

Automatic electrical controls for household and similar use —

Part 1: General requirements

ICS 97.120; 33.160.20

National foreword

This British Standard is the UK implementation of EN 60730-1:2000+A2:2008, incorporating amendments A11:2002, A12:2003, A13:2004, A14:2005, A15:2007 and A16:2007 and corrigenda August 2007 and March 2010. It is derived from IEC 60730-1:1999, incorporating amendment 2:2007. It supersedes BS EN 60730-1:2001, which will be withdrawn on 1 June 2011.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags **C** **C**.

Where a common modification has been introduced by amendment, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC amendment A11 are indicated by **C11** **C11**.

The UK participation in its preparation was entrusted to Technical Committee CPL/72, Electrical control devices for household equipment and appliances.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Amendments/corrigenda issued since publication

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15553	21 October 2005	Implementation of CENELEC amendment A13:2004 and A14:2005
17015	31 July 2007	Implementation of CENELEC amendment A15:2007 and A16:2007
17472 Corrigendum No. 1	30 November 2007	A-deviation for Sweden regarding subclause 11.1.2 deleted
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Incorporating corrigenda August 2007 and March 2010

English version

Automatic electrical controls for household and similar use —

Part 1: General requirements

(IEC 60730-1:1999, modified)

Dispositifs de commande électrique
automatiques à usage domestique et
analogue —

Partie 1: Règles générales
(CEI 60730-1:1999, modifiée)

Automatische elektrische Regel-und
Steuergeräte für den Hausgebrauch und
ähnliche Anwendungen —

Teil 1: Allgemeine Anforderungen
(IEC 60730-1:1999, modifiziert)

This European Standard was approved by CENELEC on 1999-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
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Foreword

This European Standard has been prepared by the CENELEC Technical Committee TC 72, Automatic controls for household use.

It is the endorsement of the International Standard IEC 60730-1:1999 with the necessary common modifications and is the editorial result of the combined texts of EN 6073-1:1995 and its amendments A1, A2, A11, A12, A13, A14, A15, A16 and A17, except where CENELEC common modifications have already been incorporated in IEC 60730-1:1999, together with the deletion of additional “in some countries” paragraphs and “under consideration” paragraphs which have been introduced in IEC 60730-1:1999.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 60730-1 on 1999-11-01.

The following dates were fixed:

- latest date by which the standard has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2001-07-01

This European Standard replaces EN 60730-1:1995 and its amendments. However, EN 60730-1:1995 remains valid until all the Part 2's which are used in conjunction with it have been withdrawn.

No date of withdrawal (dow) has been given pending the updating of all the Part 2's to align with this EN 60730-1:2000. The applicable date of withdrawal is given in each Part 2. It is intended the dow for this Part 1 will be fixed once all the Part 2's have been updated.

This Part 1 is to be used in conjunction with the appropriate Part 2 for a particular type of control, or for controls for particular applications. This Part 1 may also be applied, so far as reasonable, to controls not mentioned in a Part 2, and to controls designed on new principles, in which case additional requirements may be necessary.

Subclauses which are in addition to those in IEC 60730-1 are numbered 601, 602 etc. New annexes are labelled ZA, ZB etc.

Where reference is made to other International or Harmonized Standards, the edition of that standard quoted in the Annex ZA (normative) is applicable.

Special national conditions causing a deviation from this European Standard are listed in Annex ZB (normative) which forms part of this standard.

National deviations from this European Standard are listed in Annex ZC (informative).

NOTE In this standard the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Explanatory matter: in smaller roman type.

Foreword to amendment A1

The text of amendment 1:2003 to the International Standard IEC 60730-1:1999, prepared by IEC TC 72, Automatic controls for household use, together with the common modifications prepared by Technical Committee CENELEC TC 72, Automatic controls for household use, was submitted to the formal vote and was approved by CENELEC as amendment A1 to EN 60730-1:2000 on 2004-04-01.

This amendment A1 supersedes EN 60730-1:2000/A11:2002.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-04-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) —

Foreword to amendment A2

The text of amendment 2:2007 to the International Standard IEC 60730-1:1999, prepared by IEC TC 72, Automatic controls for household use, together with the common modifications prepared by Technical Committee CENELEC TC 72, Automatic controls for household use, was submitted to the formal vote and was approved by CENELEC as amendment A2 to EN 60730-1:2000 on 2008-06-01.

This document supersedes EN 60730-1:1999/A15:2007.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2009-06-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2010-05-05

Annex ZA has been added by CENELEC Document Sharing Hub

Foreword to amendment A11

This amendment to EN 60730-1:2000 has been prepared by the Technical Committee CENELEC TC 72, Automatic controls for household use.

The text of the draft was submitted to the Unique Acceptance Procedure (UAP) and was approved by CENELEC as amendment A11 to EN 60730-1:2000 on 2002-02-01.

The purpose of this amendment is to include additional requirements to EN 60730-1 in order to comply with the fundamental requirements of the Pressure Equipment Directive (PED) 97/23/EC.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-02-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2009-02-01

The reference of subclauses and annexes which are added by CENELEC is prefixed with the letter Z.

Foreword to amendment A12

This amendment to the European Standard EN 60730-1:2000 was prepared by the Technical Committee CENELEC TC 72, Automatic controls for household use.

The text of the draft was submitted to the Unique Acceptance Procedure (UAP) and was approved by CENELEC as amendment A12 to EN 60730-1:2000 on 2003-06-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2004-06-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2010-06-01

Foreword to amendment A13

This amendment to the European Standard EN 60730-1:2000 was prepared by WG 1 of the Technical Committee CENELEC TC 72, Automatic controls for household use, in order to give details of the changes which have been made since the previous edition/amendment and also to provide advice on those areas where reassessment/re-testing is considered to be necessary.

The text of the draft was submitted to the formal vote and was approved by CENELEC as amendment A13 to EN 60730-1:2000 on 2004-09-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-09-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2007-09-01

Foreword to amendment A14

This amendment to the European Standard EN 60730-1:2000 was prepared by Technical Committee CENELEC TC 72, Automatic controls for household use.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A14 to EN 60730-1:2000 on 2004-12-01.

This amendment was prepared in order to include clauses from EN 60730-2-1 which is proposed for withdrawal. Amendments to the scopes of various Part 2s on the EN 60730 series have also been made in order to make EN 60730-2-1 not applicable. The actual date when EN 60730-2-1 is to be withdrawn will align with the latest date of withdrawal for the Part 2 amendments (i.e. 2009-03-01).

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-12-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2010-06-01

Clauses, subclauses, tables and figures which are additional to those in IEC 60730-1 are prefixed “Z”.

Foreword to amendment A15

This amendment to the European Standard EN 60730-1:2000 was prepared by the Technical Committee CENELEC TC 72, Automatic controls for household use. The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A15 to EN 60730-1:2000 on 2006-07-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2007-08-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2010-06-01

Foreword to amendment A16

This amendment to the European Standard EN 60730-1:2000 was prepared by the Technical Committee CENELEC TC 72, Automatic controls for household use.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A16 to EN 60730-1:2000 on 2006-07-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2007-11-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2010-06-01

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AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE –

Part 1: General requirements

1 Scope and normative references

1.1 In general, this standard applies to automatic electrical controls for use in, on, or in association with equipment for household and similar use, including controls for heating, air-conditioning and similar applications. The equipment may use electricity, gas, oil, solid fuel, solar thermal energy, etc., or a combination thereof.

1.1.1 This standard applies to the inherent safety; to the operating values, operating times, and operating sequences where such are associated with equipment safety; and to the testing of automatic electrical control devices used in, or in association with, household or similar equipment.

This standard is also applicable to controls for appliances within the scope of IEC 60335-1.

Throughout this standard the word "equipment" means "appliance and equipment."

A1 This standard does not apply to automatic electrical controls intended exclusively for industrial applications unless explicitly mentioned in the relevant Part 2. **A1**

This standard is also applicable to individual controls utilized as part of a control system or controls which are mechanically integral with multifunctional controls having non-electrical outputs.

Automatic electrical controls for equipment not intended for normal household use, but which nevertheless may be used by the public, such as equipment intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard.

See also annex J.

C15 This standard is also applicable to the safety and operating values of relays when used as controls for EN 60335 appliances. Additional requirements for the safety and operating values of relays, when used as controls in appliances within the scope of EN 60335, are contained in Annex ZE.

NOTE 1 These requirements are referred to in Clause 1 of EN 61810-1.

NOTE 2 This standard is not intended to be used as a standalone standard for the testing of relays other than those used in appliances within the scope of EN 60335. **C15**

A2 This standard is also applicable to relays when used as controls for IEC 60335 appliances. Additional requirements for the safety and operating values of relays when used as controls for IEC 60335 appliances are contained in Annex U.

NOTE 1 These requirements are referred to by IEC 61810-1, Scope.¹⁾

NOTE 2 This standard is intended to be used for the testing of any stand-alone relay which is intended to be used as a control of an appliance according to IEC 60335-1. It is not intended to be used for any other stand-alone relay, or to replace the IEC 61810 series of standards. **A2**

1.1.2 This standard applies to automatic electrical controls, mechanically or electrically operated, responsive to or controlling such characteristics as temperature, pressure, passage of time, humidity, light, electrostatic effects, flow, or liquid level, current, **A1** voltage, acceleration, or combinations thereof. **A1**

1.1.3 This standard applies to starting relays, which are a specific type of automatic electrical control, intended to switch the starting winding of a motor. Such controls may be built into, or be separate from, the motor.

C14 NOTE Starting relays are tested as voltage sensing or current sensing controls. **C14**

A2 ¹⁾ IEC 61810-1, *Electromechanical elementary relays – Part 1: General and safety requirements*. **A2**

1.1.4 This standard applies to manual controls when such are electrically and/or mechanically integral with automatic controls.

Requirements for manual switches not forming part of an automatic control are contained in IEC 61058-1.

1.2 This standard applies to controls with a rated voltage not exceeding 690 V and with a rated current not exceeding 63 A.

1.3 This standard does not take into account the response value of an automatic action of a control, if such a response value is dependent upon the method of mounting the control in the equipment. Where a response value is of significant purpose for the protection of the user, or surroundings, the value defined in the appropriate household equipment standard or as determined by the manufacturer shall apply.

1.4 This standard applies also to controls incorporating electronic devices, requirements for which are contained in annex H.

This standard applies also to controls using NTC or PTC thermistors, requirements for which are contained in annex J.

1.5 Normative references

The following referenced documents are indispensable for the application 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.

