |
| H.11.12.1.1 | Control functions with software class B or C shall use measures to control and avoid software-related faults/errors in safety-related data and safety-related segments of the software, as detailed in H.11.12.1.2 to H.11.12.3 inclusive. | The requirements detailed in H.11.12.1.2 to H.11.12.3 inclusive have been taken into consideration. | P |
| H.11.12.1.2 | Structure for control functions with software class B or C | | P |
| H.11.12.1.2.1 | Control functions with software class C shall have one of the following structures:<br>– single channel with periodic self-test and monitoring (H.2.16.7);<br>– dual channel (homogenous) with comparison (H.2.16.3);<br>– dual channel (diverse) with comparison (H.2.16.2).<br>NOTE Comparison between dual channel structures can be performed:<br>– by the use of a comparator (H.2.18.3) or<br>– by reciprocal comparison (H.2.18.15). | | N/A |
| H.11.12.1.2.2 | Control functions with software class B shall have one of the following structures:<br>– single channel with functional test (H.2.16.5);<br>– single channel with periodic self-test (H.2.16.6);<br>– dual channel without comparison (H.2.16.1).<br>A software class C structure is also acceptable for a software class B structure. | Software class B shall be applied.<br>Single channel with functional test is found. | P |
| H.11.12.1.3 | Other structures are permitted if they can be shown to provide an equivalent level of safety to those in H.11.12.1.2. | | N/A |
| H.11.12.2 | Measures to control faults/errors | | P |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| H.11.12.2.1 | When redundant memory with comparison is provided on two areas of the same component, the data in one area shall be stored in a different format from that in the other area (see software diversity). | | N/A |
| H.11.12.2.2 | Controls with software class C using dual channel structures with comparison shall have additional fault/error detection means (such as periodic functional tests, periodic self-tests, or independent monitoring) for any fault/errors not detected by the comparison. | | N/A |
| H.11.12.2.3 | For controls with software class B or C, means shall be provided for the recognition and control of errors in transmissions to external safety-related data paths. Such means shall take into account errors in data, addressing, transmission timing and sequence of protocol. | Means are provided, refer to Part A. | P |
| H.11.12.2.4 | For control with software class B or C, the manufacturer shall provide, within the control, measures to address the fault/errors in safety-related segments and data indicated in Table H.1 and identified in Table 1, requirement 68. | . | P |
| Table H.1 | Acceptable measures to address fault/errors | | P |
| 1 | CPU | Please refer to Part A. | P |
| 1.1 | Registers (Stuck at) | Please refer to Part A. | P |
| | Registers (DC fault) | | N/A |
| 1.2 | Instruction decoding and execution (Wrong decoding and execution) | | N/A |
| 1.3 | Programme counter (Stuck at) | Please refer to Part A. | P |
| | Programme counter (DC fault) | | N/A |
| 1.4 | Addressing (DC fault) | | N/A |
| 1.5 | Data paths instruction decoding (DC fault and execution) | | N/A |
| 2 | Interrupt handling and execution (No interrupt or too frequent interrupt) | Please refer to Part A. | P |
| | Interrupt handling and execution (No interrupt or too frequent interrupt related to different sources) | | N/A |
| 3 | Clock | Please refer to Part A. | P |
| | Clock (Wrong frequency (for quartz synchronized clock: harmonics/subharmonics only)) | | N/A |
| 4 | Memory | Please refer to Part A. | P |
| 4.1 | Invariable memory (All single bit faults) | Please refer to Part A. | P |
| | Invariable memory (99.6% coverage of all information errors) | | N/A |
| 4.2 | Variable memory (DC fault) | Please refer to Part A. | P |
| | Variable memory (DC fault and dynamic cross links) | | N/A |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 4.3 | Addressing (relevant to including the address variable and invariable memory) (Stuck at) | Please refer to Part A. | P |
| | Addressing (relevant to including the address variable and invariable memory) (DC fault) | | N/A |
| 5 | Internal data path | | N/A |
| 5.1 | Data (Stuck at) | | N/A |
| | Data (DC fault) | | N/A |
| 5.2 | Addressing (Wrong address) | | N/A |
| | Addressing (Wrong address and multiple addressing) | | N/A |
| 6 | External communication | | N/A |
| 6.1 | Data (Hamming distance 3) | | N/A |
| | Data (Hamming distance 4) | | N/A |
| 6.2 | Addressing (Wrong address) | | N/A |
| | Addressing (Wrong and multiple addressing) | | N/A |
| 6.3 | Timing (Wrong point in time, Wrong sequence) | | N/A |
| | Timing (Wrong sequence) | | N/A |
| 7 | Input/output periphery | Please refer to Part A. | P |
| 7.1 | Digital I/O (Fault conditions specified in H.27) | | N/A |
| 7.2 | Analog I/O | Please refer to Part A. | P |
| 7.2.1 | A/D and D/A convertor (Fault conditions specified in H.27) | Please refer to Part A. | P |
| | A/D and D/A convertor (Fault conditions specified in H.27) | | N/A |
| 7.2.2 | Analog multiplexer (Wrong addressing) | | N/A |
| | Analog multiplexer (Wrong addressing) | | N/A |
| 8 | Monitoring devices and comparators (Any output outside the static and dynamic functional specification) | | N/A |
| 9 | Custom chips e.g. ASIC, GAL, gate array (Any output outside the static and dynamic functional specification) | | N/A |
| H.11.12.2.5 | Measures others than those specified in H.11.12.2.4 are permitted if they can be shown to satisfy the requirements listed in Table H.1. | Please refer to Part A. | P |
| H.11.12.2.6 | Software fault/error detection shall occur not later than the time declared in requirement 71 of Table 1. The acceptability of the declared time(s) is evaluated during the fault analysis of the control.<br>Part 2 standards may limit this declaration. | Please refer to Part A. | P |
| H.11.12.2.7 | For controls with functions, classified as Class B or C, detection of a fault/error shall result in the response declared in Table 1, requirement 72. For controls with functions declared as class C, independent means capable of performing this response shall be provided. | Please refer to Part A. | P |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| H.11.12.2.8 | The loss of dual channel capability is deemed to be an error in a control function using a dual channel structure with software class C. | | N/A |
| H.11.12.2.9 | The software shall be referenced to relevant parts of the operating sequence and the associated hardware functions. | Please refer to Part A. | P |
| H.11.12.2.10 | Where labels are used for memory locations, these labels shall be unique. | | P |
| H.11.12.2.11 | The software shall be protected from user alteration of safety-related segments and data. | Please refer to Part A. | P |
| H.11.12.2.12 | The software and safety-related hardware under its control shall be initialized to, and terminate at, a declared state as indicated in Table 1, requirement 66. | Please refer to Part A. | P |
| H.11.12.3 | Measures to avoid errors | | P |
| H.11.12.3.1 | General<br>For controls with software class B or C the measures shown in Figure H.1 to avoid systematic faults shall be applied.<br>Measures used for software class C are inherently acceptable for software class B.<br>The content of this is extracted from IEC 61508-3 and adapted to the needs of this standard.<br>Other methods are possible if they incorporate disciplined and structured processes including design and test phases. | V-Model has been applied to the software life cycle. | P |
| H.11.12.3.2 | Specification | | P |
| H.11.12.3.2.1 | Software safety requirements | | P |
