# UL 61058–1

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# Switches for Appliances – Part 1: General Requirements

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Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety for Switches for Appliances – Part 1: General Requirements, UL 61058–1

Third Edition, Dated September 30, 2005

***Summary of Topics***

***This new edition of the Standard for Switches for Appliances – Part 1: General Requirements, UL 61058-1, is harmonized with CSA and is a result of UL's bulletins on this subject dated January 28, 2005 and April 15, 2005. The title page reflects the September 23, 2005 ANSI recognition of this new edition of the Standard. Prior to the third edition of UL 61058-1, the requirements for the products covered by this Standard were included in the second edition of UL 61058-1A. The third edition of UL 61058-1 supersedes the second edition of UL 61058-1A.***

The new and revised requirements are substantially in accordance with UL's Proposal(s) on this subject dated January 28, 2005 and April 15, 2005.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: http://ulstandardsinfonet.ul.com/ulforeword.html

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the preface. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a ″SUPERSEDED REQUIREMENTS″ notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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This Standard consists of pages dated as shown in the following checklist:

| Page | Date |
|---|---|
| 1-204 | September 30, 2005 |

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(IEC 61058–1:2000, MOD)

Underwriters Laboratories Inc.
UL 61058-1
Third Edition

# Switches for Appliances – Part 1: General Requirements

September 30, 2005

This standard is based on IEC 61058–1, Edition 3.1 (Edition 3:2000 consolidated with amendment 1:2001).

Approved
by
Standards Council
of Canada

ANSI/UL 61058-1-2005

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**Commitment for Amendments**

This standard is issued jointly by the Canadian Standards Association (CSA) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of CSA and UL. CSA and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

The most recent designation of ANSI/UL 61058-1 as an American National Standard (ANSI) occurred on September 23, 2005.

This ANSI/UL Standard for Safety, which consists of the Third Edition is under continuous maintenance, whereby each revision is ANSI approved upon publication. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

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# Preface

This is the common CSA and UL standard for *Switches for Appliances*. It is the first edition of CAN/CSA-C22.2 No. 61058-1-05, and the third edition of UL 61058-1. This edition of UL 61058-1 will supersede the second edition of UL 61058-1A published in 2003. This standard is based on IEC 61058-1, Edition 3.1 (Edition 3:2000 consolidated with amendment 1:2001).

CAN/CSA-C22.2 No. 61058-1-05 and UL 61058-1 contain identical requirements and identical publication dates. The presentation and format of the standards material may differ between the two published standards.

This common standard was prepared by the Canadian Standards Association (CSA) and Underwriters Laboratories Inc. (UL).

This standard was reviewed by the CSA Subcommittee on Special Use Switches, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

This Standard has been approved as a National Standard of Canada by the Standards Council of Canada (SCC).

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

**Note: Although the intended primary application of this Standard is stated in its scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.**

### Level of Harmonization

This standard adopts the IEC text with national differences. The CSA and UL versions of the standard illustrate national differences immediately following the IEC text. This standard is published as an identical standard for CSA and UL. National differences between the CSA and UL version shall be word for word except for editorial changes.

### Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one literal interpretation has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

### CSA Effective Date

The effective date for CSA International will be announced through CSA Informs or a CSA Certification notice.

### UL Effective Date

The effective date for UL is the date of publication.

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A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved standard.

**SDO Forewords**

The UL Foreword is no longer located within the UL Standard. The CSA Foreword is included as an SDO-specific page in the CSA version of this co-published standard. The current version of the UL Foreword is located on ULStandardsInfoNet at: http://ulstandardsinfonet.ul.com/ulforeword.html.

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# NATIONAL DIFFERENCES

GENERAL

National Differences from the text of International Electrotechnical Commission (IEC) Publication 61058-1, Switches for Appliances, Part 1: General Requirements copyright 2001 are indicated by notations (differences) and are presented in bold text.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

**DR –** These are National Differences based on the **national regulatory requirements**.

**D1 –** These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

**D2 –** These are National Differences based on **safety practices**. These are differences for IEC requirements that may be acceptable, but adopting the IEC requirements would require considerable retesting or redesign on the manufacturer's part.

**DC –** These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

**DE –** These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

> ***Addition / Add*** - An addition entails adding a complete new numbered clause, subclause, table or figure. Addition is not meant to include adding select words to the base IEC text.
>
> ***Modification / Modify*** - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, or figure of the base IEC text.
>
> ***Deletion / Delete*** - A deletion entails complete deletion of an entire numbered clause, subclause, table or figure without any replacement text.

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### SWITCHES FOR APPLIANCES – Part 1: General requirements

# FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61058-1 has been prepared by subcommittee 23J: Switches for appliances, of IEC technical committee 23: Electrical accessories.

This third edition cancels and replaces the second edition published in 1996, and amendment 1 (1997). This third edition constitutes a technical revision.

The text of this Standard is based on the second edition, amendment 1 and the following documents:

| FDIS | Report on voting |
|---|---|
| 23J/221/FDIS | 23J/222/RVD |

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

This amendment has been prepared by subcommittee 23J: Switches for appliances, of IEC technical committee 23: Electrical accessories.

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

| FDIS | Report on voting |
|---|---|
| 23J/232/FDIS | 23J/233/RVD |

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

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

IEC 61058 consists of the following parts:

Part 1: General requirements;

Part 2-1: Particular requirements for cord switches;

Part 2-4: Particular requirements for independently mounted switches;

Part 2-5: Particular requirements for change-over selectors.

In this part, the following print types are used:

– requirements proper: roman type;

– *test specifications: italic type;*

– notes: smaller roman type.

Annexes A, C, D, E, K, L, M, N, P, Q, and R form an integral part of this standard.

Annexes B, F, G, H, J, S, and T are for information only.

The following differences exist in some countries:

– 7.1.2.9 The locked rotor power factor is 0,4 to 0,5 to reflect application conditions (USA).

– 15.3 The duration of the application of the test voltage is 1 min to assure the detection of defects in the insulation (USA).

– 17.2.4.7 The minimum number of operating cycles is 6 000 (USA).

– 17.2.5 The temperature rise at the terminals shall not exceed 30 °C (USA).

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– Table 16 The make current for the inductive circuit is I-I to reflect actual application conditions (USA).

– Table 16 The horsepower ratings are used when controlling a motor rated in horsepower (USA).

– 25 EMC is not considered to be a safety-related matter (USA).

**DV.1 DE *Modify the paragraph beginning "In this part..." to add the following:***

**– Words in SMALL CAPITALS in the text are defined in clause 3.**

**DV.2 DE *Addition of the following:***

**Annexes DVA, DVB, and DVC are normative. Annex DVD is informative.**

**DV.3 DE *Addition of the following:***

**The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.**

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# SWITCHES FOR APPLIANCES – Part 1: General requirements

## 1 Scope

1.1 This International Standard applies to switches (mechanical or electronic) for appliances actuated by hand, by foot or by other human activity, to operate or control electrical appliances and other equipment for household or similar purposes with a RATED VOLTAGE not exceeding 440 V and a RATED CURRENT not exceeding 63 A.

These switches are intended to be operated by a person, via an ACTUATING MEMBER or by actuating a SENSING UNIT. The ACTUATING MEMBER or SENSING UNIT can be integral with or arranged separately, either physically or electrically, from the switch and may involve transmission of a signal, for example electrical, optical, acoustic or thermal, between the ACTUATING MEMBER or SENSING UNIT and the switch.

Switches which incorporate additional control functions governed by the switch function are within the scope of this standard.

This standard also covers the INDIRECT ACTUATION of the switch when the operation of the actuating member or SENSING UNIT is provided by a remote control or a part of an appliance or equipment such as a door.

**NOTE 1 Electronic switches may be combined with mechanical switches giving FULL DISCONNECTION or MICRO-DISCONNECTION.**

**NOTE 2 Electronic switches without a mechanical switch in the supply circuit provide only ELECTRONIC DISCONNECTION. Therefore, the circuit on the load side is always considered to be live.**

**NOTE 3 For switches used in tropical climates, additional requirements may be necessary.**

**NOTE 4 Attention is drawn to the fact that the standards for appliances may contain additional or alternative requirements for switches.**

**NOTE 5 Throughout this standard, the word ″appliance″ means ″appliance or equipment″.**

**NOTE 6 This part of IEC 61058 is applicable when testing incorporated switches. When other types of switches for appliances are tested, this part is applicable together with the relevant IEC 61058-2.**

**This part may, however, be applied for other types of switches which are not mentioned in IEC 61058-2, provided that the electrical safety is not disregarded.**

**1.1DV.1 DR *Modification of 1.1 for supply voltages and currents:***

**Replace ″440 V″ with ″600 V.″**

**1.1DV.2 DE *Modification of 1.1 by adding the following:***

**″Equipment for similar purposes″ includes non-household applications.**

**1.1DV.3 D2 *Modification of 1.1 to revise Note 6 as follows:***

**Remove ″relevant IEC 61058-2″ and replace with ″appropriate supplements, annexes to UL 61058-1, CSA 22.2 No. 61058-1, or UL and CSA Standards.″**

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**1.1DV.4 D2** ***Modification of 1.1 to include switches with a horsepower (hp) rating and television (TV) rating:***

**See Annex DVA and Annex DVC.**

1.2 This standard applies to switches intended to be incorporated in, on or with an appliance.

1.3 This standard also applies to switches incorporating electronic devices.

1.4 This standard also applies to switches for appliances such as

– switches intended to be connected to a flexible cable (cord switches);

**NOTE In this document, the word ″cable″ means ″cable or cord″.**

– switches integrated in an appliance (INTEGRATED SWITCHES);

– switches intended to be mounted apart from the appliance (independently mounted switches) other than those within the scope of IEC 60669-1;

– change-over selectors for which, however, particular requirements are given in IEC 61058-2.

