TSU®
Technický skúšobný ústav Piešťany, a. s.
Krajinská cesta 2929/9, 921 01 Piešťany, Slovak Republic

ilac-MRA SNAS Reg. No. 009/S-047

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TEST REPORT
no.: 240500150/3/E

Test name : Safety requirements for electrical equipment

Test subject : Household equipment

Product name : Thermostat for electric floor heating

Model : TR-01
TR-210
TR-007

Manufacturer : Trivolt s.r.o.
Diaľničná cesta 22B
903 01 Senec
Slovak Republic

Applicant : COCV TSÚ Piešťany
Krajinská cesta 2929/9
921 01 Piešťany
Slovak Republic

Order no. : 240500150

Testing location : Testing laboratory TSÚ Piešťany, a. s.
Krajinská cesta 2929/9
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Slovak Republic

Test procedure : see chapter 1

Date of test : 15.09.2024 - 24.09.2024

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TECHNICKÝ SKÚŠOBNÝ ÚSTAV PIEŠŤANY, a. s.
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-213-

Tested by: **Ing. Jakub Šiška**
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1. Test methods:	**Test methods:** **MPS 01/5.1 ÷ MPS 01/5.8 in scope of standard:** **EN 60730-1:2011** Automatic electrical controls for household and similar use - Part 1: General requirements **EN 60730-2-9:2010** Automatic electrical controls for household and similar use - Part 2-9: Particular requirements for temperature sensing controls Test procedure deviation: none	
2. Test conditions:	Temperature	20 - 21 °C
	Humidity	35 – 37 %
	Atmospheric pressure	1004 – 1021 hPa

3. Test sample:	
Product name:	Thermostat for electric floor heating
Model:	TR-01 TR-007 TR-210
Manufacturer:	Trivolt s.r.o. Diaľničná cesta 22B 903 01 Senec Slovak Republic
Number of tested samples:	3 pcs.
Place and date of receipt of samples:	The samples were delivered to TSÚ Piešťany, a. s. on 04.06.2024 and recorded under the registration number 240500150/213/5536/3,4,5
Ratings:	Power rating: 230 V AC, 50 Hz, <1,5 W Output: 230 V AC, 16 A max. load
Device description:	Electronic thermostat designed for electric floor heating. The thermostat allows you to set a comfortable temperature in the room and at the same time using the floor sensor to check and manage the maximum floor temperature. The air sensor is built right on the bottom side of the thermostat and an external NTC floor sensor is supplied as a standard accessory and is included in the thermostat package. Models TR-210 and TR-007 use WiFi connection for remote control.

4. Test results

EN 60730-1:2011			
Clause	Requirement – Test	Result – Remark	Verdict
4.	**GENERAL NOTES ON TESTS**		**P**
	Tests according to this standard are type tests.		**P**
4.1	Conditions of test		**P**
4.2	Samples required		**P**
4.3	Instructions for test		**P**
4.3.1	According to submission		**P**
4.3.2	According to rating		**P**
4.3.3	According to protection against shock	class II	**P**
	Austria, Belgium, Denmark, France, Germany, Italy, Norway and United Kingdom: Class 0 and Class 01 controls are not allowed.		**N/A**
4.3.4	According to manufacturing variants	Main components of models are the same	**P**
4.3.5	According to purpose		**P**
5.	**RATING**		**P**
5.1	Maximum rated voltage	230 V AC	**P**
	The maximum rated voltage is 690 V.	< 690 V	**P**
5.3	Compliance		**P**
6.	**CLASSIFICATION**		**P**
	A control is classified:		
6.1	According to nature of supply		**P**
6.1.1	Control for a.c.	Thermostat	**P**
6.1.2	Control for d.c. only		**N/A**
6.1.3	Control for a.c. and d.c.		**N/A**
6.1.4	Control for specific supplies or multiple supplies.	Heating pad / heating mat	**P**
6.2	According to type of load to be controlled by each circuit of the control		**P**
	A control having more than one circuit need not have the same classification for each circuit.		**N/A**
6.2.1	Circuit for a substantially resistive load with a power factor not less than 0,95.		**P**
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.		**N/A**
6.2.3	Circuit for declared specific load.	Electric floor heating	**P**
6.2.4	Circuit for a current less than 20 mA.		**N/A**
6.2.5	Circuit for a.c. motor load whose characteristics are defined by the control manufacturer's declaration.		**N/A**
6.2.6	Circuit for pilot load.		**N/A**
6.3	According to their purpose		**P**
	A control may be classified for more than one purpose, in which case it is referred to as a multi-purpose control.		
6.3.1	- thermostat		**P**
6.3.2	- temperature limiter		**P**
6.3.3	- thermal cut-out		**N/A**
6.3.5	- energy regulator		**N/A**
6.3.6	- timer		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
6.3.7	- time switch		**P**
6.3.8	- manual control		**P**
6.3.9	- sensing control (other than one covered by 6.3.1 through 6.3.4)		**N/A**
6.3.10	- electrically operated control		**P**
6.3.11	- motor protector		**N/A**
6.3.11.1	- thermal motor protector		**N/A**
6.3.12	- electrically operated valve		**N/A**
6.3.13	- electrically operated mechanism		**N/A**
6.3.14	- protective control		**N/A**
6.3.15	- operating control		**P**
6.4	According to features of automatic action		
6.4.1	- Type 1 action		**P**
6.4.2	- Type 2 action		**N/A**
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:		
6.4.3.1	- Full disconnection on operation (Type 1.A or 2.A)		**N/A**
6.4.3.2	- micro-disconnection on operation (Type 1.B or 2.B)		**P**
6.4.3.3	- micro-interruption on operation (Type 1.C or 2.C)		**N/A**
6.4.3.4	- a trip-free mechanism which cannot even momentarily be reclosed against the fault (Type 1.D or 2.D)		**N/A**
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)		**N/A**
6.4.3.6	- an action which can only be reset by the use of a tool (Type 1.F or 2.F)		**N/A**
6.4.3.7	- an action which is not intended to be reset under electrically loaded conditions (Type 1.G or 2.G)		**N/A**
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)		**N/A**
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)		**N/A**
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)		**N/A**
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)		**P**
6.4.3.12	- an action which operates after a declared ageing period (Type 1.M or 2.M)		**N/A**
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.	IP20	**P**
6.5.2	According to degree of protection provided by enclosures against harmful ingress of water (see IEC 60529):	IP20	**P**
6.5.3	According to the pollution degree or degrees for which the control is declared.	PD 2	**P**

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Clause	Requirement – Test	Result – Remark	Verdict
6.6	According to method of connection		
6.6.1	Control with at least one terminal intended for the connection of fixed wiring.		**P**
6.6.2	Control with at least one terminal intended for the connection of a flexible cord.		**N/A**
	A control may be classified under both 6.6.1 and 6.6.2		**P**
6.6.3	Control without any terminals intended for the connection of an external conductor.		**N/A**
	This type of control is intended for the connection of only integrated or internal conductors.		**N/A**
6.6.4	Control intended for the connection of a primary battery		**N/A**
6.6.5	Control intended for the connection of a secondary battery (rechargeable cell)		**N/A**
6.7	According to ambient temperature limits of the switch head		**P**
6.7.1	Control with a switch head for use in an ambient temperature between a minimum value (Tmin) of 0 °C, and a maximum value (Tmax) of 55 °C.		**N/A**
6.7.2	Control with a switch head intended to be used in an ambient temperature having a maximum value (Tmax) other than 55 °C but no less than 30 °C, or a minimum value (Tmin) lower than 0 °C, or both.	0°C - 45°C	**P**
6.8	According to protection against electric shock		**P**
6.8.1	For an integrated control:		**N/A**
6.8.2	For an incorporated control for use in:		**N/A**
6.8.2.1	- class 0 equipment		**N/A**
	Austria, Belgium, Denmark, France, Germany, Italy, Norway and United Kingdom Class 0 controls are not allowed.		**N/A**
6.8.2.2	- class 0I equipment		**N/A**
	Austria, Belgium, Denmark, France, Germany, Italy, Norway and United Kingdom Class 01 controls are not allowed.		**N/A**
6.8.2.3	- class I equipment		**N/A**
6.8.2.4	- class II equipment		**N/A**
6.8.2.5	- class III equipment		**N/A**
6.8.3	For an in-line cord control, a freestanding control, or an independently mounted control:		**P**
6.8.3.1	- of class 0		**N/A**
	Austria, Belgium, Denmark, France, Germany, Italy, Norway and United Kingdom Class 0 controls are not allowed.		**N/A**
6.8.3.2	- of class 0I		**N/A**
	Austria, Belgium, Denmark, France, Germany, Italy, Norway and United Kingdom Class 0I controls are not allowed.		**N/A**
6.8.3.3	- of class I		**N/A**
6.8.3.4	- of class II		**P**
6.8.3.5	- of class III		**N/A**
6.8.4	Controls using SELV or PELV for protection against electric shock		**N/A**
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		**N/A**
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		**N/A**
6.9	According to circuit disconnection or interruption		**P**
6.9.1	- full-disconnection		**N/A**
6.9.2	- micro-disconnection		**P**
6.9.3	- micro-interruption		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
6.9.4	- all-pole disconnection		**N/A**
6.9.5	- See Annex H.	Electronic control	**P**
6.10	According to number of cycles of actuation (M) of each manual action		**P**
6.10.1	- 100 000 cycles	documentation	**P**
6.10.2	- 30 000 cycles		**N/A**
6.10.3	- 10 000 cycles		**N/A**
6.10.4	- 6 000 cycles		**N/A**
6.10.5	- 3 000 cycles [1)]		**N/A**
6.10.6	- 300 cycles [1)]		**N/A**
6.10.7	- 30 cycles [1)]		**N/A**
6.11	According to number of automatic cycles (A) of each automatic action		**P**
6.11.1	- 300 000 cycles		**N/A**
6.11.2	- 200 000 cycles		**N/A**
6.11.3	- 100 000 cycles	documentation	**P**
6.11.4	- 30 000 cycles		**N/A**
6.11.5	- 20 000 cycles		**N/A**
6.11.6	- 10 000 cycles		**N/A**
6.11.7	- 6 000 cycles		**N/A**
6.11.8	- 3 000 cycles [1)]		**N/A**
6.11.9	- 1 000 cycles [1)]		**N/A**
6.11.10	- 300 cycles [2)]		**N/A**
6.11.11	- 30 cycles [2) 4)]		**N/A**
6.11.12	- 1 cycle [3)]		**N/A**
6.12	According to temperature limits of the mounting surface of the control		**P**
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.		**P**
6.12.2	Control suitable for mounting on a surface which is more than 20 K above the ambient temperature classified in 6.7.		**N/A**
6.13	According to value of proof tracking index (PTI) for the insulation material used		**P**
6.13.1	- material of material group IIIb with a PTI of 100 and up to but excluding 175		**P**
6.13.2	- material of material group IIIa with a PTI of 175 and up to but excluding 400		**N/A**
6.13.3	- material of material group II with a PTI of 400 and up to but excluding 600		**N/A**
6.13.4	- material of material group I with a PTI of 600 and over		**N/A**
6.14	According to period of electrical stress across insulating parts supporting live parts and between live parts and earthed metal		**N/A**
6.14.1	- short period		**N/A**
6.14.2	- long period		**N/A**
6.15	According to construction:		**P**
6.15.1	- integrated control		**N/A**
6.15.2	- incorporated control		**N/A**
6.15.3	- in-line cord control		**N/A**
6.15.4	- free-standing control		**N/A**
6.15.5	See annex J		**P**
6.16	According to ageing requirements (Y) of the equipment in which, or with which, the control is intended to be used		**N/A**
6.16.1	- 60 000 h		**N/A**
6.16.2	- 30 000 h		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
6.16.3	- 10 000 h		**N/A**
6.16.4	- 3 000 h		**N/A**
6.16.5	- 300 h		**N/A**
6.16.6	- 15 h		**N/A**
6.17	According to use of the thermistor	NTC thermistor See annex J	**P**
6.18	According to classes of control functions	See annex H	**P**
7.	**INFORMATION**		**P**
7.1	General requirements		**P**
	The control manufacturer shall provide adequate information to confirm:		**P**
	– that a suitable control can be selected;		**P**
	– that the control can be mounted and used in a manner that will enable it to meet the requirements of this standard; and		**P**
	– that the relevant tests can be performed to determine compliance with this standard.		**P**
7.2	Methods of providing information		**P**
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).		**P**
	- 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.		**P**
	- 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.		**P**
	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.		**N/A**
	- 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.		**P**
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.		**P**
7.2.3	For controls submitted in, on or with an equipment, the requirement for documentation (D) is replaced by declaration (X).		**N/A**
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.		**P**
7.2.5	The requirement for documentation (D) is considered to be met if such information has been provided by marking (C).		**P**

