



BSI Standards Publication

## Rotating electrical machines

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Part 27-5: Off-line measurement of partial discharge inception voltage on winding insulation under repetitive impulse voltage

## National foreword

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The UK participation in its preparation was entrusted to Technical Committee PEL/2, Rotating electrical machinery.

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**Rotating electrical machines –  
Part 27-5: Off-line measurement of partial discharge inception voltage on  
winding insulation under repetitive impulse voltage**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ROTATING ELECTRICAL MACHINES –

**Part 27-5: Off-line measurement of partial discharge inception voltage on winding insulation under repetitive impulse voltage**

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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 TS 60034-27-5, which is a Technical Specification, has been prepared by IEC technical committee 2: Rotating machinery.

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

Draft TS	Report on voting
2/1955/DTS	2/1962A/RVDTS

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

NOTE A table of cross-references of all IEC TC 2 publications can be found on the IEC TC 2 dashboard on the IEC website.

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

- reconfirmed,
- withdrawn,
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- amended.

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## INTRODUCTION

The recent development of power electronics technology has led to various power drive systems (PDS) of variable-speed rotating electrical machines. The new influences of PDS on rotating machines are introduced in IEC TS 60034-25 [1]<sup>1</sup>. This document points out that electrical insulation of machine winding is exposed to numerous voltage impulses due to the repetitive fast switching of power devices in PDS. The severity of the impulses depends on ratings of converter and machines, converter topology, length of cable between machine and converter, filtering equipment and so on.

IEC 60034-18-41 [2], published in 2014, is the first International Standard which describes design qualification and type tests for Type I (partial discharge free) insulation systems used in converter-fed rotating electrical machines. In this document, both tests require partial discharge (PD) tests with power frequency voltage or impulse excitation. As for PD measurements with impulse excitation, IEC 60034-18-41 cites IEC TS 61934, which provides a technical explanation and several PD measuring methods, in general. For practical test guidance specific to winding insulation of rotating machines, this document was prepared as an off-line measurement of PD inception and extinction voltages during repetitive impulse condition, RPDIV and RPDEV.

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<sup>1</sup> Numbers in square brackets refer to the Bibliography

## ROTATING ELECTRICAL MACHINES –

### Part 27-5: Off-line measurement of partial discharge inception voltage on winding insulation under repetitive impulse voltage

#### 1 Scope

This document provides an off-line measurement method of the partial discharge inception and extinction voltage on winding insulation under repetitive impulse voltage. This document is relevant to rotating machines supplied by a voltage source converter.

#### 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 60034-27-1, *Rotating electrical machines – Part 27-1: Off-line partial discharge measurements on the winding insulation*

IEC TS 61934:2011, *Electrical insulating materials and systems – Electrical measurement of partial discharges (PD) under short rise time and repetitive voltage impulses*

IEC TS 62478, *High voltage test techniques – Measurement of partial discharges by electromagnetic and acoustic methods*

#### 3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms, definitions, symbols and abbreviated terms given in IEC 60034-27-1, IEC TS 61934, and the following 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 partial discharge PD

localized electrical discharge that only partially bridges the insulation between conductors and which can or cannot occur adjacent to a conductor

##### 3.2 repetitive partial discharge inception voltage RPDIV

minimum peak-to-peak impulse voltage at which more than five PD pulses occur on ten voltage impulses of the same peak-to-peak values when the impulse voltage applied to the test object is increased with step-by-step method

Note 1 to entry: This is a mean value for the specified test time and a test arrangement where the voltage applied to the test object is increased with the step-by-step method. Details are mentioned in 5.5.