1.5 This standard does not contain requirements for isolating switches.

**NOTE Requirements for isolating switches are under consideration.**

1.6 This standard does not apply to devices which control appliances and equipment not actuated intentionally by a person. These are covered by IEC 60730.

**1.7DV D2** ***Addition of 1.7DV to indicate which switches do not apply:***

**These requirements do not cover those electronic controls covered by existing standards such as UL 244A, UL 60730, CSA C22.2 No. 156, and CSA E730-1. Examples of these products include automatic controls, unintentional automatic OPERATION, and sensing (temperature, pressure, light, etc.) actuation.**

**1.8DV DC** ***Addition of 1.8DV to indicate which switches do not apply:***

**These requirements do not cover switches which are covered by an existing standard such as those constructed so that they can be installed readily in a flush-device box or an outlet-box cover or can otherwise be used in a wiring system that complies with NFPA-70 and Part 1 of the Canadian Electrical Code (CEC). This part does not apply to switches intended to be covered within the scope of UL 20, CSA C22.2 No. 111, UL 98, or CSA C22.2 No. 4.**

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61058. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61058 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and IS0 maintain registers of currently valid International Standards.

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IEC 60034-1:1996,
*Rotating electrical machines – Part 1: Rating and performance*[1)]
Amendment 1 (1997), Amendment 2 (1999)

IEC 60038:1983,
*IEC standard voltages*

IEC 60050(151):1978,
*International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 60050(411):1973,
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**2DV DC** ***Modification to add the following:***

**UL 20**
***General-Use Snap Switches***

**UL 94**
***Tests for Flammability of Plastic Materials for Parts in Devices and Appliances***

**UL 98**
***Enclosed and Dead-Front Switches***

**UL 244A**
***Solid-State Controls for Appliances***

**UL 310**
***Electrical Quick-Connect Terminals***

**UL 746B**
***Polymeric Materials – Long Term Property Evaluations***

**UL 60730-1A**
***Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements***

**CSA C22.1**
***Canadian Electrical Code, Part 1***

**CSA C22.2 No. 0.17**
***Evaluation of Properties of Polymeric Materials***

**CSA C22.2 No. 4**
***Enclosed and Dead-Front Switches***

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**CSA C22.2 No. 111**
***General-Use Snap Switches***

**CSA C22.2 No. 153**
***Quick-Connect Terminals***

**CSA C22.2 No. 156**
***Solid-State Speed Controls***

**CAN/CSA E60730-1**
***Automatic Electrical Controls for Household and Similar Use – Part 1: General Requirements***

**ASTM D495**
***Standard Test Method for High-Voltage, Low-Current Dry Arc Resistance of Solid Electrical Insulation***

**ASTM D3638**
***Standard Test Method for Comparative Tracking Index of Electrical Insulation Materials***

**IEC 60695-11-10:2003**
***Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods***
***Amendment 1 (2003)***

**NFPA 70**
***National Electrical Code***

## 3 Definitions

For the purpose of this International Standard, the following definitions apply.

### 3.1 General terms

3.1.1 MECHANICAL SWITCHING DEVICE: A switching device designed to close and open one or more electric circuits by means of separable contacts. [IEV 441-14-02]

3.1.2 SWITCH (MECHANICAL): MECHANICAL SWITCHING DEVICE capable of making, carrying and breaking currents under normal circuit conditions which may include specified operating OVERLOAD conditions and also carrying for a specified time currents under specified abnormal circuit conditions such as those of short circuit. [IEV 441-14-10]

**NOTE A SWITCH may be capable of making but not breaking SHORT-CIRCUIT CURRENTS.**

3.1.3 CONDUCTIVE PART: Part which is capable of conducting current although it may not necessarily be used for carrying service current. [IEV-441-11-09]

3.1.4 LIVE PART: Conductor or CONDUCTIVE PART intended to be energized in NORMAL USE, including a neutral conductor, but by convention, not a PEN conductor. [IEV 826-03-01]

3.1.5 POLE OF A SWITCH: The part of the SWITCH associated exclusively with one, electrically separated, conducting path of the SWITCH.

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**NOTE 1 Those parts that provide a means for mounting and operating all poles together are excluded from the definition of a pole.**

**NOTE 2 A SWITCH is called ″single pole″ if it has only one pole. If it has more than one pole, it may be called ″multipole″ (two-pole, three-pole, etc.) provided that the poles are coupled in such a manner as to operate together.**

3.1.6 CLEARANCE: The shortest distance in air between two CONDUCTIVE PARTS.

3.1.7 CREEPAGE DISTANCE: The shortest distance along the surface of the insulation material between two CONDUCTIVE PARTS. [IEV 151-03-37]

3.1.8 DETACHABLE PART: Part which is removable without the use of a TOOL when the SWITCH is mounted as in NORMAL USE.

3.1.9 TOOL: Screwdriver, coin, or any other object which may be used to operate a nut, a screw, or a similar part.

3.1.10 SPECIAL PURPOSE TOOL: TOOL which is unlikely to be readily available in a normal household, for example, a key for a three-angle headed screw.

**NOTE TOOLS such as coins, screwdrivers and spanners designed to operate square or hexagonal nuts are not SPECIAL PURPOSE TOOLS.**

3.1.11 NORMAL USE: Use of the SWITCH for the purpose for which it was made and declared.

3.1.12 AMBIENT AIR TEMPERATURE: The temperature or temperatures, determined under prescribed conditions, of the air surrounding the SWITCH when mounted as declared by the manufacturer.

3.1.13 PROOF TRACKING INDEX (PTI): The numerical value of the proof voltage in volts, at which a material withstands 50 drops of test solution without tracking.

3.1.14 UNIQUE TYPE REFERENCE: Identification marking on a SWITCH such that by quoting it in full to the SWITCH manufacturer the electrical, mechanical, dimensional and functional parameters of the original SWITCH can be unequivocally specified.

3.1.15 COMMON TYPE REFERENCE: Identification marking on a SWITCH which does not require any further specific information additional to that provided by the marking requirements of this standard for selection, installation and use in accordance with this standard.

3.1.16 COVER OR COVER PLATE: Part which is accessible when the SWITCH is mounted as in NORMAL USE but which can be removed with the aid of a TOOL.

3.1.17 SIGNAL INDICATOR: Device associated with a SWITCH to indicate the circuit state visually.

**NOTE The device may or may not be controlled by the SWITCH.**

3.1.18 UNPREPARED CONDUCTOR: Conductor which has been cut and the insulation of which has been removed for insertion into a clamping unit.

**NOTE A conductor the shape of which is arranged for introduction into a clamping unit or the strands of which are twisted to consolidate the end, is considered to be an UNPREPARED CONDUCTOR.**

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3.1.19 PREPARED CONDUCTOR: Conductor, the stripped end of which is fitted with an eyelet, a TERMINAL end, a cable lug, etc.

3.1.20 BASE MATERIAL: Insulating material, supporting electronic circuits.

3.1.21 PRINTED BOARD: A sized BASE MATERIAL including holes, if any, and bearing at least one conductive pattern.

3.1.22 PRINTED BOARD ASSEMBLY: PRINTED BOARD with electrical and mechanical components and/or other PRINTED BOARDS attached to it, with all manufacturing processes, soldering, COATING etc. completed.

3.1.23 INSULATION DISTANCE: The shortest distance of a coated PRINTED BOARD between CONDUCTIVE PARTS located on the BASE MATERIAL. See figure Q.1.

3.1.24 POLARITY REVERSAL: Change of the TERMINALS connected to the load by a switching action.

3.1.25 SEMICONDUCTOR SWITCHING DEVICE: A switching device designed to make, carry, break and/or control the current in an electric circuit by means of the controlled conductivity of a semiconductor.

