IEC 60900

Edition 4.0 2018-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Live working –
Hand tools for use up to 1 000 V AC and 1 500 V DC

Travaux sous tension –
Outils à main pour usage jusqu'à 1 000 V en courant alternatif et 1 500 V en courant continu

IEC 60900:2018-06(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LIVE WORKING – HAND TOOLS FOR USE UP TO 1 000 V AC AND 1 500 V DC

FOREWORD

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International Standard IEC 60900 has been prepared by IEC technical committee 78: Live working.

This fourth edition cancels and replaces the third edition, published in 2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) addition of a third category of tools has been added, namely *hybrid hand tools*;
b) introduction of a new informative Annex A on examples of *insulated*, *insulating* and *hybrid hand tools*.

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

FDIS	Report on voting
78/1221/FDIS	78/1229/RVD

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

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

Terms defined in Clause 3 are given in *italic* print throughout this document.

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

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- withdrawn,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

The contents of the corrigendum of January 2019 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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

This document has been prepared in accordance with the requirements of IEC 61477 where applicable.

The products covered by this document may have an impact on the environment during some or all stages of its life cycle. These impacts can range from slight to significant, be of short-term or long-term duration, and occur at the global, regional or local level.

This document does not include requirements and test provisions for the manufacturers of the products, or recommendations to the users of the products for environmental improvement. However, all parties intervening in their design, manufacture, packaging, distribution, use, maintenance, repair, reuse, recovery and disposal are invited to take account of environmental considerations.

LIVE WORKING – HAND TOOLS FOR USE UP TO 1 000 V AC AND 1 500 V DC

1 Scope

This document is applicable to *insulated*, *insulating* and *hybrid hand tools* used for working live or close to live parts at nominal voltages up to 1 000 V AC and 1 500 V DC.

The products designed and manufactured according to this document contribute to the safety of the users provided they are used by skilled persons, in accordance with safe methods of work and the instructions for use (where appropriate).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60212, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60417, *Graphical symbols for use on equipment* (available at: http://www.graphical-symbols.info/equipment)

IEC 61318, *Live working – Conformity assessment applicable to tools, devices and equipment*

IEC 61477, Live working – *Minimum requirements for the utilization of tools, devices and equipment*

ISO 1174-1, *Assembly tools for screw and nuts – Driving squares – Part 1: Driving squares for hand socket tools*

ISO 9654, *Pliers and nippers for electronics – Single-purpose nippers – Cutting nippers*

ISO 9655, *Pliers and nippers for electronics – Single-purpose pliers – Pliers for gripping and manipulating*

ISO 9656, *Pliers and nippers for electronics – Test methods*

ISO 9657, *Pliers and nippers for electronics – General technical requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61318 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

NOTE The definitions of general terms used in this document are given in IEC 60050 or in special definitions given in IEC 60743.

3.1
hand tool
hand held tool

Note 1 to entry: *Hand tools* may be *insulated hand tools*, *insulating hand tools* or *hybrid hand tools* (see Annex A).

Note 2 to entry: *Hand tools* are normally tools such as screwdrivers, pliers, spanners or knives.

Note 3 to entry: *Hand tools* are designed to provide protection to the worker against electric shock.

[SOURCE: IEC 60050-651:2014, 651-21-19, modified – Note 1 to entry has been modified to refer to Annex A.]

3.1.1
hybrid hand tool
hand tool made from insulating material(s) with exposed conductive parts at the *working head*

Note 1 to entry: *Hybrid hand tools* may have some non-exposed conductive parts used for reinforcement.

[SOURCE: IEC 60050-651:2014, 651-21-22]

3.1.2
insulated hand tool
hand tool made of conductive material(s), fully or partially covered by insulating material(s)

[SOURCE: IEC 60050-651:2014, 651-21-20]

3.1.3
insulating hand tool
hand tool made totally or essentially from insulating material(s) except for inserts made from conductive material(s) used for reinforcement, but with no exposed conductive parts

[SOURCE: IEC 60050-651: 2014, 651-21-21,]

3.2
working head
part of the tool head that is limited to the working surface and the contact area

Note 1 to entry: See Figures 5 and 7.

4 Requirements

4.1 General requirements

4.1.1 Safety

Insulated, insulating and *hybrid hand tools* shall be manufactured and dimensioned in such a way that they protect the user from electric shock.

NOTE 1 *Insulating hand tools* minimize the risk of short-circuits between two parts at different potentials.

NOTE 2 *Hybrid hand tools* reduce the risk of short-circuits between two parts at different potentials.

NOTE 3 *Insulated hand tools*, completely covered by insulating material, except the conductive part of the working surface, reduce the risk of short-circuits between two parts at different potentials.

The following requirements have been prepared in order that the *hand tools* covered by this document are designed and manufactured to contribute to the safety of the users, provided they are used by persons skilled for live working, in accordance with safe methods of work and the instructions for use (where appropriate).

