UL 62841-1

STANDARD FOR SAFETY

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

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UL Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 1: General Requirements, UL 62841-1

First Edition, Dated February 20, 2015

SUMMARY OF TOPICS

The revision of ANSI/UL 62841-1 dated August 21, 2020 are issued to incorporate the following changes:

Addition Of National Difference To Clause 14 To Clarify Moisture Resistance Test Requirements For Tools Provided With An Appliance Inlet; 14.1DV

Changes To Clause 8.14.1.1 To Match The Text Of Clause 8.14.1.1 Of IEC 62841-1

Addition Of Clause K.21.203DV To Clarify Mains Connections In Lithium-Ion Battery Systems

Addition Of National Differences To Clause L.18.201 To Align Abnormal Testing Requirements With The Inherent System Protections Of Electronically Commutated Motors; L.18.201DV.1 and L.18.201DV.2

Revisions To Clause 8.2DV And Addition Of Clause 8.14DV To Clarify Language Requirements Specific To Marking And Language Requirements Specific To Instructions

Addition Of Clause K.8.2DV To Clarify Marking Requirements Applicable To Battery Packs And Detachable Battery Packs

Revisions To Clause 14.1 To Match The Text Of Clause 14.1 Of IEC 62841-1

Editorial revisions; 20.5

UL 62841-1 is an adoption of IEC 62841-1, First Edition, issued by the IEC March 2014, and includes IEC Corrigendum 1 published May, 2014 and IEC Corrigendum 2 published October 2015 for IEC 62841-1. Please note that the National Difference document incorporates all of the U.S. national differences for UL 62841-1.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated June 21, 2019 and April 3, 2020.

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CSA Group
CAN/CSA-C22.2 No. 62841-1-15
First Edition
(IEC 62841-1:2014, MOD)

Underwriters Laboratories Inc.
UL 62841-1
First Edition

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

February 20, 2015

(Title Page Reprinted: August 21, 2020)

ANSI/UL 62841-1-2020

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This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. The technical content of the IEC and ISO publications is kept under constant review by IEC and ISO. To submit a proposal for change, please send the following information to inquiries@csagroup. org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the First Edition including revisions through August 21, 2020. The most recent designation of ANSI/UL 62841-1 as an American National Standard (ANSI) occurred on August 21, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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PREFACE

This is the harmonized CSA Group and UL standard for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 1: General Requirements. It is the First edition of CAN/CSA-C22.2 No. 62841-1, and the First edition of UL 62841-1. This harmonized standard has been jointly revised on August 21, 2020. For this purpose, CSA Group and UL are issuing revision pages dated August 21, 2020.

This harmonized standard is based on IEC Publication 62841-1: First edition Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 1: General Requirements issued March 2014. IEC publication 62841-1 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Harmonization Working Group for the Adoption of the IEC Series of Hand-Held, Motor-Operated Tool Standards are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This standard was reviewed by the CSA Subcommittee on Safety of Hand-Held Motor-Operated Electric Tools, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

This is the CAN/CSA-C22.2 No. 62841-1 Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 1: General Requirements. This CSA Group Part 1 is to be used in conjunction with the appropriate CSA Group Part 2, 3, or 4, which contains clauses to supplement or modify the corresponding clauses in the Part 1, to provide relevant requirements for each type of product.

This is the UL Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 1: General Requirements. This UL Part 1 is to be used in conjunction with the appropriate UL Part 2, 3 or 4, which contains clauses to supplement or modify the corresponding clauses in the Part 1, to provide relevant requirements for each type of product.

Level of Harmonization

This standard adopts the IEC text with national differences.

This standard is published as an equivalent standard for CSA Group and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic,

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geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the CSA Group and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

Reasons for Differences From IEC

Differences from the IEC are being added in order to address safety and regulatory situations present in Canada and the U.S.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication 62841-1, Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 1: General Requirements, copyright 2014, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword and Introduction are not a part of the requirements of this standard but are included for information purposes only.

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NATIONAL DIFFERENCES

In the CSA Group and UL publications of this standard, National Differences from the text of International Electrotechnical Commission (IEC) Publication 62841-1, Standard for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 1: General Requirements, copyright 2014 are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

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>
> ***Modification / Modify*** - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.
>
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FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY – Part 1: General requirements

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62841-1 has been prepared by IEC technical committee 116: Safety of motor-operated electric tools.

This standard is scheduled to cancel and replace the fourth edition of IEC 60745-1, published in 2006, the first edition of IEC 61029-1, published in 1990, and the fifth edition of IEC 60335-1, published in 2010, only with respect to requirements concerning lawn and garden machinery. The latter publications remain valid until they are withdrawn. This standard constitutes a technical revision.

This edition includes the following significant technical changes with respect to the fourth edition of IEC 60745-1:

– requirements in various clauses introduced or modified in order to include the requirements for transportable tools and lawn and garden machinery (formerly covered by IEC 61029-1 and IEC 60335-1);

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– leakage current test and electric strength test moved from former Clauses 13 and 15 to Annexes C and D;

– former Clauses 29, 30 and 31 renumbered to become Clauses 6, 13 and 15;

– requirements for electronic SAFETY CRITICAL FUNCTIONS added to Clause 18;

– requirements for switches revised and moved from Annex I to Clause 23;

– clarifications in respect to soft materials (elastomers) added to Clauses 9, 19 and 13;

– test finger in Figure 1 of IEC 60745-1 and test probe in Figure 2 of IEC 60745-1 replaced by references to basic IEC standards;

– requirements for Li-Ion BATTERY systems added to Annexes K and L;

– Annex M removed.

The text of this standard is based on the following documents:

FDIS	Report on voting
116/156/FDIS	116/163/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This Part 1 is to be used in conjunction with the appropriate parts of IEC 62841-2, IEC 62841-3 or IEC 62841-4 which contain clauses that supplement or modify the corresponding clauses in Part 1 to provide the relevant requirements for each type of product.

NOTE 1 In this standard, the following print types are used:

– requirements: in roman type

– *test specification: in italic type*

– NOTES: IN SMALLER ROMAN TYPE

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

NOTE 2 In Annexes B, K, and L subclauses which are additional to those in the main body of the text are numbered starting from 201.

A list of all parts of the IEC 62841 series, under the general title: *Electric motor-operated handheld tools, transportable tools and lawn and garden machinery – Safety*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore. iec. ch" in the data related to the specific publication. At this date, the publication will be

• reconfirmed,

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- withdrawn,
- replaced by a revised edition, or
- amended.

NOTE 3 The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 36 months from the date of publication.

101DV DE *Modification: Add the following to Note 1 of the IEC Foreword:*

The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.

102DV DE *Modification: Replace the paragraph after Note 1 of the IEC Foreword with the following:*

Word in SMALL ROMAN CAPS in the text are defined in Clause 3.

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INTRODUCTION

Individual countries may wish to consider the application of this Part 1 of IEC 62841, so far as is reasonable, to tools not mentioned in an individual part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 and to tools designed on new principles.

Examples of standards dealing with non-safety aspects of HAND-HELD TOOLS, TRANSPORTABLE TOOLS and LAWN AND GARDEN MACHINERY are

– standards dealing with EMC aspects;

– standards dealing with environmental aspects.

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ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY – Part 1: General requirements

1 Scope

This International Standard deals with the safety of electric motor-operated or magnetically driven:

– HAND-HELD TOOLS (IEC 62841-2);

– TRANSPORTABLE TOOLS (IEC 62841-3);

– LAWN AND GARDEN MACHINERY (IEC 62841-4).

The above listed categories are hereinafter referred to as "tools" or "machines".

The RATED VOLTAGE is not more than 250 V for single-phase a.c. or d.c. tools, and 480 V for three-phase a.c. tools. The RATED INPUT is not more than 3 700 W.

The limits for the applicability of this standard for BATTERY tools are given in K.1 and L.1.

This standard deals with the hazards presented by tools which are encountered by all persons in the NORMAL USE and reasonably foreseeable misuse of the tools.

Tools with electric heating elements are within the scope of this standard.

Requirements for motors not isolated from the supply, and having BASIC INSULATION not designed for the RATED VOLTAGE of the tools, are given in Annex B. Requirements for rechargeable BATTERY-powered motor-operated or magnetically driven tools and the BATTERY packs for such tools are given in Annex K. Requirements for such tools that are also operated and/or charged directly from the mains or a NON-ISOLATED SOURCE are given in Annex L.

Hand-held electric tools, which can be mounted on a support or working stand for use as fixed tools without any alteration of the tool itself, are within the scope of this standard and such combination of a HAND-HELD TOOL and a support is considered to be a TRANSPORTABLE TOOL and thus covered by the relevant Part 3.