3.1.26 ELECTRONIC STEP-DOWN CONVERTOR (CONVERTOR): Unit inserted between the supply and one or more tungsten-halogen or other filament lamps which serves to supply the lamp(s) with its (their) rated voltage, generally at high frequency. The unit may consist of one or more separate components.

3.1.27 ELECTRONIC SWITCH: A device capable of making, carrying, breaking and/or controlling currents under normal circuit conditions which may include specified operating OVERLOAD conditions and also carrying for a specified time currents under specified abnormal circuit conditions such as those of a short circuit. The device contains actuating members, actuating means and switching devices which may be mechanical or electronic. At least one of these must be electronic.

3.1.28 DUTY: The statement of the load(s) to which the ELECTRONIC SWITCH is subjected, including, if applicable, making, controlling and breaking and including their durations and sequence in time. [IEV 411-21-07, modified]

3.1.29 DUTY-TYPE: A continuous, short-time or periodic DUTY, comprising one or more loads remaining constant for the duration specified, or a non-periodic DUTY in which generally the load varies within the permissible operating range. [IEV 411-21-13, modified]

3.1.30 CYCLIC DURATION FACTOR: The ratio between the period of loading, including making and breaking, and the duration of the DUTY cycle, expressed as a percentage. [IEV 411-21-10, modified]

3.1.31 PROTECTIVE IMPEDANCE: An impedance connected between LIVE PARTS and accessible CONDUCTIVE PARTS, of such value that the current, in NORMAL USE and under likely fault conditions in the ELECTRONIC SWITCH, is limited to a safe value; it is so constructed that the reliability is maintained throughout the life of the ELECTRONIC SWITCH.

**NOTE Details of the likely fault conditions, the safe current and the requirements for reliability are as given in this IEC standard.**

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**3.1.32DV D2 *Addition:***

**COMPARATIVE TRACKING INDEX (CTI): The voltage, as determined under the conditions specified in the Standard Test Method for Comparative Tracking Index of Electrical Insulation Materials, ASTM D3638 (IEC 60112), that causes a permanent electrically conductive carbon path with the application of 50 drops of electrolyte that is applied at the rate of one drop every 30 s to the specimen.**

## 3.2 Definitions relating to voltages, currents and wattage

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

3.2.1 RATED VOLTAGE, CURRENT, FREQUENCY, WATTAGE ETC.: Voltage, current, frequency, wattage etc. assigned to a SWITCH by the manufacturer and to which OPERATION and performance characteristics are referred.

3.2.2 SELV: Voltage which does not exceed 50 V a.c. r.m.s. or 120 V d.c. between conductors or between any conductor and earth in a circuit which is insulated from the supply mains.

**NOTE SELV is an unearthed extra low voltage (see IEC 60364-4-41).**

3.2.3 OVER-CURRENT: Any current exceeding the RATED CURRENT. [IEV 441-11-06]

3.2.4 OVERLOAD: Operating conditions in an electrically undamaged circuit, which cause an OVER-CURRENT. [IEV 441-11-08]

3.2.5 SHORT-CIRCUIT CURRENT: An OVER-CURRENT resulting from a short-circuit due to a fault or an incorrect connection in an electric circuit. [IEV 441-11-07]

3.2.6 WORKING VOLTAGE: Highest r.m.s. value of the a.c. or d.c. voltage across any particular insulation which can occur when the SWITCH is supplied at RATED VOLTAGE.

**NOTE 1 Transients are disregarded.**

**NOTE 2 Both open-circuit conditions and normal operating conditions are taken into account.**

3.2.7 OVERVOLTAGE: Any voltage having a peak value exceeding the corresponding peak value of maximum steady-state voltage at normal operating conditions.

3.2.8 RECURRING PEAK VOLTAGE ($U_{rp}$): Maximum peak value of periodic excursions of the voltage waveform resulting from distortion of an a.c. voltage or from a.c. components superimposed on a d.c. voltage.

**NOTE Random OVERVOLTAGES, for example due to occasional switching, are not considered to be OVERVOLTAGES.**

3.2.9 TEMPORARY OVERVOLTAGE: OVERVOLTAGE at a power frequency of relatively long duration.

3.2.9.1 SHORT-TERM TEMPORARY OVERVOLTAGE: TEMPORARY OVERVOLTAGE with a duration not exceeding 5 s.

**NOTE The voltage values for SHORT-TERM TEMPORARY OVERVOLTAGE are higher than the voltage value for LONG-TERM TEMPORARY OVERVOLTAGE (see 3.3.3.2.2 of IEC 60664-1).**

3.2.9.2 LONG-TERM TEMPORARY OVERVOLTAGE: TEMPORARY OVERVOLTAGE with duration exceeding 5 s.

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3.2.10 IMPULSE WITHSTAND VOLTAGE: Highest peak value of impulse voltage of prescribed form and polarity which does not cause breakdown of insulation under specified conditions.

3.2.11 OVERVOLTAGE CATEGORY: Numeral defining a transient overvoltage condition.

**NOTE OVERVOLTAGE categories I, II and III are used (see annex K).**

3.2.12 RATED LOAD: Type of load assigned to the SWITCH by the manufacturer.

3.2.13 MINIMUM LOAD: Load at which the ELECTRONIC SWITCH still operates correctly.

3.2.14 THERMAL CURRENT: The continuous resistive CURRENT which, under the test conditions declared by the manufacturer (may also include the ambient temperature), generates, without forced cooling, the same heating as when the ELECTRONIC SWITCH is operating under specified ambient conditions at RATED LOAD, and/or DUTY TYPE in the appliance with forced cooling present, if any.

**NOTE The concept "THERMAL CURRENT" allows simplified testing of the ELECTRONIC SWITCHES, which in normal application have complex cooling conditions. The THERMAL CURRENT will always be determined by tests of the SWITCH positioned on a table or in a simple test rig and comparative tests in the appliance in question. Consequently, the THERMAL CURRENT will normally be lower than the RATED CURRENT. This necessitates additional tests of the TERMINALS, contacts, etc., in order to verify that they will be able to carry the RATED CURRENT, when the ELECTRONIC SWITCH is mounted in the appliance. These additional tests are specified in clauses 16 and 17.**

### 3.3 Definitions relating to the different types of SWITCHES

3.3.1 INCORPORATED SWITCH: SWITCH intended to be incorporated in or fixed to an appliance, which however can be tested separately.

3.3.2 INTEGRATED SWITCH: SWITCH, the function of which depends on its correct mounting and fixing in an appliance, and which can be tested only in combination with the relevant parts of that appliance.

3.3.3 ROTARY SWITCH: SWITCH, the ACTUATING MEMBER of which is a shaft or a spindle which has to be rotated to one or more indexed positions in order to achieve a change in contact state.

**NOTE The rotation of the ACTUATING MEMBER may be unlimited or restricted in either direction.**

3.3.4 LEVER SWITCH: SWITCH, the ACTUATING MEMBER of which is a lever which has to be moved (tilted) to one or more indexed positions in order to achieve a change in contact state.

3.3.5 ROCKER SWITCH: SWITCH, the ACTUATING MEMBER of which is a low profile lever (rocker) which has to be tilted to one or more indexed positions in order to achieve a change in contact state.

3.3.6 PUSH-BUTTON SWITCH: SWITCH, the ACTUATING MEMBER of which is a button which has to be pushed in order to achieve a change in contact state.

**NOTE The SWITCH may be provided with one or more ACTUATING MEMBERS.**

3.3.7 CORD-OPERATED SWITCH: SWITCH, the ACTUATING MEMBER of which is a pull-cord which has to be pulled in order to achieve a change in contact state.

3.3.8 PUSH-PULL SWITCH: SWITCH, the ACTUATING MEMBER of which is a rod which has to be pulled or pushed to one or more indexed positions in order to achieve a change in contact state.

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3.3.9 BIASED SWITCH: SWITCH, the contacts and ACTUATING MEMBER of which return to a predetermined position when the ACTUATING MEMBER is released from the actuated position.

### 3.4 Definitions relating to the OPERATION of the SWITCH

3.4.1 ACTUATION: Movement of the ACTUATING MEMBER of the SWITCH by hand, by foot, or by any other human activity.

3.4.2 INDIRECT ACTUATION: Movement of the ACTUATING MEMBER of the SWITCH provided indirectly by a part of an appliance into which the SWITCH is incorporated or integrated, for example the door of an appliance.

3.4.3 ACTUATING MEMBER: Part which is pulled, pushed, turned or otherwise moved to cause an OPERATION.

3.4.4 ACTUATING MEANS: Any part which may be interposed between the ACTUATING MEMBER and the contact mechanism in order to achieve contact OPERATION.

3.4.5 DISCONNECTION: Interruption of an electrical circuit in a pole so as to provide insulation between the supply and those parts intended to be disconnected from the supply.

3.4.6 MICRO-DISCONNECTION: DISCONNECTION that provides correct functional performance by contact separation in the case of LONG-TERM TEMPORARY OVERVOLTAGE.

