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)

Documents
Document Sharing Hub

Full document details: IEC 60900 2018

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2018 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 21 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Documents
Document Sharing Hub

Full document details: IEC 60900 2018

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 13.260; 29.240.20; 29.260.99

ISBN 978-2-8322-5783-8

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

Documents
Document Sharing Hub

Full document details: IEC 60900 2018

CONTENTS

FOREWORD 5
INTRODUCTION 7
1 Scope 8
2 Normative references 8
3 Terms and definitions 8
4 Requirements 9
4.1 General requirements 9
4.1.1 Safety 9
4.1.2 Performance under load 10
4.1.3 Multiple-ended hand tools 10
4.1.4 Marking 10
4.1.5 Separating of covers 11
4.1.6 Instructions for correct adjustment and assembly 11
4.2 Requirements concerning insulating materials 11
4.2.1 General 11
4.2.2 Thermal stability 12
4.3 Requirement concerning exposed conductive parts of hybrid tools 12
4.4 Additional requirements 12
4.4.1 Hand tools capable of being assembled 12
4.4.2 Screwdrivers 14
4.4.3 Spanners – un-insulated areas 15
4.4.4 Adjustable spanners 16
4.4.5 Pliers, strippers, cable scissors, cable-cutting hand tools 17
4.4.6 Scissors 21
4.4.7 Knives 22
4.4.8 Tweezers 23
5 Tests 24
5.1 General 24
5.2 Visual check 25
5.3 Dimensional check 25
5.4 Impact tests 25
5.4.1 Type test 25
5.4.2 Alternative methods in cases where hand tools have completed the production phase 28
5.5 Dielectric tests 28
5.5.1 General requirements 28
5.5.2 Conditioning (for type test only) 29
5.5.3 Dielectric testing of insulated and hybrid hand tools 29
5.5.4 Dielectric testing of insulating hand tools 32
5.6 Indentation test (for *insulated hand tools*) 33
5.6.1 Type test 33
5.6.2 Alternative methods in cases where insulated hand tools have completed the production phase 34
5.7 Test for adhesion of the insulating material coating of insulated hand tools 34
5.7.1 Conditioning 34
5.7.2 Type test 35

AVA Documents
Document Sharing Hub

Full document details: IEC 60900 2018

5.7.3 Alternative methods in cases where insulated hand tools have completed the production phase 40
5.8 Test of adhesion of exposed conductive parts at the working head of hybrid hand tools 41
5.8.1 Type test 41
5.8.2 Alternative methods in cases where hybrid hand tools have completed the production phase 41
5.9 Mechanical tests 41
5.9.1 Test of adhesion of insulating covers of conductive adjusting or switching elements 41
5.9.2 Insulated hand tools 42
5.9.3 Insulating and hybrid hand tools 42
5.9.4 Tweezers 43
5.9.5 Retaining force test for tools capable of being assembled 43
5.10 Durability of marking 46
5.11 Flame retardancy test 46
5.11.1 Type test 46
5.11.2 Alternative methods in cases where hand tools have completed the production phase 47
6 Conformity assessment of hand tools having completed the production phase 48
7 Modifications 48
Annex A (informative) Description and examples for insulated, hybrid and insulating hand tools 49
Annex B (informative) Mechanical strength of insulating and hybrid hand tools 50
B.1 Context 50
B.2 General 50
B.3 Insulating and hybrid screwdrivers 50
B.4 Insulating and hybrid spanners and ratchets 51
B.5 Insulating and hybrid T-spanners 51
B.6 Insulating and hybrid pliers and cable shears 51
Annex C (normative) Suitable for live working; double triangle (IEC 60417-5216:2002-10) 52
Annex D (informative) Recommendation for use and in-service care 53
D.1 General 53
D.2 Storage 53
D.3 Inspection before use 53
D.4 Temperature 53
D.5 Periodic examination and electrical retesting 53
Annex E (normative) General type test procedure 54
Annex F (normative) Examples of calculation of the total linear length of insulation and acceptable leakage current (see 5.5.3.1.1) 55
Annex G (normative) Classification of defects and tests to be allocated 56
Annex H (informative) Rationale for the classification of defects 57
Bibliography 59

Figure 1 – Marking of the electrical working limit adjacent to the double triangle symbol (IEC 60417-5216:2002-10) 11
Figure 2 – Description of the insulating overlapping element and different assembly configurations for hand tools capable of being assembled with square drives 43

AVA Documents Document Sharing Hub

Full document details: IEC 60900 2018

Figure 3 – Marking symbol for hand tools capable of being assembled and designed to be interchangeable between different manufacturers (IEC 60417-6168:2012-07) 14
Figure 4 – Illustration of insulation of a typical screwdriver 15
Figure 5 – Illustration of insulation of typical spanners 16
Figure 6 – Insulated or hybrid adjustable spanner 17
Figure 7 – Illustration of insulation of typical pliers 18
Figure 8 – Insulation of pliers 19
Figure 9 – Insulation of multiple slip joint pliers 19
Figure 10 – Insulation of pliers with a functional area below the joint 20
Figure 11 – Illustration of insulation of pliers and nippers for electronics 21
Figure 12 – Insulation of scissors 22
Figure 13 – Insulation of knives 23
Figure 14 – Example of insulation of the handles of tweezers 24
Figure 15 – Example of test arrangement for the impact test – Method A 26
Figure 16 – Example of test arrangement for the impact test – Method B 27
Figure 17 – Dielectric testing arrangement for insulated or hybrid hand tools 30
Figure 18 – Description of dummies for dielectric tests for hand tools capable of being assembled with square drives 31
Figure 19 – Dielectric testing arrangement for insulating hand tools 32
Figure 20 – Indentation test 34
Figure 21 – Principle of the testing device for checking adhesion of the insulating coating on conductive parts of the insulated hand tool – Test on the working head – Method A 36
Figure 22 – Principle of the testing device for checking adhesion of the insulating coating on conductive parts of the insulated hand tools – Test on the working head – Method B 37
Figure 23 – Testing device for checking adhesion of the insulating coating of insulated screwdrivers on conductive parts and the handle 38
Figure 24 – Example of mountings for checking stability of adhesion of the insulation of the entire insulated hand tool 40
Figure 25 – Dummies for testing locking systems used with square drives of nominal size 12,5 mm of ISO 1174 44
Figure 26 – Dummies for testing locking systems used with square drives of nominal size 10 mm of ISO 1174 45
Figure 27 – Example of a flame retardancy test arrangement 47

Table 1 – Dimensions and tolerances of the insulating overlapping element 13
Table 2 – Dimensions and tolerances for dummies to be used for dielectric tests 31
Table B.1 – Torque values for insulating and hybrid screwdrivers 50
Table E.1 – Sequential order for performing type tests 54
Table G.1 – Classification of defects and associated requirements and tests 56
Table H.1 – Justification for the type of defect 57

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 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*.

Documents
Document Sharing Hub

Full document details: IEC 60900 2018

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 corrigenda of January 2019 and May 2020 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.

Documents
Document Sharing Hub

Full document details: IEC 60900 2018

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.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

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:

AVA Documents Document Sharing Hub

Full document details: IEC 60900 2018

- 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.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

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 head*s.

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);

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

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.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

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.

