

INTERNATIONAL STANDARD



This full version of IEC 62841-3-11:2024 includes the content of the references made to IEC 62841-1:2014

**Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery – Safety –
Part 3-11: Particular requirements for transportable combined mitre and bench saws**



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INTERNATIONAL STANDARD



This full version of IEC 62841-3-11:2024 includes the content of the references made to IEC 62841-1:2014

**Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery – Safety –
Part 3-11: Particular requirements for transportable combined mitre and bench saws**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS,
TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY –
SAFETY –****Part 3-11: Particular requirements for transportable
combined mitre and bench saws**

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.
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This extended version (EXV) of the official IEC Standard provides the user with the full content of the Standard.

IEC 62841-3-11:2024 EXV includes the content of IEC 62841-3-11:2024, and the references made to IEC 62841-1:2014.

The specific content of IEC 62841-3-11:2024 is displayed on a blue background.

IEC 62841-3-11 has been prepared by IEC technical committee 116: Safety of motor-operated electric tools. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
116/802/FDIS	116/824/RVD

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

The language used for the development of this International Standard is English.

This document is to be used in conjunction with IEC 62841-1:2014.

This document supplements or modifies the corresponding clauses in IEC 62841-1, so as to convert it into the IEC Standard: Particular requirements for transportable combined mitre and bench saws.

Where a particular subclause of IEC 62841-1 is not mentioned in this document, that subclause applies as far as reasonable. Where this document states "*addition*", "*modification*" or "*replacement*", the relevant text in IEC 62841-1 is to be adapted accordingly.

The following print types are used:

- requirements: in roman type;
- *test specifications: in italic type;*
- terms defined in Clause 3: in **bold** type
- notes: in small roman type.

Subclauses, notes, tables and figures which are additional to those in IEC 62841-1 are numbered starting from 101.

Subclauses, notes, tables and figures in Annex K and Annex L which are additional to those in the main body of this document are numbered starting from 301.

A list of all parts in the IEC 62841 series, published 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.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

NOTE 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 document.

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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION to IEC 62841-1:2014

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 3-11: Particular requirements for transportable combined mitre and bench saws

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.

This part of IEC 62841 applies to transportable **combined mitre and bench saws** intended to be used with a toothed saw blade for cutting wood and analogous materials, plastics and nonferrous metals except magnesium with a saw blade diameter not exceeding 315 mm, which hereinafter is simply referred to as saw or tool.

This document does not apply to

- saws intended to cut other metals, such as magnesium, steel and iron, or food;
- saws with an automatic feeding device;
- saws designed for use with abrasive wheels;
- saws designed for use with dado blades;
- single function bench or table saws;
- single function mitre saws;
- **combined mitre and bench saws** other than transportable.

NOTE 101 Transportable saws intended to cut ferrous metals will be covered by a future part of IEC 62841-3.

NOTE 102 **Transportable tools** designed for use with abrasive wheels are covered by IEC 62841-3-10:2015.

NOTE 103 Transportable **table saws** are covered by IEC 62841-3-1:2014.

NOTE 104 Transportable mitre saws are covered by IEC 62841-3-9:2020.

NOTE 105 In Europe (EN IEC 62841-3-11), the following additional NOTE applies:

NOTE Z101 **Combined mitre and bench saws** other than transportable are covered by EN 1870-3:2014.

2 Normative references

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

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

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

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

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

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

IEC 60085:2007, *Electrical insulation – Thermal evaluation and designation*

IEC 60127 (all parts), *Miniature fuses*

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

IEC 60238, *Edison screw lampholders*

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

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

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

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

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

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

IEC 60417, *Graphical symbols for use on equipment*, available at [http://www.graphical-symbols.info/graphical-symbols/equipment/db1.nsf/\\$enHome?OpenForm](http://www.graphical-symbols.info/graphical-symbols/equipment/db1.nsf/$enHome?OpenForm)

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*²
Amendment 1:1999
Amendment 2:2013

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

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

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

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

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

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

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

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

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

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

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

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

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

IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)*

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

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

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

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

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

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

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

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

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

IEC 61058-1:2000, *Switches for appliances – Part 1: General requirements*⁴
Amendment 1:2001
Amendment 2:2007

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

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

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

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

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

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

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

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

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

IEC 61984, *Connectors – Safety requirements and tests*

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

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

IEC 62471, *Photobiological safety of lamps and lamp systems*

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

IEC 62841-1:2014, *Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery – Safety – Part 1: General requirements*

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

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

ISO 180, *Plastics – Determination of Izod impact strength*

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

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

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

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

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

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

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

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

ISO 5349-1, *Mechanical vibration – Measurement and evaluation of human exposure to hand-transmitted vibration – Part 1: General requirements*

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

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

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

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

ISO 8041, *Human response to vibration – Measuring instrumentation*

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

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

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

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

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

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

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

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

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

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

UL 969, *Standard for marking and labeling systems*

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

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

NOTE 2 In Canada, the following normative reference applies:

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

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

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

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

NOTE 101 In Europe (EN IEC 62841-3-11), the following additional normative reference applies:

EN 847-1:2017, *Tools for woodworking – Safety requirements – Part 1: Milling tools, circular saw blades*

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**

3.101

anti-kickback device

device that allows the movement of the workpiece in the cutting direction but reduces the likelihood of the rapid movement of the workpiece in the direction opposite of feed

3.102

bevel angle

angular displacement of the saw blade plane with respect to the **table top** plane, the position of the saw blade plane that is perpendicular to the **table top** being the 0° bevel position

3.103

centre workpiece support

device that has a face supporting the workpiece in conjunction with the **fence**

Note 101 to entry: See Figure 118.

3.104

combined mitre and bench saw

saw intended to be used as a down-cutting cross cut saw and as a circular bench saw

Note 101 to entry: The two possible types of saw are type "A" and type "B", as defined in 3.104.1 and 3.104.2.