This standard does not apply to:

– tools intended to be used in the presence of explosive atmosphere (dust, vapour or gas);

– tools used for preparing and processing food;

– tools for medical purposes;

NOTE 1 IEC 60601 series covers a variety of tools for medical purposes.

– tools intended to be used with cosmetics or pharmaceutical products;

– heating tools;

NOTE 2 IEC 60335-2-45 covers a variety of heating tools.

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– electric motor-operated household and similar electrical appliances;

NOTE 3 IEC 60335 series covers a variety of electric motor-operated household and similar electrical appliances.

– electrical equipment for industrial machine-tools;

NOTE 4 IEC 60204 series deals with electrical safety of machinery.

– small low voltage transformer operated bench tools intended for model making, e.g. the making of radio controlled model aircraft or cars, etc.

NOTE 5 In the United States of America, the following conditions apply:

This standard deals with tools used in non-hazardous locations in accordance with the National Electrical Code, NFPA 70.

NOTE 6 In Canada, the following conditions apply:

This standard deals with tools used in non-hazardous locations in accordance with the Canadian Electric Code, Part 1, CSA C22.1, and General Requirements – Canadian Electrical Code, Part II,CAN/CSA-C22.2 No. 0.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60061
Lamp caps and holders together with gauges for the control of interchangeability and safety-available at http://std.iec.ch/iec60061

IEC 60065:2001
Audio, video and similar electronic apparatus – Safety requirements[1]
Amendment 1:2005
Amendment 2:2010

IEC 60068-2-75:1997
Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests

IEC/TR 60083
Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC

IEC 60085:2007
Electrical insulation – Thermal evaluation and designation

IEC 60127 (all parts)
Miniature fuses

IEC 60227 (all parts)
Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V

IEC 60238
Edison screw lampholders

IEC 60245 (all parts)
Rubber insulated cables – Rated voltages up to and including 450/750 V

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IEC 60252-1
AC motor capacitors – Part 1: General – Performance, testing and rating – Safety requirements – Guidance for installation and operation

IEC 60320 (all parts)
Appliance couplers for household and similar general purposes

IEC 60320-1
Appliance couplers for household and similar general purposes – Part 1: General requirements

IEC 60335-1:2010
Household and similar electrical appliances – Safety – Part 1: General requirements

IEC 60384-14
Fixed capacitors for use in electronic equipment – Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains

IEC 60417
Graphical symbols for use on equipment
available at http://www.graphicalsymbols.info/graphical-symbols/equipment/db1.nsf/$enHome?OpenForm

IEC 60529:2013
Degrees of protection provided by enclosures (IP Code)[2]
Amendment 1:1999
Amendment 2:2013

IEC 60664-1
Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests

IEC 60695-2-11:2000
Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products

IEC 60695-2-13:2010
Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignition temperature (GWIT) test method for materials

IEC 60695-10-2:2003
Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test

IEC 60695-11-10:2013
Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods

IEC 60730-1:2010
Automatic electrical controls for household and similar use – Part 1: General requirements

IEC 60825-1:2007
Safety of laser products – Part 1: Equipment classification and requirements

IEC 60884 (all parts)
Plugs and socket-outlets for household and similar purposes

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IEC 60906-1
IEC system of plugs and socket-outlets for household and similar purposes – Part 1: Plugs and socket-outlets 16 A 250 V a.c.

IEC 60990:1999
Methods of measurement of touch current and protective conductor current

IEC 60998-2-1
Connecting devices for low-voltage circuits for household and similar purposes – Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units

IEC 60998-2-2
Connecting devices for low-voltage circuits for household and similar purposes – Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units

IEC 60999-1:1999
Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm^2 up to 35 mm^2 (included)

IEC 61000-4-2:2008
Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test

IEC 61000-4-3:2006
Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test[3]
Amendment 1:2007
Amendment 2:2010

IEC 61000-4-4:2012
Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test

IEC 61000-4-5:2005
Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test

IEC 61000-4-6:2008
Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields

IEC 61000-4-11:2004
Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests

IEC 61032:1997
Protection of persons and equipment by enclosures – Probes for verification

IEC 61056-1
General purpose lead-acid batteries (valve-regulated types) – Part 1: General requirements, functional characteristics – Methods of test

IEC 61058-1:2000

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Switches for appliances – Part 1: General requirements[4]
Amendment 1:2001
Amendment 2:2007

IEC 61210
Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements

IEC 61540:1997
Electrical accessories – Portable residual current devices without integral overcurrent protection for household and similar use (PRCDs)[5]
Amendment 1:1998

IEC 61558-1
Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests

IEC 61558-2-4
Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers

IEC 61558-2-6
Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers

IEC 61558-2-16
Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units

IEC 61951-1
Secondary cells and batteries containing alkaline or other non-acid electrolytes – Portable sealed rechargeable single cells – Part 1: Nickel-cadmium

IEC 61951-2
Secondary cells and batteries containing alkaline or other non-acid electrolytes – Portable sealed rechargeable single cells – Part 2: Nickel-metal hydride

IEC 61960
Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications

IEC 61984
Connectors – Safety requirements and tests

IEC 62133
Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications

IEC 62233
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure

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IEC 62471
Photobiological safety of lamps and lamp systems

IEC/TR 62471-2:2009
Photobiological safety of lamps and lamp systems – Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety

ISO 1463
Metallic and oxide coatings – Measurement of coating thickness – Microscopical method

ISO 2178
Non-magnetic coatings on magnetic substrates – Measurement of coating thickness – Magnetic method

ISO 2768-1
General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications

ISO 3744
Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane

ISO 3864-2
Graphical symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels

ISO 3864-3
Graphical symbols – Safety colours and safety signs – Part 3: Design principles for graphical symbols for use in safety signs

ISO 4871:1996
Acoustics – Declaration and verification of noise emission values of machinery and equipment

ISO 5347 (all parts)
Methods for the calibration of vibration and shock pick-ups

ISO 5349-1
Mechanical vibration – Measurement and evaluation of human exposure to handtransmitted vibration – Part 1: General requirements

ISO 5349-2
Mechanical vibration – Measurement and evaluation of human exposure to handtransmitted vibration – Part 2: Practical guidance for measurement in the workplace

ISO 7000:2012
Graphical symbols for use on equipment – Index and synopsis

ISO 7010
Graphical symbols – Safety colours and safety signs – Registered safety signs

ISO 7574-4
Acoustics – Statistical methods for determining and verifying stated noise emission values of machinery and equipment – Part 4: Methods for stated values for batches of machines

ISO 8041

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Human response to vibration – Measuring instrumentation

ISO 9772:2012
Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame

ISO 11201
Acoustics – Noise emitted by machinery and equipment – Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections

ISO 11203
Acoustics – Noise emitted by machinery and equipment – Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level

ISO 12100
Safety of machinery – General principles for design – Risk assessment and risk reduction

ISO 13849-1
Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design

ISO 13850
Safety of machinery – Emergency stop – Principles for design

ISO/TR 11690-3
Acoustics – Recommended practice for the design of low-noise workplaces containing machinery – Part 3: Sound propagation and noise prediction in workrooms

ISO 16063-1
Methods for the calibration of vibration and shock transducers – Part 1: Basic concepts

EN 12096
Mechanical vibration – Declaration and verification of vibration emission values

ASTM B 258
Standard specification for standard nominal diameters and cross-sectional areas of AWG sizes of solid round wires used as electrical conductors

UL 969
Standard for marking and labeling systems

NOTE 1 In the United States of America, the following normative reference applies:

US Code of Federal Regulations (CFR) Title 21 Food and Drugs.

NOTE 2 In Canada, the following normative reference applies:

C.R.C., c. 1370 Radiation Emitting Devices Regulations

NOTE 3 In Europe (EN 62841-1), the following normative references apply:

CR 1030-1 Hand-arm vibration – *Guidelines for vibration hazards reduction – Part 1: Engineering methods by design of machinery*

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EN ISO 11688-1, *Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 1: Planning (ISO/TR 11688-1)*

[1] There exists a consolidated version (Edition 7.2:2011) which includes IEC 60065:2001 and its Amendment 1 (2005) and Amendment 2 (2010).

[2] There exists a consolidated version (Edition 2.2:2013) which includes IEC 60529:1989 and its Amendment 1 (1999) and Amendment 2 (2013).

[3] There exists a consolidated version (Edition 3.2:2010) which includes IEC 61000-4-3:2006 and its Amendment 1 (2007) and Amendment 2 (2010).