AVA Documents Document Sharing Hub

Full document details: IEC 60900 2018

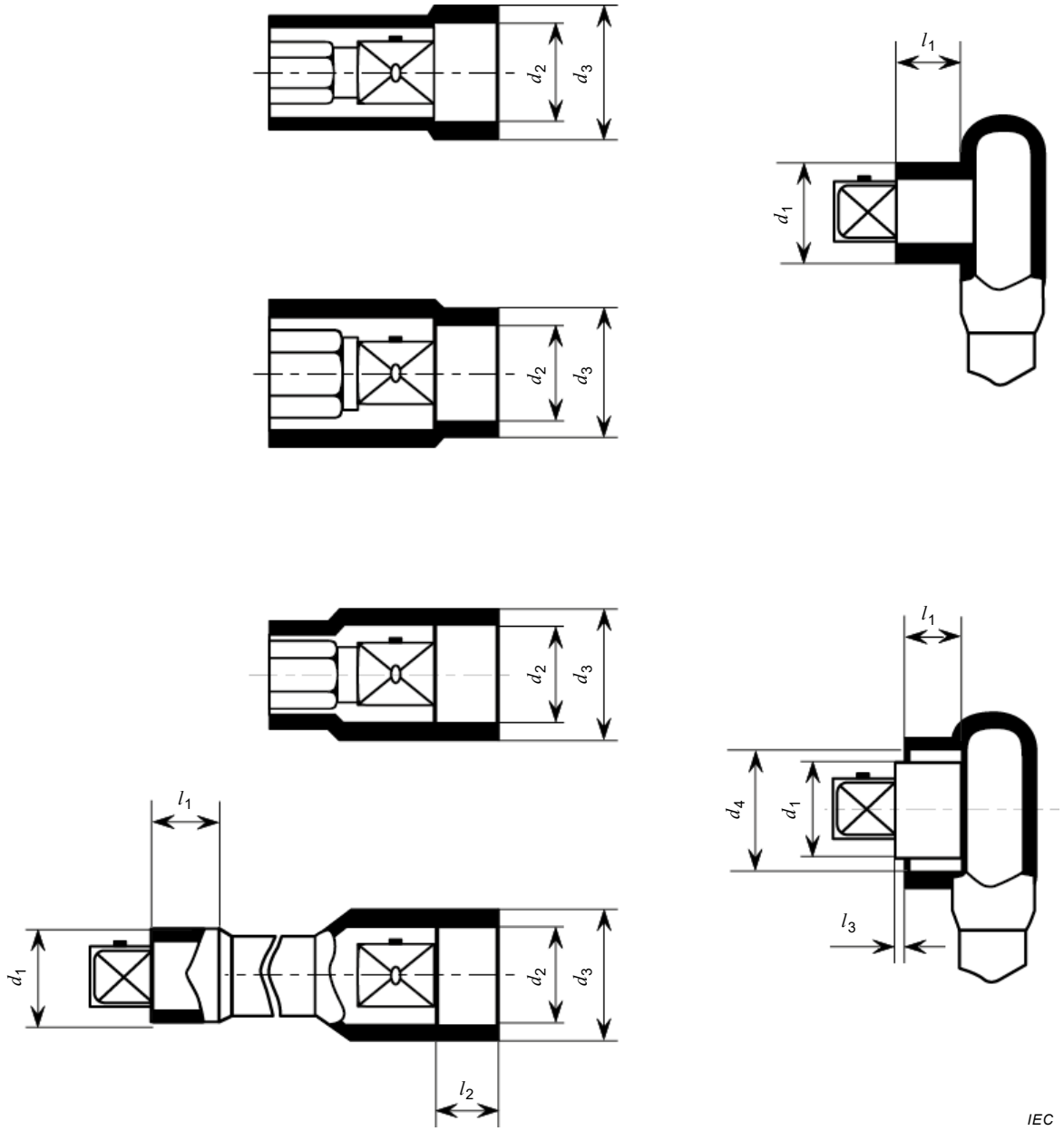


Figure 2 – Description of the insulating overlapping element and different assembly configurations for hand tools capable of being assembled with square drives

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.							

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

4.4.1.3.2 Interchangeability of components made by different manufacturers

Hand tools capable of being assembled and designed to be interchangeable between different manufacturers shall be specifically marked as such.

The marking symbol and the dimensions are given in Figure 3. The dimension H shall be greater than or equal to 5 mm.

Dimensions in millimetres

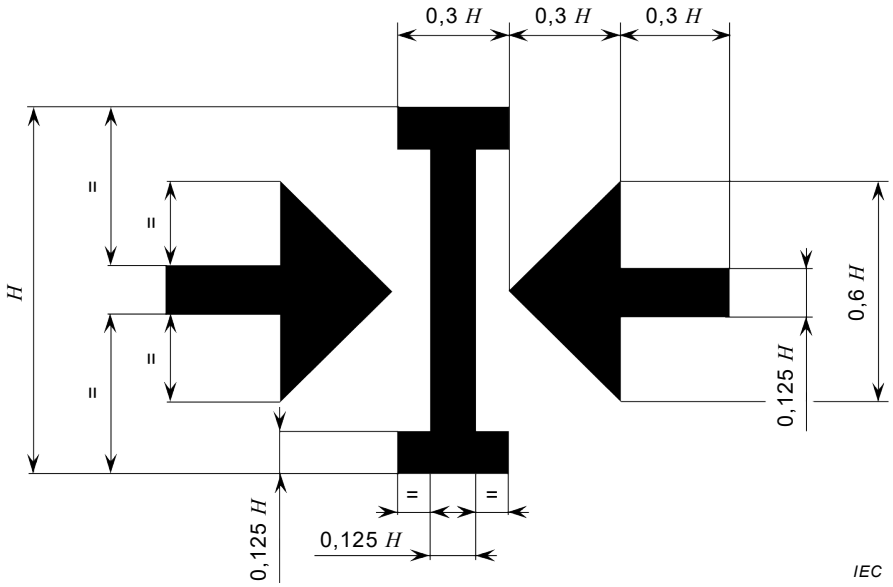


Figure 3 – Marking symbol for hand tools capable of being assembled and designed to be interchangeable between different manufacturers (IEC 60417-6168:2012-07)

The reliable function of locking systems used for these *hand tools* shall be tested by applying a separation test in accordance with 5.9.5 with a corresponding dummy.

For this kind of *hand tools*, instructions for correct assembly are mandatory. The manufacturer shall include the following information: “To assure that the complete assembly of *insulated hand tool* components from different manufacturers will withstand separating forces that are expected during the intended use, prior to the use of any assembly the user shall assure, by pulling by hand in a separating direction, that the retaining devices of all used elements are working efficiently”.

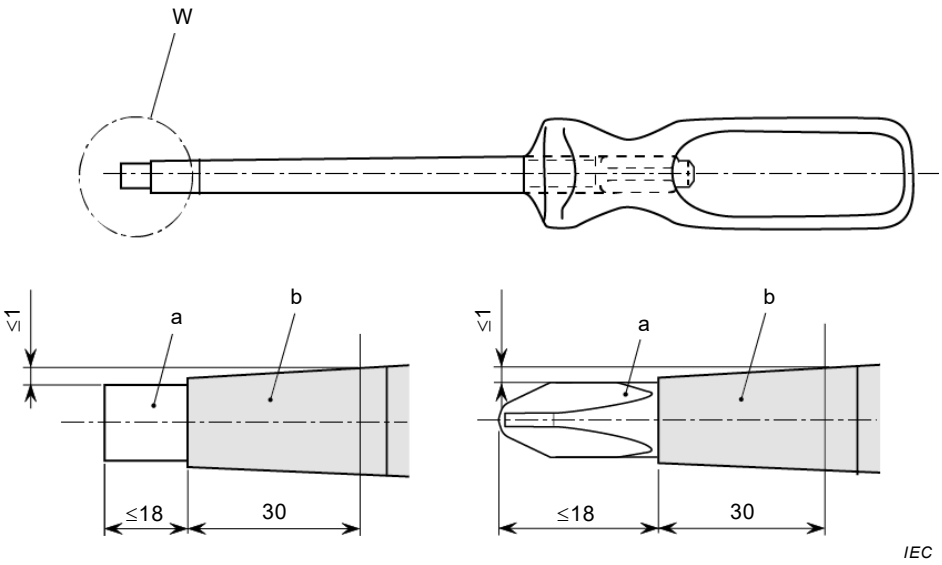
4.4.2 Screwdrivers

4.4.2.1 Un-insulated areas

For insulated or hybrid screwdrivers, an un-insulated conductive area having a maximum length of 18 mm is permissible on the *working head* (see Figure 4).

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres



Key

a conductive part

b insulation

W *working head*

Figure 4 – Illustration of insulation of a typical screwdriver

4.4.2.2 Shape of shaft insulation

The shaft insulation of insulated screwdrivers shall be bonded to the handle.

The outer diameter of the insulation of insulated and hybrid screwdrivers, over a length of 30 mm, in area "W" of Figure 4, shall not exceed by more than 2 mm the width of the shaft at the tip or the width of the tip, whatever is the larger dimension. This area may be parallel or tapered towards the tip.

This requirement does not apply to insulated bit sockets (or insulated socket drivers).

4.4.2.3 Screwdrivers with exchangeable working heads

Insulated or hybrid screwdrivers with exchangeable *working head*s are regarded as *hand tools* capable of being assembled. They shall meet the relevant requirements. The outer diameter of the insulation may exceed the dimensions of 4.4.2.2.

4.4.2.4 Screwdrivers with screw retaining devices

If an insulated or hybrid screwdriver has a screw retaining device, the screwdriver itself shall meet the requirements of this document. The outer diameter of the retaining device may exceed the dimensions of 4.4.2.2. The retaining device shall be made from insulating material.

