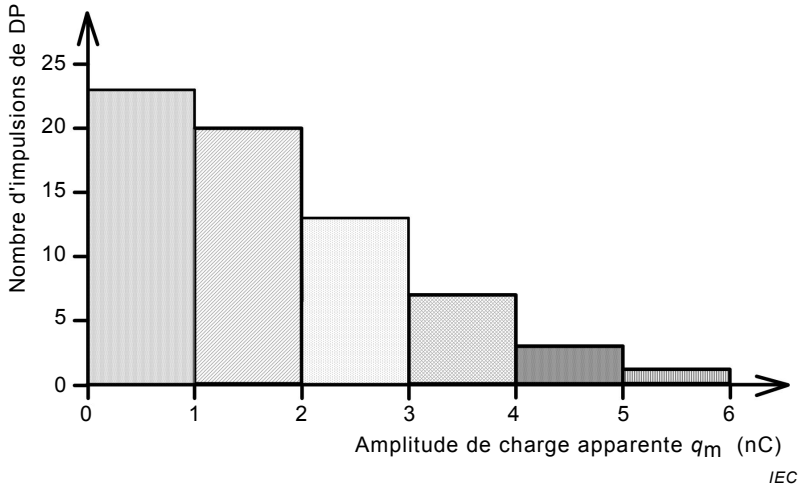
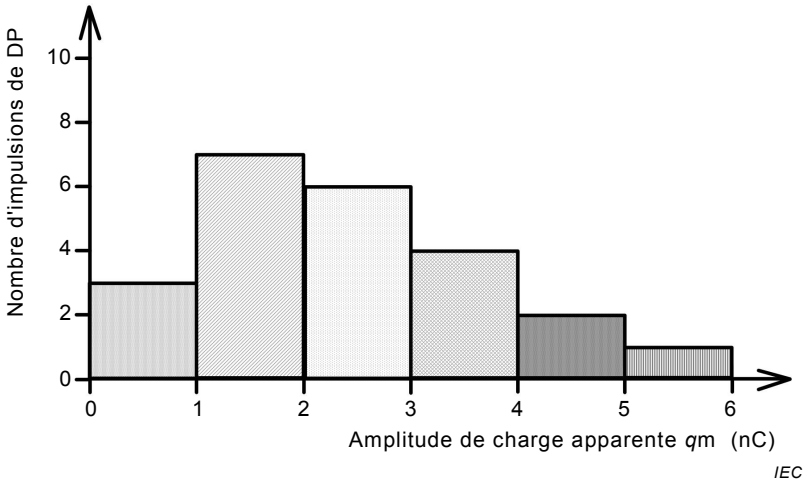
Des informations supplémentaires sur le comportement des DP peuvent être obtenues si le nombre *m* d'impulsions de DP en fonction de l'amplitude de charge apparente dépassant des niveaux de seuil spécifiés pendant le temps de mesure est affiché, comme représenté à la Figure H.2a). Ce graphique est basé sur le train d'impulsions de DP représenté à la Figure H.1a). De plus, la présentation du nombre *m* d'impulsions apparaissant à l'intérieur de limites spécifiées de l'amplitude de charge apparente semble utile pour évaluer l'activité des DP lors des essais en tension continue.



a) nombre *m* d'impulsions de DP dépassant les limites de l'amplitude de charge apparente q_m suivantes: 0 nC, 1 nC, 2 nC, 3 nC, 4 nC, 5 nC.



b) nombre *m* d'impulsions de DP apparaissant dans les intervalles de chargeapparente q_{mi} suivants: (0-1) nC, (1-2) nC, (2-3) nC, (3-4) nC, (4-5) nC

Figure H.2 – Histogrammes du nombre *m* d'impulsions de DP en fonction des intervalles de charge apparente

Bibliographie

[1] CIGRE WG D1.33, “Guide for Electrical Partial Discharge Measurements in compliance with IEC 60270,” Technical Brochure 366, *Electra*, vol. 60, no. 241, Dec. 2008.

IEC 60270

Edition 3.1 2015-11

FINAL VERSION

VERSION FINALE

colour inside

High-voltage test techniques – Partial discharge measurements

Techniques des essais à haute tension – Mesures des décharges partielles

IEC 60270:2000-12+AMD1:2015-11 CSV(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE TEST TECHNIQUES – PARTIAL DISCHARGE MEASUREMENTS

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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This Consolidated version of IEC 60270 bears the edition number 3.1. It consists of the third edition (2000-12) [documents 42/162/FDIS and 42/165/RVD] and its corrigendum 1 (2001-10), and its amendment 1 (2015-11) [documents 42/338/FDIS and 42/340/RVD]. The technical content is identical to the base edition and its amendment.

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

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

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 the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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.

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 Terms and definitions

For the purposes of this document, the following terms and 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:

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

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

3.3.6
discharge power *P*
derived quantity that is the average pulse power fed into the terminals of the test object due to **apparent charge** magnitudes q_i during a chosen reference time interval T_{ref}:

$$P = \frac{1}{T_{ref}}\left(q_1u_1 + q_2u_2 + ... + q_iu_i\right)$$

where u_1, u_2... u_i are instantaneous values of the test voltage at the instants of occurrence t_i of the individual **apparent charge** magnitudes q_i. The sign of the individual values must be observed

The **discharge power** is generally expressed in watts (W).

3.3.7
quadratic rate *D*
derived quantity that is the sum of the squares of the individual **apparent charge** magnitudes q_i during a chosen reference time interval T_{ref} divided by this time interval:

$$D = \frac{1}{T_{ref}}\left(q_1^2 + q_2^2 + ... + q_m^2\right)$$

The **quadratic rate** is generally expressed in (coulombs)^2 per second (C^2/s).

3.3.8
radio disturbance meter
quasi-peak measuring receiver for frequency band B in accordance with the provisions of CISPR 16-1:1993

NOTE This type of instrument was earlier called a radio interference (or influence) meter.

3.3.9
radio disturbance voltage U_{RDV}
derived quantity that is the reading of a **radio disturbance meter** when used for indicating the **apparent charge** q of partial discharges. For further information, see 4.5.6 and annex D

The **radio disturbance voltage** U_{RDV} is generally expressed in µV.