



IEC 60900

Edition 4.0 2018-06  
REDLINE VERSION

# INTERNATIONAL STANDARD



---

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 13.260; 29.240.20; 29.260.99

ISBN 978-2-8322-5842-2

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## 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.....	15
4.4.3 <del>Wrenches</del> <del>Spanners</del> – un-insulated areas.....	17
4.4.4 Adjustable <del>wrenches</del> spanners .....	18
4.4.5 Pliers, strippers, cable scissors, cable-cutting hand tools .....	19
4.4.6 Scissors .....	23
4.4.7 Knives .....	24
4.4.8 Tweezers.....	25
5 Tests.....	26
5.1 General.....	26
5.2 Visual check .....	27
5.3 Dimensional check.....	27
5.4 Impact tests .....	27
5.4.1 Type test .....	27
5.4.2 Alternative <del>means</del> <del>methods</del> in cases <del>of insulated and insulating</del> where hand tools have completed the production phase.....	30
5.5 Dielectric tests .....	30
5.5.1 General requirements .....	30
5.5.2 Conditioning (for type test only) .....	31
5.5.3 Dielectric testing of insulated <del>and hybrid</del> hand tools .....	31
5.5.4 Dielectric testing of insulating hand tools.....	34
5.6 Indentation test (for <i>insulated hand tools</i> ) .....	35
5.6.1 Type test .....	35
5.6.2 Alternative <del>means</del> <del>methods</del> in cases where insulated hand tools have completed the production phase .....	36
5.7 Test for adhesion of the insulating material coating of insulated hand tools.....	36
5.7.1 Conditioning .....	36
5.7.2 Type test .....	37

5.7.3	Alternative <del>means</del> methods in cases where insulated hand tools have completed the production phase .....	42
5.8	Test of adhesion of exposed conductive parts at the working head of hybrid hand tools .....	43
5.8.1	Type test .....	43
5.8.2	Alternative methods in cases where hybrid hand tools have completed the production phase .....	43
5.9	Mechanical tests .....	43
5.9.1	Test of adhesion of insulating covers of conductive adjusting or switching elements .....	43
5.9.2	Insulated hand tools .....	44
5.9.3	Insulating and hybrid hand tools .....	44
5.9.4	Tweezers .....	45
5.9.5	Retaining force test for tools capable of being assembled.....	45
5.10	Durability of marking .....	48
5.11	Flame retardancy test .....	48
5.11.1	Type test .....	48
5.11.2	Alternative <del>means</del> methods in cases where hand tools have completed the production phase .....	49
6	Conformity assessment of hand tools having completed the production phase.....	50
7	Modifications .....	50
	Annex A (informative) Description and examples for insulated, hybrid and insulating hand tools .....	51
	Annex B (informative) Mechanical strength of insulating and hybrid hand tools .....	52
B.1	Context .....	52
B.2	General.....	52
B.3	Insulating and hybrid screwdrivers .....	52
B.4	Insulating and hybrid <del>wrenches</del> spanners and ratchets .....	53
B.5	Insulating and hybrid T- <del>wrenches</del> spanners .....	53
B.6	Insulating and hybrid pliers and cable shears.....	53
	Annex C (normative) Suitable for live working; double triangle (IEC 60417-5216:2002-10).....	54
	Annex D (informative) Recommendation for use and in-service care .....	55
D.1	General.....	55
D.2	Storage .....	55
D.3	Inspection before use.....	55
D.4	Temperature .....	55
D.5	Periodic examination and electrical retesting .....	55
	Annex E (normative) General type test procedure .....	56
	Annex F (normative) Examples of calculation of the <del>unwinded</del> total linear length of <del>coating</del> insulation and acceptable leakage current (see 5.5.3.1.1).....	57
	Annex G (normative) Classification of defects and tests to be allocated .....	58
	Annex H (informative) Rationale for the classification of defects .....	60
	Bibliography.....	62
	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 .....	13

