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Guidance on the measurement of hydrophobicity of insulator surfaces

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Guidance on the measurement of hydrophobicity of insulator surfaces

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

GUIDANCE ON THE MEASUREMENT OF HYDROPHOBICITY OF INSULATOR SURFACES

FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62073, which is a technical specification, has been prepared by IEC technical committee 36: Insulators.

This second edition cancels and replaces the first edition published in 2003. This edition constitutes a technical revision.

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This edition includes the following significant technical changes with respect to the previous edition:

a) Changed wettability to hydrophobicity throughout the document

b) Redefined the criteria for the determination of hydrophobicity class in paragraph 3.4;

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

Enquiry draft	Report on voting
36/363/DTS	36/367/RVC

Full information on the voting for the approval of this technical specification 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 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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

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INTRODUCTION

The wetting properties of a surface by water are commonly described by the terms hydrophobic (or hydrophobicity) and hydrophilic (or hydrophilicity). A hydrophobic surface is water-repellent, while a surface that is easily wetted by water is hydrophilic.

The wetting phenomenon of a surface is complex and many different parameters can influence its hydrophobic properties. Some important parameters include: type of insulator material, surface roughness, heterogeneities of the surface, chemical composition (e.g. due to ageing) and presence of pollution. For insulator materials in common use, the hydrophobic properties can change over time, due to the influence of the ambient conditions. This change can be either reversible or irreversible. Thus, the result of the measurement of the hydrophobicity may be influenced by the ambient conditions and the HV corona or dry-band arcing to which the insulator has been previously exposed. This dynamic behaviour of the hydrophobicity is more or less specific to different insulator materials. These types of materials, which have an ability to retain and transfer hydrophobicity, are commonly called Hydrophobicity Transfer Materials (HTM).

The dynamic behaviour of the hydrophobicity exhibited by insulator materials is due to their chemical composition. Different processes such as oxidation, hydrolysis, migration of low molecular weight compounds, formation of complex compounds between e.g. siloxanes and water, rotation of flexible polymer chains, inter- and intra-molecular rearrangements, microbiological growth, deposition of contaminants, adhesion and encapsulation of contaminant particles, may take place at different rates, depending on material and ambient conditions. Thus hydrophobicity along and around an insulator can vary, due to differences in the exposure to solar radiation, rain, corona discharges, deposited pollution, etc. Therefore, hydrophobicity of insulators is usually measured on several separate areas of the insulator.

Measurement of the hydrophobicity of a surface is readily performed in the laboratory on well defined, homogeneous, smooth and planar surfaces of prepared specimens. In the case of insulators, for which non-destructive measurements are usually required (and where cut-out of material samples is usually not desired), these conditions do not exist and measurement with high precision is a difficult task. This is especially true when the measurement has to be performed on an insulator installed in an overhead line, substation or even in a high voltage test set-up in the laboratory.

Previously wettability class (WC) was used as equivalent technology.

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