Ⓐ₂ IEC 60038:1983, *IEC standard voltages*²⁾

Amendment 1 (1994)

Amendment 2 (1997) Ⓐ₂

IEC 60050(604):1987, *International Electrotechnical Vocabulary (IEV) – Chapter 604: Generation, transmission and distribution of electricity – Operation*

Ⓐ₂ IEC 60065:2001, *Audio, video and similar electronic apparatus – Safety requirement* Ⓐ₂

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

IEC 60085:1984, *Thermal evaluation and classification of electrical insulation*

Ⓐ₂ IEC 60099-1:1991, *Surge arresters – Part 1: Non-linear resistor type gapped arresters for a.c. systems*³⁾

Amendment 1 (1999)

Ⓐ₂ IEC 60112:2003, *Method for determination of the proof and the comparative tracking indices of solid insulating materials* Ⓐ₂

IEC 60127, *Miniature fuses*

Ⓐ₂ IEC 60216-1:2001, *Electrical insulating materials – Properties of thermal endurance – Part 1: Ageing procedures and evaluation of test results* Ⓐ₂

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

Ⓐ₂ IEC 60245-1:2003, *Rubber insulated cables – Rated voltages up to and including 450/750V – Part 1: General requirement* Ⓐ₂

IEC 60249, *Base materials for printed circuits*

IEC 60269, *Low-voltage fuses*

IEC 60326, *Printed boards*

Ⓐ₁ IEC 60326-3:1991, *Printed boards – Part 3: Design and use of printed boards* Ⓐ₁

Ⓐ₂ ²⁾ There exists a consolidated edition 6.2 including IEC 60038:1983 and its Amendments 1 (1994) and 2 (1997).

³⁾ There exists a consolidated edition 3.1 including IEC 60099-1:1991 and its Amendment 1 (1999). Ⓐ₂

A2 IEC 60335-1:2001, *Household and similar electrical appliances – Safety – Part 1: General requirements*⁴⁾

Amendment 1 (2004)

Amendment 2 (2006)

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60384-14:2005, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic suppression and connection to the supply mains*

IEC 60384-16:1992, *Fixed capacitors for use in electronic equipment – Part 16: Sectional specification – Fixed metallized polypropylene film dielectric d.c. capacitors*

IEC 60384-17:2005, *Fixed capacitors for use in electronic equipment – Part 17: Sectional specification: Fixed metallized polypropylene film dielectric a.c. and pulse capacitors*

IEC 60417, *Graphical symbols for use on equipment* **A2**

IEC 60423:1993, *Conduits for electrical purposes – Outside diameters of conduits for electrical installations and threads for conduits and fittings*

A2 IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*⁵⁾

Amendment 1 (1999)

Text deleted **A2**

IEC 60539:1976, *Directly heated negative temperature coefficient thermistors*

C IEC 60555-2:1982 and amendment 1:1985, *Disturbances in supply systems caused by household appliances and similar electrical equipment – Part 2: Harmonics*

IEC 60555-3:1982, *Disturbances in supply systems caused by household appliances and similar electrical equipment – Part 3: Voltage fluctuations* **C**

A2 IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*⁶⁾

Amendment 1 (2000)

Amendment 2 (2002)

IEC 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution* **A2**

C12 IEC 60669-1:1998, *Switches for household and similar fixed-electrical installations – Part 1: General requirements* **C12**

A2 Text deleted

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

IEC 60695-11-10:1999, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*⁷⁾

Amendment 1 (2003) **A2**

IEC 60738-1:1998, *Thermistors – Directly heated positive step-function temperature coefficient – Part 1: Generic specification*

IEC 60738-1-1:1998, *Thermistors – Directly heated positive step-function temperature coefficient – Part 1-1: Blank detail specification – Current limiting application – Assessment level EZ*

A2 ⁴⁾ There exists a consolidated edition 4.2 including IEC 60335-1:2001 and its Amendments 1 (2004) and 2 (2006).

⁵⁾ There exists a consolidated edition 2.1 including IEC 60529:1989 and its Amendment 1 (1999).

⁶⁾ There exists a consolidated edition 1.2 including IEC 60664-1:1992 and its Amendments 1 (2000) and 2 (2002).

⁷⁾ There exists a consolidated edition 1.1 including IEC 60695-11-10:1999 and its Amendment 1 (2003). **C12**

A1 Text deleted

IEC 60998-2-2:2002, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units* **A2**

A1 IEC 61000 (all parts), *Electromagnetic compatibility (EMC)* **A1**

A2 IEC 61000-3-2:2005, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)* **A2**

IEC 61000-3-3:1994, *Electromagnetic compatibility (EMC) – Part 3: Limits – Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A*

A2 IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test*.⁸⁾
Amendment 1 (1998)
Amendment 2 (2000)

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

IEC 61000-4-4:2004, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*.

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

IEC 61000-4-6:2003, *Electromagnetic compatibility (EMC) – Part 4-6, Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:1993, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 8 – Power frequency magnetic field immunity test*.⁹⁾
Amendment 1 (2000)

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measuring techniques – Voltage dips, short interruptions and voltage variations immunity tests* **A2**

C16 IEC 61000-4-20:2003, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides* **C16**

A2 IEC 61000-4-28:1999, *Electromagnetic compatibility (EMC) – Part 4-28: Testing and measurements techniques – Variation of power frequency, immunity test*.¹⁰⁾
Amendment 1 (2001)

IEC 61058-1:2000, *Switches for appliances – Part 1: General requirements*

IEC 61140:2001, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61558-2-17:1997, *Safety of power transformers, power supply units and similar – Part 2: Particular requirements for transformers for switch mode power supplies* **A2**

A1 IEC 61210:1993, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC 61558-2-6:1997, *Safety of power transformers, power supply units and similar – Part 2: Particular requirements for safety isolating transformers for general use*. Group safety publication **A1**

A2 ⁸⁾ There exists a consolidated edition 1.2 including IEC 61000-4-2:1995 and its Amendments 1 (1998) and 2 (2000).

⁹⁾ There exists a consolidated edition 1.1 including IEC 61000-4-8:1993 and its Amendment 1 (2000).

¹⁰⁾ There exists a consolidated edition 1.1 including IEC 61000-4-28:1999 and its Amendment 1 (2001). **A2**

Ⓐ₂ CISPR 14-1:2005, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission* Ⓐ₂

Ⓒ CISPR 16-1:1993, *Specification for radio disturbance and immunity measuring apparatus and methods Part 1: Radio disturbance and immunity measuring apparatus* Ⓒ

CISPR 22:1997, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

2 Definitions

For the purpose of this Standard the following definitions apply. Where the terms "voltage" and "current" are used, they imply the r.m.s. values, unless otherwise specified.

2.1 Ⓐ₁ Definitions relating to ratings, voltages, currents, frequencies, and wattages Ⓐ₁

2.1.1

rated voltage, current, frequency or wattage

voltage, current, frequency or wattage assigned to a control by the manufacturer. For three phase supply, the rated voltage is the line voltage

2.1.2

rated voltage, current, frequency or wattage range

voltage, current, frequency or wattage ranges assigned to the control by the manufacturer and expressed by lower and upper values

2.1.3

working voltage

the highest r.m.s. value of the a.c. or d.c. voltage across any particular insulation which can occur when the equipment is supplied at rated voltage

NOTE 1 – Transient overvoltages are disregarded.

NOTE 2 – Open-circuit conditions and normal operating conditions are taken into account.

Ⓐ₂ 2.1.4

extra-low voltage (ELV)

nominal voltage not exceeding 50 V between conductors and between conductors and earth, or for three-phase connection not exceeding 50 V between line conductors and 29 V between line conductors and neutral

NOTE 1 These values were derived from IEC 60335-1, definition 3.4.1.

NOTE 2 In this standard ELV-levels for use in a specific application as specified in the relevant application standard may be declared for controls used in or with such applications for environmental conditions as specified by the application standard.

2.1.5

safety extra-low voltage (SELV)

nominal voltage for use in a SELV-system or PELV-system between conductors and between conductors and earth, not exceeding 42 V between conductors, or in the case of three-phase circuits, not exceeding 24 V between conductors and neutral, the no-load voltage of the circuit not exceeding 50 V and 29 V, respectively, and which when obtained from higher voltage is provided by a safety isolating transformer or a converter with separate windings providing equivalent insulation as stated in IEC 61558-2-6 and IEC 61558-2-17

The voltage limits are based on the assumption that the safety isolating transformer is supplied at its rated voltage.

Ⓒ₂ Note deleted Ⓒ₂

Also see 2.1.20 SELV system and 2.1.21 PELV system. Ⓐ₂

2.1.6

safety isolating transformer

transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to double or reinforced insulation, and which is intended to supply safety extra-low voltage circuits

2.1.7**same polarity**

relationship between live parts such that an interconnection between them allows a flow of current through a load, and which current is thus limited by the load

2.1.8**opposite polarity**

 Void .

2.1.9**isolated limited secondary circuit**

circuit from an isolated secondary winding of a transformer having a maximum capacity of 100 VA and an open-circuit secondary voltage rating not exceeding 1 000 V

2.1.10**pilot duty**

class of operation in which the ultimate electrical load is controlled by an auxiliary means such as a relay or contactor

2.1.11**transient overvoltage**

a short duration overvoltage of a few milliseconds or less, oscillatory or non-oscillatory, usually highly damped [IEV 604-03-13]

2.1.12**rated impulse voltage**

an impulse withstand voltage assigned by the manufacturer to the equipment or to a part of it, characterizing the specified withstand capability of its insulation against overvoltages

2.1.13**overvoltage category**

a numeral characterizing a transient overvoltage condition

NOTE – Overvoltage categories I, II, III, and IV are used. See annex L.

** 2.1.14****exposed-conductive-part**

conductive part of equipment, which can be touched and which is not normally live, but which can become live when basic insulation fails

[IEV 195-06-10]

A conductive part of a control which can only become live through contact with an exposed-conductive-part which has become live, is not considered to be an exposed-conductive-part itself.

2.1.15**(conductive) screen**

 Text deleted 

conductive part that encloses or separates electric circuits and/or conductors

[IEV 195-02-38]

2.1.16**(electrically) protective screen**

 Text deleted 

conductive screen used to separate an electric circuit and/or conductors from hazardous-live-parts

[IEV 195-06-17] 

A2 2.1.17
(electrically) protective screening

C2 *Text deleted* **C2**

separation of electric circuits and conductors from hazardous live parts by an electrically protective screen (shield) connected to the protective-equipotential-bonding system and intended to provide protection against electric shock

[IEV 195-06-18]

2.1.18
simple separation

separation between circuits or between a circuit and earth by means of basic insulation

[IEC 61140, definition 3.23]

2.1.19
(electrically) protective separation

separation of one electric circuit from another by means of:

- double insulation, or
- basic insulation and electrically protective screening (shielding), or
- reinforced insulation

[IEV 195-06-19]

2.1.20
SELV system

an electrical system in which the voltage cannot exceed ELV:

- under normal conditions, and
- under single-fault conditions, including earth faults in other circuits

[IEC 61140, definition 3.26.1]

2.1.21
PELV system

an electrical system in which the voltage cannot exceed ELV:

- under normal conditions, and
- under single-fault conditions, except earth faults in other circuits

[IEC 61140, definition 3.26.2] **A2**

2.2 Definitions of types of control according to purpose

2.2.1
electrical control (hereinafter referred to as "control")

device used in, on or in association with an equipment for the purpose of varying or modifying the output from such equipment, and which embodies the aspects of initiation, transmission and operation. At least one of these aspects shall be electrical or electronic

2.2.2
manual control

control in which the initiation is by actuation and in which the transmission and the operation are both direct and without any intentional time delay

2.2.3
automatic control

control in which at least one aspect is non-manual

2.2.4**sensing control**

automatic control in which initiation is by an element sensitive to the particular activating quantity declared; for example, temperature, current, humidity, light, liquid level, position, pressure or velocity

2.2.5**thermally operated control**

automatic control in which the transmission is by a thermal prime mover

2.2.6**thermostat**

cycling temperature sensing control, which is intended to keep a temperature between two particular values under normal operating conditions and which may have provision for setting by the user

2.2.7**temperature limiter**

temperature sensing control which is intended to keep a temperature below or above one particular value during normal operating conditions and which may have provision for setting by the user

A temperature limiter may be of the automatic or of the manual reset type. It does not make the reverse operation during the normal duty cycle of the appliance.