3.104.1

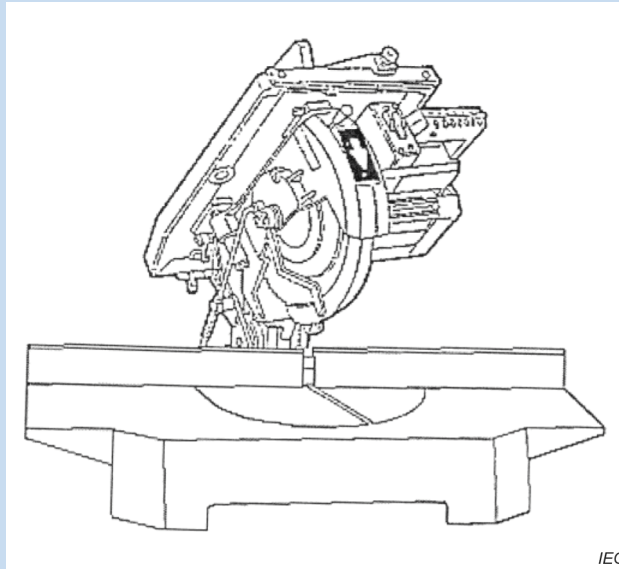
type "A" saw

combined mitre and bench saw equipped with two tables: a mitre saw table having a **fence** to support the material to be cut as the saw blade is brought down and a bench saw table which supports the material to be cut as it is fed by hand towards the saw blade

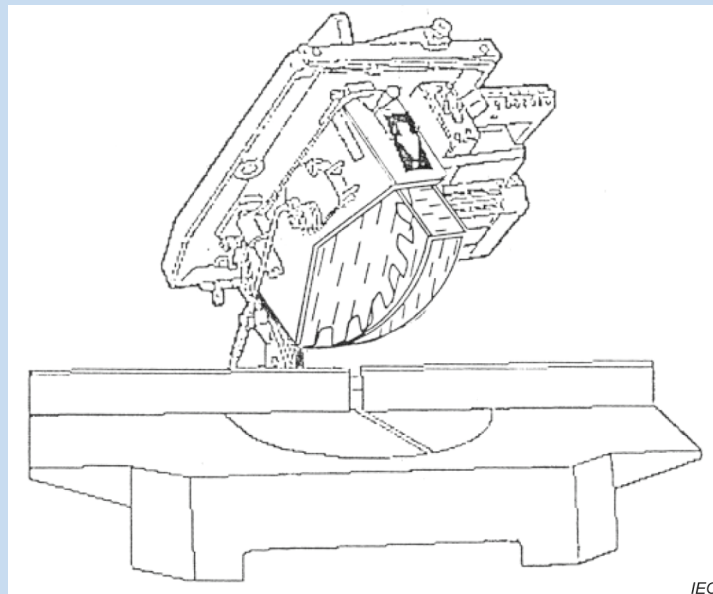
Note 101 to entry: In mitre saw mode, the saw blade is suspended over the mitre saw table from an arm, normally from a point located at the table or on a part of the frame of the tool. A sliding cutting movement can follow a downward cutting action or vice-versa.

Note 102 to entry: In bench saw mode, the saw blade projects through a slot in the bench saw table.

Note 103 to entry: See Figure 101.



a) Example provided with U-shaped guard



b) Example provided with open guard construction

Figure 101 – Combined mitre and bench saw (type "A")

3.104.2

type "B" saw

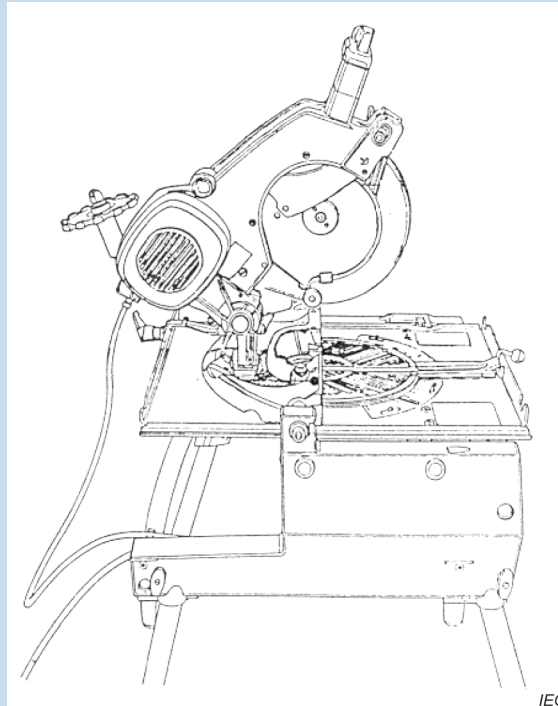
combined mitre and bench saw equipped with a single table which supports and positions the workpiece during mitre and bench sawing operations

Note 101 to entry: The saw blade is capable of being located either above or below the table.

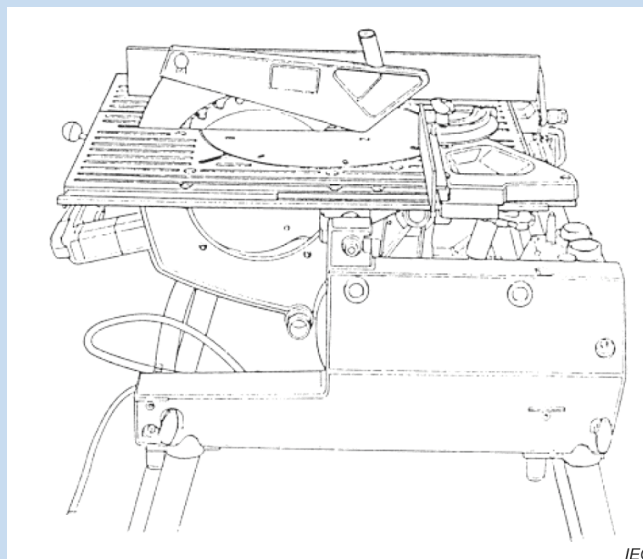
Note 102 to entry: In mitre saw mode, the saw blade is suspended over the table from an arm, normally from a point located at the table or on a part of the frame of the tool. In some cases, a sliding movement follows a downward cutting action or vice-versa.

Note 103 to entry: In bench saw mode, the saw blade projects through a slot in the table.

Note 104 to entry: See Figure 102.



a) Example in mitre saw position



b) Example in bench saw position

Figure 102 – Combined mitre and bench saw (type "B")

3.105

cross cutting

cutting operation performed utilizing a **cross-cutting fence** to guide the workpiece

Note 101 to entry: For natural wood, **cross cutting** is performed predominantly in a perpendicular direction with the grain of the wood; for engineered materials, **cross cutting** is performed perpendicular to the length of the workpiece.

3.106**cutting capacity**

for any depth setting of the saw blade at 0° bevel position, the height of the highest saw blade tooth tip above the **table top**

Note 101 to entry: For any depth setting of the saw blade, at **bevel angles** other than 0°, the height of the highest saw blade tooth tip above the **table top**, but only the side of the tooth closest to the table is considered.

3.106.1**maximum cutting capacity**

cutting capacity at the maximum depth setting of the saw blade and, unless otherwise specified, at 0° bevel

3.107**D**

maximum specified diameter of the saw blade

3.108**dadoing**

non-through cutting operation performed with a saw blade using one or more cuts to produce a rectangular sided slot in the workpiece

3.109**fence**

device to position the workpiece and absorb the horizontal forces from the saw blade during the cutting process

3.109.1**cross-cutting fence**

fence that is designed to move parallel with the plane of the saw blade during the cutting process or to position the workpiece for a table saw with sliding function

Note 101 to entry: Some **cross-cutting fences** have provisions to adjust the workpiece guiding face laterally and/or have **mitre angle** capability.

