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TECHNICAL REPORT

RAPPORT TECHNIQUE

Electrical accessories – Harmonization of general rules

Petit appareillage – Harmonisation des règles générales

IEC TR 61916:2014-11(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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ELECTRICAL ACCESSORIES – HARMONIZATION OF GENERAL RULES

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC TR 61916, which is a technical report, has been prepared by IEC technical committee 23: Electrical accessories.

This third edition cancels and replaces the second edition published in 2009 and constitutes a technical revision. This edition includes the following significant technical changes with respect to the previous edition:

a) Modification of "General requirements" to include standard conditions for operation in service and information on ambient temperature range for testing;
b) Replacement of Clause 14;
c) Addition of a Clause 15 in UV resistance;
d) Addition of Annex A on Material selection process.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
23/639/DTR	23/667A/RVC

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

In this technical report, the following print types are used:

– requirements proper: in roman type;
– *test specifications: in italic type*;
– Explanatory matter: in smaller roman type.

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

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

INTRODUCTION

The purpose of this Technical Report is to have harmonized rules on the same subjects in all the Standards published by TC 23 and its subcommittees, in order to give coordinated indications to subcommittees when making their standards.

These recommendations are meant as a guide. Consequently, subcommittees, according to their own particularities, may use whole or part of the document which is not meant to be compulsory.

In publishing these recommendations, TC 23 wishes to spread the information so that other committees of the IEC may use these recommendations, if necessary.

ELECTRICAL ACCESSORIES – HARMONIZATION OF GENERAL RULES

1 Scope

This Technical Report provides guidance on requirements and tests for subjects common to TC 23 and its subcommittees by providing recommendations applicable to electrical accessories that are within the scope of TC 23 and its subcommittees.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60228, *Conductors of insulated cables*

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

IEC TR 60664-2-1:2011, *Insulation coordination for equipment within low-voltage systems – Part 2-1: Application guide – Explanation of the application of the IEC 60664 series, dimensioning examples and dielectric testing*

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

IEC 60664-4, *Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress*

IEC 60664-5:2007, *Insulation coordination for equipment within low-voltage systems – Part 5: Comprehensive method for determining clearances and creepage distances equal to or less than 2 mm*

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

IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-10-2:2014, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60998-1:2002, *Connecting devices for low-voltage circuits for household and similar purposes – Part 1: General requirements*

IEC 60998-2-1:2002, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units*

IEC 60999 (all parts), *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units*

ISO 4892-2: 2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE The terms defined hereafter concern Clause 8 Resistance of insulation materials to tracking.

3.1
tracking
progressive formation of conducting paths, which are produced on the surface of a solid insulating material, due to the combined effects of electric stress and electrolytic contamination on this surface

[SOURCE: IEC 60050-212:2010, 212-11-56, modified – The note has been deleted.]

3.2
electrical erosion
wearing away of insulating material by action of electrical discharges

[SOURCE: IEC 60050-212:2010, 212-11-55]

3.3
comparative tracking index
CTI
numerical value of the maximum voltage in volts at which a material withstands 50 drops without tracking

Note 1 to entry: The value of each test voltage and the CTI should be divisible by 25.

[SOURCE: IEC 60050-212:2010, 212-11-59, modified – The text "and without a persistent flame occurring under specified test conditions" has been removed at the end of the definition and Note 1 to entry has been added.]

3.4
proof tracking index
PTI
numerical value of the proof voltage in volts at which a material withstands 50 drops without tracking

[SOURCE: IEC 60050-212:2010, 212-11-60, modified – Number of drops specified.]

4 General requirements

4.1 General

This guidance is applicable to the relevant clause(s) of TC 23 standards and of its subcommittees covering general requirements and/or scope.

Before tests, the specimen is stored for at least 24 h in an atmosphere having a temperature between 15 °C and 35 °C and relative humidity between 45 % and 75 %, except for the test of Clause 7 where IEC 60112 applies.

Accessories within the scope of TC 23 standards, and those of its subcommittees, shall be designed and constructed so that, in normal use, their performance is reliable and safe for the user and the surroundings.

