# TECHNICAL CONSTRUCTION FILE

## EN 60947-6-1:2005+A1:2014

## Low-voltage switchgear and controlgear —Part 6-1: Multiple function equipment — Transfer switching equipment

**Report**

| | |
|---|---|
| Report reference No……: | TLZJ19061718620 |
| Tested by (+signature)……..: | Stephen Zhang |
| Reviewed by (+signature)……..: | Kosco Yu |
| Approved by (+ signature)…… : | Kosco Yu |
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**Testing laboratory**

| | |
|---|---|
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| Testing location.....: | Same as above |

**Client**

| | |
|---|---|
| Name .....: | ZHEJIANG GEYA ELECTRICAL CO.,LTD |
| Address .....: | Wenzhou Bridge Industrial Zone, Beibaixiang Town, Yueqing, Zhejiang, China. |

**Test specification**

| | |
|---|---|
| Standard.....: | EN 60947-6-1:2005+A1:2014 |
| Test procedure .....: | CE-LVD |
| Procedure deviation.....: | N.A. |
| Non-standard test method.....: | N.A. |

**Test report form/blank test report**

| | |
|---|---|
| Test report form No…… | EN 60947-6-1 |
| TRF modified by…… | Shanghai Global Testing Services Co., Ltd |
| Master TRF……..: | PS_INFO\2-ELS.MES\REPORTS\CCA |
| Copyright blank test report……: | This report is based on a blank test report prepared by **Shanghai Global Testing Services Co., Ltd** using information obtained from the TRF originator. |

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|---|---|
| **Test item** | |
| Type of test object ……..: | W2R Series Automatic Transfer Swith（ATSE） |
| Trademark ……..: | / |
| Test model and/or type reference……: | W2R, W2R-63,W2R-100 |
| Manufacturer…….. | ZHEJIANG GEYA ELECTRICAL CO.,LTD |
| Address ..... : | Wenzhou Bridge Industrial Zone, Beibaixiang Town, Yueqing, Zhejiang, China |
| Rated ……..: | Ue:AC690V;Ui：400V |
| Equipment mobility……..……..: | / |
| Duty Class……..: | / |
| Rated Speed……..: | / |
| Thermal class……..: | / |
| Type cooling……..: | / |
| Primary coolant……..: | No |
| Maximum ambient air temperature(℃）…: | / |
| Altitude above seal level(m) ……: | / |
| IP degree of machine……..: | / |
| Mass of equipment(Kg)……..: | / |
| Secondary coolant……..: | / |
| Operating condition ……..: | Continuous |
| Tested for IT power systems : | No |
| IT testing, phase-phase voltage (V) : | N.A. |
| Class of equipment : | / |
| **Testing** | |
| Date of receipt of test item……..: | 2019-6-20 |
| Date(s) of performance of test…..: | 2019-6-20 to 2019-7-2 |

| **Possible test case verdicts** | |
|---|---|
| Test case does not apply to the test object..... : | N(.A.) |
| Test object does meet the requirement..... : | P(ass) |
| Test object does not meet the requirement..... : | F(ail) |

**General remarks**

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

**Brief description of the tested sample(s):**

Ambient temperature :20℃~25℃， humidity:50%~55%RH

Complete test was conducted on **W2R-100 .** Ue:AC690V;Ui：400V

**W2R, W2R-63,W2R-100 are the same series products.**

Ue:AC690V;

Ui：400V；

In：16A、20A、25A、32A、40A、50、63A；

Number of poles：2极、3P、4P

Iq：50kA；

Uimp：8kV；

Rated frequency：50/60Hz

Utilization category：AC-33iB、AC-31B

A representative sample of the product covered by this report has been tested and complies with the applicable requirements of this standard.

**Copy Of Marking Plate:**

| EN 60947-6-1 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| 4 | Classification | | P |
| | Data which may be used as criteria for classification are given in 5.2. | Pass muster | P |
| | a) their short-circuit capability(EN 60947-6-1) | | P |
| | class PC: TSE that is capable of making and withstanding, but is not intended for breaking short-circuit currents(EN 60947-6-1) | | N |
| | class CB: TSE that is capable of making, withstanding and is intended for breaking short-circuit currents and is provided with over-current releases(EN 60947-6-1) | | N |
| | class CC: TSE that is capable of making and withstanding, but is not intended for breaking(EN 60947-6-1) | | P |
| | b) the method of controlling the transfer: | | P |
| | manually operated switching equipment(EN 60947-6-1) | | N |
| | !remotely" operated switching equipment(EN 60947-6-1) | | N |
| | automatic transfer switching equipment(EN 60947-6-1) | | P |
| 5 | Characteristics | | P |
| 5.1 | Summary of characteristics | | |
| | –Type of equipment (5.2); (EN 60947-6-1) | | P |
| | –Rated and limiting values for the main circuit (5.3); (EN 60947-6-1) | | P |
| | -rated electrical values of protection systems | | P |
| | – utilization categories (5.4); (EN 60947-6-1) | | P |
| | -rated electrical values of characteristic variation thermal detectors(EN 60947-6-1) | | P |
| | – control circuits (5.5); (EN 60947-6-1) | | P |
| | – auxiliary circuits (5.6); (EN 60947-6-1) | | P |
| | Where the TSE uses IEC 60947 products, the relevant characteristics from those standards may also be additionally used | | P |
| 5.2 | Type of CPS | | P |
| 5.2.1 | Class and transfer control method of the equipment(EN 60947-6-1) | | P |
| 5.2.2 | Number of poles(EN 60947-6-1) | | P |
| | Rated detector operating temperature | | --- |
| 5.2.3 | Kind of current (a.c. or d.c.) (EN 60947-6-1) | A.C | P |
| 5.2.4 | operating sequence(EN 60947-6-1) | motor operated | P |
| 5.2.5 | Method of control | automatic | P |
| 5.2.6 | Method of resetting after overload | | P |
| 5.2.7 | Method of rearming after short-circuit | | P |
| | Short-circuit detection within the sensor circuit | | P |
| 5.3 | Rated and limiting values of the main circuit | | P |

