

INTERNATIONAL STANDARD

High-current test techniques - Definitions and requirements for test currents and measuring systems

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CONTENTS

FOREWORD	7
1 Scope	9
2 Normative references	9
3 Terms and definitions	9
3.1 Measuring systems	10
3.2 Components of a measuring system	11
3.3 Scale factors	12
3.4 Rated values	12
3.5 Terms and definitions related to the dynamic behaviour	13
3.6 Terms related to uncertainty	14
3.7 Terms and definitions related to tests on measuring systems	17
3.8 Terms and definitions related to steady state direct current	18
3.9 Terms related to steady state alternating current	18
3.10 Terms and definitions related to short-time direct current	18
3.11 Terms and definitions related to short-time alternating current	19
3.12 Terms and definitions related to impulse currents	21
4 Procedures for qualification and use of a measuring system	25
4.1 General principles	25
4.2 Schedule of performance tests	26
4.3 Schedule of performance checks	26
4.4 Requirements for the record of performance	26
4.4.1 Contents of the record of performance	26
4.4.2 Exceptions	27
4.5 Operating conditions	27
4.6 Uncertainty	27
5 Tests and test requirements for an approved measuring system	28
5.1 General requirements	28
5.2 Calibration – Determination of the scale factor	29
5.2.1 Calibration of a measuring system by comparison with a reference measuring system (preferred method)	29
5.2.2 Determination of the scale factor of a measuring system from those of its components (alternative method)	33
5.3 Linearity test in addition to comparison over the limited current range	34
5.3.1 Application	34
5.3.2 Alternative methods in order of suitability	34
5.4 Dynamic behaviour	35
5.4.1 General	35
5.4.2 Determination of the amplitude-frequency response of AC measuring systems	35
5.4.3 Reference method for impulse current measuring systems	35
5.5 Short-term stability	36
5.5.1 Method	36
5.5.2 Steady-state current	36
5.5.3 Impulse current and short-time current	37
5.5.4 Periodic impulse current and periodic short-time current	38
5.6 Long-term stability	39
5.7 Ambient temperature effect	40

5.8	Effect of nearby current paths	40
5.9	Software effect.....	43
5.10	Uncertainty calculation.....	44
5.10.1	General	44
5.10.2	Uncertainty of calibration	44
5.10.3	Uncertainty of measurement using an approved measuring system	45
5.11	Uncertainty calculation of time-parameter measurements (impulse currents only)	46
5.11.1	General	46
5.11.2	Uncertainty of the time-parameter calibration.....	46
5.11.3	Uncertainty of a time-parameter measurement using an approved measuring system.....	48
5.12	Interference test.....	49
5.12.1	Application.....	49
5.12.2	Current-converting shunts and current transformers with iron	49
5.12.3	Inductive measuring systems without iron (Rogowski coils)	51
5.13	Withstand tests	52
5.13.1	Voltage withstand tests	52
5.13.2	Current withstand tests	52
6	Steady-state direct current	52
6.1	Application	52
6.2	Test current	52
6.2.1	Requirements	52
6.2.2	Tolerances	52
6.3	Measurement of the test current	53
6.3.1	Requirements for an approved measuring system.....	53
6.3.2	Uncertainty contributions	53
6.3.3	Dynamic behaviour	53
6.3.4	Calibrations and tests on an approved measuring system.....	53
6.3.5	Performance check.....	54
6.4	Measurement of ripple amplitude	54
6.4.1	Requirements for an approved measuring system.....	54
6.4.2	Uncertainty contributions	54
6.4.3	Dynamic behaviour for ripple	54
6.4.4	Calibrations and tests on an approved ripple-current measuring system	55
6.4.5	Measurement of the scale factor at the ripple frequency	55
6.4.6	Performance check for ripple current measuring system	55
6.5	Test procedures	56
7	Steady-state alternating current.....	56
7.1	Application	56
7.2	Test current	56
7.2.1	Requirements	56
7.2.2	Tolerances	56
7.3	Measurement of the test current	57
7.3.1	Requirements for an approved measuring system.....	57
7.3.2	Uncertainty contributions	57
7.3.3	Dynamic behaviour	57
7.3.4	Calibrations and tests on an approved measuring system.....	59
7.3.5	Performance check.....	60