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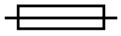
Clause	Requirement – Test	Result – Remark	Verdict
7.2.5.1	The requirement for declaration (X) is considered to be met if such information has been provided by either documentation (D) or by marking (C).		**P**
7.2.6	Except as indicated in 7.4, for integrated controls all information is provided by means 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.		**N/A**
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).		**N/A**
7.2.8	Additional marking or information is allowed, provided that it does not give rise to misunderstanding.		**P**
7.2.9	When symbols are used, they shall be as follows:		
	Amperes ..... A		**P**
	Volts V		**P**
	Watts ..... W		**P**
	Volts-amperes ..... VA		**N/A**
	Alternating current (single-phase) ..... ~ IEC 60417-5032 (2002-10)		**P**
	Alternating current (three-phase) ..... 3~		**N/A**
	Alternating current (three-phase with neutral) ..... 3N~		**N/A**
	Direct current ..... ⎓ IEC 60417-5031 (2002-10)		**N/A**
	Class II construction ..... ⧈ IEC 60417-5172 (2003-02)		**P**
	Class III control .....  IEC 60417-5180 (2003-02)		**N/A**
	Ambient temperature limits of switch head ..... T		**N/A**
	Rated current of the appropriate fuse in amperes .....  IEC 60417-5016(2002-10)		**N/A**
	Frequency ..... Hz		**P**
	Earthing terminal .....  IEC 60417-5019 (2006-08)		**N/A**
	Earthing for work  IEC 60417-5018 (2011-07)		**N/A**
	For identification of the degree of protection provided by enclosures, the symbols shown in 6.5 shall be used.	IP20	**P**
7.3	Class II symbol		**P**
7.3.1	The symbol for class II construction shall be used only for controls classified according to 6.8.3.4.		**P**
7.3.2	The dimension of the symbol for class II construction shall be such that the length of the sides of the outer square is about twice the length of the sides of the inner square.		**P**
7.3.2.1	The length of the sides of the outer square of the symbol shall be not less than 5 mm, unless the largest dimension of the control is 15 mm in length or less, in which case the dimension of the symbol may be reduced but the length of the sides of its outer square shall be not less than 3 mm.		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
7.3.2.2	Controls providing protection against electric shock as required for class II but that include terminals for earthing continuity for functional purposes shall not be marked with the symbol for class II construction, IEC 60417-5172 (2003-02), but shall be regarded as class I controls.		**N/A**
7.4	Additional requirements for marking		**P**
7.4.1	Required marking on a control shall preferably be on the main body of the control but may be placed on non-detachable parts.		**P**
	Required markings shall be legible and durable.		**P**
7.4.2	Terminals of controls intended for the connection of supply conductors shall be indicated by an arrow pointing towards the terminal, unless the method of connection to the supply mains is of no importance or is self-evident.	Self-evident	**N/A**
7.4.3	Terminals intended exclusively for a neutral external conductor shall be indicated by the letter "N".		**P**
7.4.3.1	Earthing terminals for external earthing conductors or earthing continuity, and terminals for earthing for functional purposes (as opposed to purposes of protection against electric shock) shall be indicated	No earthing	**N/A**
	- for protective earth by the earth symbol for protective earth, IEC 60417-5019 (2006-08)		**N/A**
	- for functional earth by the earth symbol for functional earth, IEC 60417-5018 (2006-10)		**N/A**
7.4.3.2	All other terminals shall be suitably identified, their purpose self-evident or the control circuitry visually apparent. The arrow, the letter "N" or the earth symbol shall not be used except as indicated above.		**P**
7.4.4	Controls intended to be set by the user or by the equipment manufacturer during installation shall be provided with an indication of the direction to increase or decrease the response value.		**N/A**
	Controls intended to be set by the equipment manufacturer or the installer shall be accompanied by documentation (D) indicating the proper method for securing the setting.		**N/A**
7.4.5	Parts destroyed during the normal operation of the control and which have to be replaced, shall be marked so as to enable them to be identified from a catalogue or the like, even after they have operated, unless they are intended to be replaced only during manufacturer servicing.		**N/A**
7.4.6	Controls intended to be connected only to SELV systems shall be marked with the graphic symbol IEC 60417-5180 (2003-02). This requirement does not apply where the means of connection to the supply is so shaped that it can only mate with a particularly designed SELV or PELV arrangement.		**N/A**
	Controls providing protection against electric shock as required for class III controls but that carry terminals for earthing continuity for functional purposes shall not be marked with the symbol for class III construction, IEC 60417-5180 (2003-02).		**N/A**
8.	**PROTECTION AGAINST ELECTRIC SHOCK**		**P**
8.1	General requirements		**P**
8.1.1	Controls shall be so constructed that there is adequate protection against accidental contact with live parts, in any unfavourable position which may occur in normal use, and after any accessible detachable parts, other than lamps located behind a detachable cover have been removed. However, during the insertion and removal of lamps, protection against accidental contact with live parts of the lamp cap shall be ensured.		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
	Unless otherwise specified, SELV-circuits or PELV-circuits supplied at a voltage not exceeding 24 V are not considered to be hazardous live parts.		**N/A**
	If SELV- or PELV-circuits supplied at higher than 24 volts are accessible, the current between the accessible part(s) and either pole of the supply source of the SELV/PELV circuits shall comply with H.8.1.10.1.		**N/A**
8.1.1.1	The value of the voltage of SELV/PELV circuits considered to be not hazardous may be specified at a different value		**N/A**
	- if the control is intended only to be used in an application governed by another product standard where the limit value of the voltage for accessible bare conductors of SELV/PELV is different		**N/A**
	- if the manufacturer declares the application, product standard governing the application, and level of voltage for accessible SELV/PELV circuits considered to be non hazardous by the application standard (Table 1, requirement 86)		**N/A**
8.1.2	For class II controls and controls for class II equipment, this requirement applies also with regard to accidental contact with metal parts separated from hazardous live parts by basic insulation only.		**P**
8.1.3	The insulating properties of lacquer, enamel, paper, cotton, oxide film on metal parts, beads and sealing compounds shall not be relied upon to give the required protection against accidental contact with hazardous live parts.	Not used	**P**
8.1.4	For those class II controls and controls for class II equipment which are connected in normal use to the gas supply mains or to the water supply mains, any metal parts conductively connected to the gas pipes or in electrical contact with the water system shall be separated from hazardous live parts by double insulation or reinforced insulation.		**N/A**
8.1.5	Those class II controls and controls for class II equipment which are intended to be permanently connected to fixed wiring shall be so designed that the required degree of protection against electric shock is not impaired by the installation of the control.		**P**
8.1.11	Between class III circuits and circuits connected to the mains or earth, insulation external to the safety isolating transformer shall comply with all requirements for class II insulation.		**N/A**
8.1.12	A live part shall be considered to be hazardous if it exceeds the values specified in 8.1.1 and it is not separated from the source by protective impedance complying with H.8.1.10 and is not a PEN conductor or a part of the equipotential bonding system.		**N/A**
8.2	Actuating members and actuating means		**P**
8.2.1	An actuating member shall not be live.		**P**
8.2.2	An actuating means shall not be live, unless either it is provided with an insulated actuating member which is adequately fixed or the actuating means is not accessible when the actuating member is removed.		**P**
8.2.3	For controls other than class III or controls for equipment other than those of class III, actuating members and handles held in normal use shall be either of insulating material, or adequately covered by insulating material; or, if of metal, their accessible parts shall be separated from their actuating means, or fixings by supplementary insulation, if such would be likely to become live in the event of an insulation fault.		**P**
	For controls for connection to fixed wiring, or for controls for stationary equipment this requirement does not apply provided that such parts are either:		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	– reliably connected to an earthing terminal or earthing contact; or		**N/A**
	– shielded from hazardous live parts by earthed metal		**N/A**
8.3	Capacitors		**N/A**
8.3.1	For class II in-line cord controls and independently mounted controls, capacitors shall not be connected to accessible metal parts. For controls for class II equipment, capacitors shall not be connected to metal likely to be connected to accessible metal when the control is mounted in accordance with the manufacturers' declarations. Metal casings of capacitors shall be separated by supplementary insulation from accessible metal parts, and from other metal parts likely to be connected to accessible metal, when the control is mounted in accordance with the manufacturers' declarations.		**N/A**
8.3.2	Controls intended to be connected to the supply by means of a plug shall be so designed that in normal use there is no risk of electric shock from charged capacitors when touching the pins of the plug.		**N/A**
8.4	Covers and uninsulated live or hazardous parts		**P**
	Controls provided with a cover or cover plate of non-metallic material shall be so designed that the cover fixing screws are not accessible, unless they are either earthed or separated from hazardous live parts by double insulation or reinforced insulation or not accessible after mounting in the equipment.		**P**
9.	**PROVISION FOR PROTECTIVE EARTHING**		**N/A**
9.1	General requirements		**N/A**
9.1.1	Accessible metal parts, other than actuating members, of in-line cord, free-standing and independently mounted controls of class 0I and class I which may become live in the event of an insulation fault, shall be permanently and reliably connected to an earthing terminal or termination within the control, or to the earthing contact of an equipment inlet.		**N/A**
	Austria, Belgium, Denmark, France, Germany, Italy, Norway and United Kingdom Class 01 controls are not allowed.		**N/A**
9.1.2	Accessible metal parts, other than actuating members, of integrated and incorporated controls for class 0I and class I equipment which may become live in the event of an insulation fault shall have provision for earthing.		**N/A**
	Austria, Belgium, Denmark, France, Germany, Italy, Norway and United Kingdom Class 01 controls are not allowed.		**N/A**
9.1.3	Earthing terminals, earthing terminations and earthing contacts shall not be electrically connected to any neutral terminal.		**N/A**
9.2	Class II and class III controls shall have no provision for protective earthing.		**N/A**
9.3	Adequacy of earth connections		**N/A**
9.3.1	General requirements		**N/A**
	The connection between an earthing terminal, earthing termination or earthing contact, and parts required to be connected thereto, shall be of low resistance.		**N/A**
9.3.2	Fixed wiring and methods X and M		**N/A**
	Earthing terminals for the connection of fixed wiring or for non-detachable cords using methods X and M shall comply with the requirements of 10.1.		**N/A**
9.3.3	External conductors		**N/A**
	Earthing connections for external conductors shall not be made using screwless terminals, however for attachment methods Y		**N/A**