| EN 60947-6-1 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | These values shall be stated in accordance with 5.3.1 to 5.3.6 but it may not be necessary to establish all the values listed. | | P |
| 5.3.1 | Rated voltages | | P |
| 5.3.2 | Currents and powers | | P |
| | A CPS is defined by the following currents and powers: | | P |
| | – conventional free air thermal current (*I*th): | | P |
| | – conventional enclosed thermal current (*I*the): | | P |
| | – rated operational currents (*I*e) | | N |
| 5.3.3 | Rated frequency | 50/60Hz | P |
| 5.3.4 | Rated duties | | P |
| 5.3.5 | Normal load and overload characteristics | | P |
| 5.3.5.1 | The rated making and breaking capacities are the values of current, stated by the manufacturer, which the transfer equipment can satisfactorily make and break under specified conditions. Unless stated otherwise, they are given in terms of a steady state current value. During the making operation, the peak value of the current on contact closing may be higher than the peak value of the steady state current depending on the characteristics of the test circuit (load) and the instant of closing on the voltage wave(EN 60947-6-1) | | P |
| 5.3.6 | Short circuit characteristics | | P |
| 5.3.6.1 | Rated short-time withstand current (*I*cw)(EN 60947-6-1) | | P |
| 5.3.6.2 | Rated short-circuit making capacity (*I*cm) (EN 60947-6-1) | | P |
| 5.3.6.3 | Rated short-circuit breaking capacity (*I*cn) (EN 60947-6-1) | | P |
| 5.3.6.4 | Rated conditional short-circuit current(EN 60947-6-1) | | P |
| 5.4 | Utilization categories | | P |
| | The utilization category of an equipment defines the intended application and shall be specified in the relevant product standard; it is characterized by one or more of the following service conditions: Examples of utilization categories for low-voltage switchgear and controlgear are given in Annex A. | | P |
| 5.5 | Control circuits | | P |
| 5.5.1 | Electro-mechanical devices controlling the main circuit | | P |
| | – kind of current; | AC | P |
| | – rated frequency if a.c.; | AC | P |
| | – rated control circuit voltage Uc (nature, and frequency if a.c.); | See instruction | P |

| EN 60947-6-1 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | – rated control supply voltage Us (nature, and frequency if a.c.), where applicable. | See instruction | P |
| | The minimum and maximum values of voltage or voltage and frequency operating limits shall be stated by the manufacturer. These limits shall correspond to the limits for the transfer control devices(EN 60947-6-1) | | |
| 5.5.2 | Transfer control devices(EN 60947-6-1) | | P |
| | The manufacturer shall state the following: | | --- |
| | a) the voltage and frequency deviations at which transfer should occur(EN 60947-6-1) | | P |
| | !b) the contact transfer time and the off time range for all TSE(EN 60947-6-1) | | P |
| | c) the operating transfer time and the return transfer time range for ATSE(EN 60947-6-1) | | P |
| | The tolerance of the voltage frequency deviations and of the times shall be speci□ ed by the manufacturer but no more than ±10 %. If the time value is lower than 1 s, the manufacturer shall state the tolerances(EN 60947-6-1) | | P |
| 5.6 | Auxiliary circuits | | P |
| | The characteristics of auxiliary contacts and switches shall comply with the requirements of the above standard. | Pass muster | P |
| 5.7 | Types of relays or releases | Not this appliance | N |
| | The following characteristics of relays and releases shall be stated in the relevant product standard, | | N |
| 5.8 | Integral fuses (integrally fused circuit-breakers) | | N |
| 5.9 | Switching overvoltages | | P |
| | The manufacturer shall specify the maximum value of switching overvoltages caused by the operation of the switching device, when required by the product standard. | According with requirement of standard | P |
| 6 | Product information | | |
| 6.1 | Nature of the information | Pass muster | P |
| | The following information shall be given by the manufacturer concerning: | | P |
| | Identification | | P |
| | a) The manufacturer's name or trademark | | P |
| | b) Type designation or serial number | | P |
| | c) Number of this part , if the manufacturer claims compliance | | P |
| | d) class of equipment: PC, CB or CC; (EN 60947-6-1) | | P |
| | e) rated operational voltage(s); (EN 60947-6-1) | | P |
| | f) utilization category and rated operational current at the rated operational voltage(EN 60947-6-1) | | P |

