SLOVENSKI STANDARD
oSIST prEN 61557-3:2018

01-april-2018

Električna varnost v nizkonapetostnih razdelilnih sistemih za izmenične napetosti do 1 kV in enosmerne napetosti do 1,5 kV - Oprema za preskušanje, merjenje ali nadzorovanje zaščitnih ukrepov - 3. del: Impedanca zanke

Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 3: Loop impedance

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Elektrische Sicherheit in Niederspannungsnetzen bis AC 1 000 V und DC 1 500 V - Geräte zum Prüfen, Messen oder Überwachen von Schutzmaßnahmen - Teil 3: Schleifenwiderstand

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Sécurité électrique dans les réseaux de distribution basse tension de 1 000 V c.a. et 1 500 V c.c. - Dispositifs de contrôle, de mesure ou de surveillance de mesures de protection - Partie 3: Impédance de boucle

Ta slovenski standard je istoveten z: **prEN 61557-3:2018**

ICS:

17.220.20	Merjenje električnih in magnetnih veličin	Measurement of electrical and magnetic quantities
29.080.01	Električna izolacija na splošno	Electrical insulation in general
29.240.01	Omrežja za prenos in distribucijo električne energije na splošno	Power transmission and distribution networks in general

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2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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85/631/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 61557-3 ED3	
DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
2018-02-09	**2018-05-04**
SUPERSEDES DOCUMENTS:	
85/609/CD,85/623/CC	

IEC TC 85 : MEASURING EQUIPMENT FOR ELECTRICAL AND ELECTROMAGNETIC QUANTITIES	
SECRETARIAT: China	SECRETARY: Mr Bo Chen
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 44,TC 64,TC 66	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☒ SAFETY

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☒ SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 3: Loop impedance

PROPOSED STABILITY DATE: 2025

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V AC AND 1 500 V DC – EQUIPMENT FOR TESTING, MEASURING OR MONITORING OF PROTECTIVE MEASURES –

Part 3: Loop impedance

FOREWORD

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International Standard IEC 61557-3 has been prepared by IEC technical committee TC85: Measuring equipment for electrical and electromagnetic quantities

This third edition cancels and replaces the second edition published in 2009. This edition constitutes a technical revision.

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

a) requirement for measurement category added
b) new requirements for operating instructions added
c) Alignment of the structure to the whole series IEC61557

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

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FDIS	Report on voting
XX/XX/FDIS	XX/XX/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 2.

This part of IEC 61557 shall be used in conjunction with Part 1.

A list of all parts in the IEC 61557 series, published under the general title *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measure,*' can be found on the IEC website.

The committee has decided that the contents of this publication 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.

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The National Committees are requested to note that for this publication the stability date is 2025

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THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

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ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V AC AND 1 500 V DC – EQUIPMENT FOR TESTING, MEASURING OR MONITORING OF PROTECTIVE MEASURES –

Part 3: Loop impedance

1 Scope

This part of IEC 61557 specifies the requirements applicable to equipment for measuring the loop impedance between a line conductor and the protective conductor or between a line conductor and neutral or between two line conductors by using the voltage drop when the circuit under test is loaded.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61010-1:2010, AMD1:2016, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61010-2-030:2017, *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for equipment having testing or measuring circuits*

3 Terms and definitions

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For the purposes of this document, the terms and definitions given in IEC 61557-1 and the following terms and definitions apply.

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ISO and IEC maintain terminological databases for use in standardization at the following addresses:

– IEC Electropedia: available at http://www.electropedia.org/

– ISO Online browsing platform: available at http://www.iso.org/obp

1.1 3.1
loading (method of)
method of loading a circuit within a distribution system to cause a voltage drop

1.2 3.2
loading equipment
part of the measuring equipment to load the circuit being tested

1.3 3.3
test current
electric current controlled by the measuring device to cause a voltage drop in a circuit being tested

1.4 3.4
system phase angle
angle between loop impedance and loop resistance of the distribution system

1.5 3.5
loop impedance
Z_L
sum of the impedances in a current loop comprising the impedance of the source of the current, the impedance of the line conductor (e.g. protective conductor, earth electrode and earth) from the point of measurement to the other terminal of the source of the current

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4 Requirements

4.1 General

In addition to the requirements of Clause 4 of IEC 61557-1, the requirements of Clause 4 shall apply.

Equipment intended to be used on the distribution system shall be rated at least for measurement category III according to IEC 61010-2-030.

Equipment intended to be used on the socket-outlets only can be rated for measurement category II according to IEC 61010-2-030.

4.2 Measurement of loop impedance

For measurements in close proximity to the transformer of the distribution system, equipment with a specified loop impedance measuring function (influence quantity for system phase angle at the minimum of 30°) shall be used or a specified additional operating uncertainty shall be taken into account by the user.

In applications where the measurement of loop resistance is carried out in close proximity to the sourcing transformer (e.g. <50 m) the system phase angle may be more than 18° (e.g. up to 30°) and therefore the inductive part of the internal impedance of transformer may not be negligible.

When the loading by loading equipment causes transients on the distribution system, the operating uncertainty shall not be exceeded as a result of the transient.

Equipment with specified influence quantity $E_{6.1}$ of system phase angle of 18° shall be marked with the warning symbol No. 14 according to Table 1 of IEC 61010-1:2010 adjacent to the loop function marking or a warning shall be given on the display.

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4.3 External resistance

When external resistances are included in the calibration as a zero offset, this shall be indicated.

This offset shall remain included as long as it is indicated regardless of any changes in range or function.