Figure 3 – Marking symbol for hand tools capable of being assembled and designed to be interchangeable between different manufacturers (IEC 60417-6168:2012-07) .....	15
<del>Figure – Illustration of insulation of typical hand tools .....</del>	<del>15</del>
Figure 4 – Illustration of insulation of a typical screwdriver .....	17
Figure 5 – Illustration of insulation of typical spanners .....	18
Figure 6 – Insulated or hybrid adjustable <del>wrench</del> spanner .....	19
Figure 7 – Illustration of insulation of typical pliers .....	20
Figure 8 – Insulation of pliers .....	21
Figure 9 – Insulation of multiple slip joint pliers .....	21
Figure 10 – Insulation of pliers with a functional area below the joint .....	22
Figure 11 – Illustration of insulation of pliers and nippers for electronics .....	23
Figure 12 – Insulation of scissors .....	24
Figure 13 – Insulation of knives .....	25
Figure 14 – Example of insulation of the handles of tweezers .....	26
Figure 15 – Example of test arrangement for the impact test – Method A .....	28
Figure 16 – Example of test arrangement for the impact test – Method B .....	29
Figure 17 – Dielectric testing arrangement for insulated or hybrid hand tools .....	32
Figure 18 – Description of dummies for dielectric tests for hand tools capable of being assembled with square drives .....	33
Figure 19 – Dielectric testing arrangement for insulating hand tools .....	34
Figure 20 – Indentation test .....	36
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 .....	38
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 .....	39
Figure 23 – Testing device for checking adhesion of the insulating coating of insulated screwdrivers on conductive parts and the handle .....	40
Figure 24 – Example of mountings for checking stability of adhesion of the insulation of the entire insulated hand tool .....	42
Figure 25 – Dummies for testing locking systems used with square drives of nominal size 12,5 mm of ISO 1174 .....	46
Figure 26 – Dummies for testing locking systems used with square drives of nominal size 10 mm of ISO 1174 .....	47
Figure 27 – Example of a flame retardancy test arrangement .....	49
Table 1 – Dimensions and tolerances of the insulating overlapping element .....	14
Table 2 – Dimensions and tolerances for dummies to be used for dielectric tests .....	33
Table B.1 – Torque values for insulating and hybrid screwdrivers .....	52
Table E.1 – Sequential order for performing type tests .....	56
Table G.1 – Classification of defects and associated requirements and tests .....	58
Table H.1 – Justification for the type of defect .....	60

## 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.

**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

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 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.**

## 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 ~~its~~ 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*



# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



---

**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**

## 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 <i>insulated hand tools</i> ) .....	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

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 .....		13

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

## 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*.

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.**

## 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*



## SOMMAIRE

AVANT-PROPOS .....	63
INTRODUCTION .....	65
1 Domaine d'application .....	66
2 Références normatives .....	66
3 Termes et définitions .....	67
4 Exigences .....	68
4.1 Exigences générales .....	68
4.1.1 Sécurité .....	68
4.1.2 Performance sous charge .....	68
4.1.3 Outils à main ayant plusieurs extrémités de travail .....	68
4.1.4 Marquage .....	68
4.1.5 Tenue des capots .....	69
4.1.6 Instructions d'assemblage ou de réglage .....	70
4.2 Exigences relatives aux matériaux isolants .....	70
4.2.1 Généralités .....	70
4.2.2 Stabilité thermique .....	70
4.3 Exigence relative aux parties conductrices accessibles des outils hybrides .....	70
4.4 Exigences complémentaires .....	70
4.4.1 Outils à main pouvant être assemblés .....	70
4.4.2 Tournevis .....	73
4.4.3 Clés – surfaces non isolées .....	74
4.4.4 Clés à molette .....	74
4.4.5 Pincés, pincés à dénuder, coupe-câbles, pincés coupantes .....	75
4.4.6 Ciseaux .....	79
4.4.7 Couteaux .....	80
4.4.8 Brucelles .....	81
5 Essais .....	82
5.1 Généralités .....	82
5.2 Contrôle visuel .....	83
5.3 Contrôle dimensionnel .....	83
5.4 Essais de chocs .....	83
5.4.1 Essai de type .....	83
5.4.2 Moyen alternatif pour les outils à main issus de la production .....	86
5.5 Essais diélectriques .....	86
5.5.1 Exigences générales .....	86
5.5.2 Conditionnement (uniquement pour l'essai de type) .....	87
5.5.3 Essai diélectrique des outils à main isolés et hybrides .....	87
5.5.4 Essai diélectrique des outils à main isolants .....	90
5.6 Essai de pénétration (pour les <i>outils à main isolés</i> ) .....	91
5.6.1 Essai de type .....	91
5.6.2 Moyen alternatif pour les outils à main isolés issus de la production .....	92
5.7 Essai d'adhérence du revêtement isolant des outils à main isolés .....	93
5.7.1 Conditionnement .....	93
5.7.2 Essai de type .....	93
5.7.3 Moyen alternatif pour les outils à main isolés issus de la production .....	98