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	and Z, screwless earthing terminals complying with IEC 60998-2-2 or 60998-2-3 are allowed.		
9.3.4	Size of accessible earthing terminals		**N/A**
	Earthing terminals which are accessible in normal use shall allow the connection of conductors having nominal cross-sectional areas of 2,5 mm^2 to 6 mm^2 inclusive and it shall not be possible to loosen them without the aid of a tool.		**N/A**
9.3.5	Size of non-accessible earthing terminals		**N/A**
	Earthing terminals which are not accessible in normal use for external conductors shall be of a size equal to or larger than that required for the corresponding current-carrying terminal.		**N/A**
9.3.6	Locking of earthing terminals		**N/A**
	Clamping means of earthing terminals for external conductors shall be adequately locked against accidental loosening.		**N/A**
9.4	Corrosion resistance		**N/A**
	All parts of an earthing terminal shall be resistant to corrosion resulting from contact between those parts and the copper of the earthing conductor or any other metal that is in contact with those parts.		**N/A**
9.4.1	Materials		**N/A**
	The body of an earthing terminal shall be of brass, or other metal no less resistant to corrosion, unless it is a part of the metal frame or enclosure. Then any screws or nuts shall be of brass, plated steel or other metal complying with Clause 22, or other metal no less resistant to corrosion.		**N/A**
9.4.2	Frames or enclosures of aluminium		**N/A**
	If the body of an earthing terminal is a part of a frame or enclosure of aluminium or aluminium alloy, precautions shall be taken to avoid the risk of corrosion resulting from contact between copper and aluminium or its alloys.		**N/A**
9.5	Other requirements		**N/A**
9.5.1	Detachable parts		**N/A**
	If a detachable part of a control has an earth connection, this connection shall be made before any current-carrying connections are established when placing the part in position, and any current-carrying connections shall be separated before the earth connection is broken when removing the part.		**N/A**
10.	**TERMINALS AND TERMINATIONS**		**P**
10.1	Terminals and terminations for external copper conductors		**P**
10.1.1	Terminals for fixed wiring and for non-detachable cords using attachment methods X and M, except as specified in 10.1.3, shall be such that connection is made by means of screws, nuts or equally effective devices or methods, but without requiring a special purpose tool for connection or disconnection.	Fixed wiring, no special tools required	**P**
10.1.1.1	Terminals or terminations for non-detachable cords using attachment methods Y and Z shall satisfy the appropriate requirements for terminals and terminations for internal conductors and may require the use of special purpose tools for connection or disconnection.		**N/A**
10.1.2	Screws and nuts which clamp external conductors shall have a metric ISO thread or a thread of equivalent effectiveness. They shall not serve to fix any other component, except that they may also clamp internal conductors if these are so arranged that they are unlikely to be displaced when fitting the external conductors.		**P**
10.1.3	Soldered, welded, crimped or similar terminations		**N/A**
	Soldered, welded, crimped or similar terminations shall not be		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	used for the connection of non-detachable cords using attachment methods X and M unless such is permitted by the appropriate equipment standard. When such terminations are used for external conductors, they shall also comply with the requirements of 10.2.2 and 10.2.3.		
10.1.4	Terminals for fixed wiring or non-detachable cords using attachment methods X or M shall allow at least the connection of conductors having nominal cross-sectional areas as shown in Table 3	>1,5 mm^2	**P**
10.1.4.1	If a terminal is designed to accommodate a wider range of fixed wiring or flexible cord conductor sizes than those indicated in columns 2 and 3 of Table 3 (10.1.4 of the previous edition), then this shall be declared.		**N/A**
10.1.5	Terminals for fixed wiring or non-detachable cords using attachment methods X or M shall be so fixed that, when the clamping means is tightened or loosened, the terminal does not work loose, internal conductors are not subjected to stress, and creepage distances and clearances are not reduced below the values specified in Clause 20.		**P**
10.1.6	Terminals for fixed wiring or non-detachable cords using attachment methods X or M shall be so designed that they clamp the conductor between metal surfaces with sufficient contact pressure and without undue damage to the conductor, except that for screwless terminals intended for circuits carrying a current not exceeding 2 A, one of the surfaces may be of non-metallic material.		**P**
10.1.7	Terminals for fixed wiring and non-detachable cords using attachment method X shall not require special preparation of the conductor in order to effect correct connection.		**P**
10.1.7.1	Terminals for attachment method X may also have alternative means of connection if at least one of the means conforms to this requirement, even if the original factory-made connection uses another means. In this case the original factory-made connection shall comply with the requirements for terminals and terminations for internal conductors.		**N/A**
10.1.8	Terminals for fixed wiring and non-detachable cords using attachment methods X or M shall be so designed or placed that neither the conductor nor a wire of a stranded conductor can slip out while any clamping screws or nuts are being tightened, or while any equally effective device is being operated.		**P**
10.1.9	Terminals shall be so designed that they clamp the conductor reliably.		**P**
10.1.9.3	During the test the conductor shall not move appreciably in the terminal.		**P**
10.1.10	Terminals shall be so designed that they do not attain excessive temperature in normal use, so as to damage the material of the supporting insulation, or the insulating covering of the clamped conductors.		**P**
10.1.11	Terminals shall be so located that each core contained within any fixed wiring sheath or flexible cord sheath can be terminated in reasonable proximity to the other cores within the same sheath, unless there is a good technical reason for the contrary.		**P**
10.1.12	Terminals for non-detachable cords using attachment methods X or M shall be so located or shielded, that should a wire escape when the conductors are fitted, there is no risk of accidental contact between live parts and accessible metal parts, and for class II controls and controls for class II equipment, between live parts and metal parts separated from accessible metal parts by supplementary insulation only. Furthermore, there shall be no risk of short-circuiting a declared action providing a full-disconnection		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
	or a micro-disconnection		
10.1.13	Terminals shall be so designed that circuit continuity is not maintained by pressure transmitted through insulating material other than ceramic, or other insulating material with characteristics no less suitable, unless there is sufficient resilience in the appropriate metal parts to compensate for any shrinkage or distortion.		**P**
10.1.14	Screws and threaded parts of terminals shall be of metal		**P**
10.1.15	Terminals of the pillar type and the mantle type shall be so designed as to allow an adequate length of conductor to be introduced into, and pass beyond the edge of the screw, to ensure that the conductor does not fall out.		**P**
10.2	Terminals and terminations for internal conductors		**N/A**
10.2.1	Terminals and terminations shall allow the connection of conductors having nominal cross-sectional areas as shown in Table 6 (10.2.1 of the previous edition).		**N/A**
	A terminal or termination is not required if a conductor is permanently connected to the control by the control manufacturer.		**N/A**
10.2.2	Terminals and terminations shall be suitable for their purpose. Terminations for making soldered, crimped and welded connections shall be capable of withstanding the stresses which occur in normal service.		**N/A**
10.2.3	When soldered terminals are used, the conductor shall be so positioned or fixed that reliance is not placed upon the soldering alone to maintain the conductor in position, unless barriers are provided such that creepage distances and clearances between live parts and other metal parts cannot be reduced to less than 50 % of the values specified in Clause 20 should the conductor break away at the soldered joint.		**N/A**
10.2.4	Flat push-on connectors		**N/A**
10.2.4.1	Tabs forming part of a control shall comply with the dimensional requirements of Figure 14 or 15.		**N/A**
	Tabs with dimensions other than those shown in Figure 14 or 15 can be used, if the dimensions and shapes are so different as to prevent any possible mismating with a standard receptacle (see Figure 16).		**N/A**
	For the dimensions of Figures 14, 15 and 16, the physical dimensions of IEC 61210 may alternatively be used. The performance requirements of IEC 61210 do not apply.		**N/A**
	Tabs allowing the polarized acceptance of receptacles can be used (see Figure 16).		**N/A**
10.2.4.2	Tabs forming part of a control shall consist of material and plating appropriate to the maximum temperature of the tabs as indicated in Table 7		**N/A**
10.2.4.3	Tabs forming part of a control shall have adequate strength to allow the insertion and withdrawal of receptacles without damage to the control such as to impair compliance with this standard.		**N/A**
10.2.4.4	Tabs forming part of a control shall be adequately spaced to allow the connection of the appropriate receptacles.		**N/A**
	For the dimensions of Figures 14, 15 and 16, the physical dimensions of IEC 61210 may alternatively be used. The performance requirements of IEC 61210 do not apply.		**N/A**
10.3	Terminals and terminations for integrated conductors		**N/A**
	There are no specific requirements or tests for terminals or terminations for integrated conductors under Clause 10, but the relevant requirements of the other clauses may apply.		**N/A**
11.	**CONSTRUCTIONAL REQUIREMENTS**		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
11.1	Materials		**P**
11.1.1	Insulating materials – Impregnated		**N/A**
	Wood, cotton, silk, ordinary paper and similar fibrous or hygroscopic material shall not be used as insulation unless impregnated.	Not used	**N/A**
11.1.2	Current-carrying parts		**N/A**
	If brass is used for current carrying parts other than threaded parts of terminals, it shall contain at least 50 % copper if the part is cast or made from bar, or at least 58 % if the part is made from rolled sheet.		**N/A**
11.1.3	Non-detachable cords		**N/A**
11.1.3.1	Non-detachable cords of class I controls shall have a green/yellow conductor insulation which is connected to the earthing terminal or termination of the control, or to the earthing contact of any equipment inlet or socket-outlet, if provided.		**N/A**
11.1.3.2	Conductor insulation identified by the color combination green/yellow shall not be connected to terminals or terminations other than earthing terminals or terminations.		**N/A**
11.2	Protection against electric shock		**P**
11.2.1	Double insulation		**P**
	When double insulation is employed, the design shall be such that the basic insulation and the supplementary insulation can be tested separately unless satisfaction with regard to the properties of both insulations is provided in another way.		**P**
11.2.1.1	If the basic and the supplementary insulation cannot be tested separately, or if satisfaction with regard to the properties of both insulations cannot be obtained in another way, the insulation is regarded as reinforced insulation.		**N/A**
11.2.2	Infringement of double or reinforced insulation		**P**
	Class II controls and controls for use in class II equipment shall be so designed that creepage distances and clearances over supplementary insulation or reinforced insulation cannot, as a result of wear, be reduced below the values specified in Clause 20. They shall be so constructed that if any wire, screw, nut, washer, spring, flat push-on receptacle or similar part becomes loose and falls out of position, it cannot in normal use become so disposed that creepage distances or clearances over supplementary insulation or reinforced insulation are reduced to less than 50 % of the value specified in Clause 20.		**P**
11.2.3	Integrated conductors		**N/A**
11.2.3.1	Integrated conductors shall be so rigid, so fixed or so insulated that in normal use creepage distances and clearances cannot be reduced below the values specified in Clause 20.		**N/A**
11.2.3.2	Insulation, if any, shall be such that it cannot be damaged during mounting or in normal use.		**N/A**
11.2.4	Flexible cord sheaths		**N/A**
	Inside a control, the sheath (jacket) of a flexible cable or cord shall be used as supplementary insulation only where it is not subject to undue mechanical or thermal stresses, and if its insulating properties are not less than those specified in IEC 60227-1 or IEC 60245-1.		**N/A**
11.2.5	Protective impedance		**N/A**
11.2.6	Protection against electric shock by use of SELV or PELV		**N/A**
11.2.7	Connections between internal and external SELV / PELV circuits		**N/A**
	Adequate measures shall be provided to prevent the interconnection of an integrated SELV circuit to an external PELV circuit and vice versa.		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	The supply of a Class III control from an external SELV source by means of a separable connection shall only be possible by means of a dedicated plug and socket system which cannot be fitted or interconnected with other connecting systems.		**N/A**
11.3	Actuation and operation		**P**
11.3.1	Full disconnection		**N/A**
	Controls with positions declared as full-disconnection shall be so designed that in the declared positions there is contact separation in all supply poles other than earth, at least equal to the relevant values specified in Clause 20. The contact separation may be obtained by automatic action or by manual action, but any subsequent automatic action shall not cause any contact separation to be reduced below the specified minimum.		**N/A**
	If the disconnection is also declared to provide all-pole disconnection, the contact operation in each supply pole shall be substantially together..		**N/A**
11.3.2	Micro-disconnection		**P**
	Controls with positions declared as micro-disconnection shall be so designed that in the declared positions there is contact separation in at least one supply pole to meet the electric strength requirements of Clause 13 but no clearance dimension is specified. The contact separation may be obtained by automatic action or by manual action, but any subsequent change of activating quantity between the limits declared in Table 1, requirement 36, or at any switch head temperature between the limits declared in Table 1, requirement 22, shall not cause an operation which would reduce the contact separation such that the requirements of Clause 13 are no longer met.		**P**
11.3.3	Reset buttons		**N/A**
	Reset buttons of controls shall be so located or protected that they are not likely to be accidentally reset.		**N/A**
11.3.4	Setting by the manufacturer		**N/A**
	Parts used for the setting of controls by the manufacturer shall be secured to prevent accidental shifting after setting.		**N/A**
11.3.5	Contacts – General		**N/A**
11.3.5.1	Contacts with a d.c. rating greater than 0,1 A, which can be operated by actuation, shall be so designed that the speeds of approach and separation of the contact surfaces are independent of the speed of actuation.		**N/A**
11.3.5.2	Systems of class C control functions shall include at least two switching elements to directly de-energize the safety relevant terminals.		**N/A**
11.3.5.2.1	Measures to prevent common mode errors		**N/A**
	Measures shall be taken to protect against failure of two (or more) switching elements, due to a common cause, by an external short circuit that would prevent the control from performing a safety shut-down		**N/A**
	Acceptable methods are, for example,		**N/A**
	- overcurrent protection device,		**N/A**
	- current limitation or		**N/A**
	- internal fault detecting means		**N/A**
	The suitability of measures to maintain the capability to interrupt the energization of the safety related output terminals by means of at least one switching element or the interruption of an overcurrent protection device shall be verified by the following test.		**N/A**
11.3.6	Contacts for full-disconnection and micro-disconnection		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
	Contacts for full-disconnection and contacts for micro-disconnection, having either a d.c. rating not greater than 0,1 A, or an a.c. rating, and which can be operated by actuation, shall be so designed that they can come to rest only in a closed position or in an open position.		**P**
11.3.7	The requirements of 11.3.5 and 11.3.6 shall not apply to contacts where inspection shows they cannot be operated on-load or are not intended to be operated on-load, nor to contacts which do not arc under conditions of normal use.		**P**
11.3.8	Contacts rest position		**P**
	Contacts shall, in any rest position of the actuating member, be either open or closed as intended, or such that no hazard can occur within the control or equipment.		**P**
11.3.9	Pull-cord actuated control		**N/A**
	A pull-cord actuated control shall be so designed that when the pull-cord is released after actuating the control, the relevant parts of the mechanism normally cannot fail to return to a position from which they allow the immediate performance of the next movement in the cycle of actuation of the control.		**N/A**
11.4	Actions		**P**
11.4.1	Combined actions		**N/A**
	A control having more than one action, with one of the actions designed to operate after the failure of the other action(s), shall be so constructed that this action remains operative after failure of any portion unique to the other action(s).		**N/A**
11.4.2	Setting by the manufacturer		**N/A**
	Type 2 action which has provision for setting by the manufacturer of its operating value, operating time or operating sequence, shall be designed such that it is clearly discernible if any subsequent interference with the setting has been made.		**N/A**
11.4.3	Type 2 action		**N/A**
	Any Type 2 action shall be so designed that the manufacturing deviation and drift of its operating value, operating time or operating sequence is within the limit declared in requirements 41 and 42 of Table 1 (7.2 of the previous edition).		**N/A**
11.4.4	Type 1.A or 2.A action		**N/A**
	A Type 1.A or 2.A action shall operate to provide the clearances and electric strength requirements specified for full-disconnection.		**N/A**
11.4.5	Type 1.B or 2.B action		**P**
	A Type 1.B or 2.B action shall operate to provide the electric strength requirements specified for micro-disconnection.		**P**
11.4.6	Type 1.C or 2.C action		**N/A**
	A Type 1.C or 2.C action shall operate to provide circuit interruption by micro-interruption.		**N/A**
11.4.7	Type 1.D or 2.D action		**N/A**
	A Type 1.D or 2.D action shall be so designed that disconnection can neither be prevented nor inhibited, by any reset mechanism and so that after disconnection, it is not possible to reclose the circuit even momentarily while the excess or fault condition persists.		**N/A**
11.4.8	Type 1.E or 2.E action		**N/A**
	A Type 1.E or 2.E action shall be designed so that disconnection can neither be prevented, nor inhibited by any reset mechanism and so that the contacts can neither be prevented from opening nor be maintained closed against a continuation of the excess or fault condition.		**N/A**
11.4.9	Type 1.F or 2.F action		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	A Type 1.F or 2.F action shall be designed so that after the control has been mounted in accordance with the manufacturers' instructions, it can only be reset with the aid of a tool.		**N/A**
11.4.10	Type 1.G or 2.G action		**N/A**
	A Type 1.G or 2.G action shall be designed so that after the control has operated, it is possible to reset the control (although not intended) under electrically loaded conditions.		**N/A**
11.4.11	Type 1.H or 2.H action		**N/A**
	A Type 1.H or 2.H action shall be so designed that the contacts cannot be prevented from opening and which may automatically reset to the closed position if the reset means is held in the reset position. The control shall not reset automatically at any temperature above –35 °C with the reset mechanism in the normal position.		**N/A**
11.4.12	Type 1.J or 2.J action		**N/A**
	A Type 1.J or 2.J action shall be so designed that 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 position. The control shall not reset automatically at any temperature above –35 °C.		**N/A**
11.4.13	Type 1.K or 2.K action		**N/A**
	A Type 1.K or 2.K action shall be so designed that in the event of a break in the sensing element, or in any other part between the sensing element and the switch head, the declared disconnection is provided before the declared operating value, operating time or operating sequence is exceeded.		**N/A**
11.4.14	Type 1.L or 2.L action		**P**
	A Type 1.L or 2.L action shall be so designed that in the case of failure of the electrical supply, it performs its intended function independently of any external auxiliary energy source or electrical supply.		**P**
11.4.15	Type 1.M or 2.M action		**N/A**
	A Type 1.M or 2.M action shall be so designed that it operates in its intended manner after the declared ageing procedure.		**N/A**
11.5	Openings in enclosures		**N/A**
	Drain holes, if any, shall have a minimum area of 20 mm^2, a maximum area of 40 mm^2 and minimum dimension of 3 mm.		**N/A**
11.6	Mounting of controls		**P**
11.6.1	Controls shall be so designed that the methods of mounting in accordance with the manufacturer's declaration do not adversely affect compliance with this standard.		**P**
11.6.2	Declared methods of mounting shall be such that the control cannot rotate or be otherwise displaced, and cannot be removed from an equipment without the aid of a tool, if such movement or removal could adversely affect compliance with this standard. If removal or partial removal is necessary for correct use of the control, then the requirements of Clauses 8, 13 and 20 shall be satisfied before and after removal.		**N/A**
11.6.3	Mounting of independently mounted controls		**P**
11.6.3.1	Independently mounted controls other than those declared for panel mounting shall either: – fit a standard box as declared;		**N/A**
	– be supplied with a conduit box if a special conduit box is required; or		**N/A**
	– be suitable for surface mounting on a plane surface.		**N/A**
11.6.3.2	If a special conduit box is required, it shall be delivered together with the control and the box shall be provided with the entries for		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	conduit specified in IEC 60423.		
11.6.3.3	Independently mounted controls for surface mounting used with buried installation (concealed wiring) not using an outlet box shall be provided with suitable holes on the back of the control allowing easy installation and connection to the terminals.		**P**
11.6.3.4	Independently mounted controls for surface mounting used with exposed wiring shall be provided with cable or conduit entries, knock-outs, or glands, which allow connection of the appropriate type of cable or conduit complying with the relevant IEC standard.		**N/A**
11.6.3.5	Independently mounted controls for surface mounting or the sub-bases for such controls, shall be constructed in such a manner that the terminals for external conductors are accessible and can be used when the control or the sub-base is correctly fixed to its support and its cover (or the control) is removed.		**N/A**
11.6.3.6	Controls intended for mounting on an outlet box or similar enclosure shall have wiring terminals, other live parts and sharp-edged metal parts, earthed or not, located or protected so that they will not be forced against wiring in the box or enclosure during installation of the control.		**N/A**
11.6.3.7	Where back wiring terminals are used, they shall be recessed or be protected by close-fitting barriers or insulating materials or the equivalent that will prevent contact with wiring installed in the box.		**P**
	Terminals that do not project into the box beyond the plane of the front edge of the box are acceptable.		**P**
	Guards provided alongside terminals and extending at least 6,5 mm beyond the terminals before wiring, with a corresponding guard between double pole mechanism, are acceptable.		**P**
11.7	Attachment of cords	No cord	**N/A**
11.7.1	Flexing		**N/A**
11.7.1.1	The flexible cords of in-line cord and free standing controls shall be capable of withstanding the flexing likely to occur in normal use. If a cord-guard is provided to meet this requirement it shall not be integral with the flexible cord if attachment method X is used.		**N/A**
11.7.2	Cord anchorages		**N/A**
11.7.2.1	Controls other than those integrated and incorporated, intended to be connected by means of a non-detachable cord, shall have cord anchorages such that the conductors are relieved from strain, including twisting, where they are connected to the terminals, and that their covering is protected from abrasion. It shall be clear how the relief from strain and the prevention of twisting is intended to be effected.		**N/A**
11.7.2.2	Cord anchorages of class II controls shall be of insulating material or, if of metal, be insulated from accessible metal parts or metal foil over accessible non metallic surfaces by insulation complying with the requirements for supplementary insulation.		**N/A**
11.7.2.3	Cord anchorages of controls, other than those of class II, shall be of insulating material or be provided with an insulating lining, if otherwise an insulation fault on the cord could make accessible metal parts live. This lining, if any, shall be fixed to the cord anchorage, unless it is a bushing which forms part of a cord guard provided to meet the requirements of 11.7.1.		**N/A**
11.7.2.4	Cord anchorages shall be so designed that:		**N/A**
	– the cord cannot touch clamping screws of the cord anchorage, if these screws are accessible metal parts;		**N/A**
	– the cord is not clamped by a metal screw which bears directly on the cord;		**N/A**
	– for attachment method X or M at least one part is securely fixed to the control;		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	– for attachment method X or M replacement of the flexible cord does not require the use of a special purpose tool;		**N/A**
	– for attachment method X they are suitable for the different types of flexible cord which may be connected;		**N/A**
	– for attachment method X the design and location make replacement of the flexible cord easily possible.		**N/A**
11.7.2.5	For other than attachment method Z, makeshift methods such as tying the cord into a knot, or tying the ends with string, shall not be used.		**N/A**
11.7.2.6	Glands shall not be used as cord anchorages in in-line cord controls using attachment method X unless they make provision for clamping all types and sizes of cords used in 10.1.4.		**N/A**
11.7.2.7	Screws, if any, which have to be operated when replacing the cord, shall not serve to fix any other component, unless either the control is rendered inoperable or manifestly incomplete if they are omitted or incorrectly replaced, or the component intended to be fixed cannot be removed without the aid of a tool when replacing the flexible cord.		**N/A**
11.7.2.15	For the measurement of the longitudinal displacement, a mark is made on the cord while it is subjected to the pull, at a distance of approximately 20 mm from the cord anchorage, before starting the tests. After the tests, the displacement of the mark on the cord in relation to the cord anchorage is measured while the cord is subjected to the pull.		**N/A**
11.8	Size of cords – non-detachable		**N/A**
11.8.1	Non-detachable cords shall not be lighter than ordinary tough rubber sheathed flexible cord, designated EN 50525-2-21, or ordinary polyvinyl chloride sheathed flexible cord, designated EN 50525-2-11. The use of a lighter flexible cord is permissible if allowed in a particular equipment standard or for connection to external SELV devices		**N/A**
11.8.2	Controls fitted with non-detachable cords shall have a cord with conductors of a size not less than that shown in Table 10		**N/A**
11.8.3	The space for the flexible cord inside the control shall be adequate to allow the conductors to be easily introduced and connected, and the cover, if any, fitted without risk of damage to the conductors or their insulation. It shall be possible to check that the conductors are correctly connected and positioned before the cover is fitted.		**N/A**
11.9	Inlet openings		**N/A**
11.9.1	Inlet openings for flexible external cords shall be so designed and shaped, or shall be provided with an inlet bushing, so that the covering of the cord can be introduced without risk of damage.		**N/A**
11.9.1.1	Conduit entries and knock-outs of independently mounted controls shall be so designed or located that introduction of the conduit or conduit fitting does not affect the protection against electric shock or reduce creepage distances and clearances below the values specified in Clause 20.		**N/A**
11.9.2	If an inlet bushing is not provided then the inlet opening shall be of insulating material.		**N/A**
11.9.3	If an inlet bushing is provided then it shall be of insulating material, and: – shall be so shaped as to prevent damage to the cord,		**N/A**
	– shall be reliably fixed,		**N/A**
	– shall not be removable without the aid of a tool,		**N/A**
	– shall, if attachment method X is used, not be integral with the cord.		**N/A**
11.9.4	An inlet bushing shall not be of rubber, with the exception that for attachment methods M, Y and Z for class 0, class 0I or class		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	I controls, rubber is allowed if the bushing is integral with the sheath of a cord of rubber.		
11.9.5	Enclosures of independently mounted controls intended to be permanently connected to fixed wiring shall have cable entries, conduit entries, knockouts or glands which permit the connection of the appropriate conduit, cable or cord, as applicable.		**N/A**
11.10	Equipment inlets and socket-outlets		**N/A**
11.10.1	The design of equipment inlets and socket-outlets intended for use by the user for the interconnection of controls and equipment shall be such as to render unlikely their engagement with each other or with equipment inlets or socket-outlets intended for other systems if such engagement could result in fire, or injury or electric shock to persons or damage to equipment or surroundings.		**N/A**
11.10.2	In-line cord controls provided with an equipment inlet or socket-outlet shall be so rated, or so protected, that unintentional overloading of either the control, equipment inlet or socket-outlet cannot occur in normal use.		**N/A**
11.10.3	Controls provided with pins, blades, or other connecting/adapting means, in order to be introduced into fixed socket outlets shall comply with the requirements of the appropriate socket-outlet system.		**N/A**
	If in-line cord controls provided with a plug and a socket outlet, where the plug can be connected to a socket outlet rated for a higher load current than the control, the control shall be provided with an incorporated fuse or a protective device to limit the current to the control's rating. The testing of the protective function is done in the sequence of tests according to 27.5.		**N/A**
	The plug and socket outlet part of the control shall comply with the appropriate standard for the plug and socket system. The control part shall comply with this standard.		**N/A**
11.11	Requirements during mounting, maintenance and servicing		**P**
11.11.1	Covers and their fixing		**P**
11.11.1.1	For other than integrated controls, the removal of a cover or cover plate, which is intended to be removed during mounting, user maintenance or servicing of the control or equipment, shall not affect the setting of the control if this might impair compliance with this standard.		**P**
11.11.1.2	The fixing of covers shall be such that they cannot be displaced, nor replaced incorrectly if this could mislead the user or would impair compliance with this standard. The fixing of covers which need to be removed for mounting shall not serve to fix any parts, other than actuating members or gaskets.		**P**
11.11.1.3	Covers of enclosures	Void	**N/A**
11.11.1.4	Glass covering an opening	Void	**N/A**
11.11.1.5	Non-detachable parts		**P**
	Non-detachable parts which provide the necessary degree of protection against electric shock, moisture or contact with moving parts, shall be fixed in a reliable manner and shall withstand the mechanical stress occurring in normal use.		**P**
	Snap-in devices used for fixing non-detachable parts shall have an obvious locked position. The fixing properties of snap-in devices used in parts which are likely to be removed for installation or during servicing shall not deteriorate.		**P**
11.11.1.6	A cover, which can be removed with one hand, shall not be released when a squeezing force of up to 45 N combined with up to 15 N for the pull test is applied at any two points, the distance between which does not exceed 125 mm, as measured by a tape		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
	stretched tightly over that portion of the surface of the cover which would be encompassed by the palm of the hand. The test is performed before and after 10 removal and replacement operations.		
11.11.2	Cover fixing means		**P**
	Fixing screws of covers or cover plates which need to be removed during mounting, user maintenance or servicing shall be captive.		**P**
11.11.3	Actuating member		**P**
11.11.3.1	A control shall not be damaged when its actuating member is mounted or removed in the intended manner.		**P**
11.11.3.2	If the maximum or minimum setting by manufacturer or user of a Type 2 action is limited by mechanical means associated with an actuating member, such actuating member shall not be removable without the use of a tool.		**N/A**
11.11.3.3	If an actuating member of a control with a Type 1 action providing an "OFF" position, or the actuating member of any control with a Type 2 action is used to indicate the condition of the control, it shall not be possible to fix the actuating member in an incorrect position.	Indication not on actuating member	**N/A**
11.11.4	Parts forming supplementary or reinforced insulation		**N/A**
	Parts of controls which serve as supplementary insulation or reinforced insulation and which might be omitted during reassembly after user maintenance or servicing, shall either be fixed in such a way that they cannot be removed without being seriously damaged, or be so designed that they cannot be replaced in an incorrect position, and that, if they are omitted, the control is rendered inoperable or manifestly incomplete.		**N/A**
11.11.5	Sleeving as supplementary insulation		**N/A**
	Sleeving used as supplementary insulation on integrated conductors shall be retained in position by a positive means.		**N/A**
11.11.6	Pull-cords		**N/A**
	Pull-cords shall be insulated from live parts and the control shall be so designed that it is possible to fit or to replace the pull-cord without live parts becoming accessible.		**N/A**
11.11.7	Insulating linings		**N/A**
	Insulating linings, barriers and the like shall have adequate mechanical strength and shall be secured in a reliable manner.		**N/A**
11.12	Controls using software	See Annex H	**P**
11.13	Protective controls and components of protective control systems		**N/A**
11.13.1	Protective controls		**N/A**
	– be so designed and constructed as to be reliable and suitable for their intended duty and take into account the maintenance and testing requirements of the devices, where applicable,		**N/A**
	– be independent of other functions, unless their safety function cannot be affected by such other functions,		**N/A**
	– comply with appropriate design principles in order to obtain suitable and reliable protection.		**N/A**
	These principles include, in particular, fail-safe modes, redundancy, diversity, and selfdiagnosis.		**N/A**
	Operating controls shall not be used as protective controls.		**P**
11.13.2	Pressure limiting devices		**N/A**
	These devices shall be so designed that the pressure will not permanently exceed the maximum allowable pressure of the controlled application; however, a short duration pressure surge of no more than 10 % of the pressure surge is allowable, where		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	appropriate, or where not specified in the relevant standard for the controlled application.		
11.13.3	Temperature monitoring devices		**P**
	These devices shall have an adequate response time on safety grounds, consistent with measurement function.		**P**
11.13.4	Batteries		**N/A**
11.13.4.1	Controls containing batteries shall be designed to reduce the risk of fire, explosion and chemical leaks under normal conditions and after a single fault in the control. For user-replaceable batteries, the design shall reduce the likelihood of reverse polarity installation if this would create a hazard.		**N/A**
11.3.4.2	Battery circuits designed for a total battery capacity > 1 000 mAh shall be designed so that:		**N/A**
	- the output characteristics of a battery charging circuit are compatible with its recharqeable battery (see Annex V); and		**N/A**
	- for non-rechargeable batteries, discharging at a rate exceeding the battery manufacturer's recommendations, and unintentional charging, are prevented; and		**N/A**
	- for rechargeable batteries (see Annex V), charging and discharging at a rate exceeding the battery manufacturer's recommendations, and reversed charging, are prevented; and		**N/A**
	- replaceable batteries shall either o have contacts that cannot be shorted with the test finger (Figure 2); or o be inherently protected to avoid creating a hazard within the meaning of the standard		**N/A**
11.13.4.3	If a battery with a capacity > 1 000 mAh contains liquid or gel electrolyte, a battery tray shall be provided that is capable of retaining any liquid that could leak as a result of internal pressure build-up in the battery. The requirement to provide a battery tray does not apply if the construction of the battery is such that leakage of the electrolyte from the battery is unlikely.		**N/A**
11.13.4.3.1	If battery tray is required, its capacity shall be at least equal to the volume of electrolyte of all the cells of the battery, or the volume of a single cell if the design of the battery is such that simultaneous leakage from multiple cells is unlikely.		**N/A**
12.	**MOISTURE AND DUST RESISTANCE**		**P**
12.1	Protection against ingress of water and dust	IP20	**P**
12.1.1	Controls shall provide the degree of protection against ingress of water and dust appropriate to their IP classification when mounted and used in the declared manner.		**P**
12.2	Protection against humid conditions	IP20	**N/A**
12.2.1	All controls shall withstand humid conditions which may occur in normal use.	See also Annex J	**N/A**
13.	**ELECTRIC STRENGTH AND INSULATION RESISTANCE**		**P**
13.1	Insulation resistance	Supplementary insulation	**P**
	The insulation resistance of in-line cord, free standing and independently mounted controls shall be adequate.		**P**
13.2	Electric strength		**P**
	The electric strength of all controls shall be adequate.		**P**
14.	**HEATING**		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
14.1	Controls and their supporting surfaces shall not attain excessive temperatures in normal use.		**P**
15.	**MANUFACTURING DEVIATION AND DRIFT**		**N/A**
15.1	Those parts of controls providing a Type 2 action shall have adequate consistency of manufacture with regard to their declared operating value, operating time, or operating sequence.		**N/A**
16.	**ENVIRONMENTAL STRESS**		**P**
16.1	Controls which are sensitive to the environmental stresses of temperature shall withstand the level of the appropriate stress likely to occur in transportation and storage.	0°C to + 45°C	**P**
16.2	Environmental stress of temperature		**P**
17.	**ENDURANCE**		**P**
17.1	General requirements		**P**
17.1.1	Controls, including those submitted in or with an equipment, shall withstand the mechanical, electrical and thermal stresses that occur in normal use.		**P**
17.1.2	Controls with Type 2 actions shall operate such that any operating value, operating time or operating sequence does not change by an amount greater than the declared drift.		**N/A**
17.1.3	Test sequence and conditions		**P**
17.1.4	See Annex H		**P**
17.2	Electrical conditions for the tests		**P**
17.3	Thermal conditions for the tests		**P**
17.4	Manual and mechanical conditions for the tests		**P**
17.5	Dielectric strength requirements		**P**
17.6	Ageing test		**N/A**
17.7	Overvoltage test of automatic action at accelerated rate		**N/A**
17.8	Test of automatic action at accelerated rate		**N/A**
17.9	Test of automatic action at slow rate		**N/A**
17.10	Overvoltage test of manual action at accelerated speed		**N/A**
17.11	Test of manual action at slow speed		**N/A**
17.12	Test of manual action at high speed		**N/A**
17.13	Test of manual action at accelerated speed		**N/A**
17.14	Evaluation of compliance		**N/A**
17.16	Test for particular purpose controls		**N/A**
18.	**MECHANICAL STRENGTH**		**P**
18.1	General requirements		**P**
18.1.1	Controls shall be so constructed as to withstand the mechanical stress that occurs in normal use.		**P**
18.1.2	Actuating members of class I and class II controls, and actuating members of controls for class I and class II equipment, shall either have adequate mechanical strength or be such that adequate protection against electric shock is maintained if the actuating member is broken.		**P**
18.1.3	Integrated controls and incorporated controls are not tested as in 18.2 as their impact resistance will be tested by the equipment standard.		**N/A**
18.2	Impact resistance		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
18.3	Void		**N/A**
18.4	Void		**N/A**
18.5	Free-standing controls		**N/A**
18.6	In-line cord controls		**N/A**
18.7	Pull-cord actuated controls		**N/A**
18.8	Foot actuated controls		**N/A**
18.9	Actuating member and actuating means		**P**
19.	**THREADED PARTS AND CONNECTIONS**		**P**
19.1	Threaded parts moved during mounting or servicing		**P**
19.1.1	Threaded parts, electrical or otherwise which are likely to be operated while the control is being mounted or during servicing shall withstand the mechanical stresses occurring in normal use.		**P**
19.1.2	Such parts shall be easily replaceable if completely removed.		**P**
19.1.3	Such threaded parts shall have a metric ISO thread or a thread of equivalent effectiveness.		**P**
19.1.4	If such a threaded part is a screw and if it generates a thread in another part, it shall not be of the thread cutting type. It may be of the thread forming (swaging) type. There is no requirement for the type of thread so produced.		**N/A**
19.1.5	Such screws may be of the space threaded type, (sheet metal) if they are provided with a suitable means to prevent loosening.		**N/A**
19.1.6	Such threaded parts shall not be of non-metallic material if their replacement by a dimensionally similar metal screw could impair compliance with Clause 13 or 20.		**N/A**
19.1.7	Such screws shall not be of metal which is soft or liable to creep such as zinc or aluminium.		**P**
	This requirement is not applicable to parts used either as a cover to limit access to setting means, or as setting means such as flow or pressure adjusters in gas controls.		**N/A**
19.1.8	Such screws operating in a thread of non-metallic material shall be such that the correct introduction of the screw into its counterpart shall be ensured.		**P**
19.1.9	Such threaded parts, when used for in-line cord controls, if they are transmitting contact pressure and if they have a nominal diameter less than 3 mm, shall screw into metal. If they are of non-metallic material they shall have a nominal diameter of at least 3 mm, and shall not be used for any electrical connection.		**N/A**
19.2	Current-carrying connections		**N/A**
19.2.1	Current-carrying connections which are not disturbed during mounting or servicing and the efficiency or security of which is maintained by the pressure of a screw, threaded part, rivet or the like shall withstand the mechanical, thermal and electrical stresses occurring in normal use.		**N/A**
19.2.2	Such current-carrying connections which are also subject to torsion in normal use, (that is, having parts integral with or connected rigidly to screw terminals etc.) shall be locked against any movement which could impair compliance with Clauses 13 or 20.		**N/A**
19.2.3	Such current-carrying connections shall be so designed that contact pressure is not transmitted through non-metallic material other than ceramic or other non-metallic material having characteristics no less suitable, unless there is sufficient resilience in the corresponding metal parts to compensate for any shrinkage or distortion of the non-metallic material.		**N/A**
19.2.4	Such current-carrying connections shall not make use of space threaded screws, unless the screws clamp the current-carrying		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	parts directly in contact with each other, and are provided with a suitable means of locking.		
19.2.4.1	Space threaded screws may be used to provide earthing continuity if at least two such screws are used for each connection.		**N/A**
19.2.5	Such current-carrying connections may make use of thread cutting screws if these produce a full-form standard machine screw thread.		**N/A**
19.2.5.1	Thread cutting screws may be used to provide earthing continuity if at least two such screws are used for each connection.		**N/A**
19.2.6	Such current-carrying connections, whose parts rely on pressure for their correct function, shall have resistance to corrosion over the area of contact not inferior to that of brass. This requirement does not apply to parts whose essential characteristics may be adversely affected by plating such as bimetallic blades, which if not plated shall be clamped into contact with parts which have adequate resistance to corrosion. Suitable corrosion resistance may be achieved by plating or a similar process.		**N/A**
20.	**CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH SOLID INSULATION**		**P**
	Controls shall be constructed so that the clearances, creepage distances and distances through solid insulation are adequate to withstand the electrical stresses that can be expected.		**P**
	Printed wiring boards conforming with all of the requirements for type 2 coating as specified in IEC 60664-3 shall comply with the minimum requirements of 20.3 for solid insulation. The spacing between the conductors before the protection is applied shall not be less than the values as specified in Table 1 of IEC 60664-3:2003.		**N/A**
	Creepage distances and clearances between terminals for the connection of external conductors shall be not less than 2 mm, or the specified limit, whichever is the highest. This requirement does not apply to such terminals if they are only used for factory attachment of conductors or if they are used for connection in ELV circuits.		**P**
	Creepage distances, clearances and distances through solid insulation in switch mode power supplies and other high frequency switching circuits where the fundamental frequency is above 30 kHz and less than 10 MHz shall be dimensioned in accordance with IEC 60664-4.		**N/A**
	The tabulated values of Clause 20 are absolute minimum values that must be maintained for all manufacturing conditions and through the lifetime of the equipment.		**P**
20.1	Clearances		**P**
	Clearances shall not be less than the values shown in Table 22 for case A, taking into account the pollution degree and the rated impulse voltage required to serve the overvoltage categories of Table 21, except that, for basic and operational insulation, smaller distances may be used if the control meets the impulse withstand test of 20.1.12 and the parts are rigid or held by mouldings, or if the construction is such that there is no likelihood of the distances being reduced by distortion or by movement of the parts (e.g. during operation or during assembly), but in no case shall the clearances be less than the values for case B.	>1,5 mm	**P**
20.1.1	The clearances of basic insulation shall be sufficient to withstand the overvoltages that can be expected in use, taking into account the rated impulse voltage. The values of Table 22, case A apply except as permitted by 20.1.7.		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
20.1.2	For operational insulation, Table 22, case A applies		**P**
	- except as permitted by 20.1.7		**N/A**
	- except that clearances for electronic controls are not specified if the requirements of H.27.1.1.3 are met with the clearances short-circuited.		**N/A**
20.1.7	For basic and operational insulation, smaller distances may be permitted if the control meets the impulse withstand test of 20.1.12 and the parts are rigid or held by mouldings, or if the construction is such that there is no likelihood of the distances being reduced by distortion, by movement of the parts, or during assembly, but in no case shall the clearances be less than the values for case B.		**N/A**
	When testing operational insulation, the impulse voltage is applied across the clearance.		**N/A**
20.1.7.1	For micro-disconnection and interruption, there is no specified minimum distance for the clearance between the contacts. For other parts separated by the action of the contacts, clearances may be smaller than those of Table 22, but shall not be less than the distance between the contacts.		**P**
20.1.7.2	For full disconnection, the values specified in Table 22, case A apply to parts separated by the switching element including the contacts, when the contacts are in the fully open position.		**N/A**
20.1.8	Clearances of supplementary insulation shall be not less than those specified for basic insulation in Table 22, case A.		**P**
20.1.9	Clearances of reinforced insulation shall be not less than those in Table 22, case A but using the next higher step for rated impulse voltage as a reference.		**N/A**
20.1.10	For controls or portions of controls supplied from a transformer with double insulation, clearances of operational insulation and basic insulation on the secondary side are based on the secondary voltage of the transformer which is used as the nominal voltage of Table 21		**P**
	In the case of supply voltages derived from transformers without separate windings, the rated impulse voltage shall be determined from Table 21 based on the primary voltage for step-down transformers, and based on the maximum measured r.m.s. value of the secondary voltage for step-up transformers.		**P**
	Part 2s may specify alternative criteria for some situations, for example, high voltage ignition sources.		**N/A**
	Annex F, Table F.2 of IEC 60664-1:2007 gives clearance dimensions for higher impulse withstand voltages.		**N/A**
20.1.11	For circuits having ELV levels which are derived from the supply by means of protective impedance, clearances of functional insulation are determined from Table 21 based on the maximum measured value of the working voltage in the ELV circuit.		**N/A**
20.1.12	The impulse voltage test, when required, is applied in accordance with 6.1.2.2.1 of IEC 60664-1:2007.		**N/A**
20.1.13	If the secondary of a transformer is earthed, or if there is an earthed screen between the primary and secondary windings, the clearances of basic insulation on the secondary side shall not be less than those specified in Table 22 but using the next lower step for rated impulse voltage as a reference.	No earthing	**N/A**
	For circuits supplied with a voltage lower than rated voltage, for example, on the secondary side of a transformer, clearances of functional insulation are based on the working voltage, which is used as the rated voltage for Table 21.		**P**
20.2	Creepage distances		**P**
20.2.1	Controls shall be constructed so that creepage distances for basic insulation are not less than those specified in Table 23 for the		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
	rated voltage, taking into account the material group and the pollution degree.		
	Creepage distances are not specified for electronic controls if the requirements of H.27.1.1.3 are met with the creepage distance short-circuited.		**P**
20.2.2	Controls shall be constructed so that creepage distances for functional insulation are not less than those specified in Table 24 for working voltage, taking into account the material group and the pollution degree.		**P**
20.2.3	Creepage distances of supplementary insulation shall be not less than those appropriate for basic insulation taking into account the material group and the pollution degree.		**P**
20.2.4	Creepage distances of reinforced insulation shall be not less than double those appropriate for basic insulation, taking into account the material group and the pollution degree.		**N/A**
20.3	Solid insulation		**P**
	Solid insulation shall be capable of durably withstanding electrical and mechanical stresses as well as thermal and environmental influences which may occur during the anticipated life of the equipment.		**P**
20.3.1	There is no dimensional requirement for the thickness of basic or functional insulation.		**P**
20.3.2	The distance through insulation for supplementary and reinforced insulation, for working voltages up to and including 300 V, between metal parts shall not be less than 0,7 mm.		**P**
	For controls having parts with double insulation where there is no metal between basic insulation and supplementary insulation, the measurements are made as though there is a metal foil between the two layers of insulation. *ia.*		**N/A**
20.3.2.1	The requirement of 20.3.2 does not apply if the insulation is applied in thin sheet form, other than mica or similar scaly material.		**N/A**
	– For supplementary insulation, it consists of at least two layers, provided that each of the layers withstands the electric strength test of 13.2 for supplementary insulation.		**N/A**
	– For reinforced insulation, it consists of at least three layers, provided that any two layers together withstand the electric strength test of 13.2 for reinforced insulation.		**N/A**
20.3.2.2	The requirement of 20.3.2 does not apply if the supplementary insulation or the reinforced insulation is inaccessible and meets one of the following criteria.		**N/A**
	– The maximum temperature determined during the tests of Clauses 27 and H.27 does not exceed the permissible value specified in Table 13.		**N/A**
	– The insulation, after having been conditioned for 168 h in an oven maintained at a temperature equal to 25 K in excess of the maximum temperature determined during the tests of Clause 14, withstands the electric strength test of 13.2, this test being made on the insulation both at the temperature occurring in the oven and after cooling to approximately room temperature.		**N/A**
	For optocouplers, the conditioning procedure is carried out at a temperature of 25 K in excess of the maximum temperature measured on the optocoupler during the tests of Clauses 14, 27 and H.27, the optocoupler being operated under the most unfavourable conditions which occur during these tests.		**N/A**
21.	**RESISTANCE TO HEAT, FIRE AND TRACKING**		**P**
21.1	General requirements		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
	All non-metallic parts of a control shall be resistant to heat, fire and tracking.	documentation	**P**
21.2	Integrated, incorporated and in-line cord controls		**N/A**
	The following test sequences shall be conducted as appropriate to the position or function of the non-metallic part and the declared ball pressure and glow-wire test temperatures.		**N/A**
21.2.3	The tests are not applicable to parts retaining in position current-carrying parts in low-power circuits as described in H.27.1.1.1.		**N/A**
21.2.7	Resistance to tracking		**P**
	All non-metallic parts for which a creepage distance is specified in Subclause 20.2 shall have a resistance to tracking as declared.		**P**
	Controls designed for operation at ELV levels are not subjected to a tracking test.		**N/A**
21.3	Independently mounted controls		**P**
21.3.1	Preconditioning		**P**
22.	**RESISTANCE TO CORROSION**		**P**
22.1	Resistance to rusting		**P**
22.1.1	Ferrous parts, including covers and enclosures, the corrosion of which might impair compliance with this standard, shall be protected against corrosion.		**N/A**
22.1.2	This requirement does not apply to temperature sensing elements or to other component parts whose performance would be adversely affected by protective treatment.		**N/A**
23.	**ELECTROMAGNETIC COMPATIBILITY (EMC) REQUIREMENTS – EMISSION**		**P**
23.1	Free standing and independently mounted controls, which cycle during normal operation, shall be so constructed that they do not generate excessive radio interference. Integrated and incorporated controls are not subjected to the tests of this clause, as the result of these tests can be affected by the incorporation of the control in equipment. They may, however, be carried out on such controls if requested by the manufacturer.	see EMC test reports 240500150/3/EMC 240500150/4/EMC 240500150/5/EMC	**P**
23.1.1	Test conditions		**P**
23.1.2	Test procedure		**P**
23.2	Controls for ISM (Industrial, Scientific and Medical) equipment and free-standing, independently mounted and in-line cord controls for use with ISM equipments shall comply with the requirements of CISPR 11.		**N/A**
24.	**COMPONENTS**		**P**
24.1	Transformers intended to supply power to a SELV-circuit or PELV-circuit shall be of the safety isolating type and shall comply with the relevant requirements of IEC 61558-2-6.		**P**
	Capacitors used to provide radio interference suppression shall comply with the requirements of IEC 60384-14.		**N/A**
	Fuses shall comply with the requirements of IEC 60127-1 or IEC 60269-1, as appropriate		**N/A**
24.1.1	Controls that incorporate a transformer as the source of supply to an external SELV-circuit or PELV-circuit are subjected to an output test with the primary energized at the upper limit of the rated voltage as indicated in 17.2.2, 17.2.3.1 and 17.2.3.2.		**P**
	Switch mode power supplies or transformers used in converters shall comply with the requirements of IEC 61558-2-16.		**N/A**
	Under any non-capacitive conditions of loading (from no load to the short-circuiting of any or all secondary SELV- or PELV-circuit		**N/A**

