BRITISH STANDARD

BS EN
61557-5:2007

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 5: Resistance to earth

The European Standard EN 61557-5:2007 has the status of a British Standard

ICS 17.220.20; 29.080.01; 29.240.01

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National foreword

This British Standard was published by BSI. It is the UK implementation of EN 61557-5:2007. It is identical with IEC 61557-5:2007. It supersedes BS EN 61557-5:1997, which will be withdrawn on 1 March 2010.

The UK participation in its preparation was entrusted to Technical Committee PEL/85, Measuring equipment for electrical and electromagnetic quantities.

A list of organizations represented on this committee can be obtained on request to its secretary.

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 61557-5

March 2007

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Supersedes EN 61557-5:1997

English version

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 5: Resistance to earth

(IEC 61557-5:2007)

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 5: Résistance à la terre (CEI 61557-5:2007)

Elektrische Sicherheit in Niederspannungsnetzen bis AC 1 000 V und DC 1 500 V - Geräte zum Prüfen, Messen oder Überwachen von Schutzmaßnahmen - Teil 5: Erdungwiderstand (IEC 61557-5:2007)

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CENELEC

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

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Foreword

The text of document 85/294/FDIS, future edition 2 of IEC 61557-5, prepared by IEC TC 85, Measuring equipment for electrical and electromagnetic quantities, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61557-5 on 2007-03-01.

This European Standard supersedes EN 61557-5:1997.

The following changes were made with respect to EN 61557-5:1997:

– complete revision of the definitions;

– revision of some requirements.

This standard is to be used in conjunction with EN 61557-1.

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)	2007-12-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-03-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61557-5:2007 was approved by CENELEC as a European Standard without any modification.

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Part 5: Resistance to earth

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1 Scope

This part of IEC 61557 specifies the requirements for equipment for measuring earth resistance using an a.c. voltage.

2 Normative references

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.

IEC 61010-1:2001, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61557-1, *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 1: General requirements*

3 Terms and definitions

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

3.1
series interference voltage
extraneous voltage superimposed on the measuring voltage

3.2
auxiliary earth electrode
additional earth electrode for a current required for the purpose of measurements

3.3
auxiliary earth electrode resistance
R_H
resistance of an additional earth electrode through which current flows that is required for the purpose of measurements

3.4
probe
additional earth electrode used as a probe for sampling potentials during measurements

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3.5
probe resistance
***R*S**
earth electrode resistance of an additional earth electrode used as a probe for sampling potentials during measurements

4 Requirements

The following requirements as well as those given in IEC 61557-1 shall apply.

4.1 The output voltage present across the terminals E and H shall be an a.c. voltage without a d.c. component.

The frequency and the waveform shall be chosen so that electrical interference, particularly from installations operating with system frequency, will not adversely influence the measurement result to an excessive degree.

4.2 If the influence of interference voltages from distribution systems as a.c. currents or as d.c. currents exceeds the requirements of 4.3, this shall be stated by the manufacturer in the operating instructions.

4.3 The maximum percentage operating uncertainty within the measurement range to be marked or stated shall not exceed ±30 % with the measured value as 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 test in accordance with the relevant parts of IEC 61557	Type of test
Intrinsic uncertainty	Reference conditions	A	Part 5, subclause 6.1	R
Position	Reference position ± 90°	E_1	Part 1, subclause 4.2	R
Supply voltage	At the limits stated by the manufacturer	E_2	Part 1, subclauses 4.2, 4.3	R
Temperature	0 °C and 35 °C	E_3	Part 1, subclause 4.2	T
Series interference voltage	See 4.2 and 4.3	E_4	Part 5, subclauses 4.2, 4.3	T
Resistance of the probes and auxiliary earth eletrodes	0 to 100 × R_A but ≤ 50 kΩ	E_5	Part 5, subclause 4.3	T
System frequency	99 % and 101 % of the nominal frequency	E_7	Part 5, subclause 4.3	T
System voltage	85 % and 110 % of the nominal voltage	E_8	Part 5, subclause 4.3	T
Operating uncertainty	$B = \pm (\lvert A \rvert + 1{,}15\sqrt{E_1^2 + E_2^2 + E_3^2 + E_4^2 + E_5^2 + E_7^2 + E_8^2})$		Part 5, subclause 4.3	R

A = intrinsic uncertainty
E_n = variations
R = routine test
T = type test

$$B\,[\%] = \pm \frac{B}{\text{fiducial value}} \times 100\,\%$$

The operating uncertainty shall apply under the rated operating conditions given in IEC 61557-1 and the following:

– injection of series interference voltages with system frequencies of 400 Hz, 60 Hz, 50 Hz, $16^2/_3$ Hz or with d.c. voltage respectively across the terminals E (ES) and S or to the earth resistance loop. The r.m.s. value of the series interference voltage for equipment with auxiliary probes shall be 3 V. For equipment using current clamps, the presence of interfering disturbances shall be clearly indicated, if the influence quantity will exceed the specified value of the variation E_4 and of operating uncertainty;

– resistance of the auxiliary earth electrode and of the probes: 0 to 100 × R_A but ≤ 50 kΩ;

– system voltages between 85 % and 110 % of the nominal voltage and between 99 % and 101 % of the nominal system frequency for measuring equipment with a mains supply and/or measuring equipment deriving its output voltage directly from the distribution system.

4.4 The measuring equipment shall be capable of determining whether the maximum permissible resistances of the probes and auxiliary earth electrodes are exceeded.

4.5 No hazardous touch voltages shall appear during the measurements.

This can be achieved by a suitable design of the source for the output voltage by:

– limiting the open-circuit value of the output voltage to an r.m.s. value of 50 V or a peak value of 70 V;

NOTE The open-circuit voltage during measurements in agricultural plants should not exceed an r.m.s. value of 25 V or a peak value of 35 V.

– limiting the r.m.s. (peak) value of the short-circuit current to 3,5 mA (5 mA) when the value of the voltage exceeds 50 V (70 V) or 25 V (35 V).

When no compliance with the above condition exists, then an automatic disconnection of the measurement process shall operate within a time period permissible according to Figure 1 of IEC 61010-1.

4.6 The user shall not be exposed to a voltage exceeding the permissible touch voltage and the measuring equipment shall recover within specification, when any plug or socket of the measuring equipment, intended for connection to the distribution system's power supply is connected to 120 % of its nominal voltage. Protective devices shall not be activated.

5 Marking and operating instructions

5.1 Marking

In addition to the marking in accordance with IEC 61557-1, the following information shall be provided on the measuring equipment.

5.1.1 Measurement range within which the maximum operating uncertainty applies.

5.1.2 Frequency of the output voltage.

5.1.3 Designation of the terminals (as far as applicable):

– E: terminal for the earth electrode;
– ES: terminal for the probe placed nearest to the earth electrode;
– S: terminal for a probe;
– H: terminal for the auxiliary earth electrode.

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5.2 Operating instructions

The operating instructions shall state the following in addition to the statements in IEC 61557-1.

5.2.1 The range of applications (e.g. for agricultural plants or others) for the equipment for measuring earth resistance.

5.2.2 If applicable, the influence of series interference voltages that are larger than the values stated under 4.3.

5.2.3 A statement relating to the correct operation of the hand-driven generator (if provided).

5.2.4 The designations of terminals when different from 5.1.3.

6 Tests

In addition to IEC 61557-1 the following tests shall be executed.

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

– nominal value of the supply voltage;
– nominal r.p.m. of the hand-driven generator when used as a supply;
– nominal frequency of the power supply in the case of mains-operated measuring equipment according to 4.3;
– reference temperature 23 °C ± 2 °C;
– reference position in accordance with the manufacturer's statement;
– resistances of probes and auxiliary earth electrodes 100 Ω;
– interference voltage 0 V.

The operating uncertainty thus evaluated shall not exceed the limits specified in 4.3.

6.2 A check as to whether the conditions for the open-circuit voltage, short-circuit current and disconnect delay stated under 4.5 are met in each of the measurement ranges *(routine test).*

6.3 A check as to whether exceeding the permissible maximum resistances for probes and auxiliary earth electrodes is indicated *(type test).*

6.4 The overload protection in accordance with 4.6 shall be tested *(type test),* when any plug or socket of the measuring equipment, intended for conncetion to the distribution system’s power supply is connected to 120 % of its nominal voltage. Protective devices shall not be activated.

6.5 Compliance with the tests in this clause shall be recorded.

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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.

Publication	Year	Title	EN/HD	Year
IEC 61010-1	2001	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	EN 61010-1 + corr. June	2001 2002
IEC 61557-1	-[1)]	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 1: General requirements	EN 61557-1	2007[2)]

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[1)] Undated reference.

[2)] Valid edition at date of issue.

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