| H.11.12.3.2.1.1 | The specification of the software safety requirements shall include:<br>– a description of each safety related function to be implemented, including its response<br>time(s):<br>• functions related to the application including their related software classes;<br>• functions related to the detection, annunciation and management of software or hardware faults;<br>– a description of interfaces between software and hardware;<br>– a description of interfaces between any safety and non-safety related functions.<br>Examples of techniques/measures can be found in Table H.2. | | P |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| Table H.2 | Standards identification<br>Semi-formal methods<br>− Logical/functional block diagrams<br>− Sequence diagrams<br>− Finite state machines/state transition diagrams<br>− Decision/truth tables<br>Other methods to comply with the requirements can be applied. | | P |
| H.11.12.3.2.2 | Software architecture | | P |
| H.11.12.3.2.2.1 | The description of software architecture shall include the following aspects:<br>– techniques and measures to control software faults/errors (refer to H.11.12.2);<br>– interactions between hardware and software;<br>– partitioning into modules and their allocation to the specified safety functions;<br>– hierarchy and call structure of the modules (control flow);<br>– interrupt handling;<br>– data flow and restrictions on data access;<br>– architecture and storage of data;<br>– time based dependencies of sequences and data.<br>Examples of techniques/measures can be found in Table H.3. | | P |
| Table H.3 | Software architecture specification<br>Fault detection and diagnosis<br>Semi-formal methods:<br>− Logic/function block diagrams<br>− Sequence diagrams<br>− Finite state machines/state transition diagrams<br>− Data flow diagrams | | P |
| H.11.12.3.2.2.2 | The architecture specification shall be verified against the specification of<br>the software safety requirements by static analysis.<br>NOTE Acceptable methods for static analysis are:<br>– control flow analysis;<br>– data flow analysis;<br>– walk-throughs/design reviews. | | P |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| H.11.12.3.2.3 | Module design and coding<br>NOTE 1 The use of computer aided design tools is accepted.<br>NOTE 2 For Defensive Programming (for example, range checks, check for division by 0, plausibility checks), see C.2.5 of IEC 61508-7:2010. | | P |
| H.11.12.3.2.3.1 | Based on the architecture design, software shall be suitably refined into modules. Software module design and coding shall be implemented in a way that is traceable<br>to the software architecture and requirements.<br>The module design shall specify:<br>– function(s),<br>– interfaces to other modules,<br>– data.<br>Examples of techniques/measures can be found in Table H.4. | | P |
| Table H.4 | Module design specification<br>Limited size of software modules<br>Information hiding/encapsulation<br>One entry/one exit point in subroutines and functions<br>Fully defined interface<br>Semi-formal methods:<br>− Logic/function block diagrams<br>− Sequence diagrams<br>− Finite state machines/state transition diagrams<br>− Data flow diagrams | | P |
| H.11.12.3.2.3.2 | Software code shall be structured.<br>NOTE Structural complexity can be minimized by applying the following principles:<br>– keep the number of possible paths through a software module small, and the relation between the input and<br>output parameters as simple as possible;<br>– avoid complicated branching and, in particular, avoid unconditional jumps (GOTO) in higher level languages;<br>– where possible, relate loop constraints and branching to input parameters;<br>– avoid using complex calculations as the basis of branching and loop decisions.<br>Examples of techniques/measures can be found in Table H.5. | | P |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| Table H.5 | Design and coding standards<br>Use of coding standard (see H.11.12.3.2.4)<br>No use of dynamic objects and variables (see Note)<br>Limited use of interrupts<br>Limited use of pointers<br>Limited use of recursion<br>No unconditional jumps in programs in higher level languages<br>Dynamic objects and/or variables are allowed if a compiler is used which ensures that sufficient memory for all dynamic objects and/or variables will be allocated before runtime, or which inserts runtime checks for the correct online allocation of memory. | | P |
| H.11.12.3.2.3.3 | Coded software shall be verified against the module specification, and the module specification shall be verified against the architecture specification by static analysis.<br>NOTE Examples of methods for static analysis are:<br>– control flow analysis;<br>– data flow analysis;<br>– walk-throughs/design reviews. | | P |
| H.11.12.3.2.4 | Design and coding standards<br>Program design and coding standards shall be consequently used during software design and maintenance.<br>Coding standards shall specify programming practice, proscribe unsafe language features, and specify procedures for source code documentation as well as for data naming conventions. | | P |
| H.11.12.3.3 | Testing | | P |
| H.11.12.3.3.1 | Module design (software system design, software module design and coding) | | P |
| H.11.12.3.3.1.1 | A test concept with suitable test cases shall be defined based on the module design specification. | | P |
| H.11.12.3.3.1.2 | Each software module shall be tested as specified within the test concept. | | P |
| H.11.12.3.3.1.3 | Test cases, test data and test results shall be documented. | | P |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| H.11.12.3.3.1.4 | Code verification of a software module by static means includes such techniques as software inspections, walk-throughs, static analysis and formal proof.<br>Code verification of a software module by dynamic means includes functional testing, white box testing and statistical testing.<br>It is the combination of both types of evidence that provides assurance that each software module satisfies its associated specification.<br>Examples of techniques/measures can be found in Table H.6. | | P |
| Table H.6 | Software module testing<br>Dynamic analysis and testing:<br>− Test case execution from boundary value analysis<br>− Structure-based testing<br>Data recording and analysis<br>Functional and black-box testing:<br>− Boundary value analysis<br>− Process simulation<br>Performance testing:<br>− Avalanche/stress testing<br>− Response timings and memory constraints<br>Interface testing<br>NOTE Software module testing is a verification activity. | | P |
| H.11.12.3.3.2 | Software integration testing | | P |
| H.11.12.3.3.2.1 | A test concept with suitable test cases shall be defined based on the architecture design specification. | | P |
| H.11.12.3.3.2.2 | The software shall be tested as specified within the test concept. | | P |
| H.11.12.3.3.2.3 | Test cases, test data and test results shall be documented.<br>Examples of techniques/measures can be found Table H.7. | | P |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| Table H.7 | Software integration testing<br>Functional and black-box testing:<br>− Boundary value analysis<br>− Process simulation<br>Performance testing:<br>− Avalanche/stress testing<br>− Response timings and memory constraints<br>NOTE Software integration testing is a verification activity. | | P |
| H.11.12.3.3.3 | Software validation | | P |
| H.11.12.3.3.3.1 | A validation concept with suitable test cases shall be defined based on the software safety requirements specification. | | P |
| H.11.12.3.3.3.2 | The software shall be validated with reference to the requirements of the software safety requirements specification as specified within the validation concept.<br>The software shall be exercised by simulation or stimulation of<br>– input signals present during normal operation,<br>– anticipated occurrences,<br>– undesired conditions requiring system action. | | P |
| H.11.12.3.3.3.3 | Test cases, test data and test results shall be documented.<br>Examples of techniques/measures can be found in Table H.8. | | P |
| Table H.8 | Software safety validation<br>Functional and black-box testing:<br>− Boundary value analysis<br>− Process simulation<br>Simulation, modelling:<br>− Finite state machines<br>− Performance modelling<br>NOTE Testing is the main validation method for software; modelling can be used to supplement the validation activities. | | P |
| H.11.12.3.4 | Other Items | | P |

