BSI Standards Publication

Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery — Safety

Part 1: General requirements

bsi.

National foreword

This British Standard is the UK implementation of EN 62841-1:2015+A1:2025. It is derived from IEC 62841-1:2014, incorporating corrigenda May 2014 and October 2025 and Amendment 1:2025. It supersedes BS EN 62841-1:2015+A11:2022, BS EN 60745-1:2009+A11:2010 and BS EN 61029-1:2009+A11:2010. However, BS EN 60745-1:2009+A11:2010 and BS EN 61029-1:2009+A11:2010 remain valid until all parts of the BS EN 62841-2 and BS EN 62841-3 series have been published.

NOTE: The BS EN 62841 series supersedes the BS EN 60745 series, the BS EN 61029 series and parts of the BS EN 60335 series (for lawn and garden machinery).

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by [A1] 〈A1〉.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags [C] 〈C〉.

The start and finish of text introduced or altered by amendment A11 is indicated in the text by tags. Tags indicating changes to text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A11 is indicated by [A11] 〈A11〉.

IEC corrigendum May 2014 corrects the first row of the Table 12.

The UK participation in its preparation was entrusted to Technical Committee CPL/116, Safety of motor-operated electric tools.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

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For the Great Britain market (England, Scotland and Wales), if UK Government has designated this publication for conformity with UKCA marking (or similar) legislation, it may contain an additional National Annex. Where such a National Annex exists, it shows the correlation between this publication and the relevant UK legislation. If there is no National Annex of this kind, the relevant Annex ZA or ZZ in the body of the European text will indicate the relationship to UK regulation applicable in Great Britain. References to EU legislation may need to be read in accordance with the UK designation and the applicable UK law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

For the Northern Ireland market, UK law will continue to implement relevant EU law subject to periodic confirmation. Therefore Annex ZA/ZZ in the European text, and references to EU legislation, are still valid for this market.

UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of www.gov.uk.

Published by BSI Standards Limited 2025

ISBN 978 0 539 31989 7

ICS 25.140.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2015.

Amendments/corrigenda issued since publication

Date	Text affected
31 December 2015	Implementation of IEC corrigendum October 2015 with CENELEC endorsement AC:2015: Subclause 5.19 modified
30 September 2022	Implementation of CENELEC amendment A11:2022
31 May 2025	Implementation of IEC amendment A1:2025 with CENELEC endorsement A1:2025

EUROPEAN STANDARD **EN 62841-1:2015+A1**

EUROPÄISCHE NORM

May 2025

ICS 25.140.20

A11 Supersedes EN 60745-1:2009, EN 61029-1:2009 A11

English Version

Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery - Safety - Part 1: General requirements (IEC 62841-1:2014 + corrigendum May 2014, modified)

Outils électroportatifs à moteur, outils portables et machines pour jardins et pelouses - Sécurité - Partie 1: Règles générales
(IEC 62841-1:2014 + corrigendum May 2014, modifiée)

Elektrische motorbetriebene handgeführte Werkzeuge, transportable Werkzeuge und Rasen- und Gartenmaschinen - Sicherheit - Teil 1: Allgemeine Anforderungen
(IEC 62841-1:2014 + corrigendum May 2014, modifiziert)

This European Standard was approved by CENELEC on 2015-06-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 62841-1:2015 E

European foreword

The text of document 116/156/FDIS, future edition 1 of IEC 62841-1, prepared by IEC/TC 116 "Safety of motor-operated electric tools" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62841-1:2015.

A draft amendment, which covers common modifications to IEC 62841-1, was prepared by CLC/TC 116 "Safety of motor-operated electric tools" and approved by CENELEC.

The following dates are fixed:

– latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-06-15
– latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	-

〚A11〉 The EN 62841 series supersedes the EN 60745 series and the EN 61029 series. 〈A11〛

This European Standard replaces EN 60745-1:2009 and EN 61029-1:2009. However, EN 60745-1:2009 and EN 61029-1:2009 remain valid until all Part 2's which are used in conjunction with them have been withdrawn. No date of withdrawal (dow) has been given pending the updating of all the Part 2's to align with this EN 62841-1:2015 as respective Part 2's and Part 3's. The applicable date of withdrawal is given in each Part 2 and Part 3. It is intended the dow for this Part 1 will be fixed once all the Part 2's and Part 3's have been published.

EN 62841-1:2015 includes the following significant technical changes:

- requirements in various clauses introduced or modified in order to include the requirements for transportable tools and lawn and garden machinery (formerly covered by EN 61029-1 and EN 60335-1);
- 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 EN 60745-1 and test probe in Figure 2 of EN 60745-1 replaced by references to basic IEC standards;
- requirements for Li-ion battery systems added to Annexes K and L;
- Annex M removed.

patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s), see informative Annex ZZ, which is an integral part of this document.