| EN 60947-6-1 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | g) either value of the rated frequency, (EN 60947-6-1) | 50-60Hz | P |
| | h) rated short-circuit making capacity for class PC | | P |
| | i) rated short-time withstand current, where applicable; | | P |
| | j) rated conditional short-circuit current and associated SCPD | | P |
| | k) rated short-circuit making and breaking capacities for Class CB | | P |
| | l) number of main contact positions | | P |
| | m) monitored supply deviation and operating limits | | N |
| | n) operating sequence time data according to 5.5.2 b), time delays and their position in the operating sequence if any | | N |
| | o) rated impulse withstand voltage | | P |
| | p) environment A or B. | | P |
| | q) special requirements | | P |
| | r) length of insulation to be removed before insertion of the conductor into the terminal | | P |
| | s) maximum number of conductors which may be clamped | | P |
| | t) for non-universal screwless terminals: | | P |
| | “s” or "sol" for terminals declared for rigid-solid conductors | | P |
| | "r" for terminals declared for rigid (solid and stranded) conductors | | P |
| | "f" for terminals declared for flexible conductors | | P |
| | u) switching position of the TSE | | P |
| | v) Environment A or environment B | | P |
| | w) Special requirements, if applicable, for example shielded or twisted conductors | | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | c) number of this standard.<br>Additional marking of Mark A control units:<br>The control unit shall be marked with the letter “A” additional to the number of this standard.<br>*Characteristics, basic rated values and utilization*<br>d) rated control supply voltage (*U*s);<br>e) rated frequency of control supply voltage;<br>f) operational voltage (*U*e) of the control unit;<br>g) operational current (*I*e) of the control unit;<br>h) utilization category, or making and breaking capacities;<br>i) a circuit diagram which specifies the terminal marking and the connections of the detectors, the control unit and the supply;<br>j) rated insulation voltage (*U*i) of the control circuit;<br>k) type of thermal detectors with which the control unit is to be used and, if applicable, the rated voltage (*U*r) of the detector circuit;<br>l) IP code in case of an enclosed equipment;<br>m) the equipment class according to the EMC emission levels and the specific requirements necessary to maintain compliance;<br>n) the immunity levels attained and the specific requirements necessary to maintain compliance;<br>o) rated impulse withstand voltage *U*imp;<br>p) rated operating temperature. | | P |
| 6.2 | Marking | | P |
| 6.3 | Instructions for installation, operation and maintenance | | P |
| | Subclause 5.3 of IEC 60947-1 applies with the following addition:<br>The manufacturer of a CPS incorporating an automatic reset overload relay capable of being connected to enable automatic restarting shall provide, with the CPS, that information necessary to alert the user to the possibility of automatic restarting | Pass muster | P |
| 7 | Normal service, mounting and transport conditions | | P |
| 7.1 | Normal service conditions | | P |
| | Equipment complying with this standard shall be capable of operating under the following standard conditions: | May operate | P |
| 7.1.1 | Ambient air temperature | | P |
| | The ambient air temperature does not exceed +40 °C and its average over a period of 24 h does not exceed +35 °C. | Pass muster | P |
| | The lower limit of the ambient air temperature is –5 °C. | Pass muster | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| | Ambient air temperature is that existing in the vicinity of the equipment if supplied without enclosure, or in the vicinity of the enclosure if supplied with an enclosure. | Pass muster | P |
| 7.1.2 | Altitude | | P |
| | The altitude of the site of installation does not exceed 2 000 m. | <2 000 m. | P |
| 7.1.3 | Atmospheric conditions | | P |
| 7.1.3.1 | Humidity | | |
| | The relative humidity of the air does not exceed 50 % at a maximum temperature of +40 °C. Higher relative humidities may be permitted at lower temperatures, e.g. 90 % at +20 °C. Special measures may be necessary in cases of occasional condensation due to variations intemperature. | <85 % | P |
| 7.1.3.2 | Degrees of pollution | | P |
| | Unless otherwise stated by the manufacturer's, a CPS is for use in pollution degree 3 environmental conditions, as defined in 6.1.3.2 of Part 1. However, other pollution degrees may be considered to apply depending upon the micro-environment | | P |
| 7.1.4 | Shock and vibration | | P |
| | Standard conditions of shock and vibration to which the equipment can be submitted are under consideration. | No damage | P |
| 7.2 | Conditions during transport and storage | | P |
| | A special agreement shall be made between user and manufacturer if the conditions during transport and storage, e.g. temperature and humidity, differ from those defined in 6.1, except that, unless otherwise specified, the following temperature range applies during transport and storage: between –25 °C and +55 °C and, for short periods not exceeding 24 h, up to +70 °C. | Pass muster | P |
| | Equipment subjected to these extreme temperatures without being operated shall not undergo any irreversible damage and shall then operate normally under the specified conditions. | No damage | P |
| 7.3 | Mounting | | P |
| | The equipment shall be mounted in accordance with the manufacturer's instructions. | See the manufacturer's instructions | P |
| 8 | Constructional and performance requirements | | P |
| 8.1 | Constructional requirements | | P |
| | The equipment with its enclosure, if any, whether integral or not, shall be designed and constructed to withstand the stresses occurring during installation and normal use and, in addition, shall provide a specified degree of resistance to abnormal heat and fire. | Pass muster | P |