| IEC 60730-1:2013+A1 Annex H / UL 60730-1:2016 Annex H | | | |
|---|---|---|---|
| Clause | Requirement - Test | Result - Remark | Verdict |
| H.11.12.3.4.1 | Tools, programming languages<br>Equipment used for software design, verification and maintenance, such as design tools, programming languages, translators and test tools, shall be qualified appropriately, and shall be shown to be suitable for purpose in manifold applications.<br>They are assumed to be suitable if they comply with "increased confidence from use" according to C.4.4 of IEC 61508-7:2010. | | P |
| H.11.12.3.4.2 | Management of software versions<br>A software version management system at the module level shall be put in place. All versions shall be uniquely identified for traceability. | | P |
| H.11.12.3.4.3 | Software modification | | P |
| H.11.12.3.4.3.1 | Software modifications shall be based on a modification request which<br>details the following:<br>– the hazards which may be affected,<br>– the proposed change,<br>– the reasons for change. | | P |
| H.11.12.3.4.3.2 | An analysis shall be carried out to determine the impact of the proposed modification on functional safety. | | P |
| H.11.12.3.4.3.3 | A detailed specification for the modification shall be generated including the necessary activities for verification and validation, such as a definition of suitable test cases. | | P |
| H.11.12.3.4.3.4 | The modification shall be carried out as planned. | | P |
| H.11.12.3.4.3.5 | The assessment of the modification shall be carried out based on the specified verification and validation activities. This may include:<br>– a reverification of changed software modules;<br>– a reverification of affected software modules;<br>– a revalidation of the complete system. | | P |
| H.11.12.3.4.3.6 | All details of modification activities shall be documented. | | P |
| H.11.12.3.5 | For class C control functions, the manufacturer shall have used one of the combinations (a–p) of analytical measures given in the columns of Table H.9 during hardware development. | | N/A |
| Table H.9 | Combinations of analytical measures during hardware development | | N/A |