4.4.3 Spanners – un-insulated areas

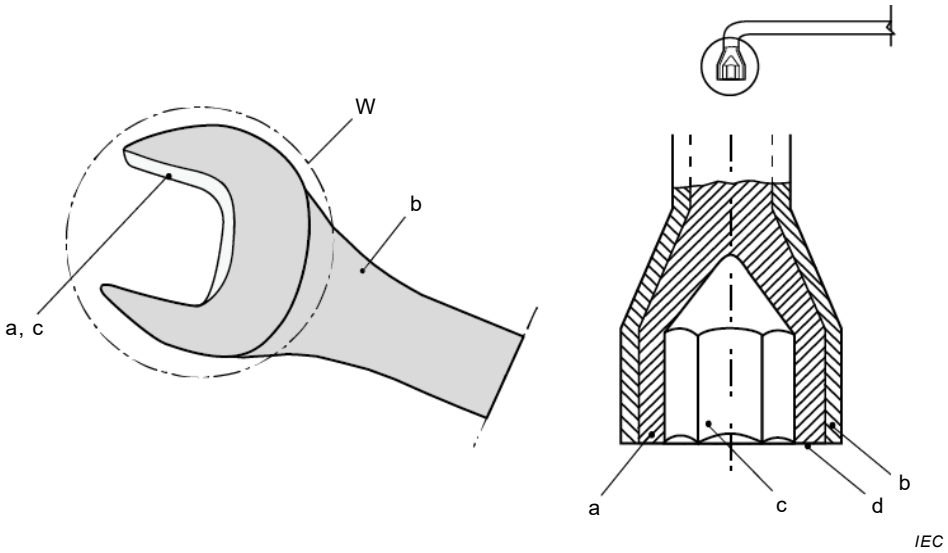
The following un-insulated areas on the *working head* of insulated and hybrid spanners are permissible (see Figure 5):

- single headed spanner: the working surface;

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

NOTE At the request of the customer, the un-insulated area can be extended to the *working head*.

- ring spanner, socket-spanner, T spanner: the working surface and the contact area.



Key

a conductive part

b insulation

c working surface

d contact area

W *working head*

Figure 5 – Illustration of insulation of typical spanners

4.4.4 Adjustable spanners

The insulation of insulated adjustable spanners shall be applied as far as possible towards the *working head*. The un-insulated area may be extended to the *working head*. If the *working head* remains un-insulated, a guard shall be applied so that the hand is prevented from slipping towards the uncovered conductive parts of the head. For the minimum dimensions of the guards, see Figure 6.

In the case of hybrid adjustable spanners where there are more uncovered conductive parts than the working surface at the head, a guard shall be applied.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres

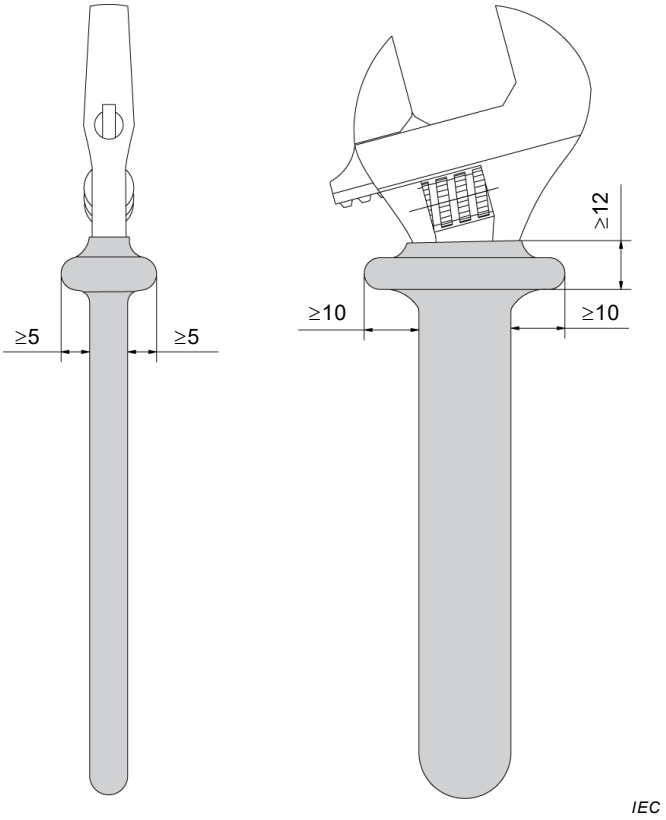
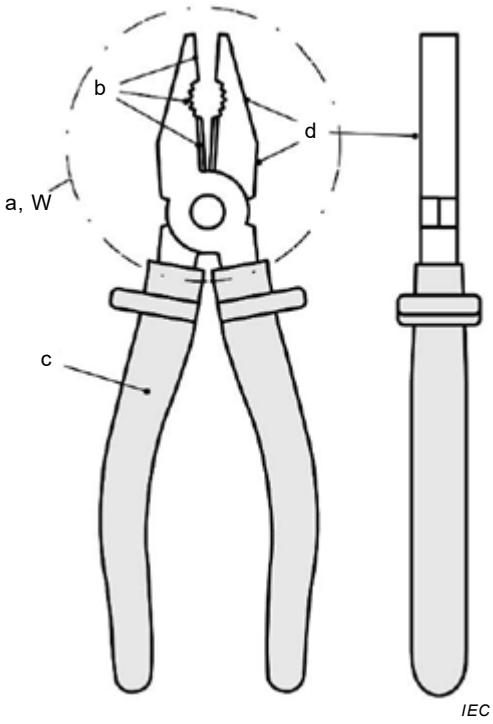


Figure 6 – Insulated or hybrid adjustable spanner

4.4.5 Pliers, strippers, cable scissors, cable-cutting hand tools

The handle insulation of such *insulated* or *hybrid hand tools* shall have a guard so that the hand is prevented from slipping towards the uncovered conductive parts of the head (see Figure 7 as an example).

Documents
Document Sharing Hub
Full document details: IEC 60900 2018



Key

a conductive part

b working surface

c insulation

d contact area

W *working head*

Figure 7 – Illustration of insulation of typical pliers

The height of the guard shall be sufficient to prevent the slipping of the fingers towards the uncovered conductive parts during the work.

For pliers, the minimum dimensions of the guard shall be (see Figures 8, 9 and 10 as an example):

- 10 mm on the left and on the right of the pliers held on a flat surface;
- 5 mm on the upper and lower part of the pliers held on a flat surface.

The minimum insulated distance between the inner edge of each guard and any non-insulated parts shall be 12 mm (see Figures 8, 9, 10 and 11). The insulation portion in front of the guard shall extend as far as possible towards the *working head*.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres

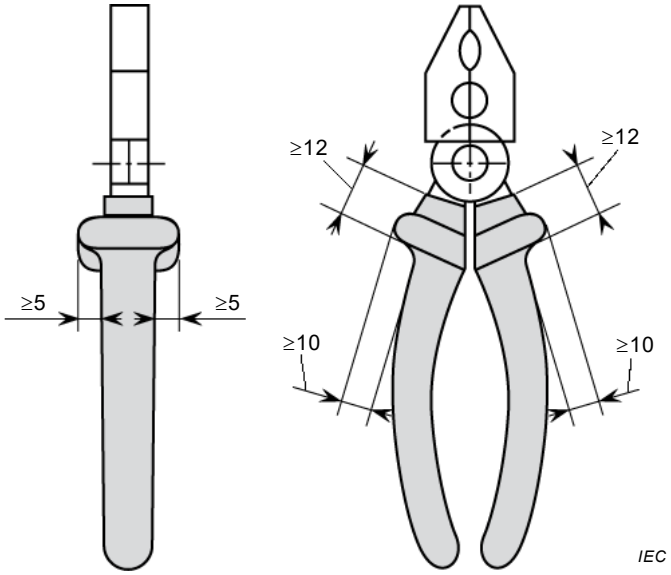


Figure 8 – Insulation of pliers

In the case of a slip joint, a guard of 5 mm shall be provided for the inner part of the handles. Refer to Figure 9 for further dimensioning.