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| Clause | Requirement – Test | Result – Remark | Verdict |
| 8.1.1 | Materials | | P |
| | The suitability of materials used is verified by making tests: | Pass muster | P |
| | a) on the equipment; or | | P |
| | b) on sections taken from the equipment; or | | N |
| | c) on samples of identical material having representative cross-section. | | N |
| | The suitability shall be determined with respect to resistance to abnormal heat and fire | May prevent to abnormal heat and fire | P |
| 8.1.2 | Current-carrying parts and their connections | | P |
| | Current-carrying parts shall have the necessary mechanical strength and current-carrying capacity for their intended use. | Pass muster | P |
| | For electrical connections, no contact pressure shall be transmitted through insulating material other than ceramic or other material with characteristics not less suitable, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage or yielding of the insulation material | | P |
| 8.1.3 | Clearances and creepage distances | | P |
| | For equipment tested according to 8.3.3.4 of this standard, minimum values are given in Tables 13 and 15. | According with requirement of standard | P |
| | In the other cases, guidance for minimum values is given in the relevant product standard. | | P |
| 8.1.4 | Actuator | Not applicable | N |
| 8.1.4.1 | Insulation | | N |
| | The actuator of the equipment shall be insulated from the live parts for the rated insulation voltage and, if applicable, the rated impulse withstand voltage. | | |
| 8.1.4.2 | Direction of movement | | N |
| | The direction of operation for actuators of devices shall normally conform to IEC 60447. Where devices cannot conform to these requirements, e.g. due to special applications or alternative mounting positions, they shall be clearly marked such that there is no doubt as to the "I" and "O" positions and the direction of operation. | | N |
| 8.1.5 | Indication of the contact position | Pass muster | P |
| 8.1.5.1 | Indicating means | | P |
| | When an equipment is provided with means for indicating the closed and open positions, these positions shall be unambiguous and clearly indicated. This is done by means of a position indicating device (see 2.3.18). | Clearly indicated | P |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | If symbols are used, they shall indicate the closed and open positions respectively, in accordance with IEC 60417-2: | Clearly indicated | P |
| | For equipment operated by means of two push-buttons, only the push-button designated for the opening operation shall be red or marked with the symbol "O". | Red | P |
| | Red colour shall not be used for any other push-button. | Don't be used for any other push-button | P |
| | The colours of other push-buttons, illuminated push-buttons and indicator lights shall be in accordance with IEC 60073. | No indicator lights | P |
| 8.1.5.2 | Indication by the actuator | | P |
| 8.1.6 | Additional requirements for equipment suitable for isolation | | P |
| | The effectiveness of each of the means of indication provided on the equipment and its mechanical strength shall be verified in accordance with 8.2.5. | Pass muster | P |
| 8.1.6.2 | Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers | Supplementary have be provided | P |
| | If equipment suitable for isolation is provided with an auxiliary switch for the purpose of electrical interlocking with contactor(s) or circuit-breaker(s) and intended to be used in motor circuits, the following requirements shall apply unless the equipment is rated for AC-23 utilization category | | P |
| | The time interval between the opening of the contacts of the auxiliary switch and the contacts of the main poles shall be sufficient to ensure that the associated contactor or circuit-breaker interrupts the current before the main poles of the equipment open | | P |
| | During the closing operation the contacts of the auxiliary switch shall close after or simultaneously with the contacts of the main poles | | P |
| 8.1.6.3 | Supplementary requirements for equipment provided with means for padlocking the open position | | P |
| | The locking means shall be designed in such a way that it cannot be removed with the appropriate padlock(s) installed. When the equipment is locked by even of a single padlock, it shall not be possible by operating the actuator, to reduce the clearance between open contacts to the extent that it no longer complies with the requirements of 7.2.3.1b) | | P |
| | Alternatively, the design may provide padlockable means to prevent access to the actuator. | | P |
| 8.1.7 | Terminals | | P |
| 8.1.7.1 | Constructional requirements | | P |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength. | | P |
| | Terminal connections shall be such that the conductors may be connected by means of screws, springs or other equivalent means so as to ensure that the necessary contact pressure is maintained. | | P |
| | Terminals shall be so constructed that the conductors can be clamped between suitable surfaces without any significant damage either to conductors or terminals. | | P |
| | Terminals shall not allow the conductors to be displaced or be displaced themselves in a manner detrimental to the operation of equipment and the insulation voltage shall not be reduced below the rated values. | | P |
| | If required by the application, terminals and conductors may be connected by means of cable lugs for copper conductors only. | | N |
| 8.1.7.2 | Connecting capacity | | P |
| 8.1.7.3 | Connection | | |
| | Terminals for connection to external conductors shall be readily accessible during installation | Pass muster | P |
| | Clamping screws and nuts shall not serve to fix any other component although they may hold the terminals in place or prevent them from turning | No danger | P |
| 8.1.7.4 | Terminal identification and marking | See the sample | |
| | Terminals shall be clearly and permanently identified in accordance with IEC 60445 and Annex L, unless superseded by the requirements of the relevant product standard | Clearly and permanently on the sample | P |
| | Terminals intended exclusively for the neutral conductor shall be identified by the letter "N", in accordance with IEC 60445 | "N" | P |
| | The protective earth terminal shall be identified in accordance with 7.1.9.3 | No this terminal | N |
| | Additional requirements for equipment provided with a neutral pole | Pass muster | P |
| 8.1.8 | Additional requirements for equipment provided with a neutral pole | Pass muster | P |
| | When an equipment is provided with a pole intended only for connecting the neutral, this pole shall be clearly identified to that effect by the letter N | ”N “clearly identified | P |
| | A switched neutral pole shall break not before and shall make not after the other poles | After the other poles | P |
| | For equipment having a value of conventional thermal current (free air or enclosed, see 4.3.2.1 and 4.3.2.2) not exceeding 63 A, this value shall be identical for all poles | | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | For higher conventional thermal current values, the neutral pole may have a value of conventional thermal current different from that of the other poles, but not less than half that value or 63 A, whichever is the higher | | N |