## *Part A Software about Safety Critical Function (SCF)*

### *A.1 Overview*

Assembly language is used in this project.
In order to avoid systematic failure, the left part of V-Model is applied in the software design, from requirement to coding. Proper diagnostics, cooperating with hardware, are provided to detect hardware random failures.

### *A.2 SCF List*

| SCF No. | SCF | Required PL | Remark |
|---|---|---|---|
| SCF 01 | Prevent unwanted switch-on | Shall not loss | Software function refer to Part B<br>Hardware fault is not considered in this report |
| SCF 02 | Provide desired switch-off | Shall not loss | Software function refer to Part B<br>Hardware fault is not considered in this report |
| SCF 03 | Provide desired direction of rotation | b | Software function refer to Part B<br>Hardware fault is not considered in this report |
| SCF 04 | Speed control function | a | Software function refer to Part B<br>Hardware fault is not considered in this report |
| SCF 05 | Braking function | b | Software function refer to Part B<br>Hardware fault is not considered in this report |
| SCF 06 | Non-self-resetting function | a | Software function refer to Part B<br>Hardware fault is not considered in this report |
| SCF 07 | Overload protection | a | Software function refer to Part B<br>Hardware fault is not considered in this report |

## *A.3 SCF requirements*

### *A.3.1 Prevent unwanted switch-on requirement*

The power switch shall prevent unwanted switch-on.
This requirement is realized by prevent unwanted switch-on function.

### *A.3.2 Provide desired switch-off requirement*

The power switch shall provide desired switch-off.
This requirement is realized by desired switch-off function.

### *A.3.3 Provide desired direction of rotation requirement*

The system shall provide desired direction of rotation for motor.
This requirement is realized by direction of rotation function.

### *A.3.4 Speed control requirement*

The system shall limit the motor speed by speed control loop.
This requirement is realized by speed control function.