3.109.2**rip fence**

fence that has the workpiece guiding face parallel with the plane of the saw blade and that can be set to a desired distance from the saw blade

3.110**fully down position**

position of the **saw unit** after adjustment of the saw in accordance with 8.14.2 a) 105) and any depth-of-cut stop as in 8.14.2 a) 107) disengaged or adjusted in order to produce the lowest position of the **saw unit**

3.111**grooving**

series of repeated non-through cuts of same or different depth and spacing from each other, performed with an ordinary saw blade, to remove material for the purpose of creating a slot or for shaping or bending the workpiece

Note 101 to entry: **Grooving** is also known as slotting or kerfing.

3.112**kerf width**

distance between two parallel planes that are touching the opposing sides of at least three saw blade tooth tips

3.113**kickback**

sudden reaction to a pinched, jammed or misaligned workpiece with respect to the saw blade, which causes the workpiece to be propelled by the saw blade

3.114**linked action**

action of opening and closing of the **guard** related to the corresponding up and down movement of the **saw unit**

3.115**mitre angle**

angular displacement of the plane of the **fence** with respect to the cutting line, the position of the saw blade plane that is perpendicular to the plane of the **fence** being the 0° mitre position

3.116**moulding head cutting**

non-through cutting operation performed with a specially shaped cutting device which produces a corresponding shape of the cutter on the bottom surface of the workpiece

Note 101 to entry: **Moulding head cutting** is also known as shaping.

Note 102 to entry: **Moulding head cutting** is predominantly used for decoration.

3.117**non-removable**

welded, riveted or secured utilizing non-standard simple fasteners and not removable with ordinary household tools, such as slotted or Philips-tip screwdrivers and/or simple wrenches

3.118**non-through cutting**

cutting operation where the cutting device does not protrude beyond the thickness of the workpiece

3.119**plowing**

non-through cutting operation performed by moving a workpiece over an ordinary saw blade in bench saw mode utilizing a special **fence** that is not parallel with the cutting line of the saw blade, and in very small increments increasing the depth of the cut after each pass to shave off large, arcing surface areas

Note 101 to entry: **Plowing** is also known as cove cutting.

3.120**plunge cutting**

non-through cutting operation starting at a location other than the edge of a workpiece

Note 101 to entry: The cut is typically performed by first securing the workpiece over the stationary saw blade lowered below the **table top** and then by slowly raising the rotating saw blade into the workpiece. The saw blade can be raised to fully cut through the thickness of the workpiece before the workpiece is advanced by guiding it with a **rip fence** or **cross-cutting fence**.

3.121**rabbeting**

non-through cutting operation creating a rectangular notch in the edge of a workpiece where the notch is cut by two non-through cuts perpendicular to each other, performed with an ordinary saw blade on the side and the bottom edge of the workpiece

Note 101 to entry: **Rabbeting** is also known as rebating.

3.122**resawing**

combination of two non-through cuts performed with an ordinary saw blade in the same plane but on opposite sides of a workpiece that result in reducing the thickness of the workpiece

3.123**riving knife**

device located behind and in the plane of the saw blade, within the **cutting capacity** of the saw blade and in a fixed proximity to the saw blade through an entire depth of cut and **bevel angle** operating range of the saw blade, with an intended function to reduce the risk of saw blade pinching and binding

3.123.1**adjustable extended riving knife**

device designed to function at least in one position as an **extended riving knife** and in a second position as a **riving knife**

3.123.2**extended riving knife**

device identical to a **riving knife** except it extends above the **maximum cutting capacity** of the saw blade to allow the mounting of a **saw blade guard**, an **anti-kickback device** or both

3.123.3**fixed extended riving knife**

extended riving knife that is fixed in position

3.124**rip cutting**

cutting operation performed utilizing a **rip fence** to guide the workpiece

Note 101 to entry: For natural wood, **rip cutting** is performed predominantly in a parallel direction with the grain of the wood; for engineered materials, **rip cutting** is performed parallel with the length of the workpiece.

3.125**saw unit**

device with an affixed saw blade, capable of performing a cutting action

3.126**saw blade guard**

device designed to minimize inadvertent contact of the blade, being either a **top guard** or a **lower guard**

3.126.1**lower guard**

movable self-closing and blade-covering **saw blade guard** in mitre saw mode

Note 101 to entry: The **lower guard** covers the saw blade below the **table top** in bench saw mode.

3.126.2**over-arm saw blade guard**

saw blade guard suspended from a device above the **table top** in bench saw mode such that the mounting structure for the **saw blade guard** is not in the workable range of the **table top** plane

3.126.3**top guard**

saw blade guard mounted above the **table top** in bench saw mode such that a workpiece will pass between the mounted device and the **table top**

3.127

table top

horizontal surface that is in contact with and supports the workpiece

3.128

tapered cut

cut performed utilizing a fixture to hold the workpiece such that the straight edge of the workpiece is not parallel with the cutting line of the saw blade

Note 101 to entry: The fixture is guided by the **rip fence**.

3.129

through cutting

cutting operation where the saw blade protrudes beyond the thickness of the workpiece

3.130

zero clearance table insert

table insert that is manufactured without any slot for the saw blade, with the intention that the slot in the table insert will be cut after installation in the saw by the actual saw blade installed in the saw

4 General requirements

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

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

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

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

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

4.101 Throughout the remaining part of this document, unless otherwise explicitly stated, whenever a requirement or a reference is made to

– "saw blade":

this shall equally apply to any "saw blade" as specified in accordance with 8.14.2 a);

– "force" as multiple of **D**:

the force shall be measured in N and the saw blade diameter **D** shall be measured in mm;

– "riving knife":

this shall equally apply to "**extended riving knife**", but not vice versa. This terminology rule does not apply to "**riving knife position**", i.e. the "**riving knife position**" cannot be substituted with an "**extended riving knife position**".

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.

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

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

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

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

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

6 Radiation, toxicity and similar hazards

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

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

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

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

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

Compliance is checked by inspection.

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

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

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

Compliance is checked by inspection.

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

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

- “**CAUTION** Do not stare at operating lamp”, or
- symbol IEC 60417-6041 (2010-08).

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

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

- the light emission at a distance of 200 mm along any direction of the tool is below 500 Lux; or
- the luminance light emission is less than 10 000 cd/m² in the range of visible light; or
- the light source (if not focused by external optics) is in Risk Group 1 or lower evaluated by the methods of IEC 62471; or
- the tool itself is evaluated by the methods of IEC 62471 and found to be in Risk Group 1 or lower.

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

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

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

7 Classification

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

class I, class II, class III.

Compliance is checked by inspection and by the relevant tests.

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

Compliance is checked by inspection and by the relevant tests.