3.4.7 ELECTRONIC-DISCONNECTION: DISCONNECTION that provides a non-cycling correct functional performance by a SEMICONDUCTOR SWITCHING DEVICE in the case of LONG-TERM TEMPORARY OVERVOLTAGE.

3.4.8 FULL-DISCONNECTION: DISCONNECTION that provides correct functional performance by contact separation in the case of short-term and LONG-TERM TEMPORARY OVERVOLTAGE and IMPULSE WITHSTAND VOLTAGE equivalent to BASIC INSULATION.

3.4.9 ALL-POLE DISCONNECTION: For single-phase a.c. appliances and for d.c. appliances a DISCONNECTION of both supply conductors substantially at the same time by a single switching action or, for appliances to be connected to more than two supply conductors, a DISCONNECTION of all supply conductors, except the earthed (grounded) conductor substantially at the same time by a single switching action.

3.4.10 OPERATION: Transfer of moving contact(s) from one position to an adjacent position. [IEV-441-16-01]

3.4.11 OPERATING CYCLE: Succession of OPERATIONS from one position to another and back to the first position through all other positions, if any. [IEV 441-16-02]

3.4.12 ELECTRONIC ACTUATING MEMBER: Part, component or component group, for example an optical or acoustic SENSING UNIT, which controls the ACTUATING MEANS or the switching device.

3.4.13 ELECTRONIC ACTUATING MEANS: Part, component or component group, which controls electronically the switching device.

3.4.14 ABNORMAL CONDITIONS: Conditions which may occur in the appliance or in the switch during normal OPERATION.

3.4.15 SENSING UNIT: Unit that is activated by any physical phenomenon or combination of those.

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### 3.5 Definitions relating to connections to the SWITCH

3.5.1 EXTERNAL CONDUCTOR: Any cable, cord, core or conductor, a part of which is external to a SWITCH, or to an appliance in or on which the SWITCH is mounted. Such a conductor may be a supply lead or interconnecting cord between separate parts of an appliance or it may form part of the fixed wiring.

3.5.2 INTEGRATED CONDUCTOR: Conductor which is either inside a SWITCH or is used to permanently interconnect TERMINALS or TERMINATIONS of a SWITCH.

3.5.3 INTERNAL CONDUCTOR: Any cable, cord, core or conductor which is internal to an appliance, but is neither an EXTERNAL CONDUCTOR nor an INTEGRATED CONDUCTOR.

3.5.4 **Methods of attachment for cords**

3.5.4.1 TYPE X ATTACHMENT: Method of attachment such that the cord can be replaced without the aid of SPECIAL PURPOSE TOOLS by a cord not requiring special preparation.

3.5.4.2 TYPE Y ATTACHMENT: Method of attachment such that the cord can only be replaced with the aid of SPECIAL PURPOSE TOOLS normally available to the manufacturer or his agent.

**NOTE Such a method of attachment may be used either with common cords or with special cords.**

3.5.4.3 TYPE Z ATTACHMENT: Method of attachment such that the cord cannot be replaced without destroying the integrity of the SWITCH.

### 3.6 Definitions relating to TERMINALS and TERMINATIONS

3.6.1 TERMINAL: CONDUCTIVE PART of a SWITCH provided for reusable electrical connections without the use of a SPECIAL PURPOSE TOOL or a special process.

3.6.2 SCREW TYPE TERMINAL: TERMINAL for the connection and/or interconnection and subsequent DISCONNECTION of one or more conductors, the connection being made directly or indirectly by means of screws or nuts of any kind.

3.6.3 PILLAR TERMINAL: SCREW TYPE TERMINAL in which the conductor(s) is (are) inserted into a hole or cavity, where it is (they are) clamped under the shank of the screw. The clamping pressure may be applied directly by the shank of the screw, or through an intermediate clamping member to which pressure is applied by the shank of the screw.

Examples of PILLAR TYPE TERMINALS are shown in figure 1.

3.6.4 SCREW TERMINAL: SCREW TYPE TERMINAL in which the conductor(s) is (are) clamped under the head of the screw. The clamping pressure may be applied directly by the head of the screw or through an intermediate part, such as a washer, clamping plate or anti-spread device.

Examples of SCREW TERMINALS are shown in figure 2.

3.6.5 STUD TERMINAL: SCREW TYPE TERMINAL in which the conductor(s) is (are) clamped under a nut. The clamping pressure may be applied directly by a suitably shaped nut or through an intermediate part, such as a washer, clamping plate or anti-spread device.

Examples of STUD TERMINALS are shown in figure 2.

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3.6.6 SADDLE TERMINAL: SCREW TYPE TERMINAL in which the conductor(s) is (are) clamped under a saddle by means of two or more screws or nuts.

Examples of SADDLE TERMINALS are shown in figure 3.

3.6.7 LUG TERMINAL: SCREW TYPE TERMINAL designed for clamping a cable lug or bar directly or indirectly by means of a screw or nut.

Examples of LUG TERMINALS are shown in figure 4.

3.6.8 MANTLE TERMINAL: SCREW TYPE TERMINAL in which the conductor(s) is (are) clamped against the base of a slot in a threaded stud by means of a nut. The conductor is clamped against the bottom of the slot by a suitably shaped washer under the nut, by a central peg if the nut is a cap nut, or by equally effective means for transmitting the pressure from the nut to the conductor within the slot.

Examples of MANTLE TERMINALS are shown in figure 5.

3.6.9 SCREWLESS TERMINAL: TERMINAL for the connection and/or interconnection and subsequent DISCONNECTION of one or more conductors, the connection being made, directly or indirectly, by means other than screws.

**NOTE The following TERMINALS are not regarded as SCREWLESS TERMINALS:**

**– TERMINALS requiring fixing of special devices to the conductors before clamping them into the TERMINAL, for example FLAT QUICK-CONNECT TERMINATIONS;**

**– TERMINALS requiring wrapping of the conductors, for example those with wrapped joints;**

**– TERMINALS providing direct contact to the conductors by means of edges or points penetrating the insulation.**

Examples of SCREWLESS TERMINALS are shown in figure 6.

3.6.10 TERMINATION: Connection between two or more CONDUCTIVE PARTS which can only be made or replaced by either a SPECIAL PURPOSE TOOL or a special process.

3.6.11 FLAT QUICK-CONNECT TERMINATION: Electrical connection consisting of a TAB and a FEMALE CONNECTOR which can be readily inserted and withdrawn without use of TOOLS.

3.6.12 TAB: Portion of a FLAT QUICK-CONNECT TERMINATION which is inserted into the FEMALE CONNECTOR and is a part integral with the SWITCH.

Examples of TABS are shown in figure 7.

3.6.13 FEMALE CONNECTOR: Portion of a FLAT QUICK-CONNECT TERMINATION which is pushed onto the TAB.

An example of a FEMALE CONNECTOR is are shown in figure 8.

3.6.14 SOLDER TERMINAL: CONDUCTIVE PART of a SWITCH provided to enable a TERMINATION to be made by means of solder.

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## 3.7 Definitions relating to insulation

3.7.1 BASIC INSULATION: Insulation applied to LIVE PARTS to provide basic protection against electric shock.

3.7.2 SUPPLEMENTARY INSULATION: Independent insulation applied in addition to the BASIC INSULATION in order to provide protection against electric shock in the event of a failure of the BASIC INSULATION.

3.7.3 DOUBLE INSULATION: Insulation comprising both BASIC INSULATION and SUPPLEMENTARY INSULATION.

3.7.4 REINFORCED INSULATION: Single insulation system applied to LIVE PARTS which provides a degree of protection against electric shock equivalent to DOUBLE INSULATION.

**NOTE The term "insulation system" does not imply that the insulation must be one homogeneous piece. It may comprise several layers which cannot be tested separately as supplementary or BASIC INSULATION.**

3.7.5 FUNCTIONAL INSULATION: Insulation between LIVE PARTS which is necessary only for the proper functioning of the SWITCH.

3.7.6 COATING: Solid insulating material laid on one or both sides of the surface of the PRINTED BOARD. COATING can be varnish, a dry film applied to the PRINTED BOARD or can be achieved by thermal deposition.

**NOTE COATING and BASE MATERIAL of the PRINTED BOARD form an insulating system that may have properties similar to SOLID INSULATION.**

3.7.7 SOLID INSULATION: Insulation material interposed between two CONDUCTIVE PARTS.

**NOTE In the case of a PRINTED BOARD ASSEMBLY with a COATING, SOLID INSULATION consists of the PRINTED BOARD itself as well as the COATING. In other cases, SOLID INSULATION consists of the encapsulating material.**

3.7.8 CLASS 0 APPLIANCE: Appliance in which protection against electric shock relies upon BASIC INSULATION; this implies that there are no means for the connection of accessible CONDUCTIVE PARTS, if any, to the protective conductor in the fixed wiring of the installation, reliance in the event of a failure of the BASIC INSULATION being placed upon the environment.