### *A.3.5 Braking function requirement*

The system shall provide electronic braking when braking signal is received.
This requirement is realized by braking function.

### *A.3.6 Overload protection requirement*

The system shall provide protection when motor is overloaded.
The requirement is realized by overload protection.

### *A.3.7 Non-self-resetting requirement*

The protection circuit that switch off the chain saw, shall be of the non-self-resetting type.
This requirement is realized by non-self-resetting function.

### *A.3.8 Self-test requirement*

The system will do self-test when system start-up, if error detected in self-test program, the system will set to a safe state.
The requirement is realized by self-test function.

#### *A.3.8.1 Registers test*

Register test has power up & periodically self-test.
This test ensures that the bits in the registers are not stuck at a value ‘0’ or ‘1’.
Test patterns are used in this test.
If the register is error, the system will set to a safe state.
Further test will be carried out to guarantee the compliance of intended action/operation.

#### *A.3.8.2 Programme counter test*

PC test has power up & periodically self-test.
This test ensures that when the bits in the PC are stuck at ‘0‘ or ‘1‘, the system will not result in a hazard condition. If the PC is error, the system will set to a safe state.
The watchdog with independent clock is used to avoid PC fault stuck at.

Further test will be carried out to guarantee the compliance of intended action/operation.

#### *A.3.8.3 Interrupt handling and execution test*

Interrupt test has power up & periodically self-test.
This test ensures that interrupts occur and are handled as expectation.
If there is no interrupt, the system will set to a safety state.
The frequency of interrupt is ensured by clock test.
Further test will be carried out to guarantee the compliance of intended action/operation.

#### *A.3.8.4 Clock test*

Clock test has power up & periodically self-test.
This test ensures that the clock works at correct frequency.
Time slot monitoring is used in this test.
In this system, the CPU has 2 internal timers, high speed timer used for system clock, lower speed timer used for the calibration. If the clock is error, the system will set to a safety state.
Further test will be carried out to guarantee the compliance of intended action/operation.

#### *A.3.8.5 Invariable memory test*

Invariable memory test has power up & periodically self-test.
This test ensures that all single bit faults can be detected.
CRC calculation method is used in this test.
If the result of calculation is incorrect, the system will set to a safety state.
Further test will be carried out to guarantee the compliance of intended action/operation.

#### *A.3.8.6 Variable memory test*

Variable memory test has self-test.
This test ensures that DC fault can be detected. The shifting of ‘0’ and ‘1’ test pattern is used in this test.
Power on self test and periodic self test is performed by checking March-C Test for data bus.
If any failure found in the RAM, the system will set to a safe state.
Further test will be carried out to guarantee the compliance of intended action/operation.

#### *A.3.8.7 Addressing (relevant to variable and invariable memory) test*

This test ensures that the bits in the address bus are not stuck at a value ‘0’ or ‘1’.
A step by step traversal test pattern is used.
Further test will be carried out to guarantee the compliance of intended action/operation.

#### *A.3.8.8 Input/output periphery test*

This test ensures the plausibility of input/output peripheral.
Further test will be carried out to guarantee the compliance of intended action/operation.

#### *A.3.8.9 A/D and D/A convertor test*

This test ensures the plausibility of A/D and D/A convertor.
Further test will be carried out to guarantee the compliance of intended action/operation.

## *Part B Tools*

### *B.1 Overview*

In order to avoid the systematic failure that caused by software tools, the qualification is required to increase the confidence in development, verification and management.

### *B.2 OS*

Windows

| | |
|---|---|
| Usage | OS |
| Version | 7 (SP1) |
| Tool classification | T1 |

### *B.3 Development*

CubeSuite

| | |
|---|---|
| Usage | Coding, Compiling, Linking |
| Version | 1.02.01 |
| Tool classification | T3 |

Altium Designer

| | |
|---|---|
| Usage | Drawing schematic, layout |
| Version | 17.1.6 (Build 538) |
| Tool classification | T3 |

### *B.4 Management*

7zip

| | |
|---|---|
| Usage | Archiving the entire software workspace |
| Version | 17.00 (x64) |
| Tool classification | T1 |

Word

| | |
|---|---|
| Usage | Maintaining the changes, date |
| Version | 2013 (15.0.4420.1017) |
| Tool classification | T1 |

Excel

| | |
|---|---|
| Usage | Performing impact analysis |
| Version | 2013 (15.0.4420.1017) |
| Tool classification | T1 |

## *Part D Compliance Assurance*

### *D.1 General*

The fingerprint of software is extracted by Hash algorithm to make the embedded software which has been evaluated compliant with that used in mass production.