Dimensions in millimetres

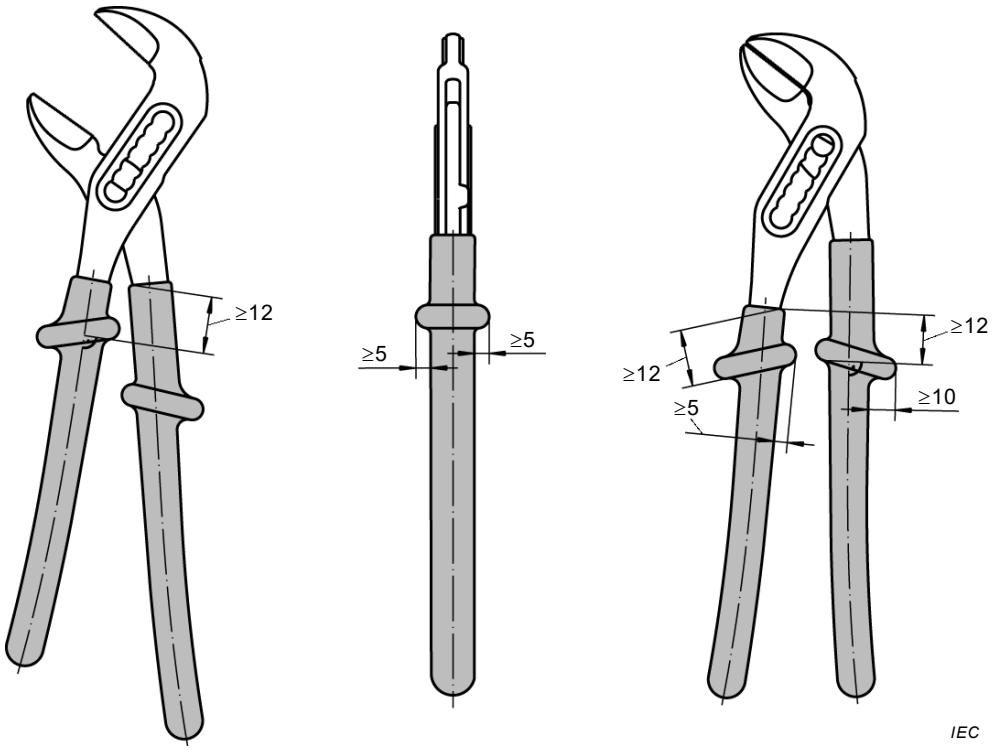


Figure 9 – Insulation of multiple slip joint pliers

Where there is a functional surface below the joint, an inner guard shall be provided (as used with multiple slip joint pliers). See Figure 10.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres

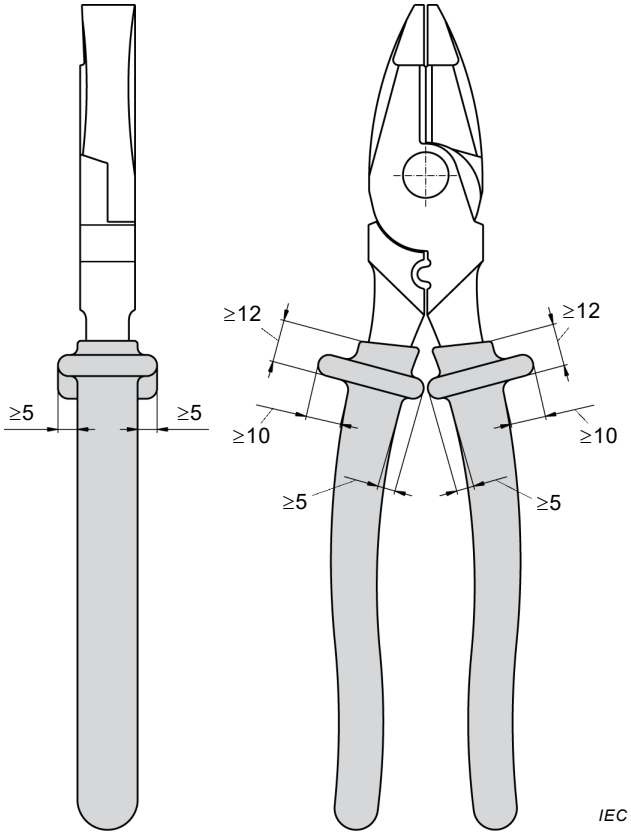


Figure 10 – Insulation of pliers with a functional area below the joint

Where the handles of the *hand tools* are longer than 400 mm, a guard is not required.

In the case of insulated pliers and nippers for electronics, the dimensions of the guard shall be at least:

- 5 mm on left and right of the pliers held on a flat surface;
- 3 mm on the upper part and the lower part of the pliers held on a flat surface.

The minimum insulated distance between the inner edge of the guard and the non-insulated part shall be 12 mm. The insulation portion in front of the guard shall extend as far as possible towards the *working head* (see Figure 11).

Insulated pliers and nippers for electronics shall be in accordance with ISO 9656 and ISO 9657 and, where relevant, with ISO 9654 or ISO 9655

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres

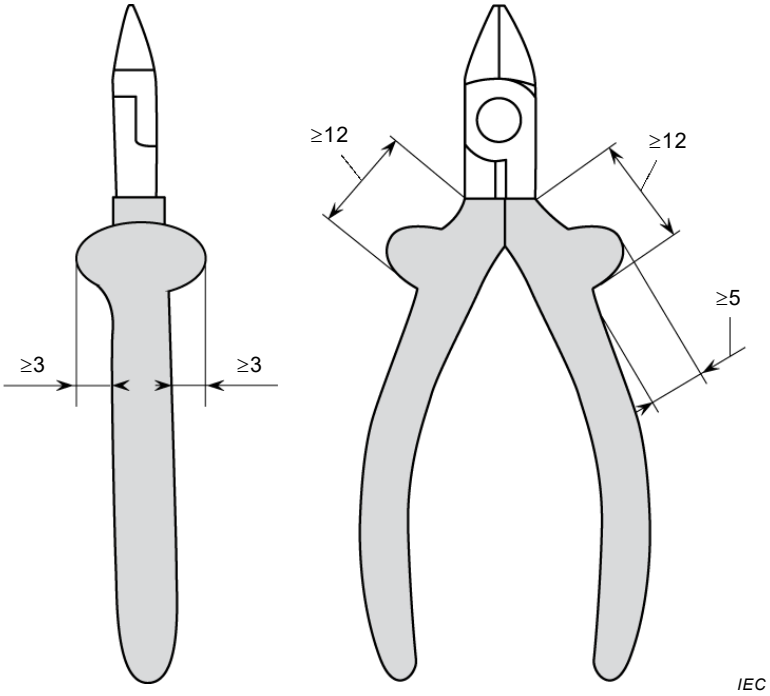


Figure 11 – Illustration of insulation of pliers and nippers for electronics

4.4.6 Scissors

A typical insulation of insulated scissors is shown in Figure 12.

The shackles of the scissors shall have the design presented in Figure 12a or the design presented in Figure 12b.

The maximum length of the un-insulated parts of scissors shall not exceed 100 mm.

The insulation portion in front of the guard shall extend as far as possible towards the *working head*. If the insulated length in front of the shackle is less than 50 mm, at least one guard is required.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres

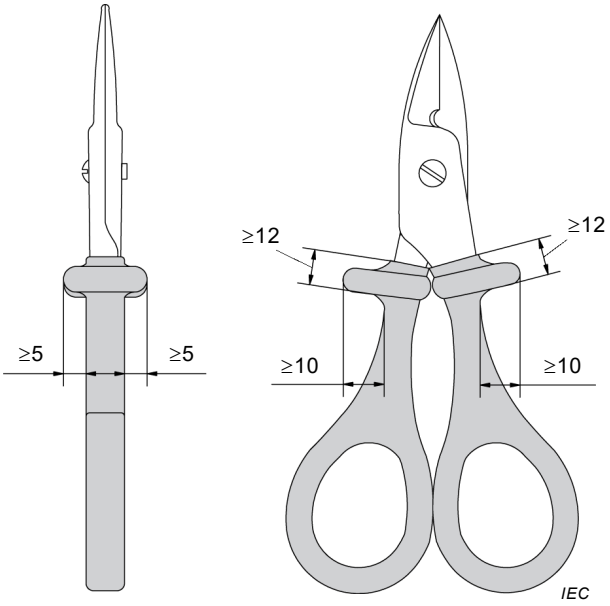


Figure 12a

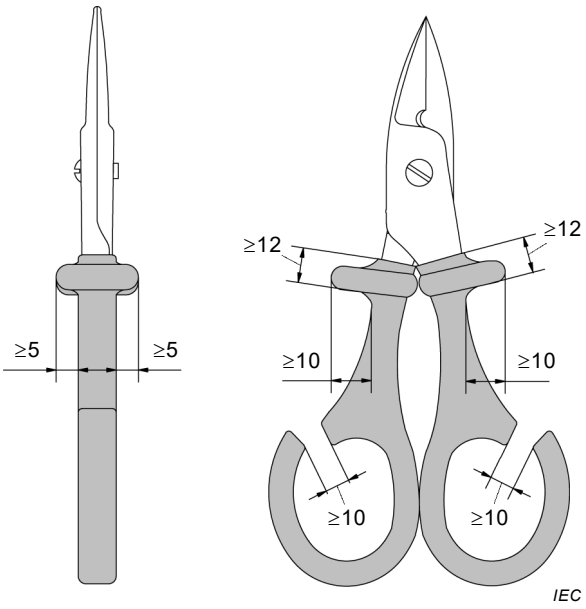


Figure 12b

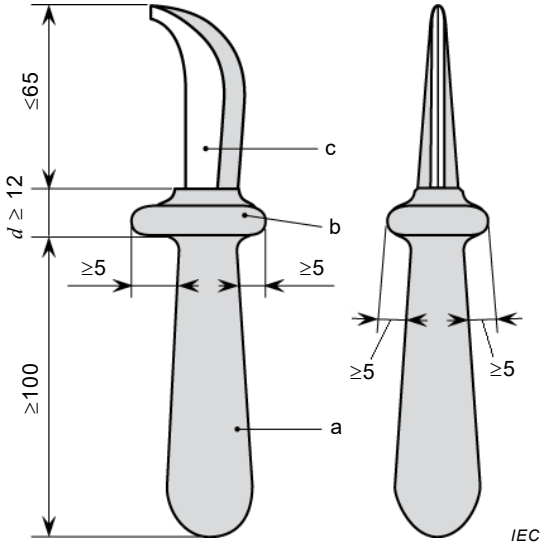
Figure 12 – Insulation of scissors

4.4.7 Knives

Figure 13 shows an example for the application of the insulation of insulated or hybrid knives. The dimensions of insulated or hybrid knives shall be in accordance with Figure 13.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres



Key

a insulation

b guard

c cutting blade (not insulated)

d distance between the inner edge of the guard and the non-insulated part

Figure 13 – Insulation of knives

4.4.8 Tweezers

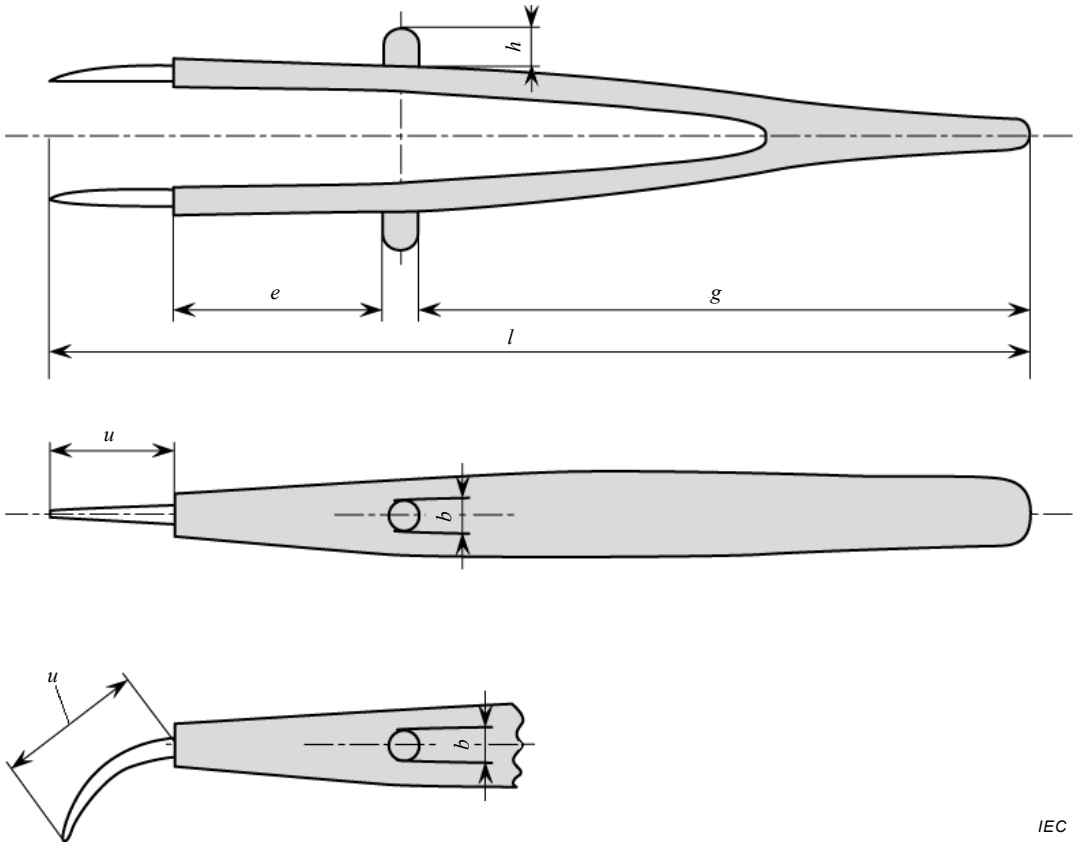
The total length l of tweezers shall be 130 mm minimum and 200 mm maximum. The length of the handles g shall be 80 mm minimum (see Figure 14).

Both handles of the tweezers shall have a guard towards the *working head*. The guard shall not be movable. Its height h and width b shall be sufficient (5 mm minimum) to prevent any slipping of the fingers during the work towards the un-insulated length u of the *working head*. On both handles, the insulated or insulating length e between the guard and the *working head* shall be 12 mm minimum and 35 mm maximum (see Figure 14).

The un-insulated length u of the *working head* shall not exceed 20 mm (see Figure 14).

In the case of tweezers with a metallic *working head*, the metallic part shall have a minimum hardness of 35 HRC at least from the *working head* up to the handles.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018



Key

l total length of the tweezers

g length of the handle (grip)

b width of the guard

h height of the guard

e insulated or insulating part of the handle between the guard and the *working head*

u *working head* (insulated or not)

Figure 14 – Example of insulation of the handles of tweezers

5 Tests

5.1 General

This document provides testing provisions to demonstrate compliance of the product to the requirements of Clause 4. These testing provisions are primarily intended to be used as type tests for validation of the design input. Where relevant, alternative means (calculation, examination, tests, etc.) are specified within the test subclauses for the purpose of *hand tools* having completed the production phase.

The type tests specified in 5.2 to 5.11 shall be carried out on at least three *hand tools* of the same design and in the sequence specified in Annex E.

Should a *hand tool* fail any part of the type test, the type test shall be repeated on at least six further *hand tools* of the same design. Should any one of these six *hand tools* fail any part of the type test, the whole test shall be regarded as having been failed.

All *hand tools* that have failed the type test shall be either destroyed or rendered unsuitable for use in live working.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Unless otherwise stated, the type tests shall be carried out after a minimum storage time of 16 h under IEC climatic conditions, 23 °C ± 5 °C, relative humidity 45 % to 75 % (see IEC 60212, "standard ambient").

Unless otherwise stated, tolerances of ± 5 % from any type test values required are permissible.

5.2 Visual check

The *hand tool* (in particular the insulation) shall be visually checked and shall be free from external defects.

The marking shall be checked for legibility and completeness in accordance with 4.1.4.

The compliance with the relevant complementary requirements of the following subclauses shall be checked by visual inspection:

- subclause 4.4.1.2, in the case of connecting parts of *hand tools* capable of being assembled;
- subclause 4.4.1.3.2 for instructions for use in the case of *hand tools* capable of being assembled and designed to be interchangeable between different manufacturers;
- subclause 4.4.2.4 for the type of material of the screw retaining devices of screwdrivers;
- subclause 4.4.3 for un-insulated areas of spanners.

5.3 Dimensional check

The dimensional requirements of 4.4 shall be checked. The dimensions of certain elements of marking shall be checked according to 4.1.4.

5.4 Impact tests

5.4.1 Type test

5.4.1.1 General

The test shall be carried out according to one of the two methods shown in Figures 15 and 16. In case of doubt, method “B” applies (see Figure 16).

In the case of *hand tools* capable of being assembled, the tool components shall be tested separately.

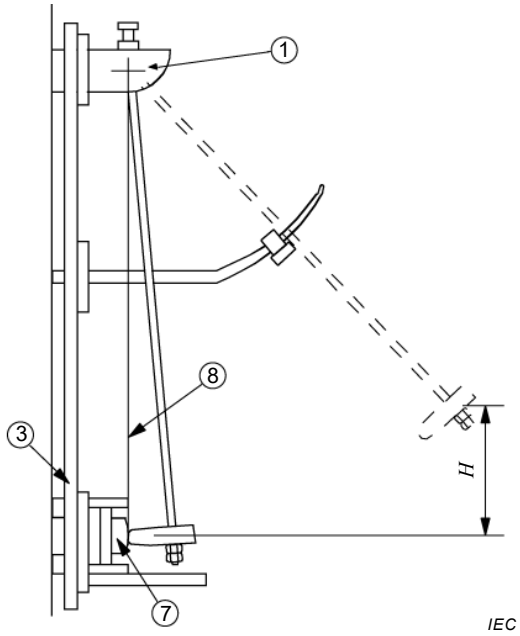
The hammer used in the apparatus of Figure 15 and the hammer and intermediate piece used in the apparatus of Figure 16 shall be made of steel with hardness between 20 HRC and 46 HRC.

