भारतीय मानक

Indian Standard

IS 9385 (Part 4) : 2024
IEC 60282-4 : 2020

उच्च-वोल्टता फ़्यूज़

भाग 4 पॉलीमेरिक इन्सुलेटर का उपयोग करने वाले उच्च-वोल्टता निष्कासन फ़्यूज़ के लिए अतिरिक्त परीक्षण आवश्यकताएँ

High-Voltage Fuses

Part 4 Additional Testing Requirements for High-Voltage Expulsion Fuses Utilizing Polymeric Insulators

ICS 29.120.50

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Fuses Sectional Committee, ETD 39

NATIONAL FOREWORD

This Indian Standard which is identical to IEC 60282-4 : 2020 ‘High Voltage Fuses —Part 4: Additional testing requirements for high-voltage expulsion fuses utilizing polymeric insulators’ issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Fuses Sectional Committee and approval of the Electrotechnical Division Council.

High-voltage expulsion fuses are tested according to IEC 60282-2 which recognizes that fuse bases may use polymer (non-ceramic) insulators. As the market for expulsion fuses using polymer insulators has grown, manufacturers have introduced many tests in addition to artificial pollution tests, covering other aspects of a fuse's performance. This document formalises such testing and provides standardisation and consistency.

The text of IEC Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminology and conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’.

b) Comma (,) has been used as a decimal marker, while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their respective places, are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 868 Plastics and ebonite — Determination of indentation hardness by means of a durometer (shore hardness)	IS 13360 (Part 5/Sec 11) : 2013/ISO 868 : 2003 Plastics — Methods of testing: Part 5 Mechanical properties, section 11 Determination of indentation hardness by means of durometer (shore hardness) (*first revision*)	Identical
ISO 4287 Geometrical product specifications (GPS) — Surface texture: profile method — Terms, definitions and surface texture parameters	IS 15262 : 2002/ISO 4287 : 1997 Geometrical product specifications (GPS) — Surface texture: Pprofile method — Terms, definitions and surface texture parameters	Identical
ISO 4892-2 : 2013 Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps	IS 17863 (Part 2) : 2022 ISO 4892-2 : 2013 Plastics — Methods of exposure to laboratory light sources Part 2 Xenon-arc lamps	Identical
IEC 60060-1 : 2010 High-Voltage test techniques — Part 1: General definitions and test requirements	IS 2071 (Part 1) : 2016/IEC 60060-1 : 2010 High-Voltage test techniques: Part 1 General definitions and test requirements (*third revision*)	Identical
IEC 60282-2 High-Voltage fuses — Part 2: Expulsion fuses	IS 9385 (Part 2) : 2018/IEC 60282-2 : 2009 High-Voltage fuses: Part 2 Expulsion fuses (*first revision*)	Identical

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding of numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

CONTENTS

INTRODUCTION

High-voltage expulsion fuses are tested according to IEC 60282-2 which recognizes that fuse-bases may use polymer (non-ceramic) insulators. However, very little additional testing is specified for fuses using such insulators. In the case of polymer post insulators and suspension insulators, only artificial pollution tests are required in accordance with IEC 61592 and IEC 61109, respectively. However, for fuses that use insulators not covered by these International Standards, such as certain fuse-cutouts, the additional testing required is by agreement between manufacturer and user. Fuses that need such "additional testing" are expulsion fuses that utilize polymer insulators in which a single mounting bracket is used, either at the centre of an insulator or connected to two insulators (a "cutout fuse-base"). As the market for expulsion fuses using polymer insulators has grown, manufacturers have introduced many tests in addition to artificial pollution tests, covering other aspects of a fuse's performance. This document formalises such testing and provides standardisation and consistency. It should be noted that the document focusses on product testing as opposed to material testing. In addition to drawing on test procedures covered by IEC 62217:2012, *Polymeric HV insulators for indoor and outdoor use – General definitions, test methods and acceptance criteria*, material from IEEE Std C37.41™:2016 (primarily 18.1.2 *Long-term deformation/creep testing*) is also used, with the permission of IEEE.