5.8	Essai d'adhérence des parties conductrices accessibles de la tête de travail des outils à main hybrides.....	99
5.8.1	Essai de type.....	99
5.8.2	Moyen alternatif pour les outils à main hybrides issus de la production.....	99
5.9	Essais mécaniques.....	99
5.9.1	Essai d'adhérence des capots isolants des pièces de réglage ou de manœuvre conductrices.....	99
5.9.2	Outils à main isolés.....	100
5.9.3	Outils à main isolants et hybrides.....	100
5.9.4	Brucelles.....	100
5.9.5	Essai de retenue pour outils pouvant être assemblés.....	101
5.10	Durabilité du marquage.....	104
5.11	Essai de non-propagation de la flamme.....	104
5.11.1	Essai de type.....	104
5.11.2	Moyen alternatif pour les outils à main issus de la production.....	105
6	Évaluation de la conformité des outils à main issus de la production.....	106
7	Modifications.....	106
Annexe A (informative) Description et exemples d'outils à main isolés, hybrides et isolants.....		107
Annexe B (informative) Résistance mécanique des outils à main isolants et hybrides.....		109
B.1	Contexte.....	109
B.2	Généralités.....	109
B.3	Tournevis isolants et hybrides.....	109
B.4	Clés et clés à cliquet isolantes et hybrides.....	110
B.5	Clés en T isolantes et hybrides.....	110
B.6	Pincés et coupe-câbles isolants et hybrides.....	110
Annexe C (normative) Approprié aux travaux sous tension; double triangle (IEC 60417-5216:2002-10).....		111
Annexe D (informative) Recommandations pour l'usage et les précautions d'emploi.....		112
D.1	Généralités.....	112
D.2	Stockage.....	112
D.3	Vérification avant usage.....	112
D.4	Température.....	112
D.5	Vérification périodique et essais électriques.....	112
Annexe E (normative) Procédure générale des essais de type.....		113
Annexe F (normative) Exemples de calcul de longueur revêtue développée de l'isolation et courant de fuite admissible (voir 5.5.3.1.1).....		114
Annexe G (normative) Classification des défauts et essais alloués.....		115
Annexe H (informative) Raisonnement ayant conduit à la classification des défauts.....		116
Bibliographie.....		118
Figure 1 – Marquage de la limite électrique de travail adjacent au symbole double triangle (IEC 60417-5216:2002-10).....		69
Figure 2 – Description de l'élément de chevauchement isolant et de différentes configurations d'assemblage d'outils à main pouvant être assemblés avec des carrés conducteurs.....		71
Figure 3 – Symbole de marquage des outils à main pouvant être assemblés et conçus pour être interchangeables entre différents fabricants (IEC 60417-6168:2012-07).....		72

Figure 4 – Représentation de l’isolation d’un tournevis typique .....	73
Figure 5 – Représentation de l’isolation d’une clé typique .....	74
Figure 6 – Clé à molette isolée ou hybride .....	75
Figure 7 – Représentation de l’isolation d’une pince typique .....	76
Figure 8 – Isolation des pinces .....	77
Figure 9 – Isolation de pinces multiprises .....	77
Figure 10 – Isolation des pinces comportant une surface fonctionnelle sous l’articulation .....	78
Figure 11 – Représentation de l’isolation des pinces et des tenailles pour l’électronique .....	79
Figure 12 – Isolation des ciseaux .....	80
Figure 13 – Isolation des couteaux .....	81
Figure 14 – Exemple de l’isolation des branches des brucelles .....	82
Figure 15 – Exemple de montage pour l’essai de choc – Méthode A .....	84
Figure 16 – Exemple de montage pour l’essai de choc – Méthode B .....	85
Figure 17 – Montage d’essai diélectrique pour outils à main isolés ou hybrides .....	88
Figure 18 – Description des gabarits pour les essais diélectriques des outils à main pouvant être assemblés avec des carrés conducteurs .....	89
Figure 19 – Dispositif d’essai diélectrique pour outils à main isolants .....	91
Figure 20 – Essai de pénétration .....	92
Figure 21 – Principe du dispositif d’essai pour vérifier l’adhérence du revêtement isolant sur les parties conductrices des outils à main isolés – Essai sur la tête de travail – Méthode A .....	94
Figure 22 – Principe du dispositif d’essai pour vérifier l’adhérence du revêtement isolant sur les parties conductrices des outils à main isolés – Essai sur la tête de travail – Méthode B .....	95
Figure 23 – Dispositif d’essai pour vérifier l’adhésion du revêtement isolant des tournevis isolés sur les parties conductrices et le manche .....	96
Figure 24 – Exemple de montages d’essai pour vérifier la stabilité d’adhérence de l’isolation de l’outil à main isolé entier .....	98
Figure 25 – Gabarits pour l’essai des systèmes de verrouillage utilisés avec des carrés conducteurs de dimension nominale 12,5 mm de l’ISO 1174 .....	102
Figure 26 – Gabarits pour l’essai des systèmes de verrouillage utilisés avec des carrés conducteurs de dimension nominale 10 mm de l’ISO 1174 .....	103
Figure 27 – Exemple de montage d’essai de non-propagation de la flamme .....	105
Tableau 1 – Dimensions et tolérances de l’élément de chevauchement isolant .....	72
Tableau 2 – Dimensions et tolérances des gabarits à utiliser pour les essais diélectriques .....	89
Tableau B.1 – Valeurs d’essai de couple pour les tournevis isolants et hybrides .....	110
Tableau E.1 – Ordre séquentiel pour la réalisation des essais de type .....	113
Tableau G.1 – Classification des défauts et exigences et essais associés .....	115
Tableau H.1 – Justification pour le type de défaut .....	116

## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**TRAVAUX SOUS TENSION – OUTILS À MAIN POUR USAGE JUSQU'À  
1 000 V EN COURANT ALTERNATIF ET 1 500 V EN COURANT CONTINU**

## AVANT-PROPOS

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 60900 a été établie par le comité d'études 78 de l'IEC: Travaux sous tension.

Cette quatrième édition annule et remplace la troisième édition, parue en 2012. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) ajout d'une troisième catégorie d'outils: les *outils à main hybrides*;
- b) introduction d'une nouvelle Annexe A informative sur des exemples des différents types d'*outils à main: isolés, isolants et hybrides*.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
78/1221/FDIS	78/1229/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Les termes définis à l'Article 3 sont rédigés en *italique* tout au long du présent document.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

Le contenu des corrigenda de janvier 2019 et mai 2020 a été pris en considération dans cet exemplaire.

**IMPORTANT – Le logo "*colour inside*" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.**

## INTRODUCTION

Le présent document a été préparé conformément aux exigences de l'IEC 61477 lorsque cela s'applique.

Pendant certaines ou pendant toutes les étapes de son cycle de vie, les produits couverts par le présent document peuvent avoir un impact sur l'environnement. Ces impacts peuvent être de légers à importants, de court ou de long terme, et se produire à un niveau local, régional ou global.

Le présent document ne contient pas d'exigences et de dispositions d'essai s'adressant aux fabricants, ou de recommandations aux utilisateurs des produits ayant pour but d'améliorer l'environnement. Cependant, tous les intervenants à la conception, la fabrication, l'emballage, la distribution, l'utilisation, l'entretien, la réparation, la réutilisation, la récupération et la mise au rebut sont invités à prendre en compte les éléments environnementaux.

# TRAVAUX SOUS TENSION – OUTILS À MAIN POUR USAGE JUSQU'À 1 000 V EN COURANT ALTERNATIF ET 1 500 V EN COURANT CONTINU

## 1 Domaine d'application

Le présent document est applicable aux *outils à main isolés, isolants et hybrides* utilisés sous tension ou à proximité de parties actives, à des tensions nominales jusqu'à 1 000 V en courant alternatif et 1 500 V en courant continu.

Les produits conçus et fabriqués en conformité avec le présent document contribuent à la sécurité des utilisateurs, à condition qu'ils soient utilisés par des personnes qualifiées, conformément à des méthodes de travail en toute sécurité et aux instructions d'emploi (le cas échéant).

## 2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60060-1, *Technique des essais à haute tension – Partie 1: Définitions et exigences générales*

IEC 60212, *Conditions normales à observer avant et pendant les essais de matériaux isolants électriques solides*

IEC 60417, *Symboles graphiques utilisables sur le matériel* (disponible sous: <http://www.graphical-symbols.info/equipment>)

IEC 61318, *Travaux sous tension – Évaluation de la conformité applicable à l'outillage, au matériel et aux dispositifs*

IEC 61477, *Travaux sous tension – Exigences minimales pour l'utilisation des outils, dispositifs et équipements*

ISO 1174-1, *Outils de manœuvre pour vis et écrous – Carrés d'entraînement – Partie 1: Carrés d'entraînement pour outils à main*

ISO 9654, *Pinces pour l'électronique – Pinces unifonction – Pinces coupantes*

ISO 9655, *Pinces pour l'électronique – Pinces unifonction – Pinces de serrage et de manipulation*

ISO 9656, *Pinces pour l'électronique – Méthodes d'essai*

ISO 9657, *Pinces pour l'électronique – Spécifications techniques générales*