2.2.8**thermal cut-out**

temperature sensing control intended to keep a temperature below or above one particular value during abnormal operating conditions and which has no provision for setting by the user

Ⓒ A thermal cut-out may be of the automatic, manual reset or non-resettable type. Ⓒ

Normally a thermal cut-out will provide a type 2 action.

2.2.9 Void**2.2.10****energy regulator**

self-cycling control which alters the energy to a load and which may incorporate means for setting by the user to change the average energy supplied

The ratio of the on-time, to the on-plus-off-time, determines the average energy supplied.

2.2.11**time-based control**

automated control in which the transmission is effected by a time-based prime mover or a time-based electrical circuit

2.2.12**electrically operated control**

automatic control in which the transmission is effected by an electrical prime mover and in which the operation controls an electric circuit, and is without intentional significant time-delay

An example is a relay.

A slugged-relay may be either an electrically operated control, or a time-based control by agreement between testing authority and manufacturer.

2.2.13**timer**

time-based control which requires actuation before the next cycle can take place

During a cycle it may require an external electrical or mechanical signal before moving from a rest position to allow the cycle to continue. An example is a programmer.

2.2.14

time switch

time-based control which continues with a subsequent cycle when the preceding one has been completed

An example is a 24 h control on a storage heater.

2.2.15

motor protector

automatic control that is specifically intended to protect the windings of an electric motor from overheating

2.2.16

thermal motor protector

automatic control, built-in or on a motor, that is specifically intended to protect the motor against overheating due to running overload and failure to start. The control carries motor current and is sensitive to motor temperature and current

The control is capable of being reset (either manually or automatically) when its temperature falls to the reset value.

2.2.17

electrically operated valve

automatic control in which the transmission is effected by an electrical prime mover and in which the operation controls the flow of a liquid or a gas

2.2.18

electrically operated mechanism

automatic control in which the transmission is effected by an electrical prime mover in which the operation controls a mechanical device

An example is an electrically operated interlock for a spin dryer lid.

An electric motor is not included in this definition.

2.2.19

operating control

control which starts or regulates the equipment during normal operation

2.2.20

protective control

control, the operation of which is intended to prevent a hazardous situation during abnormal operation of the equipment

2.2.21

multipurpose control

electrical control that can be classified and used for more than one purpose

An example of a multipurpose control is a thermostat that can also be used as a temperature limiter.

2.2.22

multifunctional control

electrical control which incorporates more than one function

An example of a multifunctional control is the combination of a thermostat and a humidistat. 

2.3 Definitions relating to the function of controls

2.3.1

initiation

alteration to that aspect of a control which is required to produce transmission and operation

2.3.2

transmission

essential coupling between initiation and operation which is required to enable the control to fulfil its purpose

2.3.3

operation

change in that aspect of a control which modifies the input to the equipment or part of the equipment

2.3.4

automatic action

that action of an automatic control in which the transmission and operation are produced by initiation which is not the result of actuation

2.3.5

slow-make slow-break automatic action

mode of operation where the rate of contact make and/or break is directly proportional to the rate of change of the activating quantity, or to the speed of movement of a prime mover

This action may be applicable to either the make, or the break, or both.

2.3.6

manual action

that action of an automatic control or of a manual control in which the transmission and operation are produced by initiation which is the result of actuation

2.3.7

actuation

movement of the actuating member of the control by the user, by hand, by foot or by any other human activity

2.3.8

located position

position of the actuating member to which it will return if it is released after being moved slightly

2.3.9

intermediate position

any position of any actuating member which is adjacent to a located position, and in which the actuating member will remain and in which the operation of the control is intermediate

2.3.10

activating quantity

physical characteristic of a medium, the variation or stability of which is being sensed

2.3.11

operating value

value of the relevant temperature, pressure, current, etc. at which a sensing control operates on a rise or fall of the activating quantity

2.3.12

operating time

duration of time, or the difference of time, between any two functions, electrical or mechanical, occurring during the automatic action of a time-based control

2.3.13

operating sequence

intended sequence, order or pattern in which the operation of the electrical or mechanical functions of a control are intended to occur as a result of either an automatic or a manual action of a control

It includes the pattern of opened or closed contacts in any located position, intermediate position or position of setting by manufacturer or user.

2.3.14

response value

operating value, the operating time or the operating sequence which relates a control to a particular equipment

2.3.15

trip-free

automatic action, with a reset actuating member, in which the automatic action is independent of manipulation or position of the reset mechanism

2.3.16

leakage current

all currents, including capacitively coupled currents, which may be conveyed between exposed conductive surfaces of a device and earth or other exposed conductive surfaces of a device

2.3.17

setting

mechanical positioning of a part of a control in order to select an operating value

2.3.18

setting by the control manufacturer

any setting carried out by the control manufacturer which is not intended to be altered by the equipment manufacturer, the installer or the user

2.3.19

setting by the equipment manufacturer

any setting carried out by the equipment manufacturer which is not intended to be altered by the installer or the user

2.3.20

setting by the installer

any setting carried out by the installer, as instructed by the equipment manufacturer or the control manufacturer, and which is not intended to be altered by the user

2.3.21

setting by the user

any selection of an operating value by actuation performed by the user

2.3.22

set point

value selected by setting

2.3.23

adjustable set point

multiple values, within a declared range of values, which can be selected by setting

2.3.24**duty cycle**

all automatic and manual actions involved in one start-to-finish operation of the controlled equipment

2.3.25**cycle of contact operation**

one contact make and one subsequent contact break action, or one contact break and one subsequent contact make action

2.3.26**operating differential**

difference between the upper and lower values of the operating value

2.3.27**adjustable differential**

ability to change or alter the operating differential within rated limits by operation of a manually actuated mechanism

2.3.28**fixed differential**

operating differential which cannot be changed from the manufacturer's setting

2.3.29**maximum working pressure (maximum rated pressure)**

declared maximum line or system working pressure to which the control or parts thereof may be subjected

2.3.30 **$T_{\max}$**

the declared maximum continuous ambient temperature to which the switch head is intended to be exposed during normal operation

2.4 Definitions relating to disconnection and interruption

Some controls may incorporate more than one form of circuit disconnection or interruption.

2.4.1**all-pole disconnection**

for single-phase a.c. appliances and for d.c. appliances, disconnection of both supply conductors by a single switching action or, for appliances to be connected to more than two supply conductors, disconnection of all supply conductors, except the earthed (grounded) conductor, by a single switching action

The protective earthing conductor is not considered to be a supply conductor.

2.4.2**full-disconnection**

contact separation in all supply poles other than earth so as to provide the equivalent of basic insulation between the supply mains and those parts intended to be disconnected

There are electric strength and dimensional requirements.

Where the number of poles on the control is equal to the number of supply poles of the appliance to which it is connected, full-disconnection provides all-pole disconnection.

See also annex H.

2.4.3

micro-disconnection

adequate contact separation in at least one pole so as to provide functional security

There is a requirement for the electric strength of the contact gap but no dimensional requirement.

Micro-disconnection denotes that for non-sensing controls the function controlled by the disconnection is secure, and that for sensing controls is secure between the limits of activating quantity declared in requirement 36 of table 7.2.

See also annex H.

2.4.4

micro-interruption

interruption of a circuit by contact separation, by a cycling action or by a non-cycling action which does not provide full-disconnection or micro-disconnection

There are no electric strength or dimensional requirements for the contact gap.

See also annex H.

2.4.5

OFF position

position providing a visible or implied indication of a full-disconnection or micro-disconnection.

2.4.6 See annex H.

2.5 Definitions of types of control according to construction

2.5.1

integrated control

control which is dependent on its correct mounting and fixing in an equipment, and which can only be tested in combination with the relevant parts of the equipment

The equipment may use electricity, gas, oil, solid fuel or a combination thereof.

Integrated control also denotes a control which is part of a more complex control (electrical or non-electrical).

2.5.2

incorporated control

control intended for incorporation in, or on, an equipment, but which can be tested separately

The fact that an incorporated control can be tested separately does not imply that it may not be tested in an equipment as specified in 4.3.1.1.

The equipment may use electricity, gas, oil, solid fuel or a combination thereof.

Incorporated control also denotes a control intended for incorporation in or on a more complex control (electrical or non-electrical).

2.5.3

in-line cord control

separately cased control intended to be connected to the supply and to the equipment by means of flexible cords, equipment inlets or socket-outlets; and is intended to be manually actuated

2.5.4

free-standing control

in-line cord control intended to stand on a table or on the floor. It may be actuated by hand, by foot or by other similar human activity

2.5.5**independently mounted control**

a control intended for permanent connection to fixed wiring, but intended to be mounted away from the controlled equipment. It may be either:

- for surface mounting such as on to a wall;
- for flush mounting, such as into a wall cavity, when installation shall be possible from the front;
- for panel mounting, such as onto or into a control panel, when installation may be from the rear

2.5.6**pull-cord actuated control**

control intended to be mounted in, or on, an equipment and actuated by means of a pull-cord

2.5.7 to 2.5.10 See annex H.

2.5.11**two-step actuation**

sequential performance of two distinct movements of the actuating member

2.6 Definitions of type of automatic action of a control according to test procedure**2.6.1****type 1 action**

automatic action for which the manufacturing deviation and the drift of its operating value, operating time or operating sequence have not been declared and tested under this standard

A type 1 action is subclassified as specified in 6.4.

2.6.2**type 2 action**

automatic control for which the manufacturing deviation and the drift of its operating value, operating time or operating sequence have been declared and tested under this standard

A type 2 action is subclassified as specified in 6.4.

2.7 Definitions relating to protection against electric shock**2.7.1****live part**

conductive part intended to be energized in normal use, including a neutral conductor, but by convention not a PEN conductor

2.7.1.1**hazardous live part**

a live part which, under certain conditions of external influences, can give an electric shock

2.7.2**class 0 control**

control 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 is placed upon the environment

 Text deleted 

An earthing terminal is only allowed if it is for continuity or functional (as distinct from protective) purposes.