Standard conditions for operation in service for electrical accessories complying with the existing standards should be suitable for use at ambient temperatures not normally exceeding 40 °C, but their average over a period of 24 h does not exceed 35 °C, with a lower limit of the ambient air temperature of –5 °C.

4.2 Standard conditions for operation in service

4.2.1 Ambient temperature

4.2.1.1 General

Unless covered by a temperature classification, accessories within the scope of TC 23 standards should be at least capable of operating under the following standard conditions.

4.2.1.2 Ambient air temperature range in normal use

Electrical accessories complying with the existing standards are suitable for normal use at ambient temperatures not normally exceeding 40 °C, but their average over a period of 24 h does not exceed 35 °C, with a lower limit of the ambient air temperature of –5 °C.

NOTE This temperature range corresponds to AA4 of IEC 60364-5-51:2005, Table 51A. Part of the temperature range of IEC 60721-3-3, class 3K5, with the high air temperature restricted to 40 °C.

Accessories intended to be used in ambient air temperatures outside the above mentioned conditions permanently or during a long period shall be covered by special requirements or tests, if necessary, to be decided by each product committee.

4.2.1.3 Ambient air temperature range in cold climate

In areas where electrical accessories are to be used in cold or arctic climate, any tests may need to be performed in a suitable cold ambient temperature.

Product committees have the responsibility to evaluate if the accessories intended to be used in ambient air temperatures in cold climate permanently or during a long period shall be tested in a temperature corresponding to the climate area, for example AA3 or AA2 of IEC 60364-5-51:2005, Table 51A.

4.2.2 Altitude

Unless otherwise specified, the accessories are intended to be installed at an altitude not higher than 2 000 m.

4.2.3 Maximum relative humidity at 40 °C

Unless otherwise specified, the maximum relative humidity at the temperature of 40 °C is 50 %.

Higher relative humidity values are admitted at lower temperature (for example 90 % at 20 °C).

4.2.4 External magnetic field

Unless otherwise specified, the external magnetic field is considered not exceeding 5 times the earth's magnetic field in any direction.

NOTE When an equipment is installed in proximity of a strong magnetic field, supplementary requirements may be necessary.

4.2.5 Accessory orientation

Unless otherwise specified, the mounting coordinates of the accessories with respect to the horizontal or vertical is as stated by the manufacturer, with a tolerance of 2° in any direction.

4.3 Ambient air temperature range for testing

Unless otherwise specified, the tests are carried out at an ambient temperature of (20 ± 5) °C.

5 Resistance to heat

5.1 General

This guidance is applicable to the relevant clause(s) of a TC 23 standard covering requirements and tests to determine the resistance to heat of accessories.

These recommendations are in accordance with IEC 60669-1.

The text includes two subclauses:

– Requirements (5.2)
– Tests (5.3)

For editing purposes the order and the numbers may be altered if necessary.

5.2 Requirements

Accessories including enclosures, if any, shall be sufficiently resistant to heat.

Compliance is checked by the tests of 5.3.

5.3 Tests

5.3.1 *Verification of resistance to heat:*

a) for surface mounting boxes, separable covers, separable cover plates and separable frames by the test of 5.3.4;

b) for accessories, with the exception of the parts, if any, covered by a), by the tests of 5.3.2, 5.3.3 and, with the exception for the accessories made from natural or synthetic rubber or a mixture of both, by the test of 5.3.4.

5.3.2 *The specimens are kept for 1 h in a heating cabinet at a temperature of 100 °C ± 2 °C.*

During the test, they shall not undergo any change impairing their further use, and sealing compound, if any, shall not flow to such an extent that live parts are exposed.

After the test and after the specimens have been allowed to cool down to approximately room temperature, there shall be no access to live parts which are normally not accessible when the specimens are mounted as in normal use, even if probe B of IEC 61032 is applied with a force not exceeding 5 N.

After the test, markings shall still be legible.

