Test Report issued under the responsibility of:

# TEST REPORT
# IEC60730-2-9
# Automatic electrical controls for household and similar use - Part 2-9: Particular requirements for temperature sensing controls

| | |
|---|---|
| **Report Number. .....:** | CTIHEA4903 |
| **Date of issue .....:** | 2015-08-17 |
| **Total number of pages .....** | 110 |
| **Applicant's name .....:** | CHANGSHU XIN DUAN ELECTRIC CO.,LTD. |
| **Address .....:** | NO.1,Biyun Road,Yushan Linchang,Changshu City,Jiangsu Province 215500 P.R.China. |
| **Test specification:** | |
| **Standard .....:** | IEC60730-2-9: 2008 (Third Edition) and Am.1:2011 in conjunction with IEC 60730-1:2010 (Fourth Edition) |
| **Test procedure .....:** | CB Scheme |
| **Non-standard test method .....:** | N/A |
| **Test Report Form No. .....:** | IEC60730_2_9H |
| **Test Report Form(s) Originator ....:** | UL(US) |
| **Master TRF .....:** | 2014-01 |

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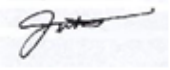
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**General disclaimer:**

The test results presented in this report relate only to the object tested.
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| | | | |
|---|---|---|---|
| **Test item description .....:** | Temperature Sensing Controls (Protector) | | |
| **Trade Mark .....:** | FULL SAFE | | |
| **Manufacturer.....:** | CHANGSHU XIN DUAN ELECTRIC CO.,LTD. | | |
| **Model/Type reference .....:** | KSD1 Series | | |
| **Ratings .....:** | 10A 250V～; 16A 250V～ 50Hz/60Hz Operating temperature range: 5℃～180℃ tab terminal type 2C IP00 pollution degree 2 10000 cycles (automatic action) PTI175<br>Base Insulating material: Phenolic resin(Backlite) | | |
| | | | |
| **Testing procedure and testing location:** | | | |
| ☒ | **CB Testing Laboratory:** | China Testing & Inspection Institute for Household Electric Appliances (CTIHEA) | |
| **Testing location/ address.....:** | | NO.3 Boxing Balu，Beijing Economic and Technological Development Area，100176，Beijing，CHINA | |
| ☐ | **Associated CB Testing Laboratory:** | | |
| **Testing location/ address.....:** | | | |
| **Tested by (name + signature) .....:** | | Tang ya yong |  |
| **Approved by (name + signature).....:** | | JIN KE |  |
| | | | |
| ☐ | **Testing procedure: TMP/CTF Stage 1:** | | |
| **Testing location/ address.....:** | | | |
| **Tested by (name + signature) .....:** | | | |
| **Approved by (name + signature).....:** | | | |
| | | | |
| ☐ | **Testing procedure: WMT/CTF Stage 2:** | | |
| **Testing location/ address.....:** | | | |
| **Tested by (name + signature) .....:** | | | |
| **Witnessed by (name + signature).....:** | | | |
| **Approved by (name + signature).....:** | | | |
| | | | |
| ☐ | **Testing procedure: SMT/CTF Stage 3 or 4:** | | |
| **Testing location/ address.....:** | | | |
| **Tested by (name + signature) .....:** | | | |
| **Witnessed by (name + signature).....:** | | | |
| **Approved by (name + signature).....:** | | | |
| **Supervised by (name + signature) .....:** | | | |

**List of Attachments (including a total number of pages in each attachment):**

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**Summary of testing:**

| **Tests performed (name of test and test clause):** | **Testing location:** |
|---|---|
| Complete test | China Testing & Inspection Institute for Household Electric Appliances (CTIHEA):<br>NO.3 Boxing Balu，Beijing Economic and Technological Development Area，100176，Beijing，CHINA |

**Summary of compliance with National Differences:**

**List of countries addressed**

☒ **The product fulfils the requirements of IEC60730-2-9: 2008 (Third Edition) and Am.1:2011 in conjunction with IEC 60730-1:2010 (Fourth Edition)**

**Copy of marking plate:**

See Sample photo

| | |
|---|---|
| **Test item particulars .....:** | |
| **Classification of installation and use .....:** | For Class Ⅰ appliances |
| **Type of operation.....:** | ☐ single operation; ☐ bimetallic single operation; ☐ non-bimetallic single operation; |
| **Control type.....:** | ☐ room thermostat; ☐ fan control; ☐ boiler thermostat; ☐ modulating thermostat; ☐ voltage maintained thermal cut-out; ☐ agricultural thermostat; ☐ other |
| **Possible test case verdicts:** | |
| **- test case does not apply to the test object.....:** | N/A |
| **- test object does meet the requirement .....:** | P (Pass) |
| **- test object does not meet the requirement.....:** | F (Fail) |
| **Testing.....:** | |
| **Date of receipt of test item .....:** | 2015-08-05 |
| **Date (s) of performance of tests.....:** | 2015-08-05– 2015-08-17 |

**General remarks:**

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

**Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**

**Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:**

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided .....:

☐ **Yes**
☒ **Not applicable**

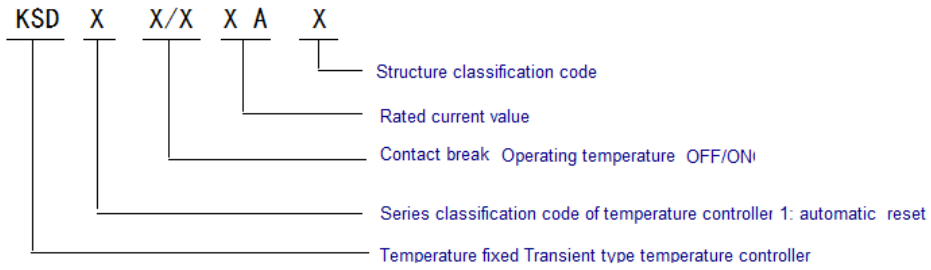
**When differences exist; they shall be identified in the General product information section.**

**Name and address of factory (ies) ..... :** CHANGSHU XIN DUAN ELECTRIC CO.,LTD.
NO.1,Biyun Road,Yushan Linchang,Changshu City,Jiangsu Province 215500 P.R.China.

**General product information:**

This product is a temperature sensing controller for bi-metallic. When the temperature reaches a certain temperature, the action of the bi-metallic pieces, so as to cut off the circuit to realize the protection function.

Type designation： Representative models: KSD1 180°C/160°C; KSD1 5°C/-10°C



| IEC 60730-2-9 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 3 | GENERAL REQUIREMENTS | | P |
| | Control designed and constructed in such a fashion not to cause injury to persons or damage to property | | P |
| 5 | Ratings | | P |
| 5.1 | Maximum rated voltage (V) .....: | 250V | P |
| 5.2 | Maximum rated current (A) .....: | 10A/16A | P |
| 6 | CLASSIFICATION | | P |
| 6.1 | Nature of supply .....: | AC | P |
| 6.2 | Type of load and power factor .....: | Resistive load 0.95 | P |
| 6.3 | Purpose.....: | Thermal cut-out | P |
| 6.4 | According to features of Automatic Action | | P |
| | Features of automatic action, Type 1 or Type 2.....: | Type 2 | P |
| 6.4.3.101 | for sensing actions, leakage from the sensing element or from parts connecting sensing element to switch head (type 2.N); no increase in the operating value | | N/A |
| 6.4.3.102 | an action operating after the thermal cycling test 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) | | N/A |
| 6.4.3.104 | an action which is initiated only after 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 (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) | | N/A |
| 6.5 | Degree of protection provided by enclosure per IEC 60529 and control pollution situation .....: | IP 00,Pollution degree 2 | P |
| 6.6 | Method of connection .....: | tab terminal | P |
| 6.7 | Ambient temperature limits of the switch ahead: $T_{min}$(°C); $T_{max}$ (°C).....: | | N/A |
| 6.7.101 | Controls for use in cooking appliances | | N/A |
| 6.7.102 | Controls for use in or on ovens of the self-cleaning type | | N/A |
| 6.7.103 | Controls for use in or on food-handling appliances | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 6.7.104 | Non-bimetallic SODs limited for use in appliances for heating or employing liquids or steam | | N/A |
| | Not suitable for instantaneous water heaters and storage water heaters | | N/A |
| 6.8 | Protection against electric shock .....: | For Class Ⅰ/Ⅱ appliances | P |
| 6.8.3 | 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 |
| 6.9 | Circuit disconnection or interruption .....: | micro- interruption | P |
| 6.10 | Number of cycles of actuation (M) of each manual action.....: | | N/A |
| 6.11 | Number of cycles of actuation (A) of each automatic action.....: | 10 000 cycles | P |
| 6.12 | Temperature limits of the mounting surface of the control (°C or K).....: | | N/A |
| 6.13 | Value of proof tracking index (PTI) for the insulation material used .....: | 175 | P |
| 6.14 | Period of the electrical stress across insulating parts supporting live parts, and between live parts and earthed metal (short or long period) .....: | Short period | P |
| 6.15 | According to Construction | Incorporated control | P |
| 6.15.101 | controls having parts containing liquid metal | | N/A |
| 6.16 | Ageing requirements (type Y) of end-product equipment .....: | | N/A |
| 6.17 | Use of thermistor (Annex J) .....: | | N/A |
| 6.18 | Use of software class (Annex H).....: | | N/A |