2.7.3

class 0I control

in-line cord control having at least basic insulation throughout and provided with an earthing terminal but with a non-detachable cord without earthing conductor, and a plug without earthing contact which cannot be introduced into a socket-outlet with earthing contact

 Text deleted 

An earthing terminal is only allowed if it is for continuity (as distinct from protective) purposes.

2.7.4

class I control

control in which protection against 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 accessible conductive parts to the protective (earthing) conductor in the fixed wiring of the installation in such a way that accessible conductive parts cannot become live in the event of a failure of the basic insulation

This provision includes a protective conductor as part of the flexible cord or cable. When class 1 controls are fitted with a two-core flexible cord or cable; provided that it is fitted with a plug which cannot be introduced into a socket-outlet with earthing contact, the protection is then equivalent to that of class 0, but the earthing provisions of the equipment in all other respects should fully comply with the requirements of class I.

 Class I controls may have parts with double insulation or parts that provide protection against electric shock by SELV or PELV. 

2.7.5

class II control

control in which protection against electric shock does not rely on basic insulation only, but in which additional protective precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions. Such a control may be one of the following types:

 Class II controls may have parts that provide protection against electric shock by use of SELV.

Class II controls cannot have parts that provide protection against electric shock by use of PELV, as such circuits require connection to an earthing terminal. 

2.7.5.1

insulation-encased class II control

a control having a durable and substantially continuous enclosure of insulation material which envelopes all metal parts, with the exception of small parts, such as name plates, screws and rivets, which are isolated from live parts by insulation at least equivalent to reinforced insulation. Such a control is called an insulation-encased class II control

2.7.5.2

metal-encased class II control

a control having a substantially continuous metal enclosure in which double insulation is used throughout, except for those parts where reinforced insulation is used, because the application of double insulation is manifestly impracticable. Such a control is called a metal-encased class II control

2.7.5.3

combination insulation-encased/metal-encased class II control

a control which is a combination of the types described in 2.7.5.1 and 2.7.5.2

The enclosure of an all-insulated class II control may form a part or the whole of the supplementary insulation or of the reinforced insulation. If a control with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact, it is deemed to be of class 0I or class I construction.

2.7.6**class III control**

A2 control relying on limitation of voltage to ELV values as provision against electric shock for basic protection and

- with no provision for fault protection;
- which for supply are only connected to a SELV-system or a PELV-system, to form part of that system;
- where internal circuits do not operate at a higher level than ELV;
- where in case of a single fault within the control no steady state touch voltage may appear or be generated exceeding ELV level; and
- not provided with a means of connection for a protective conductor. **A2**

An earthing terminal is only allowed if it is for continuity or functional (as distinct from protective) purposes.

2.7.7**detachable part**

part which can be removed or opened without the aid of a tool and which does not comply with the test of 11.11.1.5

2.7.8**accessible part or surface**

part or surface which can be touched by the test finger of figure 2, when the control is mounted as in normal use, and after detachable parts have been removed

2.7.9**operational insulation**

insulation between live parts which have a potential difference between them, and which insulation is necessary for the correct operation of the control or controlled equipment (L-L)

This was formerly part of that insulation referred to as functional insulation.

In 2.7.9 through 2.7.12 the following abbreviations are used:

- L live part;
- A accessible part (either conductive or an insulating surface);
- I intermediate part.

2.7.10**basic insulation**

insulation applied to live parts to provide basic protection against electric shock (L-A or L-I). Basic insulation includes insulation between live parts and:

- intermediate conductive parts or metal foil over intermediate insulating surfaces (class II situation);
- accessible conductive parts (class 0, 0I, I situations);
- conductive parts connected to accessible conductive parts (class 0, 0I, I situations);
- metal foil over accessible insulating surfaces (class 0 situation)

This was formerly part of that insulation referred to as functional insulation.

2.7.11

supplementary insulation

independent insulation applied in addition to basic insulation in order to provide protection against electric shock in the event of a failure of basic insulation (I-A). It includes insulation between intermediate conductive parts, or metal foil over intermediate insulating surfaces, and:

- accessible conductive parts (class II situation);
- conductive parts connected to accessible conductive parts (class II situation);
- metal foil over accessible insulating surfaces (class II situation)

2.7.12

reinforced insulation

single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in this standard (L-(I)-A). It includes insulation between live parts and:

- accessible conductive parts (class II situation);
- conductive parts connected to accessible conductive parts (class II situation);
- metal foil over accessible insulating surfaces (class II situation)

The term "insulation system" does not imply that the insulation must be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

2.7.13

double insulation

insulation comprising both basic insulation and supplementary insulation (class II situation).

2.7.14 See annex H.

2.7.15

equipotential bonding

provision of electric connections between conductive parts, intended to achieve equipotentiality

[IEV 195-01-10]

The effectiveness of the equipotential bonding depends on the frequency of the current in the bonding.

Equipotential bonding is used to connect any conductive part of a building not forming part of the electrical installation and liable to introduce an electrical potential, generally the electric potential of the local earth (extraneous-conductive part) and any conductive part of controls or equipment or components in the installation which can be touched and which is not normally live but which can become live when basic insulation fails (exposed-conductive part) to a main equipotential bonding terminal in the form of a bar, in order to bring these parts to the same potential. Parts to be connected to the equipotential bonding system include e.g. protective conductors, PE conductors, PEN conductors, earthing conductors, protective earthing terminals of controls or equipment, all conductive parts in a building, e.g. metal tubing for water (drinking and waste), metallic bathtubs, the central heating system piping, any internal gas tubing (which is also required to be isolated from external gas tubing), earth connectors for antennas and telecommunication systems, all metal parts of the building used for construction like mats and iron, and conductors for lightning protection and depending on the installation system, the earth electrode. Requirements for equipotential bonding can be found in the IEC standards for the installation of buildings. These may be relevant for the installation of controls which consist of several component-parts (e.g. sensors, actuators, central control element, interface elements) connected in parallel to or via the fixed installation of the building.

2.7.15.1

protective-equipotential-bonding

equipotential bonding for purposes of safety (protection against electric shock)

[IEV 195-01-15, modified]

Functional equipotential bonding is defined in [IEV 195-01-16]. 

2.8 Definitions relating to component parts of controls

2.8.1

sensing element

that part of the control which is intended to be exposed to the influences of the activating quantity to which the automatic action of a sensing control responds

2.8.2

switch head

complete control, except for any sensing element

If by construction it is impossible to distinguish between the switch head and the sensing element, then the whole control is considered to be the sensing element.

2.8.3

actuating member

that part which is manually moved, pulled, pushed or turned to cause initiation of a control action, or for setting by the user

The term "actuating member" does not include any device such as a set-screw used for setting by the manufacturer if such a device is adequately locked against further movement, or if a tool is required for such setting by the manufacturer.

2.8.4

actuating means

any part which connects the actuating member to the mechanism of the control

2.8.5

pull-cord

flexible actuating member which is pulled to cause actuation

2.8.6

prime mover

any device used to produce the mechanical energy required to provide the transmission for an automatic control, such as an electrically operated control, an electrically operated valve, an electrically operated mechanism or a time-based control

It may be a mechanical storage device (for example a clockwork spring), an electro-magnetic device (for example an electric motor, or stepping solenoid), an electro-thermal device (for example the heating element of an energy regulator) or any other mechanism producing mechanical energy.

2.8.7

clutch

mechanical device by which an actuating member can override either a prime mover or an activating quantity, causing or allowing the initiation or cancellation of an action

2.8.8

cover or cover plate

part which is accessible when the control is mounted as in normal use and which can be removed only with the aid of a tool. It shall not require the use of a special purpose tool for its removal

2.8.9

screwless fixed part (or component)

accessible part (or component) which, after attachment, installation, mounting or assembly into or onto an equipment or another component, or to a specially prepared support, is retained in position by positive means which do not depend on screws. Disassembly or removal may require the use of a tool, either applied directly to the part (or component), or to obtain access to the retaining means

The following are some examples of parts which are not regarded as screwless fixed parts or components:

- parts of components fixed permanently by rivets, glueing or similar means;
- flat, push-on connectors;
- screwless terminals;
- standard plugs and socket-outlets;
- standard appliance couplers, even if such have additional latching devices to prevent a single action uncoupling;
- the replacement of a lamp in a bayonet type lampholder;
- twist-lug construction;
- friction-fit construction.

2.9 Definitions of types of terminals and terminations of controls

2.9.1

pillar terminal

terminal in which the conductor is inserted into a hole or cavity, where it is clamped under the shank of the screw or screws. 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 (see figure 11)

2.9.2

screw terminal

terminal in which the conductor is 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, a clamping plate or an anti-spread device (see figure 10)

2.9.3

stud terminal

terminal in which the conductor is 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, a clamping plate or an anti-spread device (see figure 10)

2.9.4

screwless terminal

terminal in which the connection of the conductor is achieved directly or indirectly by means of springs, wedges, eccentrics, cones or the like

The following are not regarded as screwless terminals:

- terminals requiring the fixing of special devices to the conductors before clamping them in the terminal, for example flat push-on connectors;
- 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.

2.9.5

flat push-on connector

assembly of a tab and a receptacle enabling the connection, at will, of a core or conductor to a control or to another core or conductor

2.9.6**receptacle**

female part of a flat push-on connector intended to be permanently attached to a core or conductor (see figure 16)

2.9.7**tab**

male part of a flat push-on connector (see figures 14 and 15)

2.9.8**in-line tab**

tab intended to be permanently attached to a core or conductor

2.9.9**tab forming part of a control**

tab permanently attached to, or an integral part of, a control

2.9.10**termination**

part by which a conductor can be connected to a control in such a way that its replacement requires either a special purpose tool, a special process or a specially prepared end of the conductor

Soldering requires a special purpose tool. Welding requires a special process. A cable lug attached to a conductor is a specially prepared end.

2.9.11**solder termination**

termination in which the conductor is secured by a mechanical means, and the circuit continuity is assured by solder

2.9.12**saddle terminal**

terminal in which the conductor is clamped under a saddle by means of two or more screws or nuts (see figure 13a)

2.9.13**lug terminal**

screw terminal or stud terminal, intended to clamp a cable lug or bar by means of a screw or nut (see figure 13b)

2.9.14**mantle terminal**

terminal in which the conductor is clamped against the base of a slot in a threaded stud by means of a nut. The conductor is clamped against the base of the slot by a suitably shaped washer under the nut, by a central peg if the nut is a cap nut or equally effective means for transmitting the pressure from the nut to the conductor within the slot (see figure 12)

2.9.15**equipotential bonding terminal**

terminal provided on equipment or on a device and intended for the electric connection with the equipotential bonding system

[IEV 195-02-32]

2.9.16

protective bonding terminal

terminal intended for protective-equipotential-bonding purposes

Examples are a protective screen- or PE-terminal of a control or equipment.

