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Niskonaponske električne instalacije – 6. dio: Provjeravanje (IEC 60364-6:2016; HD 60364-6:2016)

Low-voltage electrical installations – Part 6: Verification (IEC 60364-6:2016; HD 60364-6:2016)

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Napomena o autorskom pravu

Hrvatski zavod za norme (HZN)
Adresa: Ulica grada Vukovara 78
10 000 Zagreb, CROATIA
Tel. ++ 385 1 610 60 95
Faks: ++ 385 1 610 93 21
e-pošta: hzn@hzn.hr
Web: www.hzn.hr

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HARMONIZATION DOCUMENT
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HD 60364-6

July 2016

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Supersedes HD 60364-6:2007

English Version

Low-voltage electrical installations - Part 6: Verification
(IEC 60364-6:2016)

Installations électriques à basse tension - Partie 6: Vérification
(IEC 60364-6:2016)

Errichten von Niederspannungsanlagen - Teil 6: Prüfungen
(IEC 60364-6:2016)

This Harmonization Document was approved by CENELEC on 2016-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document at national level.

Up-to-date lists and bibliographical references concerning such national implementations may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This Harmonization Document exists in three official versions (English, French, German).

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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. HD 60364-6:2016 E

European foreword

The text of document 64/2107/FDIS, future edition 2 of IEC 60364-6 prepared by IEC/TC 64 "Electrical installations and protection against electric shock" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as HD 60364-6:2016.

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) 2017-03-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2019-06-01

This document supersedes HD 60364-6:2007.

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 60364-6:2016 was approved by CENELEC as a Harmonization Document without any modification.

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

IEC 60238	NOTE	Harmonized as EN 60238.
IEC 60364-4-43	NOTE	Harmonized as EN 60364-4-43.
IEC 61557-2	NOTE	Harmonized as EN 61557-2.
IEC 61557-3	NOTE	Harmonized as EN 61557-3.
IEC 61557-5	NOTE	Harmonized as EN 61557-5.
IEC 61557-8	NOTE	Harmonized as EN 61557-8.
IEC 62020	NOTE	Harmonized as EN 62020.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60079-17	-	Explosive atmospheres -- Part 17: Electrical installations inspection and maintenance	EN 60079-17	-
IEC 60364	series	Low-voltage electrical installations	HD 60364	series
IEC 60364-4-41 (mod)	2005	Low-voltage electrical installations -- Part 4-41: Protection for safety - Protection against electric shock	HD 60364-4-41	2007
-	-		+ corrigendum Jul.	2007
IEC 60364-4-42 (mod)	2010	Low-voltage electrical installations - Part 4-42: Protection for safety - Protection against thermal effects	HD 60364-4-42	2011
+ A1	2014		+ A1	2015
IEC 60364-4-44 (mod)	2007	Low-voltage electrical installations -- Part 4-44: Protection for safety - Protection against voltage disturbances and electromagnetic disturbances	HD 60364-4-442	2012
+ A1 (mod)	2015		HD 60364-4-443	2016
IEC 60364-5-51 (mod)	2005	Electrical installations of building -- Part 5-51: Selection and erection of electrical equipment - Common rules	HD 60364-5-51	2009
-	-		+ A11	2013
IEC 60364-5-52 (mod)	2009	Low-voltage electrical installations -- Part 5-52: Selection and erection of electrical equipment - Wiring systems	HD 60364-5-52	2011
IEC 60364-5-53	2001	Electrical installations of buildings -- Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control		-
+ A1 (mod)	2002		HD 60364-5-534	2008
+ A2 (mod)	2015		HD 60364-5-534	2016
IEC 60364-5-54	-	Low-voltage electrical installations -- Part 5-54: Selection and erection of electrical equipment - Earthing arrangements and protective conductors	HD 60364-5-54	-
IEC 61557-6	-	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 6: Effectiveness of residual current devices (RCD) in TT, TN and IT systems	EN 61557-6	-

IEC 61557	series	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	EN 61557	series

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LOW VOLTAGE ELECTRICAL INSTALLATIONS –

Part 6: Verification

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 60364-6 has been prepared by the IEC technical committee 64: Electrical installations and protection against electric shock.

This second edition cancels and replaces the first edition published in 2006 and constitutes a technical revision.