| | | | |
|---|---|---|---|
| 7 | INFORMATION | | P |
| 7.2.1 | Methods of providing information (Addition to table 7.2) | | P |
| | 1 – Manufacturer's name or trademark (Method C): | FULL SAFE | P |
| | 2 – Unique type reference (Method C) .....: | KSD1 180°C/160°C<br>KSD1 5°C/-10°C | P |
| | 3 – Rated voltage or rated voltage range in volts (Method C).....: | 250V | P |
| | 4 – Nature of supply (Method C).....: | AC | P |
| | 5 – Frequency, if other than for range 50 Hz to 60 Hz inclusive (Method C) .....: | | N/A |
| | 6 – Purpose of control (Method D).....: | Thermal cut-out | P |
| | 6a – Construction of control (Method D).....: | Incorporated<br>non-electronic control | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 7 – The type of load controlled by each circuit (Method C) ..... : | Resistive load | P |
| | 15 – Degree of protection by enclosure: (Method C) ..... : | IP00 | P |
| | 17 – Terminals for external conductors (Method C): | | N/A |
| | 18 – Terminals for external conductors which accept a wider range of conductor sizes, (Method D) ..... : | | N/A |
| | 19 – Method of connection and disconnection for screwless terminals (Method D) ..... : | | N/A |
| | 20 – Details of any special conductors which are intended to be connected to terminals for internal conductors (Method D) ..... : | | N/A |
| | 21 – Maximum temperature of terminals for internal conductors, if higher than 85°C (Method X) ..... : | | N/A |
| | 22 – Temperature limits of the switch head, if $T_{min}$ is lower than 0°C, or $T_{max}$ is other than 55°C (Method C) ..... : | | N/A |
| | 23 – Temperature limits of mounting surfaces (Ts) if more than 20 K above $T_{max}$ (Method C) ..... : | | N/A |
| | 24 – Classification of control according to protection against electric shock (Method X) ..... : | For Class Ⅰ/Ⅱ appliances | P |
| | 25 – For Class II controls, the symbol for Class II construction (Method C) ..... : | | N/A |
| | 26 – Number of cycles of actuation (M) for each manual action (Method X) ..... : | | N/A |
| | 27 – Number of automatic cycles (A) for each automatic action (Method X) ..... : | 10 000 cycles | P |
| | 28 – Ageing period (Y) for controls with Type 1M or 2M action (Method X) ..... : | | N/A |
| | 29 – Type of disconnection or interruption provided by each circuit (Method X) ..... : | micro- interruption | P |
| | 30 – PTI of materials used for insulation (Method X) ..... : | PTI 175 | P |
| | 31 – Method of mounting controls (Method D) ..... : | Metal mounting bracket | P |
| | 31a – Method of providing earthing of control (Method D) ..... : | | N/A |
| | 32 – Method of attachment for non-detachable cords (Method D) ..... : | | N/A |
| | 33 – Intended transportation condition of control (Method X) ..... : | | N/A |
| | 34 – Details of any limitation of operating time (Method D) ..... : | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 35 – Period of electric stress across insulating parts (Method X) .....: | Short period | P |
| | 36 – Limits of activating quality for any sensing element over which micro-disconnection is secure (Method X) .....: | | N/A |
| | 37 – Minimum and/or maximum rates of change of activating quantity, or minimum and/or maximum cycling rates for a sensing control (Method X) .....: | | N/A |
| | 38 – Values of overshoot of activating quantity for sensing controls (Method X) .....: | | N/A |
| | 39 – Type 1 or Type 2 action (Method D).....: | Type 2 | P |
| | 40 – Additional features of Type 1 or Type 2 actions (Method D).....: | 2C | P |
| | 41 – Manufacturing deviation and condition of test appropriate to deviation (Method X) .....: | OFF:±5K | P |
| | 42 – Drift (Method X) .....: | OFF: ±5K | P |
| | 43 - Reset characteristics for cut-out action (Method D).....: | Automatic reset | P |
| | 44 - Hand-held control or control intended for hand-held equipment (Method X).....: | | N/A |
| | 45 - Limitation to the number or distribution of flat push-on receptacles (Method D).....: | | N/A |
| | 46 - Operating sequence for controls with more than one circuit (Method D) .....: | | N/A |
| | 47 - Extent of any sensing element (Method D).....: | | N/A |
| | 48 - Operating value(s) or operating time (Method D): | Operating temperature range: 5℃～180℃ | P |
| | 49 - Control pollution degree (Method D) .....: | Pollution degree 2 | P |
| | 50 - Control intended to be delivered exclusively to the equipment manufacturer (Method X).....: | | P |
| | 51 - Heat and fire resistance category (Method X) .....: | D | P |
| | 75 - Rated impulse voltage (Method D).....: | 2.5kV | P |
| | 76 - Type of printed wiring board coating, (Method X): | | N/A |
| | 77 – Temperature for ball pressure test (Method D).....: | | N/A |
| | 78 – Maximum declared torque on single brush mounting using thermoplastic material (Method D): | | N/A |
| | 79 – Pollution situation in the micro-environment of the creepage or clearance if cleaner than that of the control (Method D).....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 80 – Rated impulse voltage for the creepage or clearance if different from that of the control (Method D) ..... : | | N/A |
| | 81 – Values designed for tolerances of distances for which the exclusion from fault mode “short” is claimed (Method D) ..... : | | N/A |
| | 82 to 84 See Annex J ..... : | | N/A |
| | 85 – For Class III controls, the symbol for Class III construction (Method C) ..... : | | N/A |
| | 86 – For SELV or PELV circuits, the ELV limits realized (Method D) ..... : | | N/A |
| | 87 – Accessible voltage of SELV/PELV circuit, if different from 8.1.1, product standard referred to for the application of the control, in which standard(s) the accessible SELV/PELV level(s) is (are) (Method D) ..... : | | N/A |
| | And product standard referred to for application, in which standard(s) the accessible SELV/PELV level(s) is (are) (Method D) ..... : | | N/A |
| | 88 – See Annex U ..... : | | N/A |
| | 89 – Emission tests and groups as declared according to CISPR 11 (Method X) ..... : | | N/A |
| | 90 – Immunity tests for protective controls for use according to IEC 60335 appliances (Method X)..... : | | N/A |
| | 91 to 92 See Annex H ..... : | | N/A |
| | 101 – max. sensing element temperature (other than relevant to requirement 105); (Method: X) .... : | | N/A |
| | 102 - time factor; method: (Method: X) | | N/A |
| | 103 - bi-metallic SOD reset temperature (either -35°C or 0°C; (Method: X) ..... : | | N/A |
| | 104 - number of cycles for bi-metallic single-operation devices with 0°C reset; (Method: X) | | N/A |
| | 105 - maximum temperature for the sensing element for the test of 17.16.107; (Method: D)..... : | | N/A |
| | 106 - controls having parts containing liquid metal; (Method: D) ..... : | | N/A |
| | 107 - tensile yield strength; (Method: X) ..... : | | N/A |
| | 108 - min. current for the test according to clause 23.101; (Method: D)..... : | | N/A |
| | 109 - $T_{Max1}$ max. ambient temp. in which control may continuously remain in operated condition so that Table 14.1 temperatures are not exceeded ; (Method: D) ..... : | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 110 - Time period, $t_1$: max. time during which ambient temp. can be higher than $T_{Max1}$ after the control has operated; (Method: D) ..... : | | N/A |
| | 111 - Temp. limit above which automatic reset of a manual reset thermal cut-out or a voltage maintained thermal cut-out does not occur (not higher than –20 °C); (Method: X) ..... : | | N/A |
| | 112 - For Type 2.P controls, the method of test; (Method: X) ..... : | | N/A |
| | 113 - The click rate N or switching operations per minute for the purposes of testing to CISPR 14-1; (Method: X) ..... : | | N/A |
| | 114 - Rated functioning temperature ($T_f$); (Method: C) ..... : | | N/A |
| | 115 - Ageing temperature for non-bimetallic SOD; (Method: D) ..... : | | N/A |
| | 116 - Rate of rise of temperature for testing non-bimetallic SOD ; (Method: D) ..... : | | N/A |
| | 117 - Agricultural thermostat; (Method: D) ..... : | | N/A |
| 7.2.3 | For integral/separate controls Documentation (D) replaced with Declaration (X) ..... : | Product structure diagram and certificate of test | P |
| 7.2.4 | Marking for the integral control within the complex control included in the marking of the complex control | | N/A |
| 7.2.5 | Documentation (D) satisfied by similar information in Marking (C) | | P |
| 7.2.5.1 | Declaration (X) satisfied by similar information in Documentation (D) or Marking (C) | | P |
| 7.2.6 | Information for Integrated control provided by Declaration (X) | | N/A |
| | Incorporated control provided with manufacturers name or trademark and unique type reference when other required marking provided by Documentation (D) | | P |
| | Information for incorporated control intended for exclusive delivery to the equipment | | P |
| 7.2.7 | Controls with limited space marked with manufacturer’s name or trademark and the unique type reference while other required marking included in Documentation (D) | | N/A |
| 7.2.8 | Additional pertinent information permitted if does not rise misunderstanding .....: | | N/A |
| 7.2.9 | Appropriate IEC symbols used per 7.2.9.....: | V； A Correct used | P |
| 7.3 | Class II symbol | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 7.3.1 | Used only for in-line cord, free-standing, and independently mounted controls | | N/A |
| 7.3.2 | Outer square is approximately twice the size of the inner square | | N/A |
| 7.3.2.1 | Largest dimension of the control (mm) .....: | | N/A |
| | Side dimension of outer square (mm) .....: | | N/A |
| 7.3.2.2 | Controls which include terminals for earthing continuity for functional purposes are not marked with the symbol for class II | | N/A |
| 7.4.1 | Marking placed on the main body, on non-detachable parts | | P |
| | Required marking legible and durable | | P |
| 7.4.2 | An arrow pointing towards the terminal identifies terminals of control intended for connection of supply conductors | | N/A |
| | Additional markings required by the National Wiring Codes provided .....: | | N/A |
| 7.4.3 | Terminals for neutral external conductor identified by letter "N" | | N/A |
| 7.4.3.1 | External earthing and continuity terminals of Class II and III controls and terminals for earthing for functional purposes identified by earth symbol | | N/A |
| | – for protective earth by the earth symbol for protective earth, IEC 60417-5019 (2002-10) | | N/A |
| | – For functional earth by the earth symbol for functional earth, IEC 60417-5017 (2002-10). | | N/A |
| 7.4.3.2 | All other terminals appropriately identified..... : | purpose self-evident | P |
| | For use in Canada and the U.S.A, terminal intended for grounded supply conductor provided in white/grey colour | | N/A |
| | For use in Canada and the U.S.A, the wire binding screw intended for equipment earthing conductor is slotted/ hexagonal green-coloured head. Location is such that it is unlikely to be removed during servicing. | | N/A |
| | For use in Canada and the U.S.A, the pressure wire connector intended for equipment earthing conductor is marked ground, grounding, earth, or by a marking on the wiring diagram shipped with the control. Location is such that it is unlikely to be removed during servicing of control | | N/A |
| | Additional markings required by National Wiring Codes of Canada and U.S.A provided .....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 7.4.4 | Symbols “+” and “-“ provided to indicate the direction to increase or decrease response value for the controls to be set by the user or the equipment manufacturer | | N/A |
| | Controls intended to be set by the equipment manufacturer or the installer accompanied by documentation (D) indicating proper method for securing the setting | | N/A |
| 7.4.5 | Replaceable parts destroyed during the normal operation marked to enable their identification from a Catalogue or similar document, even after they operated | | N/A |
| 7.4.6 | Controls intended to be connected only to SELV systems are marked with the class III symbol | | N/A |
| | 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 designed as for class III but have terminals for earthing continuity for functional purposes are not marked with the symbol for class III construction | | N/A |
| 8 | PROTECTION AGAINST ELECTRIC SHOCK | | N/A |
| 8.1.1 | Adequate protection provided against accidental contact with live parts in all unfavourable positions of normal use, and after all accessible detachable parts (other than lamps behind the detachable cover) were removed. | | N/A |
| | Protection against accidental contact with live parts of the lamp provided to allow safe insertion and removal of the lamps. | | N/A |
| | Live parts connected to a SELV supply not exceeding 24 V considered being non-hazardous. | | 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 comply with H.8.1.10.1. | | N/A |
| | Live parts connected to a SELV supply not exceeding 30 V considered to be non-hazardous in the countries specified in the remarks column .....: | | N/A |
| 8.1.2 | Class II controls and controls for Class II equipment provided with protection against accidental contact with metal parts separated from hazardous live parts by only basic insulation | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 8.1.3 | Lacquer, enamel, paper, cotton, oxide film on metal parts, and beads and sealing compounds not relied upon for protection against accidental contact with hazardous live parts | | N/A |
| | Self-hardening sealing compounds exempted from the above requirements | | N/A |
| 8.1.4 | For controls connected to gas or water supply mains any metal part electrically connected to pipes is separated from hazardous live parts by double insulation or reinforced insulation | | N/A |
| 8.1.5 | Class II controls and controls for Class II equipment for fixed installation: protection not impaired by the installation of control / equipment | | N/A |
| 8.1.6 | Integrated and Incorporated controls: tests made to accessible parts when control is mounted as intended with detachable parts removed | | N/A |
| 8.1.7 | In-line and free-standing controls: tests are made when control fitted with cord; cross-sectional area of cord (mm²) .....: | | N/A |
| 8.1.8 | Independently mounted controls: tests are made when control mounted as in normal use, fitted with cable or with a conduit; cross-sectional area of cable (mm²) .....: | | N/A |
| 8.1.9 | Tests using the standard test finger and test pin: | | N/A |
| | - Not permissible to touch bare live parts. | | N/A |
| | - Controls with double insulation: not permissible to touch metal parts with test finger which are separated from live parts by basic insulation. | | N/A |
| 8.1.11 | Between Class III and main/earth circuits, insulation external to the safety isolating transformer complies with Class II insulation | | N/A |
| 8.1.12 | Live parts are hazardous if they exceed the values specified in 8.1.1 and it are not separated from the source by protective impedance and are not a PEN conductor or a part of the equipotential bonding system | | N/A |
| 8.2 | Actuating members and means | | N/A |
| 8.2.1 | Actuating members are not live | | N/A |
| 8.2.2 | Live actuating means provided with fixed insulated actuating member | | N/A |
| | Live actuating means not accessible when actuating member is removed | | N/A |
| 8.2.3 | Controls other than Class III or for other than Class III equipment: actuating members and handles to be held in normal use are: | | N/A |
| | - of insulating material, or | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - covered by insulating material | | N/A |
| | If of metal: accessible parts (if likely to become live in the event of an insulation fault) separated from their actuating means or fixings by supplementary insulation | | N/A |
| | Controls for fixed wiring or for stationary equipment, previous requirement not applicable if parts: | | N/A |
| | - reliably connected to an earthing terminal/contact, or | | N/A |
| | - shielded from live parts by earthed metal | | N/A |
| | - separated from live parts by double or reinforced insulation. | | N/A |
| 8.3 | Capacitors | | N/A |
| 8.3.1 | Class II in-line cord controls and independently mounted controls: capacitor not connected to accessible metal parts | | N/A |
| | Controls for Class II equipment: capacitors not connected to metal likely to be connected to accessible metal parts (control correctly mounted) | | N/A |
| | Metal casings of capacitors separated by supplementary insulation from: | | N/A |
| | - accessible metal parts | | N/A |
| | - metal parts likely to be connected to accessible metal parts | | N/A |
| 8.3.2 | Controls connected to the supply by means of a plug: no risk of electric shock (from capacitor) when touching the pins of the plug | | N/A |
| | Capacitance (µF) >0.1µF ..... : | | N/A |
| | Average voltage (V) < 34 V ..... : | | N/A |
| 8.4 | Covers and uninsulated live or hazardous parts; cover fixing screws: | | N/A |
| | - not accessible, or | | N/A |
| | - earthed, or | | N/A |
| | - separated by double or reinforced insulation, or | | N/A |
| | - not accessible after mounting in the equipment | | N/A |
| 9 | PROVISION FOR PROTECTIVE EARTHING | | N/A |
| 9.1.1 | Accessible parts other than actuating members of in-line cord, free-standing and independently mounted controls of Class 0I or Class I which may become live: | | N/A |
| | - connected to an earthing terminal, or | | N/A |
| | - terminated within the control, or | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - connected to an earthing contact of an equipment inlet. | | N/A |
| 9.1.2 | Accessible parts other than actuating members of integrated and incorporated controls for Class 0I and Class I equipment which may become live: | | N/A |
| | - have provision for earthing, or | | N/A |
| | - earthed by the fixing means | tab terminal and by the fixing means | N/A |
| 9.1.3 | Earthing terminals, terminations or contacts not electrically connected to any neutral terminal | | N/A |
| 9.2 | Control of Class II or Class III | | N/A |
| | - no provision for protective earthing | | N/A |
| 9.3 | Adequacy of earth connections | | N/A |
| 9.3.1 | Connection between earthing terminal and parts to be connected is of low resistance: | | N/A |
| | - test current (A): 1.5 times rated current but min. 25 A..... : | | N/A |
| | - duration (h): until steady conditions ..... : | | N/A |
| | - voltage drop (V), integrated conductors included, external or internal conductors excluded ..... : | | N/A |
| | - calculated resistance (Ω):≤0.1 Ω ..... : | | N/A |
| 9.3.2 | Fixed wiring and methods X and M earthing terminals meet requirements of 10.1 | | N/A |
| 9.3.3 | External earthing connections not made by screwless terminals | | N/A |
| | for attachment methods Y and Z, screwless earthing terminals complying with IEC 60998-2-2 or 60998-2-3 are allowed | | N/A |
| 9.3.4 | Size of accessible earthing terminals | | N/A |
| | - accessible earthing terminals, range: 2.5 $mm^2$ to 6 $mm^2$ | | N/A |
| | - Unable to loosen without the aid of a tool. | | N/A |
| 9.3.5 | Size of non-accessible earthing terminals | | N/A |
| | - size of current -carrying terminal ($mm^2$) ..... : | | N/A |
| | - size of earthing terminal ($mm^2$) ..... : | | N/A |
| 9.3.6 | Earthing terminals locked against accidental loosening | | N/A |
| 9.4 | Corrosion resistance | | N/A |
| 9.4.1 | Material of earthing terminals, body: | | N/A |
| | - body of earthing terminals made of brass | | N/A |
| | - other metal not less resistant to corrosion..... : | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - screws or nuts made of brass | | N/A |
| | - plated steel or other resistant material ..... : | | N/A |
| 9.4.2 | Precaution against risk of corrosion between copper and frames or enclosures of aluminium or its alloys | | N/A |
| 9.5.1 | Detachable part with earth connection | | N/A |
| | - placing part in position: earth contact made before current-carrying connections | | N/A |
| | - removing part: earth contact separated after disconnection of current-carrying connections. | | N/A |
| 9.5.2 | Incorporated controls likely to be separated from its normal earthing means after mounting in equipment, provided with permanent earthing connection or conductor | | N/A |
| 10 | TERMINALS AND TERMINATIONS | | P |
| 10.1 | Terminals and terminations for external copper conductors | | N/A |
| 10.1.1 | In terminals for fixed wiring and for cords using X and M attachment method connections made by screws, nuts or equally effective methods | | N/A |
| | Use of a special purpose tool not required | | N/A |
| 10.1.1.1 | Terminals or terminations for cords using Y and Z attachment method comply with clause 10.2 | | N/A |
| | Need for special purpose tools | | N/A |
| 10.1.2 | Screws and nuts which clamp external conductors: | | N/A |
| | - metric ISO thread; size ..... : | | N/A |
| | - ISO equivalent; size ..... : | | N/A |
| | - do not serve to fix other components | | N/A |
| | Exception: terminal also clamps internal conductors which are so arranged that they are not displaced when fitting the external conductor | | N/A |
| 10.1.3 | Soldered, welded, crimped or similar terminations not used for non-detachable cords X and M attachments | | N/A |
| 10.1.4 | Terminals for fixed wiring and non-detachable cords using attachment methods X or M: | | N/A |
| | - terminal No. or identification ..... : | | N/A |
| | - Current (A) carried by terminal ..... : | | N/A |
| | - Flexible cord or fixed wiring ..... : | | N/A |
| | -conductor cross-sectional area - smallest ($mm^2$) : | | N/A |
| | -conductor cross-sectional area - largest ($mm^2$) .. : | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 10.1.4.1 | Terminal designed for wider range of conductor size declared ..... : | | N/A |
| 10.1.4.2 | Creepage and clearances between terminals for fixed wiring and between terminals and metal parts required in Canada and the USA | | N/A |
| 10.1.5 | Terminals for fixed wiring and non-detachable cords using attachment methods X or M securely fixed | | N/A |
| 10.1.5.1 | 10 times fastening and loosening conductor of largest cross-section | | N/A |
| | - kind of wire used ..... : | | N/A |
| | - cross-sectional area ($mm^2$) ..... : | | N/A |
| | - applied torque value (Nm)..... : | | N/A |
| | - terminals did not work loose | | N/A |
| | - internal conductors not subjected to stress | | N/A |
| | - creepage and clearances distances not reduced below values required in Cl. 20 | | N/A |
| 10.1.6 | Terminals for fixed wiring and non-detachable cords using attachment methods X or M clamp conductors between metal surfaces | | N/A |
| | Screwless terminals for current ≤ 2 A with non-metallic surface | | N/A |
| | No undue damage to the conductor after tightening or loosening (tests of 10.1.5) | | N/A |
| 10.1.7 | Terminals for fixed wiring and non-detachable cords using attachment method X: | | N/A |
| | - no special preparation of conductor required | | N/A |
| 10.1.7.1 | - alternative means of connection applied | | N/A |
| 10.1.8 | In terminals for fixed wiring and non-detachable cords using attachment methods X or M conductor remains secure while clamping | | N/A |
| 10.1.8.2 | Terminals fitted with conductors: | | N/A |
| | - cross-sectional area ($mm^2$) ..... : | | N/A |
| | - Flexible cord / Fixed wiring ..... : | | N/A |
| 10.1.8.3 | Torque applied on screws (Nm)..... : | | N/A |
| 10.1.8.4 | Neither the conductor nor the wire of a stranded conductor slipped out | | N/A |
| 10.1.9 | Clamping reliability of the terminals | | N/A |
| 10.1.9.1 | Appropriate conductors fitted; torque applied on screws (Nm): 2/3 of values in Table 20 | | N/A |
| 10.1.9.2 | Pull-out force applied for 1 min to the conductor: | | N/A |
| | - adjacent to the terminal, or | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - Near the crimping or clamping device holding the conductor. | | N/A |
| 10.1.9.3 | Conductor did not move appreciably after pull-out test | | N/A |
| 10.1.11 | Location of terminals in reasonable proximity | | N/A |
| 10.1.12 | Test of escaped wire for terminals with attachment methods X or M | | N/A |
| | Free wire of stranded conductor makes no contact with accessible metal parts | | N/A |
| | Free wire of stranded conductor makes no contact with metal parts of Class II controls separated from accessible parts by supplementary insulation only | | N/A |
| | Free wire of a conductor connected to the earthing terminal makes no contact with live parts | | N/A |
| | Free wire of a conductor connected to live terminals not accessible and does not short-circuit an action providing full or micro-disconnection | | N/A |
| 10.1.13 | Contact pressure not transmitted via insulating material other than ceramic | | N/A |
| | Sufficient resiliency in the appropriate metal parts to compensate for distortion of insulating material | | N/A |
| 10.1.14 | Screws and threaded parts made of metal | | N/A |
| 10.1.15 | In pillar and mantle type terminals adequate length of the conductor can be introduced | | N/A |
| | In pillar and mantle type terminals conductor is beyond the edge of the screw | | N/A |
| 10.1.16 | Flying Leads used in U.S.A. and Canada | | N/A |
| 10.2 | Terminals and terminations for internal conductors | | P |
| 10.2.1 | Connectable conductors | 1 $mm^2$-1.5 $mm^2$, tab terminal | P |
| 10.2.2 | Terminals suitable for their purpose | | P |
| 10.2.3 | In soldered terminals: soldering is not the only means to maintain conductor in position | | N/A |
| | In soldered terminals: barriers provided to prevent reduction in creepage and clearance | | N/A |
| 10.2.4 | Flat push-on connectors | | P |
| 10.2.4.1 | Dimension of tabs: | | P |
| | - measured (mm x mm) .....: | 6.3mm×0.8mm<br>4.8mm×0.8mm ;4.8mm×0.5mm | P |
| | - compliance with Fig. 14, 15, 16 or IEC/EN 61210 | Fig. 14 | P |
| | - other dimensions allowed (mm x mm).....: | | N/A |
| | - Polarized acceptance of receptacles allowed. | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 10.2.4.2 | Tabs forming part of a control consist of material appropriate to the maximum temperatures allowed (table 7) | | P |
| 10.2.4.3 | Mechanical strength of tabs | | P |
| 10.2.4.4 | Space between tabs; applying appropriate receptacles on each tab: | | P |
| | - no strain, no distortion to any of the tabs or adjacent parts | | P |
| | - no reduction of creepage distance or clearances below values of Cl. 20 | | P |
| 10.3 | Terminals and terminations for integrated conductors | | N/A |
| 11 | CONSTRUCTION REQUIREMENTS | | P |
| 11.1.1 | Insulating materials | | P |
| | Wood, cotton, silk, ordinary paper etc. not used as insulation unless impregnated, or | | P |
| 11.1.2 | Current carrying part other than threaded parts of terminals, if made of brass: | | P |
| | - contain at least 50% copper if cast or from bar | | N/A |
| | - contain at least 58% copper if from rolled sheet | H62 | P |
| 11.1.3.1 | Non-detachable cords of Class I controls provided with a green/yellow conductor insulation and properly connected | | N/A |
| 11.1.3.2 | Non-detachable cords: green/yellow conductor not connected to other than earthing terminals | | N/A |
| 11.1.101 | Parts containing liquid metal (IEC60730-2-9:08) | | N/A |
| | Controls declared under 106 of table 7.2, parts containing Hg, Na or Ka, are constructed of metal with tensile strength at least 4 x the circumferential or other stress on the parts at the temperature 1.2 x max. temperature of the sensing element | | N/A |
| | Tested by inspection of manufacturer's declaration and according to clause 18.102 | | N/A |
| 11.1.102 | Insulating material used in non-bimetallic SODs, as defined in this standard, comply with the requirements of IEC 60216-1:2001 and are suitable for the application | | N/A |
| 11.2 | Protection against electric shock | | N/A |
| 11.2.1 | Double insulation: | | N/A |
| | - basic insulation and supplementary insulation can be tested separately, or | | N/A |
| | - properties of both insulations are otherwise provided | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 11.2.1.1 | Insulation regarded as reinforced insulation if requirements of 11.2.1 not met | | N/A |
| 11.2.2 | Infringement of double or reinforced insulation in Class II controls: | | N/A |
| | - creepage distances and clearances not reduced below values of Cl. 20 by wear | | N/A |
| | - creepage distances and clearances not reduced to less than 50% of values of Cl. 20 by parts becoming loose (wires, screws, nuts, etc.) | | N/A |
| 11.2.3 | Integrated conductors | | N/A |
| 11.2.3.1 | No reduction of creepage distances and clearances below values of Cl. 20: conductors rigid, fixed or insulated | | N/A |
| 11.2.3.2 | Insulation, if any, cannot be damaged during mounting or in normal use | | N/A |
| 11.2.4 | Sheath of flexible cord used as supplementary insulation: | | N/A |
| | - not subjected to undue mechanical or thermal stresses | | N/A |
| | - insulation properties comply with IEC 60227 or IEC 60245 | | N/A |
| 11.2.6 | Protection against electric shock by use of SELV or PELV See Annex T. | | N/A |
| 11.2.7 | Adequate measures are provided to prevent the interconnection of an integrated SELV circuit to an external PELV circuit and vice versa | | N/A |
| | Supply from an external SELV source is only possible by 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 |
| | - contact separation in all poles not below values of Cl. 20 (exception: earth) | | N/A |
| | - any subsequent action does not cause reduction of contact separation below the minimum values (Cl. 20) | | N/A |
| | For declared all-pole disconnection contact operation in each pole substantially together | | N/A |
| 11.3.2 | Micro-disconnection | | N/A |
| | - one supply pole, at least, separated | | N/A |
| | - separated pole meets electric strength requirements, Cl. 13 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - any subsequent action does not cause reduction of contact separation below value required by the Electric Strength Test | | N/A |
| 11.3.3 | Reset buttons are so located or protected that they are not to be accidentally reset | | N/A |
| 11.3.4 | Parts for setting by the manufacturer secured to prevent accidental shifting | | P |
| 11.3.5 | For contacts with d.c. rating > 0.1 A operated by actuation speed of approach and separation of contacts are independent of speed of actuation. | | N/A |
| 11.3.6 | Contacts for full- and micro-disconnection with d.c. rating ≤ 0.1 A or a.c. rating, operated by actuation can rest only in closed or open position | | N/A |
| 11.3.7 | Contacts which cannot (or are not intended to) be operated on load nor arc under normal use | | N/A |
| 11.3.7.2 | An arc not maintained by slowly opening the contacts | | N/A |
| 11.3.8 | In any rest position of the actuating member | | N/A |
| | - contacts are open or closed as intended | | N/A |
| | - no hazard can occur within the control | | N/A |
| 11.3.9 | In pull-cord actuated control the mechanism returns when pull-cord is released to allow next movement in the cycle | | N/A |
| | - pull force vertically downwards (N): ≤ 45 N .....: | | N/A |
| | - pull force 45° to vertical (N): ≤ 70 N .....: | | N/A |
| | - function after release | | N/A |
| | Second paragraph not applicable to Type 1.X or 2.X or Type 1.Z or 2.Z | | N/A |
| 11.4 | Actions | | P |
| 11.4.1 | Combined action: Control remains operative after the failure of any portion unique to the other actions | | N/A |
| 11.4.2 | Type 2 action with provision for setting by the manufacturer: clearly discernible if any subsequent interference with the setting has been made | | P |
| 11.4.3 | Type 2 action: manufacturing deviation and drift within the required limits. | | P |
| 11.4.3.101 | Thermal cut out: capacitors not connected across the contacts | | N/A |
| | Use of capacitors connected across contacts of a Type 2 control (in Canada and USA) | | N/A |
| 11.4.3.102 | Constructions requiring a soldering operation to reset thermal cut-outs are not permitted | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 11.4.4 | Type 1A or 2A action: operation provides full-disconnection. | | N/A |
| 11.4.5 | Type 1B or 2B action: operation provides micro-disconnection. | | N/A |
| 11.4.6 | Type 1C or 2C action: operation provides micro-interruption. | Type 2C action | P |
| 11.4.7 | Type 1D or 2D action: disconnection cannot be prevented and reset not possible while faults persists | | N/A |
| 11.4.8 | Type 1E or 2E action: disconnection or opening of contacts cannot be prevented/inhibited by reset mechanism or against continuation of fault condition | | N/A |
| 11.4.9 | Type 1F or 2F action: reset needs the aid of a tool | | N/A |
| 11.4.10 | Type 1G or 2G action: reset possible under electrically loaded conditions | | N/A |
| 11.4.11 | Type 1H or 2H action: | | N/A |
| | - contacts cannot be prevented from opening | | N/A |
| | - may reset automatically to “closed” if reset means is held in reset position | | N/A |
| | - no automatic reset if reset means in normal position at any temperature above –35 °C | | N/A |
| 11.4.12 | Type 1J or 2J action: | | N/A |
| | - contacts cannot be prevented from opening | | N/A |
| | - no automatic reset if reset means is held in reset position | | N/A |
| | - no automatic reset at any temperature above –35 °C | | N/A |
| 11.4.13 | Type 1K or 2K action: declared disconnection provided in the case of break in sensing element or in part between element and switch head | | N/A |
| 11.4.13.101 | Type 2.K action: event of break (sensing element and switch head): declared disconnection/ interruption provided before declared operating value plus drift is exceeded | | N/A |
| | Breaking the sensing element test | | N/A |
| | Control heated within 10K of operating temperature; temperature [°C] .....: | | N/A |
| | Temperature increased 1K/min; rising degree [K/min] .....: | | N/A |
| | Contacts open before declared operating temperature plus drift is exceeded; temperature [°C] .....: | | N/A |
| 11.4.13.102 | Also achieved by compliance a), b) or c) | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | a) two sensing elements operating independently actuating one switch head: | | N/A |
| | b1) bi-metallic sensing elements: with exposed elements attached with at least double spot welding of the bimetal at both of its end: | | N/A |
| | b2) bi-metallic sensing elements: so located/ 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 loss of fluid fill causes the contacts to remain closed: test with impact tool, fig. 11.4.13.102, dropped once, height 0.6m, tapered end, capillary on concrete surface | | N/A |
| | No damage to the bulb or capillary permitting escape of fill when subjected to impact of Fig. 11.4.14.102 from height of 0.6 m. | | N/A |
| 11.4.14 | Type 1L or 2L action: function independent of electrical supply or auxiliary energy source | | N/A |
| 11.4.15 | Type 1M or 2M action: operation provided after declared ageing procedure | | N/A |
| 11.4.101 | Type 2.N action: event of leak (sensing element or part between sensing element and switch head): declared disconnection or interruption provided before declared operating value plus drift is exceeded | | N/A |
| | Operating value (conditions acc. to part 1, clause 15); measured [°C] .....: | | N/A |
| | If means for setting: set to highest value | | N/A |
| | A hole is produced in the sensing element | | N/A |
| | Measurement of operating value repeated; measured [°C].....: | | N/A |
| | No positive drift above declared value; declared value [°C]; measured [K] .....: | | N/A |
| | Test replaced by theoretical computation of the physical mode of operation | | N/A |
| | Canada and USA type 2.N tested according to 11.4.13.102 c) | | N/A |
| 11.4.102 | type 2.P action: operates in its intended manner after thermal cycling test according to clause 17.101 | | N/A |
| 11.4.103 | bi-metallic single operation device doesn't reset above the declared reset value (requirement 103 of table 7.2), test according to clause 17.15 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 11.4.104 | Type 1.X or 2.X action so designed that turn action can only be accomplished after the completion of a push or pull action. Rotation only required to return the actuation member of the control to the off or rest position, test according to clause 18.101 | | N/A |
| 11.4.105 | Type 1.Z or 2.Z action so designed that turn action can only be accomplished after the completion of a pull or push action, test according to clause 18.101: | | N/A |
| 11.4.106 | A voltage maintained thermal cut-out is so designed that it does not reset above the reset value declared in table 7.2, item 111; value | | N/A |
| 11.4.107 | Type 1.AM or 2.AM action is so designed that it operates in its intended manner after the declared agricultural environmental exposures.<br>Tests according to Annex DD. | | N/A |
| 11.5 | Openings in enclosures (drain holes) | | N/A |
| | - minimum area ($mm^2$): .....: | | N/A |
| | - maximum area ($mm^2$): .....: | | N/A |
| | - minimum dimension ($mm^2$): .....: | | N/A |
| 11.6 | Mounting of controls | | P |
| 11.6.1 | Control mounted according to manufacturer's declaration: does not adversely affect compliance with this standard | | P |
| 11.6.2 | Control mounted as declared, if movement or removal could adversely affect compliance with this standard: | | P |
| | - cannot rotate or be displaced | | P |
| | - cannot be removed without the aid of a tool | | P |
| | - when removal (even partial) is necessary for use, requirements of clauses 8, 13, and 20 are satisfied before and after removal | | P |
| | Controls, other than with rotary actuation, fixed by a nut and single bushing: | | N/A |
| | - tightening of the nut requires a tool | | N/A |
| | - parts have adequate mechanical strength | | N/A |
| | Screwless fixing of an incorporated control: a tool is required before the control can be removed from the equipment | | N/A |
| 11.6.3 | Mounting of independently mounted controls | | N/A |
| 11.6.3.1 | Independently mounted controls (other than for panel mounting): | | N/A |
| | - fit a standard box as declared, or | | N/A |
| | - supplied with a conduit box (if special), or | | N/A |
| | - suitable for surface (plane) mounting | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 11.6.3.2 | If special conduit box is required: | | N/A |
| | - box delivered with the control | | N/A |
| | - box provided with entries for conduits specified in IEC 60423 | | N/A |
| 11.6.3.3 | Controls for surface mounting for buried installation (concealed wiring) provided with suitable holes on the backside. | | N/A |
| 11.6.3.4 | Controls for surface mounting for exposed wiring provided with entries, knock-outs or glands. | | N/A |
| 11.6.3.5 | Terminals (for external conductors) of controls or sub-bases accessible and usable when control is fixed and cover or the control is removed | | N/A |
| 11.6.3.6 | In controls for mounting on an outlet box, wiring terminals, live parts and sharp edged metal parts located or protected to prevent from being forced against wiring | | N/A |
| 11.6.3.7 | Back wiring terminals: recessed or protected to prevent contact with wiring installed in the box | | N/A |
| 11.6.3.101 | For agricultural thermostats declared in Table 7.2, item 117, the mounting method is such that the integrity of the protection by the enclosure is not compromised. | | N/A |
| 11.7 | Attachment of cords | | N/A |
| 11.7.1.1 | In-line and free-standing controls, flexible cords withstand flexing during normal use | | N/A |
| | Cords with attachment method X: cord-guard (if provided) not integral with flexible cord. | | N/A |
| 11.7.1.2 | Flexing Test for flexible cords | | N/A |
| 11.7.2 | Cord anchorages | | N/A |
| 11.7.2.1 | Controls, other than integrated or incorporated, intended to be connected by non-detachable cords provided with cord anchorage so designed that: | | N/A |
| | - conductor relieved from strain | | N/A |
| | - conductor relieved from twisting | | N/A |
| | - conductors covering protected from abrasion | | N/A |
| 11.7.2.2 | Cord anchorages of Class II controls: | | N/A |
| | - made of insulating material | | N/A |
| | - insulated from accessible metal parts by supplementary insulation | | N/A |
| 11.7.2.3 | Cord anchorages of controls other than Class II: | | N/A |
| | - made of insulating material, or | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - provided with insulating lining, if an insulation fault on the cord could make accessible metal parts live | | N/A |
| | - provided with lining fixed to the cord anchorage (exception: bushing which forms part of a cord guard) | | N/A |
| 11.7.2.4 | Cord anchorage design: | | N/A |
| | - cord cannot touch clamping screws of anchorage, if screws are accessible metal parts | | N/A |
| | - cord not clamped by metal screws bearing directly on the cord | | N/A |
| | - attachment method X or M: at least one part securely fixed to the control | | N/A |
| | - attachment method X or M: replacement of cord does not require a special purpose tool | | N/A |
| | - attachment method X: suitable for the different connectable cords | | N/A |
| | - attachment method X: design and location make replacement of the cord easily possible | | N/A |
| 11.7.2.5 | For other than attachment method Z: cord anchorage not made by make-shift methods. | | N/A |
| 11.7.2.6 | Attachment method X: in-line cord controls: | | N/A |
| | - glands not used as cord anchorage, unless | | N/A |
| | - provision exists for clamping all types of cords | | N/A |
| 11.7.2.7 | Screws to be operated when replacing the cord: | | N/A |
| | - not fixing other components, or | | N/A |
| | - control is inoperable or manifestly incomplete if components are omitted or incorrectly mounted, or | | N/A |
| | - component cannot be removed without the aid of a tool | | N/A |
| 11.7.2.9 | Push test for control fitted with flexible cord(s) | | N/A |
| | Screws of cord anchorage tightened 2/3 torque of cl. 19.1(Nm) .....: | | N/A |
| 11.7.2.10 | Push causes no damage | | N/A |
| 11.7.2.11 | Pull test for control fitted with flexible cord(s) | | N/A |
| | Free-standing control, weight (kg) .....: | | N/A |
| | In-line cord controls (all others).....: | Force: : pulls: | N/A |
| | no displacement allowed | | N/A |
| 11.7.2.12 | Torque Test on cable, torque (Nm) .....: | | N/A |
| 11.7.2.13 | Attachment method X | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - test with lightest cord: smallest cross-section used in 10.1.4: diameter (mm) .....: | | N/A |
| | - test with next heavier type with largest cross-section: diameter (mm) .....: | | N/A |
| 11.7.2.14 | Test results | | N/A |
| | - cord not damaged | | N/A |
| | - measured longitudinal displacement (≤ 2 mm ) of cord (mm).....: | | N/A |
| | - conductors have not moved in the terminals over a distance > 1 mm | | N/A |
| | - no appreciable strain at the connection | | N/A |
| | - creepage distances and clearances not reduced below values of Cl. 20 | | N/A |
| 11.8 | Size of non-detachable cords | | N/A |
| 11.8.1 | - rubber sheathed, not lighter than 60245; type .....: | | N/A |
| | - PVC sheathed, not lighter than 60227; type .....: | | N/A |
| | Exception: if specified in equipment standard or for connection to external SELV devices .....: | | N/A |
| 11.8.2 | Size of conductors in non-detachable cords: | | N/A |
| | - nominal current (A).....: | | N/A |
| | - required cross-sectional area (mm²).....: | | N/A |
| | - measured cross-sectional area (mm²).....: | | N/A |
| 11.8.3 | Space inside the control for flexible cords: | | N/A |
| | - connecting cords of largest cross-section (10.1.4) (mm²).....: | | N/A |
| | - adequate space for easy introduction and connection | | N/A |
| | - possibility to check the correct connection | | N/A |
| | - cover can be fitted without risk of damage to the conductors | | N/A |
| 11.9 | Inlet openings | | N/A |
| 11.9.1 | Inlet openings for flexible external cords: | | N/A |
| | - designed to prevent damage of the covering of the cord when introducing connectors | | N/A |
| | - provided with inlet bushing | | N/A |
| 11.9.1.1 | Conduit entries and knock-outs of independently mounted controls designed and located that introduction does not affect protection against electric shock or reduces distances and clearances (Cl. 20) | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 11.9.2 | Inlet openings without inlet bushing made of insulating material | | N/A |
| 11.9.3 | Inlet bushing: | | N/A |
| | - made of insulating material | | N/A |
| | - shaped to prevent damage to the cord | | N/A |
| | - reliably fixed | | N/A |
| | - not removable without the aid of a tool | | N/A |
| | - not integrated with the cord in case of attachment method X | | N/A |
| 11.9.4 | Inlet bushing not made of rubber | | N/A |
| | Exception: For attachment methods M, Y or Z, for Class 0, 0I or I controls, bushing integral with sheath of a cord of rubber | | N/A |
| 11.9.5 | Enclosures of independently mounted controls (for permanent connection to fixed wiring) provided with cable/conduit entries, knock-outs or glands allowing correct connection of the appropriate cable or cord | | N/A |
| 11.10 | Equipment inlets and socket-outlets | | N/A |
| 11.10.1 | Engagement with connecting devices of other systems not possible | | N/A |
| | Engagement causes no danger or damage | | N/A |
| 11.10.2 | In-line cord controls with inlet or socket-outlets: | | N/A |
| | - unintended overloading of control cannot occur, rating of the control accordingly | | N/A |
| | - protected against overload, protection means ....: | | N/A |
| 11.10.3 | Controls with pins to be introduced into fixed socket-outlets comply with requirements of the 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 is provided with an incorporated fuse or a protective device to limit the current to the control's rating | | N/A |
| | The plug and socket outlet part of the control complies with the appropriate standard for the plug and socket system | | N/A |
| 11.11 | Requirements during mounting, maintenance and servicing | | N/A |
| 11.11.1 | Covers and their fixing | | N/A |
| 11.11.1.1 | Removal of covers does not affect setting of the controls other than integrated | | N/A |
| 11.11.1.2 | Covers | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - cannot be displaced or replaced incorrectly | | N/A |
| | - fixing of covers to be removed for mounting etc., does not serve to fix any parts other than actuating members or gaskets | | N/A |
| 11.11.1.3 | Covers of enclosures giving access to fuses or any overload protective devices (Canada and U.S.) | | N/A |
| 11.11.1.4 | Glass covering an opening (Canada and U.S.) | | N/A |
| 11.11.1.5 | Non-detachable parts which provide protection against electric shock or contact with moving parts | | N/A |
| | - fixed in a reliable manner | | N/A |
| | - withstand mechanical stress | | N/A |
| | -snap-in devices have a locked position | | N/A |
| 11.11.1.5.1 | - parts likely to be removed for installation or during servicing disassembled and assembled ten times | | N/A |
| 11.11.1.5.3 | - control subjected to 50 N push force test.....: | | N/A |
| | - pull force (N) .....: | | N/A |
| | - finger nail pull force (N) .....: | | N/A |
| | - if cover subjected to twisting force, torque applied: | | N/A |
| 11.11.1.5.4 | After push / pull test, parts remain locked in position and not detached | | N/A |
| 11.11.1.6 | Cover removable with one hand, not released when subjected to squeezing and pull force | | N/A |
| 11.11.2 | Fixing screws of covers which need to be removed for mounting etc., captive | | N/A |
| 11.11.3 | Actuating member | | N/A |
| 11.11.3.1 | Control not damaged by mounting or removal of actuating member | | N/A |
| 11.11.3.2 | For Type 2 action with max/min. setting limited by means of the actuating member, the actuating member not removable without use of a tool | | N/A |
| 11.11.3.3 | Actuating member cannot be fixed in an incorrect position for Type 1 action (actuating member providing OFF position) or Type 2 action (actuating member indicating condition of the control) | | N/A |
| 11.11.4 | Parts forming supplementary or reinforced insulation and which might be omitted during re-assembly: | | N/A |
| | - fixed and cannot be removed without being damaged, or | | N/A |
| | - if omitted, control is inoperable or manifestly incomplete | | N/A |
| 11.11.5 | Sleeving as supplementary insulation on integrated conductors: retained in position by a positive means | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 11.11.6 | Pull-cords: | | N/A |
| | - insulated from live parts | | N/A |
| | - fitting and replacement possible without live parts becoming accessible | | N/A |
| 11.11.7 | Insulating linings, barriers etc.: | | N/A |
| | - adequate mechanical strength | | N/A |
| | - secured in a reliable manner | | N/A |
| 11.12 | Controls using software.....: | | N/A |
| 11.13 | Protective controls and components of protective control system | | N/A |
| 11.13.1 | - protective controls designed and constructed to be reliable and suitable for their intended duty | | N/A |
| | - protective controls are independent of other functions | | N/A |
| | - protective controls comply with appropriate design principles in order to obtain suitable and reliable protection | | N/A |
| | Operating controls are not used as protective controls | | N/A |
| 11.13.2 | The pressure of the limiting devices does not permanently exceed the maximum allowable pressure of the controlled application | | N/A |
| | A short duration pressure surge of the limiting devices does not exceed 10% of the pressure surge | | N/A |
| 11.13.3 | The temperature monitoring devices have an adequate response time on safety grounds, consistent with measurement function | | N/A |
| 11.101 | If time factor declared: checked by one of the methods in Annex BB | | N/A |
| | In Germany: for controls intended to control boiling water or flue gas temperature in heat generating systems, values is Table BB.1 not exceeded | | N/A |
| 12 | MOISTURE AND DUST RESISTANCE | | P |
| 12.1.1 | Protection against ingress of water and dust<br>IP Classification of the product.....: | IP00 | P |
| 12.1.2 | Electric Strength Test, 13.2 after tests according to IEC 60529 | | N/A |
| | Entered water does not impair compliance with this standard | | N/A |
| | No reduction of creepage distances and clearances below values of Cl. 20 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 12.1.6 | Sealing means aged in heating cabinet at temperature (°C): (70 ± 2) °C for duration (h): 10 days (240 h) | | N/A |
| | Parts then left at room temperature, duration (h): > 16 h .....: | | N/A |
| 12.2 | Protection against humid conditions | | N/A |
| 12.2.6 | Detachable parts: removed and tested with main part, if necessary | | P |
| 12.2.7 | 2 days (48 h) Humidity Test for IPx0 controls | 48 h | P |
| | 7 days (168 h) Humidity Test for other controls | | |
| 12.2.8 | Relative humidity (%): 91-95% .....: | 93%RH | P |
| | Temperature (°C): (20 - 30 ± 1) °C .....: | 30°C | P |
| 12.2.9 | Tests executed immediately after the humidity treatment (after the reassembly of detached parts) | | N/A |
| | - in-line, free-standing and independently mounted controls according to Insulation Resistance (13.1) | | N/A |
| | - Electric Strength (Clause 13.2) | | N/A |
| | - integrated and incorporated controls according to Electric Strength (Clause 13.2) | Incorporated controls | P |
| 12.3 | Leakage current test for in-line cord and free -standing controls | | N/A |
| 12.3.1 | Supply voltage; 1.06 Vr (V) .....: | | N/A |
| | Max. rated current (A) .....: | | N/A |
| | Max. declared ambient temperature, °C.....: | | N/A |
| 12.3.2 | Leakage current measured between live and accessible parts | | N/A |
| 12.3.3 | Measuring circuits used: figure number.....: | | N/A |
| 12.3.4 | During measurement all control circuits closed except controls tested to Figs. 26, 29 and 30 checked with switch S1 in the open and closed position | | N/A |
| 12.3.5 | Impedance of measuring circuits (Ω).....: | | N/A |
| | Time constant (μs).....: | | N/A |
| 12.3.6 | Error and accuracy of measuring circuit ≤5% .....: | | N/A |
| 12.3.7 | Max. leakage current | | N/A |
| 12.101 | Refrigeration controls | | N/A |
| 12.101.1 | Tests according to 12.101.2 up to 12.101.6: | | N/A |
| 12.101.2 | Controls using potting compound, softening test | | N/A |
| | Two samples stored 16h at max. operating temperature plus 15°C in climatic cabinet | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Potting material not unduly soften distort, crack or deteriorate | | N/A |
| 12.101.3 | Heating-freezing cycle test | | N/A |
| | The two samples of 12.101.2 plus one untested sample placed in water 90°C±5°C, 2h; temperature [°C] .....: | | N/A |
| | Then transferred to water below 5°C, and afterwards stored for 2h in a climatic cabinet at -35°C; temperature of the water [°C]; temperature of the climatic cabinet [°C].....: | | N/A |
| | 10 cycles executed: | | N/A |
| | In Canada and USA: defrost controls cycles one time | | N/A |
| 12.101.4 | Consecutive heating-freezing cycles | | N/A |
| | Two cycles in one working day | | N/A |
| | Ten cycles in five working days | | N/A |
| | Storage of the samples between the cycles, over the night in water at room temperature | | N/A |
| 12.101.5 | After the last freezing period | | N/A |
| | Samples thawed in water at room temperature | | N/A |
| | Insulation resistance was measured | | N/A |
| | Current carrying parts – grounded parts; required; measured..... : | | N/A |
| | Current carrying parts – surface of potting material and/ or insulation material; required; measured.....: | | N/A |
| 12.101.6 | Samples still moist | | N/A |
| | Electric strength test (2 x Vr + 1000V) | | N/A |
| | Current carrying parts – grounded parts; required; measured | | N/A |
| | Current carrying parts – surface of potting material and/ or insulation material; required; measured | | N/A |
| | -no flashover or breakdown occurs | | N/A |