8 Marking and instructions

8.1 Tools shall be marked with rating information as follows:

- **rated voltage(s)** or **rated voltage range**, in volts. Tools for star-delta connection shall be clearly marked with the two **rated voltages** (for example 230 Δ/ 400 Y). A tool that complies with this standard for a voltage range, may also be marked with any single voltage or smaller voltage range within that range;
- symbol for nature of supply, unless the **rated frequency(ies)** or **rated frequency range** is marked. The symbol for nature of supply shall be placed next to the marking for **rated voltage**;
- **rated input**, in watts or **rated current**, in amperes. The **rated input** or **rated current** to be marked on the tool is the total maximum input or current that can be drawn from external circuit at the same time. If a tool has alternative components which can be selected by a **control device**, the **rated input** or **rated current** is that corresponding to the highest loading possible;
- symbol for **class II construction**, for **class II tools** only;
- IP number according to degree of protection against ingress of water other than IPX0. If the first numeral for the IP numbering is omitted, the omitted numeral shall be replaced by the letter X, for example IPX5.

Combined mitre and bench saws shall be marked with:

- maximum saw blade diameter and minimum saw blade diameter;
- **rated no-load speed**;
- the **maximum cutting capacity** for bench sawing operation;
- saw blade bore diameter.

If the **top guard** in bench saw mode is made of non-transparent material, an indication of the cutting line in alignment with the plane of the saw blade shall be marked on the **top guard**.

Compliance is checked by inspection.

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

Example:

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

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

Examples:

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

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

Compliance is checked by inspection.

8.1.2 For tools marked with more than one **rated voltage**, a **rated voltage range** or with more than one **rated voltage range**, the **rated input** for each of these voltages shall be marked.

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

Compliance is checked by inspection.

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

- “ WARNING – To reduce the risk of injury, user must read instruction manual”, or
- symbol M002 of ISO 7010, or
- the appropriate symbol stated in the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4.

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

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

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

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

Compliance is checked by inspection and by measurement.

8.3 Tools shall be marked with additional information as follows:

- the business name and address of the manufacturer and, where applicable, his authorised representative. Any address shall be sufficient to ensure contact. Country or state, city and postal code (if any) are deemed sufficient for this purpose;
- designation of the tool,
designation of the tool may be achieved by a code that is any combination of letters, numbers or symbols, providing that this code is explained by giving the explicit designation such as “drill”, “planer” etc. in the instructions supplied with the tool;

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

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

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

- the year of manufacture and a date code identifying at least the month of manufacture;
- for tools manufactured such that its parts are shipped separately for assembly by the end user, each part shall be marked with a distinct identification on the part or the package;
- “> 25 kg” if the mass of the tool is over 25 kg.

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

The direction of rotation of the saw blade shall be indicated on a fixed part of the saw in the vicinity of the spindle axis by an arrow raised or sunk, which is visible when changing the saw blade, or by any other means not less visible and indelible.

Where the tool is designed to operate at more than one spindle speed, the selected speed shall be indicated on the tool at the selecting device (e.g. variable speed control dial provided with numerical speed settings).

Compliance is checked by inspection.

8.3.101 The **riding knife** shall be permanently marked, e.g. by engraving, stamping or etching, with its thickness and with the saw blade diameter ***D***, saw blade body thicknesses, and **kerf widths** that can be used with this **riding knife**.

Compliance is checked by inspection.

8.4 Markings specified in 8.1 to 8.3 shall not be on a **detachable part** of the tool.

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

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

Compliance is checked by inspection.

8.5 If the tool can be adjusted to suit different **rated voltages**, the voltage to which the tool is adjusted shall be clearly discernible.

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

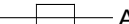
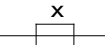
For tools where frequent changes in voltage setting are not required, this requirement is considered to be met if the **rated voltage** to which the tool is adjusted can be determined from a wiring diagram fixed to the tool. The wiring diagram may be on the inside of a cover which has to be removed to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

Compliance is checked by inspection.

8.6 For units the following shall be used:

V	volts
A	amperes
Ah	ampere-hours
Hz	hertz
W	watts
kW	kilowatts
F	farads
μF	microfarads
l	litres
g	grams
kg	kilograms
bar	bars
Pa	pascals
h	hours
min	minutes
s	seconds
n ₀	no-load speed
.../min or ...min ⁻¹	revolutions or reciprocations per minute (rpm)

For symbols the following shall be used:

 or d.c.	[symbol IEC 60417-5031 (2002-10)] direct current
 or a.c.	[symbol IEC 60417-5032 (2002-10)] alternating current
3 	three-phase alternating current
3N	three-phase alternating current with neutral
 A	rated current of the appropriate fuse-link in amperes
	time-lag miniature fuse-link where X is the symbol for the time/current characteristic, as given in IEC 60127
	[symbol IEC 60417-5019 (2006-08)] protective earth
	[symbol IEC 60417-5172 (2003-02)] class II tool
IPXX	IP symbol



.....[symbol ISO 7000-0434A or ISO 7000-0434B (2004-01)]
caution



.....[symbol M002 of ISO 7010]
read the instructions



.....[symbol IEC 60417-5012 (2002-10)]
lamp

NOTE The rated wattage of the lamp may be indicated in association with this symbol.



.....[symbol IEC 60417-6041 (2010-08)]
visible radiation, instructional safeguard

Ø

.....diameter

Li-Ion

.....lithium-ion battery

NiCd

.....nickel-cadmium battery

NiMH

.....nickel-metal hydride battery

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

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

Compliance is checked by inspection.

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

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

Compliance is checked by inspection.

8.8 Except for **type Z attachment**, terminals shall be indicated as follows:

- Terminals intended exclusively for the neutral conductor shall be indicated by the letter N.
- Earthing terminals shall be indicated by the symbol IEC 60417-5019 (2006-08).

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

Compliance is checked by inspection.

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

Compliance is checked by inspection.

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

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

The figure $\bigcirc$ shall not be used for any other indication.

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

For **transportable tools**, a power switch actuator or its cover shall not have a colour in a combination of yellow and red as specified for an emergency stop in accordance with ISO 13850.

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

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

Compliance is checked by inspection.

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

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

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

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

Compliance is checked by inspection.

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

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

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

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

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

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

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

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

- *Three labels applied to the tools or a panel of the test surface material are placed in an oven for a minimum of 24 h with the oven is maintained at a temperature of $(120 \pm 2) ^\circ\text{C}$, or alternatively for a minimum of 200 h at the temperature that the label is exposed to during the test of Clause 12.*
- *Six additional labels applied to the tool or a panel of the test surface material are placed in a controlled atmosphere maintained at $21 ^\circ\text{C}$ to $30 ^\circ\text{C}$ with a relative humidity of minimum 45 % for at least 24 h. After this conditioning, immerse three labels in water and the other three labels in IRM 903 oil at a temperature of $21 ^\circ\text{C}$ to $30 ^\circ\text{C}$ for 48 h.*
- *Three additional labels applied to the tool or a panel of the test surface material are placed in a controlled atmosphere maintained at $21 ^\circ\text{C}$ to $30 ^\circ\text{C}$ with a relative humidity of minimum 45 % for 72 h.*

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

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

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

Compliance is checked by inspection.