3.7.9 CLASS I APPLIANCE: Appliance in which protection against electric shock does not rely on BASIC INSULATION only, but which includes an additional safety precaution in such a way that means are provided for the connection of CONDUCTIVE PARTS (which are not LIVE PARTS) to the protective (earthing) conductor in the fixed wiring in such a way that these parts cannot become live in the event of a failure of the BASIC INSULATION.

3.7.10 CLASS II APPLIANCE: Appliance in which protection against electric shock does not rely on BASIC INSULATION only, but in which additional safety precautions such as DOUBLE INSULATION or REINFORCED INSULATION are provided, there being no provision for protective earthing or reliance upon installation conditions.

**NOTE A CLASS II APPLIANCE may be provided with means for maintaining the continuity of protective circuits, provided that such means are within the appliance and are insulated from accessible surfaces according to the requirements of Class II.**

3.7.11 CLASS III APPLIANCE: Appliance in which protection against electric shock relies on supply at SELV and in which voltages higher than those of SELV are not generated.

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### 3.8 Definitions relating to POLLUTION

3.8.1 POLLUTION: Any addition of foreign matter, solid, liquid, or gaseous that can result in a reduction of dielectric strength or surface resistivity of the insulation.

3.8.2 MICRO-ENVIRONMENT: Immediate environment of the insulation which particularly influences the dimensioning of CREEPAGE DISTANCES.

**NOTE For self-produced POLLUTION in arc chambers of SWITCHES, see annex L.**

3.8.3 MACRO-ENVIRONMENT: Environment of the room or other location in which the SWITCH is installed or used.

3.8.4 POLLUTION DEGREE: Numeral characterizing the expected POLLUTION of the MICRO-ENVIRONMENT.

**NOTE POLLUTION DEGREES 1, 2 and 3 are used (see 7.1.6 and annex L).**

## 4 General requirements

SWITCHES shall be designed and constructed so that in NORMAL USE they function safely so as to cause no danger to persons or surroundings even in the event of such careless use as may occur in NORMAL USE, as specified in this part 1 of IEC 61058 and any appropriate part 2.

*In general, compliance is checked by carrying out all the relevant tests.*

## 5 General notes on tests

*5.1 Tests according to this standard are type tests.*

*5.2 Unless otherwise specified in this standard, the specimens are tested as delivered, at an ambient temperature of 25 °C ± 10 °C. The specimens are mounted as declared by the manufacturer, but, if significant, using the most unfavourable method if more than one method is declared.*

**NOTE In case of doubt, the tests are made at an ambient temperature of 20 °C ± 5 °C.**

*5.3 SWITCHES to be used with a non-detachable conductor are tested with the appropriate conductor connected.*

*5.4 If the SWITCHES are provided with TABS, for the tests according to clauses 16 and 17, new FEMALE CONNECTORS shall be used.*

*The envelope dimensions of FEMALE CONNECTORS for FLAT QUICK-CONNECT TERMINATIONS used for tests shall be in accordance with figure 8.*

**NOTE A method of selection of female test connectors for FLAT QUICK-CONNECT TERMINATIONS is given in annex H.**

*The FEMALE CONNECTORS shall be of a type suitable for the rated ambient temperature of the SWITCH, and the crimped conductors shall be soldered or welded to the crimping area of the FEMALE CONNECTOR, if any.*

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**5.4DV D1** ***Modification of 5.4 to add 5.4DV.1 and 5.4DV.2 to address aspects related to LIVE PARTS shorting to dead metal parts:***

**5.4DV.1 During the testing of a SWITCH, all metal parts of the frame and the enclosure that are grounded when installed under conditions of actual service or that are exposed to contact by the user shall be connected to a conductor of the test circuit. See 5.4DV.2.**

**5.4DV.2 For the OVERLOAD and endurance tests, dead metal parts shall be connected through a 15 A or less fuse to ground (earth). The potential rating of the fuse shall be equal to, or greater than, the potential to ground or to the conductor of the test circuit to which dead metal parts of the equipment shall be connected. The circuit shall be connected so that:**

**– On direct current, the dead metal parts will be positive with respect to the nearest arcing point in the SWITCH; and**

**– The potential between LIVE PARTS and conductive dead metal parts is the full test potential.**

*5.5 Unless otherwise specified in this part 1, the tests are carried out in the order of the clauses of this part.*

*The number of test specimens required and the relevant clauses are as follows:*

**NOTE A survey of test specimens and related clauses is given in table 1.**

*5.5.1 SWITCHES with the following ratings:*

*– d.c. only;*

*– both a.c. and d.c.*

*the tests being carried out on d.c., provided that the d.c. voltage and current ratings are equal to, or greater than, the a.c. ratings.*

*For these ratings the following specimens are used:*

*– clauses 6 to 12 and 23: specimen No. 1;*

*– clauses 19 to 22: specimen No. 2; where CLEARANCES according to 20.1 are tested in accordance with annex M, three additional specimens are used;*

*– clauses 13 to 18:*

*• with polarity marking: specimens Nos. 3 to 5;*

*• without polarity marking: specimens Nos. 3 to 5 with one polarity and specimens Nos. 6 to 8 with the opposite polarity.*

*– clause 25: three additional specimens.*

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*5.5.2 SWITCHES with the following ratings:*

*– a.c. only;*

*– both a.c. and d.c., but not meeting the provisions of 5.5.1.*

*For these ratings the following specimens are used:*

*– clauses 6 to 12 and 23: specimen No. 1;*

*– clauses 19 to 22: specimen No. 2; where CLEARANCES according to 20.1 are tested in accordance with annex M, three additional specimens are used;*

*– clauses 13 to 18:*

*• for a.c.-rating: specimens Nos. 3 to 5;*

*• for d.c. rating with marked polarity: specimens Nos. 6 to 8;*

*• for d.c. rating without marked polarity: specimens Nos. 6 to 8 with one polarity and specimens Nos. 9 to 11 with the opposite polarity.*

*– clause 25: three additional specimens.*

*5.5.3 SWITCHES with more than one and/or RATED CURRENT combination within one RATED VOLTAGE nature of supply*

*For these ratings the following specimens are used:*

*– clauses 6 to 12 and 23: specimen No. 1;*

*– clauses 19 to 22: specimen No. 2; where CLEARANCES according to 20.1 are tested in accordance with annex M, three additional specimens are used;*

*– clauses 13 to 18:*

*• for the combination with the highest CURRENT rating: specimens Nos. 3 to 5;*

*• for the second combination: specimens Nos. 6 to 8;*

*• for further combinations: specimens Nos. 9 to 11 etc.*

**NOTE For SWITCHES having one RATED CURRENT for more than one voltage rating, the SWITCH shall be tested at the highest voltage rating for each type of load.**

*– clause 25: three additional specimens.*

**5.5.4DV DR *Addition to include switches with a horsepower rating (hp) and a television (TV) rating:***

**See Annex DVA and DVC.**

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## Table 1 – Test specimens

| Clause | | Specimens to be tested[1)] | Notes |
|---|---|---|---|
| 6 | Rating | 1 | |
| 7 | Classification | 1 | |
| 8 | Marking and documentation | 1 | |
| 9 | Protection against electric shock | 1 | |
| 10 | Provision for earthing | 1 | |
| 11 | TERMINALS and TERMINATIONS | 1 | 2) |
| 12 | Construction | 1 | |
| 13 | Mechanism | 3 4 5 6 7 8 | 3) |
| 14 | Protection against solid foreign objects, ingress of dust, water and humid conditions | 3 4 5 6 7 8 | 3) |
| 15 | Insulation resistance and dielectric strength | 3 4 5 6 7 8 | 2) 3) |
| 16 | Heating | 3 4 5 6 7 8 | |
| 17 | Endurance | 3 4 5 6 7 8 | 3) |
| 18 | Mechanical strength | 3 4 5 | |
| 19 | Screws, current-carrying parts and connections | 2 | |
| 20 | CLEARANCES, CREEPAGE DISTANCES solid, insulation and COATINGS of rigid PRINTED BOARD ASSEMBLIES | 2 | 4) 5) |
| 21 | Resistance to heat and fire | 2 | |
| 22 | Resistance to rusting | 2 | |
| 23 | Abnormal OPERATION and fault conditions for ELECTRONIC SWITCHES | 1 | |
| 24 | EMC requirements | three additional samples | |

1) For the purpose of selection of female test connectors according to annex H, additional specimens may be necessary.

2) Three additional new specimens may be required according to 11.1.1.3.4 or table 12, note 2).

3) The further specimens 9 to 11 etc., are tested in the same combination of clauses as specimens 6 to 8.

4) Three additional new specimens may be required according to 20.1 for the test according to annex M.

