UL 60745-1

STANDARD FOR SAFETY

Hand-Held Motor-Operated Electric Tools – Safety – Part 1: General Requirements

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER
REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

UL Standard for Safety for Hand-Held Motor-Operated Electric Tools – Safety – Part 1: General Requirements, UL 60745-1

Fourth Edition, Dated July 31, 2007

SUMMARY OF TOPICS

The revisions dated of ANSI/UL 60745-1 dated October 25, 2024 includes an update of reference test oil for adhesive label test for durability, 8.13DV

UL 60745-1 is an adoption of IEC 60745-1, Fourth Edition, issued by the IEC 2006. Please note that the National Difference document incorporates all of the U.S. national differences for UL 60745-1.

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

The revised requirements are substantially in accordance with Proposal(s) on this subject dated August 9, 2024.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of ULSE Inc. (ULSE).

ULSE provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will ULSE be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if ULSE or an authorized ULSE representative has been advised of the possibility of such damage. In no event shall ULSE's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold ULSE harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

No Text on This Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA Group
CAN/CSA-C22.2 No. 60745-1-07
Third Edition
(IEC 60745-1:2006, MOD)

ULSE Inc.
UL 60745-1
Fourth Edition

Hand-Held Motor-Operated Electric Tools – Safety – Part 1: General Requirements

July 31, 2007

(Title Page Reprinted: October 25, 2024)

This national standard is based on publication IEC 60745-1, 4th Edition (2006).

ANSI/UL 60745-1-2024

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as “CSA Group”) and ULSE Inc. (ULSE). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or ULSE at anytime. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and ULSE. CSA Group and ULSE will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

ISBN 1-55436-444-2 © 2007 Canadian Standards Association

All rights reserved. No part of this publication may be reproduced in any form whatsoever without the prior permission of the publisher.

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 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.

To purchase CSA Group Standards and related publications, visit CSA Group's Online Store at www.csagroup.org/store/ or call toll-free 1-800-463-6727 or 416-747-4044.

© 2024 ULSE Inc. All rights reserved.

Our Standards for Safety are copyrighted by ULSE Inc. Neither a printed nor electronic copy of a Standard should be altered in any way. All of our Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of ULSE Inc.

This ANSI/UL Standard for Safety consists of the Fourth edition including revisions through October 25, 2024. The most recent designation of ANSI/UL 60745-1 as an American National Standard (ANSI) occurred on October 25, 2024. 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 ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

For information on ULSE Standards, visit http://www.shopulstandards.com, call toll free 1-888-853-3503 or email us at ClientService@shopULStandards.com.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CONTENTS

Preface **9**

NATIONAL DIFFERENCES **11**

FOREWORD **13**

INTRODUCTION **17**

1 Scope 19
1DV Addition: Add the following paragraph: 19
2 Normative references 20
2DV Modification: Add the following: 20
3 Terms and Definitions 29
3.57DV Modification: Add the following to the end of the definition: 33
4 General requirements 33
5 General conditions for the tests 34
6 Void 36
7 Classification 36
8 Marking and instructions 36
8.1DV Modification: Add the following: 37
8.1DV.1 Addition: Add the following clause: 37
8.1DV.2 Modification: Add the following paragraph: 37
8.12.1DV Modification: Add the following paragraph: 41
8.12.1DV.1 Modification: Add the following paragraph to Clause 8.12.1: 42
8.13DV Modification: Add the following: 46
8.13DV.1 Modification: Add the following subclause: 47
9 Protection against access to live parts 48
10 Starting 49
11 Input and current 50
12 Heating 50
13 Leakage current 54
13.2DV Modification: Replace the class I tools item with the following: 55
14 Moisture resistance 55
15 Electric strength 58
16 Overload protection of transformers and associated circuits 60
17 Endurance 60
18 Abnormal operation 61
18.12DV Modification: Replace Clause 18.12 with Clauses 18.12DV.1 to 18.12DV.3 66
19 Mechanical hazards 68
20 Mechanical strength 69
21 Construction 70
22 Internal wiring 78
22.3DV Modification: Delete the fourth paragraph and replace the third paragraph with the following: 78
22.4DV Modification: Replace the first paragraph with the following: 79
23 Components 79
24 Supply connection and external flexible cords 81
24.1DV Modification: Add the following sentence: 82
24.4DV Modification: Replace 24.4 with the following: 83
Table 6DV Modification: Replace Table 6 with the following: 83
24.6DV Modification: Replace the first paragraph with the following: 84
25 Terminals for external conductors 89
Table 8DV Modification: Replace Table 8 with the following: 90

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

26 Provision for earthing 92
26.1DV Modification: Add the following sentence to the fifth paragraph of Clause 26.1: 92
26.2DV Modification: Add the following paragraphs: 93
27 Screws and connections 94
27.3DV Modification: 96
28 Creepage distances, clearances and distances through insulation 96
29 Resistance to heat, fire and tracking 100
29.1DV Modification: Replace the last paragraph with the following: 101
29.2DV Modification: Replace Clause 29.2 with the following: 101
30 Resistance to rusting 102
31 Radiation, toxicity and similar hazards 103

