

# **SLOVENSKI STANDARD**

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Hochspannungs-Prüftechnik - Teil 2: Messsysteme (IEC 60060-2:2010)

Techniques des essais à haute tension - Partie 2: Systèmes de mesure (CEI 60060-2:2010)

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testing

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January 2011

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English version

**High-voltage test techniques -  
Part 2: Measuring systems  
(IEC 60060-2:2010)**

Techniques des essais à haute tension -  
Partie 2: Systèmes de mesure  
(CEI 60060-2:2010)

Hochspannungs-Prüftechnik -  
Teil 2: Messsysteme  
(IEC 60060-2:2010)

This European Standard was approved by CENELEC on 2011-01-01. 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.

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

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## Foreword

The text of document 42/281/FDIS, future edition 3 of IEC 60060-2, prepared by IEC TC 42, High-voltage testing techniques, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60060-2 on 2011-01-01.

This European Standard supersedes EN 60060-2:1994 + A11:1998.

The significant technical changes with respect to EN 60060-2:1994+A11:1998 are as follows:

- a) The general layout and text was updated and improved to make the standard easier to use.
- b) The standard was revised to align it with EN 60060-1.
- c) The treatment of measurement uncertainty estimation has been expanded.

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

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) 2011-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2014-01-01

Annex ZA has been added by CENELEC.

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**Endorsement notice**

The text of the International Standard IEC 60060-2:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60051 series	NOTE	Harmonized in EN 60051 series (not modified).
IEC 60060-3:2006	NOTE	Harmonized as EN 60060-3:2006 (not modified).
IEC 60071-1:2006	NOTE	Harmonized as EN 60071-1:2006 (not modified).
IEC 60270	NOTE	Harmonized as EN 60270.
IEC 62475	NOTE	Harmonized as EN 62475.
ISO/IEC 17025:2005	NOTE	Harmonized as EN ISO/IEC 17025:2005 (not modified).

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60052	-	Voltage measurement by means of standard air gaps	EN 60052	-
IEC 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	-
IEC 61083-1	-	Instruments and software used for measurement in high-voltage impulse tests - Part 1: Requirements for instruments	EN 61083-1	-
IEC 61083-2	-	Digital recorders for measurements in high-voltage impulse tests - Part 2: Evaluation of software used for the determination of the parameters of impulse waveforms	EN 61083-2	-
ISO/IEC Guide 98-3 2008		Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-

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# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



High-voltage test techniques –  
Part 2: Measuring systems

Techniques des essais à haute tension –  
Partie 2: Systèmes de mesure

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## CONTENTS

FOREWORD.....	6
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions.....	8
3.1 Measuring systems .....	9
3.2 Components of a measuring system.....	9
3.3 Scale factors .....	10
3.4 Rated values .....	11
3.5 Definitions related to dynamic behaviour .....	11
3.6 Definitions related to uncertainty.....	13
3.7 Definitions related to tests on measuring systems .....	14
4 Procedures for qualification and use of measuring systems.....	15
4.1 General principles.....	15
4.2 Schedule of performance tests .....	16
4.3 Schedule of performance checks .....	16
4.4 Requirements for the record of performance .....	16
4.4.1 Contents of the record of performance .....	16
4.4.2 Exceptions .....	17
4.5 Operating conditions .....	17
4.6 Uncertainty.....	17
5 Tests and test requirements for an approved measuring system and its components .....	18
5.1 General requirements.....	18
5.2 Calibration – Determination of the scale factor .....	19
5.2.1 Calibration of measuring systems by comparison with a reference measuring system (preferred method) .....	19
5.2.2 Determination of the scale factor of a measuring system from the scale factors of its components (alternative method).....	22
5.3 Linearity test.....	23
5.3.1 Application .....	23
5.3.2 Alternative methods in order of suitability .....	24
5.4 Dynamic behaviour.....	25
5.4.1 General.....	25
5.4.2 Determination of the amplitude/frequency response.....	25
5.4.3 Reference method for impulse voltage measuring systems .....	26
5.5 Short-term stability.....	26
5.6 Long-term stability.....	26
5.7 Ambient temperature effect .....	27
5.8 Proximity effect.....	27
5.9 Software effect .....	27
5.10 Uncertainty calculation of the scale factor.....	27
5.10.1 General.....	27
5.10.2 Uncertainty of the calibration.....	28
5.10.3 Uncertainty of measurement using an approved measuring system .....	29
5.11 Uncertainty calculation of time parameter measurement (impulse voltages only).....	30
5.11.1 General.....	30