At least three points of the insulating material or insulating layer shall be selected as testing points, these being points which could be damaged when the *hand tool* drops on a flat surface.

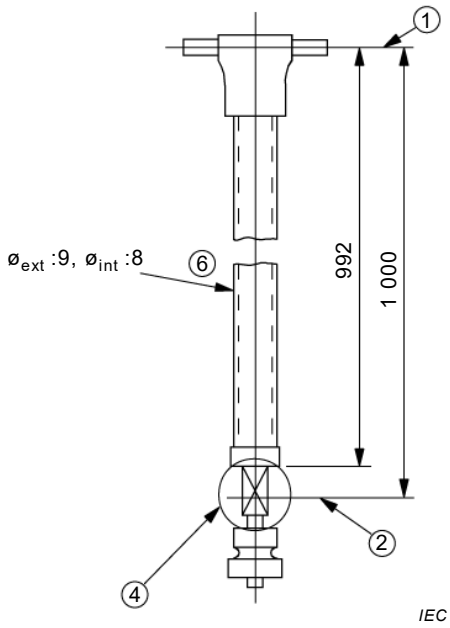
The test shall be considered as passed if the insulating material shows no breaks, peeling, or cracks. Any other visible or non-visible defects caused by the impact tests will be verified by the dielectric tests in 5.5.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres

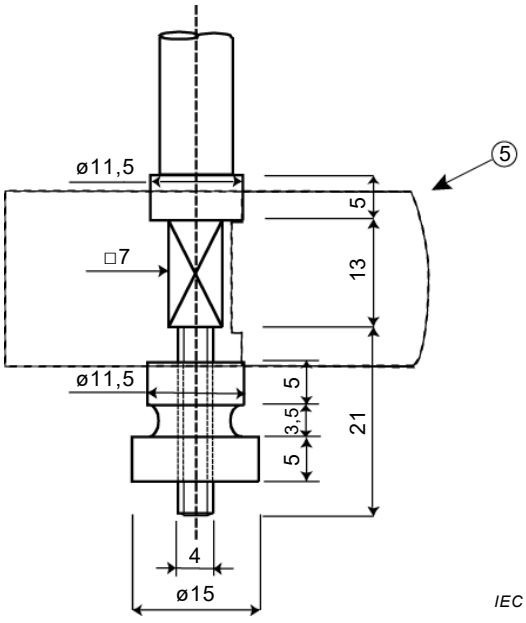


Side view

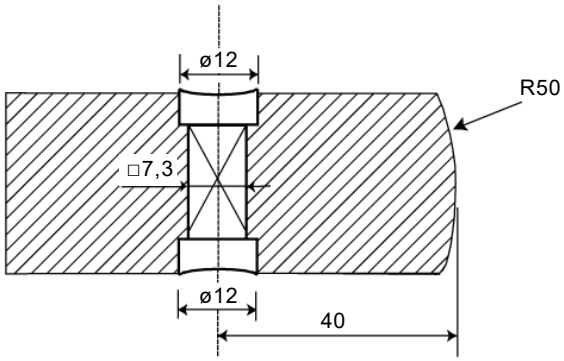


Front view

Dimensions in millimetres



Detail of the assembly of hammer



Detail of hammer head

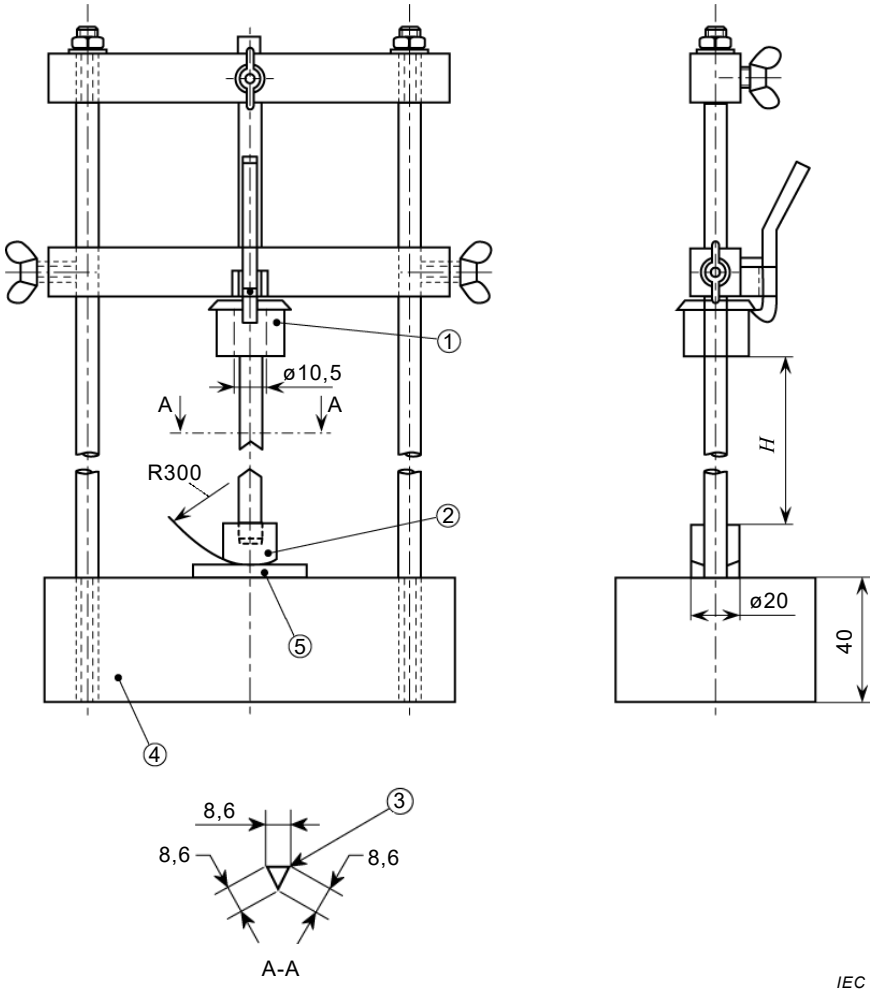
Key

1	axis of swing adjustable	5	hammer head – Rockwell hardness of material between 20 HRC and 46 HRC
2	neutral axis of hammer	6	steel tube
H	fall height	7	test piece
3	frame	8	vertical plane through axis of pendulum
4	hammer		

Figure 15 – Example of test arrangement for the impact test – Method A

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres



Key

H	fall height
1	hammer
2	steel intermediate piece 100 g
3	slightly rounded edges
4	steel part 10 kg
5	test piece

Figure 16 – Example of test arrangement for the impact test – Method B

5.4.1.2 Ambient temperature impact test

The *hand tool* shall be tested at the ambient temperature, 23 °C ± 5 °C, of the test room.

The height of fall H of the hammer shall be determined as a function of its weight P, so that the energy W of impact on the *hand tool* to be tested shall be equal to that of this tool falling on a hard surface from a height of 2 m:

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

$$H = \frac{W}{P} = \frac{2 \times F}{P}$$

where

H is the height of fall of the hammer, in metres;

F is the weight of the *hand tool* tested, in newtons;

P is the weight of the hammer, in newtons.

5.4.1.3 Low temperature impact test

Hand tools, excluding those of category "C", shall be conditioned in a cooling chamber for 2 h at –25 °C ± 3 °C. The impact test shall start 120 s after removal from the cooling chamber. The ambient temperature of the test room shall be 23 °C ± 5 °C.

The height of fall H of the hammer shall be determined as a function of its weight P, so that the energy W of impact on the *hand tool* to be tested shall be equal to that of this tool falling on a hard surface from a height of 0,6 m:

$$H = \frac{W}{P} = \frac{0{,}6 \times F}{P}$$

where

H is the height of fall of the hammer, in metres;

F is the weight of the *hand tool* tested, in newtons;

P is the weight of the hammer, in newtons.

5.4.1.4 Extreme low temperature impact test

Hand tools of category "C" shall be conditioned in a cooling chamber for 2 h at –40 °C ± 3 °C.

The impact test shall be carried out according to 5.4.1.3.

5.4.2 Alternative methods in cases where hand tools have completed the production phase

For conformity evaluation of *hand tools* having completed the production phase, the manufacturer shall prove that he has followed the same documented production procedure as per the type tested device.

The manufacturer shall document components and procedures that could affect the impact resistance.

In case of doubt, a sampling test in accordance with IEC 61318, using the test method defined for the type test, applies.

5.5 Dielectric tests

5.5.1 General requirements

For tests to be carried out according to IEC 60060-1, the test voltage shall be increased and reduced at a uniform rate of approximately 1 000 V/s.