Annex A (normative) Measurement of creepage distances and clearances

A.1 Measurement of creepage distances and clearances 115

Annex B (normative) Motors not isolated from the supply mains and having basic insulation not designed for the rated voltage of the tool

B.1 Scope 120
B.9 Protection against access to live parts 120
B.12 Heating 120
B.15 Electric strength 120
B.18 Abnormal operation 120
B.21 Construction 120
B.28 Creepage distances, clearances and distances through insulation 121

Annex C Void

Annex D Void

Annex E Void

Annex F (normative) Needle-flame test

5 Description of the test apparatus 125
5.4 Specified layer 125
7 Severities 125
9 Test procedure 125
9.3 Number of test specimens 125
11 Evaluation of test results 125

Annex G (normative) Proof tracking test

5 Test specimen 126
7 Test apparatus 126
8 Basic test procedure 126
9 Determination of erosion 126
10 Determination of proof tracking index (PTI) 126
11 Determination of comparative tracking index (CTI) 126

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Annex H Void

Annex I (normative) Switches

8 Marking and documentation 128
13 Mechanism 128
15 Insulation resistance and dielectric strength 128
17 Endurance 128
17.2.4.4 Test at accelerated speed (TC4) 129
20 Clearances, creepage distances, solid insulation and coatings of rigid printed board assemblies 129

Annex J(informative) Selection and sequence of the tests of clause 29

Annex K (normative) Battery tools and battery packs

K.1 Scope 131
K.2 Normative references 131
K.3 Terms and Definitions 131
K.5 General conditions for the tests 132
K.7 Classification 132
K.8 Marking and instructions 132
K.8.1DV Modification: Add the following after the last dashed item: 133
K.8.12.1.1DV Modification: Add the following paragraph to Clause K.8.12.1.1: 133
K.9 Protection against electric shock 134
K.10 Starting 134
K.11 Input and current 134
K.12 Heating 134
K.13 Leakage current 135
K.14 Moisture resistance 135
K.15 Electric Strength 135
K.15.1DV Modification: Add the following sentences: 135
K.16 Overload protection of transformers and associated circuits 135
K.17 Endurance 136
K.18 Abnormal operation 136
K.18.1DV.1 Modification: Replace Item (b) of Clause K.18.1 with the following: 136
K.18.1.DV.2 Modification: Replace Item (c) of Clause K.18.1 with the following: 136
K.19 Mechanical Hazards 137
K.20 Mechanical strength 137
K.21 Construction 137
K.22 Internal wiring 137
K.23 Components 137
K.24 Supply connection and external flexible cords 138
K.25 Terminals for external conductors 138
K.26 Provision for earthing 138
K.27 Screws and connections 138
K.28 Creepage distances, clearances and distances through insulation 138
K.29 Resistance to heat, fire and tracking 140

Annex L (normative) Battery tools and battery packs provided with mains connection or non-isolated sources

L.1 Scope 142

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

L.2 Normative References 142
L.3 Terms and definitions 142
L.5 General conditions for the tests 143
L.7 Classification 143
L.8 Marking and Instructions 143
L.8.12.1.1DV Modification: Add the following paragraph to Clause L.8.12.1.1: 144
L.9 Protection against electric shock 144
L.10 Starting 145
L.11 Input and current 145
L.12 Heating 145
L.13 Leakage current 145
L.14 Moisture resistance 146
L.15 Electric strength 146
L.16 Overload protection of transformers and associated circuits 146
L.17 Endurance 146
L.18 Abnormal operation 146
L.18.201DV.1 Modification: Replace Item (b) of Clause L.18.201 with the following: 147
L.18.201DV.2 Modification: Replace Item (c) of Clause L.18.201 with the following: 147
L.19 Mechanical Hazards 147
L.20 Mechanical strength 147
L.21 Construction 147
L.22 Internal wiring 148
L.23 Components 148
L.24 Supply connection and external flexible cords 148
L.25 Terminals for external conductors 149
L.26 Provision for earthing 149
L.28 Creepage distances, clearances and distances through insulation 149
L.29 Resistance to heat, fire and tracking 150

Annex M (normative) Safety of working stands for operation with hand-held motor-operated electric tools

M.1 Scope 152
M.2 Normative references 152
M.2DV Modification: Add the following sentence: 152
M.3 Terms and Definitions 152
M.5 General conditions for the tests 152
M.7 Classification 153
M.8 Marking and instructions 153
M.10 Starting 154
M.11 Input and current 154
M.17 Endurance 154
M.19 Mechanical hazards 154
M.21 Construction 155
M.23 Components 156
M.24 Supply connection and external flexible cords 157
M.25 Terminals for external conductors 157

Annex N (normative) Rules for routine tests

N.1 General 158
N.2 Correct operation test 158
N.3 Electric strength test 158
N.4 Earthing continuity test 159
Annex DVN National Difference Deleted 159

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Bibliography

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

No Text on This Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Preface

This is the harmonized CSA Group and ULSE standard for Hand-Held Motor-Operated Electric Tools – Safety – Part 1: General Requirements. It is the third edition of CAN/CSA-C22.2 No. 60745-1, and the fourth edition of UL 60745-1. This harmonized standard has been jointly revised on October 25, 2024. For this purpose, CSA Group and ULSE are issuing revision pages dated October 25, 2024.