5.11.2	Uncertainty of the time parameter calibration .....	30
5.11.3	Uncertainty of time parameter measurement using an approved measuring system .....	31
5.12	Interference test (transmission system and instrument for impulse voltage measurements) .....	32
5.13	Withstand tests of converting device .....	32
6	Measurement of direct voltage .....	33
6.1	Requirements for an approved measuring system .....	33
6.1.1	General .....	33
6.1.2	Uncertainty contributions .....	33
6.1.3	Requirement on converting device .....	33
6.1.4	Dynamic behaviour for measuring voltage changes .....	33
6.2	Tests on an approved measuring system .....	33
6.3	Performance check .....	34
6.3.1	General .....	34
6.3.2	Comparison with an approved measuring system .....	34
6.3.3	Check of the scale factors of the components .....	35
6.4	Measurement of ripple amplitude .....	35
6.4.1	Requirements .....	35
6.4.2	Uncertainty contributions .....	35
6.4.3	Calibrations and tests on an approved ripple voltage measuring system .....	35
6.4.4	Measurement of the scale factor at the ripple frequency .....	35
6.4.5	Dynamic behaviour by amplitude/frequency response .....	35
6.4.6	Performance check for ripple measuring system .....	36
7	Measurement of alternating voltage .....	36
7.1	Requirements for an approved measuring system .....	36
7.1.1	General .....	36
7.1.2	Uncertainty contributions .....	36
7.1.3	Dynamic behaviour .....	36
7.2	Tests on an approved measuring system .....	38
7.3	Dynamic behaviour test .....	38
7.4	Performance check .....	38
7.4.1	General .....	38
7.4.2	Comparison with an approved measuring system .....	38
7.4.3	Check of the scale factors of the components .....	39
8	Measurement of lightning impulse voltage .....	40
8.1	Requirements for an approved measuring system .....	40
8.1.1	General .....	40
8.1.2	Uncertainty contributions .....	40
8.1.3	Requirement on measuring instrument .....	40
8.1.4	Dynamic behaviour .....	40
8.1.5	Connection to the test object .....	40
8.2	Tests on an approved measuring system .....	41
8.3	Performance test on measuring systems .....	42
8.3.1	Reference method (preferred) .....	42
8.3.2	Alternative method supplemented by a measurement of the step response according to Annex C .....	42
8.4	Dynamic behaviour test .....	43

8.4.1	Comparison with a reference measuring system (preferred).....	43
8.4.2	Alternative method based on step response parameters (Annex C) .....	43
8.5	Performance check .....	43
8.5.1	Comparison with an approved measuring system .....	43
8.5.2	Check of the scale factors of the components .....	43
8.5.3	Dynamic behaviour check by reference record .....	43
9	Measurement of switching impulse voltage.....	43
9.1	Requirements for an approved measuring system.....	43
9.1.1	General.....	43
9.1.2	Uncertainty contribution.....	44
9.1.3	Requirements for the measuring instrument .....	44
9.1.4	Dynamic behaviour.....	44
9.1.5	Connection to the test object .....	44
9.2	Tests on an approved measuring system .....	44
9.3	Performance test on measuring systems .....	44
9.3.1	Reference method (preferred) .....	44
9.3.2	Alternative methods supplemented by a step response measurement .....	45
9.4	Dynamic behaviour test by comparison.....	45
9.5	Performance check .....	45
9.5.1	Scale factor check by comparison with an approved measuring system .....	45
9.5.2	Check of the scale factors of the components .....	45
9.5.3	Dynamic behaviour check by reference record .....	45
10	Reference measuring systems .....	47
10.1	Requirements for reference measuring systems .....	47
10.1.1	Direct voltage .....	47
10.1.2	Alternating voltage .....	47
10.1.3	Full and chopped lightning and switching impulse voltages.....	47
10.2	Calibration of a reference measuring system.....	47
10.2.1	General.....	47
10.2.2	Reference method: Comparative measurement .....	47
10.2.3	Alternative method for impulse voltages: Measurement of scale factor and evaluation of step response parameters .....	47
10.3	Interval between successive calibrations of reference measuring systems .....	47
10.4	Use of reference measuring systems.....	48
Annex A (informative)	Uncertainty of measurement .....	49
Annex B (informative)	Examples for the calculation of measuring uncertainties in high-voltage measurements .....	57
Annex C (informative)	Step response measurements .....	65
Annex D (informative)	Convolution method for the determination of dynamic behaviour from step response measurements.....	70
Bibliography	.....	73
Figure 1	– Amplitude-frequency response with examples for limit frequencies ( $f_1$ ; $f_2$ ).....	12
Figure 2	– Calibration by comparison over the full voltage range .....	20
Figure 3	– Uncertainty contributions of the calibration (example with minimum of 5 voltage levels).....	21
Figure 4	– Calibration by comparison over a limited voltage range, with an additional linearity test.....	22