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	terminals) and without disturbing internal connections, the secondary output voltage shall not be greater than that defined in 2.1.5.		
	If a converter is used as the source of supply to an external SELV-circuit or PELV-circuit, Clause T.3 applies.		**N/A**
	The secondary output power at the terminals to an isolated limited secondary circuit shall not exceed 100 VA and the secondary output current shall not exceed 8 A after 1 min of operation with overcurrent protection, if provided, bypassed.		**P**
24.2	Components other than those detailed in 24.1 are checked when carrying out the tests of this standard.		**P**
24.2.1	However, for components which have previously been found to comply with a relevant IEC safety standard, to reduce the testing necessary, assessment is limited to the following:		**P**
	a) the application of the component within the control is checked to ensure that it is covered by previous testing to the IEC safety standard;		**P**
	b) testing according to this standard of any conditions not covered by the previous testing to the IEC safety standard.		**P**
24.3	Annex U is not applicable to relays used as components in a control		**P**
25.	**NORMAL OPERATION**		**P**
	See Annex H.		**P**
26.	**ELECTROMAGNETIC COMPATIBILITY (EMC) REQUIREMENTS – IMMUNITY**		**P**
	See Clause H.26	see EMC test reports 240500150/3/EMC 240500150/4/EMC 240500150/5/EMC	**P**
27.	**ABNORMAL OPERATION**		**P**
27.1	See Annex H and Annex J.		**P**
27.2	Burnout test		**N/A**
	Controls incorporating electro-magnets shall withstand the effects of blocking of the control mechanism.	Not used	**N/A**
27.2.3	Blocked mechanical output test (abnormal temperature test)		**N/A**
	Controls with motors, such as electric actuators, shall withstand the effects of blocked output without exceeding the temperatures indicated in Table 26. Temperatures are measured by the method specified in 14.7.1. This test is not conducted on controls with motors, such as electric actuators, where, when tested under blocked output conditions for 7 h, any protective device, if provided, does not cycle under stalled conditions, and which do not exceed temperature limits in Table 13.	No motor	**N/A**
27.2.3.2	The average temperature shall be within the limits during both the second and the twenty-fourth hours of the test.		**N/A**
27.2.3.3	During the test, power shall be continually supplied to the motor.		**N/A**
27.2.3.4	Immediately upon completion of the test, the motor shall be capable of withstanding the electric strength test specified in Clause 13, without first applying the humidity treatment of 12.2.		**N/A**
27.3	Overvoltage and undervoltage test		**N/A**
	A control incorporating an electro-magnet shall operate as intended at any voltage within the range of 85% of the minimum		**N/A**