This harmonized standard is based on IEC Publication 60745-1: fourth edition Hand-Held Motor-Operated Electric Tools – Safety – Part 1: General Requirements, issued April 2006. IEC 60745-1 is copyrighted by the IEC.

This harmonized standard was prepared by the CSA Group and ULSE.

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.

Level of harmonization

This standard adopts the IEC text with national differences.

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

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, 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 ULSE versions of the standard. While the technical content is the same in each organization’s version, the format and presentation may differ.

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

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

IEC Copyright

For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication 60745-1 Hand-Held Motor-Operated Electric Tools – Safety – Part 1: General Requirements, copyright 2006, 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.

These materials are subject to copyright claims of IEC and ULSE. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of ULSE. All requests pertaining to the Hand-Held Motor-Operated Electric Tools – Safety – Part 1: General Requirements UL 60745-1 Standard should be submitted to ULSE.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

NATIONAL DIFFERENCES

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.

In the CSA Group and UL publications of this standard, National Differences from the text of International Electrotechnical Commission (IEC) Publication 60745-1, Safety Requirements for Hand-Held Motor-Operated Electrical Tools – Safety – Part-1: General Requirements, copyright 2006 are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

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:

> ***Addition / Add*** - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.
>
> ***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.
>
> ***Deletion / Delete*** - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

No Text on This Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – 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.

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

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 60745-1 has been prepared by sub-committee 61F: Safety of hand-held motor-operated electric tools, of IEC technical committee 61: Safety of household and similar electrical appliances.

This fourth edition cancels and replaces the third edition published in 2001 and its Amendment 1 (2002) and Amendment 2 (2003). It constitutes a technical revision.

Main changes in this edition include the introduction of requirements for tools with a liquid system, particularly in Clauses 8, 14 and 21; clarification in Clause 8 on the application of safety warnings; adaptation of Annex I to the latest version of IEC 61058-1; addition of requirements for electronic circuits in 18.10; introduction of requirements for supports or working stands in Annex M; and information about routine tests in Annex N.

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

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

FDIS	Report on voting
61F/632/FDIS	61F/641/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.

A vertical line in the margin shows where this fourth edition has been modified.

This Part 1 is to be used in conjunction with the appropriate part 2, which contains 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

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

IEC 60745 consists of the following parts, under the general title *Hand-held motor-operated electric tools – Safety:*

Part 1: General requirements

Part 2-1: Particular requirements for drills and impact drills

Part 2-2: Particular requirements for screwdrivers and impact wrenches

Part 2-3: Particular requirements for grinders, polishers and disk-type sanders

Part 2-4: Particular requirements for sanders and polishers other than disk type

Part 2-5: Particular requirements for circular saws and circular knives

Part 2-6: Particular requirements for hammers

Part 2-7: Particular requirements for spray guns for non-flammable liquids

Part 2-8: Particular requirements for shears and nibblers

Part 2-9:Particular requirements for tappers

Part 2-11: Particular requirements for reciprocating saws (jig and sabre saws)

Part 2-12: Particular requirements for concrete vibrators

Part 2-13: Particular requirements for chain saws

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

Part 2-14: Particular requirements for planers

Part 2-15: Particular requirements for hedge trimmers and grass shears

Part 2-16: Particular requirements for tackers

Part 2-17: Particular requirements for routers and trimmers

Part 2-18: Particular requirements for strapping tools

Part 2-19: Particular requirements for jointers

Part 2-20: Particular requirements for band saws

Part 2-21: Particular requirements for drain cleaners

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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,
- withdrawn,
- replaced by a revised edition, or
- amended.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

No Text on This Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

INTRODUCTION

Individual countries may wish to consider the application of this Part 1 of IEC 60745, so far as is reasonable, to tools not mentioned in an individual part 2 and to tools designed on new principles.

If the functions of a tool are covered by the different parts 2 of IEC 60745, the relevant part 2 is applied to each function separately, so far as is reasonable. If applicable, the influence of one function on the other is taken into account.

A product employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intention of the requirements and, if found to be substantially equivalent, may be judged to comply with the standard.

Standards dealing with non-safety aspects of hand-held tools are:

– IEC standards published by TC 59 on methods of measuring performance;

– CISPR 11 and 14 on radio interference suppression;

– IEC 61000-3-2 and IEC 61000-3-3 on electromagnetic compatibility.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

No Text on This Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY – Part 1: General requirements

1 Scope

This part of IEC 60745 deals with the safety of hand-held motor-operated or magnetically driven electric tools, the rated voltage of the tools being not more than 250 V for single-phase a.c. or d.c. tools, and 440 V for three-phase a.c. tools.