| | | | |
|---|---|---|---|
| 13 | ELECTRIC STRENGTH AND INSULATION RESISTANCE | | P |
| 13.1 | Insulation resistance of in-line cord, free-standing and independently mounted controls | | N/A |
| 13.1.2 | Reinforced or supplementary insulation measured to non-metal parts covered with metal foil | | N/A |
| 13.1.3 | Test voltage applied (V dc) .....: | | N/A |
| 13.1.4 | Insulation resistance measured | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - basic insulation ≥ 2 MΩ.....: | | N/A |
| | - supplementary insulation ≥ 5 MΩ.....: | | N/A |
| | - reinforced insulation ≥ 7 MΩ.....: | | N/A |
| 13.2 | Electric Strength Test | | P |
| 13.2.2 | Insulating surfaces covered with metal foil | | P |
| 13.2.3 | 50 or 60 Hz test voltage applied for 1 min. .....: | 50Hz | P |
| | for USA and Canada: independently mounted room thermostats for direct control of an electric space-heating equipment with resistance load | | N/A |
| 13.3 | Leakage current of in-line cord and free-standing controls after the tests of 13.1 or 13.2 | | N/A |
| | Test voltage (V) .....: | | N/A |
| 13.3.3 | Leakage current measured | | N/A |
| 14 | HEATING (KSD1 180℃/160℃ 16A250V～) | | P |
| 14.1.2 | Temperatures recorded during Heating Test did not exceed the values in Table 13 | | P |
| 14.2 | Terminals fitted with external conductors of the intermediate cross-sectional area (mm²).....: | | N/A |
| 14.2.1 | Attachment method M, Y or Z: cords as declared or supplied (mm²) .....: | | N/A |
| 14.2.2 | Terminals for flexible and fixed conductors: appropriate flexible cord (mm²).....: | | N/A |
| 14.2.3 | Terminals not for external conductors: conductors of minimum cross-sectional area or as declared in 7.2 (mm²).....: | 1.5 mm² | P |
| 14.3 | In-line cord controls tested on a dull, black painted plywood | | N/A |
| 14.3.1 | Independently mounted controls tested as in normal use | | N/A |
| 14.4 | Electrical conditions: | | P |
| | - voltage (V): most unfavourable value between 0.94 and 1.06 times UR.....: | | P |
| | - voltage (V) if circuit not voltage sensitive: min. 10% of UR .....: | 50V | P |
| | - current (A): most unfavourable value between 0.94 and 1.06 times I R .....: | 16.96A | P |
| 14.4.1 | For circuits and contacts other than for external loads, load(s) as specified by the manufacturer: voltage (V); current (A) .....: | 250V; 16A (max.) | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 14.4.2 | Actuating members placed in most unfavourable position | | N/A |
| 14.4.3 | Contacts initially closed at rated current and rated voltage | | P |
| 14.4.3.1 | Temperature sensing controls: | | P |
| | - temperature of sensing element is raised or lowered (5 ± 1)°C from operating temperature such that contacts are then in closed position | lowered 10 ℃ | P |
| | - operating temperature (°C) .....: | 168.8°C | P |
| | - temperature for heating test (°C) .....: | 158.8°C | P |
| | If the whole control is declared as the sensing element: heating test conducted under conditions of 14.4.3.1 and 14.5.1 | | P |
| | If all contacts are open under 14.4.3.1 conditions parts are considered to have reached the higher of $T_{max}$ or temperature determined under 14.5.1 (°C) : | | N/A |
| 14.4.3.1 | For a voltage maintained thermal cut-out, the heating test of 14.4.3.1 completed | | N/A |
| | After heating, the temperature of the sensing element was raised until the contacts open | | N/A |
| | At this time, the ambient temperature surrounding the sensing element was reduced to *T*max.1 in time, *t*1, at a uniform rate | | N/A |
| | The test of 14.5.1 was then completed | | N/A |
| 14.4.3.2 | For controls other than temperature sensing, sensing element maintained as near to the point of opening as practical | | N/A |
| 14.4.3.4 | The most arduous operating sequence or segment selected for other automatic controls | | N/A |
| 14.5.1 | Temperature of the switch head between $T_{max}$ and ($T_{max}$+ 5)°C, or $T_{max}$ and 1.05 times $T_{max}$ (whichever is greater) (°C) .....: | 158.8°C | P |
| | Mounting surface of the switch head maintained between $Ts_{max}$ and ($Ts_{max}$+ 5)°C, or between $Ts_{max}$ and 1.05 times $Ts_{max}$ (whichever is greater) (°C) ..: | 158.8°C | P |
| 14.5.2 | In-line cord controls, independently mounted controls and parts of these controls accessible when control is mounted, tested at room temperature between 15° and 30° C (measured temperature corrected to a 25°C reference value); measured temperature (°C) .....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 14.101 | Controls classified under 6.7.101 to 6.7.103 inclusive (cooking appliance, self-cleaning, food handling) | | N/A |
| 14.101.1 | Test of 17.16.101 may be conducted after the conditioning of 14.102 and 14.102.1, if temperature of insulating parts exceeds the permitted (this is a mean to comply with note 12): | | N/A |
| 14.102 | An untested sample is conditioned for 1000h in an oven | | N/A |
| | temperature; required [°C]; measured [°C].....: | | N/A |
| | control was not energized | | N/A |
| 14.102.1 | If the elevated temperature was localized, such or near a terminal, the 1000h conditioning is conducted between $T_{max}$ and $T_{max}$+5% for normal conditions | | N/A |
| | - Contacts closed, non-cycling | | N/A |
| | - Bi-metallic heaters energized with the corresponding current | | N/A |
| 15 | MANUFACTURING DEVIATION AND DRIFT | | P |
| 15.1 | Adequate consistency of declared operating value etc. required for parts of controls providing Type 2 actions | | P |
| | Deviation and drift acc. to annex AA unless otherwise declared by manufacturer : | | N/A |
| 15.2 | Measurement of deviation and drift | | P |
| 15.4 | Addition: manufacturers deviation and drift may be expressed separately as tolerance value to the declared operating value | | P |
| 15.5.3.101 | Setting by the user set at the maximum operating temperature; temperature [°C] .....: | | N/A |
| | Otherwise declared; temperature [°C] .....: | | N/A |
| 15.5.3.102 | Portion of control (bi-metallic or similar) exposed to a controlled ambient temperature | | P |
| | Placed in a circulating oven (to determine the operating value) | | P |
| 15.5.3.103 | Bi-metallic and similar type of controls | | P |
| | Temperature determined by a 0.25mm thermo-couple on an identical control not electrically connected, adjacent to the control under test | | P |
| 15.5.3.104 | Fluid expansion control | | N/A |
| | 0.25mm (max) thermocouple attached to the sensing portion | | N/A |
| 15.5.3.105 | Fluid expansion or contraction type controls | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Sensing part (intended use ore as declared) placed in a circulating air oven or in a liquid bath | | N/A |
| 15.5.3.106 | Temperature of the oven rapidly increased or decreased to 10K below/ above expected operation temperature; temperature [°C] .....: | 180°C | P |
| | Condition of equilibrium achieved | | P |
| | Rate of temperature change reduced to max. 0.5K/min or as declared; degree of change [K/min]: | | P |
| 15.5.3.107 | Operation sensed by a suitable device: | | P |
| | Current max. 0.05A; current [A] .....: | 0.03A | — |
| | Voltage; voltage [V] .....: | 5 V | — |
| 15.5.3.108 | Operating values recorded, see attached sheet; sheet no. .....: | | P |
| 15.5.3.109 | Single operation devices, satisfactory disconnection: | | N/A |
| | Voltage, table 13.2 applies; voltage [V] .....: | | N/A |
| 15.5.4 & 5 | Not applicable | | N/A |
| 15.5.6 | Addition: alternatively: manufacturing deviation according to Annex AA: | | N/A |
| 16 | ENVIRONMENTAL STRESS | | P |
| | Not applicable to bimetallic single-operation devices | | N/A |
| 16.1 | Control can withstand the level of stress likely to occur in transportation and storage | | P |
| 16.2 | Environmental stress of temperature | | P |
| | Entire control (not energized) maintained for 24h at a temperature of ( -10 ± 2) °C or as declared.....: | -10℃; 24 h | P |
| | Entire control (not energized) maintained for 4h at a temperature of (60 ± 5) °C or as declared.....: | 60℃; 4h | P |
| | Control capable of being actuated at room temperature to provide disconnection as declared (without dismantling) | | N/A |
| 17. | ENDURANCE (KSD1 180℃/160 ℃ 16A250V～) | | P |
| 17.2 | Electrical conditions for the tests | | P |
| | Type of circuit | Resistive load | P |
| | Rated voltage (V) ; test voltage (V) .....: | 250 V | P |
| | Rated current (A) ; test current (A) .....: | 16 A(max.) | P |
| | Rated frequency (Hz) .....: | 50 Hz | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 17.3 | Thermal conditions for the tests | | P |
| | Accessible parts: tested at room temperature (°C) : | | N/A |
| | Mounting surface temperature: Ts $_{max}$ (°C).....: | ＞180 °C | P |
| | Remainder of switch head, temperature: $T_{max}$(°C) .: | ＞180 °C | P |
| | If $T_{min}$ is less than 0°C; switch head maintained at $T_{min}$ (°C) .....: | | N/A |
| 17.3.1 | Whole control declared as sensing element and $T_{min}$ less than 0°C, tests of 17.8 conducted at $T_{min}$ and 5% of cycles declared in Table 7.2, Item 27 | | N/A |
| | Operating Temperature, (°C) .....: | | — |
| | Number of cycles.....: | | — |
| 17.4 | Manual and mechanical conditions for the tests | | P |
| 17.4.2 | Slow speed test | | N/A |
| | Accelerated speed test | | P |
| 17.4.4 | Controls with limited movement of the actuating member | | N/A |
| | Dwell period at each reversal of direction (s) .....: | | N/A |
| | Applied torque ( rotary controls ) (Nm) .....: | | N/A |
| | Applied force ( non-rotary controls ) (N) .....: | | N/A |
| | Controls with rotary actuation, movement not limited in either direction: | | N/A |
| | - 3/4 of cycles clockwise (number of cycles) .....: | | N/A |
| | - 1/4 of cycles anti-clockwise (number of cycles) ...: | | N/A |
| | Controls with rotary actuation, designed for actuation in one direction only tested in designed direction | | N/A |
| 17.4.5 | Additional lubrication not applied during tests | | N/A |
| 17.5 | Dielectric Strength Test | | P |
| 17.6 | Ageing test for controls of 1M or 2M action | | N/A |
| | - sensing element maintained at activating quantity as determined in 14 | | N/A |
| | - other parts maintained as specified in 17.3 | | N/A |
| | - electrically loaded as specified in 17.2 for breaking conditions | | N/A |
| | - voltage (V) .....: | | N/A |
| | - current ( A ).....: | | N/A |
| | - duration (h): .....: | | N/A |
| 17.7 | Over-voltage test of automatic action at accelerated rate | | P |
| 17.7.1 | Electrical conditions: specified in 17.2 | 287.5V; 16A; cos$\Phi$=0.95 | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 17.7.2 | Thermal conditions: specified in 17.3 | | P |
| 17.7.3 | Method and rate of operation | | P |
| | Control Type 1 action | | N/A |
| | Method of operation.....: | | N/A |
| | Rate of operation .....: | | N/A |
| | Control Type 2 action: | | P |
| | Method of operation.....: | Automatic disconnection of sensing element heating; Automatic reset after cooling in cold air | P |
| | Rate of operation .....: | 2 cycles/min | P |
| | Type 2 controls are tested at the most unfavourable operating value declared in Table 1, Item 48 | | P |
| 17.7.4 | Type 2 sensing action: overshoot at each operation between values stated in 7.2 | | P |
| 17.7.6 | Number of automatic cycles: the smaller of 1/10 of number declared in 7.2, or 200; (number of cycles). : | 200 cycles | P |
| 17.7.7 | Actuating members placed in the most unfavourable position during test | | N/A |
| 17.8 | Test of automatic action at accelerated rate | | P |
| | Temperature required in 17.3 applied for the last 50% of each test | | P |
| 17.8.1 | Electrical conditions: specified in 17.2 | 250V; 16A; cos$\Phi$=0.95 | P |
| 17.8.2 | Thermal conditions: specified in 17.3 | | P |
| 17.8.3 | Method and rate of operation: specified in 17.7.3 | | P |
| 17.8.4 | Number of automatic cycles: | | P |
| | - number declared in 7.2 .....: | 10 000 cycles | P |
| | - number of cycles in 17.8 .....: | 9 800 cycles | P |
| 17.8.4.1 | For slow-make, slow-break automatic actions, number of automatic cycles: (75% of cycles in Clause 17.8.4) .....: | | N/A |
| 17.8.4.101 | Independently mounted and in-line cord controls, number of automatic cycles as indicated in CC.1 (For Canada, USA see CC.2); number of cycles : | | N/A |
| | Higher number declared; number .....: | | — |
| | Test voltage ($V_R$)(V).....: | | — |
| | Test current making (A, cos$\varphi$, ms).....: | | — |
| | Test current breaking(A, cos$\varphi$, ms) .....: | | — |
| | Number of cycles (no) .....: | | — |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 17.9 | Test of automatic action at slow rate | | N/A |
| 17.9.1 | Number of automatic cycles: 25% remainder (17.8.4).....: | | N/A |
| 17.9.2 | Electrical conditions: specified in 17.2 | | N/A |
| | Thermal conditions: specified in 17.3 | | N/A |
| 17.9.3 | Method of operation and monitoring | | N/A |
| | - imposing change of value of activating quantity on sensing element (rate of change of activating quantity as declared in 7.2) | | N/A |
| | - by the prime mover | | N/A |
| | Sensing controls: overshoot between values of 7.2 | | N/A |
| 17.9.4 | Controls of which only the make or break is slow automatic action: rest of actions accelerated by agreement between testing authority and manufacturer | | N/A |
| 17.10 | Overvoltage (overload) test of manual action at accelerated speed | | N/A |
| 17.10.1 | Electrical conditions: specified in 17.2 | | N/A |
| 17.10.2 | Thermal conditions: specified in 17.3 | | N/A |
| 17.10.3 | Method of operation: specified in 17.4 for accelerated speed | | N/A |
| | Number of cycles: the smaller of 1/10 of number declared or 100 (see 7.2) .....: | | N/A |
| | Sensing elements maintained at suitable values of activating quantity or prime movers positioned that actuation causes operation | | N/A |
| 17.11 | Test of manual action at slow speed | | N/A |
| 17.11.1 | Electrical conditions: specified in 17.2 | | N/A |
| 17.11.2 | Thermal conditions: specified in 17.3 | | N/A |
| 17.11.3 | Method of operation: specified in 17.4 for slow speed | | N/A |
| 17.11.4 | Number of cycles: 1/10 of declared number or 100 (see 7.2).....: | | N/A |
| | Actuating causes operation | | N/A |
| 17.12 | Test of manual action at high speed (applied only to actions which have more than one pole and where polarity reversal occurs during the action) | | N/A |
| | - number of poles.....: | | N/A |
| | - polarity reversal occurs during action | | N/A |
| 17.12.1 | Electrical conditions: specified in 17.2 | | N/A |
| 17.12.2 | Thermal conditions: specified in 17.3 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 17.12.3 | Method of operation: specified in 17.4 for high speed | | N/A |
| 17.12.4 | Number of cycles: 100.....: | | N/A |
| | Sensing elements maintained at suitable value of activating quantity | | N/A |
| | Prime movers so positioned to ensure actuating causes appropriate operation | | N/A |
| 17.13 | Test of manual action at accelerated speed | | N/A |
| 17.13.1 | Electrical conditions: specified in 17.2 | | N/A |
| 17.13.2 | Thermal conditions: specified in 17.3 | | N/A |
| 17.13.3 | Method of operation: specified in 17.4 for accelerated speed | | N/A |
| 17.13.4 | Number of cycles: number declared in 7.2, item 26 less number made during tests of 17.10, 17.11 and 17.12; total number.....: | | N/A |
| 17.14 | Evaluation of compliance | | P |
| | Actions function in the intended and declared manner: | | P |
| | - automatically | | P |
| | - manually | | N/A |
| | The following requirements are still met: | | N/A |
| | - Cl. 14, heating: terminals for external conductors: measured (°C) .....: | | N/A |
| | - Cl. 14, heating: other terminals: measured (°C)...: | 178.6°C | P |
| | - Cl. 14, heating: current-carrying parts: measured (°C).....: | | N/A |
| | - Cl. 14, heating: supporting surfaces: measured (°C) .....: | | N/A |
| | - Cl. 8, protection against electric shock | | N/A |
| | - 17.5, electric strength (without previous humidity treatment, test voltage 75% of values 13.2) | | P |
| | - Cl. 20, distances and clearances | | P |
| | - for tests 17.5 and 20, if special samples were submitted for Cl. 13: tested at appropriate condition to ensure contacts are open | | P |
| | - requirements of Cl. 15 for type 2 actions still met | | P |
| | - manual actions: declared circuit disconnection can be obtained | | N/A |
| | No evidence that any transient fault has occurred between live parts and: | | P |
| | - earthed metal parts | (Shell) | P |
| | - accessible metal parts | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - actuating members | | N/A |
| 17.15 | Single operation devices | | N/A |
| 17.15.1 | Bi-metallic single operation devices subjected to additional tests | | N/A |
| 17.15.1.1 | 6 samples (after appropriate test clause 15): maintained 7h at –35°C or 0°C (as declared in table 7.2, requirement 103) | | N/A |
| | No reset, test acc. to 15.5.3.109 | | N/A |
| 17.15.1.2 | 6 untested Bi-metallic SOD's conditioned 720h at the lower temp. of either: | | N/A |
| | 90 % of the declared operating value ±1 K, or | | N/A |
| | (7 ± 1) K below the declared operating value. | | N/A |
| 17.15.1.2.1 | Devices do not operate (detected acc. 15.5.3.107): | | N/A |
| 17.15.1.2.2 | The appropriate tests of cl. 15 repeated on the six samples subjected to conditioning of 17.15.1.2, and | | N/A |
| | The temperature measured is within the declared deviation limits (results see attached sheet no.) .... : | | N/A |
| 17.15.1.3 | For bi-metallic SOD's | | N/A |
| | - with a declared reset temperature of -35 °C | | N/A |
| | 6 untested samples subjected to an over-voltage test for one cycle under the electrical conditions of table 17.2-1 or table 17.2-2, as appropriate | | N/A |
| | Overload test in Canada, China, and the USA | | N/A |
| 17.15.1.3.1 | For bi-metallic SOD's with a declared reset temperature of 0 °C | | N/A |
| | 1 sample subjected to an over-voltage test of 50 cycles under the electrical conditions of table 17.2-1 or table 17.2-2, as appropriate; voltage [V]; current [A]; cos θ, number of executed cycles .....: | | N/A |
| | overload test in Canada, China, and the USA ; voltage [V]; current [A]; cos ϕ, number of executed cycles .....: | | N/A |
| 17.15.2 | Non-bimetallic SODs | | N/A |
| 17.15.2.1 | Automatic temperature sensing functions other than the non-bitallic portion of the control comply with 7.16.101, 17.16.103 and 17.16.104, respectively | | N/A |
| 17.15.2.2 | Six samples conditions to either 750 h or the specified number of cycles divided by 4 .....: | | N/A |
| | Temperature declared in Table 7.2, °C.....: | | N/A |
| | SOD did not operate during aging period | | N/A |
| 17.15.2.3 | Test of Clause 15 conducted on six untested samples and six samples subjected to conditioning of 17.15.2.2 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Temperatures within declared deviation limits, $^{o}$C ..: | | N/A |
| | Electrical conditions, $V_{Rmax}$ and $I_{Rmax}$ .....: | | N/A |
| | Sensing element held at declared reset temperature, SOD held at temperature declared in Table 7.2, $^{o}$C .....: | | N/A |
| | Test continued 7h without resetting | | N/A |
| | All samples subjected to tests of Clause 13 at temperature limits declared in Table 7.2, req 36. | | N/A |
| 17.16 | Tests for particular purpose controls, additional sub-clauses | | N/A |
| 17.16.101 | Thermostats | | N/A |
| | 17.1 to 17.5 applicable | | N/A |
| | 17.6 applicable to actions type 1.M or 2.M, value "X": the greater of 5K ± 1K or ±5% of the original activating quantity.....: | | N/A |
| | 17.7 and 17.8 are applicable | | N/A |
| | 17.9 applicable to slow make and break automatic action | | N/A |
| | 17.9.3.1 not applicable | | N/A |
| | 17.10 to 17.13 applicable to thermostats with manual action and means for setting by the user. | | N/A |
| | 17.14 is applicable | | N/A |
| | 17.15 is not applicable | | N/A |
| 17.16.102 | For Canada and USA: independently mounted room thermostats for direct control of an electric space-heating equipment with resistance load | | N/A |
| 17.16.102.1 | Over-current test for 50cycles, 6 cycles/min sample 1 and 2 | | N/A |
| | Operating values acc. tab. 17.2-2 IEC 60730-1 .....: | | N/A |
| 17.16.102.2 | Endurance test for 6000cycles, 1 cycle/min sample 1 and 2 | | N/A |
| | Operating values 110% x In, 110% x Un<br>ON-time 50%±20 | | N/A |
| 17.16.102.3 | Endurance test for additional 30000cycles,<br>1 cycle/min sample 1 | | N/A |
| | Operating values In, Un, ON-time 50%±20 .....: | | N/A |
| 17.16.103 | Temperature limiters | | N/A |
| | 17.1 to 17.5 is applicable: | | N/A |
| | 17.6 is applicable to actions type 1.M or 2.M, value "X": the greater of 5K ± 1K or ±5% of the original activating quantity.....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 17.7 and 17.8 are applicable, except if reset operation is obtained by actuation | | N/A |
| | Actuation: 17.4 (for accelerated speed) as permitted by mechanism or declared, table 7.2, requirement 37. | | N/A |
| | 17.9 applicable to slow make and break automatic action | | N/A |
| | 17.9.3.1 not applicable | | N/A |
| | 17.10 to 17.13 not applicable to normal reset manual action (tested according to 17.7 to 17.9) applicable if other manual actions not tested during automatic tests | | N/A |
| | 17.14 is applicable | | N/A |
| | 17.15 is not applicable | | N/A |
| 17.16.104 | Thermal cut-outs: | | P |
| | 17.1 to 17.5 applicable | | P |
| | 17.6 applicable to actions type 1.M or 2.M, value “X“: the greater of 5K ± 1K or ±5% of the original activating quantity | | N/A |
| | 17.7 and 17.8 are applicable, except if reset operation is obtained by actuation | | P |
| | Actuation: 17.4 (for accelerated speed) as permitted by mechanism or declared, table 7.2, req. 37 | | N/A |
| | 17.9 applicable to slow make and break automatic action, for manual reset: conditions specified for 17.7 and 17.8 being used | | N/A |
| | 17.9.3.1 not applicable | | N/A |
| | 17.10 to 17.13 not applicable to normal reset manual action (tested according to 17.7 to 17.9) applicable if other manual actions not tested during automatic tests | | N/A |
| | 17.14 is applicable | | P |
| | 17.15 is not applicable | | N/A |
| 17.16.104.1 | For voltage maintained thermal cut-outs, the test of 17.16.108 is applicable | | N/A |
| 17.16.105 | USA and Canada: controls with two or more electrical ratings | | N/A |
| | Rating 1: type of load; voltage; current cycles (not less than 25% of declared cycles) | | N/A |
| | Rating 2: type of load; voltage; current cycles (not less than 25% of declared cycles) | | N/A |
| 17.16.106 | Evaluation of materials | | N/A |
| | Tests are conducted as indicated in 14.101.1 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | -Test of 17.7: 50 operations | | N/A |
| | -Test of 17.8: 1000 operations | | N/A |
| | -Conducted at ambient temperature of 20°C ± 5°C | | N/A |
| | After the test, control complies with clause 17.5 | | N/A |
| 17.16.107 | Over-temperature test of sensing element | | N/A |
| | Controls declared under req. 105 of table 7.2, the sensing element portion of a previously untested sample is exposed to 250 thermal cycles | | N/A |
| | Ambient temperature; temperature [°C].....: | | N/A |
| | Rate of temperature change; rate [K/min] .....: | | N/A |
| | Temperature extremes are maintained for 30min ...: | | N/A |
| | After the test control complies with clause 17.14 | | N/A |
| 17.16.108 | Voltage maintained thermal cut-out:<br>These requirements apply to a voltage maintained thermal cut-out | | N/A |
| | - in the operated condition with the voltage across it | | N/A |
| | 6 untested voltage maintained thermal cut-outs are conditioned for 7 h at a temperature of –20 °C (or lower, if declared); temperature [°C] .....: | | N/A |
| | Operation of the voltage maintained thermal cut-outs detected as indicated in 15.5.3.107. | | N/A |
| | During and at the conclusion of the conditioning, none operated. | | N/A |
| 17.101 | thermal cycling test for temperature sensing controls type 2.P actions, tests | | N/A |
| 17.101.1 | After the tests according to clause 17.6 and the evaluation after 17.14 the control subjected to a thermal cycling test 50,000 cycles | | N/A |
| | Temperature between 50% and 90% in 17.4 recorded cut-off temperature; temperature [°C] .....: | | N/A |
| | Switch-head is held at ambient temperature | | N/A |
| | Manufacturers declaration | | N/A |
| | Test procedures as declared in tab. 7.2 req. 112 | | N/A |
| 17.101.2 | Two bath method | | N/A |
| | Baths filled with synthetic oil, water or air .....: | | N/A |
| | -first bath, 90% of switch-off temperature (measured acc. to clause 17.4); temperature [°C] .....: | | N/A |
| | -second bath 50% of switch-off temperature (measured acc. to clause 17.4); temperature [°C] : | | N/A |
| | -sensing element alternatively immersion of at least 5 x time-constant, number of cycles: 50’000; time-constant [s].....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 17.101.3 | Thermal cycling method | | N/A |
| | Water cooled bath containing synthetic oil | | N/A |
| | Cylindrical aluminium box immersed in the bath, containing the two temperature sensing elements | | N/A |
| | Cylindrical aluminium box is heated by resistive wire | | N/A |
| | Temperature is controlled by a second identical sample | | N/A |
| | -if not otherwise declared (req. 37 acc. to table 7.2), degree of temperature change is 35 ± 10K/min .....: | | N/A |
| | Number of temperature cycles: 50,000 | | N/A |
| 17.101.4 | After this test the control is subjected additional 20 temperature cycles .....: | | N/A |
| | Temperature is risen to 1.1 x switch-off temperature; temperature [°C] .....: | | N/A |
| | Manual reset means did not reset, other conditions acc. to clause 17.101.2 | | N/A |
| 17.101.5 | After the test, switch head is lubricated thoroughly | | N/A |
| | Measuring of operating temperature acc. to clause 15; temperature [°C] .....: | | N/A |
| | Control complies with the declared deviation and drift | | N/A |
| 18 | MECHANICAL STRENGTH | | N/A |
| 18.1.1 | Control constructed to withstand mechanical stress | | N/A |
| 18.1.2 | Actuating members of class I and class II controls or for class I and class II equipment: | | N/A |
| | - adequate mechanical strength, or | | N/A |
| | - protection against electric shock is maintained if actuating member is broken | | N/A |
| 18.1.3 | For integrated and incorporated controls impact resistance (18.2) to be tested by the equipment standard | | N/A |
| 18.1.4 | Tests of 18.2 to 18.8 carried out sequentially on one sample: | | N/A |
| | - tested sample: type reference .....: | | N/A |
| | - tested sample: identification No.....: | | N/A |
| 18.1.5 | Compliance (after the tests of Cl. 18) | | N/A |
| | - no damage to impair compliance with this standard, in particular | | N/A |
| | - Cl. 8, protection against electric shock | | N/A |
| | - Cl. 13, electric strength and insulation resistance | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - Cl. 20, creepage distance and clearances | | N/A |
| | - insulating linings, etc. have not worked loose | | N/A |
| | - detachable parts: removal and replacing still possible | | N/A |
| | - actuating to provide full- or micro-disconnection still possible | | N/A |
| | - supplementary or reinforced insulation tested to clause 13 | | N/A |
| 18.1.6 | In USA and Canada, mechanical strength requirements for threaded entries. | | N/A |
| 18.2 | Impact resistance | | N/A |
| 18.2.1 - 18.2.6 | In-line cord controls, free-standing and independently mounted controls: test by means of impact test apparatus IEC 60068-2-75 | | N/A |
| 18.4 | Alternate compliance - Impact resistance (see tab 18.4.1DV or 18.4.2DV) | | N/A |
| | Enclosure material.....: | | N/A |
| | - with supporting frame (yes / no) .....: | | N/A |
| | - maximum with, maximum length .....: | | N/A |
| | - thickness required; measured.....: | | N/A |
| 18.5 | Free standing controls | | N/A |
| 18.5.1 | Additional tests of 18.5.2 and 18.5.3 required (test apparatus Fig. 4) | | N/A |
| 18.5.2 | Input terminals: 2 m of flexible, lightest cord (used in 10.1.4); cord; cross-sectional area (mm²).....: | | N/A |
| | Output terminals: 2 m of flexible, lightest cord (if intended); cord; cross-sectional area (mm²).....: | | N/A |
| | Pull and fall test (3 times) | | N/A |
| | - pull (N), increasing value, applied on the cord (Table 9).....: | | N/A |
| | - sample falls onto the base, height 0.500 m (Fig. 4) | | N/A |
| 18.6 | In-line cord controls | | N/A |
| 18.6.1 | Additional test in a tumbling barrel required (Fig. 5) | | N/A |
| 18.6.2 | Cords | | N/A |
| | - attachment method X: flexible cord(s), smallest cross-section (Cl. 10.1.4) (mm²), length approx. 50 mm.....: | | N/A |
| | - attachment M, Y or Z: cord(s) as declared or supplied, length 50 mm; cord; cross-sectional area (mm²).....: | | N/A |
| 18.6.3 | Tumbling barrel | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - mass of sample (g) ; number of falls .....: | | N/A |
| 18.6.4 | If mass > 200 g: sample tested to clause 18.5 | | N/A |
| 18.6.6 | Connection of flexible cord(s) after test | | N/A |
| 18.7 | Pull-cord actuated controls | | N/A |
| 18.7.2 | Control mounted as declared: forces applied to the pull-cord, each 1 min | | N/A |
| 18.7.3 | - rated current (A) .....: | | N/A |
| | - force in normal direction (N).....: | | N/A |
| | - force in most unfavourable direction (N) .....: | | N/A |
| 18.7.4 | No damage to the control after the tests, compliant to clauses 8, 13 and 20 | | N/A |
| 18.8 | Foot-actuated controls | | N/A |
| 18.8.2 | Control subjected to a force (increased from 250 N to 750 N and maintained for 1 min) by steel pressure plate .....: | | N/A |
| 18.8.3 | Force applied three times to control (fitted with cords) placed in different, most unfavourable positions | | N/A |
| 18.8.4 | No damage to the control after the tests, compliant to clauses 8, 13 and 20 | | N/A |
| 18.9 | Actuating member and actuating means | | N/A |
| 18.9.1 | Controls supplied (or intended to be fitted) with actuating members, tests: | | N/A |
| | - axial pull force (N) .....: | | N/A |
| | - axial push force of 30 N applied for (min) .....: | | N/A |
| 18.9.2 | Controls submitted without actuating member: pull and push of 30 N applied to the actuating means | | N/A |
| 18.9.3 | During and after the tests, control showed no damaged nor movement of the actuating members. | | N/A |
| 18.101 | Push- and turn or pull and turn actuation | | N/A |
| 18.101.1 | Controls with actions classified as type 1.X or 2.X or type 1.Z or 2.Z subjected to the tests of 18.101.2 and 18.101.3 | | N/A |
| 18.101.2 | The axial force to push or pull the actuating member not less than 10 N.....: | | N/A |
| | Axial push or pull force of 140N did not affect compliance with clause 18.1.5 | | N/A |
| | Control intended to use with special knob withstood without damage or effect on control function a torque of 4Nm | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Alternatively, if the means preventing rotation of the shaft is defeated when a torque of at least 2 Nm is applied, the effect was such that either the means wasn't damaged but overridden to close the contacts, in which case subsequent actuation at a torque less than 2Nm require both push- and turn or pull and turn to operate the contacts, or | | N/A |
| | No operation of the contacts occurred nor could 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, was not greater than 0,5 Nm | | N/A |
| | A torque of 6 Nm applied to the setting means. Any breakage or damage to the means preventing rotation of the shaft didn't 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 Type 1.X or 2.X or Type 1.Z or 2.Z actions are actuated for the declared number of manual actions | | N/A |
| | After the test, control comply with requirements of clause 18.101.1 | | N/A |
| | For the case in which the means preventing rotation is not damaged but is overridden to operate the contacts, the first 1/16th of the declared manual cycles performed without first pushing or pulling the actuating member | | N/A |
| 18.102 | Parts containing liquid metal | | N/A |
| 18.102.1 | Controls containing liquid metal withstood for 1min 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 was be agreed between manufacturer and the testing authority .....: | | N/A |
| 18.102.1.2 | After the test of 18.102.1, the hydraulic pressure was increased until rupture occurs | | N/A |
| | The rupture occurred at the bellows or diaphragm or other part, that is within the switch head or control enclosure | | N/A |
| 18.102.2 | The control did not leak or rupture when heated to 1.2 times the maximum temperature of the sensing element | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 18.102.3 | When the bellows or diaphragm of a separate sample is deliberately punctured with a sharp, pointed metal rod, liquid metal was contained in the switch head or control enclosure | | N/A |
| 19 | THREADED PARTS AND CONNECTIONS | | P |
| 19.1 | Threaded parts to be moved during mounting or servicing | | N/A |
| 19.1.2 | Threaded parts: easily replaceable if completely removed; excluded: constructions restricting complete removal | | N/A |
| 19.1.3 | Thread: | | N/A |
| | - metric ISO thread or thread of equivalent effectiveness | | N/A |
| | - for other than ISO, BA, SI or Unified thread: torque values increased by 20% | | N/A |
| 19.1.4 | Screw generating a thread | | N/A |
| | - thread forming (swaging) type screws | | N/A |
| | - thread cutting type screw not used | | N/A |
| 19.1.5 | Space threaded type screws: provided with means to prevent loosening | | N/A |
| 19.1.6 | Threaded parts of non-metallic material are not used if replacement by a dimensionally similar metal screw could impair compliance with Cl. 13 or 20: | | N/A |
| 19.1.7 | Threaded parts: not of soft material | | N/A |
| 19.1.8 | Screws operating in a non-metallic thread: correct introduction of the screw into its counterpart ensured | | N/A |
| 19.1.9 | In-line cord controls, threaded parts transmitting contact pressure: | | N/A |
| | - diameter < 3 mm: threaded part of metal | | N/A |
| | - diameter ≥ 3 mm: non-metallic allowed, but not used for electrical connection | | N/A |
| 19.1.11 | Threaded parts tightened and loosened | | N/A |
| | - one of threaded parts non-metallic material: 10 times | | N/A |
| | - both parts of metallic material: 5 times | | N/A |
| 19.1.12 | Screws in thread of non-metallic material: completely removed and reinserted each time | | N/A |
| | Terminal screws and nuts: conductor fitted in the terminal (used in 10.1.4 or 10.2.10); cross-sectional area ($mm^2$) .....: | | N/A |
| 19.1.14 | Conductor moved each time the threaded part is loosened | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - no damage impairing the further use of the threaded part | | N/A |