[4] There exists a consolidated version (Edition 3.2:2008) which includes IEC 61058-1:2000 and its Amendment 1 (2001) and Amendment 2 (2007).

[5] There exists a consolidated version (Edition 1.1:1999) which includes IEC 61540:1997 and its Amendment 1 (2001).

2DV DE *Modification: Add the following note to Clause 2:*

See Annex DVA for additional reference standards that may apply.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

Where the terms voltage and current are used, they imply the r.m.s. values, unless otherwise specified.

Where in this standard the expressions "with the aid of a tool", "without the aid of a tool", and "requires the use of a tool", are used, the word "tool" means a hand tool, for example a screwdriver, which may be used to operate a screw or other fixing means.

3.1 ACCESSIBLE PART: conductive part or surface of insulating materials that can be touched by means of the test probe B of IEC 61032:1997

3.2 ACCESSORY: device that is attached only to the output mechanism of the tool

3.3 ADJUSTABLE GUARD: GUARD which is adjustable as a whole or which incorporates adjustable part(s). For manually ADJUSTABLE GUARDS, the adjustment remains fixed during a particular operation

3.4 ALL-POLE DISCONNECTION: disconnection of all supply conductors except the protective earthing (grounding) conductor by a single initiating action

3.5 ATTACHMENT: device attached to the housing or other component of the tool and which may or may not be attached to the output mechanism and does not modify the NORMAL USE of the tool within the scope of this standard

3.6 BASIC INSULATION: insulation applied to LIVE PARTS to provide protection against electric shock. Insulation applied to LIVE PARTS not intended to provide electric shock protection is considered to be insulation for functional purposes, such as magnet wire insulation

3.7 BATTERY: assembly of one or more CELLS intended to provide electrical current to the tool

3.8 CLASS I TOOL: tool in which protection against electric shock does not rely on basic, double or REINFORCED INSULATION only, but which includes an additional safety precaution in that conductive

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ACCESSIBLE PARTS are connected to the protective earthing conductor in the fixed wiring of the installation in such a way that conductive ACCESSIBLE PARTS cannot become live in the event of a failure of the BASIC INSULATION

Note 1 to entry: Also considered as CLASS I TOOLS are tools with DOUBLE INSULATION and/or REINFORCED INSULATION throughout, but also having an earthing terminal or earthing contact.

3.9 CLASS II TOOL: tool in which protection against electric shock does not rely on BASIC INSULATION only, but in which additional safety precautions, such as DOUBLE INSULATION or REINFORCED INSULATION, are provided, there being no provision for protective earthing or reliance upon installation conditions

3.10 CLASS III TOOL: tool in which protection against electric shock relies on supply at SAFETY EXTRA-LOW VOLTAGE, and in which voltages higher than those of SAFETY EXTRA-LOW VOLTAGES are not generated

3.11 CLASS II CONSTRUCTION: part of a tool for which protection against electric shock relies upon DOUBLE INSULATION or REINFORCED INSULATION

3.12 CLASS III CONSTRUCTION: part of a tool for which protection against electric shock relies upon SAFETY EXTRA-LOW VOLTAGE, and in which voltages higher than those of SAFETY EXTRA-LOW VOLTAGES are not generated

3.13 CLEARANCE: shortest distance between two conductive parts, or between a conductive part and the outer surface of the enclosure, considered as though metal foil were pressed into contact with accessible surfaces of insulating material, measured through air

Note 1 to entry: Examples of CLEARANCES are given in Annex A.

3.14 CONTROL DEVICE: device used by the user to adjust and/or regulate an electrical or mechanical function of the tool

3.15 CREEPAGE DISTANCE: shortest path between two conductive parts, or between a conductive part and the outer surface of the enclosure, considered as though metal foil were pressed into contact with accessible surfaces of insulating material, measured along the surface of the insulating material

Note 1 to entry: Examples of CREEPAGE DISTANCES are given in Annex A.

3.16 DETACHABLE PART: part which can be removed or opened without the aid of a tool, or a part which is removed in accordance with the instruction for use, except externally accessible brush caps, even if removal requires the use of a tool

Note 1 to entry: A non-detachable part is covered by the requirements of 21.22.

3.17 DOUBLE INSULATION: insulation system comprising both BASIC INSULATION and SUPPLEMENTARY INSULATION

3.18 ELECTRONIC CIRCUIT: circuit incorporating at least one ELECTRONIC COMPONENT

3.19 ELECTRONIC COMPONENT: part in which conduction is achieved principally by electrons moving through a vacuum, gas or semiconductor, with the exclusion of neon indicators

Note 1 to entry: Examples of ELECTRONIC COMPONENTS are diodes, transistors, triacs and monolithic integrated circuits. Resistors, capacitors and inductors are not considered ELECTRONIC COMPONENTS.

3.20 EXPLOSION: failure that occurs, when an enclosure opens violently and major components are forcibly expelled in a manner that could result in injury

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3.21 EXTRA-LOW VOLTAGE: voltage supplied from a source within the tool and, which, when the tool is supplied at RATED VOLTAGE, does not exceed 50 V between conductors and between conductors and earth

3.22 FIXED GUARD: GUARD affixed in such a manner (e.g. by screws, nuts, welding) that it can only be opened or removed with the use of tools or by destruction of the affixing means

3.23 GUARD: physical barrier, designed as part of the tool, to provide protection

3.24 HAND-HELD TOOL: tool intended to do mechanical work, with or without provisions for mounting on a support, and so designed that the motor and the machine form an assembly which can easily be brought to the place of operation, and which is either held or supported by hand or suspended during operation

Note 1 to entry: HAND-HELD TOOLS include tools provided with a flexible shaft, the motor being either fixed or portable.

3.25 INHERENT OPERATING CYCLE: repetitive operation of a tool designed in such a way that the complete cycle duration cannot be altered by the operator

3.26 INTERCONNECTION CORD: external flexible cord provided for electrical connections between two parts of a tool

3.27 LAWN AND GARDEN MACHINERY: tool for garden maintenance

3.28 LIQUID SYSTEM: system that employs water or a water-based liquid from an external or integral supply that is used to perform the intended function of the tool

3.29 LIVE PART: any conductor or conductive part intended to be energized in NORMAL USE, including a neutral conductor

3.30 MEAN TIME TO DANGEROUS FAILURE $MTTF_D$: expectation of the mean time to dangerous failure

3.31 MOMENTARY POWER SWITCH: POWER SWITCH that does not remain in the “on” position when the actuating device is released

3.32 non-self-resetting thermal cut-out: THERMAL CUT-OUT which requires a manual operation for resetting, or replacement of a part, in order to restore the current

Note 1 to entry: Manual operation also includes operation of the POWER SWITCH.

3.33 NON-ISOLATED SOURCE: voltage source in which the output is not isolated from the mains supply by means of a SAFETY ISOLATING TRANSFORMER

3.34 NORMAL OPERATION: conditions under which the tool is operated in NORMAL USE when it is connected to the power supply

3.35 NORMAL USE: use of a tool for which it is designed, taking into account the manufacturer's instructions

3.36 POWER SWITCH: device that electrically activates the primary function of the tool in the "on" position and deactivates the same function of the tool in its "OFF" position

3.37 PROTECTIVE DEVICE: device, the operation of which prevents a hazardous situation under abnormal operation conditions

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3.38 PROTECTIVE IMPEDANCE: impedance connected between LIVE PARTS and accessible conductive parts, and of value so that the current is limited to a safe value

3.39 RATED CURRENT: current assigned to the tool by the manufacturer

3.40 RATED FREQUENCY: frequency assigned to the tool by the manufacturer

3.41 RATED FREQUENCY RANGE: frequency range assigned to the tool by the manufacturer, expressed by its lower and upper limits

3.42 RATED INPUT: input in watts assigned to the tool by the manufacturer

3.43 RATED NO-LOAD SPEED: no-load speed assigned to the tool by the manufacturer

3.44 RATED VOLTAGE: voltage assigned to the tool by the manufacturer. For three-phase supply, it is the voltage between phases

3.45 RATED VOLTAGE RANGE: voltage range assigned to the tools by the manufacturer, expressed by its lower and upper limits

3.46 REINFORCED INSULATION: insulation of LIVE PARTS which provides a degree of protection against electric shock equivalent to DOUBLE INSULATION

Note 1 to entry: Examples of REINFORCED INSULATION are a single layer or several layers which cannot be tested singly as BASIC INSULATION or SUPPLEMENTARY INSULATION.

