



BSI Standards Publication

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

Part 1: General requirements

National foreword

This British Standard is the UK implementation of EN 62841-1:2015+A11:2022. It is derived from IEC 62841-1:2014, incorporating corrigenda May 2014 and October 2015. It supersedes 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 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 **Ⓒ** **Ⓒ**.

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.

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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

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.

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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

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with this document have to be withdrawn

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of 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".

Endorsement notice

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withdrawn

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.



Annex ZA (normative)

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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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		+ A1	2006
+ A2 (mod)	2010		+ A2	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	-	-
+ A1	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	-	-
+ A1	1997 ¹¹		-	-
+ A2	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 EN 60252-1 1: General - Performance, testing and rating - Safety requirements - Guidance for installation and operation		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
			+ A1	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
			+ A1	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
+ A1	1999		+ A1	2000
+ A2	2013		+ A2	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	-	-
+ A1	2006 ¹¹	-	-	-
+ A2	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	-	-
+ A1	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 mm ² up to 35 mm ² (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
+ A1	2007		+ A1	2008
+ A2	2010		+ A2	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	-	-
+ A1	2001		EN 61058-1	2002
+ A2	2007		+ A2	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
+ A1	1998		+ A1	2003
			+ corrigendum Jul.	2003
			+ A2	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
			+ A1	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
			+ A1	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/TR 11690-3	-	Acoustics - Recommended practice for the design of low noise workplaces containing machinery – Part 3: Sound propagation and noise prediction in workrooms	EN ISO 11690-3	1998
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

 <u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
-	-	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



Annex ZB
(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.

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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 $(23 \pm 5) ^\circ\text{C}$ and a relative humidity of $50 \% \pm 20 \%$ 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 Water immersion: At least 24 h in a standard atmosphere^a followed by immersion in demineralized water for $(48 \pm 0,5)$ h at (23 ± 2) °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.	Following the exposure period. 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} After cooling in a standard atmosphere for at least 4 h.^a
Low temperature:^e At least 24 h in a standard atmosphere^a followed by $(7 \pm 0,25)$ 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 $50 \% \pm 10 \%$. ^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.

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 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 Directive 2006/42/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 Directive 2006/42/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	-



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The relevant Essential Requirements of Directive 2006/42/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	

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The relevant Essential Requirements of Directive 2006/42/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.”



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: General requirements

FOREWORD

- 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.
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- 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 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);

- leakage current test and electric strength test moved from former Clauses 13 and 15 to Annexes C and D;
- former Clauses 29, 30 and 31 renumbered to become Clauses 6, 13 and 15;
- requirements for electronic **safety critical functions** added to Clause 18;
- requirements for switches revised and moved from Annex I to Clause 23;
- clarifications in respect to soft materials (elastomers) added to Clauses 9, 19 and 13;
- test finger in Figure 1 of IEC 60745-1 and test probe in Figure 2 of IEC 60745-1 replaced by references to basic IEC standards;
- requirements for Li-Ion battery systems added to Annexes K and L;
- Annex M removed.

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

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

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

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

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

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

- requirements: in roman type
- *test specification: in italic type*
- Notes: in smaller roman type

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

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

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

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

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

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

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

The contents of the corrigenda 1 (May 2014) and 2 (October 2015) have been included in this copy.

Rationale for corrigendum 2

The maximum parallel capacitance for instruments for measuring voltage was increased from 25 pF to 150 pF. A 25 pF maximum parallel capacitance is not typical for voltage measuring equipment, and would require highly specialized and expensive equipment. This was not the intention of TC 116. A maximum value of 150 pF will allow the continued use of voltage measuring equipment currently being used by testing laboratories.

INTRODUCTION

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

Examples of standards dealing with non-safety aspects of **hand-held tools, transportable tools and lawn and garden machinery** are

- standards dealing with EMC aspects;
- standards dealing with environmental aspects.

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

Part 1: General requirements

1 Scope

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

- **hand-held tools** (IEC 62841-2);
- **transportable tools** (IEC 62841-3);
- **lawn and garden machinery** (IEC 62841-4).

