

TECHNICAL SPECIFICATION

**Rotating electrical machines -
Part 27-6: On-line partial discharge measurements of rotating machine windings
supplied from a converter**

get full document from standards.iteh.ai



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2026 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

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

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	3
INTRODUCTION	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Causes and effects of on-line PD	9
4.1 General requirements	9
4.2 Type I windings	9
4.3 Type II windings	9
5 Challenges with measuring PD on-line with windings connected to converters	10
5.1 General	10
5.2 Synchronizing to the fundamental AC voltage cycle	11
5.3 Fundamental frequency stability	11
5.4 Synchronizing to the impulse voltage	11
5.5 Disturbances caused by converter switching	12
6 Measurement frequency range	12
6.1 VHF	12
6.2 UHF	12
7 PD sensors	12
7.1 General	12
7.2 Capacitors	13
7.3 Electromagnetic couplers (antennas)	13
7.4 High frequency current transformers (HFCT)	14
7.5 Ultrasonic sensor	14
7.6 UV detection	14
7.7 Ozone sensor	14
8 Instrumentation and software	14
8.1 General	14
8.2 Switching transient interference suppression	15
8.3 Frequency stability check	15
8.4 Types of output plots	15
8.4.1 General	15
8.4.2 PRPD plot	15
8.4.3 PD transient impulse plot	16
8.5 Hybrid method	18
9 Sensitivity check	18
10 Measuring procedures	18
11 Basic interpretation	19
11.1 General	19
11.2 Type I windings	19
11.3 Type II windings	20
Bibliography	21
Figure 1 – PRPD plot from one phase of an operating 7,2 kV motor running at 100 Hz with an 11-level converter [1]	16

Figure 2 – Waveform from an unfiltered antenna (red line) showing the switching transient at the beginning of the impulse (blue line), as well as PD at the peak of the impulse [2]..... 17

Figure 3 – PD from an antenna and bandpass filter in a stator winding (upper trace) due to switching impulses from a converter [3] 17

Figure 4 – Modified converter connected to three phase winding for a hybrid test to measure winding PD just prior to just after motor operation [4]..... 18

Sample Document

get full document from standards.iteh.ai

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Rotating electrical machines -
Part 27-6: On-line partial discharge measurements
of rotating machine windings supplied from a converter**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 60034-27-6 has been prepared by subcommittee IEC technical committee 2: Rotating machines. It is a Technical Specification.

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

Draft	Report on voting
2/2282/DTS	2/2308/RVDTS

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 Specification 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.

A list of all parts in the IEC 60034 series, published under the general title *Rotating electrical machines*, can be found 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 <https://webstore.iec.ch/> in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

Sample Document

get full document from standards.iteh.ai

INTRODUCTION

The on-line measurement of partial discharges (PD) is a well-established technology to help assess if deterioration has occurred in the electrical insulation of form-wound stator windings in motors and generators rated 3 kV and above that are directly connected to the 50/60 Hz power system. Such on-line testing helps machine owners determine when stator winding maintenance is required.

IEC 60034-27-2 provides methods for on-line PD detection, as well as advice on interpretation. However, the methods described in IEC 60034-27-2, in general, are not effective when applied to machines connected to most common types of AC frequency converters. This is because the AC fundamental frequency is not fixed, and since some types of drives (and the voltage source PWM converter in particular) produce high voltage impulses that in many respects have the same shape as PD pulses but are orders of magnitude higher than the PD pulses. The interference from the voltage impulses from operating converters can obscure the winding PD and make on-line measurement difficult if not impossible using the methods intended for machines fed from industrial sinusoidal AC voltage.

IEC TS 60034-27-5 is concerned with the off-line measurement of PD in windings caused by voltage impulses from specialized impulse test supplies. Usually, these voltage impulses are few in number per second, and the impulse waveform is well-behaved, reducing the risk of false indications. In contrast there are often thousands of impulses per second from converters, and a variety of impulse voltage waveforms occur, even from the same converter. Although some of the methods in IEC TS 60034-27-5 can produce good results when applied on-line, it is important to apply special provisions if they are used for on-line PD detection in windings supplied by converters.

On-line testing can be relevant for type I windings to confirm that frequent PD caused by converter switching is not occurring in service. On-line testing of type II windings can also be used for insulation condition monitoring to detect if aging processes are increasing the PD activity. Since some machine vendors are being asked to supply on-line PD systems for converter-fed machines, this document is intended to make users aware of the technical reasons why the methods in IEC 60034-27-2 are usually inadequate. It also provides guidance on methods that can be more effective.

Due to the high magnitude sparking that occurs with slip rings, at this time there are no on-line PD systems usable with converter-fed windings supplied via brushes/slip-rings.

This is a rapidly evolving technology with minimally proven systems available at the time of publication. Revisions to this document are expected in the near future as technology advances.