SLOVENSKI STANDARD
SIST EN 60270:2002/A1:2016

01-maj-2016

Visokonapetostne preskusne tehnike - Meritve delnih razelektritev - Dopolnilo A1

High-voltage test techniques - Partial discharge measurements

Hochspannungs-Prüftechnik - Teilentladungsmessungen

Techniques des essais à haute tension - Mesures des décharges partielles

Ta slovenski standard je istoveten z: EN 60270:2001/A1:2016

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

SIST EN 60270:2002/A1:2016 en

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60270:2001/A1

March 2016

ICS 17.220.20; 19.080

English Version

High-voltage test techniques - Partial discharge measurements (IEC 60270:2000/A1:2015)

Techniques des essais à haute tension - Mesures des décharges partielles (IEC 60270:2000/A1:2015)

Hochspannungs-Prüftechnik - Teilentladungsmessungen (IEC 60270:2000/A1:2015)

This amendment A1 modifies the European Standard EN 60270:2001; it was approved by CENELEC on 2016-01-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 CEN-CENELEC Management Centre or to any CENELEC member.

This amendment 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 60270:2001/A1:2016 E

European foreword

The text of document 42/338/FDIS, future IEC 60270:2000/A1, prepared by IEC/TC 42 "High-voltage testing techniques" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60270:2001/A1:2016.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-10-01
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2019-01-01

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60270:2000/A1:2015 was approved by CENELEC as a European Standard without any modification.

IEC 60270

Edition 3.0 2015-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

AMENDMENT 1
AMENDEMENT 1

High-voltage test techniques – Partial discharge measurements

Techniques des essais à haute tension – Mesures des décharges partielles

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 17.220.20; 19.080

ISBN 978-2-8322-3013-8

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

FOREWORD

This amendment has been prepared by IEC technical committee 42: High-voltage and high current test techniques.

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

FDIS	Report on voting
42/338/FDIS	42/340/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website 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.

---

3 Definitions

Replace the existing title and introductory phrase with the following new title and introductory phrase:

3 Terms and definitions

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

Replace the existing definition 3.10 with the following new definition 3.10:

3.10
digital partial discharge instruments
instruments which perform a digital acquisition and evaluation of the PD data

Note 1 to entry: The A/D conversion of the PD pulses captured from the terminals of the test object can be done either directly or after the apparent charge pulses have been established employing either an analogue band-pass filter amplifier or an active integrator (see Annex E).

Add the following new definitions:

3.12
accumulated apparent charge q_a
sum of the apparent charge q of all individual pulses exceeding a specified threshold level, and occurring during a specified time interval Δt

3.13
PD pulse count m
total number of PD pulses which exceed a specified threshold level within a specified time interval Δt

3.14
PD pattern
display of the apparent charge q versus the phase angle φ_i of the PD pulses recorded during a specified time interval Δt

4.3.4 Wide-band PD instruments

Replace the last sentence of 4.3.4 with the following new text:

Recommended values for the significant frequency parameters f_1, f_2 and Δf are:

$30\text{ kHz} \leq f_1 \leq 100\text{ kHz}$

$f_2 \leq 1\text{ MHz}$

$100\text{ kHz} \leq \Delta f \leq 900\text{ kHz}$

Renumber the existing "NOTE" in 4.3.4 to "NOTE 1" and add the following new "NOTE 2":

NOTE 2 For test objects with windings like transformers and electrical machines the acquired frequency band may be reduced down to a few 100 kHz and even below. The upper limit frequency f_2 to be accepted for such kinds of test objects should be specified by the relevant Technical Committee.

5.2 Calibration procedure

Renumber the existing "NOTE" in 5.2 to "NOTE 1" and add the following new "NOTE 2" at the end of the subclause:

NOTE 2 For tall test objects, the connection leads between calibrator and terminals of the test object might exceed several meters. Thus the transfer of the charge from the calibrator to the test object may be reduced due to inevitable stray capacitances. The measurement uncertainty acceptable under this condition should be specified by the relevant Technical Committee.

6.1 General

Replace the existing third paragraph "The voltage pulses of the generator shall have a rise time t_r of less than 60 ns." with the following new text:

The parameters characterizing unipolar step voltage of magnitude U_0 shall satisfy the following conditions (see Figure 6):

Rise time:	$t_r \leq 60$ ns
Time to steady state:	$t_s \leq 200$ ns
Step voltage duration:	$t_d \geq 5$ µs
Deviation of the step voltage magnitude U_0 between t_s and t_d:	$\Delta U \leq 0.03\ U_0$

The time parameters t_r, t_s and t_d are measured from the origin t_0 of the step voltage which refers to the time instant when the rising voltage equals 10 % of U_0 (see Figure 6).

The time to steady state t_s is the shortest instant at which the deviation ΔU from U_0 remains first time less than 3 %.

The step voltage duration t_d is the instant after t_s at which the magnitude of the step voltage decays below 97% of U_0. After t_d, the voltage shall decrease continuously down to 10 % of U_0 within a time interval not shorter than 500 µs.

The magnitude U_0 of the step voltage is the mean value occurring within the steady state duration $t_d - t_s$.