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

a) Normative references updated to current publications;
b) Re-numbered to align with current IEC numbering;
c) Initial inspection requirements: 3 items added;
d) Testing sequence changed;
e) General requirements for periodic reporting – more details added;
f) New Annex A: Table A.1 – Specific resistance values for copper conductors;

g) Annex D: Example of a diagram suitable for evaluation of voltage drop. Content removed;

h) Annex E: Recommendation for electrical equipment which is being re-used in an electrical installation. Content removed;

i) Annex F: Content replaced with new Annex E – Model forms for reporting;

j) Annex G: Changed to Annex F – Model forms for inspection of electrical installations;

k) Annex H: Changed to Annex G – Model schedule of circuit details and test results;

l) Annex H: Listing of notes concerning some countries;

m) Bibliography – Updated:

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

FDIS	Report on voting
64/2107/FDIS	64/2114/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.

A list of all parts in the IEC 60364 series, published under the general title *Low voltage electrical installations*, can be found on the IEC website.

The reader's attention is drawn to the fact that Annex H lists all of the “in-some-country” clauses on differing practices of a less permanent nature relating to the subject of this standard.

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.

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.

LOW VOLTAGE ELECTRICAL INSTALLATIONS –

Part 6: Verification

6.1 Scope

This part of IEC 60364 provides requirements for initial and periodic verification of an electrical installation.

Clause 6.4 provides requirements for initial verification, by inspection and testing, of an electrical installation to determine, as far as reasonably practicable, whether the requirements of the other parts of IEC 60364 have been met and requirements for the reporting of the results of the initial verification. The initial verification takes place upon the completion of a new installation or completion of an addition or an alteration to an existing installation.

Clause 6.5 provides requirements for periodic verification of an electrical installation to determine, as far as reasonably practicable, whether the installation and all its constituent equipment are in a satisfactory condition for use and requirements for the reporting of the results of the periodic verification.

6.2 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 60079-17, *Explosive atmospheres – Part 17: Electrical installations inspection and maintenance*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-42:2010, *Low-voltage electrical installations – Part 4-42: Protection for safety – Protection against thermal effects*
IEC 60364-4-42:2010/AMD1:2014

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*
IEC 60364-4-44:2007/AMD1:2015

IEC 60364-5-51:2005, *Electrical installations of buildings – Part 5-51:– Selection and erection of electrical equipment – Common rules*

IEC 60364-5-52:2009, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60364-5-53:2001, *Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control*
IEC 60364-5-53:2001/AMD1:2002
IEC 60364-5-53:2001/AMD2:2015

IEC 60364-5-54, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*

IEC 61557 (all parts), *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*

IEC 61557-6, *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 6: Effectiveness of residual current devices (RCD) in TT, TN and IT systems*

6.3 Terms and definitions

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

6.3.1
verification
all measures by means of which compliance of the electrical installation with the relevant requirements of IEC 60364 is checked

Note 1 to entry: Verification comprises inspection, testing and reporting.

6.3.2
inspection
examination of an electrical installation using all appropriate senses in order to ascertain correct selection and proper erection of electrical equipment

6.3.3
testing
implementation of measures to assess an electrical installation by means through which its effectiveness is proved

Note 1 to entry: Testing includes ascertaining values by means of appropriate measuring instruments, said values not being detectable by inspection.

6.3.4
reporting
recording of the results of inspection and testing

6.3.5
maintenance
combination of all technical and administrative actions, including supervisory actions, intended to retain an item in, or restore it to, a state in which it can perform a required function

6.4 Initial verification

6.4.1 General

6.4.1.1 Every installation shall be verified during erection, as far as reasonably practicable, and on completion, before being put into service.

6.4.1.2 The information required by IEC 60364-5-51:2005, 514.5 and other information necessary for initial verification shall be made available to the person carrying out the initial verification.

6.4.1.3 The initial verification shall include comparison of the results with relevant criteria to confirm that the requirements of the IEC 60364 series have been met.

6.4.1.4 Precautions shall be taken to ensure that the verification shall not cause danger to persons or livestock and shall not cause damage to property and equipment even if the circuit is defective**.**

6.4.1.5 It shall be verified that an extension, addition or alteration to an existing installation complies with the IEC 60364 series and does not impair the safety of that installation, and that the safety of the new installation is not impaired by the existing installation.

6.4.1.6 The verification shall be made by a skilled person, competent in verification.

NOTE Requirements concerning qualifications are a matter for national consideration.