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	rated voltage and 110% of the maximum rated voltage, inclusive.		
27.4	See Annex H.		**N/A**
27.5	Overload tests on in-line cords controls		**N/A**
27.6	Battery short-circuit test		**N/A**
28.	**GUIDANCE ON THE USE OF ELECTRONIC DISCONNECTION**		**N/A**
	See Annex H.		**N/A**
Annex A	**INDELIBILITY OF MARKINGS**		**P**
A.1	Markings on controls shall be adequately indelible for safety and are therefore classified according to the requirements for indelibility.		**P**
A.1.1	Markings which are not mandatory within the requirements of this standard.		**P**
A.1.2	Markings which are mandatory within the requirements of this standard but which are not accessible to the final user when the control is mounted or installed in the equipment.		**P**
	These markings have to be sufficiently resistant to removal to withstand the manual handling in the control manufacturer's factory after final inspection, being packed and transported to the equipment manufacturer's factory, and handled during installation. Additionally, the marking shall remain legible in the presence of any vapour or other contaminant likely to be present.		**P**
A.1.3	Markings which are mandatory within the requirements of this standard and which are accessible to the final user of the equipment after the control is mounted or installed as for normal use.	Not accessible after installation	**N/A**
	These markings, in addition to being resistant to the handling, etc., described in A.1.2, have also to withstand the rubbing and handling expected during the use of the equipment. Markings on knobs, etc., shall survive the continual handling and rubbing as a result of manual actuation. Other markings should be resistant to cleaning, polishing and the like.		**N/A**
Annex B	**MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES IN AIR**		**P**
Annex C	**Cotton used for mercury switch test (not applicable in the countries members of CENELEC)**		**N/A**
Annex D	**Heat, fire and tracking**		**N/A**
Annex E	**CIRCUIT FOR MEASURING LEAKAGE CURRENT**		**N/A**
	A suitable circuit for measuring leakage current in accordance with H.8.1.10 is shown in Figure E.1.		**N/A**
Annex F	**FIRE HAZARD TESTING**		**N/A**
F.1	Information for controls to be integrated or incorporated into appliances according to the IEC 60335 series is given by a reference to IEC 60335-1.	Documentation on components	**N/A**
Annex G	**HEAT AND FIRE RESISTANCE TESTS**		**P**
G.2	Glow-wire test		**P**
G.4	Proof tracking test		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
G.5	Ball pressure test		**P**
G.5.1	Ball pressure test 1		**N/A**
G.5.2	Ball pressure test 2		**N/A**
Annex H	**REQUIREMENTS FOR ELECTRONIC CONTROLS**		**P**
	This annex supplements or modifies the corresponding clauses of this standard.		**P**
H.2	Terms and definitions		**P**
H.4	General notes on tests		**P**
H.4.1	Conditions of test		**P**
H.6	Classification		**P**
H.6.4	According to features of automatic action H.6.4.3		**N/A**
H.6.4.3.13	electronic disconnection on operation (Type 1.Y - 2.Y)		**N/A**
H.6.9	According to circuit disconnection or interruption		**N/A**
H.6.9.5	electronic disconnection		**N/A**
H.6.18	According to classes of control functions (see Table 1, requirement 92		**P**
H.6.18.1	- Control of class A control functions		**P**
H.6.18.2	- Control of class B control functions		**N/A**
H.6.18.3	- Control of class C control functions		**N/A**
H.7	Information		**P**
H.8	Protection against electric shock		**P**
H.8.1.10	Accessible parts shall not be considered as hazardous live parts if separated from the supply by protective impedance.		**N/A**
H.8.1.10.1	When protective impedance is used, the current between the part or parts and either pole of the supply source shall not exceed 0,7 mA (peak value) a.c. or 2 mA d.c.		**N/A**
	- for frequencies exceeding 1 kHz, the limit of 0,7 mA (peak value) is multiplied by the value of the frequency in kHz but shall not exceed 70 mA (peak value);		**N/A**
	- for voltages over 42,4 V (peak value) and up to and including 450 V (peak value), the capacitance shall not exceed 0,1 uF;		**N/A**
	- for voltages over 450 V (peak value) and up to and including 15 kV (peak value), the product of the capacitance in farads times the potential in volts shall not exceed 45 uC;		**N/A**
	- for voltages over 15 kV (peak value), the product of the capacitance in farads times the square of the potential in volts shall not exceed 350 uJ.		**N/A**
	Details of a suitable measuring circuit are shown in Figure E.1.		**N/A**
	The measuring circuit shall have an accuracy of within 5 % for all frequencies in the range of 20 Hz to 5 kHz. For frequencies above 5 kHz, alternative methods of measurement are required.		**N/A**
H.11	Constructional requirements		**N/A**
H.11.2	Protection against electric shock		**N/A**
H.11.2.5	Protective impedance shall consist of two or more impedance components of equivalent resistance values in series, which are connected between live parts and accessible parts. It shall consist of components in which the probability of a reduction in impedance during life can be ignored and the possibility of a short circuit is negligible.		**N/A**
	Such components are resistors pointed out in Table H.24, footnote c		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	Alternatively, the resistors shall comply with the requirements of 14.1 of IEC 60065:2001, Amendment 1:2005.		**N/A**
	Under these conditions, the equipment shall still comply with the requirements of H.8.1.10.		**N/A**
H.11.4	Actions		**N/A**
H.11.4.16	Type 1.Y or 2.Y action shall operate to provide electronic disconnection.		**N/A**
H.11.4.16.1	The test is carried out with the control connected to its declared maximum load, supplied with rated voltage, and at temperature Tmax.		**N/A**
H.11.4.16.2	The current through the electronic disconnection shall not exceed 5 mA or 10 % of the rated current, whichever is the lower.		**N/A**
H.11.12	Controls using software		**P**
	Controls using software shall be so constructed that the software does not impair control compliance with the requirements of this standard.		**P**
H.11.12.1	Requirements for the architecture		**N/A**
H.11.12.2	Measures to control faults/errors	Software class A	**N/A**
H.11.12.2.1	When redundant memory with comparison is provided on two areas of the same component, the data in one area shall be stored in a different format from that in the other area (see software diversity).		**N/A**
H.11.12.2.2	Controls with software class C using dual channel structures with comparison shall have additional fault/error detection means (such as periodic functional tests, periodic self-tests, or independent monitoring) for any fault/errors not detected by the comparison.		**N/A**
H.11.12.2.3	For controls with software class B or C, means shall be provided for the recognition and control of errors in transmissions to external safety-related data paths. Such means shall take into account errors in data, addressing, transmission timing and sequence of protocol.		**N/A**
H.11.12.2.4	For control with software class B or C, the manufacturer shall provide, within the control, measures to address the fault/errors in safety-related segments and data indicated in Table H.1 and identified in Table 1, requirement 68.		**N/A**
H.11.12.2.5	Measures others than those specified in H.11.12.2.4 are permitted if they can be shown to satisfy the requirements listed in Table H.1		**N/A**
H.11.12.2.6	Software fault/error detection shall occur not later than the time declared in requirement 71 of Table 1. The acceptability of the declared time(s) is evaluated during the fault analysis of the control.		**N/A**
H. 11.12.2.7	For controls with functions, classified as Class B or C, detection of a fault/error shall result in the response declared in Table 1, requirement 72. For controls with functions declared as class C, independent means capable of performing this response shall be provided.		**N/A**
H.11.12.2.8	The loss of dual channel capability is deemed to be an error in a control function using a dual channel structure with software class C.		**N/A**
H.11.12.2.9	The software shall be referenced to relevant parts of the operating sequence and the associated hardware functions.		**N/A**
H.11.12.2.10	Where labels are used for memory locations, these labels shall be unique.		**N/A**
H.11.12.2.11	The software shall be protected from user alteration of safety-related segments and data.		**N/A**
H.11.12.2.12	The software and safety-related hardware under its control shall be initialized to, and terminate at, a declared state as indicated in		**N/A**

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	Table 1, requirement 66.		
H.11.12.3	Measures to avoid errors		**N/A**
H.17	Endurance		**P**
H.17.1	General requirements		**P**
H.17.1.4	No endurance test is carried out on electronic controls with type 1 action unless this is necessary for the testing of associated components such as those with manual actions, relays, etc.		**P**
H.17.1.4.1	Electronic controls with type 2 action are not subjected to an endurance test but to a thermal cycling test under the conditions described in H.17.1.4.2. This test may be combined with the testing of any associated components such as those with manual actions, relays, etc., if this is possible.		**N/A**
H.17.1.4.2	Thermal cycling test		**N/A**
H.17.14	Evaluation of compliance		**N/A**
H.18	Mechanical strength		**N/A**
H.18.1.5	For controls providing electronic disconnection (Type 1.Y or 2.Y), the requirements of H.11.4.16 shall be met.		**N/A**
H.20	Creepage distances, clearances and distances through insulation		**P**
H.20.1.15	Electronic controls		**P**
H.20.1.15.1	Creepage distances, clearances and distances through insulation between live parts connected electrically to the mains supply and accessible surfaces or parts shall comply with the requirements of Clause 20.		**P**
H.20.1.15.2	Creepage distances, clearances and distances through insulation shall comply: - across protective impedance with the requirements of Clause 20 for double insulation or reinforced insulation; - across each separate component of protective impedance with the requirements of Clause 20 for supplementary insulation.		**N/A**
H.20.1.15.3	Creepage distances and clearances providing functional insulation shall comply with the requirements of Clause 20.		**P**
H.23	Electromagnetic compatibility (EMC) requirements – emission	see EMC test reports 240500150/3/EMC 240500150/4/EMC 240500150/5/EMC	**P**
H.23.1	Electronic controls shall be so constructed that they do not emit excessive electric or electromagnetic disturbances in their environment.		**P**
H.23.1.1	Low frequency emission, disturbances in supply systems		**P**
	Integrated and incorporated controls are not subjected to the tests of this clause, as the results of these tests are influenced by the incorporation of the control into the equipment and the use of measures to control emissions used therein. They may, however, be carried out under declared conditions if so requested by the manufacturer.		**P**
	Controls in which an electronic device controls directly an external load connected to the mains power supply (the control port) shall comply with the requirements of IEC 61000-3-2 and IEC 61000-3-3. For these tests, a load and measures to control emissions, if any, shall be used as declared by the manufacturer in requirement 74 of Table 1. This requirement does not apply to controls declared and designed for pilot duty load only.		**P**
H.23.1.2	Radio frequency emission		**P**
	Free-standing, independently mounted and in-line cord electronic controls using telecommunication ports, software, oscillating circuits, or switching power supplies shall comply with the		**P**

