



TECHNICAL SPECIFICATION



Electrical insulating materials and systems – Electrical measurement of partial discharges (PD) under short rise time and repetitive voltage impulses

INTERNATIONAL
ELECTROTECHNICAL
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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	2
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Measurement of partial discharge pulses during repetitive, short rise-time voltage impulses and comparison with power frequency	9
4.1 Measurement frequency.....	9
4.2 Measurement quantities	10
4.3 Test objects	10
4.3.1 General	10
4.3.2 Inductive test objects	10
4.3.3 Capacitive test objects.....	10
4.3.4 Distributed impedance test objects	10
4.4 Voltage impulse generators.....	11
4.4.1 General	11
4.4.2 Voltage impulse waveforms	11
4.5 Effect of testing conditions	12
4.5.1 General	12
4.5.2 Effect of environmental factors	12
4.5.3 Effect of testing conditions and ageing	12
5 PD detection methods	12
5.1 General.....	12
5.2 PD pulse coupling and detection devices	13
5.2.1 Introductory remarks.....	13
5.2.2 Coupling capacitor with multipole filter.....	13
5.2.3 HFCT with multipole filter.....	14
5.2.4 Electromagnetic couplers.....	15
5.2.5 Electromagnetic UHF antennae	15
5.2.5 Charge measurements.....	15
5.3 Source-controlled gating techniques	15
6 Measuring instruments	18
7 Sensitivity check of the PD measuring equipment and high voltage source generator.....	18
7.1 General.....	18
7.2 Test diagram for sensitivity check	18
7.3 PD detection sensitivity check.....	19
7.4 Background noise check	19
7.5 Detection system and HVIG noise check.....	19
7.6 Sensitivity report.....	20
8 Test procedure for increasing and decreasing the repetitive impulse voltage magnitude	20
9 Test report.....	22
Annex A (informative) Voltage impulse suppression required by the coupling device	24
Annex B (informative) PD pulses extracted from a supply voltage impulse through filtering techniques.....	26

Annex C (informative) Results of round-robin tests of RPDIV measurement	28
Annex D (informative) Examples of noise levels of practical PD detectors.....	30
Bibliography.....	31
Figure 1 – Coupling capacitor with multipole filter	13
Figure 2 – Example of voltage impulse and ideal PD pulse frequency spectra before and after filtering.....	14
Figure 3 – HFCT between supply and test object with multipole filter	15
Figure 4 – HFCT between test object and earth with multipole filter	15
Figure 5 – Circuit using an electromagnetic coupler (e.g. an antenna) to suppress impulses from the test supply.....	15
Figure 6 – Circuit using an electromagnetic UHF antenna	16
Figure 7 – Example of waveforms of repetitive bipolar impulse voltage and charge accumulation for a twisted-pair sample
Figure 8 – Charge measurements
Figure 9 – Example of PD detection using electronic source-controlled gating (other PD coupling devices can be used)
Figure 7 – Test diagram for sensitivity check	19
Figure 8 – Example of relation between the outputs of LVPG and PD detector.....	20
Figure 9 – Example of increasing and decreasing the impulse voltage magnitude	22
Figure A.1 – Example of overlap between voltage impulse and PD pulse spectra (dotted area).....	24
Figure A.2 – Example of voltage impulse and PD pulse spectra after filtering	24
Figure A.3 – Example of impulse voltage damping as a function of impulse voltage magnitude and rise time.....	25
Figure B.1 – Power supply waveform and recorded signal using an antenna during supply voltage commutation.....	26
Figure B.2 – Signal detected by an antenna from the record of Figure B.1, using a filtering technique (400 MHz high-pass filter)	27
Figure B.3 – Characteristic of the filter used to pass from Figure B.1 to Figure B.2	27
Figure C.1 – Sequence of negative voltage impulses used for RRT	28
Figure C.2 – PD pulses corresponding to voltage impulses	29
Figure C.3 – Dependence of normalized RPDIV on 100 data (NRPDIV/100) on relative humidity	29
Table 1 – Example of parameter values of impulse voltage waveform without load	11
Table D.1 – Examples of bandwidths and noise levels for practical PD sensors	30

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FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC TS 61934:2011. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC TS 61934 has been prepared by IEC technical committee 112: Evaluation and qualification of electrical insulating materials and systems. It is a Technical Specification.

This third edition cancels and replaces the second edition published in 2011. This edition constitutes a technical revision.

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

- a) background information on the progress being made in the field of power electronics including the introduction of wide band gap semiconductor devices has been added to the Introduction;
- b) voltage impulse generators; the parameter values of the voltage impulse waveform have been modified to reflect application of wide band gap semiconductor devices.
- c) PD detection methods; charge-based measurements are not described in this third edition nor are source-controlled gating techniques to suppress external noise.
- d) Since the previous edition in 2011, there have been significant technical advances in this field as evidenced by several hundreds of publications. Consequently, the Bibliography in the 2011 edition has been deleted in this third edition.

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

Draft	Report on voting
112/578/DTS	112/610/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.