7.4	Test procedures	60
8	Short-time direct current	60
8.1	Application	60
8.2	Test currents	61
8.2.1	Requirements for the test current	61
8.2.2	Tolerances	61
8.3	Measurement of the test current	61
8.3.1	Requirements for an approved measuring system	61
8.3.2	Uncertainty contributions	61
8.3.3	Dynamic behaviour	61
8.3.4	Calibrations and tests on an approved measuring system	62
8.3.5	Performance check	63
8.3.6	Linearity test	63
8.4	Test procedures	63
9	Short-time alternating current	64
9.1	Application	64
9.2	Test current	64
9.2.1	Requirements for the test current	64
9.2.2	Tolerances	64
9.3	Measurement of the test current	65
9.3.1	Requirements for an approved measuring system	65
9.3.2	Uncertainty contributions	65
9.3.3	Dynamic behaviour	65
9.3.4	Calibrations and tests on an approved measuring system	67
9.3.5	Performance check	67
9.3.6	Linearity test	68
9.3.7	Interference test	68
9.4	Test procedures	68
10	Impulse currents	68
10.1	Application	68
10.2	Test current	69
10.2.1	General	69
10.2.2	Tolerances	69
10.3	Measurement of the test current	70
10.3.1	Requirements for an approved measuring system	70
10.3.2	Uncertainty contributions	70
10.3.3	Dynamic behaviour	70
10.3.4	Calibrations and tests on an approved measuring system	72
10.3.5	Performance check	73
10.4	Test procedures	73
11	Current measurement in high-voltage dielectric testing	73
11.1	Application	73
11.2	Test current	74
11.3	Measurement of the test current	74
11.3.1	Requirements for an approved measuring system	74
11.3.2	Uncertainty contributions	74
11.3.3	Dynamic behaviour	74
11.3.4	Calibrations and tests on an approved measuring system	74

11.3.5	Performance check	75
11.3.6	Linearity test.....	75
11.3.7	Interference test	75
11.4	Test procedures	75
12	Reference measuring systems	75
12.1	General.....	75
12.2	Interval between subsequent calibrations of reference measuring systems	76
Annex A (informative)	Uncertainty of measurement.....	77
A.1	General.....	77
A.2	Model function	77
A.3	Type A evaluation of standard uncertainty	78
A.4	Type B evaluation of standard uncertainty	79
A.5	Combined standard uncertainty.....	80
A.6	Expanded uncertainty	81
A.7	Effective degrees of freedom	82
A.8	Uncertainty budget.....	82
A.9	Statement of the measurement result.....	83
Annex B (informative)	Examples of the uncertainty calculation in high-current measurements	85
B.1	General.....	85
B.2	Example 1: Calibration of the scale factor of an AC current measuring system (comparison or reference method)	85
B.3	Example 2: Expanded uncertainty of measurement using an approved measuring system.....	89
B.4	Example 3: Scale factor when using an approved high current measuring system (component method)	91
Annex C (informative)	Generation of current step	94
Annex D (informative)	Convolution method for estimation of dynamic behaviour from step-response measurements	96
D.1	General.....	96
D.2	Convolution method	96
D.3	Procedure for performing the convolution calculation	97
D.4	Uncertainty contributions	98
D.5	Discussion of the calculated errors of impulse parameters	99
D.5.1	Error in the peak amplitude.....	99
D.5.2	Error in the front time.....	99
D.5.3	Error in the time to half-value	99
Annex E (informative)	Constraints for certain wave shapes.....	100
Annex F (informative)	Temperature rise of measuring resistors.....	102
Annex G (informative)	Determination of RMS values of short-time AC current.....	103
G.1	General characterization of a short-time alternating current	103
G.2	True RMS value	104
G.3	Symmetrical AC component (RMS value).....	105
G.4	Numerical method of obtaining the true RMS value using the trapezium rule.....	105
G.5	Conventional RMS value of the AC component	106
G.6	Conventional RMS value of an arc current	108
G.7	Equivalent RMS value of a short-time current during a short-circuit of a given duration	109
G.8	Determination of the impedance angle from the factor κ	110