Discoloration, blisters or slight displacement of the sealing compound is disregarded provided that safety is not impaired within the meaning of the relevant standard.

5.3.3 *Parts of insulating material necessary to retain current-carrying parts and parts of the earthing circuit in position are subjected to a ball-pressure test according to IEC 60695-10-2, except that the insulating parts necessary to retain the earthing terminals in a box shall be tested instead to the test as specified in 5.3.4.*

A current carrying part or a part of the earthing circuit retained by a mechanical means is considered to be retained in position. The use of grease or the like is not considered to be mechanical means.

In case of doubt, to determine whether an insulating material is necessary to retain current carrying parts and parts of the earthing circuit in position, the specimen is examined without conductors while held in all positions with the insulating material in question removed.

Before the test is started, the ball and the support on which the specimen shall be placed, are brought to the temperature specified. The part under test shall be placed on a 3 mm thick steel plate in direct contact with it, so as to be supported to withstand the test force.

When it is not possible to carry out the test on the specimens, the test should be carried out on a piece at least 2 mm thick which is cut out of the specimen. If this is not possible, up to and including four layers, each cut out of the same specimen, may be used, in which case the total thickness of the layers should be not less than 2,5 mm.

The test load and the supporting means shall be placed within the heating cabinet for a sufficient time to ensure that they have attained the stabilized testing temperature before the test commences.

The test is made in a heating cabinet at a temperature of 125 °C ± 2 °C.

After 60 $^{+2}_{0}$ min, the ball is removed from the specimen which is then cooled and treated according to Clause 7 of IEC 60695-10-2:2014.

The diameter of the impression caused by the ball is measured in accordance with IEC 60695-10-2:2014 and shall not exceed 2 mm.

5.3.4 Parts of insulating material not necessary to retain current-carrying parts and parts of the earthing circuit in position, even though they are in contact with them, are subjected to a ball pressure test in accordance with 5.3.3, but the test is made at a temperature of 70 °C ± 2 °C or 40 °C ± 2 °C plus the highest temperature rise determined for the relevant part during the test of clause “Temperature rise test”, whichever is the higher.

6 Screws, current-carrying parts and connections (electrical and mechanical)

6.1 General

This guidance is applicable to the relevant clause(s) of a TC 23 standard covering the requirements and tests of screws, current-carrying parts and connections (electrical and mechanical) of accessories.

These recommendations are in accordance with IEC 60669-1.

The text includes three subclauses as follows:

– Definitions (6.2)

– Requirements (6.3)
– Tests (6.4)

For editing purposes, the order and numbers may be altered, if necessary.

6.2 Types of screw

6.2.1 Thread-forming screw

A tapping screw having an uninterrupted thread which by screwing-in forms a thread by displacing material in the cavity.

An example of a thread-forming screw is shown in Figure 1.

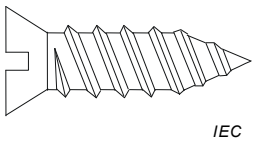

Figure 1 – Thread-forming screw

6.2.2 Thread-cutting screw

A screw having an interrupted thread which, by screwing-in, makes a thread by removing material from the cavity.

An example of thread-cutting screw is shown in Figure 2.

Figure 2 – Thread-cutting screw

6.3 Requirements

6.3.1 Connections, electrical or mechanical, using screws and nuts, shall withstand the mechanical stresses occurring in normal use.

Screws and nuts which transmit contact pressure shall be of metal and shall be in engagement with a metal thread. Screws and nuts which are operated when mounting an accessory during installation, and/or which are likely to be operated during the life of the accessory, shall be in engagement with a metal thread.

Screws for connecting external conductors shall not be tapping screws.

Screws and nuts operated when mounting the accessory during installation, and/or which are likely to be operated during the life of the accessory, shall not be of the thread cutting type.

NOTE Screws and nuts which are operated when mounting the accessory include screws for fixing cover of cover plates, etc., but not connecting means for screwed conduits and screws for fixing the base of the accessory.

Compliance is checked by inspection and by the test of 6.4.