| 8.1.9 | Provisions for protective earthing | | N |
| 8.1.9.1 | Constructional requirements | | N |
| | The exposed conductive parts other than those which cannot constitute a danger shall be electrically interconnected and connected to a protective earth terminal for connection to an earth electrode or to an external protective conductor | | N |
| | This requirement can be met by the normal structural parts providing adequate electrical continuity and applies whether the equipment is used on its own or incorporated in an assembly | | N |
| 8.1.9.2 | Protective earth terminal | | N |
| | The protective earth terminal shall be readily accessible and so placed that the connection of the equipment to the earth electrode or to the protective conductor is maintained when the cover or any other removable part is removed | | N |
| | The protective earth terminal shall be suitably protected against corrosion | | N |
| | The protective earth terminal shall have no other function, except when it is intended to be connected to a PEN conductor | | N |
| 8.1.9.3 | Protective earth terminal marking and identification | | N |
| 8.1.10 | Enclosures for equipment | Pass muster | P |
| 8.1.10.1 | Design | | P |
| | The enclosure shall be so designed that, when it is opened and other protective means, if any, are removed, all parts requiring access for installation and maintenance, as prescribed by the manufacturer , are readily accessible | No danger | P |
| | Sufficient space shall be provided inside the enclosure for the accommodation of external conductors from their point of entry into the enclosure to the terminals to ensure adequate connection | Sufficient space have be provided inside the enclosure | P |
| | The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor | Not this enclosure | N |
| | Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place | | P |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | The removable parts of the enclosure shall be firmly secured to the fixed parts by a device so that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations | | P |
| | When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices | Need use a tool | N |
| | An integral enclosure is considered to be a non-removable part | | P |
| | If the enclosure is used for mounting push-buttons, removal of buttons should be from the inside of the enclosure. Removal from the outside shall only be by use of a tool intended for this purpose | Need use a tool | P |
| 8.1.10.2 | Insulation | | P |
| | If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure | Securely fixed to the enclosure | P |
| 8.1.11 | Degrees of protection of enclosed equipment | | P |
| 8.1.12 | Conduit pull-out, torque and bending with metallic conduits | Not applicable | N |
| | Polymeric enclosures of equipment, whether integral or not, provided with threaded conduit entries, intended for the connection of extra heavy duty, rigid threaded metal conduits complying with IEC 60981, shall withstand the stresses occurring during its installation such as pull-out, torque, bending. | | N |
| 8.2 | Performance requirements | | P |
| | The following requirements apply to clean new equipment unless otherwise stated in the relevant product standard. | Pass muster | P |
| 8.2.1 | Operating conditions | | P |
| 8.2.1.1 | General | | P |
| 8.2.1.2 | Limits of operation of power operated CPS's | According with the requirement | P |
| 8.2.1.2.1 | CPSs controlled with an electromagnet | | P |
| 8.2.1.2.2 | CPSs with electronically controlled electromagnet | | P |
| 8.2.1.2.3 | CPSs operated electro-pneumatically | | P |
| 8.2.1.2.4 | Capacitive drop out test | | P |
| 8.2.1.3 | Limits of operation of under-voltage relays and releases | Not this appliance | N |
| 8.2.1.4 | Limits of operation of shunt releases | Not this appliance | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| 8.2.1.5 | Limits of operation of current sensing relays and releases | Not this appliance | N |
| 8.2.2 | Temperature-rise | | P |
| 8.2.2.1 | Terminals | 19℃ | P |
| 8.2.2.2 | Accessible parts | Enclosure: 11℃ | P |
| 8.2.2.3 | Ambient air temperature | 24℃ | P |
| 8.2.2.4 | Main circuit | Pass muster | P |
| 8.2.2.5 | Control circuits | Pass muster | P |
| 8.2.2.6 | Windings of coils and electromagnets | | N |
| 8.2.2.7 | Auxiliary circuits | Pass muster | P |
| 8.2.2.8 | Other parts | | P |
| 8.2.3 | Dielectric properties | No breakdown or flashover | P |
| 8.2.3.1 | Impulse withstand voltage | | P |
| 8.2.3.2 | Power-frequency withstand voltage of the main, auxiliary and control circuits | | P |
| 8.2.3.3 | Clearances | Pass muster | P |
| 8.2.3.4 | Creepage distances | Pass muster | P |
| 8.2.3.5 | Solid insulation | Pass muster | P |
| 8.2.3.6 | Spacing between separate circuits | | P |
| 8.2.4 | Ability to make, carry and break currents under no-load, | Pass muster | P |
| 8.2.4.1 | Making and breaking capacities | Pass muster | P |
| 8.2.4.2 | Operational performance | Pass muster | P |
| 8.2.4.3 | Durability | | N |
| 8.2.4.3.1 | Mechanical durability | | N |
| 8.2.4.3.2 | Electrical durability | | N |
| 8.2.5 | Ability to make, carry and break short-circuit currents | According with the requirement of standard | P |
| 8.2.6 | Switching overvoltages | Pass muster | P |
| 8.2.7 | Leakage currents of equipment suitable for isolation | No danger | P |
| 8.3 | Electromagnetic compatibility (EMC) | Not applicable | N |
| 8.3.1 | For products falling within the scope of this standard, two sets of environmental conditions are considered and are referred to as<br>a) environment A;<br>b) environment B. | | N |
| 8.3.2 | Immunity | | N |
| 8.3.2.1 | Equipment not incorporating electronic circuits | | N |
| | Equipment not incorporating electronic circuits is not sensitive to electromagnetic disturbances in normal service conditions, and therefore no immunity tests are required. | | N |
| 8.3.2.2 | Equipment incorporating electronic circuits | | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| 8.3.3 | Emission | | N |
| 8.3.3.1 | Equipment not incorporating electronic circuits | | N |
| 8.3.3.2 | Equipment incorporating electronic circuits | | N |
| 8.3.3.2.1 | Limits for high-frequency emissions | | N |
| 8.3.3.2.2 | Limits for low-frequency emissions | | N |
| 9 | tests | | P |
| 9.1.2 | Type test | | |
| | Type tests are intended to verify compliance of the design of a given equipment with this standard, where applicable, and the relevant product standard. | According with requirement of standard | P |
| 9.1.3 | Routine tests | | N |
| 9.1.4 | Sampling tests | | N |
| | If engineering and statistical analysis show that routine tests (on each product) are not required, sampling tests may be made instead, if so stated in the relevant product standard. | | N |
| | The tests may comprise<br>a) functional tests;<br>b) dielectric tests. | | N |
| 9.2 | Compliance with constructional requirements | | P |
| | The verification of compliance with the constructional requirements stated in 7.1 concerns, for example | Pass muster | P |
| | – the materials; | Pass muster | P |
| | – the equipment; | Pass muster | P |
| | – the degrees of protection of enclosed equipment; | See nameplate | P |