So far as is practicable, this standard deals with the common hazards presented by handheld tools which are encountered by all persons in the normal use and reasonably foreseeable misuse of the tools.

Tools with an electric heating element are within the scope of this standard. They should also comply with relevant parts of IEC 60335.

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. Those 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, hereinafter referred to as 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. Requirements for such supports or working stands are given in Annex M.

This standard does not apply to:

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

– hand-held tools used for preparing and processing food;

– hand-held tools for medical purposes (IEC 60601);

– heating tools which are covered by IEC 60335-2-45.

For hand-held tools intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary.

For hand-held tools intended to be used in tropical countries, special requirements may be necessary.

NOTE Attention is drawn to the fact that in many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities, etc.

1DV DR *Addition: Add the following paragraph:*

This standard deals with tools used in non-hazardous locations in accordance with the National Electrical Code, NFPA 70, and the Canadian Electric Code, Part 1, CSA C22.1, and General Requirements – Canadian Electrical Code, Part II, CAN/CSA-C22.2 No. 0.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

2 Normative references

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

2DV DC *Modification: Add the following:*

Where the IEC or ISO normative documents are referenced in this standard, U.S. and Canadian standards shall replace the IEC or ISO documents. The following is a matrix that provides a cross-reference between CSA, UL, IEC, and ISO standards for components. The standards listed in this table are not necessarily equivalent.

CSA, UL, IEC, and ISO Standards cross reference

Subclause from this standard	Component type	IEC or ISO publication	U.S. replacement standard requirement	Canadian replacement standard requirement
Table 1, 21.36	Audio, Video and Similar Electronic Apparatus	IEC 60065 Audio, video and similar electronic apparatus – Safety requirements	UL 60065 Audio, Video and Similar Electronic Apparatus – Safety Requirements	CAN/CSA-C22.2 No. 60065 Audio, video and similar electronic apparatus – Safety requirements
23.1.5, 23.4, 24.21	Appliance Couplers	IEC 60320 (all parts) Appliance couplers for household and similar general purposes	UL 498 Attachment Plugs and Receptacles	CSA C22.2 No. 182.3 Special use attachment plugs, receptacles, and connectors
23.1.5, 23.4, 24.4, 24.21	Attachment Plugs, Receptacles, and Connectors	IEC 60309 (all parts) Plugs, socket-outlets and couplers for industrial purposes IEC 60320 (all parts) Appliance couplers for household and similar general purposes IEC 60884 (all parts) Plugs and socket-outlets for household and similar purposes	UL 498 Attachment Plugs and Receptacles UL 1682 Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type	CSA C22.2 No. 42 General use receptacles, attachment plugs, and similar wiring devices CSA C22.2 No. 182.1 Plugs, receptacles, and cable connectors of the pin and sleeve type CSA C22.2 No. 182.2 Industrial locking type, special use attachment plugs, receptacles, and connectors
26.4, 26.5	Coatings – Metallic and Oxide – Non-Magnetic Coatings	ISO 1463 Metallic and oxide coatings – Measurement of coating thickness – micro-scopical method ISO 2178 Non-magnetic coatings on magnetic substrates – Measurement of coating thickness – Magnetic method		

CSA, UL, IEC, and ISO Standards cross reference Continued on Next Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA, UL, IEC, and ISO Standards cross reference Continued

Subclause from this standard	Component type	IEC or ISO publication	U.S. replacement standard requirement	Canadian replacement standard requirement
Annex G	Comparative Tracking Index	IEC 60112 Method for the determination of the proof and comparative tracking indices of solid insulating materials	UL 746A Polymeric Materials – Short Term Property Evaluations Note: A PLC level 3 is equivalent to a tracking index voltage of 175-250V. Or IEC 60112 Method for the determination of the proof and comparative tracking indices of solid insulating materials	CAN/CSA-C22.2 No. 0.17 Evaluation of properties of polymeric materials Note: A PLC level 3 is equivalent to a tracking index voltage of 175-250V. Or IEC 60112 Method for the determination of the proof and comparative tracking indices of solid insulating materials
Table 1, 18.10.2, 23.1.2	EMI Filters	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	UL 1283 Electromagnetic Interference Filters	CSA C22.2 No. 8 Electromagnetic interference (EMI) filters CSA E384-14 Fixed Capacitors for use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains
Table 1, 18.10.2, 23.1.2	Capacitors, Double Protection	IEC 60384-14 Fixed capacitors for use in electronic equipment –.Part 14: Sectional specification: Fixed capacitors for radio interference suppression and connection to the supply mains	UL 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	CSA C22.2, No. 1 Audio, video and similar electronic equipment
20.2	Environmental Testing – Hammer Tests	IEC 60068-2-75 Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests		
23.1.3	Flexible Cords and Cables	IEC 60227 (all parts) Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V IEC 60245 (all parts) Rubber insulated cables – rated	UL 62 Flexible Cord and Cables	CSA C22.2 No. 49 Flexible cords and cables

