SLOVENSKI STANDARD
SIST EN 60270:2002

01-september-2002

High-voltage test techniques - Partial discharge measurement (IEC 60270:2000)

High-voltage test techniques - Partial discharge measurements

Hochspannungs-Prüftechnik - Teilentladungsmessungen

Techniques des essais à haute tension - Mesure des décharges partielles

Ta slovenski standard je istoveten z: **EN 60270:2001**

ICS:

17.220.20	Merjenje električnih in magnetnih veličin	Measurement of electrical and magnetic quantities
19.080	Električno in elektronsko preskušanje	Electrical and electronic testing

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English version

High-voltage test techniques - Partial discharge measurements
(IEC 60270:2000)

Technique des essais à haute tension - Mesure des décharges partielles (CEI 60270:2000)

Hochspannungs-Prüftechnik - Teilentladungsmessungen (IEC 60270:2000)

This European Standard was approved by CENELEC on 2000-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

The text of document 42/162/FDIS, future edition 3 of IEC 60270, prepared by IEC TC 42, High-voltage testing techniques, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60270 on 2000-12-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2001-10-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2003-12-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A and ZA are normative and annexes B to G are informative.
Annex ZA has been added by CENELEC.

The words in **bold** in the text of the standard are defined in clause 3.

Endorsement notice

The text of the International Standard IEC 60270:2000 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60060-1	[1)]	High-voltage test techniques Part 1: General definitions and test requirements	HD 588.1 S1	1991[2)]
IEC 60060-2	[1)]	Part 2: Measuring systems	EN 60060-2	1994[2)]
CISPR 16-1	1993	Specification for radio disturbance and immunity measuring apparatus and methods Part 1: Radio disturbance and immunity measuring apparatus	-	-

[1)] undated reference.

[2)] valid edition at date of issue.

INTERNATIONAL STANDARD

IEC 60270

Third edition
2000-12

High-voltage test techniques – Partial discharge measurements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE TEST TECHNIQUES – PARTIAL DISCHARGE MEASUREMENTS

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60270 has been prepared by IEC technical committee 42: High-voltage test techniques.

This third edition cancels and replaces the second edition published in 1981 of which it constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
42/162/FDIS	42/165/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annex A forms an integral part of this standard.

Annexes B, C, D, E, F and G are for information only.

Terms used throughout this standard which have been defined in clause 3: **bold roman type**.

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

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

The contents of the corrigendum of October 2001 have been included in this copy.

HIGH-VOLTAGE TEST TECHNIQUES –

PARTIAL DISCHARGE MEASUREMENTS

1 Scope

This International Standard is applicable to the measurement of **partial discharges** which occur in electrical apparatus, components or systems when tested with alternating voltages up to 400 Hz or with direct voltage.

This standard

– defines the terms used;
– defines the quantities to be measured;
– describes 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 standard should be 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 standard is primarily concerned with electrical measurements of **partial discharges** 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 with other frequencies, but special test procedures and measuring system characteristics, which are not considered in this standard, may be required.

Annex A provides normative requirements for performance tests on calibrators.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements.*

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

CISPR 16-1:1993, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus*

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1
partial discharge (PD)
localized electrical discharge that only partially bridges the insulation between conductors and which can or can not occur adjacent to a conductor

NOTE 1 **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 standard.

NOTE 2 "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 **Partial discharges** are often accompanied by emission of sound, light, heat, and chemical reactions. For further information, see annex F.

3.2
partial discharge pulse (PD pulse)
current or voltage pulse that results from a **partial discharge** occurring within the object under test. The pulse is measured using suitable detector circuits, which have been introduced into the test circuit for the purpose of the test

NOTE A **partial discharge** which occurs in the test object produces a current pulse. A detector in accordance with the provisions of this standard produces a current or a voltage signal at its output, proportional to the charge of the current pulse at its input.

3.3
quantities related to partial discharge pulses

3.3.1
apparent charge *q*
of a **PD pulse** is that charge which, if injected within a very short time between the terminals of the test object in a specified test circuit, would give the same reading on the measuring instrument as the **PD current pulse** itself. The **apparent charge** is usually expressed in picocoulombs (pC)

NOTE The **apparent charge** is not equal to the amount of charge locally involved at the site of the discharge, which cannot be measured directly.

3.3.2
pulse repetition rate *n*
ratio between the total number of **PD pulses** recorded in a selected time interval and the duration of this time interval

NOTE In practice, only pulses above a specified magnitude or within a specified range of magnitudes are considered.

3.3.3
pulse repetition frequency *N*
number of **partial discharge** pulses per second, in the case of equidistant pulses

NOTE **Pulse repetition frequency *N*** is associated with the situation in calibration.

3.3.4
phase angle ϕ_i and time t_i of occurrence of a PD pulse
is

$$\phi_i = 360\ (t_i / T)$$

where t_i is the time measured between the preceding positive going transition of the test voltage through zero and the **partial discharge pulse** and T is the period of the test voltage

The phase angle is expressed in degrees (°).

3.3.5
average discharge current *I*
derived quantity and the sum of the absolute values of individual **apparent charge** magnitudes q_i during a chosen reference time interval T_{ref} divided by this time interval:

$$I = \frac{1}{T_{ref}} \left(|q_1| + |q_2| + \ldots + |q_i| \right)$$

The **average discharge current** is generally expressed in coulombs per second (C/s) or in amperes (A).