5) For testing COATINGS on PRINTED BOARDS according to 20.4, the following number of PRINTED BOARDS are needed:

– 13 specimens for type A COATING;

– 17 specimens for type B COATING.

*5.6 SWITCHES with a RATED FREQUENCY are tested at that frequency. SWITCHES without a RATED FREQUENCY are tested at 50 Hz. SWITCHES with a RATED FREQUENCY range are tested at the most unfavourable frequency within that range.*

*5.7 If not more than one specimen fails during the tests of clauses 13 to 18 inclusive such as to cause non-compliance with the appropriate clause, the tests which caused the failure, and those preceding, which may have influenced the result of that test, are repeated on another set of identical specimens, all of which shall then comply with the repeated tests. No failure shall occur during the tests of clauses 6 to 12 inclusive and 19 to 22 inclusive.*

**NOTE The applicant may submit, together with the first set of specimens, an additional set of specimens which may be needed in case one specimen fails.**

**The testing authorities will then, without further request, test the additional specimens and will only reject if a further failure occurs.**

**If the additional set of specimens is not submitted at the same time, a failure of one specimen will entail a rejection.**

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*5.8 If it is necessary to have parts with* DOUBLE INSULATION *or* REINFORCED INSULATION *in* SWITCHES *for* CLASS 0 *or* CLASS I APPLIANCES*, such parts are checked for compliance with the requirements specified for* SWITCHES *for* CLASS II APPLIANCES*.*

*Similarly if it is necessary to have parts in* SWITCHES *operating at* SELV*, such parts are also checked for compliance with the requirements specified for* SWITCHES *for* CLASS III APPLIANCES*.*

*5.9 For the tests of this standard,* ACTUATION *may be performed by test equipment. Tests at high speed, however, have to be performed according to 17.2.4.*

*For* SWITCHES *with* ELECTRONIC ACTUATING MEMBERS*,* ACTUATION *shall be performed according to the manufacturer's declarations.*

*5.10 As far as possible,* SIGNAL INDICATORS *shall be tested together with the* SWITCHES*.*

*With the exception of the luminosity which can be disregarded, the lamp shall function unless otherwise specified. The test may be performed with test samples simulating the electrical, mechanical and thermal influences of the original indicator lamp. Replaceable indicator lamps may be replaced during the tests.* SIGNAL INDICATORS*, the function of which is independent from the function of the* SWITCH*, are operated continuously.*

*The results of the tests for* SWITCHES *with indicator lamps shall be considered to apply to* SWITCHES *of equivalent construction without indicator lamps, or to indicator lamps of equivalent construction without the switching mechanism.*

*5.11* SWITCHES *intended to be operated from a specific supply, are tested with that specific supply.*

*5.12 In all tests, the measuring instruments or the measuring means shall be such as not to affect appreciably the quantity being measured.*

*5.13 For* ELECTRONIC SWITCHES*, it may be necessary to disconnect or short-circuit electronic components for the purpose of the tests.*

*5.14 For the tests of 23.1.1.1, additional specimens may be necessary.*

## 6 Rating

6.1 The maximum RATED VOLTAGE is 440 V.

**NOTE Preferred values are 50 V, 125 V, 230 V, 250 V, 400 V, 440 V.**

6.2 SWITCHES with SIGNAL INDICATORS may have different RATED VOLTAGES for the SIGNAL INDICATORS.

6.3 The maximum RATED CURRENT is 63 A.

*Compliance with the requirements of 6.1 to 6.3 is checked by inspection of marking and documentation.*

**NOTE Preferred values are 1 A, 2 A, 4 A, 6 A, 10 A, 16 A, 20 A, 25 A, 40 A, and 63 A.**

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## 7 Classification

### 7.1 Classification of SWITCHES

7.1.1 **According to nature of supply:**

7.1.1.1 – SWITCHES for a.c. only;

7.1.1.2 – SWITCHES for d.c. only;

7.1.1.3 – SWITCHES for both a.c. and d.c.

7.1.2 **According to type of load to be controlled by each circuit of the SWITCH:**

**NOTE 1 A SWITCH having more than one circuit need not have the same classification for each circuit.**

**NOTE 2 Annex F, may be used for determining whether a particular SWITCH rating is suitable for controlling the circuit in the actual application.**

7.1.2.1 – circuit for a substantially resistive load with a power factor not less than 0,9;

7.1.2.2 – circuit for either a resistive load, a motor load with a power factor not less than 0,6, or a combination of both;

7.1.2.3 – circuit for a combination of resistive and capacitive a.c. loads;

7.1.2.4 – circuit for a tungsten filament lamp load;

7.1.2.5 – circuit for a declared specific load;

7.1.2.6 – circuit for a current not exceeding 20 mA.

7.1.2.7 – circuit for specific lamp load;

7.1.2.8 – circuit for an inductive load with a power factor of not less than 0,6;

7.1.2.9 – circuit for specific load of motor with a locked rotor and with a power factor not less than 0,6.

7.1.2.10 – MINIMUM LOAD for ELECTRONIC SWITCHES.

**7.1.2.11DV D2** ***Addition of 7.1.2.11DV to include horsepower ratings:***

**– circuit for either a resistive load, a horsepower load with a power factor not less than 0,4, or a combination of both;**

**7.1.2.12DV D2** ***Addition of 7.1.2.12DV to include television ratings:***

**– circuit for controlling the supply in a television-receiving appliance (e.g., a TELEVISION SWITCH):**

**7.1.2.13DV D2** ***Addition of 7.1.2.13DV to include inductive ratings:***

**– circuit for an inductive load with a power factor of not less than 0,75;**

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**7.1.2.14DV D2** ***Addition of 7.1.2.14DV to include inductive and motor ratings:***

**– circuit for an inductive load, a motor load with a power factor not less than 0,6, or a combination of both;**

**7.1.2.15DV D2** ***Addition of 7.1.2.15DV to include inductive and horsepower ratings:***

**– circuit for an inductive load, a horsepower load with a power factor not less than 0,4, or a combination of both;**

7.1.3 **According to ambient temperature:**

7.1.3.1 – SWITCHES at which the complete SWITCH, including the ACTUATING MEMBER, is intended to be used in an ambient temperature between a minimum value of 0 °C and a maximum value of 55 °C;

7.1.3.2 – SWITCHES at which the complete SWITCH, including the ACTUATING MEMBER, is intended to be used in an AMBIENT AIR TEMPERATURE higher than 55 °C or lower than 0 °C, or both;

7.1.3.3 – SWITCHES intended to be used with the ACTUATING MEMBER and other accessible parts in an ambient temperature between 0 °C and 55 °C, and the remainder of the SWITCH in an ambient temperature higher than 55 °C.

– Preferred values of maximum AMBIENT TEMPERATURE are 85 °C, 100 °C, 125 °C and 150 °C.

– Preferred values of minimum AMBIENT AIR TEMPERATURE are -10 °C, -25 °C and -40 °C.

– Values differing from these preferred values are allowed, as long as the values are multiples of 5 °C.

7.1.3.4 Electronic cord switches and electronic independently mounted switches are classified for a maximum ambient temperature of 35 °C.

**NOTE The classification using the AMBIENT AIR TEMPERATURE 35 °C may also be used for other ELECTRONIC SWITCHES under the provision that they are properly marked according to No. 3.2 in table 3.**

7.1.3.4.1 – electronic cord switches and electronic independently mounted switches, in which the complete switch, including the ACTUATING MEMBER, is intended to be used in an AMBIENT AIR TEMPERATURE between a minimum value of 0 °C and a maximum value of 35 °C.

**NOTE The decrease of ambient temperature from 55 °C to 35 °C is caused by the fact that components of ELECTRONIC SWITCHES have a larger heat dissipation than components of MECHANICAL SWITCHES.**

7.1.3.4.2 – electronic cord switches and electronic independently mounted switches, in which the complete switch including the ACTUATING MEMBER is intended to be used in an AMBIENT AIR TEMPERATURE higher than 35 °C, or a minimum value lower than 0 °C, or both:

– preferred values of maximum AMBIENT AIR TEMPERATURE are 55 °C, 85 °C, 100 °C and 125 °C;

– preferred values of minimum AMBIENT AIR TEMPERATURE are -10 °C, -25 °C and -40 °C;

– values differing from these preferred values are allowed, as long as the values are multiples of 5 °C.

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7.1.4 **According to number of OPERATING CYCLES:**

7.1.4.1 – 100 000 OPERATING CYCLES;

7.1.4.2 – 50 000 OPERATING CYCLES;

7.1.4.3 – 25 000 OPERATING CYCLES;

7.1.4.4 – 10 000 OPERATING CYCLES;

7.1.4.5 – 6 000 OPERATING CYCLES;

**7.1.4.5DV D1** ***Modification of 7.1.4.5 to specify the minimum number of cycles as follows:***

**Replace ″6000 OPERATING CYCLES″ with ″A minimum of 6 000 cycles of OPERATION. A greater number of OPERATIONS are able to be employed when agreeable to those concerned.″**

7.1.4.6 – 3 000 OPERATING CYCLES;

7.1.4.7 – 1 000 OPERATING CYCLES;

7.1.4.8 – 300 OPERATING CYCLES.