### *D.2 "Fingerprint Extractor" capture:*

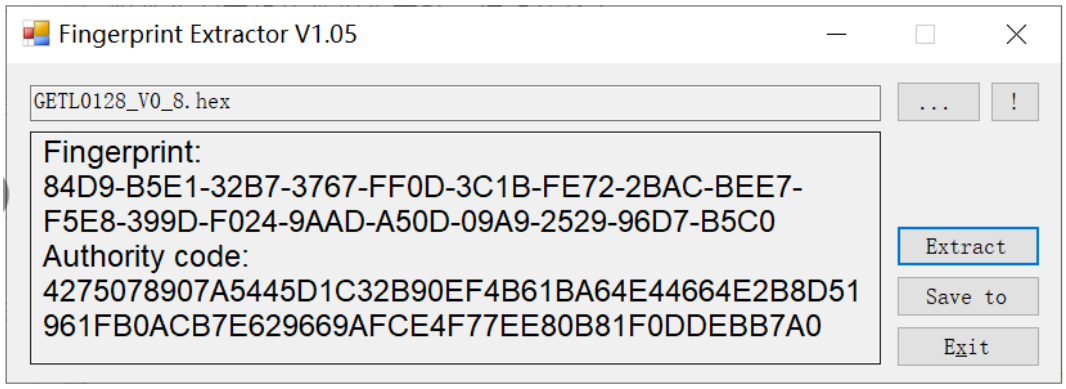



*Figure D.1*

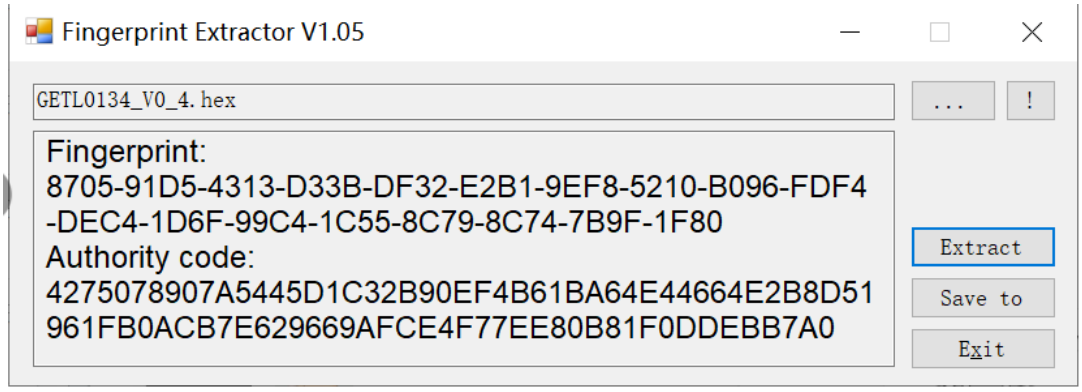



*Figure D.2*

### *D.3 "Fingerprint Extractor" authority*

| Fingerprint Extractor | |
|---|---|
| Version | 1.05 |
| Authority code | 4275078907A5445D1C32B90EF4B61BA64E44664E2B8D51961FB0A CB7E629669AFCE4F77EE80B81F0DDEBB7A0 |
| Valid | Yes |

### *D.4 Fingerprint of embedded software*

Object code: GETL0128_V0_8.hex

84D9-B5E1-32B7-3767-FF0D-3C1B-FE72-2BAC-BEE7-F5E8-399D-F024-9AAD-A50D-09A9-2529-96D7-B5C0

Object code: GETL0134_V0_4.hex

8705-91D5-4313-D33B-DF32-E2B1-9EF8-5210-B096-FDF4-DEC4-1D6F-99C4-1C55-8C79-8C74-7B9F-1F80

**--- End of Test Report ---**

**TÜV Rheinland Group**

TÜVRheinland®

**Our Reference** ZC10-XD-50050508 003

## Constructional Data Form (CDF) for Electrical Appliances



| | | |
|---|---|---|
| License holder | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No. 48 Aodihu Road, Taiping District, Wenling City, Zhejiang Province 317500, P. R. China |
| Factory | : | Zhejiang Zomax Garden Machinery Co., Ltd.<br>No. 48 Aodihu Road, Taiping District, Wenling City, Zhejiang Province 317500, P. R. China |
| Type of Appliance | : | Cordless chain saw |
| Type Designation | : | ZMDC501 |
| Rating | : | 58 V d.c. |
| Supply connection | : | ☐ fixed power cord<br>☐ permanent connection<br>☐ appliance inlet<br>☐ direct plug in<br>☒ battery operated |

Please tick above box ☒ when applicable

Additional information :