This European Standard is divided into four parts:

Part 1: General requirements which are common to most electric motor operated tools (for the purpose of this standard referred to simply as tools) which could come within the scope of this standard;

Part 2, 3 or 4: Requirements for particular types of tools which either supplement or modify the requirements given in Part 1 to account for the particular hazards and characteristics of these specific tools.

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

Compliance with the relevant clauses of Part 1 together with a relevant Part 2, 3 or 4 of this standard provides one means of conforming with the essential health and safety requirements of the Directive concerned.

A relevant Part 2, 3 or 4 is one in which the type of the tool or an accessory which is to be used with the tool is within the scope of that Part 2, 3 or 4.

When a relevant Part 2, 3, or 4 does not exist, Part 1 can help to establish the requirements for the tool, but will not by itself provide a means of conforming to the relevant essential health and safety requirements of the Machinery Directive.

Warning: Other requirements and other EU Directives can be applicable to the products falling within the scope of this standard.

CEN Technical Committees have produced a range of standards dealing with a similar range of non-electrically powered tools. Where necessary, normative references are made to these standards in the relevant Part 2, 3 or 4.

This European Standard follows the overall requirements of EN ISO 12100.

NOTE 1 In this standard, the following print types are used:
- requirements proper; in roman type
- *test specifications: in italic type;*
- explanatory matter: 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.

NOTE 3 Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 62841-1:2014 are prefixed “Z”.

The text of the International Standard IEC 62841-1:2014 + corrigendum May 2014 was approved by CENELEC as a European Standard with agreed common modifications.

Endorsement notice

The text of the corrigendum IEC 62841-1:2014/COR2:2015 was approved by CENELEC as EN 62841-1:2015/AC:2015 without any modification.

European foreword to Amendment A11

This document (EN 62841-1:2015/A11:2022) has been prepared by CLC/TC 116 ”Safety and environmental aspects of motor-operated electric tools”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2023–03–14
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2025–03–14

This document will amend EN 62841-1:2015.

This amendment was developed to correct the determination of the emission sound pressure level for hand-held tools. Since the title of Annex I is “Measurement of noise and vibration emission”, the requirements for noise and vibration reduction are transferred to Clause 21. In addition, the Annex ZZ is replaced with a detailed one. And Annex ZA and Clause 2 are replaced in order to have only dated normative references.

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

This document has been prepared under a Standardization Request given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZZ, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national committee. A complete listing of these bodies can be found on the CENELEC website.

European foreword to Amendment 1

The text of document 116/863/FDIS, future edition 1 of IEC 62841-1/AMD1, prepared by TC 116 "Safety of motor-operated electric tools" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62841-1:2015/A1:2025.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2026-05-31
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2028-05-31

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

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Endorsement notice

The text of the International Standard IEC 62841-1:2014/AMD1:2025 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60335-2-69	NOTE	Approved as EN 60335-2-69
IEC 61784-3:2021	NOTE	Approved as EN IEC 61784-3:2021 (not modified)
ISO/TR 11690-3	NOTE	Approved as EN ISO 11690-3

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60061	2005[11]	Lamp caps and holders together with gauges for the control of interchangeability and safety	-	-
IEC 60065 (mod)	2001	Audio, video and similar electronic apparatus - Safety requirements	EN 60065	2002
			+ corr. August	2007
+ A1 (mod)	2005		+ 1	2006
+ A2 (mod)	2010		+ 2	2010
-	-		+ A11	2008
-	-		+ A12	2011
IEC 60068-2–75	1997	Environmental testing – Part 2–75: Tests - Test Eh: Hammer tests	EN 60068-2–75	1997
IEC/TR 60083	2015[11]	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	EN 60085	2008
-	-	Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links	EN 60127-1	2006
-	-		+ A1	2011
-	-		+ A2	2015
-	-	Miniature fuses – Part 2: Cartridge fuse-links	EN 60127-2	2014

[11] Dated as no equivalent European Standard exists.