The dielectric testing shall be started at the latest 5 min after conditioning is completed.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

5.5.2 **Conditioning** (for type test only)

5.5.2.1 General

Before testing (according to 5.5.3 or 5.5.4), the *hand tools* shall be conditioned in accordance with one of the two possibilities described in 5.5.2.2 and 5.5.2.3.

5.5.2.2 Water bath

The *hand tools* shall be totally immersed in a bath of tap water at room temperature as specified in 5.1 (23 °C ± 5 °C) for 24 h ± 0,5 h. The water shall have a minimum conductivity of 100 µS/cm. After this conditioning, the *hand tools* shall be wiped dry and submitted to the dielectric test.

5.5.2.3 Wet chamber

The hand tools shall be stored at a relative humidity of (93 ± 2) % at a temperature of 23 °C ± 5 °C for 48 h. Hand tools capable of being assembled shall not be assembled prior to conditioning.

NOTE This humidity conditioning can be obtained by storing the *hand tools* in a closed chamber which contains a saturated solution of sodium sulphate decahydrate $Na_2\ SO_4\ 10H_2O$ (Glauber's salt) having a large exposed surface.

5.5.3 Dielectric testing of insulated and hybrid hand tools

5.5.3.1 Type test

5.5.3.1.1 General

The *hand tool* shall be immersed in a bath of tap water up to a level of 24 mm ± 2 mm from the nearest non-insulated part. The water shall have a minimum conductivity of 100 µS/cm. The accessible conductive part shall be above the water level (see Figure 17).

Pliers and similar *hand tools* shall be tested in such a position that the gap d between the two inner sides of the handles is 2 mm to 3 mm, or the minimum possible by the tool's construction but not less than 2 mm (see Figure 17).

For *hand tools* capable of being assembled and for those tools where the design does not allow testing in a water bath, the water bath shall be replaced by a bath of nickel stainless steel balls 3 mm in diameter (measured with normal industrial tolerances).

A test voltage of 10 kV rms at 50 Hz or 60 Hz shall then be continuously applied between the accessible conductive parts and the water bath / steel ball bath for a test period of 3 min according to IEC 60060-1. The current is measured during the test period, either continuously or at the end of the period.

For insulated tools this current shall be smaller than 1 mA rms for 200 mm of the insulation. This corresponds to a maximum value of the leakage current of:

$$I_M = 5\ L$$

where

I_M is the maximum leakage current (in milliamperes rms) rounded to the upper value in milliamperes;

L is the total linear length (in metres) of insulation rounded to the lower value in centimetres.

NOTE Annex F gives examples of calculation of the total linear length of insulation and the limits of acceptable leakage current.

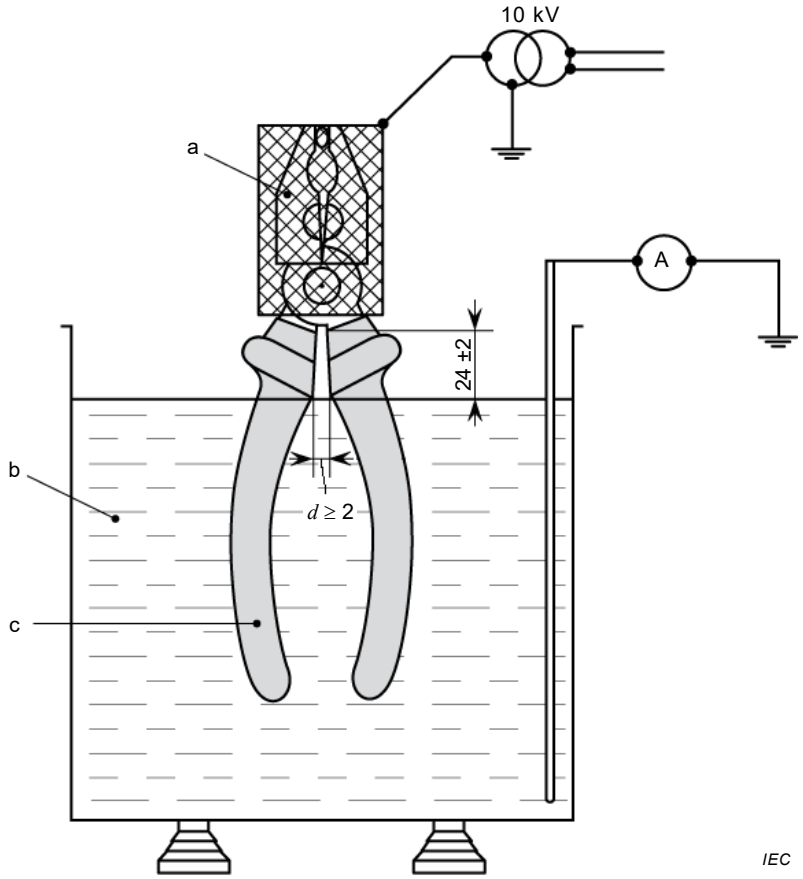
Documents
Document Sharing Hub
Full document details: IEC 60900 2018

For hybrid tools the current shall be smaller than 0,5 mA rms.

Hand tools capable of being assembled shall be tested in all variations of the assembly that are specified by the manufacturer. For tools capable of being assembled with square drives, dummies may be used for the electrical test (see 5.5.3.1.2). *Hand tools* with retaining devices shall be tested on both end positions, if applicable.

The test shall be considered as passed if no electrical puncture, sparkover or flashover occurs during the test period, and if the limits of leakage current are not exceeded.

Dimensions in millimetres



Key

a conductive part

b tap water bath

c insulated or insulating part of the *hand tool*

d gap to be maintained between the two inner sides of the legs

A ammeter

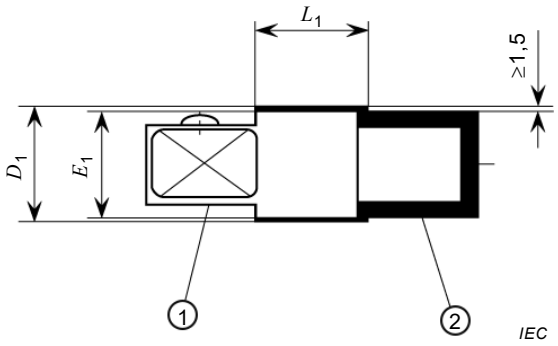
Figure 17 – Dielectric testing arrangement for insulated or hybrid hand tools

5.5.3.1.2 Tests of hand tools capable of being assembled with square drives

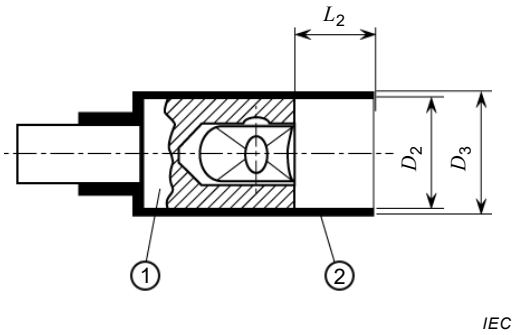
In the case of *hand tools* capable of being assembled with square drives (see 4.4.1.3.1), the tools can be tested in separate parts, if the parts are assembled with dummies described in Figure 18. The dimensions and tolerances of the dummies shall be in accordance with Table 2.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres



Dummy part 1 to be used with female *hand tool* ends



Dummy part 2 to be used with male *hand tool* ends

Key

1 conductive part

2 insulation

Figure 18 – Description of dummies for dielectric tests for hand tools capable of being assembled with square drives

Table 2 – Dimensions and tolerances for dummies to be used for dielectric tests

Dimensions in millimetres

Nominal size	L_1 ± 0,1	L_2 ± 0,1	E_1 ± 0,05	D_1 ± 0,05	D_2 ± 0,05	D_3 ± 0,05
6,3	19	16	8,4	11	14,5	16,5
10	19	16	12,7	16	19,5	21,5
12,5	19	16	16,9	20	23,5	25,5
20	19	16	25,4	30,5	34,5	35,6
L_1, L_2, E_1, D_1, D_2 and D_3 are described in Figure 18.						

Dummy part 1 shall be assembled with female tool ends and dummy part 2 with male tool ends.

On all single parts tested with dummies, the dielectric testing on the complete assembly is not required.

The test shall be considered as passed if no electrical puncture, sparkover or flashover occurs during the test period, and if the limits of leakage current are not exceeded.

5.5.3.2 Alternative test in cases where insulated hand tools have completed the production phase

For conformity evaluation of *hand tools* having completed the production phase, the manufacturer shall prove that he has followed the same documented manufacturing procedure as per the test of 5.5.3.1 which shall be performed but:

- conditioning as specified in 5.5.2 is not necessary;
- the period of test shall be 10 s after reaching the specified voltage;
- the distance of the water level (or ball level) from the nearest exposed metal part shall be 24^{+4}_{-2} mm;

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

- the leakage current measurement is not carried out.