| | – the mechanical properties of terminals; | Pass muster | P |
| | – the actuator; | | N |
| | – the position indicating device (see 2.3.18). | Pass muster | P |
| 9.2.1 | Materials | | P |
| 9.2.1.1 | Test of resistance to abnormal heat and fire | May resist to abnormal heat and fire | P |
| 9.2.1.1.1 | Glow-wire test (on equipment) | | P |
| | The glow-wire test shall be made according to clauses 4 to 10 of IEC 60695-2-10 and IEC 60695-2-11 under the conditions specified in 7.1.1.1. | No danger | P |
| 9.2.1.1.2 | Flammability, hot wire ignition and arc ignition tests (on materials) | Not applicable | N |
| 9.2.2 | Equipment | | P |
| 9.2.3 | Enclosures for equipment | | P |
| 9.2.3 | Enclosures for equipment see Annex C. | Pass muster | P |
| 9.2.4 | Mechanical properties of terminals | | P |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | This subclause does not apply to aluminium terminals nor to terminals for connection of aluminium conductors. | No aluminium conductors nor aluminium terminals | P |
| 9.2.4.1 | General conditions for tests | | P |
| | Unless otherwise stated by the manufacturer, each test shall be made on terminals in a clean and new condition. | Pass muster | P |
| 9.2.4.2 | Tests of mechanical strength of terminals | | P |
| | Tests shall be made with the appropriate type of conductor having the maximum crosssectional area. | | P |
| | The conductor shall be connected and disconnected five times. | No damage | P |
| | For screw-type terminals, the tightening torque shall be in accordance with Table 4 or 110 % of the torque specified by the manufacturer, whichever is the greater. | No damage | P |
| 9.2.4.3 | Testing for damage to and accidental loosening of conductors (flexion test) | No damage | P |
| | The test applies to terminals for the connection of unprepared round copper conductors, of number, cross-section and type (flexible and/or rigid (stranded and/or solid)), specified by the manufacturer. | | P |
| | Terminals intended for connection of both flexible or rigid (solid and/or stranded) conductors simultaneously shall be tested as stated in c) above | | P |
| | During the test, the conductor shall neither slip out of the terminal nor break near the clamping unit. | Don't slip out nor r break | P |
| | Immediately after the flexion test, each conductor under test shall be submitted in the test equipment to the test of 8.2.4.4 (pull-out test). | | N |
| 9.2.4.4 | Pull-out test | | N |
| 9.2.4.4.1 | Round copper conductors | | N |
| | The force shall be applied without jerks for 1 min. | | N |
| | During the test, the conductor shall neither slip out of the terminal nor break near the clamping unit. | | N |
| 9.2.4.4.2 | Flat copper conductors | | N |
| | A suitable length of conductor shall be secured in the terminal and the pulling force given in Table 6 applied without jerks for 1 min in a direction opposite to that of the insertion of the conductor. | | N |
| | During the test, the conductor shall neither slip out of the terminal nor break near the clamping unit. | | N |
| 9.2.4.5 | Test for insertability of unprepared round copper conductors having the maximum specified cross-section | Pass muster | P |
| 9.2.4.5.1 | Test procedure | | P |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | The measuring section of the gauge shall be able to penetrate freely into the terminal aperture to the full depth of the terminal (see also note to Table 7). | According with requirement of standard | P |
| 9.2.4.5.2 | Construction of gauges | | P |
| | Details of dimensions a and b and their permissible deviations are shown in Table 7. The measuring section of the gauge shall be made from gauge steel. | See instruction | P |
| 9.2.4.6 | Tests for insertability of flat conductors with rectangular cross-section | | N |
| | Under consideration. | | N |
| 9.2.5 | Verification of the effectiveness of indication of the main contact position of equipment suitable for isolation | Pass muster | P |
| | To verify the effectiveness of the indication of the main contact position as required by 7.1.6, all means of indication of contact position shall continue to function correctly after the operational performance type tests, and special durability tests if performed. | | P |
| 9.2.5.1 | Condition of equipment for the tests | | P |
| | The condition of the equipment for the tests shall be stated in the relevant product standard. | According with requirement of standard | P |
| 9.2.5.2 | Method of test | | P |
| 9.2.5.3 | Condition of equipment during and after test | | P |
| 9.2.5.3.1 | Dependent and independent manual operation | | P |
| | After the test, when the test force is no longer applied, the actuator being left free, the open position shall not be indicated by any of the means provided and the equipment shall not show any damage such as to impair its normal operation. | No damage | P |
| 9.2.5.3.2 | Dependent and independent power operation | | N |
| | During and after the test, the open position shall not be indicated by any of the means provided and the equipment shall not show any damage such as to impair its normal operation. | | N |
| | When the equipment is provided with means for locking in the open position, it shall not be possible to lock the equipment during the test. | | N |
| 9.2.6 | Vacant | Not applicable | N |
| 9.2.7 | Conduit pull-out test, torque test and bending test with metallic conduits | No this metallic conduits | N |
| | The tests shall be made in the sequence 8.2.7.1, 8.2.7.2 and 8.2.7.3. | | N |
| 9.2.7.1 | Pull-out test | Not applicable | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | After the test, the displacement of the conduit in relation with the entry shall be less than one thread depth and there shall be no evidence of damage impairing further use of the enclosure. | | N |
| 9.2.7.2 | Bending test | Not applicable | N |
| | When the bending moment results in a deflection of the conduit of 25 mm per 300 mm length, or the bending moment has reached the value given in Table 21, the moment is maintained for 1 min. The test is then repeated in a perpendicular direction. | | N |
| | After the test there shall be no evidence of damage impairing further use of the enclosure. | | N |
| 9.2.7.3 | Torque test | Not applicable | N |
| | For enclosures provided with a single conduit connection up to and including 16 H, the tightening torque is reduced to 25 N· m. | | N |
| | After the test, it shall be possible to unscrew the conduit and there shall be no evidence ofdamage impairing further use of the enclosure. | | N |
| 9.3 | Performance | Pass muster | P |
| 9.3.1 | Test sequences | | P |
| | Where applicable, the relevant product standard shall specify the test sequences to which the equipment is to be submitted. | According with requirement of standard | P |
| 9.3.2 | General test conditions | | P |
| 9.3.2.1 | General requirements | | P |
| 9.3.2.2 | Test quantities | According with requirement of standard | P |
| 9.3.2.2.1 | Values of test quantities | | P |
| | All the tests shall be made with the values of test quantities corresponding to the ratings assigned by the manufacturer, in accordance with the relevant tables and data of the relevant product standard. | Pass muster | P |
| 9.3.2.2.2 | Tolerances on test quantities | | P |