**Critical Components**

| Object/part No. | Manufacturer/ trademark | Type/ model | Technical data | Standard | Mark(s) of conformity |
|---|---|---|---|---|---|
| Brushless motor | Zhejiang Zomax Garden Machinery Co., Ltd. | 4.031.0011.051 | 58 V d.c | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Brushless motor controller | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMDC501 | Hardware version: GX-PT62-V1.3<br>Software version: GETL0128_V0_8 | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Battery charger | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMLC5120E | Input: 220-240 V~, 50 Hz, 1 A;<br>Output: 58 V d.c., 2 A | EN 60335-1<br>EN 60335-2-29 | TUV Rh<br>AN 50477504 |
| Alternative | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMLC5150E | Input: 220-240 V~, 50/60 Hz, 2 A;<br>Output: 58 V d.c., 5,5 A MAX. | EN 60335-1<br>EN 60335-2-29 | TUV Rh<br>AN 50460798 |

**TÜV Rheinland Group**

2023-04-06 Xu Dong

**Date** **Name** **Signature**

| | | | | | |
|---|---|---|---|---|---|
| Battery pack | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMLB5140 | 58 V, 4000 mAh | EN 62841-1 | Tested with appliance |
| Alternative | Zhejiang Zomax Garden Machinery Co., Ltd. | ZMLB5150 | 58 V, 5000 mAh | EN 62841-1 | Tested with appliance |
| Li-ion battery cell<br>(Used for battery pack ZMLB5140) | JIANGSU HIGHSTAR BATTERY MANUFACTURING CO., LTD. | ISR18650-2000 | 3,7 V, 2000 mAh | IEC 62133-2 | UL CB<br>DK-83304-UL |
| Li-ion battery cell<br>(Used for battery pack ZMLB5150) | Samsung SDI Co., Ltd. | INR18650-25R++(INR19/65) | 3,7 V, 2500 mAh | IEC 62133-2 | TUV Rh CB<br>JPTUV-109241 |
| Alternative | EVE Energy Co., Ltd. | INR18650/25P | 3,6 V, 2500 mAh | IEC 62133-2 | TUV Rh CB<br>JPTUV-113891 |
| Protection PCB assembly | Zhejiang Zomax Garden Machinery Co., Ltd. | DC-58V4AH-Li V1.6 | -- | EN 62841-1 | Tested with appliance |
| Fuse on PCB assembly | LITTELFUSE INC | BF1 | 60 A | EN 62841-1 | UL<br>E211637 + tested with appliance |
| Alternative | ADLER Elektrotechnik Leipzig GmbH | AEP | 60 A | EN 62841-1 | UL<br>E485737 + tested with appliance |
| Battery pack enclosure | Zhejiang Zomax Garden Machinery Co., Ltd. | PC+ABS | -- | EN 62841-1 | Tested with appliance |

| | | | | | |
|---|---|---|---|---|---|
| Cell bracket | Zhejiang Zomax Garden Machinery Co., Ltd. | PA6+GF30 | -- | EN 62841-1 | Tested with appliance |
| Terminal bracket | Zhejiang Zomax Garden Machinery Co., Ltd. | PA6+GF30 | -- | EN 62841-1 | Tested with appliance |
| Main Switch | Ningbo CPX Electronics Technology Co., Ltd. | 61-01P | -- | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Braking Switch | Zhejiang Jiaben Electronics Co., Ltd. | DA7-5/1 | -- | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Internal wire<br>(For power transmission) | SHANGHAI CHANGAN ELECTRIC WIRE & CABLE CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E166440 + tested with appliance |
| Alternative | DONG GUAN SHENG PAI ELECTRIC WIRE & CABLE CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E347603 + tested with appliance |
| Alternative | DONGGUAN JUNHAO WIRE TECHNOLOGY CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Alternative | WUXI WEICHENG CABLE CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Alternative | SHEYANG GUANGMING PLASTIC WIRE CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E190412 + tested with appliance |
| Internal wire<br>(For power transmission) | SHANGHAI CHANGAN ELECTRIC WIRE & CABLE CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E166440 + tested with appliance |

| | | | | | |
|---|---|---|---|---|---|
| Alternative | DONG GUAN SHENG PAI ELECTRIC WIRE & CABLE CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E347603 + tested with appliance |
| Alternative | SHENZHEN MYSUN INSULATION MATERIALS CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E239689 + tested with appliance |
| Alternative | QIFURUI ELECTRONICS CO | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E211048 + tested with appliance |
| Alternative | JIANGYIN DENGFENG SPECIAL WIRE & CABLE CO LTD | 3135 | 14 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E212429 + tested with appliance |
| Internal wire<br>(For other parts) | SHANGHAI CHANGAN ELECTRIC WIRE & CABLE CO LTD | 3135 | 22 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E166440 + tested with appliance |
| Alternative | DONG GUAN SHENG PAI ELECTRIC WIRE & CABLE CO LTD | 3135 | 22 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E347603 + tested with appliance |
| Alternative | SHENZHEN MYSUN INSULATION MATERIALS CO LTD | 3135 | 22 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E239689 + tested with appliance |
| Alternative | QIFURUI ELECTRONICS CO | 3135 | 22 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E211048 + tested with appliance |