CSA, UL, IEC, and ISO Standards cross reference Continued on Next Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA, UL, IEC, and ISO Standards cross reference Continued

Subclause from this standard	Component type	IEC or ISO publication	U.S. replacement standard requirement	Canadian replacement standard requirement
		voltages up to and including 450/750 V		
8.6, 18.10, 18.10.3	Fuses, Low-Voltage	IEC 60127-3 Miniature fuses – Part 3: Sub-miniature fuse-links	UL 248 Series UL 248-1 Low-Voltage Fuses – Part 1: General Requirements UL 248-4 Low-Voltage Fuses – Part 4: Class CC Fuses UL 248-8 Low-Voltage Fuses – Part 8: Class J Fuses UL 248-10 Low-Voltage Fuses – Part 10: Class L Fuses UL 248-12 Low-Voltage Fuses – Part 12: Class R Fuses UL 248-15 Low-Voltage Fuses – Part 15: Class T Fuses	CSA C22.2 No. 248 Series CSA C22.2 No. 248.1 Low-Voltage Fuses – Part 1: General Requirements CSA C22.2 No. 248.4 Low-Voltage Fuses – Part 4: Class CC Fuses CSA C22.2 No. 248.8 Low-Voltage Fuses – Part 8: Class J Fuses CSA C22.2 No. 248.10 Low-Voltage Fuses – Part 10: Class L Fuses CSA C22.2 No. 248.12 Low-Voltage Fuses – Part 12: Class R Fuses CSA C22.2 No. 248.15 Low-Voltage Fuses – Part 15: Class T Fuses
12.2, 15.2	Heater Elements	IEC 60335-1 Household and similar electrical appliances – Part 1: General requirements	UL 1030 Sheathed Heating Elements UL 60335-1 Safety of Household and Similar Electrical Appliances – Part 1: General Requirements	CSA C22.2 No. 72 Heater Elements CAN/CSA-E60335-1/4E Safety of Household and Similar Electrical Appliances – Safety – Part 1: General requirements
7.2, 14.1.2, 21.20	Degrees of Protection	IEC 60529 Degrees of protection provided by enclosures (IP Code)		
29.2, Annex J	Glow Wire Test	IEC 60695-2-11 Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products		
14.6	Portable Residual Current Devices (PRCDs) Ground-Fault Circuit Interruptors (GFCI)	IEC 61540 Electrical accessories – Portable residual current devices without integral overcurrent protection for household and similar use (PRCDs	UL 943 Ground-Fault Circuit-Interrupters	CSA C22.2 No. 144.1 Ground-fault circuit-interrupters
23.1.3	Lampholders	IEC 60238 Edison screw lampholders	UL 496 Lampholders	CSA C22.2 No. 43 Lampholders

CSA, UL, IEC, and ISO Standards cross reference Continued on Next Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA, UL, IEC, and ISO Standards cross reference Continued

Subclause from this standard	Component type	IEC or ISO publication	U.S. replacement standard requirement	Canadian replacement standard requirement
		IEC 60061-1 Lamp caps and holders together with gauges for the control of interchangeability and Safety – Part 1: Lamp Caps		
Annex F	Plastics – Flammability	IEC 60695-11-5 Fire hazard testing – Part 11-5: Test flames – Needle flame test method – Apparatus, confirmatory test arrangement and guidance	UL 1694 Tests for Flammability of Small Polymeric Component Materials	CAN/CSA-C22.2 No. 0.17 Evaluation of properties of polymeric materials
29.2	Plastics – Flammability	IEC 60695-11-10 Fire hazard testing Part 11-10: Test flames – 50 W Horizontal and vertical flame test methods	UL 94 Tests for Flammability of Plastic Note: test methodology is the same as IEC 60695-11-10	CAN/CSA C22.2 No. 0.17 Evaluation of properties of polymeric materials Note: test methodology is the same as IEC 60695-11-10
		IEC 60695-2-13 Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignitability test method for materials	UL 746A Polymeric Materials – Short Term Property Evaluations Note: test methodology is the same as IEC 60695-2-13	CAN/CSA C22.2 No. 0.17 Evaluation of properties of polymeric materials Note: test methodology is the same as IEC 60695-2-13
16, 23.1.4, K.2, K.3.203, L.2, L.3.203	Power Supplies	IEC 61558-1 Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests	UL 1012 Power Units Other Than Class 2 Or IEC 61558-1 Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests	CSA C22.2 No. 107.1 General use power supplies Or IEC 61558-1 Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests
		IEC 61558-2-6 Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating	UL 1310 Class 2 Power Units Or IEC 61558-2-6 Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and	CAN/CSA-C22.2 No. 223 Power supplies with extra-low-voltage class 2 outputs Or CSA IEC C22.2 No. 61558-2-6 Safety of transformers, reactors, power supply units and

CSA, UL, IEC, and ISO Standards cross reference Continued on Next Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA, UL, IEC, and ISO Standards cross reference Continued