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

The **rated voltage** is not more than 250 V for single-phase a.c. or d.c. tools, and 480 V for three-phase a.c. tools. The **rated input** is not more than 3 700 W.

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

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

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

Requirements for motors not isolated from the supply, and having **basic insulation** not designed for the **rated voltage** of the tools, are given in Annex B. Requirements for rechargeable battery-powered motor-operated or magnetically driven tools and the battery packs for such tools are given in Annex K. Requirements for such tools that are also operated and/or charged directly from the mains or a non-isolated source are given in Annex L.

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

This standard does not apply to:

- tools intended to be used in the presence of explosive atmosphere (dust, vapour or gas);
- tools used for preparing and processing food;
- tools for medical purposes;

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

- tools intended to be used with cosmetics or pharmaceutical products;
- heating tools;

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

- electric motor-operated household and similar electrical appliances;

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

- electrical equipment for industrial machine-tools;

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

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

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

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

NOTE 6 In Canada, the following conditions apply:

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

2 Normative references



Replace the normative reference IEC 60127 (all parts) with the following in Clause 2 and throughout the text:

EN 60127-1:2006,¹ *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links*

EN 60127-2:2014, *Miniature fuses - Part 2: Cartridge fuse-links*

EN 60127-3:2015, *Miniature fuses - Part 3: Sub-miniature fuse-links*

EN 60127-4:2005,² *Miniature fuses – Part 4: Universal modular fuse-links (UMF) - Through-hole and surface mount types*

EN 60127-5:2017, *Miniature fuses - Part 5: Guidelines for quality assessment of miniature fuse-links*

EN 60127-6:2014, *Miniature fuses - Part 6: Fuse-holders for miniature fuse-links*

EN 60127-7:2016, *Miniature fuses - Part 7: Miniature fuse-links for special applications*

EN IEC 60127-8:2018, *Miniature fuses - Part 8: Fuse resistors with particular overcurrent protection*

Replace the normative reference IEC 60227 (all parts) with the following in Clause 2 and throughout the text:

IEC 60227-1:2007, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60227-2:1997,³ *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods*

IEC 60227-5:2011, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*

IEC 60227-6:2001, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 6: Lift cables and cables for flexible connections*

¹ As impacted by EN 60127-1:2006/A1:2011 and EN 60127-1:2006/A2:2015

² As impacted by EN 60127-4:2005/A1:2009 and EN 60127-4:2005/A2:2013

³ As impacted by IEC 60227-2:1997/A1:2003

IEC 60227-7:1995, *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*

Replace the normative reference IEC 60245 (all parts) with the following in Clause 2 and throughout the text:

IEC 60245-1:2003, *Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60245-2:1994, *Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 2: Test methods*

IEC 60245-3:1994,⁴ *Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 3: Heat resistant silicone insulated cables*

IEC 60245-4:2011, *Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 60245-7:1994, *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, *Rubber insulated cables - Rated voltages up to and including 450/750 V – Part 8: Cords for applications requiring high flexibility*

Replace the normative reference IEC 60320 (all parts) with the following in Clause 2 and throughout the text:

EN 60320-1:2015,⁵ *Appliance couplers for household and similar general purposes – Part 1: General requirements*

EN 60320-2-2:1998, *Appliance couplers for household and similar general purposes - Part 2-2: Interconnection couplers for household and similar equipment*

EN 60320-2-3:1998,⁶ *Appliance couplers for household and similar general purposes – Part 2-3: Appliance couplers with a degree of protection higher than IPX0*

EN 60320-2-4:2006,⁷ *Appliance couplers for household and similar general purposes – Part 2-4: Appliance couplers dependent on appliance weight for engagement*

EN 60320-3:2014,⁸ *Appliance couplers for household and similar general purposes – Part 3: Standard sheets and gauges*

Replace the normative reference IEC 60884 (all parts) with the following in Clause 2 and throughout the text:

IEC 60884-1:2002,⁹ *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*

⁴ As impacted by IEC 60245-3:1994/A1:1997 and IEC 60245-3:1994/A2:2011.