4.1.2 Performance under load

The mechanical specifications for *insulated hand tools* shall comply with the corresponding ISO standards, or, where no ISO standard exists, with a standard specified by the manufacturer or the customer (for example a national standard). The mechanical specifications for the working parts of the *hand tools* shall be retained even after application of an insulating layer.

Insulating and *hybrid hand tools* specially designed for live working may have lower stress resistance than *insulated hand tools*, but they shall withstand the expected workloads without failing due to remaining deformation or breaking. These *hand tools* can be equipped with devices that limit the workloads that can be applied with them, for example by overload slipping clutches (see also Annex B).

4.1.3 Multiple-ended hand tools

Multiple-ended *hand tools*, such as box spanner, keys for hexagonal socket screws, double-ended socket-spanner, double-head open-end spanner, etc., are not allowed for *insulated hand tools* but are allowed for *insulating* or *hybrid hand tools* if the design assures that there is no conductive connection between two of the *working heads*.

4.1.4 Marking

The marking shall be clearly identifiable by persons with normal or corrected sight without further magnification.

Each *hand tool* and/or tool component shall be legibly and permanently marked with the following items of marking:

- on the insulating material or on the metal part:
  - marking of the origin (manufacturer's name or trade mark);
- on the insulating material:
  - model/type reference;
  - year of manufacture (at least the last two digits of the year);
  - symbol IEC 60417-5216:2002-10 – Suitable for live working; double triangle (see Annex C);

    NOTE For the symbol, the exact ratio of the height of the figure to the base of the triangle is 1,43:1. For the purpose of convenience, this ratio can be between the values of 1,4 and 1,5.
  - indication 1 000 V (i.e. the electrical working limit for alternating current), immediately adjacent to the double triangle symbol (see Figure 1 for an example);

Figure 1 – Marking of the electrical working limit adjacent to the double triangle symbol (IEC 60417-5216:2002-10)

- number of the relevant IEC standard immediately adjacent to the double triangle symbol (IEC 60900);
- for *hand tools* designed for use at extremely low temperature: letter “C” (see 4.2.2);
- additional marking for *hand tools* capable of being assembled and designed to be interchangeable between different manufacturers (see 4.4.1.3.2);
- additional marking where specified by the customer (for example ownership mark).

The *hand tools* shall bear no voltage marking apart from those described above.

NOTE For example, the indication of test voltage may lead to the assumption that the *hand tool* is suitable for work at that voltage.

Other characteristics or information not needed at the work location, like the year of publication of the standard and the type of *hand tool*, shall be associated to the product item by other means, such as coded information (bar codes, microchips, etc.), or shall be associated to its packaging.

The double triangle symbol shall be at least 3 mm high; the letter and the figures of the electrical working limit shall be at least 2 mm high (see Figure 1).

4.1.5 Separating of covers

If *hand tools* have conductive elements (for example: torque adjusting screws, operating direction switches, etc.) which are insulated with covers of insulating materials, these covers shall be securely fastened, so that they do not become separated during normal use (see 5.9.1).

4.1.6 Instructions for correct adjustment and assembly

Where the manufacturer deems that instructions are necessary for correct adjustment or assembly, then the manufacturer shall provide these in accordance with the general provisions given in IEC 61477 (see also Annex D).

4.2 Requirements concerning insulating materials

4.2.1 General

The insulating material shall be selected according to the electrical, mechanical and thermal stresses to which it may be exposed during use. In addition, the insulating material shall have an adequate resistance to ageing and be flame retardant.

The insulating coating may consist of one or more layers. If two or more layers are adopted, contrasting colours may be used.

The design and construction of the handles shall provide a secure handhold and prevent unintentional hand slipping. The handle and guard dimensions given in different figures are applicable to all types of *hand tools* in order to define the handling zone.

4.2.2 Thermal stability

The service ability of the *hand tools* shall not be impaired within the temperature range −20 °C to +70 °C.

The insulating material applied on *hand tools* shall adhere securely to the conductive part from −20 °C to +70 °C.

Hand tools intended for use at extremely low temperatures (down to −40 °C) shall be designated “Category °C” and shall be designed for this purpose.

4.3 Requirement concerning exposed conductive parts of hybrid tools

Exposed conductive parts shall be securely fastened, so that they do not become separated during normal use (see 5.8).

4.4 Additional requirements

4.4.1 Hand tools capable of being assembled

4.4.1.1 Retaining devices for hand tools capable of being assembled

Hand tools capable of being assembled shall have suitable retaining devices to prevent unintentional separation of the assembly. The retaining forces shall be tested according to 5.9.5.

4.4.1.2 Insulation design for hand tools capable of being assembled

In the case of connecting parts of *hand tools* capable of being assembled, the insulation shall be applied in such a manner that if any part becomes detached during use by exceeding the retaining forces according to 5.9.5, no conductive part, which may still be live, can be inadvertently touched or cause a disruptive discharge.