Indian Standard

HIGH-VOLTAGE FUSES
PART 4 ADDITIONAL TESTING REQUIREMENTS FOR HIGH-VOLTAGE EXPULSION FUSES UTILIZING POLYMERIC INSULATORS

1 Scope

This part of IEC 60282 applies to expulsion fuses complying with IEC 60282-2 and specifies additional testing requirements for fuses employing a cutout fuse-base that utilizes polymeric insulators.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60282-2:2008*, High-voltage fuses – Part 2: Expulsion fuses*

ISO 4287, *Geometrical Product Specifications (GPS) – Surface Texture: Profile method – Terms, definitions and surface texture parameters*

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

ISO 868, *Plastics and ebonite – Determination of indentation hardness by means of a durometer (Shore hardness)*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
polymeric insulator
insulator whose insulating body consists of at least one organic based material

Note 1 to entry: Polymeric insulators are also known as non-ceramic insulators.

Note 2 to entry: Coupling devices may be attached to the ends of the insulating body.

[SOURCE: IEC 60050-471:2007, 471-01-13]

3.2
composite polymeric insulator
polymeric insulator made of at least two polymeric insulating parts, namely a core and a housing equipped with end fittings

[SOURCE: IEC 60050-471:2007, 471-01-02, modified – the term "polymeric" added and the note to entry deleted.]

3.3
core (of a composite polymeric insulator)
central insulating part of a composite polymeric insulator which provides the primary mechanical characteristics of the insulator

[SOURCE: IEC 60050-471:2007, 471-01-03, modified – addition of "composite polymeric"; addition of "primary" and "of the insulator"; note to entry deleted.]

3.4
housing
external insulating part(s) of a composite polymeric insulator that provides the necessary creepage distance, other dielectric characteristics of the insulator, and protects the core from the environment

[SOURCE: IEC 60050-471:2007, 471-01-09, modified – "of a composite polymeric insulator" and "other dielectric characteristics of the insulator" added.]

3.5
insulating body
insulating assembly that contains the insulator and permanent fittings

3.6
insulator trunk
central insulating part of an insulator from which the sheds project

Note 1 to entry: Also known as shank on smaller insulators.

[SOURCE: IEC 60050-471:2007, 471-01-11]

3.7
shed (of an insulator)
insulating part, projecting from the insulator trunk, intended to increase the creepage distance

Note 1 to entry: The shed can be with or without ribs.

[SOURCE: IEC 60050-471:2007, 471-01-15]

3.8
cutout fuse-base
fuse-base that uses an insulator or insulators having a single point mounting bracket

Note 1 to entry: The mounting bracket is generally located centrally between the terminals that are mounted at the outer ends of the insulator(s).

3.9
resin insulator
polymeric insulator whose insulating body consists of a solid shank and sheds protruding from the shank made from only one organic based housing material (e.g. cycloaliphatic epoxy)

3.10
interface
surface between the different materials

Note 1 to entry: Various interfaces occur in most composite insulators, for example:

– between housing and fixing devices;

– between core and housing.

4 Type tests

4.1 General requirements

Fuses according to this document shall comply with the requirements of IEC 60282-2, except for those that are specifically replaced with requirements specified in this document for the following type tests.

4.2 Mechanical tests

4.2.1 Mechanical stressing at temperature extremes

4.2.1.1 General

When conducting this test with a fuse using a polymeric insulator(s), it is not necessary to perform the mechanical tests outlined in 8.8.1 of IEC 60282-2:2008. The testing covered in 4.2.1 only applies to devices that can be opened and closed manually.

4.2.1.2 Test procedure

Three new fuses shall be used for this test. The test samples shall consist of the fuse-base, fuse-carrier, and end fittings. The fuse carriers should contain fuse-links of sufficiently high current rating, or dummy links, so that the fuse-links are not subjected to the same endurance test as the fuse-bases and fuse-carriers.