3.47 RESIDUAL CURRENT DEVICE RCD: device intended to detect a diversion of current from a circuit in a way that may expose the user to an electric shock; in such conditions the device opens the circuit

Note 1 to entry: Such a device is also known as portable RESIDUAL CURRENT DEVICE (PRCD), ground fault circuit interrupter (GFCI) or earth leakage circuit breaker (ELCB).

3.48 SAFETY CRITICAL FUNCTION SCF: function(s) required by this standard, the loss of which would cause the tool to function in such a manner as to expose the user to a risk that is in excess of the risk that is permitted by this standard under abnormal conditions

3.49 SAFETY EXTRA-LOW VOLTAGE: voltage not exceeding a peak value of 42,4 V between conductors and between conductors and earth, the no-load voltage not exceeding a peak value of 50 V, in an electric circuit which has galvanic separation from the supplying electric power system by such means as a SAFETY ISOLATING TRANSFORMER or a converter with separate windings, the insulation of which complies with DOUBLE INSULATION or REINFORCED INSULATION requirements

3.50 SAFETY ISOLATING TRANSFORMER: transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to DOUBLE INSULATION or REINFORCED INSULATION, and which is intended to supply a distribution circuit, a tool or other equipment at SAFETY EXTRA-LOW VOLTAGE

3.51 SELF-RESETTING THERMAL CUT-OUT: THERMAL CUT-OUT which automatically restores the current after the relevant part of the tool has cooled down to a given value

3.52 SUPPLEMENTARY INSULATION: independent insulation applied in addition to the BASIC INSULATION, in order to provide protection against electric shock in the event of a failure of the BASIC INSULATION

3.53 SUPPLY CORD: flexible cord, for supply purposes, which is fixed to the tool

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3.54 TEMPERATURE LIMITER: temperature-sensing device, the operating temperature of which may be either fixed or adjustable, and which, during NORMAL OPERATION, operates by opening or closing a circuit when the temperature of the controlled part reaches a predetermined value

Note 1 to entry: This does not reverse this operation of opening or closing a circuit during the NORMAL OPERATION of the tool.

3.55 THERMAL CUT-OUT: device which, during abnormal operation, limits the temperature of the controlled part by automatically opening the circuit, or by reducing the current, the setting of which cannot be altered by the user

3.56 THERMAL LINK: THERMAL CUT-OUT which operates only once, and then requires partial or complete replacement

3.57 THERMOSTAT: temperature-sensing device, the operating temperature of which may be either fixed or adjustable; and which, during NORMAL OPERATION, keeps the temperature of the controlled part between certain limits by automatically opening and closing a circuit

3.58 TRANSPORTABLE TOOL: tool that has the following characteristics:

a) intended to be taken to various designated working areas. The tool performs work on the material that is either brought to the tool, the tool is mounted to the workpiece or the tool is placed in proximity of the workpiece;

b) intended to be moved by one or two people, with or without simple devices to facilitate transportation, e.g. handles, wheels and the like;

c) used in a stationary position set up on a bench, table, floor or incorporating a device that performs the function of a bench or table, with or without fixing, e.g. fast clamping devices, bolting and the like, or mounted to the workpiece;

d) used under the control of an operator;

e) either the workpiece or the tool is fed or introduced manually;

f) not intended for continuous production or production line use;

g) if mains operated, supplied with a flexible SUPPLY CORD and plug

3.59 TYPE X ATTACHMENT: method of ATTACHMENT of the SUPPLY CORD specified by the manufacturer so that it can easily be replaced

3.60 TYPE Y ATTACHMENT: method of ATTACHMENT of the SUPPLY CORD such that any replacement is intended to be made by the manufacturer, its service agent or similar qualified person

3.61 TYPE Z ATTACHMENT: method of ATTACHMENT of the SUPPLY CORD so that it cannot be replaced without breaking or destroying the tool

3.62 USER MAINTENANCE: maintenance operation(s) which are intended to be carried out by the user in accordance with the instruction manual

3.63 WORKING VOLTAGE: maximum voltage, without the effect of transient voltages, to which the part under consideration is subjected when the tool is supplied at its RATED VOLTAGE and operating with RATED INPUT or RATED CURRENT

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4 General requirements

Tools shall be so constructed that they operate safely so as to cause no danger to persons or surroundings.

Tools that have clearly separate modes of operation shall comply separately with the requirements applicable to each specific mode of operation.

Multifunction tools shall comply separately with the applicable part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 and shall take into account any other hazards due to the combination of functions.

NOTE In Europe (EN 62841-1), the above paragraph is not applicable.

Compliance is checked by fulfilling the relevant requirements and carrying out the relevant tests of this standard.

5 General conditions for the tests

5.1 *Tests according to this standard are type tests. General test conditions in Clause 5 apply unless otherwise specified in this standard.*

NOTE Annex F shows an example of routine tests.

5.2 *The tests are made on separate samples. However, at the manufacturer's discretion, fewer samples may be used.*

The cumulative stress resulting from successive tests on ELECTRONIC CIRCUITS *is to be avoided. It may be necessary to replace components or to use additional samples.*

If several tests are conducted on a single sample, then the results shall not be affected by previous tests.

5.3 *If it is evident from the construction of the tool that a particular test is not applicable, the test is not made.*

5.4 *The tests are carried out with the tool, and/or any movable part of it, placed in the most unfavourable position that may occur in* NORMAL USE.

5.5 *Tools provided with controls or switching devices are tested with these controls or devices adjusted to their most unfavourable settings, if the setting can be altered by the user. Electronic speed* CONTROL DEVICES *are set for the highest speed.*

If the adjusting means of the control is accessible without the aid of a tool, 5.5 applies whether the setting can be altered by hand or with the aid of a tool. If the adjusting means is not accessible without the aid of a tool, and if the setting is not intended to be altered by the user, 5.5 does not apply.

Adequate sealing is regarded as preventing alteration of the setting by the user.

5.6 *The tests are made in a draught-free location and at an ambient temperature of (20 ±5) °C.*

If the temperature attained by any part is limited by a temperature sensitive device, the ambient temperature is, in case of doubt, maintained at (23 ±2) °C.

5.7 *The test conditions related to frequency and voltage are specified in 5.7.1 to 5.7.3.*

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5.7.1 *Tools for a.c. only are tested with a.c. at RATED FREQUENCY, if marked, and those for a.c./d.c. are tested with the most unfavourable supply.*

Tools for a.c. which are not marked with RATED FREQUENCY, or marked with a RATED FREQUENCY RANGE of 50 Hz to 60 Hz or with 50/60 Hz, are tested with either 50 Hz or 60 Hz, whichever is the most unfavourable, unless the tool employs only series motors, in which case either frequency may be used.

5.7.2 *Tools having more than one RATED VOLTAGE or having a RATED VOLTAGE RANGE are tested at the highest voltage.*

5.7.3 *For tests that require a value for RATED CURRENT and with tools where there is no marked RATED CURRENT, the value of the RATED CURRENT is substituted by the current measured when the tool is operated at RATED INPUT at the lowest RATED VOLTAGE or the lower value of the RATED VOLTAGE RANGE.*

5.8 *When alternative heating elements or ATTACHMENTS are made available for the tool by its manufacturer, the tool is tested with those heating elements or ATTACHMENTS which give the most unfavourable results.*

5.9 *Tools are tested with the specified flexible SUPPLY CORD connected to the tool.*

5.10 *If CLASS I TOOLS have ACCESSIBLE PARTS which are not connected to an earthing terminal or earthing contact, and are not separated from LIVE PARTS by an intermediate metal part which is connected to an earthing terminal or earthing contact, such parts are checked for compliance with the appropriate requirements specified for CLASS II CONSTRUCTION.*

5.11 *If CLASS I TOOLS or CLASS II TOOLS have parts operating at SAFETY EXTRA-LOW VOLTAGE, such parts are checked for compliance with the appropriate requirements specified for CLASS III TOOLS.*

5.12 *When testing ELECTRONIC CIRCUITS, the supply is to be free from those perturbations from external sources that can influence the results of the tests.*

5.13 *If, in NORMAL USE, a heating element, if any, cannot be operated unless the motor is running, the element is tested with the motor running. If the heating element can be operated without the motor running, the element is tested with or without the motor running, whichever is the more unfavourable. Heating elements incorporated in the tool are connected to a separate supply unless otherwise specified.*

5.14 *For ATTACHMENTS performing a function which is within the scope of one of the relevant parts of IEC 62841-2, IEC 62841-3 or IEC 62841-4, the tests are made in accordance with that part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.*

5.15 *If a torque is to be applied, the method of loading is chosen so as to avoid additional stresses, such as those caused by side thrust. Additional loads necessary for the correct operation of the tool are, however, taken into consideration.*

If a brake is used for applying a load, it must be applied gradually to assure that the starting current does not affect the test. Modification of output means for purpose of loading is permitted for the connection to a brake.