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IMPORTANT – The “colour inside” logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Power electronics has been developed along with both control theory and semiconductor technology. Switching is one of the essential features of power electronics control. For higher efficiency and smoother operation, switching times of ~~the latest~~ devices such as an insulated-gate bipolar transistor (IGBT) tend to be shorter than microseconds. The introduction of wide band gap devices, such as those based on silicon carbide, can result in transients with rise times of the order of a few tens of nanoseconds. Such a short rise time ~~may~~ can cause transient overvoltage impulses or surges in systems. When the voltage impulses reach the breakdown strength of an air gap, partial discharge (PD) ~~may~~ can occur. In addition, the impulses are repetitive from power electronics modulation such as pulse width modulation (PWM). Since PD ~~may~~ can cause degradation of electrical insulation parts in the system, it is one of the most important parameters to be measured.

The first edition of IEC TS 61934 was issued in April 2006. Because of rapid development in this field, the revision activity for the latest information was approved by TC 112 at their Berlin meeting in September 2006. ~~In addition to technical and editorial changes, practical experience obtained through round-robin test (RRT) is also presented in Annex C.~~ The second edition of IEC TS 61934 was published in 2011. Owing to further advances in this area, a revision of the second edition was commenced formally in 2019 and has resulted in this third edition.

ELECTRICAL INSULATING MATERIALS AND SYSTEMS – ELECTRICAL MEASUREMENT OF PARTIAL DISCHARGES (PD) UNDER SHORT RISE TIME AND REPETITIVE VOLTAGE IMPULSES

1 Scope

This document is applicable to the off-line electrical measurement of partial discharges (PDs) that occur in electrical insulation systems (EISs) when stressed by repetitive voltage impulses generated from ~~electronic~~ power electronics devices.

Typical applications are EISs belonging to apparatus driven by power electronics, such as motors, inductive reactors ~~and windmill~~, wind turbine generators and the power electronics modules themselves.

NOTE 1 Use of this document with specific products ~~may~~ can require the application of additional procedures.

NOTE 2 ~~The procedures described in this technical specification are emerging technologies. Experience and caution, as well as certain preconditions, are needed to apply it.~~

Excluded from the scope of this document are

- methods based on optical or ultrasonic PD detection,
- fields of application for PD measurements when stressed by non-repetitive impulse voltages such as lightning impulse or switching impulses from switchgear.

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 (all parts), Rotating electrical machines~~

IEC 60270:2000, *High-voltage test techniques – Partial discharge measurements*

TECHNICAL SPECIFICATION



Electrical insulating materials and systems – Electrical measurement of partial discharges (PD) under short rise time and repetitive voltage impulses



CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Measurement of partial discharge pulses during repetitive, short rise-time voltage impulses and comparison with power frequency	9
4.1 Measurement frequency.....	9
4.2 Measurement quantities	9
4.3 Test objects	10
4.3.1 General	10
4.3.2 Inductive test objects	10
4.3.3 Capacitive test objects.....	10
4.3.4 Distributed impedance test objects	10
4.4 Voltage impulse generators.....	10
4.4.1 General	10
4.4.2 Voltage impulse waveforms	11
4.5 Effect of testing conditions	11
4.5.1 General	11
4.5.2 Effect of environmental factors	12
4.5.3 Effect of testing conditions and ageing	12
5 PD detection methods	12
5.1 General.....	12
5.2 PD pulse coupling and detection devices	12
5.2.1 Introductory remarks.....	12
5.2.2 Coupling capacitor with multipole filter.....	13
5.2.3 HFCT with multipole filter.....	14
5.2.4 Electromagnetic couplers.....	15
5.2.5 Electromagnetic UHF antennae	15
6 Measuring instruments	16
7 Sensitivity check of the PD measuring equipment and high voltage source generator.....	16
7.1 General.....	16
7.2 Test diagram for sensitivity check	16
7.3 PD detection sensitivity check.....	17
7.4 Background noise check	17
7.5 Detection system and HVIG noise check.....	17
7.6 Sensitivity report.....	17
8 Test procedure for increasing and decreasing the repetitive impulse voltage magnitude	18
9 Test report.....	19
Annex A (informative) Voltage impulse suppression required by the coupling device	20
Annex B (informative) PD pulses extracted from a supply voltage impulse through filtering techniques.....	22
Annex C (informative) Results of round-robin tests of RPDIV measurement.....	24
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Bibliography.....	27
Figure 1 – Coupling capacitor with multipole filter	13
Figure 2 – Example of voltage impulse and ideal PD pulse frequency spectra before and after filtering.....	14
Figure 3 – HFCT between supply and test object with multipole filter	14
Figure 4 – HFCT between test object and earth with multipole filter	15
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Figure 6 – Circuit using an electromagnetic UHF antenna	16
Figure 7 – Test diagram for sensitivity check	17
Figure 8 – Example of relation between the outputs of LVPG and PD detector.....	18
Figure 9 – Example of increasing and decreasing the impulse voltage magnitude	19
Figure A.1 – Example of overlap between voltage impulse and PD pulse spectra (dotted area).....	20
Figure A.2 – Example of voltage impulse and PD pulse spectra after filtering	20
Figure A.3 – Example of impulse voltage damping as a function of impulse voltage magnitude and rise time.....	21
Figure B.1 – Power supply waveform and recorded signal using an antenna during supply voltage commutation.....	22
Figure B.2 – Signal detected by an antenna from the record of Figure B.1, using a filtering technique (400 MHz high-pass filter)	23
Figure B.3 – Characteristic of the filter used to pass from Figure B.1 to Figure B.2	23
Figure C.1 – Sequence of negative voltage impulses used for RRT	24
Figure C.2 – PD pulses corresponding to voltage impulses	25
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