All samples shall be cycled between −30 °C (+0 °C, −5 °C) and +40 °C (+5 °C, −0 °C). The samples shall remain at each temperature extreme for a minimum of 8 h per cycle. The cycle time from one temperature extreme to the other shall be any convenient value, however the sample rate of temperature change should be no more than 0,5 °C/min to avoid thermal shock. All samples shall complete 4 cycles (a cycle includes both temperature extremes) resulting in a minimum total test time of approximately 83 h. See Figure 1 for a representation of the preferred test sequence. If the specified minimum ambient air temperature for the fuse is other than −30 °C (see IEC 60282-2:2008, 4.1 a)) then this value (+0 °C, −5 °C) shall be used for the minimum temperature of the cycle.

Once per cycle, manual open/close operations shall be performed, using a device approved by the manufacturer. At the end of an eight-hour cold or hot period, each sample is subjected to 50 open/close operations. All operations shall be performed at a minimum 30° angle from centreline with 25 on the right and 25 on the left. The closing force should simulate typical service conditions as recommended by the manufacturer. Tests shall alternate with each cycle such that over the four cycles, a total of 100 open/close operations are performed hot and 100 open/close operations cold. The four-cycle sequence can start with a hot period or cold period, but a cold period is the preferred sequence.

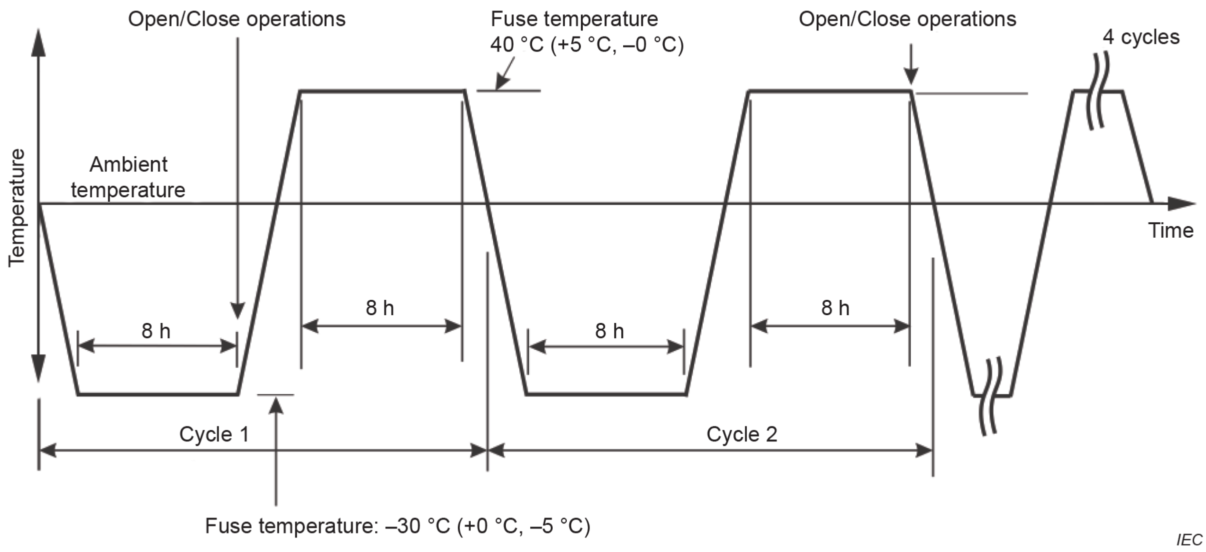

Figure 1 – Test sequence

4.2.1.3 Acceptance criteria

4.2.1.3.1 Initial acceptance criteria

The following are the initial criteria for successful completion of this test:

a) Overall length of fuse-base shall comply with manufacturer's specification.

b) No loose or deformed parts, cracks or other obvious visual deformation in any of the assemblies shall occur.

c) Each sample shall perform its intended function as demonstrated by 4.2.1.3.2.

