

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Automatic electrical controls for household and similar use –
Part 1: General requirements**

**Dispositifs de commande électrique automatiques à usage domestique et
analogue –
Partie 1: Exigences générales**

WITKO2010



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**AUTOMATIC ELECTRICAL CONTROLS
FOR HOUSEHOLD AND SIMILAR USE –****Part 1: General requirements****FOREWORD**

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International Standard IEC 60730-1 has been prepared by IEC technical committee 72: Automatic controls for household use.

This fourth edition cancels and replaces the third edition published in 1999, Amendment 1 (2003), and Amendment 2 (2007).

The main technical modifications of this standard since this previous publication are listed below:

- changes to the low temperature test requirements for in-line cords;
- revision to the pollution degree for the environment surrounding contacts;
- addition of the use of screwless terminals on printed circuit boards and revisions to creepage distances;
- additions of CISPR 11 EMC requirements;

- incorporation of EMC test levels from IEC 60335 series;
- additional testing for flexible cords;
- revisions to the requirements for resistance to heat, fire and tracking including replacement of Clause 21 and Annexes F and G;
- new Annex T for additional requirements for non-SELV supplied sensor cable or cord;
- new requirements in H.27.1 for first and second fault approach to ensure functional safety;
- incorporation of software techniques from IEC 61508-3 in H.11.12;
- replacement of Annex D (Canada and USA) with a reference to UL 746C;
- updates to the references and bibliography;
- the keyword index was deleted as unnecessary due to the availability of search functions for electronic editions of the standard.

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

FDIS	Report on voting
72/789/FDIS	72/790/RVD

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

A list of all parts of the IEC 60730 series, under the general title: *Automatic controls for household and similar use*, can be found on the IEC website.

In the development of a fully international standard to cover automatic controls for household and similar use, it has been necessary to take into consideration the differing requirements resulting from practical experience in various parts of the world and to recognize the variation in national electrical systems and wiring rules.

The “in some countries” notes regarding differing national practices are contained in the following subclauses:

2.1.5	12.1.6	18.1.6.2
2.7.2	12.3	18.1.6.3
2.7.3	Table 12 (13.2.1), Note 14	18.4
2.14.2	13.3.4	19.2.4.1
4.2.1	14.1.1	19.2.5.1
6.6.1	Table 13 (14.7.4), Notes 1, 7	20
Table 1 (7.2), Note 9	14.4	21.1
7.4.3	15.1	21.4
7.4.3.2	16.2.1	27.2.3.1
8.1.1	17.1.3.1	Annex C
8.4	Table 14 (17.2.5)	Annex D
9.3.2	17.2.2	
9.3.4	Table 15 (17.2.5)	H.26.10
9.5.2	17.2.3	Table H.16 (H.26.10.4)
Table 3 (10.1.4), Note 1	17.2.3.1	
10.1.4.2	Table 16 (17.2.5)	
10.1.4.3	17.5.1	Table H.21 (H.27.1), Note 7
10.1.14	17.6.2	Table K.1
10.1.16	17.7.7	Table K.2

10.1.16.1	17.8.4.1	R.1
Table 6 (10.2.1), Note 1	17.10	T.3.2
11.5	17.10.4	
Table 10 (11.8.2), Note 1	17.12.5	
11.11.1.2	17.14	
11.11.1.3	18.1.6	
11.11.1.4	18.1.6.1	

It is envisaged that in the next edition of this standard it will be found possible to remove those differences that are covered by new IEC standards now being prepared by other technical committees.

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 cases additional requirements may be considered to be necessary.

See also 4.3.5.2 and 4.3.5.3.

Where, for a particular clause or subclause, the text of part 2 indicates:

Addition:	the part 1 text applies with the additional requirement indicated in a part 2;
Modification:	the part 1 text applies with a minor change as indicated in a part 2;
Replacement:	the part 2 text contains a change which replaces the part 1 text in its entirety.

Where no change is necessary, the part 2 indicates that the relevant clause or subclause applies.

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.

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

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

This standard is also applicable to controls for building automation systems within the scope of ISO 16484-2

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

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

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.

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.

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.

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, voltage, acceleration, or combinations thereof.

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.

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.

IEC 60038, *IEC standard voltages*

IEC 60065:2001, *Audio, video and similar electronic apparatus – Safety requirements*¹⁾
Amendment 1 (2004)

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

IEC 60085:2007, *Electrical insulation – Thermal evaluation and designation*

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

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

IEC 60127-1:2006, *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links*

IEC 60227-1, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

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

IEC 60269-1, *Low-voltage fuses – Part 1: General requirements*

¹⁾ There exists a consolidated edition 7.1 including IEC 60065:2001 and its Amendment 1 (2004).

IEC 60335-1:2001, *Household and similar electrical appliances – Safety – Part 1: General requirements*²⁾

Amendment 1 (2004)

Amendment 2 (2006)

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

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

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

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

IEC 60417 (all parts), *Graphical symbols for use on equipment*

IEC 60423, *Conduit systems for cable management – Outside diameters of conduits for electrical installations and threads for conduits and fittings*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*³⁾
Amendment 1 (1999)

IEC 60539 (all parts), *Directly heated negative temperature coefficient thermistors*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

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

IEC 60695-2-10, *Fire Hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

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 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

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

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

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*

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

³⁾ There exists a consolidated edition 2.1 including IEC 60529:1989 and its Amendment 1 (1999).