| | - no breakage of screws | | N/A |
| | - no damage to the slot head or washers | | N/A |
| 19.1.15 | Torque test | | N/A |
| 19.2 | Current-carrying connections | | P |
| 19.2.1 | - Not disturbed by mounting or servicing capable of withstanding the stresses in normal use. | | P |
| 19.2.2 | - subjected to torsion in normal use locked against movement | | P |
| | - movement is limited | | N/A |
| 19.2.3 | Contact pressure | | P |
| | - not transmitted through non-metallic material, or | | P |
| | - sufficient resilience in the metallic part | | N/A |
| | Non-metallic material: suitability considered with respect to stability of dimension within temperatures applicable to the control; max. temperature (°C) ...: | | N/A |
| 19.2.4 | Space threaded screws | | N/A |
| | - screws clamp current-carrying parts directly in contact with each other | | N/A |
| | - provided with means of locking | | N/A |
| 19.2.4.1 | - used to provide earthing continuity; at least two screws used for each connection | | N/A |
| 19.2.5 | Thread cutting screws: screws produce a full-form standard machine screw thread | | N/A |
| 19.2.5.1 | Thread cutting screws used to provide earthing continuity; at least two screws used for each connection | | N/A |
| 19.2.6 | Current-carrying connection whose parts rely on pressure for correct function: resistant to corrosion (not inferior to that of brass) | | P |
| | If not plated, e.g. bimetallic blades: parts are clamped into contact with parts resistant to corrosion | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 20 | CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION | | P |
| | PCB:<br>coating conforming requirement of IEC 60664-3 | | N/A |
| | PCB: coating meets requirements of Clause 20.3 | | N/A |
| | PCB: No creepage and clearance applies to conductor under coating (see Annex Q) | | N/A |
| 20.1 | Clearances | | P |
| 20.1.1 | Basic Insulation - Case A applies except as permitted in Cl. 20.1.7 | | P |
| 20.1.2 | Operational Insulation - Case A applies except as permitted in Cl. 20.1.7 or | | N/A |
| | For electronic controls Cl. H27.1.3 met | | N/A |
| 20.1.3 | Methods of measurement: Annex B and Fig. 17 | | P |
| 20.1.3.1 | Controls with equipment inlet and/or socket-outlet with connector / plug inserted and without | | N/A |
| 20.1.3.2 | Controls with terminals for external conductors: without conductors and with conductors of largest cross-sectional area (mm²) (10.1.4).....: | | N/A |
| 20.1.3.3 | Controls with terminals for internal conductors: without conductors and with conductors for minimum cross-sectional area (mm²) (10.2.1).....: | 1.5 mm² | P |
| 20.1.4 | Distances through slots or openings of insulating material measured to metal foil in contact with the surface, foil pushed into corners with test finger | | N/A |
| 20.1.5 | Standard test finger applied to apertures as specified in 8.1: distances between live parts and metal foil not reduced below required values | | N/A |
| 20.1.6 | Force (standard test finger) to be applied in an endeavour to reduce distances: | | N/A |
| 20.1.6.1 | - 2 N force applied by standard test finger to any point on bare live parts accessible before control is mounted.....: | | N/A |
| | - 30 N force applied by standard test finger to accessible surfaces after control mounted .....: | | N/A |
| 20.1.7 | For basic and operational insulation, smaller distances permitted but no less than values specified in Case B of table 22, provided that: | | N/A |
| | - control meets the impulse test, Cl. 20.1.12 | | N/A |
| | - all parts are rigid and secure | | N/A |
| | - no likelihood of the distance being reduced | | N/A |
| | Impulse voltage applied across clearance of operational insulation | | N/A |
| 20.1.7.1 | For micro-disconnection and interruption: | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - clearance distance not specified | | P |
| | - other parts- not less than contact separation | | P |
| 20.1.7.2 | Full disconnection - case A applies to parts separated by switching element incl. contacts | | N/A |
| 20.1.8 | Clearances of supplementary insulation: not less than basic insulation, case A | | N/A |
| 20.1.9 | Clearances of reinforced insulation: next higher step for rated impulse voltage used | | N/A |
| 20.1.10 | Clearances of operational and basic insulation in controls supplied from a double insulated transformer | | N/A |
| | Clearances in controls supplied from a transformer without separate windings | | N/A |
| 20.1.11 | ELV circuits derived from supply using protective impedance, clearance of operational insulation determined from table 21 and based on max. working voltage in the ELV circuit | | N/A |
| 20.1.12 | Impulse voltage test, Cl. 4.1.1.2.1 of IEC 60664-1 applied between live parts and metal (V) .....: | | N/A |
| 20.1.13 | If the secondary winding of a transformer is earthed, (or an earthed screen between windings) clearances on the sec. side: basic insulation > limits in Table 22 but using the next lower step for rated impulse voltage | | N/A |
| | For circuits supplied with a voltage lower than rated voltage, clearances of functional insulation are based on the working voltage | | N/A |
| 20.2 | Creepage distances | | P |
| 20.2.1 | Creepage distances for basic insulation, per table 23 and based on material group and pollution degree: | | P |
| | - measurements | See the table | P |
| | - 2 N force applied by standard test finger to bare conductors .....: | | N/A |
| | - 30 N force applied to accessible surfaces applied by standard test finger.....: | | N/A |
| 20.2.2 | Creepage distance for operational insulation, per table 24 and based on material group and pollution degree | | N/A |
| | - measurements | See the table | N/A |
| | - 2 N force applied by standard test finger to bare conductors : | | N/A |
| | - 30 N force applied to accessible surfaces applied by standard test finger : | | N/A |
| 20.2.3 | Supplementary insulation: not less than basic | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 20.2.4 | Reinforced insulation: double the value of basic | | N/A |
| 20.3 | Solid Insulation | | P |
| | Solid insulation is capable of durably withstanding electrical and mechanical stresses as well as possible thermal and environmental influences | | P |
| 20.3.2 | For working voltages ≤ 300V, supplementary and reinforced insulation between metal parts | | N/A |
| | - minimum 0.7mm thick; measured (mm).....: | | N/A |
| 20.3.2.1 | Insulation is applied in thin sheet form, other than mica or similar scaly material | | N/A |
| | - the supplementary insulation consists of at least two layers and each layer complies with Cl. 13.2 for supplementary insulation | | N/A |
| | - the reinforced insulation consists of at least three layers and any two layers complies with Cl. 13.2 for reinforced insulation | | N/A |
| 20.3.2.2 | The supplementary insulation or reinforced insulation is inaccessible and meets one of the following: | | N/A |
| | - max. temperature measured per Cl. 27 and H.27 does not exceed permissible values in Table 13 | | N/A |
| | - conditioned insulation complies with Cl. 13.2 at the oven and room temperatures | | N/A |
| | For optocouplers, the conditioning procedure has to be carried out at a temperature of 25 K in excess of the max. temperature measured on the optocoupler during the tests of Clauses 14, 27 and H.27 .....: | | N/A |
| | The optocoupler is operated under the most unfavourable conditions which occur during these tests | | N/A |
| 21 | FIRE HAZARD TESTING | | P |
| | For Canada and USA see Annex D | | N/A |
| 21.1 | No requirements exist for small parts as defined in IEC 60695-2-11, Sub-clause 3.1 | | N/A |
| 21.2 | Integrated, incorporated and in-line cord controls | | P |
| 21.2.1 | Accessible parts (control correctly mounted) | | N/A |
| | - ball-pressure test 1 (G.5.1) conducted at temperature (°C).....: | | N/A |
| | diameter of the impression ≤ 2.0mm (mm).....: | | N/A |
| | - glow-wire test (G2.) at 550°C | | N/A |
| 21.2.2 | Parts retaining current-carrying parts in position (other than electrical connections): | | N/A |
| | - Ball-pressure test 2 (G.5.2) conducted at temperature (°C).....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - diameter of the impression ≤ 2.0mm (mm) .....: | | N/A |
| | - glow-wire test (G2.) at 550°C | | N/A |
| 21.2.3 | Parts maintaining or retaining electrical connections in position:<br>according to Annexes F and G | | P |
| | Glow-wire temperature levels according to IEC 60695-2-11 | | N/A |
| | - Ball-pressure test 2 conducted at temp. (°C) .....: | | N/A |
| | diameter of the impression ≤ 2.0mm (mm).....: | | N/A |
| | - glow-wire test (G2.) at 650°C | | N/A |
| | - Ball-pressure test 2 conducted at temp. (°C) .....: | | N/A |
| | diameter of the impression ≤ 2.0mm (mm) .....: | | N/A |
| | - glow-wire test (G2.) at 750 °C | | N/A |
| | - Ball-pressure test 2 conducted at temp. (°C) .....: | 220°C (Base) | P |
| | diameter of the impression ≤ 2.0mm (mm) .....: | 1.2 mm | P |
| | - glow-wire test (G2.) at 850°C | 850°C | P |
| | Clause 21.2.3 not applied to parts retaining in position current-carrying parts in low-power circuits as described in H.27.1.1.1 | | N/A |
| 21.2.4 | Other parts (except small parts unlikely to be ignited): | | N/A |
| | - glow-wire test (G2.) at 550°C | | N/A |
| 21.2.7 | Resistance to tracking | | P |
| | Test procedure see Annex G, Clause G4; applied voltage corresponding to the PTI value declared Table 1, item 30 | 175V | P |
| | Controls designed for operation at ELV levels are not subjected to a tracking test | | N/A |
| 21.3 | Independently-mounted controls | | N/A |
| 21.3.1 | Preconditioning | | N/A |
| | Controls without T rating | | N/A |
| | - circuit of switching part and driving mechanism not connected, detachable parts (covers) removed | | N/A |
| | - temperature (°C): (80 ± 2)°C, 1x24 h.....: | | N/A |
| | Controls with T rating up to 85°C: | | N/A |
| | - Switching circuit and driving mech.- not connected, without covers: temp. (°C): (80 ± 2)°C, 1x24 h.....: | | N/A |
| | - switching circuit and driving mech. Connected, with covers: temperature (°C): ($T_{max}$ ±2) K, 6x24 h.: | | N/A |
| | Controls with T rating higher than 85°C | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - switching circuit and driving mech. Connected, with covers: temp. (°C): ($T_{max}$ ±2) K, 6x24 h.....: | | N/A |
| 21.4 | Controls with mercury-tube switch, subjected to short-circuit test | | N/A |
| | - working voltage, ac/dc.....: | | — |
| | - maximum power rating (VA) .....: | | — |
| | - short-circuit current (A).....: | | — |
| | - fuse rating (A) .....: | | — |
| | - no ignition of cotton placed around openings | | N/A |
| | - no emission of flame or molten metal ( except mercury from the enclosure housing the switch) | | N/A |
| | - wiring not damaged except tube leads | | N/A |
| 22 | RESISTANCE TO CORROSION | | N/A |
| 22.1.1 | Ferrous parts protected against corrosion | No ferrous parts | N/A |
| 22.1.2 | Test not required on temperature sensing elements and other component parts adversely affected by protective treatment | | N/A |
| 22.1.4 | Control or parts stored in a humidity cabinet for 14 days | | N/A |
| | - temperature (°C): (40±2)°C.....: | | N/A |
| | - relative humidity (%): 93-97%.....: | | N/A |
| 22.1.5 | Control or parts dried in a heating cabinet: for 10 min | | N/A |
| | - Temperature (°C): (100 ± 5)°C .....: | | N/A |
| | After parts have been dried: no evidence of corrosion on surfaces. | | N/A |
| 23 | ELECTROMAGNETIC COMPATIBILITY (EMC) REQUIREMENTS - EMISSION | | N/A |
| 23.1 | Free standing and independently mounted controls which cycle under normal operation evaluated: | | N/A |
| | - to CISPR 14-1 with modifications and/or CISPR 22, class B or | | N/A |
| | - to clauses 23.1.1 and 23.1.2 | | N/A |
| | - to show minimum time between contact operations during normal operation < 10 minutes | | N/A |
| 23.1.1 | Electrical and thermal conditions for EMC test as specified in 17.2 and 17.3 | | N/A |
| | - for sensing controls: rate of change is $\alpha_1$ and $\beta_1$ | | N/A |
| | - For non-sensing controls: operated at the lowest contact operating speed. | | N/A |
| | - inductive loads – pf 0.6; resistive loads – pf 1 | | N/A |
| 23.1.2 | Control operated for 5 cycles | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - duration of radio interference; < 20ms.....: | | N/A |
| 23.2 | Controls for ISM (Industrial, Scientific and Medical) equipment, free-standing, independently mounted, and in-line cord controls for ISM equipment comply with the requirements of CISPR 11 | | N/A |
| 23.101 | Thermostats constructed so they do not generate radio interference for a time period exceeding 20 ms | | N/A |
| 23.101.1 | Three untested sample subjected to the test | | N/A |
| | Thermal and electrical conditions acc. to 17.2 and 17.3, except | | N/A |
| | Test conducted at the lowest declared voltage and lowest declared current (table 7.2, requirement 108) | | N/A |
| | The rate of temperature change are α1 and β1 | | N/A |
| | If not declared;<br>1 K/15 min for sensing elements in gases<br>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 | | N/A |
| | For controls declared for use with purely resistive loads, the power factor is 1.0 | | N/A |
| 23.101.2 | Test procedure | | N/A |
| | Five cycles of operation with the contacts opening and five cycles of operation with contacts closing | | N/A |
| | The duration of radio interference is measured by an oscilloscope connected to the control so as to measure the voltage drop across the contacts | | N/A |
| 24 | COMPONENTS | | N/A |
| 24.1 | Transformers intended to supply power to a safety extra-low voltage circuit (SELV): | | N/A |
| | - complies with relevant requirements of IEC 61558-2-6 | | N/A |
| | Capacitors for radio interference suppression: comply with requirements of IEC 60384-14 | | N/A |
| | Fuses: comply with requirements of IEC 60127 or IEC 60269 | | N/A |
| 24.1.1 | Safety isolating transformer supplies external isolated limited secondary circuits. | | N/A |
| | Output test conducted with the primary energized at upper limit of rated voltage | | N/A |
| | Secondary output voltage (V), power (VA) and current (A).....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 24.2 | Components other than those of 24.1: checked when carrying out the tests of this standard or/and complies with appropriate safety standard | | N/A |
| 24.3 | Annex U is not applicable to relays used as components in a control. | | N/A |
| 25 | NORMAL OPERATION | | N/A |
| | Meets requirements per annex H .....: | See annex H | N/A |
| 26 | ELECTROMAGNETIC COMPATIBILITY (EMC) REQUIREMENTS - IMMUNITY | | N/A |
| | Meets requirements per Cl. H.26 .....: | See clause H.26 | N/A |
| 27 | ABNORMAL OPERATION | | N/A |
| 27.2 | Burnout test (for controls incorporating electro-magnets) | | N/A |
| 27.2.1 | Control mechanism blocked in position when control is de-energized: | | N/A |
| | - energized at rated frequency and rated voltage (17.2.2, 17.2.3 and 17.2.3.2) | | N/A |
| | - duration: 7 h or until burnout .....: | | N/A |
| 27.2.2 | Compliance for burnout test | | N/A |
| | - no emission of flame or molten metal after test | | N/A |
| | - no evidence of damage impairing compliance with this standard | | N/A |
| | - no evidence of dielectric breakdown (Clause 13.2) | | N/A |
| 27.2.3 | Blocked mechanical output test (abnormal temperature test) | | N/A |
| | During blocked output test: temperatures did not exceed indicated limits in Table 26 | | N/A |
| | Test not required on controls, if no protective device cycles and temperatures within limits of 14.1 | | N/A |
| | Test carried out at room-temperature and rated voltage (V) for 24h .....: | | N/A |
| 27.2.3.2 | The average temperature was 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 was continually supplied to the motor | | N/A |
| 27.2.3.4 | Immediately upon completion of the test, the motor was capable of withstanding the electric strength test (Clause 13) | | N/A |
| 27.3 | Over-voltage and under-voltage test (for controls incorporating electro-magnets) | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 28 | GUIDANCE ON THE USE OF ELECTRONIC DISCONNECTION | | N/A |
| | Meets requirement of Annex H .....: | | N/A |
| A | ANNEX A – INDELIBILITY OF MARKING | | P |
| A.1 | Classification of markings | | P |
| A.1.1 | Markings, which are not mandatory | | N/A |
| A.1.2 | Markings which are mandatory but not accessible to the final user | | P |
| A.1.3 | Markings which are mandatory and accessible to the final user | | N/A |
| A.1.4 | Permanence of marking test | | P |
| | - solvents: neutral liquid detergent | | P |
| | - solvents: petroleum spirit | | P |
| | - solvents: water | | P |
| A2 | Test of indelibility of markings classified in A1.2 | | P |
| A2.1 | Drops of detergent standing on the marked surface, duration (h): 4 h .....: | 4 h | P |
| | Drops removed by fine spray of warm water (40 ± 5°C) or by lightly wiping .....: | 40°C | P |
| A2.2 | Allowed to dry completely at (25 ± 5)°C .....: | 25°C | P |
| A2.3 | Rubbed in the apparatus ( Fig. 8 ) with dry lint, weight 250 g, duration (s): 15 s | 15 s | P |
| A2.4 | Rubbed in the apparatus ( Fig. 8) with water-soaked lint, weight 250 g, duration (s): 15 s | 15 s | P |
| A2.6 | Marking after these tests still legible | | P |
| A3. | Test of indelibility of markings classified A1.3 | | N/A |
| A3.1 | Rubbed in the apparatus ( Fig. 8) with dry lint, weight 750 g, duration (s): 15 s | | N/A |
| A3.2 | Rubbed in the apparatus ( Fig. 8) with water-soaked lint, weight 750 g, duration (s): 15 s | | N/A |
| A3.3 | Drops of detergent standing on the marked surface: duration (h): 4 h .....: | | N/A |
| | Then removed by fine spray of warm water (40 ± 5 °C) or by lightly wiping .....: | | N/A |
| A3.4 | After sample was dried, marking rubbed (apparatus Fig. 8) with detergent soaked lint, weight 750 g, duration (s): 15 s | | N/A |
| A3.5 | Marking rubbed in apparatus with petroleum spirit soaked lint, weight 750 g, duration (s): 15 s | | N/A |
| A3.7 | Marking after these tests still legible | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| C | ANNEX C - COTTON USED FOR MERCURY SWITCH TEST FOR USA AND CANADA | | N/A |
| | Part 1 is applicable | | N/A |
| D | ANNEX D – HEAT, FIRE AND TRACKING | | N/A |
| | Canada and USA national difference | | N/A |
| G | ANNEX G – HEAT AND FIRE RESISTANCES TESTS | | P |
| G.2 | Glow-wire test: Performed in accordance with IEC 60695-2-1 with amendments | | P |
| G.4 | Proof tracking test: Performed in accordance with IEC 60112 with amendments | | N/A |
| G.5 | Ball pressure test | | P |
| G.5.1 | Ball-pressure test 1<br>(tests not to be made on parts of ceramic material and glass) | | N/A |
| | Temperature during ball pressure, the higher of: | | N/A |
| | - (20 ± 2) K (or (15 ± 2) K if control for appliances within IEC 355-1) in excess of the maximum temperature during test Cl. 14 (°C), or.....: | | N/A |
| | - 75 ± 2°C, or .....: | | N/A |
| | - as declared (°C) .....: | | N/A |
| | Ball (steel) diameter: 5mm, force: 20N, duration: 1 h | | N/A |
| G.5.2 | Ball-pressure test 2<br>(tests not to be made on parts of ceramic material and glass) | | P |
| | Temperature Tb during ball pressure: | 24.0℃,46%RH | P |
| | - Tb (°C): 100°C if $T_{max}$ = 30 to 54°C .....: | | N/A |
| | - Tb (°C): 125°C if $T_{max}$ = 55 to 84°C .....: | | N/A |
| | - Tb (°C): 125°C for controls to be incorporated in appliances (EN 60 335-1) .....: | | N/A |
| | - Tb (°C): ($T_{max}$ + 40)°C if $T_{max}$ is 85°C or above ...: | 220℃<br>(Operating temperature:180°C) | P |
| | - Tb (°C): 20 K in excess of the max. temperature during tests of Cl. 14 (°C), if higher.....: | | N/A |
| | - Compliance with Annex H.27.1.1.3 | | N/A |
| | Ball (steel) diameter: 5mm, force: 20N, duration: 1 h | | P |
| H | ANNEX H – REQUIREMENTS FOR ELECTRONIC CIRCUITS | | N/A |
| H.6.4.3.13 | Classification, additions: electronic disconnection on operation (Type 1.Y - 2.Y).....: | | N/A |
| H.6.9.5 | - electronic disconnection | | N/A |
| H.6.18 | Class of control function (A, B, C).....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H.6.18.2 | Thermal cut-outs have functions classified as Software Class B or C ..... : | | N/A |
| H.6.18.3 | Thermal cut-outs for closed water heater systems have functions classified as Software Class C ..... : | | N/A |
| H.7 | Information in addition to Table 1 provided | | N/A |
| | 36 - Replacement: limits of activating quantity for any sensing element over which micro-disconnection or electronic disconnection is secure; clause: 11.3.2, H11.4.16, H17.14, H18.1.5, H27.1.1, H.28; method: X | | N/A |
| | 52 - The minimum parameters of any heat dissipater (e.g. heat sink) not provide with an electronic control but essential to its correct operation; clause 14; method: D | | N/A |
| | 53 - Type of output waveform if other than sinusoidal; clause H25; method: X | | N/A |
| | 54 - Details of the leakage current waveform produced after failure of the basic insulation; clause H27; method: X | | N/A |
| | 55 - The relevant parameters of those electronic devices or other circuit components considered as unlikely to fail (see paragraph 1 of H27.1.1.4); clause H27; method: X | | N/A |
| | 56 - Type of output waveform(s) produced after failure of an electronic device or other circuit component (see item g) of H27.1.1.3); clause H27; method: X | | N/A |
| | 57 - The effect on controlled output(s) after electronic circuit component failure if relevant (item c) of H27.1.1.3); clause H27; method: X | | N/A |
| | 58a - For integrated and incorporated electronic controls, if any protection is claimed against mains borne perturbations, magnetic and electro-magnetic disturbances, which of the tests of Cl. H.26 must be performed and the effect on controlled output(s) and function after a failure to operate as a result of each test; clauses H26.2, H26.15; method: X | | N/A |
| | 58a - See footnote c of Table H.26.2.101 | | N/A |
| | 58b - For other than integrated and incorporated electronic controls, the effect on controlled output(s) and function after a failure to operate as a result of tests of Cl. H26; clauses H26.2, H26.15; method: X | | N/A |
| | 59 - Any component relied upon for electronic disconnection, which is disconnected as required by note 15 to Table 12; clause 13.2, H27.1; method: X | | N/A |
| | 60 - Category (surge immunity); clause H26.8.2, H26.10.4; method: X | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 66 - Software sequence documentation; clause H11.12.2.9; method: X | | N/A |
| | 67 - Program documentation; clauses H11.12.2.9, H11.12.2.12; method: X | | N/A |
| | 68 - Software fault analysis; clauses H11.12, H27.1.1.4; method: X | | N/A |
| | 69 - Software class(es) and structure; clauses H.11.12.2, H.11.12.3, H.27.1.2.2.1, H.27.1.2.3.1; method: D | | N/A |
| | 70 - Analytical measures and fault/error control techniques employed; clauses H.11.12.1.2, H.11.12.2.2, H.11.12.2.4; method: X | | N/A |
| | 71 - Software fault/error detection time(s) for controls with software Classes B or C; clauses H2.17.10, H11.12.2.6; method: X | | N/A |
| | 72 - Control response(s) in case of detected fault/error; clause H.11.12.2.7; method: X | | N/A |
| | 73 - Controls subjected to a second fault analysis and declared condition as a result of the second fault; clause H.27.1.2.3; method: X | | N/A |
| | 74 - External load and emission control measures to be used for test purposes; clause H.23.1.1; method: X | | N/A |
| | 91 - Fault reaction time; clause H.2.23.2, H.27.1.2.2.2, H.27.1.2.2.3, H.27.1.2.3.2, H.27.1.2.3.3 , H.27.1.2.4.2, H.27.1.2.4.3; method: X | | N/A |
| | 92 - Class or classes of control function(s); clause H.6.18, H.27.1.2.2, H.27.1.2.3; method: X | | N/A |
| | 109 - output condition of thermal cut outs type 2 thermostats and type 2 limiters after operation, clauses H26.2.103, H26.2.104, H26.2.105 | | N/A |
| | 117 - condition of test when requested by the manufacturer for integrated and incorporated electronic controls, clause H23.1.2 | | N/A |
| H.8 | Protection against electric shock | | N/A |
| H.8.1.10 | Accessible parts separated from the supply by protective impedance; identification of circuit.....: | | N/A |
| H.8.1.10.1 | Maximum current between accessible parts and either pole of the supply | | N/A |
| | - 0.7 mA (peak value) a.c.; current (mA) .....: | | N/A |
| | - 2 mA d.c.; current (mA).....: | | N/A |
| | - if frequency f > 1 kHz: current (mA): 0.7x f (kHz) <70 mA; f (kHz) .....: | | N/A |
| | Maximum capacitance | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - peak value (V) .....: | | N/A |
| | 42.4V<V≤450V: capacitance C (μF): ≤ 0.1μF .....: | | N/A |
| | 450V<V ≤15kV: capacitance C (μF): C x V≤45μC; calculated $C_{max}$ (μF).....: | | N/A |
| | V>15kV: capacitance C (μF): C x V² ≤350μJ; calculated $C_{max}$ (μF).....: | | N/A |
| H.11 | Constructional requirements | | N/A |
| H.11.2.5 | Protection against electric shock – protective impedance (chain) | | N/A |
| | - consists of at least 2 impedances in series | | N/A |
| | - connected between live and accessible parts | | N/A |
| | - consists 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 |
| | - type of resistors (Table H.21 note 13) | | N/A |
| | - resistors comply with IEC 60065, cl. 14.1 | | N/A |
| | a) and b) short-circuiting and open-circuiting each impedance in turn | | N/A |
| | c) applying a fault condition to any other part which might influence the leakage current | | N/A |
| | Requirements of Clause H.8.1.10 still met: leakage current (mA).....: | | N/A |
| H.11.4 | Actions | | N/A |
| H.11.4.16 | - Type 1.Y and 2.Y action provides electronic disconnection | | N/A |
| H.11.4.16.1 | Test with control connected to maximum load | | N/A |
| | - supplied with rated voltage (V) .....: | | N/A |
| | - at temperature $T_{max}$ (°C).....: | | N/A |
| H.11.4.16.2 | Current through electronic disconnection not exceeding the lower of 5mA (mA).....: | | N/A |
| | or 10% of the rated current (mA) .....: | | N/A |
| H.11.12 | Controls using software | | N/A |
| | Controls with software Class B or C: complies with clauses H11.12.1 to H11.12.13 | | N/A |
| H.11.12.1 | Requirements for the architecture | | N/A |
| H.11.12.1.1 | Control functions with software class B or C use measures to control and avoid software-related faults/errors in safety-related data and safety-related segments of the software, as detailed in H.11.12.1.2 to H.11.12.3 inclusive | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H.11.12.1.2 | Control functions with software class C have one of the following structures | | N/A |
| | – single channel with periodic self-test and monitoring (H.2.16.7) | | N/A |
| | – dual channel (homogenous) with comparison (H.2.16.3) | | N/A |
| | – dual channel (homogenous) with comparison (H.2.16.3) | | N/A |
| | Comparison between dual channel structures performed by | | N/A |
| | – the use of a comparator (H.2.18.3) | | N/A |
| | – reciprocal comparison (H.2.18.15) | | N/A |
| | Control functions with software class B have one of the following structures | | N/A |
| | – single channel with functional test (H.2.16.5) | | N/A |
| | – single channel with periodic self-test (H.2.16.6) | | N/A |
| | – dual channel without comparison (H.2.16.1) | | N/A |
| H.11.12.1.3 | Other structure with equivalent safety level H.11.12.1.2 .....: | | N/A |
| H.11.12.2 | Measures to control faults/errors | | N/A |
| H.11.12.2.1 | Redundant memory with comparison on two areas of the same component: storage in a different form | | N/A |
| H.11.12.2.2 | Software class C using dual channel structures with comparison: additional fault/error detection | | N/A |
| H.11.12.2.3 | Software class B or C:<br>means for recognition and control of errors in transmission to external safety related data paths | | N/A |
| H.11.12.2.4 | Software class B or C:<br>within the control, measures are taken to address the fault/errors in safety-related segments and data indicated in Table H.1 and Table 1, requirement 68 | | N/A |
| H.11.12.2.5 | Measures, others than those specified in H.11.12.4, 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 | | N/A |
| | - occurs not later than declared time(s), Table 1, requirement 71 | | N/A |
| | - acceptability of declared time(s): evaluated during fault analysis of the control | | N/A |
| | values declared in Table 1, requirement 71 limited by the relevant Part 2 .....: | | N/A |
| H.11.12.2.7 | For controls with functions, classified as Class B or C, detection of fault/error | | N/A |
| | - results in the response declared in Table 1, requirement 72 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - if Class C: independent means provided | | N/A |
| H.11.12.2.8 | Class C, dual channel structure, loss of dual channel capability judged to be an error | | N/A |
| H.11.12.2.9 | Software referenced: | | N/A |
| | - to relevant parts of the operating sequence | | N/A |
| | - to the associated hardware functions | | N/A |
| H.11.12.2.10 | Where labels used for memory locations: labels are unique | | N/A |
| H.11.12.2.11 | Software protected from users alteration of safety-related segments and data | | N/A |
| H.11.12.2.12 | Software and safety-related hardware under its control: initialized to and terminate at a declared state, Table 1, requirement 66 | | N/A |
| H.11.12.3 | Measures to avoid errors | | N/A |
| H.11.12.3.1 | For controls with software Class B or C the V-model for the software life cycle was applied | | N/A |
| | Measures used for software class C are inherently acceptable for software class B | | N/A |
| | Other methods are possible if they incorporate disciplined and structured processes including design and test phases | | N/A |
| H.11.12.3.2 | Specification | | N/A |
| H.11.12.3.2.1 | Software safety requirements | | N/A |
| N/A H.11.12.3.2.1.1 | The specification of the software safety requirements includes: | | N/A |
| | A description of each safety related function to be implemented, including its response time(s) | | N/A |
| | - functions related to the application including their related software classes | | N/A |
| | - functions related to the detection, annunciation and management of software or hardware faults | | N/A |
| | A description of interfaces between software and hardware | | N/A |
| | A description of interfaces between any safety and non-safety related functions | | N/A |
| H.11.12.3.2.2.1 | Software architecture - The description includes required aspects | | N/A |
| | Techniques and measures to control software faults/errors (refer to H.11.12.2) | | N/A |
| | Interactions between hardware and software | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Partitioning into modules and their allocation to the specified safety functions | | N/A |
| | Hierarchy and call structure of the modules (control flow) | | N/A |
| | Interrupt handling | | N/A |
| | Data flow and restrictions on data access | | N/A |
| | Architecture and storage of data | | N/A |
| | Time based dependencies of sequences and data | | N/A |
| H.11.12.3.2.2.2 | The architecture specification verified against the specification of the software safety requirements by static analysis. Acceptable methods are: | | N/A |
| | Control flow analysis | | N/A |
| | Data flow analysis | | N/A |
| | Walk-throughs / design reviews | | N/A |
| H.11.12.3.2.3.1 | Based on the architecture design, software is suitably refined into modules, which design and coding are implemented in a way that is traceable to the software architecture and requirements | | N/A |
| H.11.12.3.2.3.2 | Software code is structured | | N/A |
| H.11.12.3.2.3.3 | Coded software is verified against the module specification, and the module specification is verified against the architecture specification by static analysis | | N/A |
| H.11.12.3.2.4 | Design and coding standards | | N/A |
| | Program design and coding standards is consequently used during software design and maintenance | | N/A |
| | Coding standards specify programming practice, proscribe unsafe language features, and specify procedures for source code documentation as well as for data naming conventions | | N/A |
| H.11.12.3.3 | Testing | | N/A |
| H.11.12.3.3.1 | Module design (software system design, software module design and coding) | | N/A |
| H.11.12.3.3.1.1 | A test concept with suitable test cases is defined based on the module design specification | | N/A |
| H.11.12.3.3.1.2 | Each software module is tested as specified within the test concept | | N/A |
| H.11.12.3.3.1.3 | Test cases, test data, test results are documented | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H.11.12.3.3.1.4 | Code verification of a software module by static means includes such techniques as software inspections, walk-throughs, static analysis and formal proof | | N/A |
| | Code verification of a software module by dynamic means includes functional testing, white-box testing and statistical testing | | N/A |
| H.11.12.3.3.2 | Software integration testing | | N/A |
| H.11.12.3.3.2.1 | A test concept with suitable test cases is defined based on the architecture design specification | | N/A |
| H.11.12.3.3.2.2 | The software is tested as specified within the test concept | | N/A |
| H.11.12.3.3.2.3 | Test cases, test data, test results are documented | | N/A |
| H.11.12.3.3.3 | Software validation | | N/A |
| H.11.12.3.3.3.1 | A validation concept with suitable test cases is defined based on the software safety requirements specification | | N/A |
| H.11.12.3.3.3.2 | The software is validated with reference to the requirements of the software safety requirements specification as specified within the validation concept. | | N/A |
| | The software is exercised by simulation or stimulation of: | | N/A |
| | input signals present during normal operation | | N/A |
| | anticipated occurrences | | N/A |
| | undesired conditions requiring system action | | N/A |
| H.11.12.3.3.3.4 | Test cases, test data, test results are documented | | N/A |
| H.11.12.3.4 | Other Items | | N/A |
| H.11.12.3.4.1 | Tools, programming languages are assumed to be suitable if they comply with "increased confidence from use" according to IEC 61508-7, C.4.4 | | N/A |
| H.11.12.3.4.2 | Management of software versions: All versions are uniquely identified for traceability | | N/A |
| H.11.12.3.4.3.1 | Software modifications based on a modification request which details required | | N/A |
| | - hazards which may be affected | | N/A |
| | - proposed changes | | N/A |
| | - reasons for change | | N/A |
| H.11.12.3.4.3.2 | An analysis is carried out to determine the impact of the proposed modification on functional safety | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H.11.12.3.4.3.3 | A detailed specification for the modification is generated including the necessary activities for verification and validation, such as a definition of suitable test cases | | N/A |