Figure 5 – Linearity test of the measuring system with a linear device in the extended voltage range .....	24
Figure 6 – Shaded area for acceptable normalised amplitude-frequency responses of measuring systems intended for single fundamental frequencies $f_{\text{nom}}$ (to be tested in the range $(1...7)f_{\text{nom}}$ ) .....	37
Figure 7 – Shaded area for acceptable normalised amplitude-frequency responses of measuring systems intended for a range of fundamental frequencies $f_{\text{nom1}}$ to $f_{\text{nom2}}$ (to be tested in the range $f_{\text{nom1}}$ to $7 f_{\text{nom2}}$ ) .....	38
Figure A.1 – Normal probability distribution $p(x)$ .....	55
Figure A.2 – Rectangular probability distribution $p(x)$ .....	56
Figure B.1 – Comparison between the system under test, X, and the reference system, N ...	64
Figure B.2 – Front time deviation $\Delta T_{1j}$ of system X, related to the reference system N, and their mean $\Delta T_{1m}$ in the range of $T_1 = 0,8 \mu\text{s} \dots 1,6 \mu\text{s}$ .....	64
Figure C.1 – Definitions of response parameters .....	68
Figure C.2 – A unit-step response $g(t)$ showing an initial distortion of initial distortion time $T_0$ .....	69
Figure C.3 – Suitable circuits for step response measurement .....	69
Table 1 – Tests required for an approved direct voltage measuring system .....	34
Table 2 – Required tests for uncertainty contributions in ripple measurement .....	36
Table 3 – Tests required for an approved alternating voltage measuring system .....	39
Table 4 – Tests required for an approved lightning impulse voltage measuring system .....	41
Table 5 – Tests required for a switching impulse voltage measuring system .....	46
Table 6 – Recommended response parameters for impulse voltage reference measuring systems .....	48
Table A.1 – Coverage factor $k$ for effective degrees of freedom $\nu_{\text{eff}}$ ( $p = 95,45 \%$ ) .....	54
Table A.2 – Schematic of an uncertainty budget .....	55
Table B.1 – Result of the comparison measurement at a single voltage level .....	58
Table B.2 – Summary of results for $h = 5$ voltage levels ( $V_{X\text{max}} = 500 \text{ kV}$ ) .....	59
Table B.3 – Uncertainty budget of the assigned scale factor $F_X$ .....	60
Table B.4 – Uncertainty budget of the assigned scale factor $F$ .....	61
Table B.5 – Calibration result for front time $T_1$ and deviations .....	63
Table B.6 – Uncertainty budget of the front time deviation $\Delta T_{1\text{cal}}$ .....	63

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## HIGH-VOLTAGE TEST TECHNIQUES –

## Part 2: Measuring systems

## 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.
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- 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.

International Standard IEC 60060-2 has been prepared by IEC technical committee 42: High-voltage test techniques.