The manufacturer shall document components and procedures that could affect the dielectric performance.

In any doubt, a sampling test in accordance with IEC 61318, using the test method defined for the type test, applies.

5.5.3.3 Alternative methods in cases where hybrid hand tools have completed the production phase

For conformity evaluation of *hybrid hand tools* having completed the production phase, the manufacturer shall prove that he has followed the same documented manufacturing procedure as per the type tested device.

The manufacturer shall document components and procedures that could affect the dielectric performance.

In any doubt, a sampling test in accordance with IEC 61318, using the test method defined for the type test, applies.

5.5.4 Dielectric testing of insulating hand tools

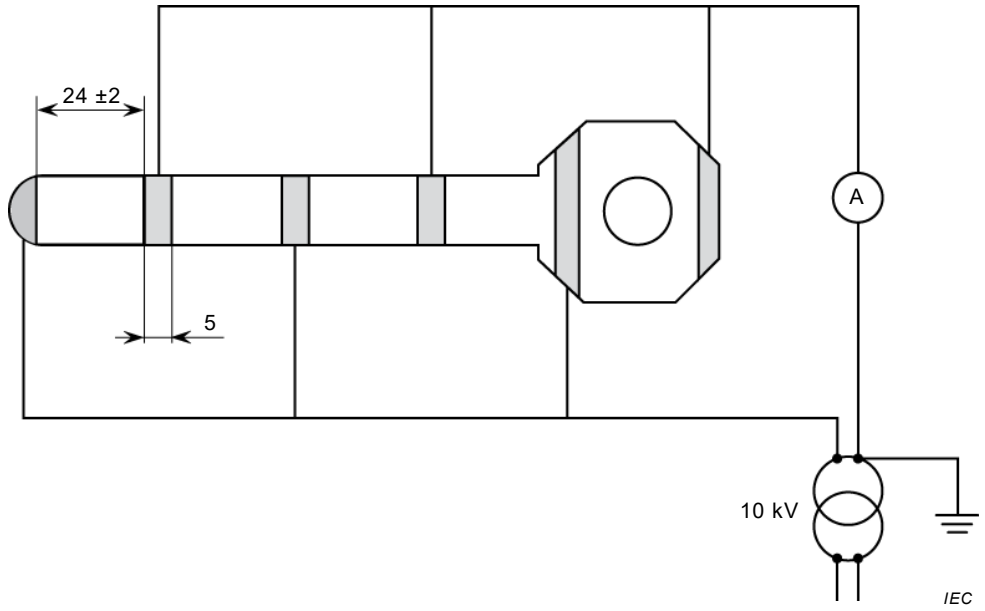
5.5.4.1 Type test

Tools having no exposed conductive parts shall be tested as follows.

NOTE The purpose of this test is to check the dielectric quality of the material used for the tool.

Electrodes of conductive tape or conductive paint, in 5 mm wide strips, shall be placed on the surface of the handle at intervals of 24 mm ± 2 mm (see Figure 19). In accordance with IEC 60060-1, a test voltage of 10 kV rms at 50 Hz or 60 Hz shall then be continuously applied for a test period of 3 min between each adjacent electrode.

Dimensions in millimetres



Key

A ammeter

Figure 19 – Dielectric testing arrangement for insulating hand tools

AVA Documents
Document Sharing Hub

Full document details: IEC 60900 2018

The test shall be considered as passed if no electrical puncture, sparkover or flashover occurs during the test period, and if the leakage current is less than 0,5 mA rms multiplied by the number of spaces between adjacent electrodes.

5.5.4.2 Alternative methods in cases where insulating hand tools have completed the production phase

For conformity evaluation of *insulating hand tools* having completed the production phase, the manufacturer shall prove that he has followed the same documented manufacturing procedure as per the type tested device.

The manufacturer shall document components and procedures that could affect the dielectric performance.

In case of doubt, a sampling test in accordance with IEC 61318, using the test method defined for the type test, applies.

5.6 Indentation test (for *insulated hand tools*)

5.6.1 Type test

All parts of the insulating coating of *insulated hand tools*, electrically tested as indicated in the relevant subclauses of 5.5 shall pass this test. The test shall be performed on the most vulnerable part(s) for screwdrivers with insulated shaft, and for other *hand tools* at the external middle part of the handle or legs.

If the radius R at the test point is equal to or larger than 10 mm, the test shall be made with a test device according to Figure 20a. The part of the mass m in contact with the test piece shall be a stainless steel hemispheric nose-piece of 5 mm diameter. The applied force F shall be 20 N.

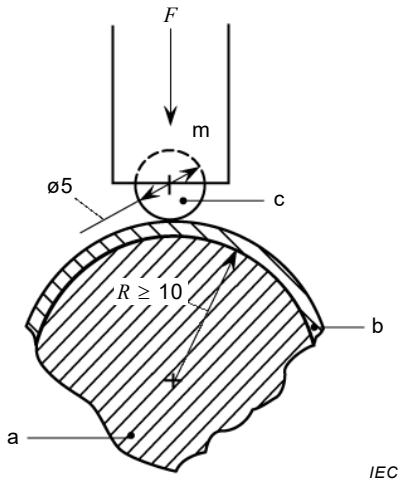
If the radius R at the test point is less than 10 mm, a rod of 4 mm diameter and at least 30 mm in length placed at right angles to the tool axis shall be used with the same force F of 20 N (see Figure 20b).

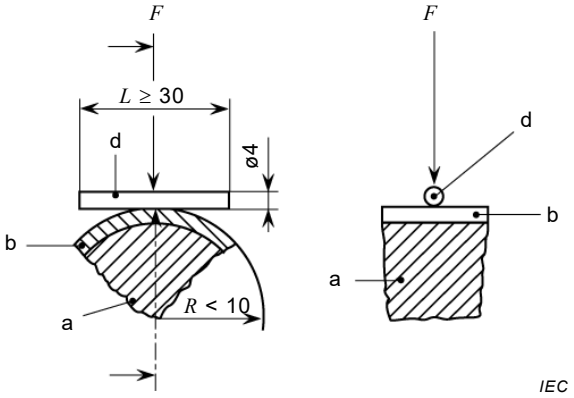
The *hand tool* shall be clamped in such a way that the insulating material coating at the test point is in a horizontal position. After setting up the testing device, the arrangement shall be held according to code 2 h/70 °C/<20 % of IEC 60212, in a heating chamber with ventilation. At the end of the heating time and after a cooling period outside the chamber of 5 min, a test voltage of 5 kV rms at 50 Hz or 60 Hz shall be applied continuously, in accordance with IEC 60060-1, between the testing device and the metal part of the *hand tool* for a test period of 3 min, using the code 18–28 °C/45–75 % of IEC 60212.

The test shall be considered as passed if no electrical puncture, sparkover or flashover occurs during the test period.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

Dimensions in millimetres





Key

a conductive part

b insulation (test point)

c hemispheric nose-piece

d rod

R radius at the test point of the *hand tool*

m testing mass

Figure 20a – Radius at the test point of the hand tool ≥ 10 mm

Figure 20b – Radius at the test point of the hand tool < 10 mm

Figure 20 – Indentation test

5.6.2 Alternative methods in cases where insulated hand tools have completed the production phase

For conformity evaluation of *insulated hand tools* having completed the production phase, the manufacturer shall prove that he has followed the same documented production procedure as per the type tested device.

The manufacturer shall document components and procedures that could affect the indentation resistance.

In case of doubt, a sampling test in accordance with IEC 61318, using the test method defined for the type test, applies.

5.7 Test for adhesion of the insulating material coating of insulated hand tools

5.7.1 Conditioning

Before the test, the *insulated hand tools* shall be conditioned in a heating chamber with ventilation at a temperature of 70 °C ± 3 °C for 168 h.

The following tests shall be started at ambient temperature 3 min after removal from the heating chamber, using the code 18–28 °C/45–75 % of IEC 60212.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018

5.7.2 Type test

5.7.2.1 Test on the working head of insulated hand tools

The test shall be made on the following *insulated hand tools*:

- spanner;
- open-jaw holding spanner;
- *hand tools* capable of being assembled (except for pieces acting as screwdrivers).

The test may be carried out using either method A or method B as shown in Figures 21 and 22, respectively. In case of doubt, method A shall apply.

Method A (see Figure 21):

A hook having a cutting edge of 5 mm width shall be placed on the *working head* in such a manner that it does not touch the conductive part.

A force F of 50 N shall be applied in the direction of the line dividing the insulating material coating from the conductive part for 3 min.

Documents
Document Sharing Hub
Full document details: IEC 60900 2018