Publication	Year	Title	EN/HD	Year
-	-	Miniature fuses – Part 3: Sub-miniature fuse-links	EN 60127-3	2015
-	-	Miniature fuses – Part 4: Universal modular fuse-links (UMF) - Through-hole and surface mount types	EN 60127-4	2005
-	-		+ A1	2009
-	-		+ A2	2013
-	-	Miniature fuses – Part 5: Guidelines for quality assessment of miniature fuse-links	EN 60127-5	2017
-	-	Miniature fuses – Part 6: Fuse-holders for miniature fuse-links	EN 60127-6	2014
-	-	Miniature fuses – Part 7: Miniature fuse-links for special applications	EN 60127-7	2016
-	-	Miniature fuses – Part 8: Fuse resistors with particular overcurrent protection	EN IEC 60127-8	2018
IEC 60227-1	2007[11]	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements	-	-
IEC 60227-2	1997[11]	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2 Test methods	-	-
+ 1	2003[11]		-	-
IEC 60227-5	2011[11]	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)	-	-
IEC 60227-6	2001[11]	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 6: Lift cables and cables for flexible connections	-	-
IEC 60227-7	1995[11]	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 7: Flexible cables screened and unscreened with two or more conductors	-	-
IEC 60238	-	Edison screw lampholders	EN IEC 60238	2018

Publication	Year	Title	EN/HD	Year
IEC 60245-1	2003[11]	Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 1: General requirements	-	-
IEC 60245-2	1994[11]	Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 2: Test methods	-	-
IEC 60245-3	1994[11]	Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 3: Heat resistant silicone insulated cables	-	-
+ 1	1997[11]		-	-
+ 2	2011[11]		-	-
IEC 60245-4	2011[11]	Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables	-	-
IEC 60245-7	1994[11]	Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 7: Heat resistant ethylene-vinyl acetate rubber insulated cables	-	-
IEC 60245-8	1998[11]	Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 8: Cords for applications requiring high flexibility	-	-
IEC 60252-1	-	AC motor capacitors - Part 1: General - Performance, testing and rating - Safety requirements - Guidance for installation and operation	EN 60252-1	2011
-	-		+ A1	2013
-	-	Appliance couplers for household and similar general purposes - Part 1: General requirements	EN 60320-1	2015
-	-		+ AC	2016
-	-	Appliance couplers for household and similar general purposes – Part 2–2: Interconnection couplers for household and similar equipment	EN 60320-2–2	1998

Publication	Year	Title	EN/HD	Year
-	-	Appliance couplers for household and similar general purposes – Part 2–3: Appliance couplers with a degree of protection higher than IPX0	EN 60320-2–3	1998
-	-		+ A1	2005
-	-	Appliance couplers for household and similar general purposes – Part 2–4: Appliance couplers dependent on appliance weight for engagement	EN 60320-2–4	2006
-	-		+ A1	2009
-	-	Appliance couplers for household and similar general purposes – Part 3: Standard sheets and gauges	EN 60320-3	2014
			+ 1	2021
IEC 60335-1 (mod)	2010	Household and similar electrical appliances - Safety - Part 1: General requirements	EN 60335-1	2012
-	-		+ A11	2014
-	-		+ AC	2014
-	-		+ A13	2017
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	EN 60384-14	2013
			+ 1	2016
IEC 60417	1973[11]	Graphical symbols for use on equipment. Index, survey and compilation of the single sheets.	-	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
-	-		+ corrigendum May	1993
+ 1	1999		+ 1	2000
+ 2	2013		+ 2	2013

Publication	Year	Title	EN/HD	Year
IEC 60664-1	-	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2020
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	EN 60695-2–11	2001
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	EN 60695-2–13	2010
IEC 60695-10–2	2003	Fire hazard testing – Part 10–2: Abnormal heat - Ball pressure test	EN 60695-10–2	2003
IEC 60695-11–10	2013	Fire hazard testing - Part 11–10: Test flames - 50 W horizontal and vertical flame test methods	EN 60695-11–10	2013
IEC 60730-1 (mod)	2010	Automatic electrical controls for household and similar use – Part 1: General requirements	EN 60730-1	2011
IEC 60825-1	2007[12]	Safety of laser products – Part 1: Equipment classification and requirements	EN 60825-1	2007[13]
IEC 60884-1	2002[11]	Plugs and socket-outlets for household and similar purposes – Part 1: General requirements		-
+ 1	2006[11]		-	-
+ 2	2013[11]		-	-
IEC 60884-2–1	2006[11]	Plugs and socket-outlets for household and similar purposes – Part 2–1: Particular requirements for fused plugs	-	-
IEC 60884-2–2	2006[11]	Plugs and socket-outlets for household and similar purposes – Part 2–2: Particular requirements for socket-outlets for appliances	-	-

[12] This standard has been withdrawn and replaced by IEC 60825-1:2014.

[13] This standard has been withdrawn and replaced by EN 60825-1:2014.