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	requirements of CISPR 14-1 and/or CISPR 22, class B, as indicated in Table H.12.		
	Controls for ISM equipment and free-standing, independently mounted and in-line cord controls for use with ISM equipment shall comply with the requirements of CISPR 11.		**N/A**
	Additional details may be given in the relevant part 2.		**N/A**
H.25	Normal operation		**N/A**
H.25.1	The output waveform of electronic controls shall be as declared.		**N/A**
H.26	Electromagnetic compatibility (EMC) requirements – Immunity	see EMC test reports 240500150/3/EMC 240500150/4/EMC 240500150/5/EMC	**P**
H.27	Abnormal operation		**P**
H.27.1	Electronic controls – assessment against internal faults		**P**
H.27.1.2	Protection against internal faults to ensure functional safety		**P**
H.27.1.2.1	Design and construction requirements		**P**
H.27.1.2.2	Class B control function		**N/A**
H.27.1.2.3	Class C control function		**N/A**
H.27.1.2.4	Faults during defined state		**N/A**
H.27.1.2.5	Circuit and construction evaluation		**N/A**
H.27.4	Controls providing electronic disconnection (type 1.Y or 2.Y) shall withstand the abnormal overvoltage conditions which may occur.		**N/A**
H.28	Guidance on the use of electronic disconnection		**N/A**
H.28.1	Main features of solid-state switching devices		**N/A**
H.28.2	Application of solid-state switching devices		**N/A**
Annex J	**REQUIREMENTS FOR CONTROLS USING THERMISTORS**		**P**
J.4	General notes on tests		**P**
J.4.3.5	According to purpose		**P**
J.4.3.5.4	Type 1 controls using thermistors as temperature sensing devices where self-heating is negligible are not subjected to the tests for thermistors.		**P**
J.6	Classification		**P**
J.6.4	According to features of automatic action J.6.4.3.3		**P**
	For the purpose of this standard, a PTC thermistor control or sensing element that is in the switched mode (high resistance) or an NTC thermistor in the unswitched mode (high resistance), are considered to provide the equivalent of micro-interruption.		**P**
J.6.4.3.14	Type 2.AL action	See J.11.4.17	**N/A**
J.6.15	According to construction		**P**
J.6.15.6	Control using NTC or PTC thermistors	NTC thermistor	**P**
J.6.17	According to use of the thermistor		**P**
J.6.17.1	- thermistor control element		**X**
J.6.17.2	- self-controlled heater		**X**
J.6.17.3	- thermistor sensing element		**P**
J.7	Information		**P**
	Table J.5 provides additional requirements to Table 1.		**P**
J.11	Constructional requirements		**N/A**
J.11.4.17	Type 2.AL action		**N/A**
	A type 2.AL action shall be so designed that it trips after the time to trip value (TTI-max) at the specific current limit value (IT-max)		**N/A**

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	and at the minimum operating ambient temperature (Tmin).		
	The declared R/T characteristic of the device providing type 2.AL action shall, after the tests of J.17.17, be within the values specified for manufacturing deviation and drift, Table 1 (7.2 of the previous edition), requirements 61 and 62.		**N/A**
J.12	Moisture and dust resistance		**N/A**
J.12.2	Protection against humid conditions		**N/A**
J.12.2.1	For Type 2 controls using thermistors, R/T measurements are performed before and after the test and the R/T characteristic and its drift shall be within the declared limits.		**N/A**
J.13	Electric strength and insulation resistance		**P**
J.13.2	Electric strength		**P**
J.15	Manufacturing deviation and drift		**N/A**
J.15.7	The resistance/temperature (R/T) characteristic shall be determined as indicated in J.12.2.1 and J.17.17 using the method declared by the manufacturer as specified in Table 1, requirement 65.		**N/A**
J.15.8	Calibration tests for NTC thermistors		**N/A**
J.17	Endurance		**P**
J.17.17	The sequence of tests is as follows:		**P**
J.17.18	Conditioning tests J.17.18.1		**P**
J.17.18.1	Method of R/T measurement The method of measurement used (see Table 1 (7.2 of the previous edition), requirement 65) shall include considerations such as self-heating, thermal dissipation and voltage effect, which may produce an erroneous R/T curve.		**P**
J.17.18.2	Extended cycling		**N/A**
J.17.18.3	Thermal conditioning		**N/A**
J.17.18.3.1	Unswitched mode		**N/A**
J.17.18.3.2	Switched mode		**N/A**
J.17.18.4	Cold environmental electrical cycling		**N/A**
J.17.18.5	Thermal runaway by increased voltage		**N/A**
J.17.18.6	Thermal runaway by increased current		**N/A**
J.20	Void		**N/A**
J.24	Components		**N/A**
J.24.2.1	This subclause is applicable to thermistors previously tested under IEC 60738-1, IEC 60738-1-1 or IEC 60539.		**N/A**
Annex L	**OVERVOLTAGE CATEGORIES**		**P**
	Overvoltage category is a numeral characterizing a transient overvoltage condition		**P**
	Equipment of overvoltage category IV is for use at the origin of the installation.		**N/A**
	Equipment of overvoltage category III is equipment in fixed installations and for cases where the reliability and the availability of the equipment is subject to special requirements.		**N/A**
	Equipment of overvoltage category II is energy consuming equipment to be supplied from the fixed installation.		**P**
	If such equipment is subjected to special requirements with regard to reliability and availability, overvoltage category III applies.		**N/A**
	Equipment of overvoltage category I is equipment for connection to circuits in which measures are taken to limit transient overvoltages to an appropriately low level.		**N/A**

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Annex N	**POLLUTION DEGREES**		**P**
N.1	Pollution		**P**
	The micro-environment determines the effects of pollution on the insulation. The macroenvironment, however, has to be taken into account when considering the micro-environment.		**P**
	Means may be provided to reduce pollution at the insulation under consideration by the effective use of coatings, enclosures, encapsulation or hermetic sealing. Such means to reduce pollution may not be effective when the equipment is subject to condensation or if, in normal operation, it generates pollutants itself.		**N/A**
	Small clearances can be bridged completely by solid particles, dust and water and therefore minimum clearances are specified where pollution may be present in the micro-environment.		**N/A**
N.2	Degrees of pollution in the micro-environment		**P**
	For the purpose of evaluating creepage distances and clearances, the following four degrees of pollution in the micro-environment are established: – Pollution degree 1 No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. – Pollution degree 2 Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected. – Pollution degree 3 Conductive pollution occurs or dry non-conductive pollution occurs which becomes conductive due to condensation which is to be expected. – Pollution degree 4 The pollution generates persistent conductivity caused by conductive dust or by rain or snow.	PD 2	**P**
Annex P	**PRINTED CIRCUIT BOARD COATING PERFORMANCE TEST**		**N/A**
P.1	A coating intended to be used on a printed circuit board that has creepages in accordance with Clause 20, pollution degree 1, shall comply with the requirements of this annex.		**N/A**
P.2	A printed circuit board assembly that is used with a coating, including inks, solder resists and assembled components, is to be acceptable for its application in terms of temperature, solder conditions, conductor size and adhesion to the base material as determined by the requirements of IEC 61249 series.		**N/A**
P.3	Electric strength of coating – A coating shall withstand the electric strength test of 13.2 for operational insulation at a test voltage determined from Table 12 (13.2 of the previous edition), based on the maximum working voltage supplied to the board assembly, after the conditioning of Subclauses P.3.3 and P.3.4.		**N/A**
P.3.1	Ten test samples shall be prepared with the minimum applicable creepage distances and the minimum coating thickness using the pattern shown in Figure P.1. The samples are to be prepared by normal production means using the primer or cleaner employed prior to applying the coating to the board. Wiring suitable to the voltages and temperatures involved is to be attached.		**N/A**
P.3.2	Ageing test – Five samples of the coated board as described in P.3.1 shall be subjected to a temperature of 130 °C ± 2 °C for 1 000 h.		**N/A**
P.3.3	Humidity conditioning – The five samples of the coated board		**N/A**