| | The test recorded in the test report shall be within the tolerances given in Table 8, unless otherwise specified in the relevant subclauses. However, with the agreement of the manufacturer, the tests may be made under more severe conditions than those specified. | According with requirement of standard | P |
| 9.3.2.2.3 | Recovery voltage | | N |
| | a) Power-frequency recovery voltage | | N |
| | b) Transient recovery voltage | | N |
| 9.3.2.3 | Evaluation of test results | | N |
| | Behaviour of the equipment during the tests and its condition after the tests shall be specified in the relevant product standard. For short-circuit tests, see also 8.3.4.1.7 and 8.3.4.1.9. | | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| 9.3.2.4 | Test reports | | P |
| 9.3.3 | Performance under no-load, normal load and overload conditions | | P |
| 9.3.3.1 | Operation | | P |
| | Tests shall be made to verify that the equipment operates correctly according to the requirements of 7.2.1.1. | Pass muster | P |
| 9.3.3.2 | Operating limits | | P |
| 9.3.3.2.1 | Power operated equipment | | P |
| | It shall be verified that the equipment opens and closes correctly within the limiting values of the control quantities, such as voltage, current, air pressure and temperatures, specified in the relevant product standard. Tests are made with no current flowing through the main circuit, unless otherwise specified. | Pass muster | P |
| 9.3.3.2.2 | Relays and releases | Not this appliance | N |
| 9.3.3.3 | Temperature-rise | Pass muster | P |
| 9.3.3.3.1 | Ambient air temperature | | P |
| | During the tests, the ambient air temperature shall be between +10 °C and +40 °C and shall not vary by more than 10 K | | P |
| 9.3.3.3.2 | Measurement of the temperature of parts | Pass muster | P |
| 9.3.3.3.3 | Temperature-rise of a part | Pass muster | P |
| 9.3.3.3.4 | Temperature-rise of the main circuit | | P |
| 9.3.3.3.5 | Temperature-rise of control circuits | | P |
| 9.3.3.3.6 | Temperature-rise of coils of electromagnets | | N |
| 9.3.3.3.7 | Temperature-rise of auxiliary circuits | | P |
| 9.3.3.4 | Dielectric properties | | P |
| 9.3.3.4.1 | Type tests | | P |
| | 1) General conditions for withstand voltage tests | | P |
| | The equipment to be tested shall comply with the general requirements of 8.3.2.1. | | P |
| | 2) Verification of impulse withstand voltage | | P |
| | 3) Power-frequency withstand verification of solid insulation | | P |
| | 4) Power-frequency withstand verification after switching and short-circuit tests | | P |
| | 5) Vacant | | N |
| | 6) Verification of d.c. withstand voltage<br>Under consideration. | | N |
| | 7) Verification of creepage distances | | P |
| | 8) Verification of leakage current of equipment suitable for isolation | | P |
| 9.3.3.4.2 | Routine tests | | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| 9.3.3.4.3 | Sampling tests for verification of clearances | | N |
| 9.3.3.4.4 | Tests for equipment with protective separation | | P |
| | Tests for equipment with protective separation are given in Annex N. | Pass muster | P |
| 9.3.3.5 | Making and breaking capacities | Pass muster | P |
| 8.3.3.5.1 | General test conditions | | P |
| | Tests for verification of making and breaking capacities shall be made according to the general test requirements stated in 8.3.2. | Pass muster | P |
| 9.3.3.5.2 | Test circuit | | P |
| 9.3.3.5.3 | Characteristics of transient recovery voltage | | N |
| 9.3.3.5.4 | Vacant | Not applicable | N |
| 9.3.3.5.5 | Test procedure for making and breaking capacities | | P |
| | The number of operations, the "on" and "off" times and the ambient conditions shall be stated in the relevant product standard. | According with requirement of relevant standard | P |
| 9.3.3.5.6 | Behaviour of the equipment during and after making and breaking capacity tests | | P |
| | The criteria for acceptance during and after the tests shall be stated in the relevant product standard. | Pass muster | P |
| 9.3.3.6 | Operational performance capability | | P |
| | Detailed test conditions shall be stated in the relevant product standard. | Pass muster | P |
| 8.3.3.7 | Durability | | N |
| | Durability tests are intended to verify the number of operating cycles that an equipment is likely to be capable of performing without repair or replacement of parts. | | N |
| 9.3.3.7.1 | Mechanical durability | | N |
| 9.3.3.7.2 | Electrical durability | | N |
| | Evaluation of test results shall be defined in the relevant product standard. | | N |
| 9.3.4 | Performance under short-circuit conditions | No damage | P |
| 9.3.4.1 | General conditions for short-circuit tests | No damage | P |
| 9.3.4.1.1 | General requirements | | P |
| | Additional test conditions may be specified in the relevant product standard. | Pass muster | P |
| 9.3.4.1.2 | Test circuit | | P |
| 9.3.4.1.3 | Power-factor of the test circuit | | N |
| | For a.c., the power-factor of each phase of the test circuit should be determined according to an established method which shall be stated in the test report. | | N |
| 9.3.4.1.4 | Time-constant of the test circuit | | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| | For d.c., the time-constant of the test circuit may be determined according to the method given in Annex F, clause F.2. | Not applicable | N |
| 9.3.4.1.5 | Calibration of the test circuit | | N |
| | The calibration of the test circuit is carried out by placing temporary connections B of negligible impedance as close as reasonably possible to the terminals provided for connecting the equipment under test. | | N |
| 9.3.4.1.6 | Test procedure | | P |
| | Tests for the performance under short-circuit conditions shall be made according to the requirements of the relevant product standard. | Pass muster | P |
| 9.3.4.1.7 | Behaviour of the equipment during short-circuit making and breaking tests | Pass muster | P |
| | There shall be neither arcing nor flashover between poles, or between poles and frame, and no melting of the fusible element F in the leakage detection circuit (see 8.3.4.1.2). | Pass muster | P |
| 9.3.4.1.8 | Interpretation of records | | P |
| 9.3.4.1.9 | Condition of the equipment after the tests | Pass muster | P |
| 9.3.4.2 | Short-circuit making and breaking capacities | Pass muster | P |
| 9.3.4.3 | Verification of the ability to carry the rated short-time withstand current | | P |
| | The test shall be made with the equipment in the closed position, at a prospective current equal to the rated short-time withstand current and the corresponding operational voltage under the general conditions of 8.3.4.1. | | P |
| 9.3.4.4 | Co-ordination with short-circuit protective devices and rated conditional shortcircuit current | | P |
| | Test conditions and procedures, where applicable, shall be stated in the relevant product standard. | | P |
| 9.4 | Routine tests | | P |
| | Routine tests shall be made on new and clean TSE and shall consist of: | | --- |
| | a) Verification of the operating mechanism as stated in 9.3.3.1 | | p |
| | b) Verification of controls, sequence and limits as stated in 9.3.3.2.4, 9.3.3.2.5 and 9.3.3.2.6 | | P |
| | c) Verification of dielectric withstand according to 8.3.3.4.2 of IEC 60947-1 | | P |
| 9.5 | EMC tests | See EMC test report | N |

