

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrical insulating materials used under severe ambient conditions – Test methods for evaluating resistance to tracking and erosion

Matériaux isolants électriques utilisés dans des conditions ambiantes sévères – Méthodes d'essai pour évaluer la résistance au cheminement et à l'érosion

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL INSULATING MATERIALS
USED UNDER SEVERE AMBIENT CONDITIONS –
TEST METHODS FOR EVALUATING RESISTANCE
TO TRACKING AND EROSION**

FOREWORD

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International Standard IEC 60587 has been prepared by IEC technical committee 112: Evaluation and qualification of electrical insulating materials and systems.

This third edition cancels and replaces the second edition, published in 1984, and constitutes a technical revision. The main changes from the previous edition are as follows: experience has indicated the need for improved description of the experimental method. For the preparation of the test specimens abrasion is recommended only if necessary. The ventilation of the test chamber is described in detail. For specimens of soft elastomeric materials a mounting support is described. The maximum depth of erosion has to be reported in the classification.

This bilingual version, published in 2009-11, corresponds to the English version.

The text of this standard is based on the following documents:

FDIS	Report on voting
112/56/FDIS	112/61/RVD

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

The French version of this standard has not been voted upon.

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

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

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- withdrawn;
- replaced by a revised edition, or
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ELECTRICAL INSULATING MATERIALS USED UNDER SEVERE AMBIENT CONDITIONS – TEST METHODS FOR EVALUATING RESISTANCE TO TRACKING AND EROSION

1 Scope

This International standard describes two test methods for the evaluation of electrical insulating materials for use under severe ambient conditions at power frequencies (45 Hz to 65 Hz) by measurement of the resistance to tracking and erosion, using a liquid contaminant and inclined plane specimens. The two methods are as follows:

- Method 1: constant tracking voltage;
- Method 2: stepwise tracking voltage.

NOTE 1 Method 1 is the most widely used method as there is less need for continual inspection.

NOTE 2 The test conditions are designed to accelerate the production of the effects, but do not reproduce all the conditions encountered in service.

2 Terms and definitions

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

2.1

track

partially conducting path created by localized deterioration on the surface of an insulating material

2.2

tracking

progressive degradation of the surface of a solid insulating material by local discharges to form conducting or partially conducting paths

NOTE Tracking usually occurs due to surface contamination.

[IEC 60050-212-01-42¹]

2.3

erosion, electrical

loss of material by leakage current or electrical discharge

2.4

time-to-track

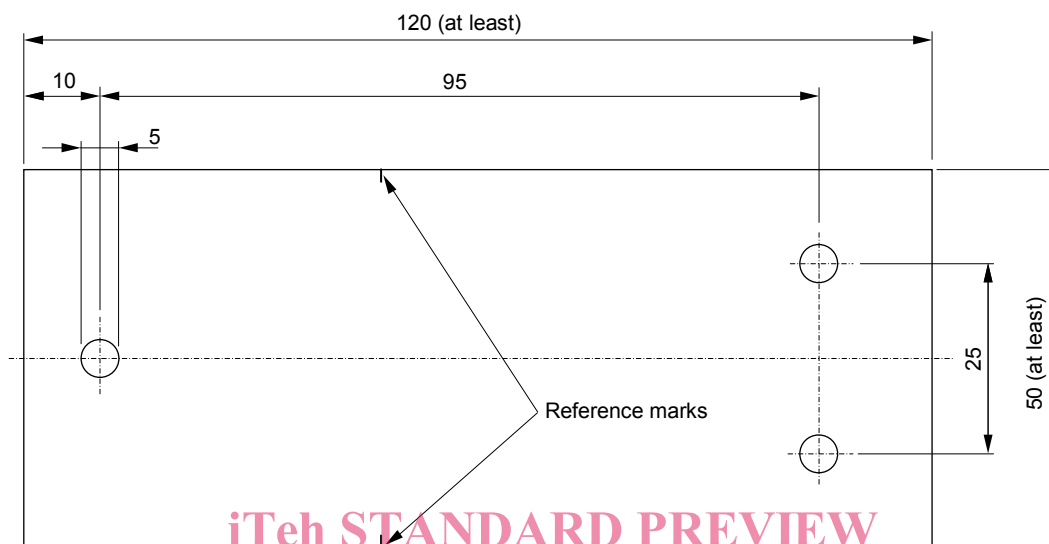
time required to produce tracks under the specified conditions of test

¹ IEC 60050-212:1990, *International Electrotechnical Vocabulary – Chapter 212: Insulating solids, liquids and gases*

3 Test specimens

3.1 Dimensions

Flat specimens with a size of at least 50 mm X 120 mm shall be used. The preferred thickness shall be 6 mm. Other thicknesses may be used, but must be mentioned in the test report. The specimens shall be drilled as shown in Figure 1, to attach the electrodes.