Publication	Year	Title	EN/HD	Year
IEC 60884-2–5	2017[11]	Plugs and socket-outlets for household and similar purposes – Part 2–5: Particular requirements for adaptors	-	-
IEC 60884-2–7	2011[11]	Plugs and socket-outlets for household and similar purposes – Part 2–7: Particular requirements for cord extension sets	-	-
+ 1	2013[11]		-	-
IEC 60906-1	2009[11]	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	EN 60990	1999
IEC 60998-2–1 (mod)	-	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	EN 60998-2–1	2004
IEC 60998-2–2 (mod)	-	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	EN 60998-2–2	2004
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 mm2 up to 35 mm2 (included)	EN 60999-1	2000
IEC 61000-4–2	2008	Electromagnetic compatibility (EMC) - Part 4–2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4–2	2009

Publication	Year	Title	EN/HD	Year
IEC 61000-4–3	2006	Electromagnetic compatibility (EMC) - Part 4–3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4–3	2006
+ 1	2007		+ 1	2008
+ 2	2010		+ 2	2010
IEC 61000-4–4	2012	Electromagnetic compatibility (EMC) - Part 4–4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4–4	2012
IEC 61000-4–5	2005	Electromagnetic compatibility (EMC) – Part 4–5: Testing and measurement techniques - Surge immunity test	EN 61000-4–5	2006
IEC 61000-4–6	2008	Electromagnetic compatibility (EMC) – Part 4–6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4–6	2009
IEC 61000-4–11	2004	Electromagnetic compatibility (EMC) - Part 4–11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4–11	2004
IEC 61032	1997	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	1998
IEC 61056-1	-	General purpose lead-acid batteries (valve-regulated types) - Part 1: General requirements, functional characteristics - Methods of test	EN 61056-1	2012
IEC 61058-1	2000	Switches for appliances – Part 1: General requirements	-	-
+ 1	2001		EN 61058-1	2002
+ 2	2007		+ 2	2008

Publication	Year	Title	EN/HD	Year
IEC 61210 (mod)	-	Connecting devices - Flat quick-connect terminations for electrical copper conductors - Safety requirements	EN 61210	2010
IEC 61540 (mod)	1997	Electrical accessories - Portable residual current devices without integral overcurrent protection for household and similar use (PRCDs)	HD 639 S1	2002
+ 1	1998		+ 1	2003
			+ corrigendum Jul.	2003
			+ 2	2010
IEC 61558-1	-	Safety of power transformers, power supplies, reactors and similar products –Part 1: General requirements and tests	EN 61558-1	2019
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	EN 61558-2–4	2009
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	EN 61558-2–6	2009
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	EN 61558-2–16	2009
			+ 1	2013

Publication	Year	Title	EN/HD	Year
IEC 61951-1	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary sealed cells and batteries for portable applications - Part 1: Nickel-Cadmium	EN 61951-1	2017
IEC 61951-2	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary sealed cells and batteries for portable applications - Part 2: Nickel-metal hydride	EN 61951-2	2017
IEC 61960	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications	EN 61960	2011
IEC 61984	-	Connectors - Safety requirements and tests	EN 61984	2009
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	EN 62133	2013
IEC 62233 (mod)	-	Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure	EN 62233	2008
			+ corrigendum Aug.	2008
IEC 62471 (mod)	-	Photobiological safety of lamps and lamp systems	EN 62471	2008
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	EN ISO 1463	2004

Publication	Year	Title	EN/HD	Year
ISO 2178	-	Non-magnetic coatings on magnetic substrates – Measurement of coating thickness – Magnetic method	EN ISO 2178	2016
ISO 2768-1	-	General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications	EN 22768-1	1993
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	EN ISO 3744	2010
ISO 3864-2	2016[11]	Graphical symbols - Safety colours and safety signs – Part 2: Design principles for product safety labels	-	-
ISO 3864-3	2012[11]	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	EN ISO 4871	2009
ISO 5347-8	1993[11]	Methods for the calibration of vibration and shock pick-ups - Part 8: Primary calibration by dual centrifuge	-	-
ISO 5347-12	1993[11]	Methods for the calibration of vibration and shock pick-ups - Part 12: Testing of transverse shock sensitivity	-	-
ISO 5347-13	1993[11]	Methods for the calibration of vibration and shock pick-ups - Part 13: Testing of base strain sensitivity	-	-
ISO 5347-15	1993[11]	Methods for the calibration of vibration and shock pick-ups - Part 15: Testing of acoustic sensitivity	-	-
ISO 5347-16	1993[11]	Methods for the calibration of vibration and shock pick-ups - Part 16: Testing of mounting torque sensitivity	-	-