4.2.1.3.2 Acceptance testing

After the samples have passed the initial acceptance criteria listed in 4.2.1.3.1, further tests are performed to determine that the fuse has not received damage to impair its current carrying capability and drop-out capability.

a) Each sample shall be subjected to a temperature rise test as specified in IEC 60282-2. The temperature rise of individual components may exceed the temperature rise limits specified in IEC 60282-2, provided that all temperature measurements demonstrate that the fuse has reached temperature stability, without thermal runaway occurring.

b) Each sample shall demonstrate it is capable of full mechanical performance when a fuse element melts. For drop-out devices, capability can be verified by the following process. Each sample shall have a fuse-carrier mounted in the fuse-support with an appropriately sized fuse-link. Sufficient current shall be passed through the fuse to cause the element to melt. The sample shall operate and move to the proper open condition.

4.2.1.4 Dye penetration test for composite polymeric insulators

After the testing detailed in 4.2.1.3.1 and 4.2.1.3.2 a dye penetration test is performed to verify that no damage to the core material occurred during the mechanical tests. Four samples shall be cut from each tested insulator making the cut approximately 90° to the long axis of the insulator. Using a diamond-coated circular saw blade under running cold water is the preferred method, however other cutting methods may be used with agreement from the manufacturer. The length of the samples shall be 10 mm ± 1,0 mm. The cut surfaces shall be smoothed by means of fine abrasive cloth (grain size 180). The cut ends shall be clean and parallel. The specimens shall be placed (long axis of the insulator vertical) on a layer of steel or glass balls of the same diameter (1 mm to 2 mm) in a vessel or tray. A solution of 1 % (by weight) of Astrazon BR 200[1] in methanol shall be poured into the vessel, its level being 2 mm to 3 mm higher than the level of the balls. See Figure 2 for a representation of this test arrangement. The specimens shall be observed for 15 min. Other, equivalent, products to Astrazon BR 200 may be used.

Dimensions in millimetres

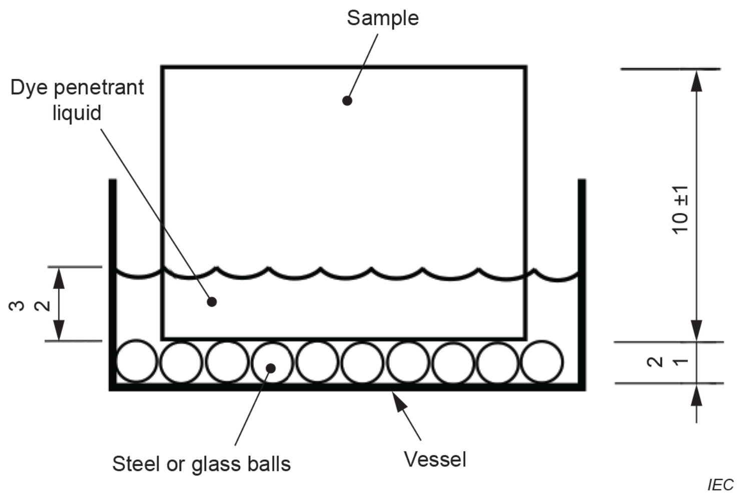

Figure 2 – Dye penetration test arrangement

4.2.1.5 Dye penetration test acceptance criteria

No dye shall rise through the specimens before the 15 min have elapsed. Steps may be taken to prevent dye wicking up the outside surface of the samples.