IEC 60998-2-2, *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*

IEC 60998-2-3:2002, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-3: Particular requirements for connecting devices as separate entities with insulation-piercing clamping units*

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

IEC 61000-3-2:2005, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*
Amendment 1 (2008)
Amendment 2 (2009)⁴⁾

IEC 61000-3-3:2008, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2008, *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 61000-4-6:2008, *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 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test⁵⁾*
Amendment 1 (2000)

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

IEC 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests⁶⁾*
Amendment 1 (2009)

⁴⁾ There exists a consolidated edition 3.2 including IEC 61000-3-2:2005 and its Amendments 1 (2008) and 2 (2009).

⁵⁾ There exists a consolidated edition 1.1 including IEC 61000-4-8:1993 and its Amendment 1 (2000).

⁶⁾ There exists a consolidated edition 1.1 including IEC 61000-4-13:2002 and its Amendment 1 (2009).

IEC 61000-4-28:1999, *Electromagnetic compatibility (EMC) – Part 4-28: Testing and measurements techniques – Variation of power frequency, immunity test*⁷⁾
Amendment 1 (2001)
Amendment 2 (2009)

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

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

IEC 61249 (all parts), *Materials for printed boards and other interconnecting structures*

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers*

IEC 61558-2-16, *Safety of transformers, reactors, power supply units and similar products for voltages up to 1 100 V – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units*

IEC 62326 (all parts), *Printed boards*

CISPR 11:2009, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 14-1:2005, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*⁸⁾
Amendment 1 (2008)

CISPR 22:2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

ISO 16484-2, *Building automation and control systems (BACS) – Part 2: Hardware*

2 Definitions

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

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

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

⁷⁾ There exists a consolidated edition 1.1 including IEC 61000-4-28:1999, its Amendment 1 (2001) and Amendment 2 (2009).

⁸⁾ There exists a consolidated edition 5.1 including CISPR 14-1:2005 and its Amendment 1 (2008).

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.

2.1.4

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.

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

NOTE 1 Converters with separate windings providing equivalent insulation are dealt with in IEC 61558-2-6 and IEC 61558-2-16.

NOTE 2 In Canada and the USA, the limit for safety extra-low voltage is 30 V.

Also see 2.1.20 SELV system and 2.1.21 PELV system.

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 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 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****(conductive) shield (US)**

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

[IEV 195-02-38]

2.1.16**(electrically) protective screen****(electrically) protective shield (US)**

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

[IEV 195-06-17]

2.1.17**(electrically) protective screening****(electrically) protective shielding (US)**

separation of electric circuits and conductors from hazardous live parts by an electrically protective screen 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]

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 or of the manual reset 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.

2.2.23
system

The control and control sensors and actuators as applied to an application or processes

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 1 (7.2 of the previous edition).

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

In Austria, Belgium, Denmark, France, Germany, Italy, Norway, and the United Kingdom class 0 controls are not allowed.

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

In Austria, Belgium, Denmark, France, Germany, Italy, Norway, and the United Kingdom class 0I controls are not allowed.

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

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

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, actors, 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

2.13.8

failure

termination of the ability of an item to perform a required function

[IEV 191-14-01]

2.13.9

fault

state of an item characterised by its inability to perform a required function, excluding the inability during preventive maintenance or other planned actions, or due to lack of external resources

[IEV 191-05 01]

EXPLANATORY NOTE 1	„Failure“ is an event, as distinguished from „fault“, which is a state.
EXPLANATORY NOTE 2	After failure the item has a fault.
EXPLANATORY NOTE 3	This concept as defined does not apply to items consisting of software only.
EXPLANATORY NOTE 4	A fault is often the result of a failure of the item itself, but may exist without prior failure.

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

In Canada and the USA, the equipment manufacturer is indicated as the OEM (original equipment manufacturer). The OEM receives controls from control manufacturers for integration or incorporation into equipment.

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.

2.21 Definitions relating to classes of control functions

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.

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.

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 ± 5) °C, except that in cases of doubt, it shall be maintained at (23 ± 2) °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 1 (7.2 of the previous edition) 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 28 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.

In Canada and the USA only 1 sample is used for the tests of Clauses 12 to 17 inclusive and the sample tested must comply.

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 Causes 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.*

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 11.2.6.

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

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

The maximum rated voltage is 690 V.

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.D. 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):

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

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	8
0	IP00								
1									
2	IP20	IP21							
3									
4		IP41		IP43	IP44				
5					IP54	IP55			
6						IP65		IP67	IP68

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.

In Canada and the USA flying leads are allowed.

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;

6.8.2.2 – class 0I equipment;

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;

6.8.3.2 – of class 0I;

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 1 (7.2 of the previous edition), requirement 86

6.8.4.2 Controls using PELV-circuit(s), and if applicable, the information declared in Table 1 (7.2 of the previous edition), 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 classes of control functions

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 1 (7.2 of the previous edition).

It is not intended that Table 1 (7.2 of the previous edition) 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.

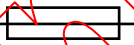
7.2.7 For controls that are neither integrated nor incorporated, where lack of space prevents legible marking as specified, the control shall be marked with the manufacturer's name (or trade mark) and the unique type reference only. The other marking required shall be included in documentation (D).

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).....	~ IEC 60417-5032 ⁹⁾
Alternating current (three-phase).....	3~
Alternating current (three-phase with neutral)	3N~

⁹⁾ 2002-10

Direct current	 IEC 60417-5031 ¹⁰⁾
Class II construction	 IEC 60417-5172 ¹¹⁾
Class III control	 IEC 60417-5180 ¹²⁾
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	 IEC 60417-5016 ¹³⁾
Frequency	Hz  IEC 60417-5019 ¹⁴⁾
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) A 250 V ~ or 16 (3) / 250 ~ 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".

- 10) 2002-10
- 11) 2003-02
- 12) 2003-02
- 13) 2002-10
- 14) 2006-08