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

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

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

The words “Original instructions” shall appear on the language version(s) verified by the manufacturer or his authorised representative. Where no “Original instructions” exist in the official language(s) of the country where the tool is to be used, a translation into that/those language(s) shall be provided by the manufacturer or his authorised representative or by the person bringing the tool into the language area in question. The translations shall bear the words “Translation of the original instructions”, and they shall be accompanied by a copy of the “Original instructions”.

They shall be legible and contrast with the background.

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

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

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

As the term “power tool” or “tool” is not appropriate for **lawn and garden machinery**, for these products an appropriate term such as “machine” may be used.

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

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

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

The additional safety instructions as specified in 8.14.1.101 to 8.14.1.103 shall be given. This part may be printed separately from the “General Power Tool Safety Warnings”.

8.14.1.1 General power tool safety warnings

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

Save all warnings and instructions for future reference.

The term “power tool” in the warnings refers to your mains-operated (corded) power tool or battery-operated (cordless) power tool.

1) Work area safety

- a) **Keep work area clean and well lit.** *Cluttered or dark areas invite accidents.*
- b) **Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.** *Power tools create sparks which may ignite the dust or fumes.*
- c) **Keep children and bystanders away while operating a power tool.** *Distractions can cause you to lose control.*

2) Electrical safety

- a) **Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) power tools.** *Unmodified plugs and matching outlets will reduce risk of electric shock.*
- b) **Avoid body contact with earthed or grounded surfaces, such as pipes, radiators, ranges and refrigerators.** *There is an increased risk of electric shock if your body is earthed or grounded.*
- c) **Do not expose power tools to rain or wet conditions.** *Water entering a power tool will increase the risk of electric shock.*
- d) **Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the power tool. Keep cord away from heat, oil, sharp edges or moving parts.** *Damaged or entangled cords increase the risk of electric shock.*

- e) **When operating a power tool outdoors, use an extension cord suitable for outdoor use.** *Use of a cord suitable for outdoor use reduces the risk of electric shock.*
- f) **If operating a power tool in a damp location is unavoidable, use a residual current device (RCD) protected supply.** *Use of an RCD reduces the risk of electric shock.*

NOTE The term “residual current device (RCD)” can be replaced by the term “ground fault circuit interrupter (GFCI)” or “earth leakage circuit breaker (ELCB)”.

3) Personal safety

- a) **Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired or under the influence of drugs, alcohol or medication.** *A moment of inattention while operating power tools may result in serious personal injury.*
- b) **Use personal protective equipment. Always wear eye protection.** *Protective equipment such as a dust mask, non-skid safety shoes, hard hat or hearing protection used for appropriate conditions will reduce personal injuries.*
- c) **Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source and/or battery pack, picking up or carrying the tool.** *Carrying power tools with your finger on the switch or energising power tools that have the switch on invites accidents.*
- d) **Remove any adjusting key or wrench before turning the power tool on.** *A wrench or a key left attached to a rotating part of the power tool may result in personal injury.*
- e) **Do not overreach. Keep proper footing and balance at all times.** *This enables better control of the power tool in unexpected situations.*
- f) **Dress properly. Do not wear loose clothing or jewellery. Keep your hair and clothing away from moving parts.** *Loose clothes, jewellery or long hair can be caught in moving parts.*
- g) **If devices are provided for the connection of dust extraction and collection facilities, ensure these are connected and properly used.** *Use of dust collection can reduce dust-related hazards.*
- h) **Do not let familiarity gained from frequent use of tools allow you to become complacent and ignore tool safety principles.** *A careless action can cause severe injury within a fraction of a second.*

4) Power tool use and care

- a) **Do not force the power tool. Use the correct power tool for your application.** *The correct power tool will do the job better and safer at the rate for which it was designed.*
- b) **Do not use the power tool if the switch does not turn it on and off.** *Any power tool that cannot be controlled with the switch is dangerous and must be repaired.*
- c) **Disconnect the plug from the power source and/or remove the battery pack, if detachable, from the power tool before making any adjustments, changing accessories, or storing power tools.** *Such preventive safety measures reduce the risk of starting the power tool accidentally.*
- d) **Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool.** *Power tools are dangerous in the hands of untrained users.*
- e) **Maintain power tools and accessories. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the power tool's operation. If damaged, have the power tool repaired before use.** *Many accidents are caused by poorly maintained power tools.*
- f) **Keep cutting tools sharp and clean.** *Properly maintained cutting tools with sharp cutting edges are less likely to bind and are easier to control.*
- g) **Use the power tool, accessories and tool bits etc. in accordance with these instructions, taking into account the working conditions and the work to be**

performed. *Use of the power tool for operations different from those intended could result in a hazardous situation.*

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

5) Service

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

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

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

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

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

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

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

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

Example:

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

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

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

Example:

 **Circular Saw Safety Warnings – Cutting Procedures**

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

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

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

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

Save all warnings and instructions for future reference.

8.14.1.101 Safety instructions for combined mitre and bench saws

- a) **Combined mitre and bench saws are intended to cut wood or wood-like products, they cannot be used with abrasive cut-off wheels for cutting ferrous material such as bars, rods, studs, etc. Abrasive dust causes moving parts such as the lower guard to jam. Sparks from abrasive cutting will burn the lower guard, the kerf insert and other plastic parts.**
- b) **Keep guards in place. Guards must be in working order and be properly mounted, especially after a mode change. A guard that is loose, damaged, or is not functioning correctly must be repaired or replaced.**
- c) **Do not use the saw until the table is clear of all tools, wood scraps, etc., except for the workpiece. Small debris or loose pieces of wood or other objects that contact the revolving blade can be thrown with high speed.**
- d) **Cut only one workpiece at a time. Stacked multiple workpieces cannot be adequately clamped or braced and may bind on the blade or shift during cutting.**
- e) **The cut-off piece must not be jammed or pressed by any means against the spinning saw blade. If confined, for example using length stops, the cut-off piece could get wedged against the blade and thrown violently.**
- f) **Turn off the saw and disconnect the power cord when removing the table insert, changing the saw blade or making adjustments to the riving knife, anti-kickback device or saw blade guard, and when the machine is left unattended. Precautionary measures will avoid accidents.**

NOTE 101 If an **anti-kickback device** is not provided, the phrase "**anti-kickback device**" is omitted in item f) above.

NOTE 102 At the manufacturer's discretion, it is possible to replace the term "**anti-kickback device**" by an appropriate term such as "**anti-kickback pawls**" or "**anti-kickback rollers**" in item f) above.