| | | | | | |
|---|---|---|---|---|---|
| Alternative | JIANGYIN DENGFENG SPECIAL WIRE & CABLE CO LTD | 3135 | 22 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E212429 + tested with appliance |
| Alternative | YUEQING BOYUAN ELECTRONIC WIRE & CABLE CO LTD | 2651<br>1007 | 26-28 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E203561 + tested with appliance |
| Alternative | XINYA ELECTRONIC CO LTD | 2651<br>1007 | 26-28 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E170689 + tested with appliance |
| Alternative | ZHEJIANG XINXIN ELECTRONIC WIRE ROD CO LTD | 2651<br>1007 | 26-28 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E225383 + tested with appliance |
| Alternative | DONGGUAN TRIUMPHCABLE CO LTD | 2651<br>1007 | 26-28 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E249743 + tested with appliance |
| Alternative | Suzhou Dian Hang Electronic Co Ltd | 2651<br>1007 | 26-28 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E354173 + tested with appliance |
| Alternative | CHANGZHOU HONG CHANG ELECTRONICS CO LTD | 1007 | 26-28 AWG | EN 62841-1<br>EN 62841-4-1 | UL<br>E212395 + tested with appliance |
| 14 inch saw chain | Oregon Cutting Systems Division Blount, Inc. | 91P052X | Specified pitch: 9,525 mm (3/8 inch); Specified gauge: 1,27 mm (0,050 inch) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Alternative | Oregon Cutting Systems Division Blount, Inc. | 90PX052X | Specified pitch: 9,525 mm (3/8 inch); Specified gauge: 1,27 mm (0,050 inch) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| 16 inch saw chain | Oregon Cutting Systems Division Blount, Inc. | 91P056X | Specified pitch: 9,525 mm (3/8 inch); Specified gauge: 1,27 mm (0,050 inch) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |

**TÜV Rheinland Group**

TÜVRheinland®

**Our Reference** ZC10-XD-50050508 003

## Constructional Data Form (CDF) for Electrical Appliances



| | | | | | |
|---|---|---|---|---|---|
| Alternative | Oregon Cutting Systems Division Blount, Inc. | 90PX056X | Specified pitch: 9,525 mm (3/8 inch); Specified gauge: 1,27 mm (0,050 inch) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| 18 inch saw chain | Oregon Cutting Systems Division Blount, Inc. | 91P062X | Specified pitch: 9,525 mm (3/8 inch); Specified gauge: 1,27 mm (0,050 inch) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| 14 inch guide bar | Oregon Cutting Systems Division Blount, Inc. | 140SDEA041 or 518304 | Guide bar length: 14 inch (420 mm) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Alternative | Zhejiang Zomax Garden Machinery Co., Ltd. | ZM14-52-50-3/8 | Guide bar length: 14 inch (420 mm) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Alternative | Oregon Cutting Systems Division Blount, Inc. | 144MLEA041 | Guide bar length: 14 inch (420 mm) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| 16 inch guide bar | Oregon Cutting Systems Division Blount, Inc. | 160SDEA041 or 564489 | Guide bar length: 16 inch (455 mm) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Alternative | Zhejiang Zomax Garden Machinery Co., Ltd. | ZM16-56-50-3/8 | Guide bar length: 16 inch (455 mm) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Alternative | Oregon Cutting Systems Division Blount, Inc. | 164MLEA041 | Guide bar length: 16 inch (455 mm) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| 18 inch guide bar | Oregon Cutting Systems Division Blount, Inc. | 180SDEA041 | Guide bar length: 18 inch (510 mm) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Alternative | Zhejiang Zomax Garden Machinery Co., Ltd. | ZM18-62-50-3/8 | Guide bar length: 18 inch (510 mm) | EN 62841-1<br>EN 62841-4-1 | Tested with appliance |
| Label | AVERY DENNISON (CHINA) CO LTD | 25 micron clear PET TC/S333 | 100°C ~ -40°C, affixed to PA enclosure | ANSI/UL 969 | UL<br>MH20558 |

**TÜV Rheinland Group**

2023-04-06 Xu Dong

**Date** **Name** **Signature**