IEC 672/07

Dimensions in millimetres

Figure 1 – Test specimen with holes for fixing electrodes

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3.2 Preparation

The specimens shall be washed with a suitable solvent (e.g. isopropyl alcohol) to remove leftovers such as fat from handling. After that the specimens shall be rinsed with distilled water.

The cleaned specimens shall be mounted carefully to avoid contamination.

If the contaminant does not wet the surface evenly within the observation time mentioned in 5.1, the surface of the specimens can be slightly abraded. The abrasion should be done with a fine (U.S. grade (CAMI): 400 mesh; European grade (FEPA): P800) aluminium-oxide- or zirconia-alumina-abrasive under water until the whole surface wets and appears uniformly matt when dry. When abraded the specimen shall be cleaned another time with distilled water.

Abrasion has to be mentioned in the test report.

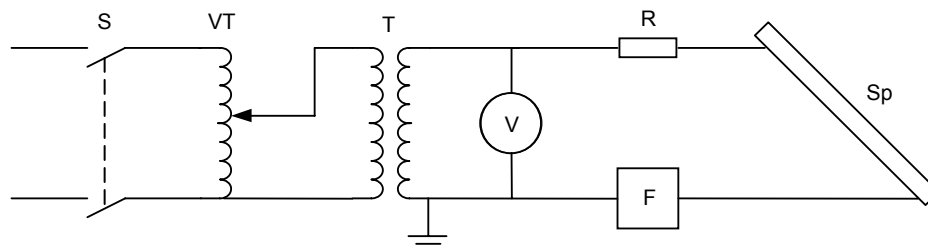
Specimens used for criterion B (see 5.4) shall have reference marks on both edges, 25 mm above the lower electrode (see Figures 1 and 7).

4 Apparatus

4.1 Electrical apparatus

A schematic circuit is given in Figure 2. As the test will be carried out at high voltages, it is obviously necessary to use an earthed safety enclosure. The circuit comprises:

- A 45 Hz to 65 Hz power supply with an output voltage stabilized to $\pm 5\%$ which can be varied up to about 6 kV with a rated current not less than 0,1 A for each specimen. Preferred test voltages are 2,5 kV, 3,5 kV and 4,5 kV, for method 1.



IEC 673/07

Components

S	power supply switch
VT	variable ratio transformer
T	high-voltage transformer
R	series resistor
V	voltmeter
Sp	specimen
F	overcurrent device, fuse or relay

Figure 2 – Schematic circuit diagram
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NOTE If only one power supply is used for several specimens, each should have a circuit-breaker or a similar device (see 4.1, last sentence).

[IEC 60587:2007](https://standards.iteh.ai/catalog/standards/sist/dd23d22f-3d31-4817-adc4-acc09a10/iec-60587-2007)

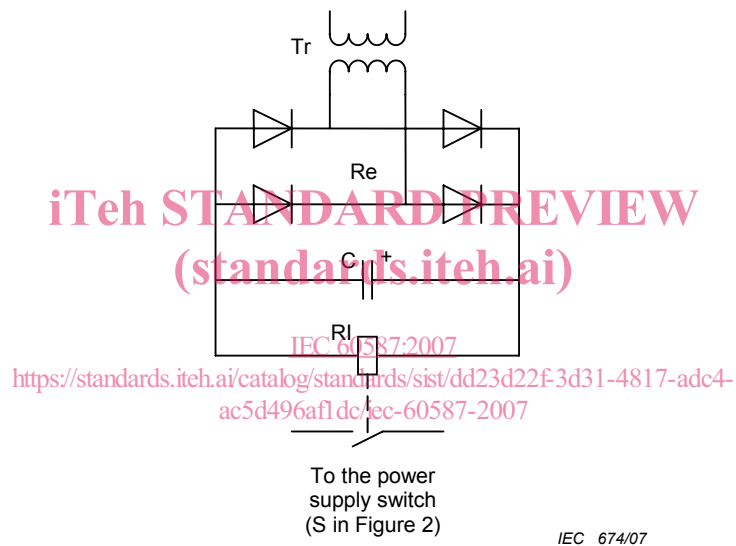
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- A 200 W resistor with $\pm 10\%$ tolerance in series with each specimen at the high-voltage side of the power supply. The resistance of the resistor shall be taken from Table 1.

Table 1 – Test parameters

Test voltage kV	Preferred test voltage for method 1 kV	Contaminant flow rate ml/min	Series resistor, Resistance kΩ
1,0 to 1,75	-	0,075	1
2,0 to 2,75	2,5	0,15	10
3,0 to 3,75	3,5	0,30	22
4,0 to 4,75	4,5	0,60	33
5,0 to 6,0	-	0,90	33

- A true r.m.s. voltmeter with an accuracy of 1,5 % of reading shall be used.
- An overcurrent delay relay (for example see Figure 3) or any other device which operates when $60 \text{ mA} \pm 6 \text{ mA}$ or more has persisted in the high-voltage circuit for 2 s to 3 s.