4.2.2 Long term deformation/creep testing

4.2.2.1 General

This test is for fuses that incorporate composite and/or resin type polymeric insulators.[2]

4.2.2.2 Number of devices to be tested

Three new test samples shall be used for this test, consisting of a fuse-base and a disconnecting blade, or a fuse-base, fuse-carrier and fuse-link. The test procedure is:

a) The distance between the upper contact and lower hinge on all three fuse-bases shall be measured.
b) The test samples shall be placed into an oven at 75 °C (+5 °C, −0 °C) until all components have reached thermal equilibrium.
c) Once all components have reached the proper temperature, the three disconnecting blades or fuse-carriers and fuse-links shall be installed into the three fuse-bases in the closed position.
d) After 8 h have passed, the first device is removed and placed in a water bath, at ambient temperature, for one minute. After one minute, the disconnecting blade or fuse-carrier and fuse-link is removed and the distance between the upper contact and lower hinge is measured.

[1] Astrazon BR 200 is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by the IEC of this product.

[2] Reproduced from IEEE Std C37.41:2016, with the permission of IEEE.

e) After 24 h have passed, the second device is removed and placed in a water bath, at ambient temperature, for one minute. After one minute, the disconnecting blade or fuse-carrier and fuse-link is removed and the distance between the upper contact and lower hinge is measured.
f) After 168 h, the final device is removed and placed in a water bath, at ambient temperature, for one minute. After one minute, the disconnecting blade or fuse-carrier and fuse-link is removed and the distance between the upper contact and lower hinge is measured.

4.2.2.3 Acceptance criteria

a) The final measured length of all samples shall be within the limits defined by the manufacturer.
b) Each sample shall be subjected to a temperature rise test at rated current of the fuse-base or fuse-carrier, whichever is lower. The temperature rise of individual components may exceed the temperature rise limits specified in IEC 60282-2, provided that all measurements demonstrate that temperature stability, without thermal runaway, has occurred.
c) The samples shall demonstrate that they remain capable of proper mechanical performance. For dropout devices, performance shall be verified by the following process. Each sample shall have a fuse-carrier mounted in the fuse-support and current passed through the fuse element sufficient to melt it. The sample shall be verified to have operated and moved to the proper open state.

4.3 Environmental tests

4.3.1 General

These tests are for fuses that incorporate composite and/or resin type polymeric insulators.

4.3.2 Accelerated weathering test

4.3.2.1 Test procedure

Three new fuse-bases shall be selected with labels/markings included, if applicable.

The new fuse-bases shall be subjected to a 1 000 h UV light test using the following test method. Markings on the housing, if any, shall be directly exposed to UV light:

Xenon-arc methods: ISO 4892-2, using cycle 1 with a dark period of 8 h

NOTE More information on accelerated weathering tests can be found in CIGRE Technical Brochure No. 488.

4.3.2.2 Acceptance criteria

After the test, markings on shed or housing material shall still be legible; cracks, blisters, and crumbling are not permitted. General surface degradation shall be measured using the following method.

Two surface roughness measurements shall be made on each of the three specimens. The roughness, Rz as defined in ISO 4287, shall be measured along a sampling length of at least 2,5 mm. Rz shall not exceed 0,1 mm.

A 1 min dry power frequency withstand voltage test shall be performed on each sample (fitted with a disconnecting blade, or a fuse-carrier and fuse-link) as specified in IEC 60060-1. Each sample shall withstand its rated short-duration power frequency withstand voltage. If flashover or puncture occurs, the fuse shall be considered to have failed the test.

4.3.3 Tracking and erosion test

4.3.3.1 General

These tests are for fuses that incorporate composite and/or resin type polymeric insulators.

Three samples shall be selected for the test procedure in 4.3.3.2, and for acceptance criteria testing in 4.3.3.3. A fourth sample shall be selected for acceptance criteria testing in 4.2.2.3. This forth reference sample shall not be tested in accordance with 4.3.3.2.

The devices shall be mounting on a tracking wheel. The tracking wheel cycles each device through 4 periods: submersion, drip, energized, and cooling, see Figure 3 for reference. The saline solution in the tank shall contain deionized water and 1,40 ± 0,06g/l of NaCl.