Subclause from this standard	Component type	IEC or ISO publication	U.S. replacement standard requirement	Canadian replacement standard requirement
		transformers for general applications	tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications Or UL 5085-1 Low Voltage Transformers – Part 1: General Requirements And UL 5085-3 Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers	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 Or CSA C22.2 No. 66.1 Low Voltage Transformers – Part 1: General Requirements And CSA C22.2 No. 66.3 Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers
K.1, L.1	Battery Chargers	IEC 60335-2-29, Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers	UL 60335-2-29, Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers UL 1310 Class 2 Power Units UL 1012 Power Units Other Than Class 2 UL 60950-1 Information Technology Equipment – Safety – Part 1: General Requirements UL 1564 Industrial Battery Chargers UL 62368-1 Audio/video, Information and Communication Technology Equipment – Part 1: Safety Requirements	CSA C22.2 No. 60335-2-29 Household and similar electrical appliances – Safety – Part 2-29: Particular requirements for battery chargers CAN/CSA-C22.2 No. 107.2 Battery Chargers CAN/CSA-C22.2 No. 223 Power supplies with extra-low-voltage class 2 outputs CAN/CSA-C22.2 No. 60950-1 Information Technology Equipment – Safety – Part 1: General Requirements CSA C22.2 No. 62368-1 Audio/video, Information and Communication Technology Equipment – Part 1: Safety Requirements
23.1.10, 23.1.11, I, Clause 8 in Annex I, M.23.1.11	Switches for Appliances	IEC 61058-1 Switches for appliances – Part 1: General requirements	UL 61058-1 (3rd edition or later) Switches for	CAN/CSA-C22.2 No 61058-1 (1st edition or later) Switches for

CSA, UL, IEC, and ISO Standards cross reference Continued on Next Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA, UL, IEC, and ISO Standards cross reference Continued

Subclause from this standard	Component type	IEC or ISO publication	U.S. replacement standard requirement	Canadian replacement standard requirement
			Appliances – Part 1: General Requirements UL 61058-2-6 Switches for appliances – Part 2- 6: Particular requirements for switches used in electric motor-operated hand-held tools, transportable tools and lawn and garden machinery	appliances – Part 1: General requirements CSA C22.2 No. 61058-2-6 Switches for appliances – Part 2-6: Particular requirements for switches used in electric motor-operated hand-held tools, transportable tools and lawn and garden machinery
8.10	Symbols	IEC 60417 DB Graphical symbols for use on equipment – Part 1: overview and application		
Table 1, 12.6	Systems of Insulating Material	IEC 60085 Electrical insulation – Thermal classification	UL 1446 Systems of Insulating Materials – General	CAN/CSA-C22.2 No. 0 General Requirements – Canadian Electrical Code, Part II
26.2	Terminals, Quick Connect	IEC 60760 Flat, quick-connect terminations	UL 310 Electrical Quick-Connect Terminals	CSA C22.2-No. 153 Quick-connect terminals CSA C22.2 No. 0.4 Bonding of Electrical Equipment
31.2	Lasers Requirements for Equipment Incorporating Lasers Requirements for Lasers Contained in the Applicable National Codes and Regulations	IEC 60825-1 Safety of laser products – Part 1: Equipment classification, requirements and user's guide	See Note.	CAN/CSA-E60825-1 Safety of laser products – Part 1: Equipment classification, requirements and user's guide
25.1, 25.3, 26.2	Wire Connectors and Soldering Lugs	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	UL 486A-486B Wire Connectors	CSA C22.2 No. 65 Wire connectors

CSA, UL, IEC, and ISO Standards cross reference Continued on Next Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA, UL, IEC, and ISO Standards cross reference Continued

Subclause from this standard	Component type	IEC or ISO publication	U.S. replacement standard requirement	Canadian replacement standard requirement
		connecting devices as separate entities with screwless-type clamping units IEC 60999-1 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)		
22.3, 23.1.3	Wires and Cables	IEC 60227 (all parts) Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V IEC 60245 (all parts) Rubber insulated cables – rated voltages up to and including 450/750 V	UL 44 Thermoset-Insulated Wires and Cables UL 83 Thermoplastic-Insulated Wires and Cables UL 758 Appliance Wiring Material	CSA C22.2 No. 38 Thermoset insulated wires and cables CSA C22.2 No. 75 Thermoplastic-insulated wires and cables CSA C22.2 No. 127 Equipment and Lead Wires CSA-C22.2 No. 210 Appliance wiring material products
8.13DV	Marking and Labeling Systems		UL 969 Marking and Labeling Systems	CSA C22.2 No. 0.15 Adhesive labels
23.1.6	Temperature-Indicating and -Regulating Equipment	IEC 60730-1 Automatic electrical controls for household and similar Use – Part 1: General requirements	UL 60730-1A Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements	CSA C22.2 No. 24 Temperature-indicating and -regulating equipment
8.13DV	Tests for Rubber Property – Effect of Liquids		ANSI/ASTM D 471 Tests for Rubber Property – Effect of Liquids	
8.13	Graphical Symbols – Design Principles	ISO 3864-2 Graphical symbols – safety colours and safety signs – Part 2: Design principles for product safety labels		