4.4.1.3 Hand tools capable of being assembled with square drives

4.4.1.3.1 General

Hand tools capable of being assembled with square drives shall have square drives and square sockets in accordance with ISO 1174-1 (for separating forces, see 5.9.5.2). To ensure compatibility of insulation between different manufacturers, these *hand tools* shall be designed with overlapping elements described in Figure 2. Their dimensions and tolerances shall be in accordance with Table 1.

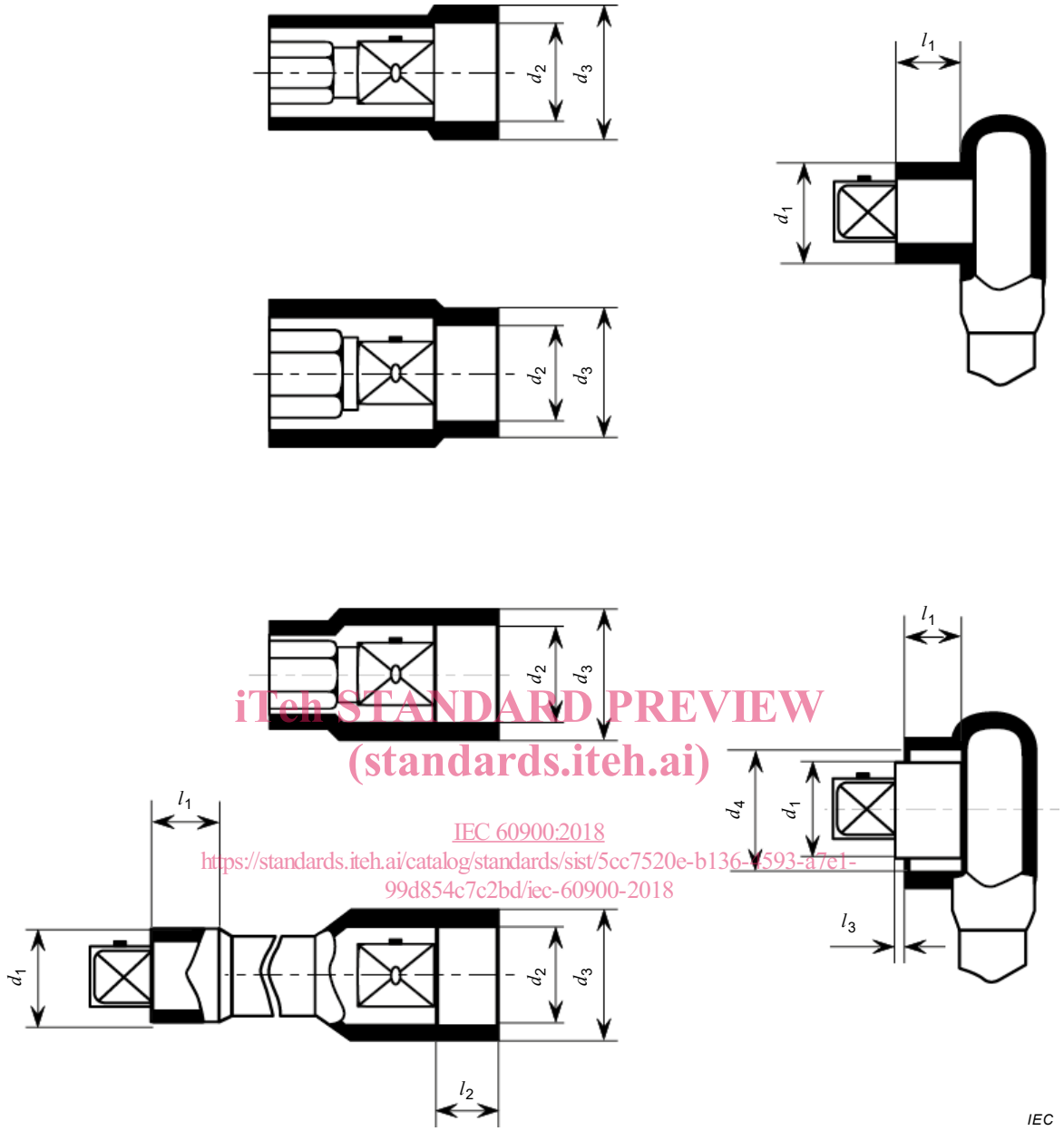

Figure 2 – Description of the insulating overlapping element and different assembly configurations for hand tools capable of being assembled with square drives

Table 1 – Dimensions and tolerances of the insulating overlapping element

Dimensions in millimetres

Nominal size of the square drive	l_1 min.	l_2 $^{+2}_{0}$	l_3 $^{+0,5}_{-0,5}$	d_1 $^{0}_{-1,5}$	d_2 $^{+1,5}_{0}$	d_3 $^{0}_{-1,5}$	d_4 $^{+1,5}_{0}$
6,3	19	16	2	12,5	13	18	19
10	19	16	2	17,5	18	23	24
12,5	19	16	2	21,5	22	27	28
20	19	16	2	32	33	38	39
l_1, l_2, l_3, d_1, d_2, d_3 and d_4 are described in Figure 2.							