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4.4 Fault voltage exceeding U_L

Fault voltages as a result of the measurement, which exceed U_L at the point of test, shall be avoided. This can be achieved by automatic disconnection in accordance with Figure 2 of IEC 61010-1:2010.

4.5 Overvoltage

The measuring equipment shall not be damaged nor shall the user be exposed to danger when the measuring equipment is connected to 120 % of the nominal voltage of the distribution system for which the measuring equipment has been designed. Protective devices of the test equipment shall not be activated.

The user shall not be exposed to danger and the equipment shall not be damaged when the measuring equipment is accidentally connected to a voltage having a value of 173 % of its rated voltage to earth according to IEC 61010-2-030 for 1 min. Protective devices of the test equipment can be activated.

If the measuring equipment indicates the value of the voltage at its measuring terminals, it shall also indicate if the system voltage exists and if the live conductor is exchanged with the protective conductor.

5 Marking and operating instructions

5.1 Marking

In addition to Clause 5 of IEC 61557-1, the following information shall be provided on the measuring equipment.

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Marking is permitted on the display for any of the following:

– Range of the resistance of the loop impedance or of the calculated short-circuit current respectively within which compliance with the uncertainty limits in accordance with 4.2 is maintained.
– Nominal system voltage for which the equipment is rated.
– Rated system frequency for which the equipment is rated.
– Phase angle of the loading equipment when this angle is >18°
– Rated voltage to earth and measurement category.

5.2 Operating instructions

In addition to Clause 5 of IEC 61557-1, the following information shall be provided in the operating instructions for the measuring equipment.

– Data relating to the loading equipment if the phase angle is >18°.
– The amplitude and waveform of test current and duration of loading.
– Range of system voltages within which the operating uncertainty stated in 4.2 is not exceeded.
– Range of loop impedance (magnitude and angle) within which the operating uncertainty stated in 4.2 is not exceeded.
– Information on possible measurement uncertainties, for example due to preloading the circuit under test.
– Data relating to the effect of system voltage variations and other effects from the system such as measuring in close proximity to the transformer of the distribution system. A specific user correction shall be stated, unless the instrument has a fully specified loop impedance measuring function.

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6 Tests

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6.1 General

In addition to Clause 6 of IEC 61557-1 the following tests shall be performed.

6.2 Operating uncertainty

The operating uncertainty shall be determined under the rated operating conditions of IEC 61557-1 and in addition the following shall apply:

– the electrical distribution system on which a loop impedance test is performed shall be under constant load condition, except for load changes provoked by the test instrument;
– measurement shall be carried out without changing existing loads within the electrical distribution system under test;
– system voltage shall be between 85 % and 110 % of the nominal voltage of the distribution system for which the equipment has been designed;
– system frequency shall be between 99 % and 101 % of the nominal frequency of the distribution system for which the equipment has been designed;
– system voltage and frequency shall not change during the measurement by more than 0,5 %;
– measured circuit shall be loaded with loading equipment.

The operating uncertainty shall be calculated in accordance with Table 1. In this process, the intrinsic uncertainty shall be determined under the following reference conditions:

– nominal system voltage;
– nominal system frequency;
– reference temperature 23 °C ± 2 °C;

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– reference position in accordance with the manufacturer's statement;

– nominal distribution system supply or battery voltage respectively;

– difference between phase angle of the loading equipment and the loop impedance of the circuit under test ≤ 5°.

– The maximum percentage operating uncertainty within the measuring range to be marked or stated shall not exceed ±30 % with the measured value as the fiducial value, as determined in accordance with Table 1.

Table 1 – Calculation of operating uncertainty

Intrinsic uncertainty or influence quantity	Reference conditions or specified operating range	Designation code	Requirements or tests in accordance with relevant parts of IEC 61557	Type of test
Intrinsic uncertainty	Reference conditions	A	Part 3, Subclause 6.1	R
Position (on equipment using mechanical displays)	Reference position ±90°	E_1	Part 1, Subclause 6.2	R
Supply voltage	At the limits stated by the manufacturer	E_2	Part 1, Subclauses 6.2, 6.3	R
Temperature	0 °C and 35 °C	E_3	Part 1, Subclause 6.2	T
Phase angle	At a phase angle 0° to 18°	E_6	Part 3, Subclause 6.2	T
System phase angle	At a system phase angle 0° to 18° at the bottom of the measurement range	$E_{6.1}$ [a]	Part 3, Subclause 6.2	T
System phase angle	At a system phase angle 0° to 30° at the bottom of the measurement range	$E_{6.2}$ [a]	Part 3, Subclause 6.2	T
System frequency	95 % to 105 % of the nominal frequency	E_7	Part 3, Subclause 6.2	T
System voltage	85 % to 110 % of the nominal voltage	E_8	Part 3, Subclause 6.2	T
Harmonics	5 % of 3rd harmonic at 0° phase angle 6 % of 5th harmonic at 180° phase angle 5 % of 7th harmonic at 0° phase angle (percentage of the fundamental of nominal voltage of distribution system)	E_9	Part 3, Subclause 6.2	T
D.c quantity	Add additional DC quantities of 0,5 % of the nominal voltage of distribution system in both polarities. It is recommended that manufacturers include E_{10} into the calculation of operating uncertainty according to this table.	E_{10} [b]	Part 3, Subclause 6.2	T
Operating uncertainty	$B = \pm\sqrt{A^2 + \frac{4}{3}\sum_i E_i^2}$		Part 3, Subclause 6.2	R

A = intrinsic uncertainty
E_i = variations
R = routine test
T = type test
F = fiducial value

$$B\,[\%] = \pm\frac{B}{F}\cdot 100\,\%$$

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