6.4.2 Inspection

6.4.2.1 Inspection shall precede testing and shall normally be done prior to energizing the installation.

6.4.2.2 The inspection shall be made to confirm that electrical equipment which is part of the fixed installation is:

– in compliance with the safety requirements of the relevant equipment standards;

NOTE This can be ascertained by examination of the manufacturer's information, marking or certification.

– correctly selected and erected according to the IEC 60364 series and taking into account the manufacturer's instructions;

– not visibly damaged or defective so as to impair safety.

6.4.2.3 Inspection shall include at least the checking of the following, where relevant:

a) method of protection against electric shock (see IEC 60364-4-41);

b) presence of fire barriers and other precautions against propagation of fire and protection against thermal effects (see IEC 60364-4-42 and IEC 60364-5-52:2009, Clause 527);

c) selection of conductors for current-carrying capacity (see IEC 60364-4-43 and IEC 60364-5-52:2009, Clauses 523);

d) choice, setting, selectivity and coordination of protective and monitoring devices (see IEC 60364-5-53:2001, Clause 536);

e) selection, location and installation of suitable overvoltage protective devices (SPD) where specified (see IEC 60364-5-53:2001 and IEC 60364-5-53:2001/AMD2:2015, Clause 534);

f) selection, location and installation of suitable isolating and switching devices (see IEC 60364-5-53:2001, Clause 536);

g) selection of equipment and protective measures appropriate to external influences and mechanical stresses (see IEC 60364-4-42:2010, Clause 422, IEC 60364-5-51:2005, 512.2 and IEC 60364-5-52:2009, Clause 522);

h) identification of neutral and protective conductors (see IEC 60364-5-51:2005, 514.3);

i) presence of diagrams, warning notices or similar information (see IEC 60364-5-51:2005, 514.5);

j) identification of circuits, overcurrent protective devices, switches, terminals etc. (see IEC 60364-5-51:2005, Clause 514);

k) adequacy of termination and connection of cables and conductors (see IEC 60364-5-52:2009, Clause 526);

l) selection and installation of earthing arrangements, protective conductors and their connections (see IEC 60364-5-54);

m) accessibility of equipment for convenience of operation, identification and maintenance (see IEC 60364-5-51:2005, Clauses 513 and 514);

n) measures against electromagnetic disturbances (see IEC 60364-4-44:2007, Clause 444);

o) exposed-conductive-parts are connected to the earthing arrangement (see IEC 60364-4-41:2005, Clause 411);

p) selection and erection of the wiring systems (see IEC 60364-5-52:2009, Clauses 521 and 522).

Inspection shall include all particular requirements for special installations or locations.

6.4.3 Testing

6.4.3.1 General

The test methods described in 6.4.3 are given as reference methods; other methods are not precluded, provided they give no less valid results.

Measuring instruments and monitoring equipment and methods shall be chosen in accordance with the relevant parts of the IEC 61557 series. If other measuring equipment is used, it shall provide no less a degree of performance and safety.

The following tests shall be carried out where relevant and should preferably be made in the following sequence:

a) continuity of conductors (see 6.4.3.2);

b) insulation resistance (see 6.4.3.3);

c) insulation resistance testing to confirm the effectiveness of protection by SELV, PELV or electrical separation (see 6.4.3.4);

d) insulation resistance testing to confirm the effectiveness of floor and wall resistance/impedance (see 6.4.3.5);

e) polarity test (see 6.4.3.6);

f) testing to confirm effectiveness of automatic disconnection of supply (see 6.4.3.7);

g) testing to confirm the effectiveness of additional protection (see 6.4.3.8);

h) test of phase sequence (see 6.4.3.9);

i) functional tests (see 6.4.3.10);

j) voltage drop (see 6.4.3.11).

In the event of any test indicating failure to comply, that test and any preceding test, the results of which may have been influenced by the fault indicated, shall be repeated after the fault has been rectified.

When testing in a potentially explosive atmosphere appropriate safety precautions in accordance with IEC 60079-17 are necessary.

6.4.3.2 Continuity of conductors

The continuity of conductors and connection to exposed-conductive-parts, if any, shall be verified by a measurement of resistance on:

a) protective conductors, including protective bonding conductors,

b) exposed-conductive-parts, and

c) in the case of ring final circuits, live conductors.