Publication	Year	Title	EN/HD	Year
ISO 5347-18	1993[11]	Methods for the calibration of vibration and shock pick-ups - Part 18: Testing of transient temperature sensitivity	-	-
ISO 5347-22	1997[11]	Methods for the calibration of vibration and shock pick-ups - Part 22: Accelerometer resonance testing - General methods	-	-
ISO 5349-1	-	Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration – Part 1: General requirements	EN ISO 5349-1	2001
ISO 5349-2	-	Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration – Part 2: Practical guidance for measurement in the workplace	EN ISO 5349-2	2001
			+ 1	2015
ISO 7000	2012	Graphical symbols for use on equipment - Registered symbols	-	-
ISO 7010	-	Graphical symbols - Safety colours and safety signs - Registered safety signs	EN ISO 7010	2020
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	EN 27574-4	1988
ISO 8041	-	Human response to vibration - Measuring instrumentation	EN ISO 8041	2005
			+AC	2008
ISO 9772	2012	Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame	-	-

Publication	Year	Title	EN/HD	Year
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	EN ISO 11201	2010
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	EN ISO 11203	2009
ISO 12100	-	Safety of machinery - General principles for design - Risk assessment and risk reduction	EN ISO 12100	2010
ISO 13849-1	-	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	EN ISO 13849-1	2015
ISO 13850	-	Safety of machinery - Emergency stop function - Principles for design	EN ISO 13850	2015
ISO 16063-1	1998[11]	Methods for the calibration of vibration and shock transducers – Part 1: Basic concepts	-	-
-	-	Mechanical vibration – Declaration and verification of vibration emission values	EN 12096	1997
-	-	Hand-arm vibration – Guidelines for vibration hazards reduction – Part 1: Engineering methods by design of machinery	CR 1030-1	1995

Publication	Year	Title	EN/HD	Year
-	-	Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 1: Planning (ISO/TR 11688-1:1995)	EN ISO 11688-1	2009 〈A11

(normative)

Durability requirements for adhesive labels

NOTE The text in this Annex has been taken from UL 969 Ed5.0:2017.

ZB.1 General

This annex covers adhesive-attached **labels** for use as permanent nameplates or markers. These **labels** are intended to be used by manufacturers for application to their products at their place of manufacture.

ZB.2 Performance

ZB.2.1 Labels applied or bonded to representative test surfaces and exposed to the applicable conditions described in ZB.5 shall show permanence and legibility as given in Table ZB.1.

Table ZB.1 — Permanence and legibility

Test	Requirement
Visual examination – The **labels** shall be viewed with normal vision from a distance of (500 ± 50) mm.	A **label** shall adhere to the test surface without any significant curling or loosening around the perimeter greater than 10 % of the **label** area, or other indication of loss of adhesion such as wrinkles or bubbles. It shall not excessively craze, shrink more than 10 % of the **label** area or slip from its original position on the test panel more than 5 mm. **Overlamination**, if present, shall show no separation, excessive darkening or shrinkage of more than 10 % of the **label** area. Printing shall be legible and there shall be no significant deterioration of legibility such as fading or bleeding. Significant change in print colours shall be noted.
Legibility test – Printed surfaces of **labels** are to be rubbed with thumb or finger back and forth ten times with a downward force of approximately 18 N and then examined for legibility as in the visual examination.[a]	Printing shall be legible and there shall be no significant deterioration or blurring of legibility.
Defacement test – **Labels** are to be scraped back and forth ten times across printed areas and edges, with a downward force of between 7,2 N and 9 N using the edge of a 1,65 mm to 2,5 mm thick steel blade held at a right angle to the test surface. The portion of the blade contacting the test surface shall have a radius of curvature of 25 mm to 33 mm and the edges of the blade shall be rounded to a radius of 0,41 mm ± 0.08 mm.	A **label**, including **overlamination** or overprint coating, if present, shall remain in place and shall not be torn, uplifted, or otherwise damaged. Scratching or defacement of unprotected printing, either text or background, is not considered a noncompliance.

Adhesion test (see ZB.6) – This test is to be conducted if it is possible to remove test strips from surfaces. If removal as described in ZB.6 is not possible because of breaking, tearing, or excessive rigidity of the **label** material, adhesion is to be determined by attempting to remove the entire sample by hand.	The average quantitative adhesion value shall not be less than 0,088 N/mm width and the adhesion shall not be less than 0,0175 N/mm at any point. If it is not possible to separate test strips from the surface, the sample shall show good adhesion to the surface when removal by hand is attempted.
[a] Subsurface printed **labels** and **labels** in which printing is protected by an **overlamination** are not subject to the legibility test.	