2.9.17

protective conductor

PE

conductor provided for purposes of safety (protection against electric shock)

[IEV 195-02-09, modified] 

2.10 Definitions relating to the connections to controls

2.10.1

external conductor

any cable, flexible cord, core or conductor, a part of which is external to an in-line cord control, an independently mounted control or to an equipment in or on which a control is mounted

Such a conductor may be a supply lead, a function cord or interconnecting cord between different parts of an equipment; or it may form part of the fixed wiring.

2.10.2

fixed wiring

any external conductor which is permanently secured to the fabric of the building such that, in normal use at the point at which the conductor enters the equipment or control, there is no likelihood of any strain being applied to the conductor

Such securing to the fabric of the building may be, for example, by the enclosing of conductors in conduit, burying cables in walls, adequately fixing cables or cords to walls or other surfaces, etc.

2.10.3

internal conductor

any cable, flexible cord, core or conductor which is neither an external conductor, nor an integrated conductor

An example is a conductor inside the equipment to interconnect the control and the equipment.

2.10.4

integrated conductor

conductor which is inside a control, or is used to permanently interconnect terminals or terminations of a control

2.10.5

detachable cord

flexible external cord connected to a control or equipment by means of an equipment inlet, or plug and socket arrangement

2.10.6

non-detachable cord

flexible external conductor connected to, or assembled to, a control according to one of the following methods

2.10.6.1

type X attachment

method of attachment such that the cord can be easily replaced without special-purpose tools, using standard cords without any special preparation

2.10.6.2**type M attachment**

method of attachment such that the cord can be easily replaced without special purpose tools, but is intended to use only a special cord, such as one with a moulded-on cord guard, or one with special prepared ends

This attachment method does not apply if it is possible to fit a standard cord during servicing unless such is permitted by a particular equipment standard.

2.10.6.3**type Y attachment**

method of attachment of the supply cord such that any replacement is intended to be made by the manufacturer, its service agent or a similar qualified person

2.10.6.4**type Z attachment**

method of attachment such that the flexible cable or cord cannot be replaced without breaking or destroying a part of the control

2.10.7**flying lead (pigtail)**

wire or wires intended for the connection of the control, with one end permanently connected to the control by the control manufacturer

2.11 Definitions relating to the performance of Type 2 actions**2.11.1****manufacturing deviation**

maximum difference of operating value, operating time or operating sequence which is claimed between any two controls, supplied by the manufacturer to a unique type reference, when tested as submitted and in the same manner

The difference may be related to an absolute value if permitted by the appropriate subclause of clause 15.

2.11.2**drift**

maximum alteration of operating value, operating time or operating sequence of any one sample which can occur when it is tested under the conditions specified in this standard

The alteration may be related to an absolute value, or combined with the manufacturing deviation, if permitted by the appropriate subclause of clause 15.

2.12 Definitions relating to the requirements for creepage distances and clearances**2.12.1****clearance**

shortest distance through air between two conductive parts, or between a conductive part and a metal foil in contact with a surface of insulating material

The method of measurement is detailed in annex B and figure 17.

2.12.2**creepage distance**

shortest distance along the surface of the insulating material between two conductive parts, or between a conductive part and a metal foil in contact with any accessible surface of insulating material

The method of measurement is detailed in annex B and figure 17.

2.12.3 Void

2.12.4 Void

2.12.5 Void

2.12.6 Void

2.12.7 Void

2.12.8
pollution

any addition of foreign matter, solid, liquid, or gaseous that can result in a reduction of electric strength or surface resistivity of the insulation

2.12.9 environment

2.12.9.1
macro-environment

the environment of the room or other location in which the equipment is installed or used

2.12.9.2
micro-environment

the immediate environment of the insulation which particularly influences the dimensioning of the creepage distances

2.12.9.3
pollution degree

a numeral characterizing the expected pollution of the micro-environment

NOTE – Pollution degrees 1, 2, 3, and 4 are used. See annex N.

2.13 Miscellaneous definitions

2.13.1
unique type reference

marking such that by quoting it in full to the manufacturer of the control, a replacement can be supplied which will be fully interchangeable with the original, electrically, mechanically, dimensionally and functionally

2.13.2
tool

screwdriver, a coin or any other object which may be used to operate a nut, a screw or similar part

2.13.3
special-purpose tool

tool which is unlikely to be readily available in a normal household, for example, a key for a hexagonal socket-headed screw. Tools such as coins, screwdrivers and spanners intended to operate square, or hexagonal nuts, are not special-purpose tools

2.13.4**normal use**

use of the control, or its associated equipment, for the purpose for which it was made, and in the manner intended by the manufacturer

Normal use includes any overload, or abnormal operating conditions specified in the equipment standard.

Normal use does not include any process which is necessary to maintain the control or equipment in good order, even though this may be carried out by the user according to the manufacturer's instructions.

2.13.5**user maintenance**

any periodic process necessary to maintain the control, or equipment, in good order, for which details are given in the manufacturer's instructions to the user

2.13.6**servicing**

any process necessary to maintain a control, or equipment, in good order, that would be done by a competent person, such as in a workshop, by an electrician or by a service organization. This includes replacing a flexible cord, thermal link or the like

2.13.7**manufacturer servicing**

servicing which can only be done by the manufacturer, or his accredited serviceman. This may be due to the need for special tools, or special instrumentation, and includes the setting by the manufacturer

2.14 Definitions relating to manufacturer and user**2.14.1****control manufacturer**

manufacturer of the control

2.14.2**equipment manufacturer**

manufacturer of equipment in which, on which, or together with which the control is used

 Text deleted 

2.14.3**installer**

person qualified to install the control and possibly the associated equipment

2.14.4**user**

one who uses the control with the aid of documentation (user maintenance) during its normal life. The user is considered a layman.

2.15 Definitions pertaining to thermistors

See annex J.

2.16 Definitions relating to the structure of controls using software

See annex H.

2.17 Definitions relating to error avoidance in controls using software

See annex H.

2.18 Definitions relating to fault/error control techniques for controls using software

See annex H.

2.19 Definitions relating to memory tests for controls using software

See annex H

2.20 Definitions of software terminology – General

See annex H.

3 General requirements

Controls shall be so designed and constructed that in normal use they function so as not to cause injury to persons or damage to surrounding property, even in the event of such carelessness as may occur in normal use.

In general, compliance is checked by carrying out the relevant tests specified in this standard and the appropriate part 2.

4 General notes on tests

Tests according to this standard are type tests.

[A1] If the results of any of the prescribed tests can be determined beyond doubt by assessment, then the test or tests need not be performed.

See also annex H. The requirements of annex H are not applicable to non-electronic controls, unless specified in an appropriate part 2 of this standard. **[A1]**

4.1 Conditions of test

4.1.1 *Unless otherwise specified in this standard, the samples are tested as delivered, having been mounted as declared by the manufacturer, but, when significant, in the most unfavourable position.*

4.1.2 *If the test results are influenced by the room temperature, this shall be maintained at $(20 \pm 5) ^\circ\text{C}$, except that in cases of doubt, it shall be maintained at $(23 \pm 2) ^\circ\text{C}$, unless otherwise specified in a particular clause.*

4.1.3 *Actuating members are placed in the most unfavourably located position, intermediate position or position of setting by the user, unless other instructions are given in a particular clause.*

4.1.4 *Unless otherwise specified in this standard, the tests are carried out in the order of the clauses of this standard.*

See also annex H.

4.1.5 *During the tests of this standard, actuation may be performed by test equipment if so desired, except for the high-speed tests of 17.12.*

4.1.6 *During and for the purpose of the tests of this standard, other than for the tests of 17.12, the actuating means can be used to actuate the control, if an actuating member is not supplied by the manufacturer.*

4.1.7 *The rates of temperature change declared in 7.2 and used in clause 17 (that is α_1 , β_1 , α_2 and β_2) shall have test tolerances of ± 12 K/h.*

For other activating quantities, the minimum and/or maximum rates of change declared in requirement 37 of table 7.2 and used in clause 17 (that is α_1 , β_1 , α_2 and β_2) shall have test tolerances as specified in the appropriate part 2.

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

4.1.9 to 4.1.11 See annex H.

4.2 Samples required

4.2.1 *One sample is used for the tests in clauses 5 to 11 and 18 to 23 inclusive. A set of three samples is subjected to the remaining tests.*

If one sample does not comply with the tests of clauses 12 to 17 inclusive, the test which caused the non-compliance, and those preceding which may have influenced the result of that test, are repeated on another set of identical samples, all of which shall then comply with the repeated tests.

The manufacturer may submit, together with the first set of samples, the additional set or sets which may be wanted should one sample not comply. The testing authority will then, without further request, test the additional samples, and will only reject if a further non-compliance occurs. If the additional sets of samples are not submitted at the same time, a non-compliance of one sample may entail a rejection.

 Text deleted 

4.2.2 *Void*

4.2.3 *Additional samples may be required for some destructive tests of this standard.*

4.2.4 *Controls which are intended to meet the requirements of more than one part 2 document shall, in general, be tested to each part 2 separately.*

By agreement between manufacturer and testing authority, requirements and tests which are common to more than one part 2, need only be checked once, unless the common tests may influence the results of any specific tests.

4.3 Instructions for test

4.3.1 According to submission

4.3.1.1 *Controls, if submitted in or with an equipment, may either be tested in or with the equipment, in which case they are classified as for declared specific load or tested separately, in which case they may be classified as for declared specific load, resistive load or resistive and inductive load. In either of the latter two cases, the current in the appropriate circuit when the equipment is operating under normal load, is regarded as the rated current of the circuit.*

4.3.1.2 *For all controls submitted, in, on or with an equipment, all other relevant information as required by 7.2 may be obtained by inspection and measurement of the submitted equipment.*

4.3.1.3 *Integrated controls are classified as for declared specific load and are tested in the equipment, or part thereof, for which they are intended.*

4.3.1.4 *Controls not submitted in or with an equipment are tested separately.*

4.3.1.5 *Controls for use with non-detachable cords are tested with the appropriate cord connected.*

4.3.2 According to rating

4.3.2.1 *Controls for a.c. only are tested with a.c. at rated frequency if declared; those for d.c. only are tested with d.c. and those for a.c./d.c. at the more unfavourable supply.*

4.3.2.2 *Controls for a.c. only, which are not declared for a rated frequency, are tested at either 50 Hz or 60 Hz whichever is the more unfavourable. Controls with a rated frequency within a declared range other than 50 Hz to 60 Hz are tested at the most unfavourable frequency within the marked or declared range.*

4.3.2.3 *When testing controls intended for d.c. only, the possible influence of polarity on the operation of the control is taken into consideration.*

4.3.2.4 *For controls with different a.c. and d.c. ratings the tests for clauses 12, 13, 14 and 17, are made on two sets of samples, one being tested according to the a.c. rating, and the other according to the d.c. rating.*

At the option of the testing authority a reduced number of tests may be made to cover the various ratings.