- g) **Never leave the saw running unattended. Turn it off and do not leave the tool until it comes to a complete stop. An unattended running saw is an uncontrolled hazard.**
- h) **Mount or place the saw in a well-lit and level area where you can maintain good footing and balance. It should be installed in an area with firm work surface that provides enough room to easily handle the size of your workpiece. Cramped, dark areas, and uneven slippery floors invite accidents. A level and firm work surface reduces the risk of the saw becoming unstable.**
- i) **Frequently clean and remove sawdust from under the saw table and/or the dust collection device. Accumulated sawdust is combustible and may self-ignite.**
- j) **The saw must be secured. A saw that is not properly secured may move or tip over.**
- k) **Always use saw blades with correct size and shape (diamond versus round) of arbour holes. Saw blades that do not match the mounting hardware of the saw will run off-centre, causing loss of control.**
- l) **Never use damaged or incorrect saw blade mounting means such as flanges, saw blade washers, bolts or nuts. These mounting means were specially designed for your saw, for safe operation and optimum performance.**
- m) **Never stand on the saw, do not use it as a stepping stool. Serious injury could occur if the tool is tipped or if the cutting tool is accidentally contacted.**
- n) **Make sure that the saw blade is installed to rotate in the proper direction. Do not use grinding wheels, wire brushes, or abrasive wheels on a saw. Improper saw blade installation or use of accessories not recommended may cause serious injury.**

- o) **Keep saw blades clean, sharp, and with sufficient set. Never use warped saw blades or saw blades with cracked or broken teeth. Sharp and properly set saw blades minimize binding, stalling and kickback.**

8.14.1.102 Safety instructions for mitre saw mode

- a) **Use clamps to support the workpiece whenever possible. If supporting the workpiece by hand, you must always keep your hand at least 100 mm from either side of the saw blade. Do not use this saw to cut pieces that are too small to be securely clamped or held by hand. If your hand is placed too close to the saw blade, there is an increased risk of injury from blade contact.**
- b) **The workpiece must be stationary and clamped or held against both the fence and the table. Do not feed the workpiece into the blade or cut "freehand" in any way. Unrestrained or moving workpieces could be thrown at high speeds, causing injury.**
- c) **Push the saw through the workpiece. Do not pull the saw through the workpiece. To make a cut, raise the saw head and pull it out over the workpiece without cutting, start the motor, press the saw head down and push the saw through the workpiece. Cutting on the pull stroke is likely to cause the saw blade to climb on top of the workpiece and violently throw the blade assembly towards the operator.**
- d) **Never cross your hand over the intended line of cutting either in front of or behind the saw blade. Supporting the workpiece "cross handed", which means holding the workpiece to the right of the saw blade with your left hand or vice versa, is very dangerous.**
- e) **Do not reach behind the fence with either hand closer than 100 mm from either side of the saw blade, to remove wood scraps, or for any other reason while the blade is spinning. The proximity of the spinning saw blade to your hand may not be obvious and you may be seriously injured.**
- f) **Inspect your workpiece before cutting. If the workpiece is bowed or warped, clamp it with the outside bowed face toward the fence. Always make certain that there is no gap between the workpiece, fence and table along the line of the cut. Bent or warped workpieces can twist or shift and may cause binding on the spinning saw blade while cutting. There should be no nails or foreign objects in the workpiece.**
- g) **Plan your work. Every time you change the bevel or mitre angle setting, make sure the adjustable fence is set correctly to support the workpiece and will not interfere with the blade or the guarding system. Without turning the tool "ON" and with no workpiece on the table, move the saw blade through a complete simulated cut to assure there will be no interference or danger of cutting the fence.**

NOTE 101 The phrase "bevel or" does not apply for saws without bevel adjustment in item g) above.

- h) **Provide adequate support such as table extensions, saw horses, etc. for a workpiece that is wider or longer than the table top. Workpieces longer or wider than the table top can tip if not securely supported. If the cut-off piece or workpiece tips, it can lift the lower guard or be thrown by the spinning blade.**
- i) **Do not use another person as a substitute for a table extension or as additional support. Unstable support for the workpiece can cause the blade to bind or the workpiece to shift during the cutting operation, pulling you and the helper into the spinning blade.**
- j) **Always use a clamp or a fixture designed to properly support round material such as rods or tubing. Rods have a tendency to roll while being cut, causing the blade to "bite" and pull the work with your hand into the blade.**
- k) **Let the blade reach full speed before contacting the workpiece. This will reduce the risk of the workpiece being thrown.**
- l) **If the workpiece or blade becomes jammed, turn the saw off. Wait for all moving parts to stop and disconnect the plug from the power source and/or remove the battery pack. Then work to free the jammed material. Continued sawing with a jammed workpiece could cause loss of control or damage to the saw.**

- m) **After finishing the cut, release the switch, hold the saw head down and wait for the blade to stop before removing the cut-off piece.** *Reaching with your hand near the coasting blade is dangerous.*
- n) **Hold the handle firmly when making an incomplete cut or when releasing the switch before the saw head is completely in the down position.** *The braking action of the saw may cause the saw head to be suddenly pulled downward, causing a risk of injury.*

NOTE 102 The warning in item n) above applies only for saws with a brake system.

8.14.1.103 Safety instructions for bench saw mode

1) Guarding related warnings

- a) **Always use saw blade guard, riving knife and anti-kickback device for every through-cutting operation.** *For through-cutting operations where the saw blade cuts completely through the thickness of the workpiece, the guard and other safety devices help reduce the risk of injury.*

NOTE 101 If an **anti-kickback device** is not provided, the phrase "and **anti-kickback device**" is omitted in item 1) a) above.

NOTE 102 At the manufacturer's discretion, it is possible to replace the term "**anti-kickback device**" by an appropriate term such as "**anti-kickback** pawls" or "**anti-kickback** rollers" in item 1) a) above.

NOTE 103 The warning in item 1) a) above is omitted, if the saw is designed with a **non-removable fixed extended riving knife** that has a **non-removable** guarding system.

- b) **After completing a non-through cut such as rabbeting, resawing, or dadoing, restore the riving knife to the extended-up position. With the riving knife in the extended-up position, reattach the blade guard and the anti-kickback device.** *The guard, riving knife, and anti-kickback device help to reduce the risk of injury.*

NOTE 104 The term "**rabbeting**" can be substituted by "rebating" in item 1) b) above.

NOTE 105 If **dadoing** or **resawing** cuts are not permitted, the term "**dadoing** or **resawing** cuts" is omitted in item 1) b) above.

NOTE 106 If an **anti-kickback device** is not provided, the warning in item 1) b) above is revised as follows:

After completing a non-through cut such as rabbeting, resawing, or dadoing, restore the riving knife to the extended-up position. With the riving knife in the extended-up position, reattach the blade guard. *The guard and riving knife help to reduce the risk of injury.*

NOTE 107 At the manufacturer's discretion, it is possible to replace the term "**anti-kickback device**" by an appropriate term such as "**anti-kickback** pawls" or "**anti-kickback** rollers" in item 1) b) above.