| H.11.12.3.4.3.4 | The modification are carried out as planned | | N/A |
| H.11.12.3.4.3.5 | The assessment of the modification is carried out based on the specified verification and validation activities and may include: | | N/A |
| | - re-verification of changed software modules | | N/A |
| | - re-verification of affected software modules | | N/A |
| | - re-validation of the complete system | | N/A |
| H.11.12.3.4.3.6 | All details of modification activities are documented | | N/A |
| H.11.12.3.5 | For class C control functions: One of the combinations (a–p) of analytical measures given in columns of table H.9 is used during hardware development .....: | | N/A |
| H.11.12 | Controls using software | | N/A |
| H.11.12.8 | Values declared in H.7.2 requirement 71 may be given in applicable equipment standard<br>(In IEC 60730-1 Ed. 4, this clause is renumbered as H.11.12.2.6) | | N/A |
| H.11.12.8.1 | Values declared in H.7.2 requirement 72 may be given in applicable equipment standard<br>(In IEC 60730-1 Ed. 4, this clause is renumbered as H.11.12.2.7) | | N/A |
| H.13 | Electric strength and insulation resistance | | N/A |
| H.13.2 | Across electronic disconnection.....: | | N/A |
| H.17 | Endurance | | N/A |
| H.17.1 | General requirements | | N/A |
| H.17.1.4 | Electronic controls with Type 1 action:<br>no endurance test (unless necessary for testing of associated components) | | N/A |
| H.17.1.4.1 | Electronic controls with Type 2 action:<br>thermal cycling test (H.17.1.4.2) executed | | N/A |
| H.17.1.4.2 | Thermal cycling test: conditions forming the basis of the test: | | N/A |
| | a) Duration (h) .....: | | N/A |
| | b) Electrical conditions: | | N/A |
| | - loaded, according to manufacturer's declaration .: | | N/A |
| | - voltage (V): 1.1 times Vr.....: | | N/A |
| | - for 30 min. of each 24 h period: voltage (V):<br>0.9 times Vr.....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - during each 24 h period: duration of supply switched off (s); 30 s .....: | | N/A |
| | - change of voltage not synchronized with change of temperature | | N/A |
| | c) Thermal conditions: temperature (ambient and/or mounting surface) varied between: | | N/A |
| | - $T_{max}$ (Ts max) (°C) .....: | | N/A |
| | - $T_{min}$ (Ts min) (°C) .....: | | N/A |
| | - rate of change: 1°C/min | | N/A |
| | - extremes maintained: 1 h | | N/A |
| | d) Rate of operation: cycled at the fastest rate possible, max. 6 cycles/min) (cycles/min) .....: | | N/A |
| | If operational mode to be set by the user: | | N/A |
| | - 1/3 test period: maximum setting | | N/A |
| | - 1/3 test period: intermediate setting | | N/A |
| | - 1/3 test period: minimum setting | | N/A |
| | According to the following requirements: | | N/A |
| | - duration of heating period (h).....: | | — |
| | - Duration of maintaining max. temperature (h).....: | | — |
| | - duration of cooling period (h) .....: | | — |
| | - duration of maintaining min. temperature (h) .....: | | — |
| | - duration of 1 complete cycle (h).....: | | — |
| | - total number of cycles executed .....: | | — |
| H.17.14 | Evaluation of compliance: For types 1.Y and 2.Y controls, Clause H.11.4.16 met | | N/A |
| H.18 | Mechanical strength | | N/A |
| H.18.1.5 | Controls providing electronic disconnection (Type 1.Y and 2.Y), requirements of H11.4.16 met | | N/A |
| H.20 | Creepage distances, clearances and distances through insulation | | N/A |
| H.20.1.9 | Electronic controls | | N/A |
| H.20.1.9.1 | Spacing between live parts (supply) and accessible surfaces and parts | | N/A |
| H.20.1.9.3 | Across protective impedances: double or reinforced insulation | | N/A |
| | Across each component: supplementary insulation | | N/A |
| H.20.1.9.4 | Providing operational insulation | | N/A |
| H.23 | Electromagnetic compatibility (EMC) requirements – emission | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H.23.1 | Electronic controls do not emit excessive electric or electromagnetic disturbances | | N/A |
| H.23.1.1 | Low frequency emission, disturbances in supply systems: controls other than integrated or incorporated that directly control an external load except pilot duty: comply with IEC 61000-3-2 and IEC 61000-3-3. | | N/A |
| H.23.1.2 | Radio frequency emission: free-standing, independently mounted and in-line cord controls using software, oscillating circuits, etc. comply with CISPR 14-1 and/or CISPR 22, Class B | | N/A |
| H.23.1.2 | For integrated and incorporated electronic controls test may be carried out under declared conditions if so requested by the manufacturer | | N/A |
| H.25 | Normal operation | | N/A |
| H.25.1 | - output waveform sinusoidal, examined under all normal operating conditions, or | | N/A |
| | - as declared, see 7.2, item 53 | | N/A |
| H.26 | Electromagnetic compatibility (EMC) requirements - immunity | | N/A |
| H.26.2 | Controls with Type 1 or 2 action: tests levels as indicated in Table H.11 | | N/A |
| H.26.2.1 | Integrated and incorporated controls Type 1 action: tests H.26.8 and H.26.9, if declared in Table 1, requirement 58a | | N/A |
| H.26.2.2 | Integrated and incorporated controls Type 2 action: | | N/A |
| | - tests H.26.5 | | N/A |
| | - Any other tests of H.26. declared in Table 1, requirement 58a | | N/A |
| H26.2.101 | The control remained in its current condition and thereafter continued to operate as declared within the limits verified in clause 15, if applicable | | N/A |
| H26.2.102 | The control assumed the condition declared in tab. 7.2, req. 109 and thereafter operated as in H26.2.101 | | N/A |
| H26.2.103 | The control assumed the conditions declared in tab. 7.2 req. 109 - such that it cannot be reset automatically or manually. The output wave form was sinusoidal or as declared in Tab. 7.3, req. 53 | | N/A |
| H26.2.104 | The control remained in the condition declared in tab. 7.2 req. 109. A non-resetting control can only reset manually. After the temperature which caused cut-out to occur was removed, it operated as in H26.2.101 or remained in the declared condition as in H26.2.103 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H26.2.105 | The control may return to its initial state and thereafter operated as in H26.2.101 | | N/A |
| H26.2.106 | The output and functions were as declared in tab. 7.2 req. 58a or 58b and the control complied with the requirement of 17.5 | | N/A |
| H.26.3 | Separate samples used for each test: multiple test on a single sample (option of the control manufacturer) | | N/A |
| H.26.5 | Voltage dips and voltage interruptions in the power supply network.....: | (See Table H.26.5) | N/A |
| | Test values for voltage dips and interruptions applied to all the test levels | | N/A |
| H.26.5.3 | Test procedure according to IEC 61000-4-11 | | N/A |
| | The voltage dips and interruptions, at random phase with respect to the mains frequency, performed at least three times in the relevant operating modes with a waiting time of at least 10 s | | N/A |
| | Protective controls are subjected to voltage dips and interruptions at random phase angles with respect to the mains frequency as well as at the zero crossing of the supply voltage | | N/A |
| H.26.5.4 | Voltage variation test; severity levels observed ..... : | (See Table H.26.5.4) | N/A |
| H.26.5.4.3 | The control subjected to each of the specified voltage test cycles three times with 10 s intervals between each test cycle for the most representative modes of operation | | N/A |
| H.26.6 | Influence of voltage unbalance | | N/A |
| H.26.6.1 | Test applies only to three-phase equipment | | N/A |
| H.26.6.4 | Test carried out with an unbalanced factor of 2%, no dangerous influence on equipment; unbalance factor (%) .....: | | N/A |
| H.26.8 | Surge immunity test conducted in accordance with IEC 61000-4-5 | | N/A |
| H.26.8.2 | Severity levels | | N/A |
| | Installation class .....: | | N/A |
| | Power supply: coupling mode | | N/A |
| | Line-to-line, test level (kV peak) .....: | | N/A |
| | Line-to-earth, test level (kV peak) .....: | | N/A |
| | Unbalanced operated circuits and lines: coupling mode | | N/A |
| | Line-to-line, test level (kV peak) .....: | | N/A |
| | Line-to-earth, test level (kV peak) .....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Balanced operated circuits and lines: coupling mode | | N/A |
| | Line-to-line, test level (kV peak).....: | | N/A |
| | Line-to-earth, test level (kV peak) .....: | | N/A |
| | Protective controls declared according to item 90 of Table 1 an additional test to the power supply terminals as defined in H.26.8.2 applies | | N/A |
| H.26.8.3 | Test procedure: impulse intervals ≥ 60 s: Five pulses of each polarity (+,-): | | N/A |
| | - between any external conductor and neutral | | N/A |
| | - between external conductors/terminals (signal, data, control etc), if designed for cables > than 10 m | | N/A |
| H26.8.3.101 | For controls declared under tab. 7.2 req. 109, three of the tests are performed when the control is in the declared condition and two when it is not: | | N/A |
| H.26.9 | Fast transient burst test: conducted in accordance with IEC 61000-4-4 | | N/A |
| | Test level.....: | | N/A |
| | Repetition frequency (kHz) .....: | | N/A |
| | Generator drive .....: | | N/A |
| | Minimum number of applications: 1 (+ , -) polarity; number of applications .....: | | N/A |
| | Operating conditions: per Part 2 .....: | | N/A |
| | A.C. power supply (Table H.15) between: | | N/A |
| | - reference ground plane and each power supply line | | N/A |
| | - reference ground plane to protective earth terminal | | N/A |
| | - reference ground plane to all combinations of power supply lines and also earth line | | N/A |
| | D.C. power supply: capacitive clamps | | N/A |
| | Data lines: capacitive clamps | | N/A |
| | For protective controls declared according to item 90 of table, test level 4 applies to the power supply lines. | | N/A |
| H.26.9.3.101 | Test procedure: Control subjected to five tests | | N/A |
| | For controls declared under tab. 7.2 req. 109, three of the tests are performed when the control is in the declared condition and two when it is not: | | N/A |
| H.26.10 | Ring wave test: (U.S. and Canada difference) | | N/A |
| H26.10.5 | Test procedure | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H26.10.5.101 | For controls declared under tab. 7.2 req. 109, three of the tests are performed when the control is in the declared condition and two when it is not | | N/A |
| H.26.11 | Electrostatic discharge test: conducted in accordance with IEC 61000-4-2, clause 5, severity level 3: | | N/A |
| | - contact discharge to accessible metal parts .....: | | N/A |
| | - air discharge to accessible insulating parts.....: | | N/A |
| | Protective controls declared according to item 90 of Table 1 an additional test as defined in H.26.11 applies | | N/A |
| H.26.12 | Radio-frequency electromagnetic field immunity | | N/A |
| H.26.12.2.1 | Test levels for conducted disturbances per table H.17 applied | | N/A |
| H.26.12.2.2 | Test executed in accordance with IEC 61000-4-6 | | N/A |
| | - sweep rate 1.5 x $10^3$ decades/sec | | N/A |
| | - step size ≤ 1% of $f_o$ if frequency range swept incrementally | | N/A |
| | 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 | Immunity to radiated electromagnetic fields | | N/A |
| H.26.12.3.1 | Test level for radiated electromagnetic fields per table H.18 applied | | N/A |
| H.26.12.3.2 | Test executed in accordance with IEC 61000-4-3 | | N/A |
| | - each side of the control exposed | | N/A |
| | - entire frequency range applied in both the horizontal and vertical antenna orientation | | N/A |
| | - sweep rate 1.5 x $10^3$ decades/sec | | N/A |
| | - step size ≤ 1% of $f_o$ if frequency range swept incrementally | | N/A |
| 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 influences of supply frequency variations in accordance with IEC 61000-4-28 | | N/A |
| H.26.13.2 | Test values of table H.19 applied | | N/A |
| | - test level 2 applied | | N/A |
| | - test level 3 applied | | N/A |
| H.26.13.3 | For controls declared under Item 109 of Table 7.2, the test is 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 in accordance with IEC 61000-4-8 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| H.26.14.2 | Test levels of table H.20 applied | | N/A |
| | - test level 2 applied – 3 A/m | | N/A |
| | - test level 3 applied – 10 A/m | | N/A |
| H.26.14.3 | For controls declared under Item 109 of Table 7.2, the test is performed when the control is in the declared condition and when it is not. | | N/A |
| H.26.15 | Evaluation of compliance | | N/A |
| H.26.15.1 | After the tests of H.26.2 to H.26.12, the control meets applicable requirements of: | | N/A |
| | - Cl. 8, protection against electric shock | | N/A |
| | - Cl. 17.5, electric strength requirements after the endurance tests | | N/A |
| | - Cl. 20, creepage and clearance distances | | N/A |
| H.26.15.2 | The control meets requirements of H.17.14, or | | N/A |
| | - output(s) and functions as declared in table 1, items 58a and 58b | | N/A |
| | Compliance with table H.26.2.101 | | N/A |
| H.26.15.3 | Different output and functions declared by manufacturer after testing at level 2 or 3 | | N/A |
| H.26.15.4 | Compliance criteria given in part 2 and based on operating output conditions and functional specifications of the control under test: | | N/A |
| | - Normal performance with no loss of protective functions and control within declared limits. | | N/A |
| | - Loss of protective function within declared limits | | N/A |
| | - Loss of protective function with safety shut down | | N/A |
| | - Loss of protective function with unsafe operation | | N/A |
| | Compliance with table H.26.2.101 | | N/A |
| H.26.16 | Harmonics and inter-harmonics including mains signalling at a.c. power port, low frequency immunity tests | | N/A |
| | For protective controls declared according to item 90 of Table 1: The control subjected to mains signals in accordance with IEC 61000-4-13, test level class 2 | | N/A |
| H.27.1.1.1 | Fault conditions specified in H.27.1.1.5 not applied if: | | N/A |
| | - electronic circuit is a low-power circuit and | | N/A |
| | - protection against electric shock, fire hazard or dangerous malfunction does not rely on the correct functioning of the electronic circuit | | N/A |
| | - measurement of low-power circuit according to Cl. H.27.1.1.1 | | N/A |
| | - circuit under evaluation .....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - max. power consumed by the variable resistor (W): ≤ 15 W, 5 s.....: | | N/A |
| | Electronic circuits operating to ensure compliance with Cl. H.27: relevant test to be repeated with a single fault simulated as indicated in H.27.1.4, items 1) to 5) | | N/A |
| H.27.1.1.2 | Operating conditions: | | N/A |
| | a) at most unfavourable voltage (V): range: 0.9-1.1 times VR .....: | | N/A |
| | b) load producing the most onerous effect: kind of load; significant values .....: | | N/A |
| | c) ambient temperature (°C): (20 ± 5) °C or other..: | | N/A |
| | d) fuse (supply), rating (A) such that test result not influenced by operation of the fuse.....: | | N/A |
| | e) actuating member in the most unfavourable position.....: | | N/A |
| H.27.1.2 | Controls declared under req. 109 of tab. 7.2 tested when the control is in the declared condition and when it is not<br>(In IEC 60730-1 Ed. 4, this clause is renumbered as H.27.1.1.2) | | N/A |
| H.27.1.1.3 | Requirements, evaluation of compliance: | | N/A |
| | a) no emission of flames or hot metal or hot plastics | | N/A |
| | b) temperature of supplementary and reinforced insulation: | | N/A |
| | - not exceeding 1.5 times value specified in Cl. 14 | | N/A |
| | - exception: thermoplastic material | | N/A |
| | c) change in the output as declared in Table 1, requirement 57 | | N/A |
| | d) control continuous to comply with requirements of Cl. 8 and Cl. 13 | | N/A |
| | e) no deterioration of parts that would result in failure to comply with requirements of Cl. 20 | | N/A |
| | f) no rupture of fuse use supply, or | | N/A |
| | - rupture with operation of an internal protecting device | | N/A |
| | Internal protecting device not required since sample, after replacement of the fuse in the supply, complied: | | N/A |
| | - with a), b) and d) of H.27.1.1.3 | | N/A |
| | - with requirements of Cl. 20 for accessible distances from active parts to accessible surfaces (control mounted as for its intended use) | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | g) output waveform as declared in Table 1, requirement 56 | | N/A |
| H.27.1.1.5 | Electronic circuit fault conditions per table H.21..... : | | N/A |
| H.27.1.1.6 | Motor load, if failure or malfunction causes change in the supply waveform to the controlled motor: | | N/A |
| | 1) load (normal waveform) adjusted to 6 times rated load, or | | N/A |
| | - locked rotor rating declared | | N/A |
| | 2) fault conditions introduced | | N/A |
| | 3) test conditions per H.27.1.2 | | N/A |
| | a) unfavourable voltage (V).....: | | — |
| | c) ambient temperature (°C).....: | | — |
| | d) fuse rating (A).....: | | — |
| | e) actuating member .....: | | — |
| | 4) evaluation of compliance per H.27.1.3 a) to e) | | N/A |
| H.27.1.2 | Protection against internal faults to ensure functional safety | | N/A |
| H.27.1.2 | controls declared under req. 109 of tab. 7.2 tested when the control is in the declared condition and when it is not: | | N/A |
| H.27.1.2.1 | Design and construction requirements | | N/A |
| H.27.1.2.1.1 | Fault avoidance and fault tolerance | | N/A |
| | Controls incorporating control functions of class B or C are designed per H.27.1.2 taking into account the failure modes of Table H.21 and H.11.12 for software, if applicable | | N/A |
| | The system configuration is either inherently failsafe | | N/A |
| | Or, components with direct safety-critical functions are guarded by safeguards according to H.11.12 software class B or C, | | N/A |
| | safeguards are built into hardware and can be supplemented by software | | N/A |
| | safeguards can cause a completely independent safety-shut-down | | N/A |
| | Time slot monitoring is sensitive to both an upper and a lower limit of the time interval | | N/A |
| | In a class C control function if a single fault in a primary safeguard can render the safeguard inoperative, a secondary safeguard is provided | | N/A |
| | The reaction time of the secondary safeguard is in accordance with Clause H.27.1.2.3 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Components are dimensioned on the basis of the worst-case conditions which can arise in the control, as stated by the manufacturer | | N/A |
| H.27.1.2.1.2 | Documentation | | N/A |
| | The documentation is based on H.11.12.3 | | N/A |
| | The functional analysis of the control and the safety related programs under its control are documented in a clear hierarchical way in accordance with the safety philosophy and the program requirements | | N/A |
| | Minimum documentation provided for assessment: | | N/A |
| | A description of the system philosophy, the control flow, data flow and timings | | N/A |
| | A clear description of the safety philosophy of the system with all safeguards and safety functions clearly indicated. Sufficient design information is provided to enable the safety functions or safeguards to be assessed | | N/A |
| | Documentation for any software within the system | | N/A |
| | Programming documentation is supplied in a programming design language declared by the manufacturer..... : | | N/A |
| | Safety related data and safety related segments of the operating sequence are identified and classified according to H.11.12.3 | | N/A |
| | There is a clear relationship between the various parts of the documentation | | N/A |
| H.27.1.2.2 | Class B control function | | N/A |
| H.27.1.2.2.1 | Design and construction requirements | | N/A |
| | A class B control function is designed such that under single fault conditions it remains in or proceeds to the defined state. | | N/A |
| | Software complies with software class B | | N/A |
| | The assessment is performed according to H.27.1.2.2.2 and H.27.1.2.2.3 and under the test conditions and criteria of H.27.1.2.5 | | N/A |
| H.27.1.2.2.2 | First fault | | N/A |
| | Any first fault (see Table H.21) in any one component or any one fault together with any other fault arising from that first fault results in either: | | N/A |
| | a) the control becomes inoperative with all safety related output terminals de-energized or assumes a status in which they ensure a safe situation; or | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | b) the control reacts within the fault reaction time (see Table 1, requirement 91) by proceeding to safety shut-down, or to lock-out, provided that subsequent reset from the lock-out condition under the same fault condition results in the system returning to the lock-out condition; or | | N/A |
| | c) the control continuous to operate, the fault is identified during the next start-up sequence, the result is a) or b); or ..... : | | N/A |
| | d) the control remains operational in accordance with the safety related functional requirements of the relevant part 2..... : | | N/A |
| H.27.1.2.2.3 | Fault introduced during lock-out or safety- shut-down | | N/A |
| | Any first fault (together with any other fault arising from that fault) in any one component (see Table H.21), induced while the control stays in the safety-shut-down or lock-out position, results in either: | | N/A |
| | a) The control remains in safety-shut-down or lock-out, safety related output terminals remaining de-energized; or | | N/A |
| | b) The control becomes inoperative with all safety related output terminals remaining de-energized; or | | N/A |
| | c) the control comes again in operation resulting in a) or b) as mentioned in this clause under the condition that the safety related output terminals are energized not longer than the fault reaction time (see Table 1, requirement 91) | | N/A |
| | If the cause of the original safety shut-down or lock-out condition no longer remains and the control comes in operation again, it operates in accordance with the safety related functional requirements of the relevant part 2 | | N/A |
| | The relevant part 2 specifies the fault reaction time as well as the applicability of c)..... : | | N/A |
| H.27.1.2.3 | Class C control function | | N/A |
| H.27.1.2.3.1 | Design and construction requirements | | N/A |
| | A class C control function is designed such that under first and second fault conditions it remains in or proceeds to the defined state | | N/A |
| | The assessment is performed according to H.27.1.2.3.2, H.27.1.2.3.3 and H.27.1.2.4 and under the test conditions and criteria of H.27.1.2.5. | | N/A |
| H.27.1.2.3.2 | First fault | | N/A |
| | Any first fault (see Table H.21) in any one component or any one fault together with any other fault arising from that first fault results in either: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | a) the control becomes inoperative with all safety related output terminals de-energized or assumes a status in which they ensure a safe situation; | | N/A |
| | b) the control reacts within the fault reaction time (see Table 1, requirement 91) by proceeding to safety shut-down, or to lock-out, providing that subsequent reset from the lock-out condition under the same fault condition results in the system returning to the lock-out condition; | | N/A |
| | c) the control continuous to operate, the fault is identified during the next start-up sequence, the result is a) or b); ..... : | | N/A |
| | d) The control remains operational in accordance with the safety related functional requirements of the relevant part 2. | | N/A |
| H.27.1.2.3.3 | Second fault | | N/A |
| | Any further independent fault considered together with the first fault results in either, H.27.1.2.3.2 a), b), c) or d). During assessment, the second fault has only to be considered to occur | | N/A |
| | a) Either, when a start-up sequence has been performed between the first and the second fault, or | | N/A |
| | b) 24 h after the first fault. | | N/A |
| | Part 2 specifies the applicability of a) or b) and the fault reaction time (Table 1, requirement 91) ..... : | | N/A |
| H.27.1.2.4 | Faults during lock-out or safety- shut-down | | N/A |
| H.27.1.2.4.2 | First fault introduced during lock-out or safety- shut-down | | N/A |
| | Any first fault (together with any other fault arising from that fault) in any one component (Table H.21), induced while the control is staying in the safety-shut-down or lock-out position, results in either: | | N/A |
| | a) The control remaining in safety-shut-down or lock-out, safety related output terminals remaining de-energized or in a status in which they ensure a safe situation; | | N/A |
| | b) The control becoming inoperative with all safety related output terminals remaining de-energized or assuming a status in which they ensure a safe situation; | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | c) The control comes again in operation resulting in a) or b) as mentioned in this clause under the condition that the safety related output terminals are energized not longer than the fault reaction time (Table 1, requirement 91). If the cause of the original safety shut-down or lock-out condition no longer remains and the control comes again in operation, it operates in accordance with the safety related functional requirements of Part 2 and the second fault assessment carried out according to clause H.27.1.2.3.3 | | N/A |
| H.27.1.2.4.3 | Second fault introduced during lock-out or safety- shut-down | | N/A |
| | Any second fault (together with any other fault arising from that fault) in any one component (see Table H.21), induced while the control is staying in the safety shut-down or lock-out position, results in either H.27.1.2.4.2 a), b) or c) ..... : | | N/A |
| | The relevant part 2 specifies the fault reaction time. : | | N/A |
| | It may also specify a different time span in which the second fault does not occur, if different from 24 h ... : | | N/A |
| H.27.1.2.5 | Circuit and construction evaluation | | N/A |
| H.27.1.2.5.1 | Test conditions | | N/A |
| | The fault is considered to have occurred at any stage in the control program sequence | | N/A |
| | The control is operated or considered to operate under the following conditions: | | N/A |
| | a) at the most unfavourable voltage in the range 85 % to 110 % of the rated supply voltage (V) ..... : | | N/A |
| | b) loaded with the most unfavourable load declared by the manufacturer..... : | | N/A |
| | c) in an ambient temperature of (20 ± 5) °C, unless there are significant reasons for conducting the test at another temperature within the manufacturer's declared range; (°C) ..... : | | N/A |
| | d) with any actuating member placed in the most unfavourable position; | | N/A |
| | e) with tissue paper placed on the supporting surface(s) of the control; | | N/A |
| | f) with sparks of about 3 mm in length and having an energy of not less than 0,5 J applied to those components which are likely to liberate flammable gases during the test | | N/A |
| H.27.1.2.5.2 | Test criteria | | N/A |
| | During the appraisal, it is verified that under the conditions described above, the following criteria are satisfied. | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | a) The control does not emit flames, hot metal or hot plastics, the tissue paper does not ignite, no explosion results from the liberation of flammable gases and any flame produced does not continue to burn for more than 10 s after switching off the spark generator | | N/A |
| | When a control is incorporated with any appliance, any enclosure afforded by the appliance is taken into consideration | | N/A |
| | b) If the control continues to function, it complies with Clauses 8 and 13 or Clauses 8 and 13 of the relevant part 2. | | N/A |
| | If it ceases to function, it still continues to comply with Clause 8 or Clause 8 of the relevant part 2 | | N/A |
| | c) There is no loss of protective function | | N/A |
| | After the tests there is no deterioration of the various parts of the control that result in failure to comply with Clause 20 or Clause 20 of the relevant part 2. | | N/A |
| H.27.1.2.5.3 | Assessment | | N/A |
| | A thorough appraisal of the circuit is carried out to determine its performance under the specified fault conditions. This appraisal takes the form of a theoretical analysis and a component failure simulation test | | N/A |
| | Fault simulations may also be carried out to simulate faults within complex devices, e. g. EPROM emulation tests | | N/A |
| | Only the safety related software (software class B and C) as identified in H.27.1.2.1.2 are subjected to further assessment. For class identification, a fault tree analysis used | | N/A |
| H.27.4 | Electronic disconnection: withstands abnormal overvoltage conditions | | N/A |
| H.27.4.1 | - control loaded as indicated in Cl. 17.2; rated voltage (V).....: | | N/A |
| | - control subjected to 1,15 x VR for 5 s during electronic disconnection; test voltage (V) .....: | | N/A |
| H.27.4.2 | - control provides electronic disconnection as determined by the test of H.11.4.16.2 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| J | ANNEX J – REQUIREMENTS FOR CONTROLS USING THERMISTORS | | N/A |
| 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 | | N/A |
| J.6.4.3.3 | According to features of automatic action provide the equivalent of micro-interruption | | N/A |
| J4.3.5.101 | Thermistor evaluated for the function performed in the control. Type 2 tested with thermistor | | N/A |
| | Requirement 64 in table 7.2 observed | | N/A |
| J.6.15.5 | According to construction, addition: control using NTC or PTC thermistors | | N/A |
| J.6.17 | According to use of the thermistor, addition: | | N/A |
| J.6.17.1 | - thermistor control element | | N/A |
| J.6.17.2 | - self-controlled heater | | N/A |
| J.6.17.3 | - thermistor sensing element | | N/A |
| J.7 | Information, addition to Table 1 | | N/A |
| | J61 - according to the use of a thermistor; clause: J6.7; method: X | | N/A |
| | J62 - resistance/temperature characteristics; clauses: J15.7, J17.17.1, J12.2.1; method: X | | N/A |
| | J63 - resistance/temperature characteristics drift; clause: J17.18.2; method: X | | N/A |
| | J64 - Number of cycles; clause: J17.18.2 and J.4.3.5.101; method: X | | N/A |
| | J65 - Method of resistance/temperature measurements; clauses: J15.7, J17.18.1; method: X | | N/A |
| J.12.2.1 | Protection against humid conditions, addition: Type 2 controls using thermistors | | N/A |
| | - resistance/temperature measurements performed before and after the test | | N/A |
| | - resistance/temperature characteristics and drift within the declared limits | | N/A |
| J.15.7 | Manufacturing deviation and drift, addition: resistance/temperature characteristics determined, (indicated in J.12.2.1 and J.17.17) using the method declared (manufacturer) in Table 1, requirement 65 | | N/A |
| J.17 | Endurance, addition: sequence of tests: | | N/A |
| | a) Type 1 controls using thermistors: | | N/A |
| | - Thermal runaway by increased voltage (PTC), J.17.8.5. | | N/A |
| | - Overcurrent test (NTC), J17.18.6 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | b) Type 2 controls using thermistors:<br>1) Resistance/Temperature measurements before and after each of the following | | N/A |
| | - extended cycling, J.17.18.2 | | N/A |
| | - thermal conditioning, J.17.18.3 | | N/A |
| | - cold environmental electrical cycling, J.17.18.4 | | N/A |
| | - thermal runaway (PTC), J.17.18.5 | | N/A |
| | - overcurrent test (NTC), J.17.18.6 | | N/A |
| J.17.17.1 | Compliance, after tests J17.18.1 to J17.18.4: | | N/A |
| | - performance of the control not adversely affected | | N/A |
| | - function as intended and declared | | N/A |
| | Type 2 controls using thermistors, resistance/temperature characteristic(s): | | N/A |
| | - determined as indicated in b) of J.17.17 | | N/A |
| | - as declared, Table 1, requirement 63 | | N/A |
| J.17.17.2 | Compliance after tests J.17.18.5 and J.17.18.6 | | N/A |
| | - control complies with requirements of Cl. 8 and 13 | | N/A |
| | - no emission of flames or expulsion of particles | | N/A |
| J.17.18 | Test conditions: test conducted on 3 samples; identification numbers; number.....: | | N/A |
| J.17.18.1 | Method of resistance/temperature measurement (Table 1, requirement 65):<br>R/T curve established taking into consideration, self-heating, thermal dissipation and voltage effect | | N/A |
| J.17.18.2 | Extended cycling, thermistor subjected to: | | N/A |
| | - number of cycles declared (manufacturer); Table 1, requirement 64; number of cycles.....: | | — |
| | - cycling over the portion of the resistance/ temperature curve used in the application | | N/A |
| | Self-controlled heaters and thermistor control elements cycled electrically | | N/A |
| | - at max. rated voltage (V) .....: | | — |
| | - at max. load conditions .....: | | — |
| | Thermistor sensing elements | | N/A |
| | - Cycled thermally | | N/A |
| J.17.18.3.1 | Unswitched mode, thermal conditioning: | | N/A |
| | - without energizing | | N/A |
| | - temperature just below the step-like change in resistance occurs, resistance/temperature declaration; Table 1, req. 62; temperature (°C) .....: | | N/A |
| | - duration.....: | 1000 h | — |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| J.17.18.3.2 | Switched mode, thermal conditioning: | | N/A |
| | - without energizing | | N/A |
| | - temperature: 30 K above temperature increment in which step-like change occurs; temperature (°C) .: | | N/A |
| | - duration.....: | 1000 h | — |
| J17.18.4 | Cold environmental electrical cycling: | | N/A |
| | - control in a chamber at 0 °C or $T_{min}$ (the lower); temperature (°C) .....: | | N/A |
| | - Thermistor cycled at max. rated electrical conditions | | N/A |
| | - over the significant portion of the resistance/ temperature curve; temperature (°C) .....: | | N/A |
| | - number of cycles .....: | 1000 cycles | — |
| J.17.18.5 | Thermal runaway by increased voltage: | | N/A |
| | - Thermistors energized with max. rated conditions (until thermally stabilized) | | N/A |
| | - voltage increased (appropriate rate: 0.1 times every 2 min) until breakdown occurs or 2 x working voltage is reached; voltage (V) .....: | | N/A |
| J.17.18.6 | Overcurrent test (NTC) | | N/A |
| | - Thermistor to be operated at max. rated conditions (A) (until thermally stabilized) .....: | | N/A |
| | - Current increased (0.1 times every 4 min) until 1.5 times max. working current is reached; current (A) .....: | | N/A |
| J.24.2.1 | Components, addition: thermistors tested under IEC 60738-1, IEC 60738-1-1 or IEC 60539 | | N/A |