5.16 *Tools intended to be operated at SAFETY EXTRA-LOW VOLTAGE are tested using a supply transformer intended to be used with the tool.*

5.17 *If a requirement is based upon the mass of the tool, the mass shall be determined without SUPPLY CORD, if any, and without tool bits or ACCESSORIES, but with all equipment and ATTACHMENTS needed for*

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NORMAL USE. Details of the required ACCESSORIES, equipment and ATTACHMENTS are given in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.

If the tool is supplied with more than one ACCESSORY, equipment or ATTACHMENT, the heaviest configuration shall be used to determine the mass.

5.18 *If linear and angular dimensions are specified without a tolerance, ISO 2768-1, class "c" is applicable.*

5.19 *All electrical measurements shall be made with a maximum measurement error of 5%.*

Instruments for measuring voltage shall have an input resistance of at least 1 MΩ with a maximum parallel capacitance of 150 pF.

5.20 *Thermal equilibrium is considered achieved when the total deviation of three successive temperature rise readings, taken at 3 min intervals, does not exceed 4 K. For induction motors, a measurement time of 1 h is considered sufficient.*

For motors, thermal equilibrium may be evaluated by measuring the temperature of the stator laminations.

6 Radiation, toxicity and similar hazards

6.1 Tools shall not emit harmful radiation, or present a toxic or similar hazard.

Compliance is checked by the test, given in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4, where necessary.

NOTE Previous studies have shown that the level of electromagnetic fields (EMF) emitted by power tools and garden machinery, measured in accordance with IEC 62233, is far below the applicable limits, provided the sole significant source of EMF is the motor, which is typically a universal, DC (with or without brushes), induction or solenoid motor. Therefore, a general measurement in accordance with IEC 62233 was regarded as not necessary.

6.2 If the tool is fitted with a laser to indicate a cutting line or the like, the laser class shall be 2M or lower, according to IEC 60825-1:2007.

In addition, the tool shall be marked with the symbol(s) as required by IEC 60825-1:2007 for the relevant laser class.

Compliance is checked by inspection.

6.3 If a tool is fitted with non-coherent light sources, users of tools shall be cautioned as to the risk of potential photo-biological harm, if such harm exists.

Depending on the type of light source, the requirements of 6.3.1, 6.3.2 or 6.3.3 apply.

6.3.1 Visible light indicators (pilot lamps) and Infrared sources used for signalling and communication are considered to have no risk of photo-biological harm and require no marking.

Compliance is checked by inspection.

6.3.2 Tools emitting visible light from electroluminescent, incandescent or LED sources are considered to be for short term, non-general light services use where exposure is both incidental and intermittent.

Tools emitting light from these sources shall be marked with one of the following:

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– "**CAUTION** Do not stare at operating lamp", or

– symbol IEC 60417-6041(2010-08).

The marking may be omitted, if it can be demonstrated that the emitted light presents no reasonable risk of harm.

The emitted light is considered to present no reasonable risk or harm, if either

– the light emission at a distance of 200 mm along any direction of the tool is below 500 Lux; or

– the luminance light emission is less than 10 000 cd/m^2 in the range of visible light; or

– the light source (if not focused by external optics) is in Risk Group 1 or lower evaluated by the methods of IEC 62471; or

– the tool itself is evaluated by the methods of IEC 62471 and found to be in Risk Group 1 or lower.

Compliance is checked by measurement and by the methods specified in IEC 62471.

6.3.3 For light derived by sources other than those mentioned in 6.3.2, the product shall be evaluated by the methods of IEC 62471 and the markings shall be guided by 5.4 of IEC/TR 62471-2:2009.

Compliance is checked by inspection and by the methods specified in IEC 62471.

7 Classification

7.1 Tools shall be of one of the following classes with respect to protection against electric shock:

CLASS I, CLASS II, CLASS III.

Compliance is checked by inspection and by the relevant tests.

7.2 Tools shall have the appropriate degree of protection against harmful ingress of water according to IEC 60529:2013. If a degree other than IPX0 is required this shall be specified in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.

Compliance is checked by inspection and by the relevant tests.

8 Marking and instructions

8.1 Tools shall be marked with rating information as follows:

– RATED VOLTAGE (S) or RATED VOLTAGE RANGE, in volts. Tools for star-delta connection shall be clearly marked with the two RATED VOLTAGES (for example 230 Δ/ 400 Y). A tool that complies with this standard for a voltage range, may also be marked with any single voltage or smaller voltage range within that range;

– symbol for nature of supply, unless the RATED FREQUENCY (IES) or RATED FREQUENCY RANGE is marked. The symbol for nature of supply shall be placed next to the marking for RATED VOLTAGE;

– RATED INPUT, in watts or RATED CURRENT, in amperes. The RATED INPUT or RATED CURRENT to be marked on the tool is the total maximum input or current that can be drawn from external circuit at the same time. If a tool has alternative components which can be selected by a CONTROL DEVICE, the RATED INPUT or RATED CURRENT is that corresponding to the highest loading possible;

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– symbol for CLASS II CONSTRUCTION, for CLASS II TOOLS only;

– IP number according to degree of protection against ingress of water other than IPX0. If the first numeral for the IP numbering is omitted, the omitted numeral shall be replaced by the letter X, for example IPX5.

Compliance is checked by inspection.

8.1.1 Tools having a range of rated values such as for voltage and frequency and which can be operated without adjustment throughout the range shall be marked with the lower and upper limits of the range separated by a hyphen.

Example:

115-230 V: The tool is suitable for any value within the marked range.

Tools having different rated values and which have to be adjusted for use of a particular value by the user or installer shall be marked with the different values separated by an oblique stroke. This requirement is also applicable to tools with provision for connection to both singlephase and multi-phase supplies.

Examples:

115/230 V: The tool is only suitable for the marked values.

230/400 V: The tool is only suitable for the voltages values indicated, 230 V being for singlephase operation and 400 V for three-phase operation.

Compliance is checked by inspection.

8.1.2 For tools marked with more than one RATED VOLTAGE, a RATED VOLTAGE RANGE or with more than one RATED VOLTAGE RANGE, the RATED INPUT for each of these voltages shall be marked.

The upper and lower limits of the rated power input shall be marked on the tool so that the relation between input and voltage appears distinctly, unless the difference between the upper and lower limits of a RATED VOLTAGE RANGE does not exceed 20 % of the mean value of the range, in which case the marking for RATED INPUT may be related to the mean value of the range.

Compliance is checked by inspection.

8.2 Tools shall be marked with a safety warning in one of the following versions:

– "⚠ WARNING – To reduce the risk of injury, user must read instruction manual", or

– symbol M002 of ISO 7010, or

– the appropriate symbol stated in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.

If used, the word "WARNING" shall be in capital letters not less than 2,4 mm high and shall not be separated from either the cautionary statement or the symbol ISO 7000-0434A or ISO 7000-0434B (2004-01).

If used, the statement shall be verbatim except the term "operator's manual" or "user guide" may be used for the term "instruction manual".

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If additional symbols are used, they shall be in accordance with ISO 7010 or be designed in accordance with ISO 3864-2 or ISO 3864-3.

Cautionary statements having the same signal word such as "⚠ WARNING" may be combined into one paragraph under one signal word. The order of statements shall be markings required by IEC 62841-1, markings required by the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 and then any optional markings.

Compliance is checked by inspection and by measurement.

8.2DV D1 ***Modification: Add the following to Clause 8.2:***

For tools sold in Canada, safety warnings marked on the product shall be written in both English and French. For tools sold in the United States of America, safety instructions/warnings marked on the product shall be written in English.

8.3 Tools shall be marked with additional information as follows:

– the business name and address of the manufacturer and, where applicable, his authorised representative. Any address shall be sufficient to ensure contact. Country or state, city and postal code (if any) are deemed sufficient for this purpose;

– designation of the tool,
designation of the tool may be achieved by a code that is any combination of letters, numbers or symbols, providing that this code is explained by giving the explicit designation such as "drill", "planer" etc. in the instructions supplied with the tool;

NOTE 1 An example of such code is "A123-B".

– designation of series or type,
allowing the technical identification of the product. This may be achieved by a combination of letters and/or numbers and may be combined with the designation of tool;

NOTE 2 The term "designation of series or type" is also known as model number.