⁵ As impacted by EN 60320-1:2015/AC:2016.

⁶ As impacted by EN 60320-2-3:1998/A1:2005.

⁷ As impacted by EN 60320-2-4:1998/A1:2009.

⁸ As impacted by EN 60320-3:2014/A1:2021.

⁹ As impacted by IEC 60884-1:2002/A1:2006 and IEC 60884-1:2002/A2:2013.

IEC 60884-2-1:2006, *Plugs and socket-outlets for household and similar purposes – Part 2-1: Particular requirements for fused plugs*

IEC 60884-2-2:2006, *Plugs and socket-outlets for household and similar purposes – Part 2-2: Particular requirements for socket-outlets for appliances*

IEC 60884-2-5:2017, *Plugs and socket-outlets for household and similar purposes – Part 2-5: Particular requirements for adaptors*

IEC 60884-2-7:2011,¹⁰ *Plugs and socket-outlets for household and similar purposes – Part 2-7: Particular requirements for cord extension sets*

Replace the normative reference ISO 5347 (all parts) with the following in Clause 2 and throughout the text:

ISO 5347-8:1993, *Methods for the calibration of vibration and shock pick-ups — Part 8: Primary calibration by dual centrifuge*

ISO 5347-12:1993, *Methods for the calibration of vibration and shock pick-ups — Part 12: Testing of transverse shock sensitivity*

ISO 5347-13:1993, *Methods for the calibration of vibration and shock pick-ups — Part 13: Testing of base strain sensitivity*

ISO 5347-15:1993, *Methods for the calibration of vibration and shock pick-ups — Part 15: Testing of acoustic sensitivity*

ISO 5347-16:1993, *Methods for the calibration of vibration and shock pick-ups — Part 16: Testing of mounting torque sensitivity*

ISO 5347-18:1993, *Methods for the calibration of vibration and shock pick-ups — Part 18: Testing of transient temperature sensitivity*

ISO 5347-22:1997, *Methods for the calibration of vibration and shock pick-ups — Part 22: Accelerometer resonance testing — General methods*

Add the following normative references:

CR 1030-1:1995, *Hand-arm vibration - Guidelines for vibration hazards reduction - Part 1: Engineering methods by design of machinery*

EN ISO 11688-1:2009, *Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning (ISO/TR 11688-1:1995)*

Delete the normative references ASTM B 258 and UL 969. 

¹⁰ As impacted by IEC 60884-2-7:2011/A1:2013.

3 Terms and definitions

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

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

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

3.1

accessible part

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

3.2

accessory

device that is attached only to the output mechanism of the tool

3.3

adjustable guard

guard which is adjustable as a whole or which incorporates adjustable part(s). For manually adjustable guards, the adjustment remains fixed during a particular operation

3.4

all-pole disconnection

disconnection of all supply conductors except the protective earthing (grounding) conductor by a single initiating action

3.5

attachment

device attached to the housing or other component of the tool and which may or may not be attached to the output mechanism and does not modify the **normal use** of the tool within the scope of this standard

3.6

basic insulation

insulation applied to **live parts** to provide protection against electric shock. Insulation applied to **live parts** not intended to provide electric shock protection is considered to be insulation for functional purposes, such as magnet wire insulation

3.7

battery

assembly of one or more **cells** intended to provide electrical current to the tool

3.8

class I tool

tool in which protection against electric shock does not rely on basic, double or **reinforced insulation** only, but which includes an additional safety precaution in that conductive **accessible parts** are connected to the protective earthing conductor in the fixed wiring of the installation in such a way that conductive **accessible parts** cannot become live in the event of a failure of the **basic insulation**

Note 1 to entry: Also considered as **class I tools** are tools with **double insulation** and/or **reinforced insulation** throughout, but also having an earthing terminal or earthing contact.