| | | |
|---|---|---|
| L | ANNEX L (NORMATIVE) – OVERVOLTAGE CATEGORIES | P |
| | Requirements for overvoltage categories based on IEC 60664-1 considered | P |

| | | |
|---|---|---|
| N | ANNEX N (NORMATIVE) – POLLUTION DEGREES | P |
| | Degrees of Pollution in the micro-environment per Annex N considered | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| P | ANNEX P (NORMATIVE) – PRINTED CIRCUIT BOARD (PCB) COATING PERFORMANCE TEST | | N/A |
| P.2 | PCB base material complies with IEC 60249 series | | N/A |
| P.3 | Electric strength of coating | | N/A |
| | - test conducted after conditioning - Clauses P.3.3 and P.3.4 | | N/A |
| | - based on operational insulation | | N/A |
| | - test voltage per table 12.....: | | N/A |
| P.3.2 | Ageing test: | | N/A |
| | - five samples subjected to 130° C ± 2° C.....: | | N/A |
| | - duration: 1000 hours | | N/A |
| P.3.3 | Humidity Conditioning: | | N/A |
| | - performed on same samples used in Cl. P.3.2 | | N/A |
| | - conditioned in humidity chamber at a temperature of (35 ± 1)° C and (90 ± 5)% relative humidity | | N/A |
| | - duration..... : | 48 hours | — |
| | After conditioning, each sample was subjected to the electric strength test with complying test results | | N/A |
| P.3.4 | Environmental cycle conditioning: | | N/A |
| | - five samples subjected to three complete cycles of conditioning per table P.1 | | N/A |
| | After conditioning, each sample was subjected to the electric strength test with complying test results. | | N/A |
| P.3.5 | After conditioning, each sample wrapped in aluminium foil was subjected to the electric strength test, Cl. P.3.1 between: | | N/A |
| P3.6 | - leads A, B, and C individually and common lead (figure P.1) | | N/A |
| | - no evidence of flashover or breakdown | | N/A |
| Q | ANNEX Q (NORMATIVE) – PRINTED CIRCUIT BOARD COATING PERFORMANCE TEST | | N/A |
| Q.1 | Printed wiring board conforming to requirements for type 1 coating (IEC 60664-3): complies with creepage requirements of Cl. 20, pollution degree 1 | | N/A |
| Q.2 | Printed wiring board conforming to requirements for type 2 coating (IEC 60664-3): complies with requirements for solid insulation, Cl. 20.3 | | N/A |
| Q.3 | Samples: production printed boards or standard test boards (figs. Q.1 and Q.2) used: | | N/A |
| | - Thirteen (13) samples for type 1 | | N/A |
| | - Seventeen (17) samples for type 2 | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| Q.4 + Q5 | Compliance for type 1 or 2 coating: checked by tests of IEC 60664-3, Cl. 5 with test levels or conditions specified in Cl. Q.5 | | N/A |
| T | ANNEX T (NORMATIVE) - REQUIREMENTS FOR SELV AND PELV | | N/A |
| T.2 | Protection against electric shock by SELV or PELV | | N/A |
| T.2.1 | SELV - Protection against electric shock is provided by the following measures | | N/A |
| | – limitation of voltage, ELV according to T.3.1 in a circuit (the SELV-system), and | | N/A |
| | – protective-separation, according to T.3.2, of the SELV-system from all circuits other than SELV and PELV, and | | N/A |
| | – 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 |
| | In special locations where SELV is required and where protective screening according to T.3.2.1 is applied, | | N/A |
| | Separation between protective screen and every circuit by basic insulation rated for the highest voltage present | | N/A |
| | Requirements for the elements of SELV are given in Clause T.3 | | N/A |
| T.2.2 | PELV - Protection against electric shock is provided by the following measures: | | N/A |
| | – 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 | | N/A |
| | – Protective separation according to T.3.2 of the PELV-system from all circuits other than SELV and PELV | | N/A |
| | 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 are bonded to the protective earthing terminal or termination of the control | | N/A |
| | Requirements for the elements of PELV are given in Clause T.3. | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| T.3 | ELV, protective separation, simple separation, protective bonding as elements of SELV and PELV | | N/A |
| T.3.1 | Limitation of voltage provides 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 is achieved by means of: | | N/A |
| | – basic insulation and supplementary insulation, each rated for the highest voltage present, i.e. double insulation, or | | N/A |
| | – reinforced insulation rated for the highest voltage present, or | | N/A |
| | – protective screening according to T.3.2.1 with the protective screen being separated from | | N/A |
| | each adjacent circuit by basic insulation rated for the highest adjacent circuit voltage (see also T.2.1, last paragraph), or | | N/A |
| | – A combination of these provisions. | | N/A |
| | If conductors of different circuits are contained together in a multi-conductor cable or in another grouping of conductors, they are insulated 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 complies 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 is either | | N/A |
| | – through a safety isolating transformer, or | | N/A |
| | – a converter with separate windings providing equivalent insulation and meeting following requirements: | | N/A |
| | Control declared IPX7 was subjected to second fault analysis (item 73 of Table H.1) for the circuits and insulation between windings of the converter and as result of second fault the ELV value of 0 V was not exceeded. The current between the poles of the output complied with H.8.1.10. | | N/A |
| | Compliance is checked by inspection, measurement and when performing the appropriate test(s) in the order of this standard. | | N/A |
| T.3.2.1 | Protective screening consists of a conductive screen interposed between hazardous-live-parts of the control, installation, or system and the part being protected (e.g. a SELV-circuit or a PELV circuit). | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The protective screen is permanently connected to the protective earthing and the connection complies with Clause 9; and | | N/A |
| | – Itself complies with the requirements of Clause 9. | | N/A |
| T.3.3 | Basic insulation is required between SELV- / PELV-circuits and other SELV-/ PELV-systems or earth and is rated for the highest voltage present. | | N/A |
| | Component connected between separated circuits withstands the electric stresses specified for the insulation which it bridges and its impedance limits the prospective current flow through the component to the steady-state current values indicated in H.8.1.10 and H.11.2.5 for protective impedance | | N/A |
| T.3.4 | The requirements for protective bonding (Clause 9 of this standard) met | | N/A |
| | For the installation of controls which consist of parts of the fixed electrical installation of a building, the requirements for protective bonding in IEC standards for installation of buildings apply | | N/A |

