TECHNICAL REPORT

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Selection guide for polymeric materials for outdoor use under HV stress

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SELECTION GUIDE FOR POLYMERIC MATERIALS FOR OUTDOOR USE UNDER HV STRESS

FOREWORD

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IEC 62039, which is a technical report, has been prepared by IEC technical committee 112: Evaluation and qualification of electrical insulating materials and systems.

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

Enquiry draft	Report on voting
112/34/DTR	112/54/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.

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

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- withdrawn;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

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

There is an urgent need within utilities and industry for material standards, which define the physical properties of the polymers applied for outdoor insulation. This requirement was identified during discussions in IEC TC 36 and IEC TC 15 which is today part of IEC TC 112. As a consequence, in the year 2001, CIGRE formed the WG D1.14 with the specific task of defining the physical parameters important for the polymeric materials applied in outdoor insulation and to develop the relevant test methods where necessary. As a first step, a state-of-the-art report was issued by CIGRE in the brochure 255. Twelve properties have been identified; standardised test methods and minimum requirements where available for eight of them. For the remaining four properties, test methods and minimum requirements still need to be defined. This will be the future task of WG D1. This IEC Technical Report presents – as conclusion of the CIGRE-report – the important material properties for polymeric materials used in outdoor insulation and where they are applicable, and lists the standardised test methods including the minimum requirements. If no standardised tests are available, then test methods reported in literature are summarised.

SELECTION GUIDE FOR POLYMERIC MATERIALS FOR OUTDOOR USE UNDER HV STRESS

1 Scope

This IEC Technical Report presents the important material properties for polymeric materials used in outdoor insulation and, where applicable, lists the standardised test methods including the minimum requirements. If no standardised tests are available, then test methods reported in literature are summarised.

This report is valid for insulating materials used in outdoor high voltage electrical applications with a system voltage greater than 1000 V a.c. having polymeric insulation including also such applications where the housing is an integral part of the devices e.g. in surge arrestors and cable terminations. The scope of this report is limited to the materials only. The performance of insulators in service depends on several factors such as the type of material, the design, environmental conditions etc. Consequently, the choice of materials that fulfil the requirements listed below is a necessary condition but does not guarantee satisfactory performance when used in outdoor insulation.

2 Normative references

The following referenced documents are indispensable for the application 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 60093, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials*

IEC 60243-1, *Electrical strength of insulating materials – Test methods – Part 1: Tests at power frequencies*

IEC 60250, *Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths*

IEC 60455-2:1998, *Resin based reactive compounds used for electrical insulation – Part 2: Methods of test*

IEC 60587, *Test method for evaluating resistance to tracking and erosion of electrical insulating materials used under severe ambient conditions*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 61006, *Electrical insulating materials – Methods of test for the determination of the glass transition temperature*

IEC 61109, *Composite insulators for a.c. overhead lines with a nominal voltage greater than 1000 V – Definitions, test methods and acceptance criteria*
Amendment 1 (1995)

IEC 61621, *Dry, solid insulating materials – Resistance test to high-voltage, low-current arc discharges*

IEC 62217, *Polymeric insulators for indoor and outdoor use with a nominal voltage greater than 1 000 V – General definitions, test methods and acceptance criteria*

ISO 62, *Plastics – Determination of water absorption*

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

ISO 4892-3, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*

ISO 4892-4:2004, *Plastics – Methods of exposure to laboratory light sources – Part 4: Open-flame carbon-arc lamps*

ISO 11357-2, *Plastics – Differential scanning calorimetry (DSC) – Part 2: Determination of glass transition temperature*

ISO 11359-2:1999, *Plastics – Thermomechanical analysis (TMA) – Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*