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

Annex A

| EN 60947-6-1 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| A.1 | General | | N |
| A.2 | Rated duty | | N |
| A.2.1 | Intermittent periodic duty or intermittent duty | | N |
| A.2.2 | Temporary duty | | N |
| A.3 | Making and breaking capacities | | N |
| A.4 | Utilization category | | N |
| A.5 | Operational performance | | N |
| A.6 | Mechanical durability | | N |
| A.7 | Electrical durability | | N |
| A.8 | Verification of making and breaking capacities | | N |
| A.9 | Operational performance test | | N |
| A.10 | Special tests | | N |
| A.10.1 | Mechanical durability test | | N |
| A.10.1.1 | Condition of the equipment for tests | | N |
| A.10.1.2 | Operating conditions | | N |
| A.10.1.3 | Test procedure | | N |
| A.10.1.4 | Results to be obtained | | N |
| A.10.2 | Electrical durability test | | N |
| Annex B | | | |
| 4.4 | Switching of capacitors or of tungsten filament lamps | No such components | N |
| 7.1.7.1 | Locking in the closed position for particular applications | | N |
| 7.1.7.2 | Operating time of auxiliary contacts provided for interlocking | | N |
| 7.2.4.2 and Table 4 | Increase of the operating rate for the verification of the operational performance | | N |
| 8.3.3.3.1 | Time interval greater than 30 s ± 10 s between close-open cycles for making and breaking capacity test of equipment of *I*th > 400 A<br>For categories AC-23A and AC-23B testing of making and breaking capacities by make cycles at 10 *I*e followed by the same number of make-break cycles at 8 *I*e | | N |
| 8.3.3.3.3 | Verification of making and breaking capacities for utilization categories DC-22 and DC-23: replacement of the load of the test circuit by a motor | | N |
| 8.3.5.2.3 | AC test circuit calibration for the short-circuit making capacity test in the case of d.c. equipment | | N |
| Annex A | Utilization categories other than those listed in Table A.2 | | N |
| Table A.1 | Switching of rotor circuits, capacitors or tungsten filament lamps | | N |

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|---|---|---|---|
| Clause | Requirement – Test | Result – Remark | Verdict |
| A.8 | Verification of making and breaking capacities | | N |
| A.9 | Operational performance test | | N |
| Annex C | | | |
| C.1 | General | | N |
| C.2 | Tests | | N |
| C.3 | Test set-up and sequence | | N |
| C.3.1 | Making and breaking capacities (8.3.3.3) and operational performance (8.3.4.1) | | N |
| C.3.2 | Fuse protected short-circuit test (8.3.6.2) | | N |
| C.4 | Condition of equipment after tests | | N |
| C.5 | Instructions for use | | N |

# Photos of the sample

--- End of Test Report ---