| | | | |
|---|---|---|---|
| U | ANNEX U - REQUIREMENTS FOR RELAYS WHEN USED AS CONTROLS IN IEC 60335 APPLIANCES | | N/A |
| U.6.3 | Classification according to their purpose | | N/A |
| U.6.6 | Classification according to method of connection | | N/A |
| U.6.8 | Classification according to protection against electric shock | | N/A |
| U.6.8.4 | For a relay: insulation between coil and contact circuits | | N/A |
| U.6.8.5 | For a relay: insulation between live parts and test function, manual action actuating member | | N/A |
| U.7 | Information | | N/A |
| | 3 - Rated voltage for both coil and contacts (method C) .....: | | N/A |
| | 4 - Nature of supply for both coil and contacts (method C) .....: | | N/A |
| | 88 – Max. intended click rate U.23 (method D) .....: | | N/A |
| U.14 | Heating | | N/A |
| U.14.4 | Replacement: Tests were conducted under following conditions: | | N/A |
| | $U_{Coil}$ × 0,9 + contacts loaded or $I_{Coil}$ × 0,9 + contacts loaded | | N/A |
| | $U_{Coil}$ × 1,1 + contacts loaded or $I_{Coil}$ × 1,1 + contacts loaded | | N/A |
| | $I_{Coil}$ =0 + contacts loaded (N.C. contacts) | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Relays were mounted as specified | | N/A |
| | – PWB connected relays were mounted to PWB if submitted with relays to be tested | | N/A |
| | If not available, relays mounted to plain PWB material, conductors according to Tab 10.2.1 were soldered to PWB pins | | N/A |
| U.17.14 | Endurance - Evaluation of compliance | | N/A |
| | Replacement of second list item as follows: Requirements of Cl. 14, under the conditions stated by U.14.4, for terminals, current carrying parts, and supporting surfaces met (Table 13 Note 1) | | N/A |
| U.17.16 | Test for particular purpose controls | | N/A |
| | Relays were endurance tested according to the following schedule: | | N/A |
| | Ageing test of 17.6 | | N/A |
| | Over-voltage test of automatic action of 17.7 | | N/A |
| | Test of automatic action at accelerated rate of 17.8 | | N/A |
| | Test of automatic action at slow rate of 17.9 | | N/A |
| | Overcurrent test of manual action at accelerated speed of 7.10 | | N/A |
| | Test of manual action at slow speed of 7.11 | | N/A |
| | Test of manual action at high speed of 17.12 | | N/A |
| | Test of manual action at accelerated speed of 17.13 if applicable | | N/A |
| U.20 | Creepage distances, clearances and distances through solid insulation | | N/A |
| | Assessment was conducted with relay energized, de-energized, and manually operated | | N/A |
| U.23 | Electromagnetic compatibility (EMC) requirements – emission | | N/A |
| | Consideration given as to whether EMC requirements are applicable to relays | | N/A |
| | | | N/A |
| U.24 | Components: Relays incorporating electronic components assessed according to Annex H. | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| AA | ANNEX AA - MAXIMUM MANUFACTURING DEVIATION AND DRIFT | | N/A |
| | Allowable deviation and drift | | N/A |
| | Type of control.....: | | — |
| | Temperature range.....: | | — |
| | Maximum allowable deviation from declared operating value | | N/A |
| | % of declared value.....: | | — |
| | Declared value [K].....: | | — |
| | Declared value [°C].....: | | — |
| | Calculated values | | N/A |
| | Minimum operating temperature [°C].....: | | — |
| | Maximum operating temperature [°C].....: | | — |
| | Measured operating values (see clause 15) .....: | | — |
| | Maximum allowable drift from initial measured value | | N/A |
| | % of declared value.....: | | — |
| | Declared value [K].....: | | — |
| | Measured value [°C].....: | | — |
| | Calculated values | | N/A |
| | Minimum operating temperature [°C].....: | | — |
| | Maximum operating temperature [°C].....: | | — |
| | Measured operating values see clause 15.....: | | — |
| | Notes a) through e) observed | | N/A |
| BB | ANNEX BB - TIME FACTOR | | N/A |
| | Method to determine time factor by one of the following methods | | N/A |
| | BB.2: two bath method | | N/A |
| | BB.3: gradient method | | N/A |
| BB.1 | Characteristics and switching point for determination of T | | N/A |
| | Checked in a steady state | | N/A |
| BB.1.1 | Media | | N/A |
| | Working medium.....: | | — |
| | Test medium.....: | | — |
| | Conversion factor .....: | | — |
| BB.1.2 | T measured (as declared) | | N/A |
| | With sheath or bulb | | N/A |
| | Without sheath or bulb | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| BB.1.3 | Velocity of the test medium | | N/A |
| | Fluids: 0.2 - 0.3m/s .....: | | — |
| | Air: 1.0 - 1.5m/s .....: | | — |
| BB.2 | Two bath method | | N/A |
| | Initial steady state temperature, °C.....: | | — |
| | Temperature of the bath, °C.....: | | — |
| | Set temperature of the control, 63.2% of the sudden rise, °C .....: | | — |
| | Time (measured) up to reached output signal (=time factor T).....: | | — |
| | Declared value T, °C .....: | | — |
| | Value of T according to table BB.1 | | N/A |
| BB.3 | Gradient method: | | N/A |
| | Initial steady state temperature, °C .....: | | — |
| | Test bath gradient.....: | | — |
| | Set temperature of the control, °C .....: | | — |
| | Time between reached bath temperature and reached output signal (=time factor T).....: | | — |
| | Declared value T, °C .....: | | — |
| | Value of T according to table BB.1 | | N/A |
| CC | ANNEX CC - NUMBER OF CYCLES | | N/A |
| CC.1 | Independently mounted and in-line cord controls | | N/A |
| | Type of thermal control.....: | | — |
| | Required number of automatic action.....: | | — |
| | Required number of manual action.....: | | — |
| CC.2 | Independently mounted and in-line cord controls (Canada and USA) | | N/A |
| | Type of thermal control.....: | | — |
| | Required number of automatic action.....: | | — |
| DD | ANNEX DD CONTROLS FOR USE IN AGRICULTURAL CONFINEMENT BUILDINGS (normative) | | N/A |
| DD.5 | Pre-Conditioning | | N/A |
| | Wiring, fittings and etc. were supplied and their openings were sealed | | N/A |
| DD.7.1 | Moist carbon dioxide - sulphur dioxide - air mixture test | | N/A |
| | One sample for 10 days | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | One sample for 30 days | | N/A |
| | 1% of volume of carbon dioxide per day | | N/A |
| | 1% of volume of sulphur dioxide per day | | N/A |
| | Previous day's mixture purged | | N/A |
| | 8 days during 10 day exposure and 2 days during 30 day exposure | | N/A |
| | 10 ml of water per 0.003$m^3$ of chamber volume maintained at bottom of chamber | | N/A |
| | Temperature of test chamber maintained at (35±2)°C | | N/A |
| DD.7.2 | Moist hydrogen sulphide - air mixture test | | N/A |
| | One sample for 10 days | | N/A |
| | One sample for 30 days | | N/A |
| | 1% of volume of hydrogen sulphide per day | | N/A |
| | Previous day's mixture purged | | N/A |
| | 8 days during 10 day exposure and 2 days during 30 day exposure | | N/A |
| | 10 mL of water per 0.003$m^3$ of chamber volume maintained at bottom of chamber | | N/A |
| | Temperature of test chamber maintained at (25±2)°C | | N/A |
| DD.7.3 | Moist ammonia - air mixture tests | | N/A |
| | One sample for 10 days | | N/A |
| | One sample for 30 days | | N/A |
| | Ammonium hydroxide-water solution with concentration of 1% by volume ammonia vapour above the solution | | N/A |
| | Remaining vapour of air and water | | N/A |
| | Solution not replaced or replenished | | N/A |
| | Temperature of test chamber maintained at (35±2)°C | | N/A |
| DD.7.4 | Urea - water vapour test | | N/A |
| | One sample for 10 days | | N/A |
| | One sample for 30 days | | N/A |
| | Saturated urea-water solution, excess crystals in 10 mL of water per 0,003 $m^3$ of chamber volume | | N/A |
| | Solution not replaced or replenished | | N/A |
| | Temperature of test chamber maintained at (35±2)°C | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| DD.7.5 | Warm humid air test | | N/A |
| | One sample for 10 days | | N/A |
| | One sample for 30 days | | N/A |
| | The humidity of the test chamber is maintained at (98 ± 2) % | | N/A |
| | Temperature of test chamber maintained at (60±1)°C | | N/A |
| DD.7.6 | Disinfectant - germicide - water mixture exposure test | | N/A |
| | One sample for 1300 cycles | | N/A |
| | Intermittent spraying and drying of disinfectant germicide-water mixture, 10 min spray and 50 min no spray | | N/A |
| | Temperature of test chamber maintained at (35±1)°C | | N/A |
| | Dairy disinfectant-germicide concentration of 7.8 ml per litre of water | | N/A |
| | Disinfectant-germicide composed of 15% dimethyl ammonium compounds and 85% inert ingredients | | N/A |
| DD.7.7.1 | Dust penetration test | | N/A |
| | One sample, IEC 60529, first numeral 5 | | N/A |
| | Category 1 or Category 2.....: | | — |
| DD.7.7.2 | Dust heating, abnormal test | | N/A |
| | Controls with heat generating components, mounted and electrically connected as intended. | | N/A |
| | Wheat and cord dust passed through 0.075 mm mesh width screen | | N/A |
| | Chamber temperature $T_{max}$ or 40°C .....: | | — |
| | Rated voltage and current until temperature stability | | N/A |
| DD.8 | Recovery: Samples rinsed with water and allowed to dry at room temperature | | N/A |
| DD.9 | General evaluation | | N/A |
| DD.9.1 | Gaskets and other enclosure sealing materials not deteriorated excessively | | N/A |
| | External adjustments and other mechanisms remain operable | | N/A |
| | Each corrosive exposure test without undue corrosion which may affect integrity of enclosure | | N/A |
| DD.9.2 | Each sample complies with Clause 8, Sub-clause 17.5 and Clause 20 after the overvoltage test of 17.1.3.1 conducted at room temperature | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | In Canada and the USA, the overvoltage test replaced by an overload test | | N/A |
| DD.9.3 | For the test of DD.7.7.1, dust did not enter the enclosure | | N/A |
| DD.9.4 | For test of DD.7.7.2, the temperatures specified in Clause 14 were not exceeded by more than 15 K. | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| 8.3.2 | TABLE: Risk of electric shock test | | N/A |
| trial # | Total ($V_{TOTAL}$) (V)..... : | | — |
| | Average ($V_{TOTAL}$ /10) ..... : | | — |
| | Voltage between pins ($V_{RMS}$) | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Supplementary information: | | | |