4.3.2.5 *Unless otherwise specified, controls declared for one or more voltage ranges, shall be tested at the most unfavourable voltage within the declared range, and this voltage being multiplied by the factor indicated in the appropriate clause (see 4.3.2.7).*

4.3.2.6 *For controls marked or declared for more than one rated voltage or rated current, the tests of clause 17 are made on sets of samples for each combination of rated voltage and rated current.*

At the option of the testing authority a reduced number of tests may be made to cover the various ratings.

4.3.2.7 *For controls declared for a voltage range, tests are made on one set of samples at each limit of the range, unless the difference between the limits does not exceed 10 % of the mean value of the range, in which case the tests are made on one set of samples at the upper limit of the range.*

4.3.2.8 *Controls intended to be operated from a specific supply, are tested with that specific supply.*

4.3.3 According to protection against shock

4.3.3.1 *If in class 0, class 0I or class I controls, or in controls for class 0, class 0I or class I equipment, it is necessary to have parts with double insulation or reinforced insulation, such parts are checked for compliance with the appropriate requirements specified for class II controls.*

[C] See annex ZB **[C]**

4.3.3.2 *In any class I control, and in any control used in a class I equipment, unearthed accessible metal or accessible insulating surfaces shall be provided with insulation complying with the requirements for a class II control (see 9.1.1).*

4.3.3.3 *If in class 0, class 0I, class I or class II controls, or controls for class 0, class 0I, class I or class II equipment, it is necessary to have parts using SELV-circuits, such parts are also checked for compliance with the appropriate requirements specified for protection by use of SELV in 11.2.6.*

If in class I controls or controls for class I equipment it is necessary to have parts using PELV-circuits, such parts are also checked for compliance with the appropriate requirements specified for protection by use of PELV in Clause 11.2.6.

By definition (2.7.5) class II controls cannot use PELV-circuits. **A2**

C See annex ZB **C**

4.3.4 According to manufacturing variants

4.3.4.1 *Controls which are otherwise identical but which may be set by the manufacturer, or which may, by the inclusion at the manufacturing stage of alternative components or parts produce various operating values, operating times or operating sequences, are for the purpose of this standard normally treated as a single submission. Normally, controls set to the most arduous condition will be sufficient. However, the testing authority may require extra samples, set to other values, where it can be clearly shown that these are necessary to allow approval of the whole range.*

4.3.4.2 *In these cases due attention shall be paid to possible variations in manufacturing deviation and drift of any operating value, operating time or operating sequence, and, for sensing controls, to the minimum and maximum acceptable rates of rise and fall of the appropriate activating quantity which may be applicable to different parts of the range.*

4.3.5 According to purpose

4.3.5.1 *Multi-purpose controls shall, according to 6.3, in general be tested for each purpose separately. During the tests for any one purpose, the activating quantities and prime movers applicable to all other purposes, shall be maintained constant at the most arduous value or position within the declared range or ranges.*

4.3.5.2 *Such controls without an appropriate section of clause 17 shall be tested in a manner agreed between the manufacturer and the testing authority so that the essential intended operating values, operating times and operating sequences are tested.*

4.3.5.3 *Any control with a purpose not classified in 6.3, or in the appropriate part 2, may be tested and approved to this specification, except for clause 17. A test schedule for clause 17 shall be based, wherever possible, on the intent of that clause and shall be agreed between the manufacturer and the testing authority.*

4.3.5.4 *See annex J.*

5 Rating

5.1 Maximum rated voltage

C The rated voltage of controls, having terminals intended to be directly connected to the supply mains single phase, shall cover usage at 230 V and to the supply mains multi-phase, 400 V. **C**

5.2 Maximum rated current

The maximum rated current is 63 A.

5.3 Compliance

Compliance with 5.1 and 5.2 is checked by the information requirements in clause 7.

6 Classification

A control is classified:

6.1 According to nature of supply

6.1.1 Control for a.c. only

A control for a.c. only may be used on a d.c. circuit provided that the current does not exceed 10 % of the rated current for a.c., or 0,1 A, whichever is smaller.

 Additional tests may be required to establish the d.c. rating. 

6.1.2 Control for d.c. only.

6.1.3 Control for a.c. and d.c.

6.1.4 Control for specific supplies or multiple supplies.

6.2 According to type of load to be controlled by each circuit of the control

A control having more than one circuit need not have the same classification for each circuit.

6.2.1 Circuit for a substantially resistive load with a power factor not less than 0,95.

Such circuits may be used for an inductive load, provided that the power factor is not less than 0,8, and the inductive load does not exceed 60 % of the current rating for the resistive load. Such circuits may also be used for other reactive loads provided that the reactive current does not exceed 5 % of the rated resistive current, and that the load is not greater than 10 VA.

6.2.2 Circuit suitable for either a resistive load or for an inductive load with a power factor not less than 0,6 or a combination of both.

An example is a circuit in a fan-heater which incorporates both a heating element and a motor.

Circuits intended for inductive loads only may either be classified under this subclause by declaring that the resistive load is equal to the inductive load, or may be classified as for a declared specific load.

6.2.3 Circuit for declared specific load

Examples are circuits for tungsten filament or fluorescent lamp loads, highly inductive loads with a power factor of less than 0,6, capacitive loads, and contacts intended to be operated off load.

6.2.4 Circuit for a current less than 20 mA

Examples are circuits for neon indicators and other signal lamps.

6.2.5 Circuit for a.c. motor load whose characteristics are defined by the control manufacturer's declaration.

6.2.6 Circuit for pilot load.

6.3 According to their purpose

A control may be classified for more than one purpose, in which case it is referred to as a multi-purpose control.

Any manual action of an automatic control or a separate manual action being integral with an automatic control is not classified according to this subclause.

- 6.3.1** – thermostat;
- 6.3.2** – temperature limiter;
- 6.3.3** – thermal cut-out;
- 6.3.4** Void
- 6.3.5** – energy regulator;
- 6.3.6** – timer;
- 6.3.7** – time switch;
- 6.3.8** – manual control;
- 6.3.9** – sensing control (other than one covered by 6.3.1 through 6.3.4);
- 6.3.10** – electrically operated control;
- 6.3.11** – motor protector;
- 6.3.11.1** – thermal motor protector;
- 6.3.12** – electrically operated valve;
- 6.3.13** – electrically operated mechanism;
- 6.3.14** – protective control;
- 6.3.15** – operating control.

Further classification can be found in the appropriate part 2.

6.4 According to features of automatic action

- 6.4.1** – Type 1 action;
- 6.4.2** – Type 2 action.

6.4.3 Type 1 actions and Type 2 actions are further classified according to one or more of the following constructional or operational features:

These further classifications are only applicable if the relevant declarations have been made and any appropriate tests completed.

An action providing more than one feature may be classified by a combination of the appropriate letters, for example, Type 1.C.L. or Type 2.A.E.

A manual action is not classified according to this subclause.

- 6.4.3.1 – full-disconnection on operation (Type 1.A or 2.A);
- 6.4.3.2 – micro-disconnection on operation (Type 1.B or 2.B);
- 6.4.3.3 – micro-interruption on operation (Type 1.C or 2.C);

See also annex J.

- 6.4.3.4 – a trip-free mechanism which cannot even momentarily be reclosed against the fault (Type 1.D or 2.D);
- 6.4.3.5 – a trip-free mechanism in which the contacts cannot be prevented from opening or maintained closed against a continuation of the fault (Type 1.E or 2.E);

An example is a current-sensing control which has to be reclosed or can be reclosed momentarily to detect that the excess current fault still exists.

- 6.4.3.6 – an action which can only be reset by the use of a tool (Type 1.F or 2.F);
- 6.4.3.7 – an action which is not intended to be reset under electrically loaded conditions (Type 1.G or 2.G);
- 6.4.3.8 – a trip-free mechanism in which the contacts cannot be prevented from opening and which may automatically be reset to the "closed" position after normal operation conditions have been restored if the reset means is held in the "reset" position (Type 1.H or 2.H);
- 6.4.3.9 – a trip-free mechanism in which the contacts cannot be prevented from opening and the control is not permitted to function as an automatic reset device if the reset means is held in the "reset" or "on" position (Type 1.J or 2.J);
- 6.4.3.10 – for sensing actions, no increase in the operating value as the result of a breakage in the sensing element, or in parts connecting the sensing element to the switch head (Type 1.K or 2.K);
- 6.4.3.11 – an action that does not require any external auxiliary energy source of electrical supply for its intended operation (Type 1.L or 2.L);
- 6.4.3.12 – an action which operates after a declared ageing period (Type 1.M or 2.M).
- 6.4.3.13 See annex H.

 6.4.3.14 See Annex J, J.6.4.3.14. 

6.5 According to the degree of protection and control pollution degree

6.5.1 According to degrees of protection provided by enclosures against ingress of solid objects and dust (see IEC 60529).

 IP0X, IP1X, IP2X, IP3X, IP4X, IP5X, IP6X. 

6.5.2 According to degree of protection provided by enclosures against harmful ingress of water (see IEC 60529):

Ⓐ2 IPX0, IPX1, IPX2, IPX3, IPX4, IPX5, IPX6, IPX7, IPX8. Ⓐ2

A control intended for use in a particular environment may be used for a different environment if the appropriate provisions, if any, are made in the equipment.
Preferred combinations of degrees of protection according to 6.5.1 and 6.5.2:

First characteristic numeral Protection against ingress of foreign bodies	Second characteristic numeral Protection against ingress of water							
	0	1	2	3	4	5	6	7
0	IP00							
1								
2	IP20	IP21						
3								
4		IP41		IP43	IP44			
5					IP54	IP55		
6						IP65		IP67

6.5.3 According to the pollution degree or degrees for which the control is declared. See annex N

NOTE – It is possible that when a control is mounted in accordance with the manufacturer’s declaration, different parts of the control may be in macro-environments having different pollution degrees.

6.6 According to method of connection

6.6.1 Control with at least one terminal intended for the connection of fixed wiring.

Ⓒ Text deleted Ⓒ

6.6.2 Control with at least one terminal intended for the connection of a flexible cord.

A control may be classified under both 6.6.1 and 6.6.2

6.6.3 Control without any terminals intended for the connection of an external conductor.

This type of control is intended for the connection of only integrated or internal conductors.

6.7 According to ambient temperature limits of the switch head

6.7.1 Control with a switch head for use in an ambient temperature between a minimum value (T_{min}) of 0 °C, and a maximum value (T_{max}) of 55 °C.

6.7.2 Control with a switch head intended to be used in an ambient temperature having a maximum value (T_{max}) other than 55 °C but no less than 30 °C, or a minimum value (T_{min}) lower than 0 °C, or both.