For test objects represented by a lumped capacitance C_a the calibrating capacitor C_0 shall satisfy the conditions $C_0 \leq 200$ pF and $C_0 \leq 0{,}01\ C_a$.

For test objects represented by a characteristic impedance Z_c, such as power cables exceeding a length of 200 m, the value of the calibrating capacitor shall satisfy the conditions $C_0 \leq 1$nF and $C_0 \times Z_c \leq 30$ ns.

For calibrators manufactured before this amendment was published, whose time and voltage parameters do not comply with the above specified values, the deviation of the measured values from the specified values shall be stated in the test protocol.

11.2 Quantities related to partial discharges

Replace the existing title and text of 11.2 with the following new title and text:

11.2 PD quantities

PD measurements with direct voltage should be based on the following quantities:

– apparent charge of each individual PD pulse occurring during a specified time interval Δt_i at constant test voltage, as defined in 3.3.1 (see Figure H.1a)).
– accumulated apparent charge of a PD pulse train occurring within a specified time interval Δt_i at constant test voltage, as defined in 3.12 (see Figure H.1b)).
– PD pulse count m of PD pulse trains as defined in 3.13 exceeding specified limits of the apparent charge magnitude q_m during a specified time interval Δt_i at constant test voltage level (see Figure H.2a)).
– PD pulse count m occurring within specified ranges of the apparent charge magnitude q_m for a specified time interval Δt_i at constant test voltage level (see Figure H.2b)).

To determine the PD pulse count m care should be taken so that noisy pulses are not counted to avoid misleading statistics. Thus before starting the actual PD measurement the background noise level in terms of pC shall be determined. Based on this the apparent charge threshold level shall be adjusted to at least twice the background noise.

Values for the PD quantities listed above shall be specified by the relevant Technical Committee.

11.4 Test circuits and measuring systems

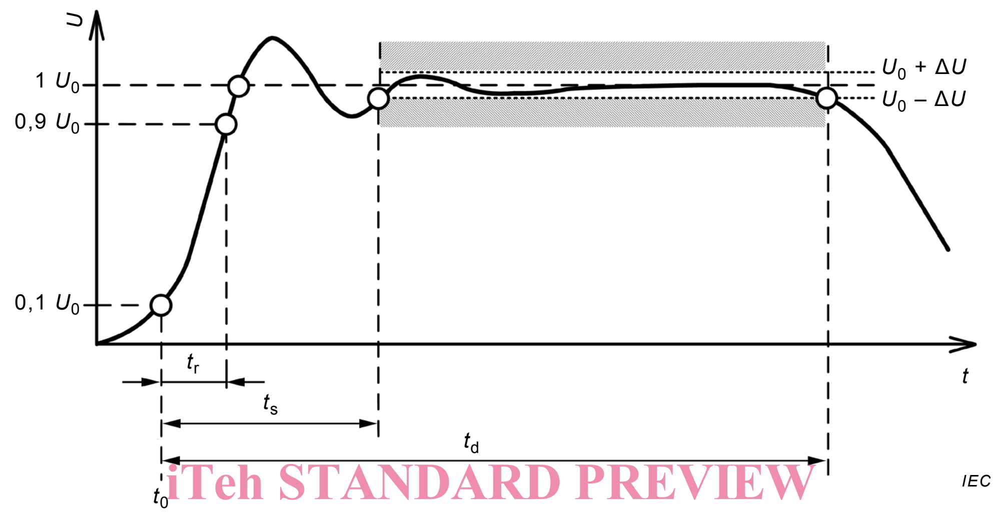
Replace the existing text with the following new text:

To measure the apparent charge according to 3.3.1, the basic circuits shown in Figure 1a to Figure 1d shall be used in conjunction with either analogue or digital PD measuring systems, as described in 4.3 and 4.4 and Annex E. The PD instruments applied shall have a pulse train response that is independent of the repetition rate of PD pulses.

To indicate the PD pulse count *m*, the application of either digital PD instruments with integrated pulse counters or analogue PD instruments in combination with suitable pulse counting devices is recommended.

The calibration procedures recommended in Clause 5 and the calibrators specified in Clause 6 can also be applied for testing with direct voltage.

Add, after Figure 5, the following new Figure 6:



Key

U_0	step voltage magnitude	t_d	step voltage duration
t_0	origin of the step voltage	$(t_d - t_s)$	steady state duration
t_r	rise time of the step voltage	ΔU	absolute voltage deviation from U_0
t_s	time to steady state		

Figure 6 – Step voltage parameters of a calibrator

A.3 Alternative method

Replace the existing title of Clause A.3 with the following new title:

A.3 Numerical integration method

Add, at the end of Clause A.3, the following new text:

The voltage and time parameters of the step voltage specified in 6.1 and in Figure 6 can be determined if the current through the calibration capacitor C_0 caused by the voltage step U_0 is measured by means of a resistive shunt R_m (see Figure A.2). For example, this shunt can be a 50 Ω feed-through low-inductive termination. Under this condition the calibrating charge can be determined based on a numerical integration of the time dependent voltage signal $u_r(t)$ appearing across R_m. Care shall be taken on the offset voltage which shall be adjusted exactly to zero to avoid an integration error.