CSA, UL, IEC, and ISO Standards cross reference Continued on Next Page

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

CSA, UL, IEC, and ISO Standards cross reference Continued

Subclause from this standard	Component type	IEC or ISO publication	U.S. replacement standard requirement	Canadian replacement standard requirement
8.1	Graphical Symbols – Safety Signs	ISO 7010 Graphical symbols – safety colours and safety signs – safety signs used in workplaces and public areas		
29.2	Plastics – Flammability	ISO 9772 Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame	UL 94 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances	CAN/CSA C22.2 No. 0.17 Evaluation of properties of polymeric materials
Note: Additional regulatory requirements apply to equipment incorporating lasers, which are contained in the applicable national codes and regulations; for example, in Canada, the Radiation Emitting Devices Regulations, (C.R.C., c. 1370) and in the US, the Code of Federal Regulations (CFR), Title 21, Part 1040.				

IEC 60061-DB[1)]: 2005
Lamp caps and holders together with gauges for the control of interchangeability and safety

IEC 60065: 2001
Audio, video and similar electronic apparatus – Safety requirements

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

IEC 60085
Electrical insulation – Thermal classification

IEC 60112:2003
Method for the determination of the proof and the comparative tracking indices of solid insulating materials

IEC 60127-3
Miniature fuses – Part 3: Sub-miniature fuse-links

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

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

IEC 60309(all parts)
Plugs, socket-outlets and couplers for industrial purposes

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

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

IEC 60335-1:2001
Safety of household and similar electrical appliances – Part 1: General requirements Amendment 1 (2004)[2]

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-DB[3]:2002
Graphical symbols for use on equipment

IEC 60529:1989
Degrees of protection provided by enclosures (IP Code) Amendment 1 (1999)[4]

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

IEC 60695-11-5:2004
Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance

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

IEC 60730-1:1999
Automatic electrical controls for household and similar use – Part 1: General requirements Amendment 1 (2003) [5]

IEC 60760
Flat, quick connect terminations

IEC 60825-1
Safety of Laser Products – Part 1: Equipment classification, requirements and user's guide

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

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 61058-1:2000
Switches for appliances – Part 1: General requirements Amendment 1 (2001)[6]

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

IEC 61540: 1997
Electrical accessories – Portable residual current devices without integral overcurrent protection for household and similar use (PRCDs) Amendment 1 (1998)[7]

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

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

ISO 7010
Graphical symbols – Safety colours and safety signs – Safety signs used in workplaces and public areas

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

[1]"DB" refers to the on-line IEC database.
[2] A consolidated edition (4.1) exists including IEC 60335-1:2001 and its Amendment 1 (2001).
[3]"DB" refers to the on-line IEC database.
[4] A consolidated edition (2.1) exists including IEC 60529:1989 and its Amendment 1 (1999).
[5] A consolidated edition (3.1) exists including IEC 60730-1:1999 and its Amendment 1 (2003).
[6] A consolidated edition (3.1) exists including IEC 61058-1:2000 and its Amendment 1 (2001).
[7] A consolidated edition (1.1) exists including IEC 61540:1997 and its Amendment 1 (1998).

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:** part which can be touched by means of the standard test finger in Figure 1, including, for accessible metal parts, any metal part connected to it

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

3.3 **all-pole disconnection:** disconnection of all supply conductors except the protective earthing (grounding) conductor by a single initiating action

3.4 **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

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

3.5 **basic insulation:** insulation, not necessarily including insulation used for functional purposes, applied to live parts to provide basic protection against electric shock

3.6 **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 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. Also considered as class I tools are tools with double insulation and/or reinforced insulation throughout having an earthing terminal or earthing contact

3.7 **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

3.8 **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

3.9 **class II construction:** part of a tool for which protection against electric shock relies upon double insulation or reinforced insulation

3.10 **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

3.11 **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 Examples of clearance distances are given in Annex A.

3.12 **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 Examples of creepage distances are given in Annex A.

3.13 **detachable cord:** flexible cord, for supply, intended to be connected to the tool by means of a suitable appliance coupler

3.14 **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 user maintenance items, even if removal requires the use of a tool

3.15 **double insulation:** insulation system comprising both basic insulation and supplementary insulation

3.16 **electronic circuit:** circuit incorporating at least one electronic component

3.17 **electronic component:** part in which conduction is achieved principally by electrons moving through a vacuum, gas or semiconductor, with the exclusion of neon indicators

3.18 **exchange type tool:** tool which is intended not to be repaired at all, or to be repaired by the manufacturer's service organization only

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

3.19 **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

3.20 **extra-severe duty conditions of insulating material:** where there is heavy deposition of conductive material and a long period of electrical stress; or an extra heavy deposition of conductive material and a short period of electrical stress

3.21 **hand-held tool (in this standard abbreviated to "tool"):** electric motor-operated or magnetically-driven machine 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 Hand-held tools may be provided with a flexible shaft, the motor being either fixed or portable.