– the year of manufacture and a date code identifying at least the month of manufacture;

– for tools manufactured such that its parts are shipped separately for assembly by the end user, each part shall be marked with a distinct identification on the part or the package;

– "> 25 kg" if the mass of the tool is over 25 kg.

If additional markings are used, they shall not give rise to misunderstanding.

Compliance is checked by inspection.

8.4 Markings specified in 8.1 to 8.3 shall not be on a DETACHABLE PART of the tool.

Markings specified in 8.2 and 8.3 shall be clearly discernible from the outside of the tool. For markings other than symbols, this may be achieved by the use of a fold-over label on power cords of tools with TYPE Y ATTACHMENT or TYPE Z ATTACHMENT. Other markings on the tool may be visible after removal of a cover, if necessary.

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Indications for switches and controls shall be placed on or in the vicinity of these components; they shall not be placed on parts which can be repositioned, or positioned in such a way that the marking is misleading.

Compliance is checked by inspection.

8.5 If the tool can be adjusted to suit different RATED VOLTAGES, the voltage to which the tool is adjusted shall be clearly discernible.

This requirement does not apply to tools for star-delta connection.

For tools where frequent changes in voltage setting are not required, this requirement is considered to be met if the RATED VOLTAGE to which the tool is adjusted can be determined from a wiring diagram fixed to the tool. The wiring diagram may be on the inside of a cover which has to be removed to connect the supply conductors. It shall not be on a label loosely attached to the tool.

Compliance is checked by inspection.

8.6 For units the following shall be used:

V ..... volts
A ..... amperes
Ah ..... ampere-hours
Hz ..... hertz
W ..... watts
kW ..... kilowatts
F ..... farads
μF ..... microfarads
l ..... litres
g ..... grams
kg ..... kilograms
bar ..... bars
Pa ..... pascals
h ..... hours
min ..... minutes
s..... seconds
n_0 ..... no-load speed
.../min or …min^{-1} ..... revolutions or reciprocations per minute (rpm)

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For symbols the following shall be used:

or d.c.	..... [symbol IEC 60417-5031 (2002-10)] direct current
or a.c.	..... [symbol IEC 60417-5032 (2002-10)] alternating current
3 ∿	..... three-phase alternating current
3N	..... three-phase alternating current with neutral
A	..... rated current of the appropriate fuse-link in amperes
x	..... time-lag miniature fuse-link where X is the symbol for the time/current characteristic, as given in IEC 60127
	..... [symbol IEC 60417-5019 (2006-08)] protective earth
	..... [symbol IEC 60417-5172 (2003-02)] class II tool
IPXX	..... IP symbol
	..... [symbol ISO 7000-0434A or ISO 7000-0434B (2004-01)] caution
	..... [symbol M002 of ISO 7010] read the instructions
	..... [symbol IEC 60417-5012 (2002-10)] lamp NOTE The rated wattage of the lamp may be indicated in association with this symbol
	..... [symbol IEC 60417-6041 (2010-08)] visible radiation, instructional safeguard
Ø	..... diameter
Li-Ion	..... lithium-ion battery
NiCd	..... nickel-cadmium battery
NiMH	..... nickel-metal hydride battery

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If additional symbols are used, they shall not give rise to misunderstanding and be explained in the instructions.

When other units are used, the units and their symbols shall be those of the international standardized system.

Compliance is checked by inspection.

8.7 Tools to be connected to more than two supply conductors shall be provided with a connection diagram, fixed to the tool, unless the terminals are clearly identified.

The earthing conductor is not considered to be a supply conductor. For tools for star-delta connection, the wiring diagram shall show how the windings are to be connected.

Compliance is checked by inspection.

8.8 Except for TYPE Z ATTACHMENT, terminals shall be indicated as follows:

– Terminals intended exclusively for the neutral conductor shall be indicated by the letter N.

– Earthing terminals shall be indicated by the symbol IEC 60417-5019 (2006-08).

These indications shall not be placed on screws, removable washers or other parts which might be removed when conductors are being connected.

Compliance is checked by inspection.

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8.9 Switches which may give rise to a hazard when operated shall be marked or so placed as to indicate clearly which part of the tool they control.

Compliance is checked by inspection.

8.10 The "off" position of a multi-stable POWER SWITCH shall be indicated; the indication shall be the figure O, as given by symbol IEC 60417-5008 (2002-10). A MOMENTARY POWER SWITCH which can be locked in the "on" position is not considered as a multi-stable switch.

Push-buttons used only for the "off" function shall be indicated by marking the button/position with the figure O and the colour of the button shall be red or black.

The figure O shall not be used for any other indication.

NOTE The figure O can, for example, also be used on a digital programming keyboard.

For TRANSPORTABLE TOOLS, a POWER SWITCH actuator or its cover shall not have a colour in a combination of yellow and red as specified for an emergency stop in accordance with ISO 13850.

When a flap/cover is provided and covers only the start button, the colour of the flap/cover shall not be black, red or yellow.

When a flap/cover is provided and covers the stop button, such flap/cover shall be red or black.

Compliance is checked by inspection.

8.11 CONTROL DEVICES intended to be adjusted during operation, shall be provided with an indication for the direction of adjustment to increase or to decrease the value of the characteristic being adjusted. An indication of + and – is considered to be sufficient for this requirement.

The requirement does not apply to CONTROL DEVICES provided with an adjusting means, if its fully "on" position is opposite to its "off" position.

If figures are used for indicating the different positions, the "off" position shall be indicated by the figure O and the other positions shall be indicated by figures reflecting the greater output, input, speed, etc.

The indication for the different positions of the operating means of a CONTROL DEVICE shall be placed on the device itself, or adjacent to the operating means.

Compliance is checked by inspection.

8.12 Markings required by the standard shall be legible and durable. Signs shall be in contrast such as colour, texture, or relief, to their background such that the information or instructions provided by the signs are clearly legible when viewed with normal vision from a distance of (500 + 50) mm. Signs need not be in accordance with the blue colour requirements of ISO 3864-2.

Compliance is checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

After the tests of 8.12, the marking shall be easily legible, it shall not be easily possible to remove markings.

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In considering the durability of the marking, the effect of NORMAL USE is taken into account. Thus, for example, marking by means of paint or enamel other than vitreous enamel on containers that are likely to be cleaned frequently is not considered to be durable.

The petroleum spirit to be used for the test shall be a reagent grade hexane with a minimum of 85 % as n-hexane.

NOTE The designation "n-hexane" is the chemical nomenclature for a "normal" or straight chain hydrocarbon. An example of this petroleum spirit is also known as a certified ACS (American Chemical Society) reagent grade hexane (CAS #110-54-3).

If the marking has an adhesive backing, the adhesive backing shall be durable.

Compliance is checked by either meeting the requirements of UL 969 under the conditions of occasional exposure to oil, humidity and water, and appropriate for the surface to which it is applied, or by the following tests.

– Three labels applied to the tools or a panel of the test surface material are placed in an oven for a minimum of 24 h with the oven is maintained at a temperature of (120 ±2) °C, or alternatively for a minimum of 200 h at the temperature that the label is exposed to during the test of Clause 12.

– Six additional labels applied to the tool or a panel of the test surface material are placed in a controlled atmosphere maintained at 21 °C to 30 °C with a relative humidity of minimum 45 % for at least 24 h. After this conditioning, immerse three labels in water and the other three labels in IRM 903 oil at a temperature of 21 °C to 30 °C for 48 h.

– Three additional labels applied to the tool or a panel of the test surface material are placed in a controlled atmosphere maintained at 21 °C to 30 °C with a relative humidity of minimum 45 % for 72 h.

After these conditionings, it shall not be easy to remove the label by scraping across the label with a flat steel blade of 0,8 mm thickness and any convenient width, held at right angles, and the label shall show no signs of curling.

8.12DV D2 *Modification: Add the following after the first sentence of the seventh paragraph of Clause 8.12:*

In Canada, the requirements of UL 969 are replaced with the requirements of CSA C22.2 No. 0.15.

8.13 If compliance with this standard depends upon the operation of a replaceable THERMAL LINK or fuse-link, the reference number or other means for identifying the link shall be marked on the link, or in a place that it is clearly visible after the link has failed, when the tool has been dismantled to the extent necessary for replacing the link.

This requirement does not apply to links which can only be replaced together with a part of the tool.

Compliance is checked by inspection.

8.14 An instruction manual and safety instructions shall be provided with the tool and packaged in such a way that is noticed by the user when the tool is removed from the packaging. An explanation of the symbols required by this standard and used on the tool shall be provided in either the instruction manual or the safety instructions.