3.9

class II tool

tool in which protection against electric shock does not rely on **basic insulation** only, but in which additional safety precautions, such as **double insulation** or **reinforced insulation**, are provided, there being no provision for protective earthing or reliance upon installation conditions

3.10

class III tool

tool in which protection against electric shock relies on supply at **safety extra-low voltage**, and in which voltages higher than those of **safety extra-low voltages** are not generated

3.11

class II construction

part of a tool for which protection against electric shock relies upon **double insulation** or **reinforced insulation**

3.12

class III construction

part of a tool for which protection against electric shock relies upon **safety extra-low voltage**, and in which voltages higher than those of **safety extra-low voltages** are not generated

3.13

clearance

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

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

3.14

control device

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

3.15

creepage distance

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

Note 1 to entry: Examples of **creepage distances** are given in Annex A.

3.16

detachable part

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

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

3.17

double insulation

insulation system comprising both **basic insulation** and **supplementary insulation**

3.18

electronic circuit

circuit incorporating at least one **electronic component**

3.19

electronic component

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

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

3.20

explosion

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

3.21

extra-low voltage

voltage supplied from a source within the tool and, which, when the tool is supplied at **rated voltage**, does not exceed 50 V between conductors and between conductors and earth

3.22

fixed guard

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

3.23

guard

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

3.24

hand-held tool

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

Note 1 to entry: **Hand-held tools** include tools provided with a flexible shaft, the motor being either fixed or portable.

3.25

inherent operating cycle

repetitive operation of a tool designed in such a way that the complete cycle duration cannot be altered by the operator

3.26

interconnection cord

external flexible cord provided for electrical connections between two parts of a tool

3.27

lawn and garden machinery

tool for garden maintenance

3.28

liquid system

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

3.29

live part

any conductor or conductive part intended to be energized in **normal use**, including a neutral conductor

3.30**mean time to dangerous failure****MTTF_d**

expectation of the mean time to dangerous failure

3.31**momentary power switch**

power switch that does not remain in the “on” position when the actuating device is released

3.32**non-self-resetting thermal cut-out**

thermal cut-out which requires a manual operation for resetting, or replacement of a part, in order to restore the current

Note 1 to entry: Manual operation also includes operation of the **power switch**.

3.33**non-isolated source**

voltage source in which the output is not isolated from the mains supply by means of a **safety isolating transformer**

3.34**normal operation**

conditions under which the tool is operated in **normal use** when it is connected to the power supply

3.35**normal use**

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

3.36**power switch**

device that electrically activates the primary function of the tool in the “on” position and deactivates the same function of the tool in its “off” position

3.37**protective device**

device, the operation of which prevents a hazardous situation under abnormal operation conditions

3.38**protective impedance**

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

3.39**rated current**

current assigned to the tool by the manufacturer

3.40**rated frequency**

frequency assigned to the tool by the manufacturer

3.41**rated frequency range**

frequency range assigned to the tool by the manufacturer, expressed by its lower and upper limits

3.42

rated input

input in watts assigned to the tool by the manufacturer

3.43

rated no-load speed

no-load speed assigned to the tool by the manufacturer

3.44

rated voltage

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

3.45

rated voltage range

voltage range assigned to the tools by the manufacturer, expressed by its lower and upper limits

3.46

reinforced insulation

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

Note 1 to entry: Examples of **reinforced insulation** are a single layer or several layers which cannot be tested singly as **basic insulation** or **supplementary insulation**.

3.47

residual current device

RCD

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

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

3.48

safety critical function

SCF

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

3.49

safety extra-low voltage

voltage not exceeding a peak value of 42,4 V between conductors and between conductors and earth, the no-load voltage not exceeding a peak value of 50 V, in an electric circuit which has galvanic separation from the supplying electric power system by such means as a **safety isolating transformer** or a converter with separate windings, the insulation of which complies with **double insulation** or **reinforced insulation** requirements

3.50

safety isolating transformer

transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to **double insulation** or **reinforced insulation**, and which is intended to supply a distribution circuit, a tool or other equipment at **safety extra-low voltage**

3.51

self-resetting thermal cut-out

thermal cut-out which automatically restores the current after the relevant part of the tool has cooled down to a given value