4.3.3.2 Test procedure

a) Set up and energize the circuit. The test voltage shall be no less than 58 % of the device's maximum rated voltage. The test circuit, when loaded with a resistive current of 250 mA (RMS) on the high-voltage side, shall experience a maximum drop of 5 %.
b) Each sample shall be exposed to 30 000 cycles. One cycle shall consist of one insulator rotating through each period. Each cycle shall be completed in 200 s ± 25 s, with the insulator being stationary no less than 80 % of the cycle time. Each of the 4 periods shall be approximately equal in duration. Several interruptions of the test for inspection purposes, each of these not exceeding 15 min, are permissible. Interruption periods shall not be counted in the test duration.
c) The test samples shall be given a 24-hour recovery period after each 96 h test period. During this period, the test procedure remains unchanged, except that the saline solution is removed from the dip tank.

   The 24 h recovery period may be omitted upon agreement with the manufacturer and test station.
d) Upon completion of all 30 000 cycles. The samples shall be removed and evaluated within a 48 h period.

The tracking and erosion test shall be regarded as passed if all samples met the following criteria and the acceptance testing according to 4.3.3.3:

- Each sample shall complete all 30 000 cycles without the leakage current rising above 250 mA.
- No punctures of a shed, housing or interface.
- For composite insulators: tracking/erosion shall not reach the core.
- For resin insulators: erosion depth is less than 3 mm.

4.3.3.3 Acceptance testing procedure

Each aged sample and reference sample shall be subjected to the following tests. The procedures shall be completed in the following order.

a) Rinse all samples with deionized water.
b) Measure the resistance using a mega-ohm meter with a test voltage not less than 1 kV. The resistance shall not be less than 3 MΩ. Three measurements shall be taken: end fitting to end fitting and each end fitting to the centre fitting.
c) Steep-front impulse voltage test and acceptance criteria according to 4.4.3.2.
d) Dry power frequency withstand voltage test and acceptance criteria according to 4.4.3.3.
e) Lightning impulse voltage dry test according to IEC 60060-1. Impulse wave shape shall be the standard 1,2/50 µs. Each sample shall withstand 80 % of its rated lightning impulse withstand voltage.