7.1.5 **According to degree of protection provided by the SWITCH, when mounted as declared, as part of an appliance enclosure:**

7.1.5.1 **Degree of protection against ingress of solid objects and dust (according to IEC 60529):**

7.1.5.1.1 – non-protected against solid foreign objects (IP0X);

7.1.5.1.2 – protected against solid foreign objects of 50 mm diameter and greater (IP1X);

7.1.5.1.3 – protected against solid foreign objects of 12,5 mm diameter and greater (IP2X);

7.1.5.1.4 – protected against solid foreign objects of 2,5 mm diameter and greater (IP3X);

7.1.5.1.5 – protected against solid foreign objects of 1,0 mm diameter and greater (IP4X);

7.1.5.1.6 – dust-protected (IP5X);

7.1.5.1.7 – dust-tight (IP6X).

7.1.5.2 **Degree of protection against harmful ingress of water (according to IEC 60529):**

7.1.5.2.1 – non-protected against ingress of water (IPX0);

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7.1.5.2.2 – protected against vertically falling water drops (IPX1);

7.1.5.2.3 – protected against vertically falling water drops when enclosure tilted up to 15° (IPX2);

7.1.5.2.4 – protected against spraying water (IPX3);

7.1.5.2.5 – protected against splashing water (IPX4);

7.1.5.2.6 – protected against water jets (IPX5);

7.1.5.2.7 – protected against powerful water jets (IPX6);

7.1.5.2.8 – protected against the effects of temporary immersion in water (IPX7).

7.1.5.3 **Degree of protection against electric shock for an INCORPORATED SWITCH for use in:**

7.1.5.3.1 – a CLASS 0 APPLIANCE;

7.1.5.3.2 – a CLASS I APPLIANCE;

7.1.5.3.3 – a CLASS II APPLIANCE;

7.1.5.3.4 – a CLASS III APPLIANCE.

**NOTE SWITCHES for use in CLASS II APPLIANCES may be used without additional protection in all other appliances, independently of class.**

7.1.6 **According to degree of POLLUTION:**

7.1.6.1 – POLLUTION DEGREE 1;

7.1.6.2 – POLLUTION DEGREE 2;

7.1.6.3 – POLLUTION DEGREE 3;

**NOTE 1 Details for the POLLUTION DEGREES are specified in annex L.**

**NOTE 2 A SWITCH suitable for use in a particular situation may be used in a less polluted situation.**

**NOTE 3 A SWITCH may be used in a more polluted situation than that for which it is designed if the appropriate additional protection is applied by the appliance.**

7.1.7 **According to the method of actuating the SWITCH:**

**NOTE This classification is not restrictive. PUSH-BUTTON SWITCHES may have more than one push-button.**

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7.1.7.1 – ROTARY SWITCH;

7.1.7.2 – LEVER SWITCH;

7.1.7.3 – ROCKER SWITCH;

7.1.7.4 – PUSH-BUTTON SWITCH;

7.1.7.5 – CORD-OPERATED SWITCH;

7.1.7.6 – PUSH-PULL SWITCH.

7.1.7.7 – ELECTRONIC SWITCHES operated via a SENSING UNIT (for example touching, approaching, turning, optical, acoustic, thermal or any other influences).

7.1.8 **According to marking:**

7.1.8.1 – SWITCH with limited marking U.T. (UNIQUE TYPE REFERENCE, U.T.);

7.1.8.2 – SWITCH with full marking C.T. (COMMON TYPE REFERENCE, C.T.).

7.1.9 **According to application level for resistance to heat and fire:**

**7.1.9DV D2** ***Modification of 7.1.9 to replace all wording as follows:***

**According to the glow wire temperature:**

7.1.9.1 – Level 1 SWITCH;

**7.1.9.1DV D2** ***Modification of 7.1.9.1 to replace all wording as follows:***

**– 650 °C for glow wire by GWEP according to 21DV.5.2, or 675 °C for glow wire by GWIT according to 21DV.5.3.**

7.1.9.2 – Level 2 SWITCH;

**7.1.9.2DV D2** ***Modification of 7.1.9.2 to replace all wording as follows:***

**– 750 °C for glow wire by GWEP according to 21DV.5.2, or 775 °C for glow wire by GWIT according to 21DV.5.3.**

7.1.9.3 – Level 3 SWITCH;

**NOTE For guidance concerning the levels, see clause 21.**

**7.1.9.3DV D2** ***Modification of 7.1.9.3 to replace all wording as follows:***

**– 850 °C for glow wire by GWEP according to 21DV.5.2, or 875 °C for glow wire by GWIT according to 21DV.5.3.**

7.1.10 **According to the rated IMPULSE WITHSTAND VOLTAGE:**

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7.1.10.1 – 330 V;

7.1.10.2 – 500 V;

7.1.10.3 – 800 V;

7.1.10.4 – 1 500 V;

7.1.10.5 – 2 500 V;

7.1.10.6 – 4 000 V.

**NOTE The relation between rated IMPULSE WITHSTAND VOLTAGE, RATED VOLTAGE and OVERVOLTAGE CATEGORY is given in annex K.**

7.1.11 **According to type of DISCONNECTION:**

7.1.11.1 – ELECTRONIC DISCONNECTION;

7.1.11.2 – MICRO DISCONNECTION;

7.1.11.3 – FULL DISCONNECTION.

7.1.12 **According to the type of COATING for rigid PRINTED BOARD ASSEMBLIES:**

7.1.12.1 – type A COATING;

7.1.12.2 – type B COATING.

**NOTE Explanations for type A and type B COATING are given in annex P.**

7.1.13 **According to type and/or connection of SWITCHES**

Details for types of SWITCHES and connections are specified in table 2.

7.1.13.1 **One-way switches:**

7.1.13.1.1 – declared specific type and/or connection;

7.1.13.1.2 – single pole, single load (single-pole DISCONNECTION);

7.1.13.1.3 – double pole, single load (ALL-POLE DISCONNECTION);

7.1.13.1.4 – double pole, double load (single-pole DISCONNECTION);

7.1.13.1.5 – double pole, double load (single-pole DISCONNECTION, load connected to opposite polarity);

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7.1.13.1.6 – three pole, three loads, unswitched neutral (three-pole DISCONNECTION);

7.1.13.1.7 – four-pole, three-load switched neutral (four-pole DISCONNECTION);

7.1.13.1.8 – three pole, three load (three-pole DISCONNECTION).

7.1.13.2 **Two-way switches:**

7.1.13.2.1 – declared specific type and/or connection;

7.1.13.2.2 – single pole, single load (single-pole DISCONNECTION);

7.1.13.2.3 – single pole, double load (single-pole DISCONNECTION, for specific circuits and loads only);

7.1.13.2.4 – double pole, single load (ALL-POLE DISCONNECTION);

7.1.13.2.5 – double pole, double load (ALL-POLE DISCONNECTION, for specific circuits and loads only);

7.1.13.2.6 – double pole, single load with POLARITY REVERSAL;

7.1.13.2.7 – double pole, four load (single-pole DISCONNECTION, load connected to opposite polarity, for specific circuits and loads only);

7.1.13.2.8 – double pole, double load (single-pole DISCONNECTION, load connected to opposite polarity);

7.1.13.2.9 – double pole, four load (single-pole DISCONNECTION for specific circuits and loads only).

7.1.13.3 **Two-way switches with centre position for DISCONNECTION:**

7.1.13.3.1 – declared specific type and/or connection;

7.1.13.3.2 – single pole, single load (single-pole DISCONNECTION);

7.1.13.3.3 – single pole, double load (single-pole DISCONNECTION);

7.1.13.3.4 – double pole, single load (ALL-POLE DISCONNECTION);

7.1.13.3.5 – double pole, double load (ALL-POLE DISCONNECTION);

7.1.13.3.6 – double pole, single load with POLARITY REVERSAL (ALL-POLE DISCONNECTION);

7.1.13.3.7 – double pole, four load (single-pole DISCONNECTION, load connected to opposite polarity);

7.1.13.3.8 – double pole, double load (single-pole DISCONNECTION, load connected to opposite polarity);

7.1.13.3.9 – double pole, four load (single-pole DISCONNECTION).