NOTE 108 The warning in item 1) b) above is omitted, if the saw is designed with a **non-removable fixed extended riving knife** that has a **non-removable** guarding system.

- c) **Make sure the saw blade is not contacting the guard, riving knife or the workpiece before the switch is turned on.** *Inadvertent contact of these items with the saw blade could cause a hazardous condition.*
- d) **Adjust the riving knife as described in this instruction manual.** *Incorrect spacing, positioning and alignment can make the riving knife ineffective in reducing the likelihood of kickback.*
- e) **For the riving knife and anti-kickback device to work, they must be engaged in the workpiece.** *The riving knife and anti-kickback device are ineffective when cutting workpieces that are too short to be engaged with the riving knife and anti-kickback device. Under these conditions, kickback cannot be prevented by the riving knife and anti-kickback device.*

NOTE 109 If an **anti-kickback device** is not provided, the warning in item 1) e) above is revised as follows:

For the riving knife to work, it must be engaged in the workpiece. *The riving knife is ineffective when cutting workpieces that are too short to be engaged with the riving knife. Under these conditions, a kickback cannot be prevented by the riving knife.*

NOTE 110 At the manufacturer's discretion, it is possible to replace the term "anti-kickback device" by an appropriate term such as "anti-kickback pawls" or "anti-kickback rollers" in item 1) e) above.

- f) **Use the appropriate saw blade for the riving knife.** *For the riving knife to function properly, the saw blade diameter must match the appropriate riving knife and the body of the saw blade must be thinner than the thickness of the riving knife and the cutting width of the saw blade must be wider than the thickness of the riving knife.*

2) Cutting procedures warnings

- a)  **DANGER: Never place your fingers or hands in the vicinity of or in line with the saw blade.** *A moment of inattention or a slip could direct your hand towards the saw blade and result in serious personal injury.*
- b) **Feed the workpiece into the saw blade or cutter only against the direction of rotation.** *Feeding the workpiece in the same direction that the saw blade is rotating above the table may result in the workpiece, and your hand, being pulled into the saw blade.*

NOTE 111 If cutters other than the saw blade are not permitted in accordance with 8.14.2, then "or cutter" is omitted in item 2) b) above.

- c) **Never use the mitre gauge to feed the workpiece when ripping and do not use the rip fence as a length stop when cross cutting with the mitre gauge.** *Guiding the workpiece with the rip fence and the mitre gauge at the same time increases the likelihood of saw blade binding and kickback.*
- d) **When ripping, always keep the workpiece in full contact with the fence and always apply the workpiece feeding force between the fence and the saw blade. Use a push stick when the distance between the fence and the saw blade is less than 150 mm, and use a push block when this distance is less than 50 mm. "Work helping" devices will keep your hand at a safe distance from the saw blade.**
- e) **Use only the push stick provided by the manufacturer or constructed in accordance with the instructions.** *This push stick provides sufficient distance of the hand from the saw blade.*
- f) **Never use a damaged or cut push stick.** *A damaged or cut push stick may break causing your hand to slip into the saw blade.*
- g) **Do not perform any operation "freehand". Always use either the rip fence or the mitre gauge to position and guide the workpiece.** *"Freehand" means using your hands to support or guide the workpiece, in lieu of a rip fence or mitre gauge. Freehand sawing leads to misalignment, binding and kickback.*
- h) **Never reach around or over a rotating saw blade.** *Reaching for a workpiece may lead to accidental contact with the moving saw blade.*
- i) **Provide auxiliary workpiece support to the rear and/or sides of the saw table for long and/or wide workpieces to keep them level.** *A long and/or wide workpiece has a tendency to pivot on the table's edge, causing loss of control, saw blade binding and kickback.*
- j) **Feed the workpiece at an even pace. Do not bend, twist or shift the workpiece from side to side. If jamming occurs, turn the tool off immediately, unplug the tool, then clear the jam. Jamming the saw blade by the workpiece can cause kickback or stall the motor.**
- k) **Do not remove pieces of cut-off material while the saw is running.** *The material may become trapped between the fence or inside the saw blade guard and the saw blade, pulling your fingers into the saw blade. Turn the saw off and wait until the saw blade stops before removing material.*
- l) **Use an auxiliary fence in contact with the table top when ripping workpieces less than 2 mm thick.** *A thin workpiece may wedge under the rip fence and create a kickback.*

3) Kickback causes and related warnings

Kickback is a sudden reaction of the workpiece due to a pinched saw blade, a jammed saw blade or misaligned line of cut in the workpiece with respect to the saw blade or fence.

a part of the workpiece binds between the saw blade and the rip fence or other fixed object.

Most frequently during **kickback**, the workpiece is lifted from the table by the rear portion of the saw blade and is propelled towards the operator.

Kickback is the result of saw misuse and/or incorrect operating procedures or conditions and can be avoided by taking proper precautions as given below.

- a) **Never stand directly in line with the saw blade. Always position your body on the same side of the saw blade as the fence.** *Kickback may propel the workpiece at high velocity towards anyone standing in front of and in line with the saw blade.*
- b) **Never reach over or in back of the saw blade to pull or to support the workpiece.** *Accidental contact with the saw blade may occur or kickback may drag your fingers into the saw blade.*
- c) **Never hold and press the workpiece that is being cut off against the rotating saw blade.** *Pressing the workpiece being cut off against the saw blade will create a binding condition and kickback.*
- d) **Align the fence to be parallel with the saw blade.** *A misaligned fence will pinch the workpiece against the saw blade and create kickback.*
- e) **Use a featherboard to guide the workpiece against the table and fence when making non-through cuts such as rabbeting, dadoing or resawing cuts.** *A featherboard helps to control the workpiece in the event of a kickback.*

NOTE 112 The term "**rabbeting**" can be substituted by "rebating" in item 3) e) above.

NOTE 113 If **dadoing** or **resawing** cuts are not permitted, the term "**dadoing or resawing cuts**" is omitted in item 3) e) above.

NOTE 114 The warning in item 3) e) above is omitted, if the saw is designed with a **non-removable fixed extended riving knife** that has a **non-removable saw blade guard**.

- f) **Use extra caution when making a cut into blind areas of assembled workpieces.** *The protruding saw blade may cut objects that can cause kickback.*

NOTE 115 The safety warning in item 3) f) above only applies to tools where such cuts are permitted by design and instruction.