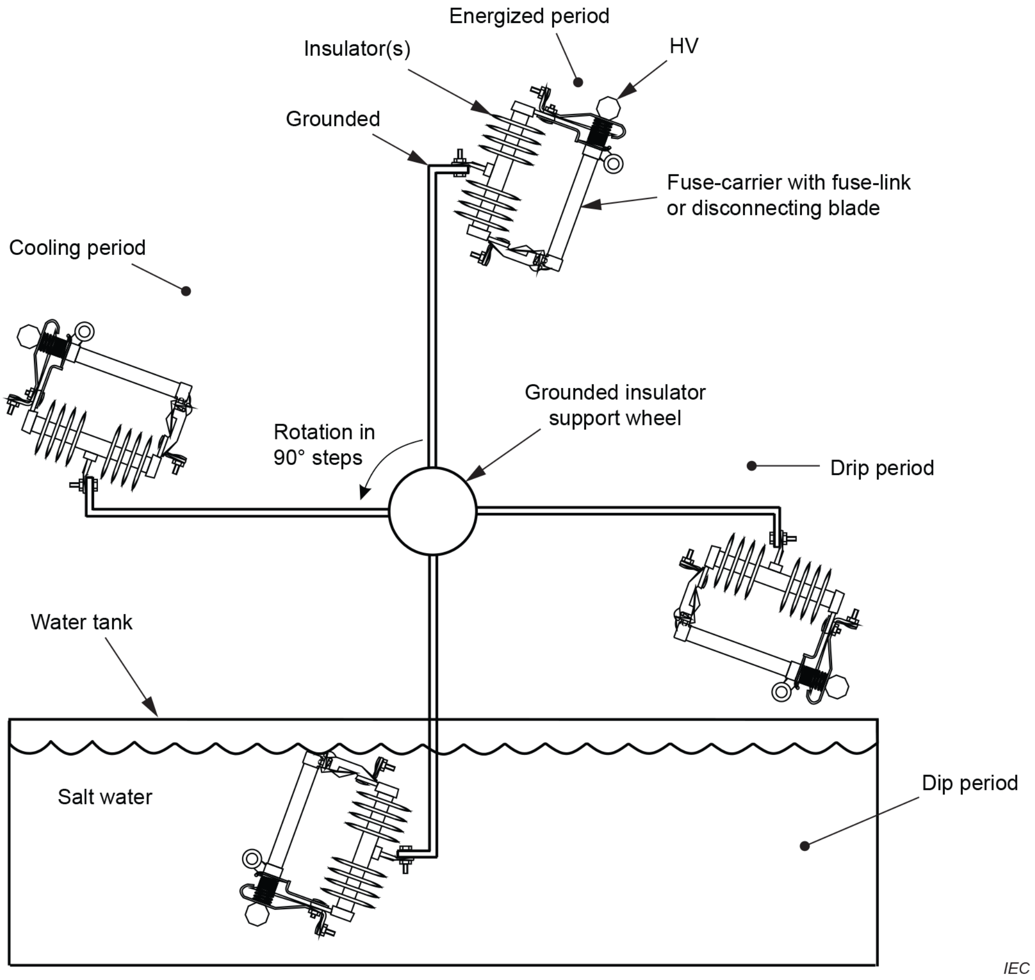

Figure 3 – Tracking wheel test arrangement

4.3.4 Flammability test

No flammability tests are required for any type of polymeric insulator being part of cut out fuse bases. However, if required by the customer, further information on flammability testing associated with polymer insulators can be found in IEC 62217.

4.4 Tests on interfaces and connections of end fittings

4.4.1 General

This testing is for fuses that incorporate composite and/or resin type polymeric insulators. A test sample shall consist of a fuse-base and a disconnecting blade, or a fuse-base, fuse-carrier, and fuse-link.

Fuses using composite polymeric insulators are subject to pre-stressing. For pre-stressing, three samples shall be selected. A fourth sample shall be selected for verification tests (4.4.3) but this reference sample shall not be pre-stressed.

Fuses that do not require pre-stressing (i.e. those that use resin insulators) before the verification tests do not require the use of a reference sample as the tested fuses are used to determine the reference flashover voltage. Three samples shall be tested.

4.4.2 Water immersion pre-stressing procedure

Pre-stressing only applies to fuses using composite polymeric insulators. Only the fuse-base is required to undergo the pre-stressing procedure.

a) The hardness of the insulator housing shall be measured for each sample. Measurement shall be in accordance with ISO 868 using a Shore A Durometer.
b) Each sample shall be boiled for 100 h in water having 0,1 % by weight of NaCl.
c) After boiling, each insulator sample shall be allowed to cool and rinsed with deionized water.
d) The hardness shall be re-measured. The hardness shall not have changed by more than 20 %.
e) The verification tests (4.4.3) shall be completed within 48 h of the samples being removed from the boiling water.

4.4.3 Verification tests

4.4.3.1 General

The following verification tests apply to fuses that incorporate composite and/or resin type polymeric insulators. Tests in 4.4.3.2 shall be performed before tests in 4.4.3.3. Additionally, for composite polymeric insulators, the procedure in 4.4.2 shall be performed prior to tests in 4.4.3.2.

4.4.3.2 Steep-front impulse voltage test

Each sample, and the reference sample if necessary, shall be subjected to steep-front impulse flashovers resulting from ten positive and ten negative voltage waves. The voltage shall rise at a minimum of 1 000 kV/µs. For an example of these waves see IEC 60060-1:2010, Figure 12. The samples shall be mounted per the manufacturer's specification with fuse-carriers or disconnecting blades installed in the fuse-base. The fuse-base shall be earthed and both terminals energised. The test shall be regarded as passed if all samples met the following criteria:

- Each impulse shall cause an external flashover.
- For composite insulators: there are no punctures that expose the core.
- For resin insulators: there are no punctures to any potted fittings.

