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TECHNICAL REPORT

Low voltage switchgear and controlgear – Partial discharge voltages and PD-level in low voltage switchgear and controlgear



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

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LOW VOLTAGE SWITCHGEAR AND CONTROLGEAR –

PARTIAL DISCHARGE VOLTAGES AND PD-LEVEL IN LOW VOLTAGE SWITCHGEAR AND CONTROLGEAR

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IEC TR 63434 has been prepared by subcommittee 121A: Low voltage switchgear and controlgear, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low-voltage. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
121A/549/DTR	121A/556A/RVDTR

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

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

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

INTRODUCTION

The application of this document is intended to provide awareness about partial discharge phenomena. Special emphasis is given to the electrical field stress through solid insulation as it relates to the risk of insulation failure.

IEC 60664-1[1] [1] is only providing requirements for partial discharge testing of solid insulation when the peak value of the operational voltage exceeds 700 V and the average field strength is higher than 1 kV/mm. However, in practice, partial discharge testing gives random results below 4 kV/mm, mainly because of the intrinsic fluctuation of PD inception voltage in gaps, the variations of the shape and size of the internal voids in solid materials, and the large influence of the temperature and humidity on the material characteristics. Therefore, this document is providing guidance related to the proper design of the insulation and the selection criteria of the material.

[1] Numbers in square brackets refer to the Bibliography.

LOW VOLTAGE SWITCHGEAR AND CONTROLGEAR –

PARTIAL DISCHARGE VOLTAGES AND PD-LEVEL IN LOW VOLTAGE SWITCHGEAR AND CONTROLGEAR

1 Scope

This document is intended to provide awareness about partial discharge phenomena. This document gives guidance for some conditions when partial discharge can occur in low voltage switchgear and controlgear connected to networks of up to 1 000 V AC. Internal operational voltages can exceed these values. This document gives guidance on the design of conductors and dimensioning of insulation exposed to electrical fields.

This document explains the partial discharge phenomena considering electrical field stress, type of insulation material and other construction parameters, such as the voltage, frequency, temperature, humidity and the distances within the device.

This document does not cover:

- phenomena associated with semiconductor power switching by effects on equipment placed downstream of semiconductor power switching systems;
- partial discharge test procedures (see IEC 60270) [2];
- pure DC systems which are under consideration;
- selection of solid insulation material.

2 Normative references

There are no normative references in this document.

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
homogeneous electric field
electric field which has an essentially constant voltage gradient between electrodes, such as that between two spheres where the radius of each sphere is greater than the distance between them

Note 1 to entry: The homogeneous field condition is referred to as case B in IEC 60664-1[1].

[SOURCE: IEC 60050-442:2014[3], 442-09-02]

3.2
inhomogeneous electric field
electric field which does not have an essentially constant voltage gradient between electrodes