3.22 **intermittent operation:** operation in a series of specified identical cycles, each cycle being composed of a period of operation under normal load followed by a rest period with the tool running idle or switched off

3.23 **liquid system:** system that employs water or a water-based liquid from an external or integral supply that is necessary to complete the intended function of the tool

3.24 **live part:** any conductor or conductive part intended to be energized in normal use, including a neutral conductor but, by convention, not a PEN conductor

3.25 **no-load input/current:** highest input or current obtained when a tool is operated at rated voltage and frequency with no external load (work) applied to the accessories packaged with the tool by the manufacturer and adjusted according to manufacturer's instructions, ready for use

3.26 **non-detachable part:** part which can only be removed or opened with the aid of a tool, or a part which fulfils the test of 21.22

3.27 **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

3.28 **normal duty conditions of insulating material:** where there is virtually no deposition of conductive material and a long period of electrical stress; or a light deposition of conductive material and a short period of electrical stress

3.29 **normal load:** load to be applied to a tool at rated voltage or at the upper limit of the rated voltage range, to obtain rated input or rated current, any marking of short-time or intermittent operation being observed and, unless otherwise specified, heating elements, if any, being operated as in normal use

3.30 **normal use:** use of a tool for which it is designed, taking into account the manufacturer's instructions

3.31 **protective device:** device the operation of which prevents a hazardous situation under abnormal operation conditions

3.32 **protective impedance:** impedance connected between live parts and accessible conductive parts, and of value so that the current is limited to a safe value

3.33 **rated current:** current assigned to the tool by the manufacturer. If no current rating is assigned to the tool, the rated current for the purpose of this standard is the current measured when the tool is operated under normal load

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

3.34 **rated frequency:** frequency assigned to the tool by the manufacturer

3.35 **rated frequency range:** frequency range assigned to the tool by the manufacturer, expressed by its lower and upper limits

3.36 **rated input:** input in watts assigned to the tool by the manufacturer. If no input is assigned to the tool, the rated input for the purpose of this standard is the input measured when the tool is operated under normal load

3.37 **rated input range:** input range in watts assigned to the tool by the manufacturer, expressed by its lower and upper limits

3.38 **rated no-load speed:** no-load speed at rated voltage or at the upper limit of the rated voltage range assigned to the tool by the manufacturer

3.39 **rated operating time:** operating time assigned to the tool by the manufacturer

3.40 **rated voltage:** voltage assigned to the tool by the manufacturer. For three-phase supply, it is the voltage between phases

3.41 **rated voltage range:** voltage range assigned to the tools by the manufacturer, expressed by its lower and upper limits

3.42 **reinforced insulation:** insulation of hazardous live parts which provides a degree of protection against electric shock equivalent to double insulation

NOTE Examples of reinforced insulation are a single layer or several layers which cannot be tested singly as basic insulation or supplementary insulation.

3.43 **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 Such a device is also known as portable residual current device (PRCD), ground fault circuit interrupter (GFCI) or earth leakage circuit breaker (ELCB)

3.44 **routine servicing:** periodic servicing which requires tool disassembly as instructed by the instruction manual and performed by authorized service centre

3.45 **safety extra-low voltage:** rated voltage not exceeding 42 V between conductors and between conductors and earth, the no-load voltage not exceeding 50 V. When safety extra-low voltage is obtained from the supply mains, it is to be through a safety isolating transformer or a convertor with separate windings, the insulation of which complies with double or reinforced insulation requirements

3.46 **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

3.47 **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

3.48 **severe duty conditions of insulating material:** where there is a light deposition of conductive material and a long period of electrical stress; or a heavy deposition of conductive material and a short period of electrical stress

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.

3.49 **short-time operation:** operation under normal load for a specified period, starting from cold, the intervals between each period of operation being sufficient to allow the tool to cool down approximately to ambient temperature

3.50 **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

3.51 **supply cord:** flexible cord, for supply purposes, which is fixed to the tool

3.52 **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. It does not make the reverse operation during the normal duty cycle of the tool

3.53 **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, and which is so constructed that its setting cannot be altered by the user

3.54 **thermal link:** thermal cut-out which operates only once, and then requires partial or complete replacement

3.55 **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

3.56 **type X attachment:** method of attachment of the supply cord so that it can easily be replaced

3.57 **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

3.57DV D2 ***Modification: Add the following to the end of the definition:***

as recommended in the instruction manual

3.58 **type Z attachment:** method of attachment of the supply cord so that it cannot be replaced without breaking or destroying the tool

3.59 **user maintenance:** any maintenance operation stated in the instructions for use or marked on the tool which the manufacturer of the tool intends the user to perform

3.60 **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 under normal load

4 General requirements

Tools shall be so constructed that in normal use they function safely so as to cause no danger to persons or surroundings, even in the event of reasonably foreseeable misuse.

In general, this principle is achieved by fulfilling the relevant requirements specified in this standard, and compliance is checked by carrying out all the relevant tests.

NOTE Annex N shows an example of routine tests.

ULSE INC. COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM ULSE INC.