Components

- Re rectifier
- Tr transformer (winding 300/900 turns)
- RI relay (2 500 Ω/11 000 turns)
- C capacitor (200 μF)

Figure 3 – Example: typical circuit for an overcurrent delay relay (F in Figure 2)

4.2 Electrodes

All electrodes, fixtures and assembly elements associated with the electrodes, such as screws, shall be made of stainless steel e.g. grade 302. The electrode assembly is shown in Figure 6.

NOTE The electrodes shall be cleaned prior to each test and replaced when necessary.

The top electrode is shown in Figure 4. The bottom electrode is shown in Figure 5.

NOTE This can be done by pumping the contaminant through a tube into the filter-paper pad. The tube can be held between the filter papers by a clip of stainless steel. Another possibility is to drip the contaminant into the filter-paper pad with a fixed drop size and fixed number of drops per minute.

- The rate of application of contaminant shall be that within $\pm 10\%$ specified in Table 1 in relation to the applied voltage.

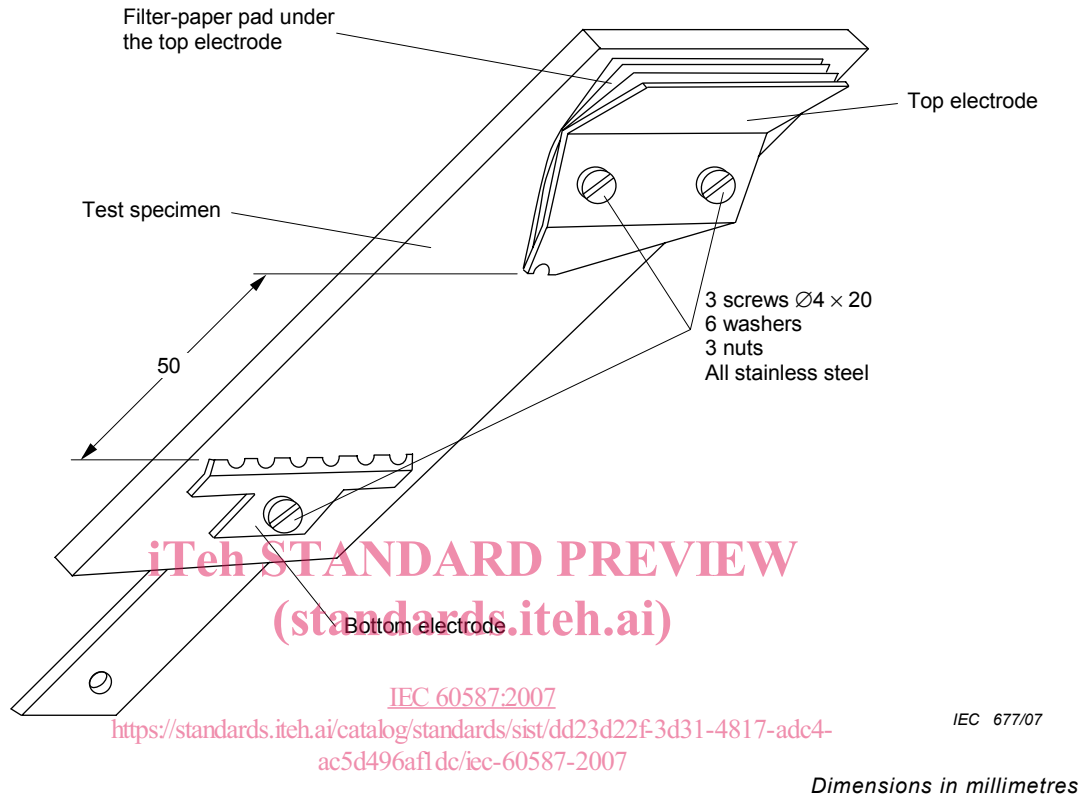


Figure 6 – Assembly of the electrodes

4.4 Timing device

A timing device with an accuracy of about ± 1 min/h shall be used.

NOTE For example a 1 min pulser with a counter is acceptable.

4.5 Depth gauge

A depth gauge with an accuracy of $\pm 0,01$ mm shall be used. The point of the probe shall be hemispherical with a radius of 0,25 mm.

4.6 Ventilation

The test chamber shall be equipped with a ventilation to allow an exhaust of steam and gaseous decomposition products. The ventilation of the test chamber should be moderate and constant to avoid permanent condensation of water. Direct airflow across the test specimens shall be avoided.

NOTE Experience shows that the intensity of ventilation may influence the test result.