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	which were subjected to the ageing test of P.3.2 are to be conditioned for 48 h in a test chamber at a temperature of (35 ± 1) °C and (90 ± 5) % relative humidity. Immediately following removal from the test chamber, each sample is to be subjected to the electric strength test described in P.3.5 and P.3.6.		
P.3.4	Environmental cycle conditioning – Five of the samples of the coated board described in P.3.1 are to be subjected to three complete cycles of environmental conditioning as described in table P.1. Immediately following the conditioning, each sample is to be subjected to the electric strength test described in P.3.5 and P.3.6.		**N/A**
P.3.5	After conditioning, the samples of the coated board as described in P.3.1 are to be provided with tight-fitting aluminium foil (representing an electrically conductive deposit along the surface of the coating) that covers the test pattern except for the insulated test lead wire and solder points.		**N/A**
P.3.6	The voltage stress is to be applied according to P.3 to each conditioned sample between leads A, B, and C individually and the common lead (see Figure P.1). No flashover or breakdown shall occur. Glow discharges without drop in voltage are neglected.		**N/A**
Annex Q	**PRINTED CIRCUIT BOARD COATING PERFORMANCE TEST**		**N/A**
Q.1	A printed wiring board conforming with all of the requirements for type 1 coating as specified in IEC 60664-3 shall comply with the minimum creepage requirements of Clause 20 of this standard, pollution degree 1.		**N/A**
Q.2	A printed wiring board conforming with all of the requirements for type 2 coating as specified in IEC 60664-3 shall comply with the minimum requirements for solid insulation as specified in 20.3 of this standard. No creepage or clearance dimensions apply to conductor dimensions for type 2 coating.		**N/A**
Q.3	Actual printed boards representative of production samples or standard test boards according to figures Q.1 and Q.2 may be used for the tests. Thirteen samples are required for type 1 tests, seventeen samples for type 2 tests.		**N/A**
Q.5	For the tests of Clause 5 of IEC 60664-3:2003, Amendment 1:2010, the test levels or conditions given in Table Q.1 apply:		**N/A**
Annex T	**REQUIREMENTS FOR SELV AND PELV**		**N/A**
T.1	Overview of the requirements for SELV and PELV		**N/A**
T.1.1	Protection by SELV		**N/A**
T.1.2	Protection by PELV		**N/A**
T.2	Protection against electric shock by SELV or PELV		**N/A**
T.2.1	SELV		**N/A**
	Protection against electric shock shall be provided by the following measures: – limitation of voltage, ELV according to T.3.1 in a circuit (the SELV-system), and – protective-separation, according to T.3.2, of the SELV-system from all circuits other than SELV and PELV, and – simple-separation, according to T.3.3, of the SELV-system from other SELV-systems, from PELV-systems and from earth.		**N/A**
	Intentional connection of exposed-conductive-parts of the control to a protective conductor or to an earth-conductor is not permitted.		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	In special locations where SELV is required and where protective screening according to T.3.2.1 is applied, the protective screen shall be separated from each adjacent circuit by basic insulation rated for the highest voltage present.		**N/A**
T.2.2	PELV		**N/A**
	Protection against electric shock shall be provided by the following measures: – limitation of voltage, ELV according to T.3.1 in a circuit which may be earthed and/or the exposed-conductive-parts of which may be earthed (the PELV-system), and – protective separation according to T.3.2 of the PELV-system from all circuits other than SELV and PELV.		**N/A**
	If the PELV circuit is earthed and if protective screening according to T.3.2.1 is used, it is not necessary to provide basic insulation between the protective screen and the PELV-system.		**N/A**
	Where live parts of the PELV-system are accessible (touchable) simultaneously with conductive parts which, in case of a fault, could assume the potential of the primary circuit, protection against electric shock depends on protective-equipotential-bonding (T.3.4) of all such conductive parts. Such parts shall be bonded to the protective earthing terminal or termination of the control.		**N/A**
T.3	ELV, protective separation, simple separation, protective bonding as elements of SELV and PELV		**N/A**
T.3.1	Limitation of voltage shall provide that the voltage between simultaneously accessible parts does not exceed relevant ELV limits as specified in 2.1.5 and as specified in 8.1.1.		**N/A**
T.3.2	Protective separation between a SELV/PELV-circuit and other live circuits shall be achieved by means of: – basic insulation and supplementary insulation, each rated for the highest voltage present, i.e. double insulation, or – reinforced insulation rated for the highest voltage present, or – protective screening according to T.3.2.1 with the protective screen being separated from each adjacent circuit by basic insulation rated for the highest adjacent circuit voltage (see also T.2.1, last paragraph), or – a combination of these provisions.		**N/A**
	If conductors of the separated circuit are contained together with conductors of other circuits in a multiconductor cable or in another grouping of conductors, they shall be insulated, individually or collectively, for the highest voltage present, so that double insulation or reinforced insulation is achieved.		**N/A**
	If any component is connected between the separated circuits, that component shall comply with the requirements for protective impedance.		**N/A**
	When the supply of SELV or PELV circuits is obtained from supply mains of higher voltages, it shall – either be through a safety isolating transformer, or – a converter with separate windings providing equivalent insulation and with requirements as below.		**N/A**
	If a converter is used, and the control is declared - IPX7 per 6.5.2, the control shall be declared to be subjected to second fault analysis (requirement 73 of Table 1) for the circuits and insulation between windings of the converter and as result of second fault the ELV value of 0 V shall not be exceeded. The current between the poles of the output shall comply with H.8.1.10.		**N/A**
T.3.2.1	Protective screening shall consist of a conductive screen interposed between hazardous-live-parts of the control, installation, or system and the part being protected (e.g. a		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	SELV-circuit or a PELV circuit). The protective screen: – shall be permanently and reliably connected to the protective earthing terminal of the control and the connection shall comply with the requirements of Clause 9; and – shall itself comply with the requirements of Clause 9.		
T.3.3	Simple-separation between a SELV-circuit and other SELV-systems or PELV-systems or earth shall comply with the requirements for basic insulation throughout, rated for the highest voltage present.		**N/A**
	If any component is connected between the separated circuits, that component shall withstand the electric stresses specified for the insulation which it bridges and its impedance shall limit the prospective current flow through the component to the steady-state current values indicated		**N/A**
T.3.4	Protective bonding		**N/A**
	The requirements for protective bonding are those for protective earthing in Clause 9 of this standard.		**N/A**
	For the installation of controls which consist of several component parts (sensing component, transmitters, central control unit, receivers, actors, interface units) and where such component parts are parts of the fixed electrical installation of a building, the requirements for protective		**N/A**
Annex U	**REQUIREMENTS FOR RELAYS WHEN USED AS CONTROLS IN IEC 60335 APPLIANCES**		**P**
	Annex U supplements or modifies the corresponding clauses of this standard.	Relay used for control of IEC 60335 appliances	**P**
U.2.2	Definitions of types of control according to purpose		**P**
U.2.2.12	electrically operated control for the purpose of this annex, a relay is a control as defined in 2.2.12,		**P**
U.4	General notes on tests		**P**
U.4.3	Instructions for test		**P**
U.4.3.5	According to purpose		**N/A**
U.6	Classification		**P**
U.6.3	According to their purpose		**P**
U.6.3.10.1	- relay		**P**
U.6.3.10.2	- current operated relay		**N/A**
U.6.3.10.3	- voltage operated relay		**P**
U.6.6	According to method of connection		**N/A**
U.6.6.6	- control for printed wiring board mounting		**N/A**
U.6.6.7	- control for printed wiring board mounting, contact connections via other than printed wiring board tracks		**N/A**
U.6.6.8	- plug-in relay		**N/A**
U.6.8	According to protection against electric shock		**P**
U.6.8.5	For a relay: insulation between coil and contact circuits:		**P**
U.6.8.5.1	Of class 0		**N/A**
U.6.8.5.2	Of class 0I		**N/A**
U.6.8.5.3	Of class I		**N/A**
U.6.8.5.4	Of class II		**P**
U.6.8.5.5	Of class III		**N/A**
U.6.8.6	For a relay: insulation between live parts and test function, manual action actuating member:		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
U.6.8.6.1	Of class 0		**N/A**
U.6.8.6.2	Of class 0I		**N/A**
U.6.8.6.3	Of class I		**N/A**
U.6.8.6.4	Of class II		**N/A**
U.6.8.6.5	Of class III		**N/A**
U.7	Information		**N/A**
U.14	Heating		**N/A**
U.17	Endurance	Documentation	**N/A**
U.17.14	Evaluation of compliance		**N/A**
U.17.16	Test for particular purpose controls		**N/A**
U.20	Creepage distances, clearances and distances through solid insulation		**P**
	Assessment shall be conducted with relay energised, de-energised, and manually operated (if applicable).		**P**
U.23	Electromagnetic compatibility (EMC) requirements - Emission		**P**
	Consideration should be given as to whether EMC requirements are applicable to relays.	Tested as a part of the appliance, see EMC test reports 240500150/3/EMC 240500150/4/EMC 240500150/5/EMC	**P**
U.24	Components		**N/A**
	Relays incorporating electronic components shall be assessed according to Annex H.		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
4.	**GENERAL NOTES ON TESTS**		**P**
4.1	Conditions of test		
	This clause of Part 1 is applicable except as follows:		**P**
4.1.7	Not applicable		**N/A**
	Additional subclauses:		
4.1.101	For the purposes of the tests of this standard and unless otherwise indicated, ambient temperature excursions beyond Tmax during abnormal operation as a precursor to the operation of a manual reset thermal cut-out or a bimetallic SOD are ignored.	No SODs	**N/A**
4.1.102	For manual reset thermal cut-outs and bimetallic SODs which have an operating value above Tmax, the temperature at the sensing element is raised, as necessary, to achieve any cycling required during the tests.		**N/A**
4.2	Samples required		
4.2.1	*Addition:*		
	Six samples of bimetallic SODs are used for the test of Clause 15.		**N/A**
5.	**RATING**		**P**
	This clause of Part 1 is applicable.		**P**
6.	**CLASSIFICATION**		**P**
	This clause of Part 1 is applicable except as follows:		**P**
6.4	According to features of automatic action		
6.4.3	*Additional subclauses:*		
6.4.3.101	– for sensing actions, no increase in the operating value as a result of any leakage from the sensing element, or from parts connecting the sensing element to the switch head (Type 2.N);	No leakages	**N/A**
6.4.3.102	– an action which operates after a declared thermal cycling test as specified in 17.101 (Type 2.P);		**N/A**
6.4.3.103	– an action which is initiated only after a push-and-turn or pull-and-turn actuation and in which only rotation is required to return the actuating member to the off or rest position (Type 1.X or 2.X);	No such actuation	**N/A**
6.4.3.104	– an action which is initiated only after a push-and-turn or pull-and-turn actuation (Type 1.Z or 2.Z);		**N/A**
6.4.3.105	– an action which cannot be reset under electrically loaded conditions and at temperatures above -20 °C or at a lower temperature if so declared (Type 1.AK or 2.AK);		**N/A**
6.4.3.106	an action which operates after declared agricultural environmental exposures (Type 1.AM or 2.AM).	Not used in agriculture	**N/A**
6.7	According to ambient temperature limits of the switch head		
	Additional subclauses:		
6.7.101	Controls for use in or on cooking appliances.	Not such use	**N/A**
6.7.102	Controls for use in or on ovens of the self-cleaning type.	Not such use	**N/A**
6.7.103	Controls for use in or on food-handling appliances.	Not such use	**N/A**
6.7.104	Non-bimetallic SOD for incorporation into appliances for heating or employing liquids or steam.		**N/A**
6.8.3	*Modification: Replace the first paragraph by:*		
	For an in-line cord control, a free standing control, an independently mounted control or a control integrated or incorporated in an assembly utilizing a non-electrical energy source:		**N/A**
6.15	According to construction		
	Additional subclause:		
6.15.101	– controls having parts containing liquid metal.	Not contained	**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
7.	**INFORMATION**		**P**
	This clause of Part 1 is applicable except as follows:		**P**
7.2	Methods of providing information		
8.	**PROTECTION AGAINST ELECTRIC SHOCK**		**P**
	This clause of Part 1 is applicable.		**P**
9.	**PROVISION FOR PROTECTIVE EARTHING**		**N/A**
	This clause of Part 1 is applicable.		**N/A**
10.	**TERMINALS AND TERMINATIONS**		**P**
	This clause of Part 1 is applicable.		**P**
11.	**CONSTRUCTIONAL REQUIREMENTS**		**P**
	This clause of Part 1 is applicable except as follows:		**P**
11.1	Materials		
	Additional subclause:		
11.1.101	Parts containing liquid metal		
	For controls declared under Item 106 of Table 7.2, parts that contain mercury (Hg), and parts of any control that contain sodium (Na), potassium (K), or both, shall be constructed of metal that has a tensile yield strength at least four times the circumferential (hoop) or other stress on the parts at a temperature 1,2 times the maximum temperature of the sensing element (Te).		**N/A**
11.1.102	*Add the following at the end of the first sentence:*		
	Insulating material used in non-bimetallic SODs as defined in this standard shall comply with the requirements of EN 60216-1:2001 and be suitable for the application.		**N/A**
11.3	Actuation and operation		
11.3.9	Pull-cord actuated control		
	Addition:		
11.4	Actions		
11.4.3	Type 2 action		
	Additional subclauses:		
11.4.3.101	Capacitors shall not be connected across the contacts of a thermal cut-out.		**N/A**
11.4.3.102	Constructions requiring a soldering operation to reset thermal cut-outs are not permitted.		**N/A**
11.4.3.13	*Replacement:*		
11.4.3.13	Type 2.K action		
	Additional subclauses:		
11.4.13.101	A Type 2.K action shall be so designed that in the event of a break in the sensing element, or in any other part between the sensing element and the switch head, the declared disconnection or interruption is provided before the sum of the declared operating value and drift is exceeded.		**N/A**
11.4.13.102	Type 2.K action may also be achieved by compliance with a), b) or c).		
	a) Two sensing elements operating independently from each other and actuating one switched head.		**N/A**
	b) Bimetallic sensing elements with		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
	1) exposed elements attached with at least double spot welding of the bimetal at both of its ends, or		**N/A**
	2) elements so located or installed in a control of such construction that the bimetal is not likely to be physically damaged during installation and use.		**N/A**
	c) If the loss of the fluid fill causes the contacts of the control to remain closed or leakage causes upward shift beyond the declared maximum operating temperature, the bulb and capillary of a temperature sensing control which is actuated by a change in the pressure of a fluid confined in the bulb and capillary shall conform to the following.		**N/A**
	There shall be no damage to the bulb or capillary to the extent which will permit escape of any of the fill when an impact tool, as illustrated in Figure 11.4.13.102, is dropped once from a height of 0,60 m so that the tapered end of the tool strikes the bulb or capillary in a perpendicular position. For this test, the capillary or the bulb shall be on a concrete surface.		**N/A**
	Additional subclauses:		
11.4.101	Type 2.N action		
	A Type 2.N action shall be so designed that in the event of a leak in the sensing element, or in any other part between the sensing element and the switch head, the declared disconnection or interruption is provided before the sum of the declared operating value and drift is exceeded.		**N/A**
11.4.102	Type 2.P action		
	A Type 2.P action shall be so designed that it operates in its intended manner after a thermal cycling test.		**N/A**
11.4.103	Bimetallic single-operation device		
	A bimetallic single-operation device shall be so designed that it does not reset above the reset value declared in Table 7.2, Item 103.		**N/A**
11.4.104	Type 1.X or 2.X		
	A Type 1.X or 2.X action shall be so designed that a turn action can only be accomplished after the completion of a push action or a pull action. Only rotation shall be required to return the actuating member of the control to the off or rest position.		**N/A**
11.4.105	Type 1.Z or 2.Z		
	A Type 1.Z or 2.Z action shall be so designed that a turn action can only be accomplished after the completion of a push action or a pull action.		**N/A**
11.4.106	Voltage maintained thermal cut-out (Type 1.AK or Type 2.AK)		
	A voltage maintained thermal cut-out shall be so designed that it does not automatically reset at any temperature higher than -20 °C or any lower temperature declared in Table 7.2, Requirement 111.		**N/A**
11.4.107	Type 1.AM or 2.AM		
	A Type 1.AM or 2.AM action shall be so designed that it operates in its intended manner after the declared agricultural environmental exposures.		**N/A**
11.6	Mounting of controls		
11.6.3	Mounting of independently mounted controls		
	Additional subclauses:		
11.6.3.101	For agricultural thermostats declared in Table 7.2, Item 117, the mounting method shall be such that the integrity of the protection by the enclosure is not compromised.		**N/A**
11.101	Time factor		
	If a time factor is declared, this shall be checked by one of the applicable determining methods as indicated in Annex BB. The determined value shall not exceed the rated values. See Table BB.1.		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
12.	**MOISTURE AND DUST RESISTANCE**		**P**
	This clause of Part 1 is applicable except as follows:		**P**
	Additional subclauses:		
12.101	Refrigeration controls		
	Controls which have the switch head and sensing element mounted in the evaporator of refrigeration or similar equipment, producing conditions of overtemperature and of freezing and melting, shall maintain insulation integrity.		**N/A**
13.	**ELECTRIC STRENGTH AND INSULATION RESISTANCE**		**P**
	This clause of Part 1 is applicable.		**P**
14.	**HEATING**		**P**
	This clause of Part 1 is applicable except as follows:		**P**
14.4.3.1	The second paragraph is under consideration.		
	Addition:		
	For a voltage maintained thermal cut-out, the heating test of 14.4.3.1 is completed, after which the temperature of the sensing element is raised until the contacts open. At this time, the ambient temperature surrounding the sensing element is reduced to Tmax.1 in time period t1, at a uniform rate. The test of 14.5.1 is then completed.		**N/A**
	Additional subclauses:		
14.101	The following is applicable to controls classified under 6.7.101 to 6.7.103 inclusive.		**N/A**
14.101.1	As a means of complying with Note 12) of Table 14.1, if the temperature of insulating parts exceeds that permitted in Table 14.1, then the test of 17.16.101 may be conducted after the conditioning of 14.102 and 14.102.1.		**N/A**
14.102	A previously untested sample of the control is conditioned for 1 000 h in an oven maintained at a temperature between 1,02 T1 + 20 K and 1,05 times that temperature where T1 is the maximum measured temperature on the insulating part during the test of Clause 14. The control shall not be energized during this test.		**N/A**
14.102.1	If the elevated temperature is localized, such as at or near a terminal, the 1 000 h conditioning is conducted with the control between Tmax and Tmax + 5 % for normal conditions, but with the contacts closed and non-cycling. If necessary, the contacts may be forced closed to provide the most arduous temperature conditions. A bimetal heater across the mains is energized at 1,1 times rated voltage. A series bimetal heater shall conduct at 1,1 times rated current.		**N/A**
15.	**MANUFACTURING DEVIATION AND DRIFT**		**N/A**
	This clause of Part 1 is applicable except as follows:		**N/A**
15.1	*Addition:*		
	The values of manufacturing deviation and drift shall be according to Annex AA unless otherwise declared by the manufacturer.	Not declared	**N/A**
15.5.4	Not applicable.		**N/A**
15.5.5	Not applicable.		**N/A**
16.	**ENVIRONMENTAL STRESS**		**P**
	This clause of Part 1 is applicable except as follows:		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
17.	**ENDURANCE**		**P**
	This clause of Part 1 is applicable except as follows:		**P**
17.3.1	*Addition:*		
	– for controls in which the whole control is declared as the sensing element and for which the minimum operating temperature declared in Table 7.2, Item 48, is less than 0 °C, the test of Subclause 17.8 is carried out on a further set of three samples at the minimum declared operating temperature with a tolerance of +5 K, –0 K, the number of cycles being 5 % of the number declared in Table 7.2, Item 27.		**N/A**
17.15	*This subclause of Part 1 is replaced as follows:*		
17.15	Single operation devices		
17.15.1	Bimetallic single operation devices		
	Bimetallic single operation devices shall be subjected to the following tests:		
17.15.2	*Replace the subclause as follows:*		
17.15.2	Non-bimetallic single operation devices		
	Non-bimetallic Single Operation Devices are subject to the following tests:		
	For a non-bimetallic SOD, automatic temperature sensing functions except those for the non-bimetallic part of the control, such as thermostat, temperature limiter and/or the thermal-cut-out, shall comply with 17.16.101, 17.16.103 and 17.16.104 respectively.		**N/A**
	These tests are conducted on separate samples.		**N/A**
	The apparatus used for the tests of 17.15.2.1 and 17.15.2.2 shall be constructed so that heat can be applied to the thermal sensing element of the single operation device whilst taking care that other parts of the control are protected from exposure to temperatures in excess of their intended use.		**N/A**
17.5.2.1	Six untested samples are then to be mounted in a suitable apparatus and the thermal sensing elements are conditioned for an ageing period equal to either 750 h or the result of the specified number of cycles declared by the end product application divided by 4 (calculation value is the number of hours), whichever is greater. The ageing temperature is declared in Table 7.2, Item 115, tolerance of 0 K -5 K. No operation of the single operation devices shall occur during this ageing period. Operation of the devices shall be detected as indicated in 15.5.3.107.		**N/A**
17.5.2.2	At the end of the ageing period, the samples are removed from the apparatus.		**N/A**
	The appropriate tests of Clause 15 shall be repeated on six untested samples and the six samples subjected to the conditioning of 17.15.2.1 and the temperatures measured shall be within the declared deviation limits, with the electrical conditions of the test VRmax and IRmax.		**N/A**
	For non-bimetallic SOD's where any sensing element has a declared reset temperature, the SOD's shall be held at the temperature declared in Table 7.2, the test shall continue for 7 h. The device shall not reset during this period as determined as indicated in 15.5.3.109.		**N/A**
	All samples shall then be subjected to the test of Clause 13, carried out at the temperature limits declared in Table 7.2, Requirement 36.		**N/A**
17.16	Test for particular purpose controls		
	Additional subclauses:		
17.16.104.1	For voltage maintained thermal cut-outs, the test of 17.16.108 is applicable.		**N/A**
17.16.105	*Replace this subclause by:* “Void”.		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
17.16.108	Voltage maintained thermal cut-out		
	Six untested voltage maintained thermal cut-outs are conditioned for 7 h at a temperature of –20 °C (or lower, if declared).		**N/A**
	During and at the conclusion of the conditioning, none of the six samples shall have operated.		**N/A**
	Operation of the voltage maintained thermal cut-outs shall be detected as indicated in 15.5.3.107.		**N/A**
	These requirements apply to a voltage maintained thermal cut-out in the operated condition with the voltage across it.		**N/A**
	Additional subclauses:		
17.101	Type 2.P cycling test		
	Temperature sensing controls of Type 2.P action shall be tested as follows:		
17.101.1	Following the appropriate tests of 17.16 and the evaluation of 17.14, the control is subjected to a thermal cycling test of 50 000 cycles at a temperature maintained between 50 % and 90 % of the switch-off temperature recorded in 17.14. During this test, the switch head is maintained at (20 ± 5) °C.		**N/A**
	The manufacturer shall declare whether the method of 17.101.2 or 17.101.3 is to be used.		**N/A**
	The test shall be carried out in accordance with the manufacturer's declaration in Item 112 of Table 7.2.		**N/A**
17.101.2	Two-bath method		
	The two baths are filled with synthetic oil, water or air (two chambers). The first bath is maintained at a temperature equal to 90 % of the switch-off temperature (°C) recorded in 17.14. The second bath is maintained at a temperature equal to 50 % of the switch-off temperature recorded in 17.14.		**N/A**
17.101.3	Temperature change method		
	This method is based on a continuously water-cooled oil-filled bath (synthetic oil).		**N/A**
	An aluminum cylinder (see figure 17.101.3) is immersed in this bath. The cylinder contains the temperature sensing element under test and a temperature sensing element to control temperature cycling between 50 % and 90 % of the switch-off temperature (°C) recorded in 17.14.		**N/A**
	The aluminium cylinder is wrapped with a resistance wire to heat the temperature sensing element. To eliminate the difficulties resulting from the difference between the time factor of the temperature sensing element under test and the temperature sensing element which is controlling the test temperature range, the temperature sensing element of a second identical test sample is used.		**N/A**
	The two membrane positions of the second sample, calculated at 50 % and 90 % of the switchoff temperature (°C) are measured by a position sensor and used to switch the current through the resistance wire (heat) on and off.		**N/A**
	Unless otherwise declared by the manufacturer in Table 7.2, Item 37, the rate of change of temperature rise/fall shall be (35 ± 10) K/min.		**N/A**
17.101.4	After this test, for controls other than bimetallic SODs, an additional 20 cycles are carried out by increasing the temperature from (20 ± 5) °C to 1,1 times the switch-off temperature.		**N/A**
	During this test, any manual reset mechanism shall not be reset. The other conditions of 17.101.1 are unchanged.		**N/A**
18.	**MECHANICAL STRENGTH**		**P**
	This clause of Part 1 is applicable except as follows:		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
	Additional subclauses:		
18.101	Push-and-turn or pull-and-turn actuation	No such actuation	
18.101.1	Controls with actions classified as Type 1.X or 2.X or Type 1.Z or 2.Z shall be subjected to the tests of 18.101.2 and 18.101.3.		**N/A**
18.101.2	Controls with actions classified as Type 1.X or 2.X or Type 1.Z or 2.Z shall be subjected to the following tests.		
	– The axial force required to push or pull the actuating member shall be not less than 10 N.		**N/A**
	– An axial push or pull force of 140 N applied to the actuating member shall not affect compliance with 18.1.5.		**N/A**
	– For a control intended for use with a knob having a grip diameter or length of 50 mm or less, the means preventing rotation of the shaft prior to the push or pull actuation shall withstand, without damage, or effect on control function, a torque of 4 Nm.		**N/A**
	– Alternatively, if the means preventing rotation of the shaft is defeated when a torque of at least 2 Nm is applied, the effect shall be such that either		
	• the means is not damaged, but overridden to close the contacts, in which case subsequent actuation at a torque less than 2 Nm shall require both push-and-turn or pull-and-turn to operate the contacts, or		**N/A**
	• no operation of the contacts occurs nor can be made to occur.		**N/A**
	– The torque required to reset the control to the initial contact condition, if necessary after the application of the push or pull, shall not be greater than 0,5 Nm.		**N/A**
	– A torque of 6 Nm is applied to the setting means. Any breakage or damage to the means preventing rotation of the shaft shall not result in failure to comply with the requirements of Clauses 8, 13 and 20.		**N/A**
	– For controls intended for use with a knob having a grip diameter or length greater than 50 mm, the values of torque are increased proportionally.		**N/A**
18.101.3	Controls with actions classified as Type 1.X or 2.X or Type 1.Z or 2.Z shall be actuated for the declared number of manual cycles.		**N/A**
	After this test, the control shall comply with the requirements of 18.101.2. For the case in which the means preventing rotation is not damaged but is overridden to operate the contacts, the first 1/6th of the declared manual cycles shall be performed without first pushing or pulling the actuating member.		**N/A**
18.102	Parts containing liquid metal	Not contained	
18.102.1	Parts of all controls containing sodium (Na), potassium (K), or both, and parts of controls classified under 6.7.101 to 6.7.103 inclusive that contain mercury (Hg) shall withstand for 1 min, without leakage or rupture, a hydraulic pressure equal to five times the maximum internal pressure achieved during operation.		**N/A**
18.102.1.1	The method of test and the number of samples required shall be agreed between the manufacturer and the test authority.		**N/A**
19.	**THREADED PARTS AND CONNECTIONS**		**P**
	This clause of Part 1 is applicable.		**P**
20.	**CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH SOLID INSULATION**		**P**
	This clause of Part 1 is applicable.		**P**
21.	**FIRE HAZARD TESTING**		**P**
	This clause of Part 1 is applicable.		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
22.	**RESISTANCE TO CORROSION**		**P**
	This clause of Part 1 is applicable.		**P**
23.	**ELECTROMAGNETIC COMPATIBILITY (EMC) REQUIREMENTS – EMISSION**		**P**
	This clause of Part 1 is applicable except as follows:		**P**
	Additional subclauses:		
23.101	Thermostats shall be so constructed that they do not generate radio interference for a time period exceeding 20 ms.		**P**
23.101.1	Test conditions		
	Three previously untested samples are subjected to the test.		**P**
	The electrical and thermal conditions are as specified in 17.2 and 17.3, except as follows.		
	– The test is conducted at the lowest declared voltage and lowest declared current (Table 7.2, Item 108).		**P**
	– The rates of temperature change are α1 and β 1. If these have not been declared, the following are used:		
	1 K/15 min for sensing elements in gases;		**N/A**
	1 K/min for sensing elements in other media.		**N/A**
	– For controls declared for use with inductive loads, the power factor is 0,2. For controls declared for use with purely resistive loads, the power factor is 1,0.		**N/A**
23.101.2	Test procedure		
	The control is subjected to five cycles of operation with the contacts opening and five cycles of operation with the contacts closing.		**P**
	The duration of radio interference is measured by an oscilloscope connected to the control so as to measure the voltage drop across the contacts.		**P**
24.	**COMPONENTS**		**P**
	This clause of Part 1 is applicable.		**P**
25.	**NORMAL OPERATION**		**P**
	This clause of Part 1 is applicable.		**P**
26.	**ELECTROMAGNETIC COMPATIBILITY (EMC) REQUIREMENTS – IMMUNITY**		**P**
	This clause of Part 1 is applicable.		**P**
27.	**ABNORMAL OPERATION**		**P**
	This clause of Part 1 is applicable.		**P**
28.	**GUIDANCE ON THE USE OF ELECTRONIC DISCONNECTION**		**P**
	This clause of Part 1 is applicable.		**P**
Annexes	The annexes of Part 1 are applicable except as follows:		
Annex H	**REQUIREMENTS FOR ELECTRONIC CONTROLS**		**P**
	Replacement:		
	This annex of Part 1 is applicable except as follows:		**P**