G.9 Determination of the impedance angle by means of the phase shift between current and voltage	111
Annex H (informative) Examples of IEC standards with high-current tests	113
Bibliography	115
Figure 1 – Amplitude frequency response with examples for limit frequencies ($f_1; f_2$)	14
Figure 2 – Example of short-time direct current	19
Figure 3 – Exponential impulse current	21
Figure 4 – Exponential impulse current – Oscillating tail	22
Figure 5 – Impulse current – Rectangular, smooth	23
Figure 6 – Impulse current – Rectangular with oscillations	23
Figure 7 – Calibration by comparison over full assigned measurement range, $h = 5$	31
Figure 8 – Uncertainty contributions for calibrations over five current levels	31
Figure 9 – Combining calibration and linearity test	33
Figure 10 – Linearity test in the extended current range	34
Figure 11 – Short-term stability test for steady-state current	37
Figure 12 – Short-term stability test for impulse current and short-time current	38
Figure 13 – Short-term stability test for periodic impulse-current and periodic short-time current	39
Figure 14 – Test circuit for effect of nearby current path for current-converting shunts and current transformers with iron	42
Figure 15 – Test circuit for effect of nearby current path for inductive measuring systems without iron (Rogowski coils)	43
Figure 16 – Principle of interference test circuit	50
Figure 17 – Interference test on the measuring system $i_1(t)$ based on current-converting shunt or current transformer with iron in a typical 3-phase short-circuit set-up	50
Figure 18 – Test circuit for interference test for inductive systems without iron (Rogowski coils)	51
Figure 19 – Acceptable normalized amplitude-frequency response of an AC measuring system intended for a single fundamental frequency f_{nom}	58
Figure 20 – Acceptable normalized amplitude-frequency response of an AC measuring system intended for a range of fundamental frequencies f_{nom1} to f_{nom2}	59
Figure 21 – Example of short-time alternating current	64
Figure A.1 – Normal probability distribution $p(x)$ of a continuous random variable x	83
Figure A.2 – Rectangular probability distribution $p(x)$	84
Figure B.1 – Comparison between the system under calibration X and the reference system N	85
Figure C.1 – Circuit to generate current step using a coaxial cable	94
Figure C.2 – Circuit to generate current step using a capacitor	95
Figure E.1 – Attainable time parameters (shaded area) for 8/20 μs current impulse	101
Figure G.1 – Equivalent circuit of short-circuit test	103
Figure G.2 – Symmetrical AC component of an alternating short-circuit current	105
Figure G.3 – Numerical evaluation of RMS value showing both instantaneous current and instantaneous squared value of the current	106
Figure G.4 – Three-crest method	107

Figure G.5 – Evaluation of conventional RMS value of an arc current using the three-crest method.....	108
Figure G.6 – Evaluation of equivalent RMS value of a short-time current during a short-circuit test.....	109
Figure G.7 – Relation between factor κ and power factor $\cos(\varphi)$	111
Figure G.8 – Phase displacement based on an ohmic-inductive circuit.....	111
Table 1 – Required tests for steady-state direct current	53
Table 2 – Required tests for ripple current	55
Table 3 – Required tests for steady-state alternating current	59
Table 4 – Tolerance requirement on test-current parameters for short-time direct current.....	61
Table 5 – Required tests for short-time direct current.....	62
Table 6 – Tolerance requirements on the short-time alternating current test parameters	65
Table 7 – List of typical tests in a high-power laboratory and required minimum frequency range of the measuring system.....	66
Table 8 – Tolerance requirements on scale factor	66
Table 9 – Required tests for short-time alternating current.....	67
Table 10 – Examples of exponential impulse-current types	69
Table 11 – Tolerance requirements on exponential impulse current	69
Table 12 – Tolerance requirements on rectangular impulse current.....	70
Table 13 – Required tests for impulse current.....	72
Table 14 – Required tests for impulse current in high-voltage dielectric testing	74
Table A.1 – Coverage factor k for effective degrees of freedom ν_{eff} ($p = 95\%$).....	82
Table A.2 – Schematic of an uncertainty budget	83
Table B.1 – Result of the comparison measurement	87
Table B.2 – Result of the comparison measurement	88
Table B.3 – Uncertainty budget for calibration of scale factor F_X	88
Table B.4 – Result of linearity test	90
Table B.5 – Uncertainty budget of scale factor $F_{X,\text{mes}}$	90
Table B.6 – Uncertainty budget of the assigned scale factor F	93
Table H.1 – List of typical tests with short-time alternating current.....	113
Table H.2 – List of typical tests with exponential impulse current	113
Table H.3 – List of typical tests with rectangular impulse current	114

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**High-current test techniques -
Definitions and requirements for test currents and measuring systems**

FOREWORD

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IEC 62475 has been prepared by IEC technical committee 42: High-voltage and high-current test techniques. It is an International Standard.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

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

- a) minor errors in edition 1 have corrected;
- b) terms and definitions have been modified to achieve best possible adherence to IEC 60060-2:2025 and have been ascribed appropriate [SOURCE];
- c) terms and definitions which in edition 1 were presented in clauses other than Clause 3 have been moved into Clause 3.