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7.1.13.4 **Multiway switches:**

7.1.13.4.1 – the number of poles, type of connection and load as declared;

7.1.13.4.2 – single pole, four positions with POLARITY REVERSAL (single-pole DISCONNECTION, for resistive load according to 7.1.2.1);

7.1.13.4.3 – double pole, four positions with POLARITY REVERSAL (ALL-POLE DISCONNECTION, for resistive load according to 7.1.2.1);

7.1.13.4.4 – double pole, five positions with POLARITY REVERSAL (ALL-POLE DISCONNECTION, for resistive load according to 7.1.2.1);

7.1.13.4.5 – double pole, seven positions with POLARITY REVERSAL (ALL-POLE DISCONNECTION, for resistive load according to 7.1.2.1).

**NOTE SWITCHES classified in 7.1.13.4.2 to 7.1.13.4.5 are designed for the step-wise increase or decrease of the resulting wattage of a combination of resistors ($R_1$ to $R_3$) according to table 2.**

7.1.14 **According to switching device for ELECTRONIC SWITCHES:**

7.1.14.1 – with SEMICONDUCTOR SWITCHING DEVICE;

7.1.14.2 – with MECHANICAL SWITCHING DEVICE.

7.1.15 **According to the condition of cooling for ELECTRONIC SWITCHES:**

7.1.15.1 – not requiring forced cooling;

7.1.15.2 – requiring forced cooling.

7.1.16 **According to DUTY-TYPE for ELECTRONIC SWITCHES :**

7.1.16.1 – continuous DUTY. DUTY-TYPE S1;

7.1.16.2 – short-time DUTY. DUTY-TYPE S2;

7.1.16.3 – intermittent periodic DUTY. DUTY-TYPE S3.

**NOTE 1 The different types of DUTY-TYPE are illustrated in figures 14 to 16.**

**NOTE 2 The concept DUTY-TYPE is taken from IEC 60034-1.**

7.1.17 **According to test conditions for ELECTRONIC SWITCHES:**

7.1.17.1 – functional test conditions with THERMAL CURRENT or maximum rated resistive current;

**NOTE This test condition reflects the proper functioning of the SWITCH. This test does not simulate the actual load of the end application.**

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7.1.17.2 – simulated test conditions with type of load as classified in 7.1.2;

**NOTE This test condition reflects the proper functioning of the SWITCH. It also simulates all conditions of the end application.**

7.1.17.3 – specific test conditions of end application, i.e. in or together with the appliance and under the cooling conditions of the appliance;

7.1.17.4 – test conditions according to DUTY-TYPE.

7.1.18 **According to built-in protection for ELECTRONIC SWITCHES:**

7.1.18.1 – with built-in protection;

7.1.18.2 – without built-in protection.

### 7.2 Classification of TERMINALS

7.2.1 – TERMINALS intended for the connection of UNPREPARED CONDUCTORS and not requiring the use of any SPECIAL PURPOSE TOOL;

**NOTE Twisting of a stranded conductor to consolidate the end is not considered as special preparation.**

7.2.2 – TERMINALS intended for the connection of PREPARED CONDUCTORS and/or requiring the use of a SPECIAL PURPOSE TOOL;

7.2.3 – TERMINALS suitable for the connection of supply cables or cords with UNPREPARED CONDUCTORS and not requiring the use of any SPECIAL PURPOSE TOOL;

7.2.4 – TERMINALS suitable for the connection of supply cables or cords with PREPARED CONDUCTORS and/or requiring the use of a SPECIAL PURPOSE TOOL;

7.2.5 – TERMINALS suitable for the interconnection of two or more conductors;

7.2.6 – TERMINALS intended for the connection of rigid, solid conductors;

7.2.7 – TERMINALS intended for the connection of rigid, solid and stranded conductors;

7.2.8 – TERMINALS intended for the connection of flexible conductors;

7.2.9 – TERMINALS suitable for the connection of both flexible and rigid (solid and stranded) conductors;

7.2.10 – SOLDER TERMINALS intended for soldering by hand with a soldering iron;

7.2.11 – SOLDER TERMINALS intended for soldering with a solder bath;

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7.2.12 – SOLDER TERMINALS with provisions for securing the conductor by mechanical means and providing circuit continuity by soldering;

7.2.13 – SOLDER TERMINALS without provisions for securing the conductor by mechanical means. The circuit continuity is ensured by soldering solely.

7.2.14 **According to the resistance to soldering heat:**

7.2.14.1 – SOLDER TERMINALS type 1;

7.2.14.2 – SOLDER TERMINALS type 2.

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## Table 2 – Type and connection of SWITCHES

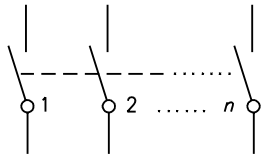
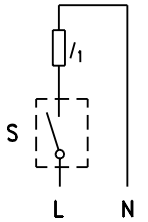
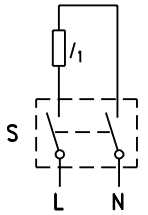
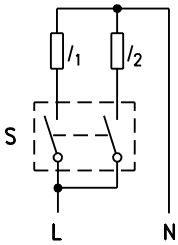
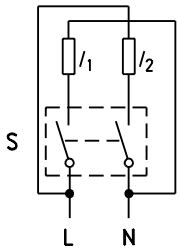
| Classification | Code [1] | Type of switch | Type of connection | Test circuit [3] |
|---|---|---|---|---|
| | | One-way switch | | |
| 7.1.13.1 | | Principle of one-way switches with one to *n* poles | |  |
| 7.1.13.1.1 | 1.1 | The number of poles, type of connection and load as declared | | |
| 7.1.13.1.2 | 1.2 | Single pole | Single load (single-pole disconnection) |  S = Specimen |
| 7.1.13.1.3 | 1.3 | Double pole | Single load (all-pole disconnection) |  S = Specimen |
| 7.1.13.1.4 | 1.4<br>[1.2] | Double pole | Double load (single-pole disconnection) |  S = Specimen |
| 7.1.13.1.5 | 1.5<br>[1.2]<br>[1.4] | Double pole | Double load (single-pole disconnection, load connected to opposite polarity) |  S = Specimen |

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**Table 2** *(continued)*

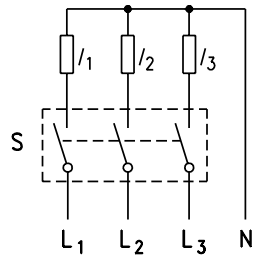
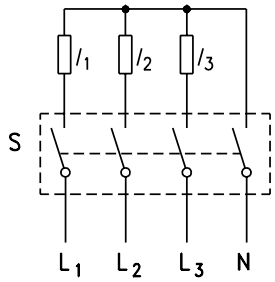
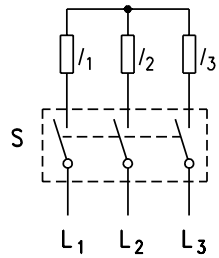
| Classification | Code 1) | Type of switch | Type of connection | Test circuit 3) |
|---|---|---|---|---|
| 7.1.13.1.6 | 1.6 | Three pole | Three loads unswitched neutral, (three–pole disconnection) |   S = Specimen |
| 7.1.13.1.7 | 1.7 | Four pole | Three loads switched neutral, (four–pole disconnection) |   S = Specimen |
| 7.1.13.1.8 | 1.8 | Three pole | Three loads (three–pole disconnection) |   S = Specimen |

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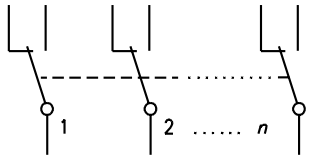
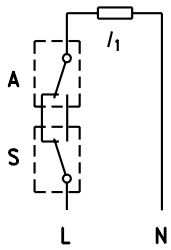
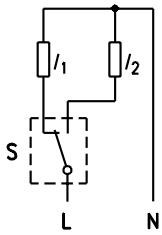
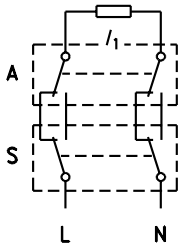
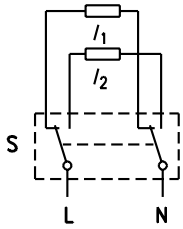
**Table 2** *(continued)*

| Classification | Code [1] | Type of switch | Type of connection | Test circuit [3] |
|---|---|---|---|---|
| | | Two-way switch | | |
| 7.1.13.2 | | Principle of two-way switches with one to *n* poles | |  |
| 7.1.13.2.1 | 2.1 | The number of poles, type of connection and load as declared | | |
| 7.1.13.2.2 | 2.2<br>[1.2] | Single pole | Single load (single-pole disconnection) |  S = Specimen,<br>A = Auxiliary switch |
| 7.1.13.2.3 [2] | 2.3 | Single pole | Double load (single-pole disconnection) |  S = Specimen |
| 7.1.13.2.4 | 2.4<br>[1.3] | Double pole | Single load (all-pole disconnection) |  S = Specimen,<br>A = Auxiliary switch |
| 7.1.13.2.5 [2] | 2.5 | Double pole | Double load (all-pole disconnection) |  S = Specimen |

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