They shall be written in the official language(s) of the country in which the tool is sold.

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NOTE In Europe (EN 62841-1), the following additional requirement applies:

The words "Original instructions" shall appear on the language version (s) verified by the manufacturer or his authorised representative. 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) shall be provided by the manufacturer or his authorised representative or by the person bringing the tool into the language area in question. The translations shall bear the words "Translation of the original instructions", and they shall be accompanied by a copy of the "Original instructions".

They shall be legible and contrast with the background.

They shall include the business name and address of the manufacturer and, where applicable, his authorised representative. Any address shall be sufficient to ensure contact. Country or state, city and postal code (if any) are deemed sufficient for this purpose.

They shall include the designation of the tool and series or type as required by 8.3, including description of machine such as "drill", "planer" etc.

8.14DV D1 ***Modification: Add the following to Clause 8.14:***

For tools sold in Canada, instruction manuals and safety instructions shall be written in both English and French. For tools sold in the United States of America, instruction manuals and safety instructions shall be written in English.

8.14.1 The subjects of safety instructions are the "General Power Tool Safety Warnings" of Part 1 as given in 8.14.1.1, the specific tool safety warnings of the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 and any additional safety warning statements deemed necessary by the manufacturer. The "General Power Tool Safety Warnings" and the specific tool safety warnings, if in English, shall be verbatim and in any other official language to be equivalent. The numbering of the safety instructions, as given below, is not mandatory and may be omitted or replaced by other sorting means such as bullets. The "General Power Tool Safety Warnings" may be separate from the instruction manual.

As the term "power tool" or "tool" is not appropriate for LAWN AND GARDEN MACHINERY, for these products an appropriate term such as "machine" may be used.

The term verbatim means word-for-word but permits the differences in spelling between English-speaking countries.

Format of all safety warnings must differentiate, by font, highlighting or similar means, the context of clauses as illustrated below.

All notes in the safety instructions are not to be printed, they are information for the designer of the manual.

8.14.1.1 **General power tool safety warnings**

⚠ **WARNING Read all safety warnings, instructions, illustrations and specifications provided with this power tool.** *Failure to follow all instructions listed below may result in electric shock, fire and/or serious injury.*

Save all warnings and instructions for future reference.

The term "power tool" in the warnings refers to your mains-operated (corded) power tool or BATTERY-operated (cordless) power tool.

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1) **Work area safety**

a) **Keep work area clean and well lit.** *Cluttered or dark areas invite accidents.*

b) **Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.** *Power tools create sparks which may ignite the dust or fumes.*

c) **Keep children and bystanders away while operating a power tool.** *Distractions can cause you to lose control.*

2) **Electrical safety**

a) **Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) power tools.** *Unmodified plugs and matching outlets will reduce risk of electric shock.*

b) **Avoid body contact with earthed or grounded surfaces, such as pipes, radiators, ranges and refrigerators.** *There is an increased risk of electric shock if your body is earthed or grounded.*

c) **Do not expose power tools to rain or wet conditions.** *Water entering a power tool will increase the risk of electric shock.*

d) **Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the power tool. Keep cord away from heat, oil, sharp edges or moving parts.** *Damaged or entangled cords increase the risk of electric shock.*

e) **When operating a power tool outdoors, use an extension cord suitable for outdoor use.** *Use of a cord suitable for outdoor use reduces the risk of electric shock.*

f) **If operating a power tool in a damp location is unavoidable, use a RESIDUAL CURRENT DEVICE (RCD) protected supply.** *Use of an RCD reduces the risk of electric shock.*

NOTE The term "RESIDUAL CURRENT DEVICE (RCD)" may be replaced by the term "ground fault circuit interrupter (GFCI)"or "earth leakage circuit breaker (ELCB)".

3) **Personal safety**

a) **Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired or under the influence of drugs, alcohol or medication.** *A moment of inattention while operating power tools may result in serious personal injury.*

b) **Use personal protective equipment. Always wear eye protection.** *Protective equipment such as a dust mask, non-skid safety shoes, hard hat or hearing protection used for appropriate conditions will reduce personal injuries.*

c) **Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source and/or BATTERY pack, picking up or carrying the tool.** *Carrying power tools with your finger on the switch or energising power tools that have the switch on invites accidents.*

d) **Remove any adjusting key or wrench before turning the power tool on.** *A wrench or a key left attached to a rotating part of the power tool may result in personal injury.*

e) **Do not overreach. Keep proper footing and balance at all times.** *This enables better control of the power tool in unexpected situations.*

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f) **Dress properly. Do not wear loose clothing or jewellery. Keep your hair and clothing away from moving parts.** *Loose clothes, jewellery or long hair can be caught in moving parts.*

g) **If devices are provided for the connection of dust extraction and collection facilities, ensure these are connected and properly used.** *Use of dust collection can reduce dust-related hazards.*

h) **Do not let familiarity gained from frequent use of tools allow you to become complacent and ignore tool safety principles.** *A careless action can cause severe injury within a fraction of a second.*

4) **Power tool use and care**

a) **Do not force the power tool. Use the correct power tool for your application.** *The correct power tool will do the job better and safer at the rate for which it was designed.*

b) **Do not use the power tool if the switch does not turn it on and off.** *Any power tool that cannot be controlled with the switch is dangerous and must be repaired.*

c) **Disconnect the plug from the power source and/or remove the BATTERY pack, if detachable, from the power tool before making any adjustments, changing accessories, or storing power tools** *Such preventive safety measures reduce the risk of starting the power tool accidentally.*

d) **Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool.** *Power tools are dangerous in the hands of untrained users.*

e) **Maintain power tools and accessories. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the power tool's operation. If damaged, have the power tool repaired before use.** *Many accidents are caused by poorly maintained power tools.*

f) **Keep cutting tools sharp and clean.** *Properly maintained cutting tools with sharp cutting edges are less likely to bind and are easier to control.*

g) **Use the power tool, accessories and tool bits etc. in accordance with these instructions, taking into account the working conditions and the work to be performed.** *Use of the power tool for operations different from those intended could result in a hazardous situation.*

h) **Keep handles and grasping surfaces dry, clean and free from oil and grease.** *Slippery handles and grasping surfaces do not allow for safe handling and control of the tool in unexpected situations.*

5) **Service**

a) **Have your power tool serviced by a qualified repair person using only identical replacement parts.** *This will ensure that the safety of the power tool is maintained.*

8.14.1.2 The order of the safety warnings shall be in accordance with either item A) or B) and in accordance with item C):

A) The IEC 62841-1 warnings are followed by the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings. The order of the warnings within IEC 62841-1 and the IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings shall remain as given above and in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.

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B) The IEC 62841-1 and the IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings may be divided into the sections defined by the numbered subtitles and the associated warnings below the numbered subtitle. The order of warnings within each section shall remain as given above and in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.

When warnings are presented in this manner, the title of the IEC 62841-1 "General Power Tool Safety Warnings" shall be omitted and the 1st sentence of the warnings in 8.14.1.1 and 8.14.1.3, if applicable, shall be modified as follows:

⚠ **WARNING Read all safety warnings designated by the ⚠ symbol and all instructions.**

The sections of the safety warnings shall be presented in the related topic of the instruction manual.

The instruction manual section titles for IEC 62841-1 warnings shall have a format:

⚠ **General Power Tool Safety Warnings – [Section subtitle]**

Example:

⚠ **General Power Tool Safety Warnings – Personal Safety**

The instruction manual section titles for IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings shall have a format:

⚠ **[Tool category name] Safety Warnings – [Section subtitle]**

Example:

⚠ **Circular Saw Safety Warnings – Cutting Procedures**

If particular IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings do not have a numbered subtitle, then all warnings required by the particular IEC 62841-2, IEC 62841-3 or IEC 62841-4 shall be presented in the given order and the formatting rule above shall be followed without the **[Section subtitle]**.

C) Any additional warnings deemed necessary by the manufacturer, shall not be inserted within any of the IEC 62841-1 or IEC 62841-2, IEC 62841-3 or IEC 62841-4 warnings. They may be either appended to the section(s) of the IEC 62841-1 or IEC 62841-2, or IEC 62841-3 or IEC 62841-4 in accordance with the topic of the safety warnings or located in any other part of the instruction manual.

8.14.1.3 If the safety instructions are separate from the instruction manual, then the following warnings shall be included in the instruction manual. These warnings, if in English, shall be verbatim and in any other official language to be equivalent.

⚠ **WARNING Read all safety warnings, instructions, illustrations and specifications provided with this power tool.** *Failure to follow all instructions listed below may result in electric shock, fire and/or serious injury.*

Save all warnings and instructions for future reference.