NOTE The typical industry perspective is that punctures of any kind are not allowed. However, the intent of this test is to significantly stress the interface between core and housing, or fitting and resin insulator, by subjecting the cutout to a "failure" mode (flashover). Based on the typical construction of composite polymer cutouts, punctures to the centrally located mounting bracket may not impact the rated dielectric strength of some designs. To test this, additional, subsequent, tests are specified. These are a dry power frequency test in 4.4.3.3, and in the case of the tracking and erosion test (4.3.3), after the testing performed in accordance with 4.4.3.2 and 4.4.3.3 a lightning impulse test is performed (see 4.3.3.3). Note that for these tests, any (additional) punctures are not allowed.

4.4.3.3 Dry power frequency test

The dry power frequency voltage (reference flashover voltage) shall be determined by averaging five flashover voltages on each sample. If a reference sample is being used, the average flashover voltage for this sample is the reference flashover voltage. The reference flashover voltage shall be corrected to normal standard atmospheric conditions in accordance with IEC 60060-1. The flashover voltage shall be obtained by increasing the voltage linearly from zero within 1 min.

Before commencing the following test, the shank temperature on all test samples, including the reference sample if applicable, shall be determined by averaging three values measured between the sheds along the length of the insulator(s) (reference temperature).

The test samples, and the reference test sample if applicable, shall then be continuously subjected for 30 min to 80 % of the reference flashover voltage.

Measurement of the shank temperature on all test specimens, and of the reference sample if applicable, shall be repeated immediately after the removal of the test voltage.

The test shall be regarded as passed if all samples meet the following criteria:

- The average flashover voltage of a pre-stressed sample shall be greater than or equal to 90 % of the reference flashover voltage.
- There are no additional punctures of the shed, housing or interface.
- The difference between the temperature rise of the pre-stressed samples and the reference sample shall be less than 10 K.
- In cases where there is no reference sample, then the maximum temperature rise shall be less than 20 K compared to the reference temperature determined prior to the power frequency tests.

4.5 Breaking tests with dye penetration

4.5.1 General

This test applies to fuses that use composite and/or resin type polymeric insulators. The purpose of the test is to assess the interrupting performance of fuse-bases incorporating polymeric insulators.

4.5.2 Description of tests to be made

The breaking tests shall be made with single-phase alternating current.

Tests shall be made in accordance with IEC 60282-2:2008, 8.6, Test Duty 1: Verification of operation with the rated maximum breaking current I_1.

It is not necessary to perform additional Test Duty 1 tests to those specified in IEC 60282-2:2008. Fuse-supports from tests performed in accordance with Test Duty 1 of IEC 60282-2:2008, 8.6 may be used to evaluate the requirements of 4.5.

4.6 Acceptance criteria

a) There shall be no visible damage to the polymeric insulator(s) and test samples shall meet the requirements of IEC 60282-2:2008, 7.2.

b) For fuses that use composite polymeric insulators, samples cut from each tested insulator shall be subjected to a dye penetration test in accordance to the requirements of 4.2.1.4 in order to verify that no damage to the core material has occurred. The fuses are considered to have passed the tests if all samples meet the requirements in 4.2.1.5.

Bibliography

IEC 62217:2012, *Polymeric HV insulators for indoor and outdoor use – General definitions, test methods and acceptance criteria*

IEEE C37.41™-2016, *IEEE Standard Design Tests for High-Voltage (>1000 V) Fuses and Accessories*

CIGRE Technical Brochure No. 488, *Resistance to Weathering and UV Radiation of Polymeric Materials for Outdoor Insulation*

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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