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High-voltage test techniques - Charge-based measurement of partial discharges

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NATIONAL FOREWORD

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ICS 17.220.20, 19.080

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English Version

**High-voltage test techniques - Charge-based measurement of
partial discharges
(IEC 60270:2025)**

Techniques des essais à haute tension - Mesurages des
décharges partielles fondés sur les charges
(IEC 60270:2025)

Hochspannungs-Prüftechnik - Ladungsbasierte Messung
von Teilentladungen
(IEC 60270:2025)

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European foreword

The text of document 42/452/FDIS, future edition 4 of IEC 60270, prepared by TC 42 "High-voltage and high-current test techniques" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60270:2025.

The following dates are fixed:

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IEC 60034-18-41	NOTE	Approved as EN 60034-18-41
IEC 60034-18-42	NOTE	Approved as EN 60034-18-42
IEC 60034-27-1	NOTE	Approved as EN IEC 60034-27-1
IEC 60076-3	NOTE	Approved as EN 60076-3
IEC 60137	NOTE	Approved as EN 60137
IEC 61558-1	NOTE	Approved as EN IEC 61558-1
IEC 62068	NOTE	Approved as EN 62068
CISPR 16-1-1:2019	NOTE	Approved as EN IEC 55016-1-1:2019 (not modified)
IEC 60567	NOTE	Approved as EN IEC 60567
IEC 60599	NOTE	Approved as EN IEC 60599
IEC 61181:2007	NOTE	Approved as EN 61181:2007 (not modified)

INTERNATIONAL STANDARD

NORME INTERNATIONALE

High-voltage test techniques – Charge-based measurement of partial discharges

Techniques des essais à haute tension – Mesurages des décharges partielles fondés sur les charges



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HIGH-VOLTAGE TEST TECHNIQUES – CHARGE-BASED
MEASUREMENT OF PARTIAL DISCHARGES**

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IEC 60270 has been prepared by IEC technical committee 42: High-voltage and high-current test techniques. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2000 and Amendment 1:2015. This edition constitutes a technical revision.

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

- a) Title modified.
- b) Use with alternating voltages up to 500 Hz or with direct voltage.
- c) Clear focus on charge-based partial discharge measurements.
- d) Streamlined performance checks for partial discharge measurement system components.
- e) Improved normative Annex A for performance tests on calibrators.
- f) Revised and new informative Annexes.

The text of this International Standard is based on the following documents:

Draft	Report on voting
42/452/FDIS	42/456/RVD

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 International Standard 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.

In a future revision, this document will seek horizontal publication status in accordance with IEC Guide 108.

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,
- withdrawn, or
- revised.

HIGH-VOLTAGE TEST TECHNIQUES – CHARGE-BASED MEASUREMENT OF PARTIAL DISCHARGES

1 Scope

This document is applicable to the charge-based measurement of partial discharges which occur in electrical apparatus, components or systems when tested with alternating voltages (AC) up to 500 Hz or with direct voltage (DC).

This document:

- defines the terms used;
- defines the quantities to be measured;
- describes the measurement frequencies as well as the test and measuring circuits which may be used;
- defines analogue and digital measuring methods required for common applications;
- specifies methods for calibration and requirements of instruments used for calibration;
- gives guidance on test procedures;
- gives some assistance concerning the discrimination of partial discharges from external interference.

The provisions of this document are used in the drafting of specifications relating to partial discharge measurements for specific power apparatus. It deals with electrical measurements of impulsive (short-duration) partial discharges, but reference is also made to non-electrical methods primarily used for partial discharge location (see Annex F). Diagnosis of the behaviour of specific power apparatus can be aided by digital processing of partial discharge data (see Annex E) and also by non-electrical methods that are primarily used for partial discharge location (see Annex F).

This document is primarily concerned with electrical measurement of partial discharge in terms of apparent charge for specific power apparatus made during tests with alternating voltage, but specific problems which arise when tests are made with direct voltage are considered in Clause 11.

The terminology, definitions, basic test circuits and procedures often also apply to tests at other PD measurement frequencies, but special test procedures and measuring system characteristics which are not considered in this document may be required. For measurements at higher frequency ranges, see IEC TS 62478 [5]¹.

Annex A provides normative requirements for performance tests on calibrators.

NOTE This document defines and provides guidance for charge-based direct electrical PD measurements at the terminals of the equipment under test, differentiating from other PD measurement and detection methods, e.g. acoustic PD techniques or electromagnetic methods in elevated frequency ranges, e.g. ultra-high frequency (UHF).

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.

¹ Numbers in square brackets refer to the Bibliography.

For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-2, *High-voltage test techniques – Part 2: Measuring systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

partial discharge

PD

localized electrical discharge that only partially bridges the insulation between conductors and which can occur adjacent to a conductor

Note 1 to entry: Partial discharges are in general a consequence of local electrical stress concentrations in the insulation or on the surface of the insulation. Generally, such discharges appear as pulses having a duration of much less than 1 μs . More continuous forms can, however, occur, such as the so-called pulse-less discharges in gaseous dielectrics. This kind of discharge will normally not be detected by the measurement methods described in this document.

Note 2 to entry: "Corona" is a form of partial discharge that occurs in gaseous media around conductors which are remote from solid or liquid insulation. "Corona" should not be used as a general term for all forms of PD.

Note 3 to entry: Partial discharges are accompanied by emission of acoustic transients (sound), electromagnetic waves, optical signals (light), heat, and associated chemical reactions. For further information, see Annex F.

3.2

partial discharge pulse

PD pulse

signal produced by a partial discharge occurring within the object under test, measured using suitable detector circuits introduced into the test circuit

Note 1 to entry: A partial discharge which occurs in the test object produces a current pulse at its origin. A detector in accordance with the provisions of this document produces a current or a voltage signal at its output proportional to the charge of the PD pulse.

3.3

quantities related to partial discharge pulses

3.3.1

apparent charge

q

<of a PD pulse> charge which, if injected between the terminals of the test object in a specified test circuit, would result in the same reading on the measuring instrument as the PD pulse itself, typically expressed in units of picocoulombs (pC) or nanocoulombs (nC)

Note 1 to entry: The apparent charge is not equal to the amount of charge locally involved at the site of the discharge, which cannot be measured directly.