ZB.2.2 If after any exposure condition the test surface excessively warps, bubbles, deteriorates, melts, chips, or otherwise renders it impossible to determine compliance of the **label** with the requirements of this standard, the evaluation of the sample applied to the test surface is considered to be inconclusive.

ZB.2.3 Samples are to be representative of the construction of the **label** to be tested. Significant construction variables such as top-surface or subsurface printing; top coating; face stock; **overlamination** or adhesive thickness range; partial adhesive coverage; differing types or colours of similar face stock or adhesive (for example, clear, pigmented, or metallized); and alternative printing processes and inks (including floodcoating for subsurface printed constructions) are to be represented in the samples provided.

ZB.2.4 The minimum recommended sample size is 50 mm x 50 mm.

ZB.3 Test surfaces

ZB.3.1 Test surface panels shall be provided for each material on which the samples are to be tested. Panels shall be essentially flat, smooth, and rigid, and shall measure approximately 75 mm x 280 mm. Larger panels that can be cut, or smaller panels, if sufficient in number, may be used. If samples shall be investigated for use on a curved surface, curved surfaces or tubing of representative radius shall be provided. When samples shall be investigated for use on a textured surface, panels of the specific textured surface shall be provided.

ZB.3.2 Test surfaces shall be cleaned as described in ZB.3.3 to ZB.3.4, before the samples are applied.

ZB.3.3 A test panel shall be repeatedly wiped with cheesecloth (bleached cotton gauze) dampened with denatured ethyl alcohol or isopropanol until it appears clean. The surface shall then be wiped once more, with the dampened cheesecloth turned to expose a clean area, and is then allowed to dry in air for at least 1 min.

ZB.3.4 If alcohol affects the surface or is not considered the solvent of choice for a particular test surface:

— An alternative solvent that does not affect the surface or leave a film shall be used; or

— A detergent and water solution shall be used, after which the surface shall be thoroughly rinsed with demineralized water, wiped with clean dry cheesecloth, and allowed to dry in air for 1 h.

ZB.4 Application of labels to surfaces

ZB.4.1 Two or more samples of a particular construction shall be applied to one or more panels of a test surface material for each exposure. Separate panels shall be used for each exposure. The number of samples applied to a panel may vary, depending upon sample size, and panel size.

ZB.4.2 Samples applied to the test surface panels shall be stored at (23 ± 5) °C and a relative humidity of 50 % ± 20 % until they are subjected to the applicable exposure conditions.

ZB.5 Exposure conditions

ZB.5.1 **Labels** shall be subjected to each of the conditions given in Table ZB.2.

Table ZB.2 — Exposure conditions

Exposure conditions	Time of evaluation
As received: at least 72 h in a standard atmosphere.[a]	Following the exposure period.
Water immersion: At least 24 h in a standard atmosphere[a] followed by immersion in demineralized water for (48 ± 0,5) h at (23 ± 2) °C.	While wet immediately after removal from the water, except for the adhesion test.[b] The adhesion test according to ZB.6 shall be conducted after drying at least 24 h in a standard atmosphere.[a,c]
Elevated temperature: At least 24 h in a standard atmosphere[a] followed by (240 ± 1) h in an air-circulating oven at the test temperature corresponding to the **maximum temperature rating**.[d] See ZB.5.2. The test panels shall be placed in a rack in the vertical position in a manner that does not prevent slippage of the **label**, with the panels oriented parallel to the direction of the air flow. Thermoplastic test panels that require support to prevent distortion resulting from stress relief are permitted to be placed on a horizontal tray. Additionally, to reduce distortion of thermoplastic test panels, preconditioning of plastic test panels at or below the elevated test temperature is permitted before **labels** are applied.	After cooling in a standard atmosphere for at least 4 h.[a]
Low temperature:[e] At least 24 h in a standard athmosphere[a] followed by (7 ± 0,25) h in a cold box maintained at the temperature (±2) °C corresponding to the **minimum temperature rating**.	Following the exposure period.[b] The adhesion test is not conducted after this exposure condition.

[a] Standard atmosphere: (23 ± 2) °C and a relative humidity of 50 % ± 10 %.

[b] Test panels are removed one at a time from the exposure condition and tested immediately in the following order: defacement test, visual examination, legibility test (see Table ZB.1).

[c] Blotting of the water in a manner that does not affect subsequent evaluation is acceptable to aid in drying the test panels.

[d] A full draft air-circulating oven capable of maintaining the test temperature with a minimum of five air changes per hour.

[e] This test is only applicable for tools intended to be used at ambient air temperatures lower than 0 °C.

ZB.5.2 Test temperatures applicable to the **maximum temperature rating** are given in Table ZB.3.