Preferred values of T_{max} are 30 °C, 55 °C, 70 °C, 85 °C, 105 °C, 125 °C, 150 °C. Preferred values of T_{min} are 0 °C, –10 °C, –20 °C, –30 °C, and –40 °C.
Values differing from these preferred values are allowed.

6.8 According to protection against electric shock

6.8.1 For an integrated control:

An integrated control is not classified but takes the classification of the equipment with which it is integrated.

6.8.2 For an incorporated control for use in:

- 6.8.2.1 – class 0 equipment;  See annex ZB 
- 6.8.2.2 – class 0I equipment;  See annex ZB 
- 6.8.2.3 – class I equipment;
- 6.8.2.4 – class II equipment;
- 6.8.2.5 – class III equipment.

 For coordination of electrical equipment class 0, class I, class II and class III see IEC 61140, and for protective provisions within an electrical installation see IEC 60364.

A control intended for incorporation in a particular class of equipment may be used for a different class if appropriate provisions are made in the equipment. 

6.8.3 For an in-line cord control, a freestanding control, or an independently mounted control:

- 6.8.3.1 – of class 0;  See annex ZB 
- 6.8.3.2 – of class 0I;  See annex ZB 
- 6.8.3.3 – of class I;
- 6.8.3.4 – of class II;
- 6.8.3.5 – of class III.

 For coordination of electrical equipment class 0, class I, class II and class III see IEC 61140, and for protective provisions within an electrical installation see IEC 60364.

A control intended for incorporation in a particular class of equipment may be used for a different class if appropriate provisions are made in the equipment.

6.8.4 Controls using SELV or PELV for protection against electric shock

6.8.4.1 Controls using SELV-circuit(s), and if applicable, the information declared in Table 7.2, requirement 86

6.8.4.2 Controls using PELV-circuit(s), and if applicable, the information declared in Table 7.2, requirement 86 

6.9 According to circuit disconnection or interruption:

- 6.9.1 – full-disconnection;
- 6.9.2 – micro-disconnection;
- 6.9.3 – micro-interruption;
- 6.9.4 – all-pole disconnection;
- 6.9.5 – See annex H.

Some equipment standards may require full-disconnection, others may permit either full-disconnection or micro-disconnection; some may only require micro-interruption.

Different actions of a control may provide different circuit disconnections or interruptions.

6.10 According to number of cycles of actuation (M) of each manual action

Preferred values are:

- 6.10.1 – 100 000 cycles;
- 6.10.2 – 30 000 cycles;
- 6.10.3 – 10 000 cycles;
- 6.10.4 – 6 000 cycles;
- 6.10.5 – 3 000 cycles ¹⁾ ;
- 6.10.6 – 300 cycles ¹⁾ ;
- 6.10.7 – 30 cycles ¹⁾ .

¹⁾ Applicable only to actions of controls for specific equipment and applications such as voltage-tap controls, summer/winter controls for water heaters and where permitted by the appropriate equipment standard.

For controls with more than one manual action, a different value may be declared for each. If a control has more than one intended "OFF" position, then a cycle of actuation shall be regarded as a movement from one "OFF" position to the next "OFF" position.

6.11 According to number of automatic cycles (A) of each automatic action

Preferred values are:

- 6.11.1 – 300 000 cycles;
- 6.11.2 – 200 000 cycles;
- 6.11.3 – 100 000 cycles;
- 6.11.4 – 30 000 cycles;
- 6.11.5 – 20 000 cycles;
- 6.11.6 – 10 000 cycles;
- 6.11.7 – 6 000 cycles;
- 6.11.8 – 3 000 cycles ¹⁾;
- 6.11.9 – 1 000 cycles ¹⁾;
- 6.11.10 – 300 cycles ²⁾ ;
- 6.11.11 – 30 cycles ²⁾⁴⁾ ;
- 6.11.12 – 1 cycle ³⁾ .

¹⁾ Not applicable to thermostats or to other fast cycling actions.

²⁾ Applicable only to manual reset.

³⁾ Applicable only to actions which require the replacement of a part after each operation.

⁴⁾ Can only be reset during manufacturer servicing.

For controls having more than one automatic action, a different value may be declared for each.

6.12 According to temperature limits of the mounting surface of the control

6.12.1 Control suitable for mounting on a surface which is not more than 20 K above the ambient temperature classified in 6.7.

6.12.2 Control suitable for mounting on a surface which is more than 20 K above the ambient temperature classified in 6.7.

An example of such a control is one mounted on a compressor unit in a refrigerator, where the mounting surface may be 150 °C, although the sensing element is at a temperature of -10 °C, and the ambient temperature is only 30 °C.

6.13 According to value of proof tracking index (PTI) for the insulation material used

6.13.1 – material of material group IIIb with a PTI of 100 and up to but excluding 175;

6.13.2 – material of material group IIIa with a PTI of 175 and up to but excluding 400;

6.13.3 – material of material group II with a PTI of 400 and up to but excluding 600;

6.13.4 – material of material group I with a PTI of 600 and over.

6.14 According to period of electrical stress across insulating parts supporting live parts and between live parts and earthed metal

6.14.1 – short period;

6.14.2 – long period.

Long periods of electrical stress are considered to exist if the control is used in an equipment for continuous use; and also for the supply side of a control in any other equipment unlikely to be disconnected from the supply by the removal of a plug or by the operation of a control providing full disconnection.

6.15 According to construction:

6.15.1 – integrated control;

6.15.2 – incorporated control;

6.15.3 – in-line cord control;

6.15.3.1 – free-standing control;

6.15.4 – independently mounted control for:

6.15.4.1 – surface mounting;

6.15.4.2 – flush mounting;

6.15.4.3 – panel mounting.

6.15.5 See annex J.

6.16 According to ageing requirements (Y) of the equipment in which, or with which, the control is intended to be used

6.16.1 – 60 000 h;

6.16.2 – 30 000 h;

6.16.3 – 10 000 h;

6.16.4 – 3 000 h;

6.16.5 – 300 h;

6.16.6 – 15 h.

Controls which operate during the heating or endurance tests of the equipment standard are not classified according to this subclause.

6.17 According to use of the thermistor

See annex J.

6.18 According to software class

See annex H.

7 Information**7.1 General requirements**

The control manufacturer shall provide adequate information to confirm:

- that a suitable control can be selected;
- that the control can be mounted and used in a manner that will enable it to meet the requirements of this standard; and
- that the relevant tests can be performed to determine compliance with this standard.

7.2 Methods of providing information

7.2.1 Information shall be provided using one or more of the following methods. The information required for controls and the appropriate method for providing this information shall be as indicated in table 7.2.

It is not intended that table 7.2 itself necessarily be the actual form used to communicate between manufacturer and test house.

- By marking (C) – this information shall be provided by marking on the control itself, except that, in the case of an integrated control, such marking can be on an adjacent part of the equipment, provided that it is clear that it refers to the control.

Information provided by marking (C) may also be included in documentation (D).

- By documentation (D) – this information shall be provided for the user or installer of the control, and shall consist of legible instructions. Each control shall be accompanied by such instructions. Instruction sheets and other texts required by this standard shall be written in the official language(s) of the country in which the control is to be sold.

For controls intended to be exclusively delivered to the equipment manufacturer, the instruction sheet may be replaced by a leaflet, letter or drawing, etc. It is not necessary for each control to be accompanied by such a document.

- By declaration (X) – this information shall be provided for the testing authority for purposes of test and in a manner agreed between testing authority and manufacturer. It may, for example, be provided by a marking on the control, by a leaflet, letter or drawing or, in the case of a control submitted in, on or with an equipment, by measurement or inspection of the submitted equipment.

Information which is indicated as being required by declaration (X) should also be provided to the equipment manufacturer, as appropriate.

7.2.2 Information which is indicated as being required by marking (C) or by documentation (D) shall also be provided for the testing authority in an agreed manner if so requested by the testing authority.

7.2.3 For controls submitted in, on or with an equipment, the requirement for documentation (D) is replaced by declaration (X).

7.2.4 For an integrated control forming part of a more complex control, the marking relating to the integrated control may be included in the marking of the more complex control.

7.2.5 The requirement for documentation (D) is considered to be met if such information has been provided by marking (C).

7.2.5.1 The requirement for declaration (X) is considered to be met if such information has been provided by either documentation (D) or by marking (C).

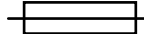
7.2.6 Except as indicated in 7.4, for integrated controls all information is provided by means of declaration (X). Unless otherwise indicated in a part 2, for incorporated controls, the only marking required is the manufacturer's name or trade mark and the unique type reference, if other required marking is provided by documentation (D). For incorporated controls declared under item 50, see the explanation of documentation (D) contained in 7.2.1.

7.2.7 For controls that are neither integrated nor incorporated, where lack of space prevents legible marking as specified, the control shall be marked with the manufacturer's name (or trade mark) and the unique type reference only. The other marking required shall be included in documentation (D).

7.2.8 Additional marking or information is allowed, provided that it does not give rise to misunderstanding.

7.2.9 When symbols are used, they shall be as follows:

Amperes.....	A
Volts	V
Watts	W
Volts-amperes	VA
Alternating current (single-phase)	~
Alternating current (three-phase)	3~
Alternating current (three-phase with neutral).....	3N~
Direct current	— — —

Class II construction	
 Class III control.....	 
Ambient temperature limits of switch head T	(The letter T preceded by a minus sign and the numerical value of the lower temperature if T_{min} less than 0 °C, or followed by the numerical value of the higher temperature if T_{max} other than 55 °C.)
Rated current of the appropriate fuse in amperes	 A
Frequency	Hz
 Earthing terminal.....	 

For identification of the degree of protection provided by enclosures, the symbols shown in 6.5 shall be used.

Information about rated current and rated voltage may be provided by using figures alone, the figure for the rated current preceding or above that for the rated voltage and separated from it by a line. For circuits for resistive load and inductive loads, the rated current for inductive load is placed between parentheses and immediately following the rated current for resistive load. The symbol for the nature of the supply is placed after the current and voltage.

Current, voltage and nature of supply may be indicated as follows:

$$16 (3) \text{ A } 250 \text{ V } \sim \text{ or } 16 (3) / 250 \sim \text{ or } \frac{16 (3)}{250} \sim$$

The following are examples of ways to provide information about the temperature limits of a control:

– 20T 30 (meaning minus 20 °C up to plus 30 °C)

T85 (meaning 0 °C up to plus 85 °C)

Information concerning declared specific loads may be given by reference to drawings or to types, for example:

"Electric motor, drawing No. ..., part list No. ..., made by..." or "5 x 80 W fluorescent".