| 10.1.9.1 | TABLE: Terminal clamping | | | | | | N/A |
|---|---|---|---|---|---|---|---|
| terminal No. | applied torque | fixed wiring | | flexible conductor | | pull force | movement |
| | (Nm) | smallest (mm) | largest (mm) | smallest (mm) | largest (mm) | (N) | (Yes/No) |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Supplementary information: | | | | | | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 10.2.1 | TABLE: Connectable conductors | | P |
|---|---|---|---|
| terminal No. | nominal current (A) | cross-sectional area ($mm^2$) | |
| Tab terminal | 10/16 | 1/1.5 | |
| —— | | | |
| —— | | | |
| —— | | | |
| Supplementary information: | | | |

| 10.2.4.3 | TABLE: Axial push and pull test | | | P |
|---|---|---|---|---|
| tab identification | size (mm x mm) | axial push (N) | axial pull (N) | result code |
| —— | 6.3 x 0.8 | 80 | 70 | ND |
| —— | 4.8 x 0.8<br>4.8 x 0.5 | 60 | 50 | ND |
| —— | | | | |
| —— | | | | |
| Supplementary information: ND - No Displacement / Dama, D - Displacement / Damage | | | | |

| 11.7.1.2.1 | TABLE: Flexing test | | | | | N/A |
|---|---|---|---|---|---|---|
| flexible cords used in product | No. of conductors in cord | rated current (A) | rated voltage (V) | No. of flexings | flexing rate per minute | % broken |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Supplementary information: | | | | | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | |
|---|---|---|
| 11.7.2.9 | TABLE: Push test (option –T /-TP) | N/A |

| cord identification | cross-sectional area ($mm^2$) | torque applied on terminals (Nm) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| Supplementary information: | | |

| | | |
|---|---|---|
| 11.7.2.11+ 11.7.2.12 | TABLE: Pull test | N/A |

| control type | pull (N) | No. of pulls applied | torque (Nm) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| | | |
|---|---|---|
| 12.3 | TABLE: Leakage current test (for in-line cord and free -standing controls) | N/A |

| circuit identification | position of switch S1 | class of control | required leakage current; (mA) | measured leakage current; (mA) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Supplementary information: | | | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 13.2 | TABLE: Electric strength test | | | | | P |
|---|---|---|---|---|---|---|
| test location / circuit | | type of insulation | type/model | working voltage; (V) | test voltage; (V) | No flashover/ breakdown |
| Between the live part and the metal part | | Basic insulation | KSD1 180°C/160°C KSD1 50°C/-10°C | 250 | 1450 | No flashover |
| —— | | | | | | |
| —— | | | | | | |
| —— | | | | | | |
| —— | | | | | | |
| —— | | | | | | |
| Supplementary information: | | | | | | |

| 13.3.3 | TABLE: Leakage current of in-line cord and free-standing controls | | | | N/A |
|---|---|---|---|---|---|
| circuit identification | position of switch S1 | class of control | Max. leakage current (mA) | Measured current (mA) | |
| —— | —— | —— | —— | —— | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Supplementary information: —— | | | | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 14.6 + 14.7 | TABLE: Heating test | | P |
|---|---|---|---|
| thermocouple locations | Max. temperature measured, (°C) | temperature limit (°C) | Verdict |
| Tab terminals | 174.8 (max.) | 400 | P |
| -—— | | | |
| —— | | | |
| Supplementary information: Model: KSD1 180°C/160°C | | | |

| 15.2 a) | TABLE: Manufacturing deviation Model: KSD1 180°C /160°C | | | | P |
|---|---|---|---|---|---|
| condition | sample Nos. | declared values | | measured values | |
| | | open | close | open | close |
| —— | 4# | 180 °C±5 °C | 160 °C±5 °C | 179.6 °C | 160.8 °C |
| —— | 5# | 180 °C±5 °C | 160 °C±5 °C | 179.3 °C | 161.2 °C |
| —— | 6# | 180 °C±5 °C | 160 °C±5 °C | 179.5°C | 160.5 °C |
| Supplementary information: Manufacturing deviation 0.3℃ / 0.7 (max.) | | | | | |

| 15.2 b) | TABLE: Manufacturing drift | | | | P |
|---|---|---|---|---|---|
| Condition | Sample No. | Measured values ( deviation ) from as Received condition | | Measured values ( drift ) | |
| | | open | close | open | close |
| After Environmental Stress test | 4# | 180.3℃ | 161.1 °C | +0.7℃ | +0.3℃ |
| | 5# | 180.2℃ | 161.3 °C | +0.9℃ | +0.1℃ |
| | 6# | 180.2℃ | 160.8 °C | +0.7℃ | +0.3℃ |
| After Endurance test ( $T_{max}$ ) | 4# | 180.9℃ | 161.6 °C | +1.3℃ | +0.8℃ |
| | 5# | 180.7℃ | 161.8 °C | +1.4℃ | +0.6℃ |
| | 6# | 181.2℃ | 161.5 °C | +1.7℃ | +1.0℃ |
| After Endurance test ( $T_{min}$ ) | —— | —— | —— | —— | —— |
| Supplementary information: | | | | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 17.2.1 | TABLE: Circuits loaded according to declared ratings | | | | | P |
|---|---|---|---|---|---|---|
| circuits | | a.c./ d.c. | voltage $U_R$ (V) | current (A) | time constant (ms) / power factor (cos ϕ) | |
| substantially resistive (6.2.1), making and breaking | | a.c. | 250 | 16 (max.) | cos ϕ=0.95 | P |
| resistive or inductive (6.2.2), making | | | | | | |
| resistive or inductive (6.2.2), breaking | | | | | | |
| declared specific load (6.2.3), making | | | | | | |
| declared specific load (6.2.3), breaking | | | | | | |
| 20 mA load (6.2.4), making and breaking | | | | | | |
| declared motor load (6.2.5), making | | | | | | |
| declared motor load (6.2.5), breaking | | | | | | |
| pilot duty load (6.2.6), making | | | | | | |
| pilot duty load (6.2.6), breaking | | | | | | |
| Supplementary information: | | | | | | |

| 17.5.1 | TABLE: Dielectric strength | | | P |
|---|---|---|---|---|
| insulation or disconnection tested | | test potential applied between the following circuits | test voltage applied (V) | flashover/ breakdown |
| Basic insulation | | Between the live part and the metal part | 1088 | NO |
| —— | | —— | —— | —— |
| —— | | —— | —— | —— |
| —— | | —— | —— | —— |
| Supplementary information:—— | | | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 18.2.1 | TABLE: Impact resistance | | N/A |
|---|---|---|---|
| impacts per surface | surface tested | impact energy ( Nm ) | — |
| ——— | ——— | ——— | ——— |
| ——— | ——— | ——— | ——— |
| ——— | ——— | ——— | ——— |
| Supplementary information: | | | |

| 19.1.15 | TABLE: Threaded part torque test | | | N/A |
|---|---|---|---|---|
| threaded part identification | diameter of thread (mm) | column number ( I, II, or III) | Torque (Nm) | — |
| ——— | ——— | ——— | ——— | — |
| ——— | ——— | ——— | ——— | — |
| ——— | ——— | ——— | ——— | — |
| ——— | ——— | ——— | ——— | — |
| ——— | ——— | ——— | ——— | — |
| Supplementary information: | | | | |

| IEC 60730-2-9 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| 20 | TABLE: Creepage distance and clearance measurements | | P |
| | requirements creepage distance and clearance met | | |
| | supply working voltage (V) ..... : | 250 V | — |
| | overvoltage category ..... : | II | — |
| | rated impulse voltage according to table 20.1(V) ..... : | 2.5kV | — |
| | requirements for case B (20.1.7, 20.1.12) met (cl. 20.1, Note 2) ..... : | | |

| creepage distance Cd and clearance Cl across (type of insulation) | nominal Volt. (V) | pollution degree | required Cd (mm) | Cd (mm) | required Cl (mm) | Cl (mm) |
|---|---|---|---|---|---|---|
| Between the live part and the metal part (B) | 250 | 2 | 2.5 | ＞3.0 | 1.5 | ＞3.0 |
| —— | —— | —— | —— | —— | —— | —— |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| full disconnection | | | | | | |
| micro-disconnection | | | | | | |
| electronic disconnection | | | | | | |

Abbreviations for types of insulation:

OP: operational S: supplementary
B: basic R: reinforced

| IEC 60730-2-9 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 21 | TEBLE: Resistance to heat fire and tracking | P |
|---|---|---|

| **Specimen** | | | | **Ball pressure** | | | **Glow wire** | | **Tracking test** | |
|---|---|---|---|---|---|---|---|---|---|---|
| Description | | Material | Colour | Temp | Imprint | OK? | Temp | OK? | Voltage | OK? |
| | | | | ϑ[°C] | ∅mm | | ϑ[°C] | | U[V] | |
| 1 | BASE | Phenolic resin (Bakelite) | Black | 220 | 1.2 | √ | 850 | √ | 175 | √ |
| 2 | --- | --- | --- | -- | -- | -- | -- | -- | -- | -- |
| 3 | --- | --- | --- | --- | -- | -- | -- | -- | -- | -- |
| 4 | --- | --- | --- | --- | -- | -- | -- | -- | -- | -- |

Supplementary information: Sample maximum operating temperature:180 °C Tb=(Tmax.+40°C)=220 °C

| 24.1 | TABLE: Transformers supplying external SELV circuit | N/A |
|---|---|---|

| secondary winding tested | maximum output voltage (V) | maximum output current (A) | maximum power (VA) |
|---|---|---|---|
| —— | —— | —— | —— |
| | | | |
| | | | |
| | | | |
| | | | |

Supplementary information:

| IEC 60730-2-9 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 24.1 / 24.2 | TABLE: Components | | | | N/A |
|---|---|---|---|---|---|
| object/part No. | manufacturer/ trademark | type/model | technical data | standard | mark(s) of conformity[1]) |
| ——— | ——— | ——— | ——— | ——— | ——— |
| | | | | | |
| | | | | | |
| | | | | | |
| 1) an asterisk indicates a mark which assures the agreed level of surveillance | | | | | |

| 27.2.3 | TABLE: Blocked output test | | | N/A |
|---|---|---|---|---|
| Thermocouple locations | Max. temperature measured, (°C) | | Temperature limit, (°C) | — |
| | 2nd hour | 24th hour | | |
| ——— | ——— | ——— | ——— | ——— |
| | | | | |
| Supplementary information: | | | | |

| 27.3 | TABLE: Over-voltage and under-voltage test | | | | N/A |
|---|---|---|---|---|---|
| Test | operating condition | rated voltage (V) | test voltage 85/110% (V) | temperature (°C) | — |
| Over-voltage transformer | $T_{max}$ | | | | |
| Under-voltage transformer | $T_{max}$ | | | | |
| Over-voltage valve | $T_{min}$ | | | | |
| Under-voltage valve | $T_{min}$ | | | | |
| Supplementary information: | | | | | |

| IEC 60730-2-9 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| H.26.5 | TABLE: Voltage dips and interruptions | | | | | | N/A |
|---|---|---|---|---|---|---|---|
| comment codes trials | | | operating condition | voltage dip | voltage interruption | test voltage | rated voltage | — |
| 1 | 2 | 3 | | (%) | (%) | (V) | (V) | — |
| | | | | 30 | | | | |
| | | | | 60 | | | | |
| | | | | — | 100 | | | |
| | | | | — | 100 | | | |
| Supplementary information: | | | | | | | | |

| H.26.5.4 | TABLE: Voltage variation test | | | | | | | N/A |
|---|---|---|---|---|---|---|---|---|
| comment codes trials | | | operating condition | Rated voltage | Test voltage | Voltage variation | duration | — |
| 1 | 2 | 3 | | (V) | (V) | (%) | (s) | |
| | | | | | | 100 | | |
| | | | | | | 40 | | |
| | | | | | | 40 | | |
| | | | | | | 100 | | |
| | | | | | | 100 | | |
| | | | | | 0 | 0 | | |
| | | | | | 0 | 0 | | |
| | | | | | | 100 | | |
| Supplementary information: | | | | | | | | |

| IEC 60730-2-9 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| H27.1 | TABLE: Electrical / electronic component fault modes | | | | | | | | | | N/A |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Component | short circuiting | open circuit | a) No flames | b) 1.5 x max temp. of Cl. 14 | c) as declared (H57) | d) protect. against el. shock | d) electric strength, insulation | e) creepage and clearance | f) no rupture of ext. fuses or | f) complies with a), b) and d) | g) as declared in H58 |
| | | | | | | | | | | | |
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| Supplementary information: | | | | | | | | | | | |

**List of test equipment used:**

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to TMP/CTF stage 1 or WMT/CTF stage 2 procedure has been used.

| Clause | Measurement / testing | Testing / measuring equipment / material used, (Equipment ID) | Range used | Calibration due date |
|---|---|---|---|---|
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |
| — | — | — | — | — |

**Material list:**

| Object / part No. | Manufacturer/ trademark | Type / model | Technical data | Mark(s) of conformity |
|---|---|---|---|---|
| Metal Cap | Changshu jiangnan ele-compoent Factory | LY12 or Stainless Steel | -- | -- |
| | Changshu Hongzhou electronic equipment co.,ltd. | | | |
| | Changshu ChengAn Electric Appliance Part Factory | | | |
| | Wuxi Longqiba Electric Appliance Part Factory | | | |
| | Ruian Fuhai Electric Appliance Part Factory | | | |
| Thermal Disc | Changshu jiangnan elec-component Factory | BR;BH;BL or TB or FPA | -- | -- |
| | Neomax Materials Co.,Ltd | | | |
| | Sumitomo Metal Industries, Ltd | | | |
| | Foshan Electrical Precision Alloy Co.,Ltd | | | |
| | Shanghai Sumsion Special Metals Co.,Ltd | | | |
| Top Cap | Changshu YueJin elec-component Factory | Phenolic resin （Backlite） | -- | -- |
| | Suzhou Yafeng Plastic Electrical Co., Ltd | | | |
| | Ningbo Fanglong Electric Co.,Ltd. | | | |
| Contact Piece | Changshu jiangnan elec-component Factory | H62 | -- | -- |
| | Changshu Hongzhou electron equipment co.,Ltd | | | |
| | Changshu ChengAn Electric Appliance Part Factory | | | |
| | Ruian Fuhai Electric Appliance Part Co.,Ltd | | | |
| Push rod | Changshu Xuxin Electronics Co.,Ltd | ceramic | -- | -- |
| | Changshu DongZhang Electronic Appliance part factory | | | |
| | Shuyang Yongtai Precision Ceramics Factory | | | |
| Rivert | Wujin Yongfeng Alloy Connector Factory | Red copper | -- | -- |
| | Changshu jiaji elec-component Factory | | | |
| | Yangzhou Chengchun Electrical Co., Ltd | | | |
| Terminal (Tab) | Changshu jiangnan elec-component Factory | H62 (Plated Steel or H62) | -- | -- |
| | Changshu Hongzhou electron equipment co.,Ltd | | | |
| | Changshu ChengAn Electric Appliance Part Factory | | | |
| | Wuxi Longqiba Electric Appliance Part Factory | | | |
| | Ruian Fuhai Electric Appliance Part Co.,Ltd | | | |

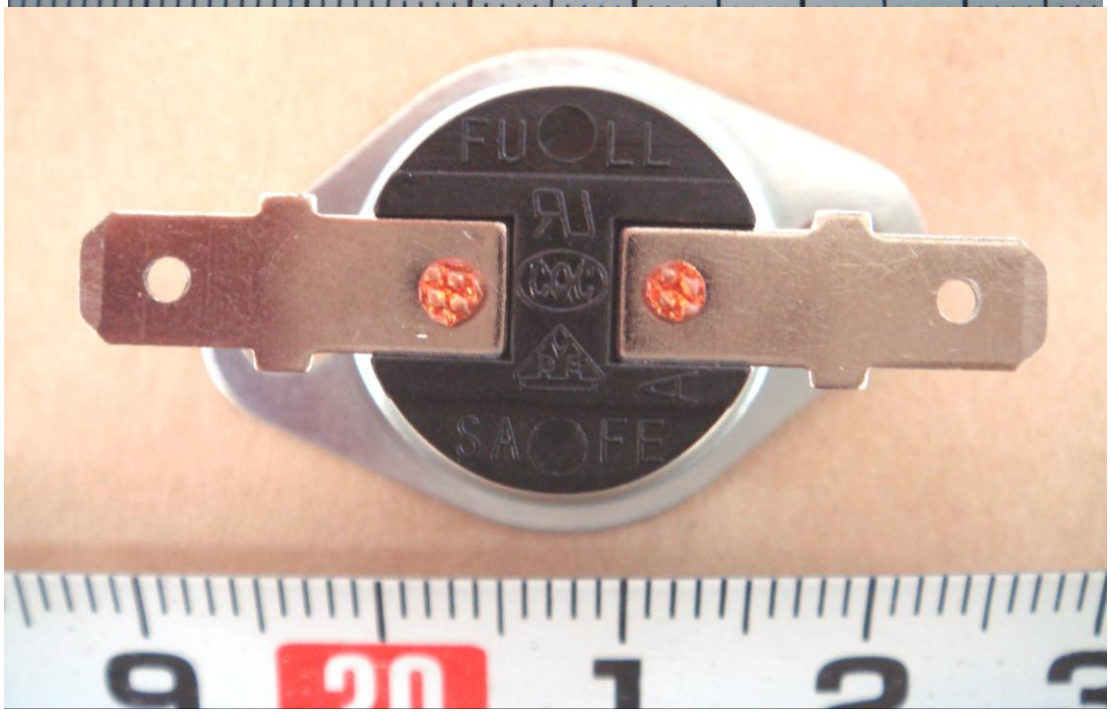
**Material list: (**Continued)

| Object / part No. | Manufacturer/ trademark | Type / model | Technical data | Mark(s) of conformity |
|---|---|---|---|---|
| Terminal (Tab) | Changshu DongZhang Electronic Appliance part factory | H62 (Plated Steel or H62) | -- | -- |
| Spring Piece | Changshu jiangnan elec-component Factory | BeCu 07-HT or QBe or C17410 | -- | -- |
| | Changshu Hongzhou electron equipment co.,Ltd | | | |
| | Changshu ChengAn Electric Appliance Part Factory | | | |
| | Ruian Fuhai Electric Appliance Part Co.,Ltd | | | |
| Silver Contact | Ningbo Shenle Company | AgNi(10)Cu | -- | -- |
| | Ningbo JiangBei KeHua Electro-Dopant Factory | | | |
| | Ningbo Jiangbei Huachang Electrical Factroy | | | |
| | Foshan Electrical Precision Alloy Co.,Ltd | | | |
| | Wujiang Dongfeng Electrical Alloy Co.,Ltd | | | |
| | Jiangyin Jinlijia Electric Appliance Co.,Ltd | | | |
| Shell (BASE) | Changshu YueJin elec-component Factory | Phenolic resin （Backlite） | -- | -- |
| | Suzhou Yafeng Plastic Electrical Co., Ltd | | | |
| | Ningbo Fanlong Electrical Co.,Ltd. | | | |
| Rotator (Movable mounting base) | Changshu jiangnan elec-component Factory | Plated Steel | -- | -- |
| | Changshu Hongzhou electron equipment co.,Ltd | | | |
| | Changshu ChengAn Electric Appliance Part Factory | | | |
| | Ruian Fuhai Electric Appliance Part Co.,Ltd | | | |

| IEC 60 730-2-9 |
| --- |
| Remarks |

Sample photo:

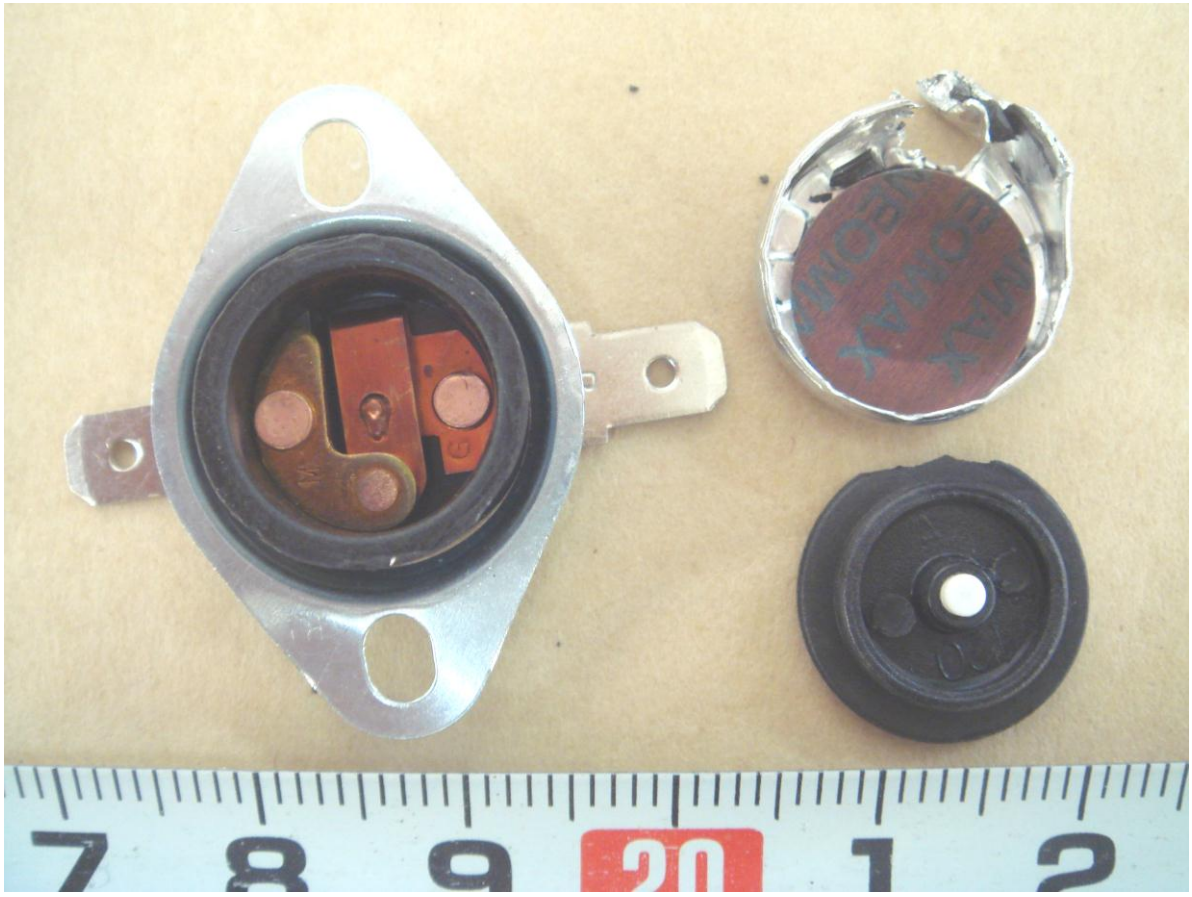



KSD1 180℃/160℃、KSD1 5℃/-10℃ Sample appearance and identification Structure

| IEC 60 730-2-9 |
| --- |
| Remarks |

Sample photo:



Sample Internal structure