Table ZB.3 — Ten-day oven test temperatures

Maximum temperature rating °C	**Test temperature** °C
40	60 ± 2
60	87 ± 2
80	105 ± 3
100	121 ± 3

ZB.5.3 Labels shall be conditioned for at least 24 h in a standard atmosphere of (23 ± 2) °C and a relative humidity of 50 % ± 10 %.

The samples shall then be immersed in IRM903 lubricating oil for (48 ± 0,5) h. After being immersed, the samples shall be evaluated in accordance with the water immersion exposure in Table ZB.2 for compliance with the requirements in Table ZB.1 except that **label** panels removed from the lubricating oil are permitted to drain up to 5 min before being evaluated. When exposure to the oil should be avoided, the legibility test (see Table ZB.1) shall be conducted using a thin, smooth-surfaced latex or nitrile rubber glove.

ZB.6 Adhesion test

Samples shall be tested as follows. Test strips approximately 12 mm wide are prepared by making two parallel cuts through the sample to the test surface, using a sharp instrument such as a razor blade. Strips are cut parallel to the length and width of the sample if the size and configuration of samples allows. One end of each strip is separated from the surface for attachment to the apparatus for test. The remainder of each strip, at least 25 mm is then pulled from the surface at a 90° ± 5° angle and at a rate of (50,8 ± 2,5) mm/min, using a tension machine equipped with an automatic recorder that graphs the adhesion profile of the test strip. The average force required to remove the strip is calculated in N/mm width rounding to the nearest 0,002 N/mm. The value obtained for two or more samples is averaged and taken as the quantitative adhesion value. Notation shall be made if the quantitative adhesion value drops below 0,02 N/mm at any point during the test. 〈A11〉

〈A11〉 Annex ZZ
(informative)

Relationship between this European Standard and the essential requirements of Directive 2006/42/EC [2006 OJ L157] aimed to be covered

This European Standard has been prepared under a Commission's standardization request "M/396 Mandate to CEN and CENELEC for Standardisation in the field of machinery" to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZZ.1 — Correspondence between this European Standard and Annex I of Directive 2006/42/EC

The relevant Essential Requirements of Directive2006/42/EC	Clause(s) / subclause(s) of this EN	Remarks / Notes:
		To cover all the relevant safety requirements for the product(s) in its scope, this standard (providing general/common requirements for a whole machine family) has to be applied in conjunction with the appropriate Part 2, 3 or 4 of this standard series (providing specific requirements for a particular type of tools).
1.1.2 a)	4	-
1.1.2 c)	18	-
1.1.3 (Materials and products)	5, 6.1, 21.6, K.5, L.5, L.21	-
1.1.5 (Design of machinery to facilitate its handling)	19.4	-
1.1.6 (Ergonomics)	5, 19.5, 21.18.1, 21.18.2, K.5, L.5, L.21	-
1.1.7 (Operating positions)	21.35, L.21	-
1.2.1 (Safety and reliability of control systems)	5, 18.6, 18.8, 23.1.6, 23.1.10, 23.1.11, 23.3, K.5, K.18.6, K.18.8, K.23.1.10, K.23.1.201, L.5, L.18, L.23.1.10	-
1.2.2 (Control devices)	5, 8.5, 8.9, 8.10, 8.11, 21.1, 21.2, 21.4, 21.17, 21.18, K.21.17.1.2, K.5, L.5, L.21	-
1.2.3 (Starting)	5, 21.17, K.5, K.21.17.1.2, L.5, L.21	-
1.2.4.1 (Normal stop)	5, 21.17, K.5, K.21.17.1.2, L.5, L.21	-
1.2.5 (Selection of control or operating modes)	4	-
1.2.6 (Failure of the power supply)	5, 21.18.1.Z1, 21.18.2.1, 23.3, K.5, L.5, L.21	-
1.3.1 (Risk of loss of stability)	5, 19.7, 19.8, K.5, L.5	-