- d) Annex B, Clause B.4 has been amended to provide an example of uncertainty calculation for the use of an approved measuring system;
- e) Clause C.2 has been deleted since the definitions given there are not referred to, with the exception of the origin of the step, which is used in Annex D. The applicable information has been added to Annex D as Note 1.
- f) Annex G, Clause G.8 has been amended to replace “peak factor” by “a factor”. Texts have been clarified. Equations for relation between factor κ and $\cos \phi$ have been developed to a simplified form.
- g) Annex G, Clause G.9 has been added.

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

Draft	Report on voting
42/472/FDIS	42/475/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.

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.

1 Scope

This document is applicable to high-current testing and measurements on both high-voltage and low-voltage equipment. It deals with steady-state and short-time direct current (as e.g. encountered in high-power DC testing), steady-state and short-time alternating current (as e.g. encountered in high-power AC testing), and impulse-current. In general, currents above 100 A are considered in this document, although currents less than this can occur in tests.

NOTE This document also covers fault detection during, for example, lightning impulse testing.

This document:

- defines the terms used;
- defines parameters and their tolerances;
- describes methods to estimate uncertainties of high-current measurements;
- states the requirements applicable to a complete measuring system;
- describes the methods for approving a measuring system and checking its components;
- describes the procedure by which the user shows that a measuring system meets the requirements of this document, including limits set for uncertainty of measurement.

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

NOTE Informative references on subjects included in this document are given in the bibliography.

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

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 Measuring systems

3.1.1

measuring system

complete set of devices suitable for performing measurements of a quantity to be measured

Note 1 to entry: A high-current measuring system usually comprises the following components:

- converting device with either terminals to connect this device in circuit or appropriate coupling to the circuit, and connections to earth;
- transmission system(s) connecting the output terminals of the converting device to the measuring instrument(s) with its attenuating, terminating, and adapting impedances or networks;
- measuring instrument(s) together with any connections 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;
- and in some cases the measuring system can include software to calculate the measurand.

Note 2 to entry: The environment in which a measuring system functions, its clearances to live, current carrying, and earthed structures, and the presence of electromagnetic fields can significantly affect the measurement result and its uncertainty.

[SOURCE: IEC 60060-2:2025, 3.1.1, modified – "a high-voltage measurement" replaced with "measurements of a quantity to be measured"; in Note 1: addition of "high-current" in the introductory sentence, modification of the first and third hyphens; in Note 2 to entry, addition of "current carrying" and replacement of "electric or magnetic fields may" with "electromagnetic fields can".]

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 document have been met

Note 1 to entry: This evidence includes the results of the initial performance test and the schedule and results of each subsequent performance test and performance check.

[SOURCE: IEC 60060-2:2025, 3.1.2]

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 IEC 62475

3.1.4

reference measuring system

measuring system with its calibration traceable to relevant national or international standards of measurement, 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 current

Note 1 to entry: A reference measuring system (maintained in accordance with the requirements of this document) can be used as an approved measuring system but the converse is not true.

[SOURCE: IEC 60060-2:2025, 3.1.4, modified – In the definition, replacement of "conducted in conformity with" with "traceable to", and "voltage" with "current".]

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

[SOURCE: IEC 60060-2:2025, 3.2.1]

3.2.2

current-converting shunt

resistor across which the voltage is proportional to the current to be measured

3.2.3

current transformer

instrument transformer in which the secondary current, in normal conditions of use, is substantially proportional to the primary current and differs in phase from it by an angle which is approximately zero for an appropriate direction of the connections

Note 1 to entry: Current transformers are usually defined for a single frequency, but special designs with a wide frequency range are possible.

[SOURCE: IEC 60050-321:1986, 321-02-01, modified – Addition of Note 1 to entry.]

3.2.4

Rogowski coil

inductive current-converting device without iron that includes an integrating circuit (passive, active, or numerical)

3.2.5

transmission system

set of devices that transfers the output signal of a converting device to a measuring instrument(s)

Note 1 to entry: A transmission system usually consists of a coaxial cable with its terminating impedance, but it can include attenuators, amplifiers, or other devices connected between the converting device and the measuring instrument(s). For example, an optical link includes a transmitter, an optical cable, and a receiver as well as related amplifiers.