Table 7.2

Information	Clause or subclause	Method
1 Manufacturer's name or trade mark ²⁾	7.2.6	C
2 Unique type reference ¹⁾²⁾	2.11.1, 2.13.1, 7.2.6	C
3 Rated voltage or rated voltage range in volts (V)	 2.1.2, 4.3.2   14.4 	C
4 Nature of supply unless the control is for both a.c. and d.c., or unless the rating is the same for a.c. and d.c.	4.3.2, 6.1	C
5 Frequency if other than for range 50 Hz to 60 Hz inclusive	4.3.2	C
6 Purpose of control	2.2, 4.2.4, 4.3.5, 6.3, 17.16	D
6a Construction of control and whether the control is electronic	6.15, annex H, H.2.5.7	D
7  The type of load controlled by each circuit ⁷⁾ 	6.2, 14, 17, 23.1.1	C
15 Degree of protection provided by enclosure ⁸⁾	6.5.1, 6.5.2 11.5	C
17 Which of the terminals are suitable for the connection of external conductors, and if they are suitable for line or neutral conductors, or both	6.6, 7.4.2 7.4.3	C
18 Which of the terminals for external conductors are for a wider range of conductor sizes than those indicated in the table of 10.1.4.	10.1	D

Table 7.2 (continued)

Information	Clause or subclause	Method
19  For screwless terminals the method of connection and disconnection 	10	D
20 Details of any special conductors which are intended to be connected to the terminals for internal conductors	 10.2.1 	D
21 Maximum temperature of terminals for internal conductors and terminals for external conductors of incorporated and integrated controls, if higher than 85 °C	14	X
22 Temperature limits of the switch head, if T_{min} lower than 0 °C or T_{max} other than 55 °C	6.7, 14.5 14.7, 17.3	C
23 Temperature limits of mounting surfaces (T_s)  if more than 20 K above T_{max} 	6.12.2, 14.1, 17.3	C
24 Classification of control according to protection against electric shock	6.8	X
25 For Class II controls, the symbol for Class II construction	7.3	C
26 Number of cycles of actuation (M) for each manual action	6.10, 17.10, 17.11	X
27 Number of automatic cycles (A) for each automatic action	6.11, 17.8, 17.9	X
28 Ageing period (Y) for controls with Type 1M or 2M action	6.16, 17.6	X
29 Type of disconnection or interruption provided by each circuit	2.4.1, 2.4.2, 2.4.3, 2.4.4, 6.9	X
 30 PTI of materials used for insulation	6.13, Table 20.3, note 2, Table 20.4, note 1, 21.2.7	X 
31 Method of mounting control ⁵⁾	11.6	D
31a Method of providing earthing of control	7.4.3, 9, 9.1.1, 9.1.2	D
32 Method of attachment for non-detachable cords ⁶⁾	10.1, 11.7	D
33 Intended transportation condition of control ²⁰⁾	16.1	X
34 Details of any limitation of operating time ²¹⁾	14, 17	D
35 Period of electric stress across insulating parts	6.14	X
36 Limits of activating quantity for any sensing element over which micro-disconnection is secure (see also H.7.2, item 36)	11.3.2	X
37 Minimum and/or maximum rates of change of actuating quantity, or minimum and/or maximum cycling rates for a sensing control ⁴⁾	4.1.7, 15, 17	X
38 Values of overshoot of activating quantity for sensing controls which are necessary for correct action, or which can be used for test purposes	17	X
39 Type 1 or Type 2 action	6.4	D
40 Additional features of Type 1 or Type 2 actions	6.4.3, 11.4	D
41 Manufacturing deviation and condition of test appropriate to deviation	2.11.1, 11.4.3, 15 17.14	X
42 Drift	2.11.2, 11.4.3, 15, 16.2.4	X
43 Reset characteristics for cut-out action ³⁾	6.4	D
44 If a control is either to be hand-held or is intended for a hand-held equipment	21	X
45 Any limitation to the number or distribution of flat push-on receptacles which can be fitted	10.2.4.4	D
46 Operating sequence for controls with more than one circuit, if significant	11.4.3	D

Table 7.2 (continued)

Information	Clause or subclause	Method
47 Extent of any sensing element	2.8.1	D
48 Operating value (or values) or operating time	2.3.11, 2.3.12, 6.4.3.10, 11, 14, 15.6, 17	D
49 A_1 Control pollution degree A_1	6.5.3	D
50 Control intended to be delivered exclusively to the equipment manufacturer	7.2.1, 7.2.6	X
51 Heat and fire resistance category	21	X
52 to 60 See annex H		
61 to 65 C See annex J C		
66 to 74 See annex H		
75 Rated impulse voltage	2.1.12, 20.1	D
76 Type of printed circuit board coating	Annex P or Annex Q	X
77 Temperature for the ball pressure test	21.2.5	D
A_1 78 Maximum declared torque on single bush mounting using thermoplastic material	Table 19.1, note 1	D
A_2 79 Pollution degree in the micro-environment of the creepage or clearance if cleaner than that of the control, and how this is designed	Table H.27.1	D A_2
80 Rated impulse voltage for the creepage or clearance if different from that of the control, and how this is ensured	Table H.27.1	D
81 The values designed for tolerances of distances for which the exclusion from fault mode "short" is claimed	Table H.27.1	D A_1
A_2 82 to 84 See Annex J		
85 For Class III controls, the symbol for Class III construction	7.4.6	C
86 For SELV or PELV circuits, the ELV limits realized	2.1.5, T.3.2	D
87 Value of accessible voltage of SELV/PELV circuit, if different from 8.1.1, product standard referred to for the application of the control, in which standard(s) the accessible SELV/PELV level(s) is (are) given	2.1.4, 6.8.4.1, 6.8.4.2, 8.1.1	D
88 See Annex U		A_2
Items 8 to 14, inclusive, are void NOTES 1) The unique type reference shall be such that, when it is quoted in full, the manufacturer of the control can supply a replacement which will be fully interchangeable with the original electrically, mechanically, dimensionally, and functionally. It may comprise a series type reference with other marking, such as voltage rating or an ambient temperature marking, which together provide a unique type reference. 2) Void 3) The manufacturer may declare a time before which, or a specific value of activating quantity above which, manual reset shall not occur. 4) α_1 = minimum rising rate β_1 = minimum falling rate The rate of change (α_1 and β_1) of the activating quantity are those applicable to normal use. α_1 = maximum rising rate (for Type 2 actions only) β_1 = maximum falling rate (for Type 2 actions only)		

Table 7.2 (concluded)

For test purposes, α_1 and β_1 shall be as declared but not lower than the limit(s) indicated in the appropriate Part 2s for Type 1 actions and/or Type 2 actions. The values α_1 and β_1 are for test purposes only, and may alternatively be declared as a maximum cycling rate. The rates of change for the purpose of this standard shall be expressed in the units as shown in the following table*:

Activating quantity	Unit for rate of change
Pressure	Pa/s
Temperature	K/h
Position	mm/s
Illumination	lux/s
Velocity	mm/s ²
Liquid level	mm/s
Current	A/s
Humidity	α_1 %/s α_1
Air flow	m ³ /s ²

α_1 * When using other activating quantities, the units shall be expressed in SI-units. α_1

- 5) If, for independently mounted controls, it is necessary to take special precautions when installing or using the control, these details shall be given in an instruction sheet accompanying the control.

Special precautions may be necessary, for example, for flush mounting independently mounted controls. In order to ensure that, after building-in, the conditions necessary to meet the requirements of this standard are achieved, the instruction sheet for such controls shall include clear information concerning:

- the dimensions of the space to be provided for the control;
- the dimensions and position of the means for supporting and fixing the control within this space;
- a minimum clearance between the various parts of the control and the surrounding parts of the fitment;
- the minimum dimensions of ventilating openings and their correct arrangements;
- the connection of the control to the supply and the interconnection of separate components, if any.

If the supply conductors of a control can come into contact with parts of a terminal block or a compartment for fixed wiring, and these parts have, under conditions of normal use, a temperature exceeding that specified in table 14.1, the instruction sheet shall also state that the control shall be connected by means of conductors having the appropriate T rating (see note 1 of table 14.1).

- 6) In-line cord, free-standing and independently mounted controls, if fitted with non-detachable cords using attachment methods Y or Z, shall have Documentation (D) containing the substance of one of the following statements, whichever is appropriate:

- "The supply cord of this control cannot be replaced; if the cord is damaged, the control should be discarded" (Z)

or

- "The supply cord of this control can be replaced only by the manufacturer or his accredited service agent" (Y).

- 7) α_1 For each circuit of the control, the type of load and rated current. For controls with more than one circuit it shall be made clear to which circuit or terminal the information applies. For circuits for resistive and inductive loads, the rated current, or the rated load in VA, at power factors as indicated in table 17.2.1. α_1

- 8) The marking (C) requirement does not apply to controls or parts thereof classified as IP00, IP10, IP20, IP30 and IP40.

α_1 Footnote deleted α_1

α_1 10) and 11) Void. α_1

12) to 19) See annex H.

20) The method of packaging does not have to be declared.

21) For in-line cord, free-standing and independently mounted controls, this information shall be provided by method C.

α_1 601) These declarations are intended to cover normal use. α_1

7.3 Class II symbol

7.3.1 The symbol for class II construction shall be used only for controls classified according to 6.8.3.4.

7.3.2 The dimension of the symbol for class II construction shall be such that the length of the sides of the outer square is about twice the length of the sides of the inner square.

7.3.2.1 The length of the sides of the outer square of the symbol shall be not less than 5 mm, unless the largest dimension of the control is 15 mm in length or less, in which case the dimension of the symbol may be reduced but the length of the sides of its outer square shall be not less than 3 mm.

7.3.2.2 Controls providing protection against electric shock as required for class II but that include terminals for earthing continuity for functional purposes shall not be marked with the symbol for class II construction, IEC 60417-5019 (2002-10), but shall be regarded as class I controls. 

7.4 Additional requirements for marking

7.4.1 Required marking on a control shall preferably be on the main body of the control but may be placed on non-detachable parts.

Required markings shall be legible and durable.

Compliance is checked by inspection and by the tests of annex A.

7.4.2 Terminals of controls intended for the connection of supply conductors shall be indicated by an arrow pointing towards the terminal, unless the method of connection to the supply mains is of no importance or is self-evident.

Compliance is checked by inspection.

7.4.3 Terminals intended exclusively for a neutral external conductor shall be indicated by the letter "N".  See annex ZB 

7.4.3.1  Earthing terminals for external earthing conductors or earthing continuity, and terminals for earthing for functional purposes (as opposed to purposes of protection against electric shock) shall be indicated

- for protective earth by the earth symbol for protective earth, IEC 60417-5019 (2002-10);
- for functional earth by the earth symbol for functional earth, IEC 60417-5017 (2002-10) 

7.4.3.2 All other terminals shall be suitably identified, their purpose self-evident or the control circuitry visually apparent. The arrow, the letter "N" or the earth symbol shall not be used except as indicated above.

Compliance is checked by inspection.

 See annex ZB 

7.4.4 Controls intended to be set by the user or by the equipment manufacturer during installation shall be provided with an indication of the direction to increase or decrease the response value.

An indication of "+" or "-" is sufficient.

Controls intended to be set by the equipment manufacturer or the installer shall be accompanied by documentation (D) indicating the proper method for securing the setting.