3.52**supplementary insulation**

independent insulation applied in addition to the **basic insulation**, in order to provide protection against electric shock in the event of a failure of the **basic insulation**

3.53**supply cord**

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

3.54**temperature limiter**

temperature-sensing device, the operating temperature of which may be either fixed or adjustable, and which, during **normal operation**, operates by opening or closing a circuit when the temperature of the controlled part reaches a predetermined value

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

3.55**thermal cut-out**

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

3.56**thermal link**

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

3.57**thermostat**

temperature-sensing device, the operating temperature of which may be either fixed or adjustable; and which, during **normal operation**, keeps the temperature of the controlled part between certain limits by automatically opening and closing a circuit

3.58**transportable tool**

tool that has the following characteristics:

- a) intended to be taken to various designated working areas. The tool performs work on the material that is either brought to the tool, the tool is mounted to the workpiece or the tool is placed in proximity of the workpiece;
- b) intended to be moved by one or two people, with or without simple devices to facilitate transportation, e.g. handles, wheels and the like;
- c) used in a stationary position set up on a bench, table, floor or incorporating a device that performs the function of a bench or table, with or without fixing, e.g. fast clamping devices, bolting and the like, or mounted to the workpiece;
- d) used under the control of an operator;
- e) either the workpiece or the tool is fed or introduced manually;
- f) not intended for continuous production or production line use;
- g) if mains operated, supplied with a flexible **supply cord** and plug

3.59**type X attachment**

method of attachment of the **supply cord** specified by the manufacturer so that it can easily be replaced

3.60

type Y attachment

method of attachment of the **supply cord** such that any replacement is intended to be made by the manufacturer, its service agent or similar qualified person

3.61

type Z attachment

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

3.62

user maintenance

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

3.63

working voltage

maximum voltage, without the effect of transient voltages, to which the part under consideration is subjected when the tool is supplied at its **rated voltage** and operating with **rated input** or **rated current**



Z.3.1

label

adhesive-backed construction bearing printing

Z.3.2

maximum temperature rating

highest surface temperature at which a **label** is intended to be used

Z.3.3

minimum temperature rating

lowest surface temperature at which a **label** is intended to be used

Z.3.4

overlamination

transparent film applied over printed material for protection 

4 General requirements

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

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

Text deleted

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

5 General conditions for the tests

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

NOTE Annex F shows an example of routine tests.

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

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

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

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

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

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

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

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

5.6 *The tests are made in a draught-free location and at an ambient temperature of $(20 \pm 5) ^\circ\text{C}$.*

If the temperature attained by any part is limited by a temperature sensitive device, the ambient temperature is, in case of doubt, maintained at $(23 \pm 2) ^\circ\text{C}$.

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

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

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

5.7.2 Tools having more than one **rated voltage** or having a **rated voltage range** are tested at the highest voltage.

5.7.3 For tests that require a value for **rated current** and with tools where there is no marked **rated current**, the value of the **rated current** is substituted by the current measured when the tool is operated at **rated input** at the lowest **rated voltage** or the lower value of the **rated voltage range**.

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

5.9 Tools are tested with the specified flexible **supply cord** connected to the tool.

5.10 If **class I tools** have **accessible parts** which are not connected to an earthing terminal or earthing contact, and are not separated from **live parts** by an intermediate metal part which is connected to an earthing terminal or earthing contact, such parts are checked for compliance with the appropriate requirements specified for **class II construction**.

5.11 If **class I tools** or **class II tools** have parts operating at **safety extra-low voltage**, such parts are checked for compliance with the appropriate requirements specified for **class III tools**.

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

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

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

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

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

5.16 Tools intended to be operated at **safety extra-low voltage** are tested using a supply transformer intended to be used with the tool.

5.17 If a requirement is based upon the mass of the tool, the mass shall be determined without **supply cord**, if any, and without tool bits or **accessories**, but with all equipment and **attachments** needed for **normal use**. Details of the required **accessories**, equipment and **attachments** are given in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.

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