8.14.2 The instruction manual shall be provided with the following, if appropriate.

a) Instructions for putting into use

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1) Setting-up or fixing power tools in a stable position as appropriate for power tools which can be mounted on a support or fixed to a bench or the floor;

2) Assembly;

3) Connection to power supply, cabling, fusing, socket type and earthing requirements;

4) For tools adjustable to different RATED VOLTAGES: instructions, illustrations, or both for changing the voltage. The terminal identification shall be provided if the motor connection has to be altered to operate at a voltage other than that for which it was connected when shipped from the factory;

5) Illustrated description of functions;

6) Limitations on ambient conditions;

7) Fitting and adjusting of GUARDS required by 19.1;

8) Information about disassembly and reassembly if applicable for transportation and/or use.

b) Operating instructions

1) Setting and testing;

2) Tool changing;

3) Clamping of the workpiece;

4) Limits on size of workpiece and type of material;

5) General instructions for use;

6) Identification of handle(s) and grasping surface(s) required by 19.4;

7) For tools with electronic speed or load regulators which do not immediately restart the tool after a stalling: a warning that the tool will restart automatically if stalled;

8) For TRANSPORTABLE TOOLS only: instruction on lifting and transportation.

c) Maintenance and servicing instructions

1) USER MAINTENANCE, such as cleaning, sharpening, lubricating, servicing and/or replacing of parts;

2) Servicing by manufacturer or agent; list of addresses;

3) List of user-replaceable parts and instruction how to replace them;

4) Special tools which may be required;

5) For power tools with TYPE X ATTACHMENT: instruction that, if the SUPPLY CORD of this power tool is damaged, it must be replaced by a specially prepared SUPPLY CORD available through the service organization;

6) For power tools with TYPE Y ATTACHMENT: instruction that, if the replacement of the SUPPLY CORD is necessary, this has to be done by the manufacturer or his agent in order to avoid a safety hazard;

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7) For power tools with TYPE Z ATTACHMENT: information that the SUPPLY CORD of this power tool cannot be replaced, and the power tool shall be scrapped.

d) For tools with a LIQUID SYSTEM, the substance of the following, as appropriate:

1) Instructions for

– the connection to the liquid supply;

– the use of the liquid and the use of ATTACHMENTS to comply with 14.3 in order to

– avoid the tool being affected by the liquid;

– the inspection of hoses and other critical parts which could deteriorate;

– the maximum permitted pressure of the liquid supply;

2) For tools provided with an RCD

– warning never to use the tool without the RCD provided with the tool;

– instruction always to test the correct operation of the RCD before starting work, unless the RCD is of a self-checking type;

3) For tools for use in combination with an isolating transformer: warning never to use the tool without the transformer delivered with the tool or of the type as specified in these instructions;

4) Instruction that replacement of the plug or the SUPPLY CORD shall always be carried out by the manufacturer of the tool or his service organization;

5) Instruction to keep liquid clear of the parts of the tool and away from persons in the working area.

NOTE In Europe (EN 62841-1), the following additional requirements apply:

Emissions

1) The noise emission, measured in accordance with I.2, as follows:

– A-weighted sound pressure level L_{pA} and its uncertainty K_{pA} where L_{pA} exceeds 70 dB(A). Where L_{pA} does not exceed 70 dB(A), this fact shall be indicated;

– 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);

– peak C-weighted instantaneous sound pressure value L_{pCpeak}, where this exceeds 63 Pa (130 dB in relation to 20 μPa).

2) Recommendation for the operator to wear hearing protection.

3) The vibration total value and its uncertainty measured in accordance with I.3.

When the vibration total value does not exceed 2,5 m/s^2, this shall be stated.

When the vibration total value exceeds 2,5 m/s^2, its value shall be given in the instructions.

4) The following 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;

– that the declared vibration total value may also be used in a preliminary assessment of exposure.

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5) 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; and

– 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).

8.14.3 If information about the mass or weight of the tool is provided, it shall be the mass specified in 5.17.

Compliance is checked by inspection.

9 Protection against access to LIVE PARTS

9.1 Tools shall be so constructed and enclosed that there is adequate protection against accidental contact with LIVE PARTS. The requirement applies for all positions of the tool, even after removal of DETACHABLE PARTS and soft materials (elastomers), such as soft grip coverings.

Compliance is checked by inspection, and by the tests of 9.2 to 9.4, as applicable.

9.2 An ACCESSIBLE PART is not considered to be live if:

– the part is supplied with SAFETY EXTRA-LOW VOLTAGE

or

– the part is separated from LIVE PARTS by PROTECTIVE IMPEDANCE.

In the case of PROTECTIVE IMPEDANCE, the current between the part and the supply source shall not exceed 2 mA for d.c., and its peak value shall not exceed 0,7 mA for a.c., and moreover:

– for voltages having a peak value over 42,4 V up to and including 450 V, the capacitance shall not exceed 0,1 μF;

– for voltages having a peak value over 450 V up to and including 15 kV, the discharge shall not exceed 45 μC.

Compliance is checked by operating the tool at RATED VOLTAGE. Voltages and currents are measured between the relevant parts and each pole of the supply source. Discharges are measured immediately after the interruption of the supply.

The quantity of electricity in the discharge is measured using a resistor having a nominal noninductive resistance of 2 000 Ω. The quantity of electricity is calculated from the sum of all areas recorded on the voltage/time graph without taking voltage polarity into account.

NOTE Details of a suitable circuit for measuring the current are given in Figure C.3.

9.3 *Lamps located behind a detachable cover are not removed, provided the tool can be isolated from the supply by means of a plug or an ALL-POLE DISCONNECTION. However, during insertion or removal of lamps which are located behind a detachable cover, protection against contact with LIVE PARTS of the lamp cap shall be ensured.*

This excludes the use of screw type fuses and screw-type miniature circuit breakers which are accessible without the aid of a tool.

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Test probe B of IEC 61032:1997 is applied with a force not exceeding 5 N, the tool being in every possible position except that tools normally used on the floor and having a mass exceeding 40 kg are not tilted. Through openings, the test probe is applied to any depth that the probe will permit, and it is rotated or angled before, during, and after insertion to any position.

If the opening does not allow the entry of the probe, a rigid test probe with the dimensions of the test probe B of IEC 61032:1997, but without any articulation, is used, the force on the probe is increased to 20 N and the test with the articulated test probe B of IEC 61032:1997 repeated.

It shall not be possible to touch with the test probe LIVE PARTS or LIVE PARTS protected only by lacquer, enamel, ordinary paper, cotton, oxide film, beads or sealing compound.

NOTE Lacquer, enamel, ordinary paper, cotton, oxide film on metal parts, beads and sealing compound, except self-hardening resins, are not considered to give the required protection against contact with LIVE PARTS.

9.4 Test probe 13 of IEC 61032:1997 is applied with a force not exceeding 5 N through openings in CLASS II TOOLS and CLASS II CONSTRUCTIONS, except for those giving access to lamp caps and LIVE PARTS in socket-outlets.

The test probe is also applied through openings in earthed metal enclosures having a nonconductive coating such as enamel or lacquer.

It shall not be possible to touch LIVE PARTS with the test probe.

9.5 CLASS II TOOLS and CLASS II CONSTRUCTIONS shall be so constructed and enclosed that there is adequate protection against accidental contact with BASIC INSULATION, and metal parts separated from LIVE PARTS by BASIC INSULATION only.

Parts which are not separated from LIVE PARTS by DOUBLE INSULATION or REINFORCED INSULATION shall not be accessible.

This requirement applies for all positions of the tool, even after removal of DETACHABLE PARTS.

Compliance is checked by inspection and by applying the test probe B of IEC 61032:1997, as described in 9.3.

10 Starting

10.1 Tools shall start under all normal voltage conditions which may occur in use.

Compliance is checked by starting the tool 10 times at no-load in succession at a voltage equal to 0,85 times the lowest RATED VOLTAGE or 0,85 times the lower limit of the RATED VOLTAGE RANGE, CONTROL DEVICES other than speed controls, if any, being set as in NORMAL USE.

Tools shall in addition be started 10 times in succession at a voltage equal to 1,1 times RATED VOLTAGE.

The interval between consecutive starts is made sufficiently long enough to prevent undue heating.

In all cases, the tool shall operate and overload protection devices incorporated in the tool shall not activate. Centrifugal and other automatic starting switches, if any, shall operate reliably, and without contact chattering.

10.2 Tools shall not draw excessive input current during starting that could lead to nuisance operation of facility mains over-current protection devices.

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