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Clause	Requirement – Test	Result – Remark	Verdict
H.23	Electromagnetic compatibility (EMC) requirements – emission		
H.23.1.2	Radio frequency emission		
	Addition:		
	Integrated and incorporated controls are not subjected to the tests of this subclause, as the results of these tests are influenced by the incorporation of the control into the equipment and the use of measures to control emissions used therein. They may, however, be carried out under declared conditions if so requested by the manufacturer.		**N/A**
H.26	Electromagnetic compatibility (EMC) requirements – immunity		
H.26.2	*Additional subclauses:*		
	After each test, one or more of the following criteria shall apply, as permitted in Table H.26.2.101.		**P**
H.26.2.101	The control shall remain in its current condition and thereafter shall continue to operate as declared within the limits verified in Clause 15, if applicable.		**P**
H.26.2.102	The control shall assume the condition declared in Table 7.2, Item 109 and thereafter shall operate as in H.26.2.101.	Only for type 2 thermostats and temperature limiters	**N/A**
H.26.2.103	The control shall assume the condition declared in Table 7.2, Item 109, such that it cannot be reset automatically or manually. The output waveform shall be sinusoidal or as declared in item 53 of Table 7.2 for normal operation.	Only for type 2 thermostats and temperature limiters	**N/A**
H.26.2.104	The control shall remain in the condition declared in Table 7.2, Item 109. A non-self-resetting control shall be such that it can only reset manually. After the temperature which caused cut-out to occur is removed, it shall operate as in H.26.2.101 or shall remain in the declared condition as in H.26.2.103.	Only for type 2 thermostats and temperature limiters	**N/A**
H.26.2.105	The control may return to its initial state and thereafter shall operate as in H.26.2.101.		**P**
H.26.2.106	The output and functions shall be as declared in Table 7.2, Item 58a or 58b and the control shall comply with the requirement of 17.5.	Only for integrated or incorporated controls	**N/A**
H.26.5	Voltage dips and voltage interruptions in the power supply network		
H.26.5.4	Voltage variation test		
	Replacement		
H.26.5.4.3	The control is subjected to each of the specified voltage test cycles three times with 10 s intervals between each test cycle. For a control declared under Item 109 of Table 7.2, each test cycle is performed three times when the control is in the declared condition and three times when it is not.	documentation	**N/A**
H.26.8	Surge immunity test		
H.26.8.3	Test procedure		
	Additional subclause:		
H.26.8.3.101	For controls declared under Item 109 of Table 7.2, three of the tests are performed when the control is in the declared condition and two are performed when it is not.		**N/A**
H.26.9	Electrical fast transient/burst immunity test		
	Additional subclause:		
H.26.9.3.101	Test procedure		
	The control is subjected to five tests. For controls declared under Item 109 of Table 7.2, three tests are performed when the control is in the declared condition and two are performed when it is not.		**N/A**
H.26.10	Ring wave test		
H.26.10	*Replace „Ring wave test" by:* "Void".		**N/A**

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Clause	Requirement – Test	Result – Remark	Verdict
H.26.10.5	*Replace the addition by:* “Void”.		**N/A**
H.26.12	Radio-frequency electromagnetic field immunity		
H.26.12.2	Immunity to conducted disturbances		
H.26.12.2.2	Test procedure		
	Addition:		
	For controls declared under Item 109 of Table 7.2, sweeping is performed when the control is in the declared condition and when it is not.		**N/A**
H.26.12.3	Radiated electromagnetic fields immunity evaluation		
	Addition:		
H.26.12.3.101	For controls declared under Item 109 of Table 7.2, sweeping is performed when the control is in the declared condition and when it is not.		**N/A**
H.26.13	Test of influence of supply frequency variations		
H.26.13.3	Test procedure		
	Addition:		
	For controls declared under Item 109 of Table 7.2, the test shall be performed when the control is in the declared condition and when it is not.		**N/A**
H.26.14	Power frequency magnetic field immunity test		
H.26.14.3	Test procedure		
	Addition:		
	For controls declared under Item 109 of Table 7.2, the test shall be performed when the control is in the declared condition and when it is not.		**N/A**
H.27	Abnormal operation		
H.27.1.2	*Replace the first line by:*		
	The control shall be operated under the following conditions. In addition, controls declared under Item 109 of Table 7.2 shall be tested when the control is in the declared condition and when it is not.		**P**
Annex J	**REQUIREMENTS FOR CONTROLS USING THERMISTORS**		**P**
	Replacement:		
	This annex of Part 1 is applicable except as follows:		**P**
J.4	General notes on tests		
J.4.3.5	According to purpose		
	Additional subclause:		
J.4.3.5.101	For the purpose of declaring the number of endurance cycles in Table 7.2, Item 64, thermistors are evaluated for the function performed in the control.		**N/A**
Annex DD	**CONTROLS FOR USE IN AGRICULTURAL CONFINEMENT BUILDINGS**		**N/A**

9.3.1	TABLE: Adequacy of earth connections	N/A

Type of ME EQUIPMENT & impedance measured between parts	Test current (A) /Duration (s)	Voltage drop measured between parts (V)	Maximum calculated impedance (Ω)	Maximum allowable impedance (Ω)

Supplementary information:

13.1	TABLE: Insulation resistance	P

Insulation resistance R between:	R (MΩ)	Required R (MΩ)
Basic insulation	>2	>2
Supplementary insulation	>5	>5

Supplementary information:

13.2	TABLE: Electric strength	P

Test voltage applied between:	Test voltage (V)	Breakdown
L-N	2500	No

Supplementary information:

14.1	TABLE: Heating	P

Monitored point	T(°C) 230 V AC	Permitted Tmax(°C)
Accessible surfaces, touch panel	40	85

Supplementary information:

24.1 / 24.2	TABLE: Components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity [1])**
PCBs	various		FR4	UL94V-0	
1A Adjustable/Fixed Low Dropout Linear Regulator	Advanced Monolithic Systems	AMS117-ADJ	4,7 V output		
Safety capacitor	MEX/TENTA	MKP X2	0,1 uF 275 VAC	IEC 60384-14	
2A surface mount glass passivated bridge rectifier	Diodes Incorporated	ABS210	2 A output 1,1 V forward 1000 V reverse	UL94V-0	
Miniature high power relay	HONGFA RELAY	HF115F HF115FK	12 VDC 16 A 250 VAC		UL E134517 VDE 116934
Varistor	HONG ZHI ELECTRONICS CO.,LTD.	HEL 7D471K	470 V		UL E324904 VDE 40037512

Supplementary information:

5. Conclusion

Results of inspection, measure, test & findings:

EN 60730-1:2011
Automatic electrical controls for household and similar use - Part 1: General requirements

EN 60730-2-9:2010
Automatic electrical controls for household and similar use - Part 2-9: Particular requirements for temperature sensing controls

Clause of standard	4	5	6	7	8	9	10	11	12	13	14	15
Result	**P**	**P**	**P**	**P**	**P**	**N/A**	**P**	**P**	**P**	**P**	**P**	**N/A**

Clause of standard	16	17	18	19	20	21	22	23	24	25	26	27	28
Result	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**N/A**

Annex	A	B	C	D	E	F	G	H	J	L	N	P	Q	T	U	DD
Result	**P**	**P**	**N/A**	**N/A**	**N/A**	**N/A**	**P**	**P**	**P**	**P**	**P**	**N/A**	**N/A**	**N/A**	**P**	**N/A**

Legend:

P ⇔ Test object does meet the requirement
F ⇔ Test object does not meet the requirement
N/T ⇔ Test not performed
N/A ⇔ Test case does not apply to the test object

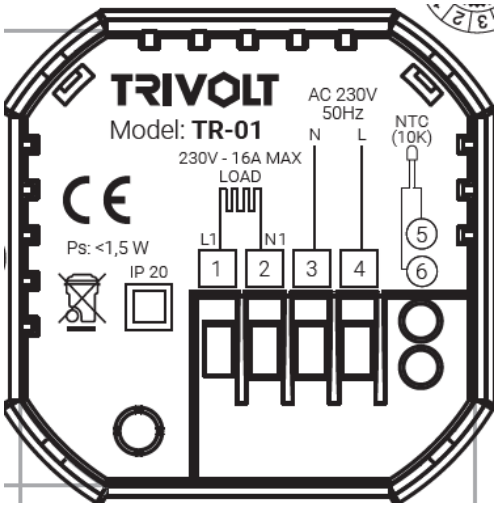
REQUIREMENTS ARE MET IN ACCORDANCE WITH STANDARD

6. Photographs from test site

TR 01 model:

EUT:

Product label design:

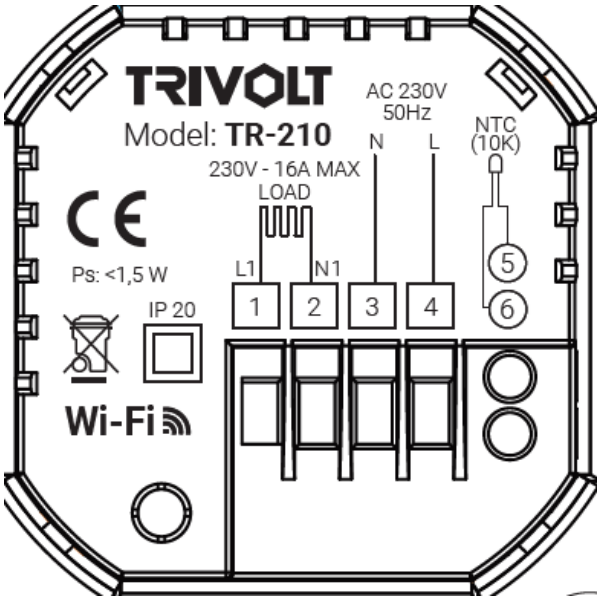


Internal view:

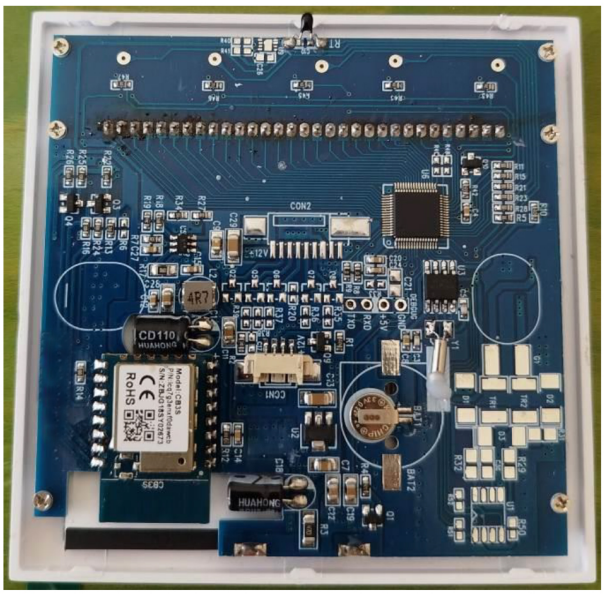
TR 210 model:

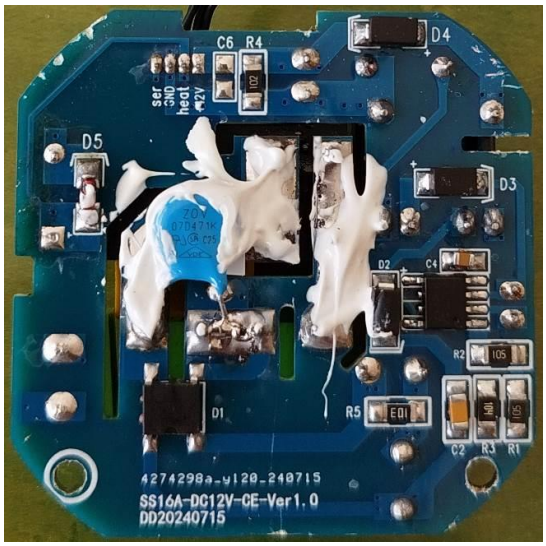
EUT:

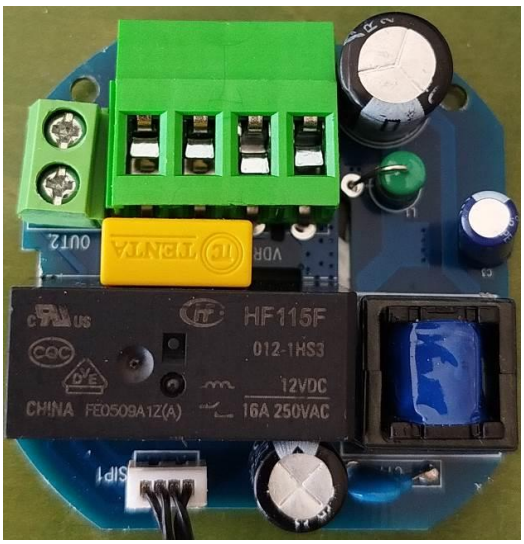
Product label design:



Internal view:



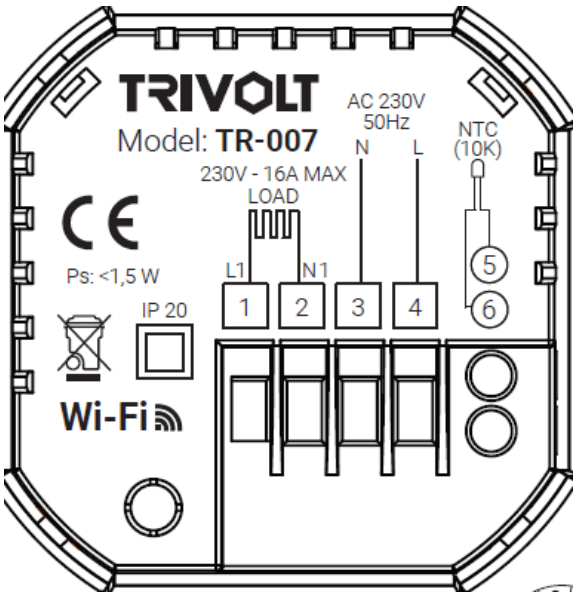




TR 007 model:

EUT:

Product label design:



Internal view:

End of test report