- g) **Support large panels to minimize the risk of saw blade pinching and kickback.** *Large panels tend to sag under their own weight. Support(s) must be placed under all portions of the panel overhanging the table top.*
- h) **Use extra caution when cutting a workpiece that is twisted, knotted, warped or does not have a straight edge to guide it with a mitre gauge or along the fence.** *A warped, knotted, or twisted workpiece is unstable and causes misalignment of the kerf with the saw blade, binding and kickback.*
- i) **Never cut more than one workpiece, stacked vertically or horizontally.** *The saw blade could pick up one or more pieces and cause kickback.*
- j) **When restarting the saw with the saw blade in the workpiece, centre the saw blade in the kerf so that the saw teeth are not engaged in the material.** *If the saw blade binds, it may lift up the workpiece and cause kickback when the saw is restarted.*

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

- a) Instructions for putting into use
 - 1) Setting-up or fixing power tools in a stable position as appropriate for power tools which can be mounted on a support or fixed to a bench or the floor;
 - 2) Assembly;
 - 3) Connection to power supply, cabling, fusing, socket type and earthing requirements;
 - 4) For tools adjustable to different **rated voltages**: instructions, illustrations, or both for changing the voltage. The terminal identification shall be provided if the motor connection has to be altered to operate at a voltage other than that for which it was connected when shipped from the factory;

- 5) Illustrated description of functions;
- 6) Limitations on ambient conditions;
- 7) Fitting and adjusting of **guards** required by 19.1;
- 8) Information about disassembly and reassembly if applicable for transportation and/or use.

- 101) Instruction to identify the correct saw blade to be used for the material to be cut;
- 102) Information about **maximum cutting capacities** at zero and maximum **bevel angles**;
- 103) Information about maximum **bevel angle** and **mitre angle** settings, as applicable;
- 104) Information about the bore diameter, the allowed range of **kerf width** and the saw blade body thickness and instruction on how to correctly match the saw blade diameter, **kerf width** and body dimensions to the **riding knife**;
- 105) Instructions for adjusting the saw for proper **cutting capacity**, if applicable;
- 106) Instruction how to use and correct adjustment of the **lower guard** in bench saw mode;
- 107) Instruction how to properly use the setting device(s) and the locking device(s) for the saw blade depth-of-cut stop, **mitre angle** and **bevel angle**, as applicable;
- 108) For **saws** with sliding function: Instruction for the cutting sequence;
- 109) Instructions on how to set the depth of cut of the saw blade for non-through cuts, as applicable;
- 110) Instruction to use only sharp saw blades that are not damaged or deformed;
- 111) Instruction not to use saw blades manufactured from high speed steel;
- 112) Instruction to ensure the speed marked on the saw blade is at least equal to the speed marked on the saw;
- 113) Instructions for the saw blade changing procedure including proper saw blade direction installation, including instruction how to remove and install table inserts or saw blade access panels, and instruction how to adjust their height with respect to the **table top**, if applicable;
- 114) Instruction how to properly use the saw blade depth and **bevel angle** setting locking device(s), as applicable;
- 115) Instruction how to align the **fence**, if applicable;
- 116) Instruction how to align the saw blade to be parallel with the guiding device used for **cross cutting** and how to align the **rip fence** to be parallel with the saw blade;
- 117) Instruction how to mount and adjust the **riding knife** or the **extended riding knife**;
- 118) Instruction how to use **anti-kickback devices**, if any. Also instruction how to enable and disable **anti-kickback devices**, if this feature is provided;
- 119) Instruction how to check that the **saw blade guard** is functioning correctly;
- 120) Instructions for making "Work Helpers" such as a push stick, auxiliary **fence**, feather boards and push block, including material and geometry, and instruction how to properly use them. Instructions for feather boards may be omitted, if the saw is designed with a **non-removable fixed extended riding knife** that has a **non-removable** guarding system;
- 121) Instruction how to connect dust extraction systems;
- 122) Instruction to always put the push stick into storage when it is not in use;
- 123) When fitted with a laser or LED: warning not to exchange the laser or LED with a different type. Instruction that repairs shall only be carried out by the manufacturer or an authorized agent;
- 124) Instruction to ensure that the upper portion of the saw blade is completely enclosed in the mitre saw mode;
- 125) For **type "B" saws**: instruction how to correctly locate the saw in either the mitre or bench saw mode;

- 126) For saws with **over-arm saw blade guard**: Instruction to adjust the **saw blade guard** to contact the **table top** and instruction to adjust the **saw blade guard** to prevent contact with the saw blade for any depth and **bevel angle** setting;
- 127) For saws with sliding function: Instruction how to set up the saw for **rip cutting** and **cross cutting** and how to adjust the **cross-cutting fence**;
- 128) For **non-through cutting** operations only: Instructions on how and when to remove and install the guarding system components and the **anti-kickback device**, if any. Instruction how to adjust the **adjustable extended riving knife** or to exchange the **fixed extended riving knife**, as applicable.

NOTE In Europe (EN IEC 62841-3-11), the following additional requirement applies:

Z101) Instruction to use only saw blades specified by the manufacturer, with a warning that the **riving knife** shall not be thicker than the width of the groove cut by the saw blade and not thinner than the body of the saw blade. Instruction that specified saw blades intended for wood and analogous materials shall comply with EN 847-1:2017.

b) Operating instructions

- 1) Setting and testing;
 - 2) Tool changing;
 - 3) Clamping of the workpiece;
 - 4) Limits on size of workpiece and type of material;
 - 5) General instructions for use;
 - 6) Identification of handle(s) and grasping surface(s) required by 19.4;
 - 7) For tools with electronic speed or load regulators which do not immediately restart the tool after a stalling: a warning that the tool will restart automatically if stalled;
 - 8) For **transportable tools** only: instruction on lifting and transportation.
- 101) Instruction how to correctly replace and reposition the saw blade, including details for correct **guard** repositioning in mitre saw mode and bench saw mode;
 - 102) Instruction to ensure that the arm is securely fixed when bevelling;
 - 103) Instruction to ensure that the arm is securely fixed in the working position in the bench saw mode;
 - 104) Instruction to ensure that the bench saw table is securely fixed at the chosen height (for **type "A" saws** only);
 - 105) Instruction how to perform cuts correctly and safely:
 - i) in mitre saw mode, always to clamp workpieces to the saw table;
 - ii) ensure that the saw is always stable and secure (e.g. fixed to a bench) and instruction how to fix the tool to a workbench or the like;
 - iii) if adjustable and/or removable workpiece support extension(s) are provided, instruction to always fix and use these extension(s) during operation;
 - iv) to support long workpieces with appropriate additional supports;
 - 106) Instruction how to clamp workpieces to the mitre table and the proper use of the workpiece clamping device;
 - 107) Instruction on correct **through cutting** operations, including **cross cutting** and **rip cutting**, **mitre angle** and **bevel angle** cutting procedures, the use of the **cross-cutting fence** and the use of the high and low **rip fence**;
 - 108) Instruction whether and how simple **non-through cutting** operations such as **grooving** or **rabbeting** should be carried out, including guarding requirements and the use of featherboards;
 - 109) Instruction that the saw shall not be used for slotting (stopped groove);
 - 110) For tools with variable speed: a table giving guidance on spindle speed selection for different materials to be sawn;