The relevant Essential Requirements of Directive2006/42/EC	Clause(s) / subclause(s) of this EN	Remarks / Notes:
1.3.2 (Risk of break-up during operation)	5, 13.1, 17, 19.6, 20, 21.23, 24.11, 24.12, 27, K.5, K.13.1, K.19.6, K.20, K.27.1, L.5, L.13.1, L.17, L.20, L.21	-
1.3.3 (Risk due to falling or ejected objects)	5, 18.3, 21.35, K.5, L.5, L.18, L.21	-
1.3.4 (Risks due to surfaces, edges or angles)	19.2, 21.24, L.21	-
1.3.7 (Risks related to moving parts)	5, 19.1, 19.3, K.5, L.5	-
1.3.8.1 (Moving transmission parts)	5, 19.1, 19.3, K.5, L.5	-
1.3.8.2 (Moving parts involved in the process)	5, 19.1, K.5, L.5	-
1.4.1 (General requirements (for guards and protective devices))	5, 19.1, 20.1, 20.2, 20.3, 20.4, 21.22, K.5, K.20.1, K.20.3, L.5, L.20, L.21	-
1.4.2.1 (Special requirements for fixed guards)	5, 19.1, 19.9, K.5, L.5	-
1.4.2.3 (Special requirements for adjustable guards restricting access)	5, 19.1, K.5, L.5	-
1.5.1 (Risks due to electricity supply)	5, 7, 9, 10, 11, 12, 14, 15, 16, 17, 18.1 to 18.7, 20.5, 21.3, 21.5 to 21.16, 21.19 to 21.22, 21.25 to 21.34, 22, 23.1.1 to 23.1.5, 23.1.7 to 23.1.9, 23.2, 23.4, 23.5, 24, 25, 26, 27, 28, K.5, K.9, K.12, K.18.1 to K.18.7, K.22, K.24, K.27.1, K.28.1, L.5, L.7.1, L.9, L.10, L.11, L.12, L.14, L.16, L.17, L.18, L.20, L.21, L.22, L.24, L.25, L.26, L.28.1, Annex C	-
1.5.4 (Risks due to errors of fitting)	5, 8.7, 8.8, 8.13, 8.14.2, 21.7, 21.8, 21.19, 27.1, K.5, K.19.201, K.21.201, K.21.203, K.27.1, L.5, L.19.201, L.21	-
1.5.5 (Risks due to extreme temperatures)	5, 12.5, 18.4, K.5, K.12.1, L.5	-

The relevant Essential Requirements of Directive2006/42/EC	Clause(s) / subclause(s) of this EN	Remarks / Notes:
1.5.6 (Risks due to fire)	5, 13, 18.1, 18.2, 18.6, 28.1, K.5, K.12.201, K.13, K.18.1, K.18.6, K.18.201, K.18.202, K.18.203, K.20.1, K.20.3, K.21.201, K.21.203, K.23.201, K.23.202, K.28.1, L.5, L.12.201, L.13, L.18, L.20.201, L.20.202, L.21.201, L.21.203, L.23.201, L.23.202, L.28.1, L.28.201	-
1.5.7 (Risks due to explosion)	5, K.5, K.12.201, K.18.201, K.18.202, K.18.203, K.19.202, K.20.1, K.20.3, K.21.202, K.21.203, L.5, L.12.201, L.18.202, L.18.203, L.18.204, L.19.202, L.20.201, L.20.202, L.21.202, L.21.203	-
1.5.8 (Noise reduction)	21.Z1	-
1.5.9 (Vibration reduction)	21.Z2	-
1.5.10 (Risks due to radiation)	5, 6.1, 6.3, K.5, L.5	-
1.5.11 (Risks due to external radiation)	5, 18.8, K.5, K.18.8, L.5, L.18.8	-
1.5.12 (Risks due to laser radiation)	6.2	-
1.5.13 (Risks due to emissions of hazardous materials and substances)	21.35, L.21	-
1.6.1 (Machinery maintenance)	24.1	-
1.6.3 (Isolation of energy sources)	24.1	-
1.7.1 (Information and warnings on machinery)	8.1, 8.2, 8.4, 8.6, K.8.4, L.8.1, L.8.4	-
1.7.2 (Warning of residual risks)	8.2, 8.4, K.8.4, L.8.4	-
1.7.3 (Marking of machinery)	8.3, 8.4, 8.12, K.8.3, K.8.4, L.8.3, L.8.4	-
1.7.4 (Instructions)	8.14	
1.7.4.1 (General principles for drafting of instructions)	8.14	-
1.7.4.2 (Contents of the instructions)	8.14, 8.14.1, 8.14.2, 8.14.3, K.8.14.1.1, K.8.14.2, L.8.14.1.1, L.8.14.2	

The relevant Essential Requirements of Directive2006/42/EC	Clause(s) / subclause(s) of this EN	Remarks / Notes:
1.7.4.3 (Sales literature)	-	Not covered
2.2.1 (General requirements for portable hand-held and/or hand-guided machinery)	5, 19.4, 19.5, 21.18.1, K.5, L.5, L.21	-
2.2.1.1 (Instructions for portable hand-held and/or hand-guided machinery)	5, 8.14.2 Za) 3), I.3.6.2, K.5, L.5	-

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard. 〈A11〉

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY –

Part 1: General requirements

FOREWORD

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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);