This third edition of IEC 60060-2 cancels and replaces the second edition, published in 1994, and constitutes a technical revision.

The significant technical changes with respect to the previous edition are as follows:

- a) The general layout and text was updated and improved to make the standard easier to use.
- b) The standard was revised to align it with IEC 60060-1.
- c) The treatment of measurement uncertainty estimation has been expanded.

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

FDIS	Report on voting
42/281/FDIS	42/287/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.

A list of all parts of IEC 60060 series, under the general title *High-voltage test techniques*, can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part-2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to this specific publication. At this date, the publication will be:

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

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## HIGH-VOLTAGE TEST TECHNIQUES –

### Part 2: Measuring systems

#### 1 Scope

This part of IEC 60060 is applicable to complete measuring systems, and to their components, used for the measurement of high voltages during laboratory and factory tests with direct voltage, alternating voltage and lightning and switching impulse voltages as specified in IEC 60060-1. For measurements during on-site tests see IEC 60060-3.

The limits on uncertainties of measurements stated in this standard apply to test levels stated in IEC 60071-1:2006. The principles of this standard apply also to higher levels but the uncertainty may be greater.

This standard:

- defines the terms used;
- describes methods to estimate the uncertainties of high-voltage measurements;
- states the requirements which the measuring systems shall meet;
- describes the methods for approving a measuring system and checking its components;
- describes the procedures by which the user shall show that a measuring system meets the requirements of this standard, including the limits set for the uncertainty of measurement.

#### 2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60052, *Voltage measurement by means of standard air gaps*

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

IEC 61083-1, *Instruments and software used for measurement in high-voltage impulse tests – Part 1: Requirements for instruments*

IEC 61083-2, *Digital recorders for measurement in high-voltage impulse tests – Part 2: Evaluation of software used for the determination of the parameters of impulse waveforms*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurements (GUM)*

NOTE Further related standards, guides, etc. on subjects included in this International Standard are given in the bibliography.

#### 3 Terms and definitions

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

### 3.1 Measuring systems

#### 3.1.1

##### **measuring system**

complete set of devices suitable for performing a high-voltage measurement; software, used to obtain or calculate measuring results, also forms a part of the measuring system

NOTE 1 A measuring system usually comprises the following components:

- a converting device with the leads required for connecting this device to the test object or into the circuit and the connections to earth;
- a transmission system connecting the output terminals of the converting device to the measuring instruments with its attenuating, terminating and adapting impedances or networks;
- a measuring instrument together with any connection to the power supply. Measuring systems which comprise only some of the above components or which are based on non-conventional principles are acceptable if they meet the uncertainty requirements specified in this document.

NOTE 2 The environment in which a measuring system functions, its clearances to live and earthed structures and the presence of electric or magnetic fields may significantly affect the measurement result and its uncertainty.

#### 3.1.2

##### **record of performance**

detailed record, established and maintained by the user, describing the measuring system and containing evidence that the requirements given in this standard have been met

NOTE This evidence includes the results of the initial performance test and the schedule and results of each subsequent performance test and performance check.

#### 3.1.3

##### **approved measuring system**

measuring system that is shown to comply with one or more of the sets of requirements set out in this document

#### 3.1.4

##### **reference measuring system**

measuring system with its calibration traceable to relevant national and/or international standards, and having sufficient accuracy and stability for use in the approval of other systems by making simultaneous comparative measurements with specific types of waveform and ranges of voltage

NOTE A reference measuring system (maintained according to the requirements of this standard) may be used as an approved measuring system but the converse is not true.

### 3.2 Components of a measuring system

#### 3.2.1

##### **converting device**

device for converting the quantity to be measured (measurand) into a quantity, compatible with the measuring instrument

#### 3.2.2

##### **voltage divider**

converting device consisting of a high-voltage and a low-voltage arm such that the input voltage is applied across the complete device and the output voltage is taken from the low-voltage arm

NOTE The elements of the two arms are usually resistors or capacitors or combinations of these. The device is designated by the type and arrangement of its elements (for example, resistive, capacitive or resistive-capacitive).