Note 2 to entry: A transmission system can be partially or completely included in the converting device or in the measuring instrument.

Note 3 to entry: A transmission system for purely digital data is not intended as this term.

[SOURCE: IEC 60060-2:2025, 3.2.6 modified – NOTE 3 to entry added.]

3.2.6

measuring instrument

device intended to make measurements, alone or in conjunction with supplementary devices

[SOURCE: IEC 60050-300:2001, 311-03-01]

3.3 Scale factors

3.3.1

scale factor

<of a measuring system> factor by which the value of the measuring-instrument reading is multiplied to obtain the value of the input quantity of the complete measuring system

Note 1 to entry: A measuring system can have multiple scale factors for different current ranges, frequency ranges or waveforms.

Note 2 to entry: Some measuring systems display the value of the input quantity directly (i.e., the nominal scale factor of the measuring system is unity).

[SOURCE: IEC 60060-2:2025, 3.3.1, modified – In Note 1 to entry, replacement of "assigned measurement" to "current"; In Note 2 to entry, addition of "i.e." and parentheses.]

3.3.2

scale factor

<of a converting device> factor by which the output of the converting device is multiplied to obtain its input quantity

Note 1 to entry: The scale factor of a converting device can be dimensionless (for example, the ratio of a current transformer) or can have dimensions (for example, related to the impedance of a current-converting shunt).

[SOURCE: IEC 60060-2:2025, 3.3.2, modified – In Note 1 to entry, replacement of "divider" with "current transformer" and "voltage converting impedance" with "current-converting shunt".]

3.3.3

scale factor

<of a transmission system> factor by which the output of a transmission system is multiplied to obtain its input quantity

[SOURCE: IEC 60060-2:2025, 3.3.3]

3.3.4

scale factor

<of a measuring instrument> factor by which the instrument reading is multiplied to obtain its input quantity

[SOURCE: IEC 60060-2:2025, 3.3.4]

3.3.5

assigned scale factor

F

scale factor of a measuring system determined at the most recent performance test

Note 1 to entry: A measuring system can have more than one assigned scale factor; for example, it can have several ranges, each with a different scale factor.

[SOURCE: IEC 60060-2:2025, 3.3.5]

3.4 Rated values

3.4.1

operating conditions

specified ranges of conditions under which a measuring system will operate within the specified uncertainty limits

[SOURCE: IEC 60060-2:2025, 3.4.1]

3.4.2**rated current**

maximum level of current of specified frequency or waveform at which a measuring system is designed to be used

Note 1 to entry: The rated current can be higher than the upper limit of the assigned measurement range.

3.4.3**assigned measurement range**

range of current of specified frequency or waveform in which a measuring system can be used within the uncertainty limits given in this document, characterized by a single scale factor

Note 1 to entry: The limits of the assigned measurement range are chosen by the user and verified by the performance tests specified in this document.

Note 2 to entry: A measuring system can have more than one assigned measurement range, with different scale factors established for the different ranges.

[SOURCE: IEC 60060-2:2025, 3.4.3, modified – In the definition, replacement of "voltage" with "current" and addition of " within the uncertainty limits given in this document"; in Note 2 to entry, addition of "for the different ranges".]

3.4.4**assigned operating time**

longest time during which a DC or AC current measuring system can operate at the upper limit of the assigned measurement range within the uncertainty limits given in IEC 62475

[SOURCE: IEC 60060-2:2025, 3.4.4, modified – Replacement of "a measuring system for direct or alternating voltages" with " a DC or AC current measuring system" and addition of " within the uncertainty limits given in IEC 62475".]

3.4.5**assigned rate of application**

highest rate of specified short-time currents or impulse currents that can be applied in a given time interval, at which the measuring system can operate at the upper limit of the assigned measurement range and stay within the uncertainty limits given in IEC 62475

Note 1 to entry: The assigned rate of application is normally given as applications per minute and the time interval in minutes or hours.

[SOURCE: IEC 60060-2:2025, 3.4.5]

3.5 Terms and definitions related to the dynamic behaviour**3.5.1****response of a measuring system**

G

output, as a function of time or frequency, when a specified current is applied to the input of the system

[SOURCE: IEC 60060-2:2025, 3.5.1, modified – "voltage" replaced by "current".]

3.5.2**amplitude-frequency response**

$G(f)$

ratio of the output to the input of a measuring system as a function of frequency, f , when the input is sinusoidal, see Figure 1