NOTE See also Annex A.

6.4.3.3 Insulation resistance of the electrical installation

The insulation resistance shall be measured between:

a) live conductors, and

b) live conductors and the protective conductor connected to the earthing arrangement.

Where appropriate during this measurement, live conductors may be connected together. In practice, it may be necessary to carry out this measurement during erection of the installation before the connection of the equipment.

Where the circuit includes equipment that is likely to influence the results or be damaged, only a measurement between the live conductors connected together and earth shall be made.

The insulation resistance measured with the test voltages indicated in Table 6.1 shall be considered satisfactory if the main switchboard and each distribution circuit tested separately, with all its final circuits connected but with current-using equipment disconnected, has an insulation resistance not less than the appropriate value given in Table 6.1.

Table 6.1 – Minimum values of insulation resistance

Nominal circuit voltage V	Test voltage d.c. V	Minimum insulation resistance MΩ
SELV and PELV	250	0.5
Up to and including 500 V, including FELV	500	1
Above 500 V	1 000	1

Table 6.1 shall be applied for a verification of the insulation resistance between non-earthed protective conductors and earth.

FELV circuits shall be tested at the same test voltage as that applied to the primary side of the source.

Where surge protective devices (SPDs) or other equipment are likely to influence the verification test, or be damaged, such equipment shall be disconnected before carrying out the insulation resistance test.

Where it is not reasonably practicable to disconnect such equipment (e.g. in case of fixed socket-outlets incorporating an SPD) the test voltage for a particular circuit may be reduced to 250 V d.c. but the insulation resistance shall have a value of at least 1 MΩ.

To facilitate measurement, the neutral conductor shall be disconnected from the main earthing terminal (MET).

In TN-C systems, a measurement should be made between the live conductors and the PEN conductor.

Insulation resistance values are usually much higher than those of Table 6.1. When measured values show evident differences between circuits, further investigation to identify the reasons is required.

6.4.3.4 Insulation resistance testing to confirm effectiveness of SELV, PELV or electrical separation

The separation of circuits shall be in accordance with 6.4.3.4.1 in the case of protection by SELV, 6.4.3.4.2 in the case of protection by PELV and 6.4.3.4.3 in the case of protection by electrical separation.

The resistance value obtained in 6.4.3.4.1, 6.4.3.4.2 and 6.4.3.4.3 shall be at least that of the circuit with the highest voltage present in accordance with Table 6.1.

6.4.3.4.1 Protection by SELV

The separation of live parts from those of other circuits and from earth, according to IEC 60364-4-41:2005, Clause 414, shall be confirmed by a measurement of the insulation resistance.

6.4.3.4.2 Protection by PELV

The separation of the live parts from other circuits, according to IEC 60364-4-41:2005 Clause 414, shall be confirmed by a measurement of the insulation resistance.

6.4.3.4.3 Protection by electrical separation

The separation of the live parts from those of other circuits and from earth, according to IEC 60364-4-41:2005, Clause 413, shall be confirmed by a measurement of the insulation resistance.

For electrical separation with more than one item of current-using equipment, it shall be verified either by measurement or by calculation that in the case of two coincidental faults with negligible impedance between different line conductors and either the protective bonding conductor or exposed-conductive-parts connected to it, at least one of the faulty circuits shall be disconnected. The disconnection time shall be in accordance with that for the protective measure automatic disconnection of supply in a TN system.

6.4.3.5 Insulation resistance/impedance of floors and walls

When it is necessary to comply with the requirements of IEC 60364-4-41:2005, Clause C.1, at least three measurements shall be made in the same location, one of these measurements being approximately 1 m from any accessible extraneous-conductive-part in the location. The other two measurements shall be made at greater distances.

The measurement of resistance/impedance of insulating floors and walls is carried out with the system voltage to earth at nominal frequency.

The above series of measurements shall be repeated for each relevant surface of the location.

NOTE Further information on the measurement of the insulation resistance/impedance of floors and walls is given in Annex B.

6.4.3.6 Polarity

Where relevant, the polarity of the supply at the origin of the installation shall be verified before the installation is energized.

Where single pole switching devices are not permitted in the neutral conductor, a test shall be made to verify that all such devices are connected in the line conductor(s) only.

During the polarity test, it should be verified that:

a) every fuse and single-pole control and protective device is connected in the line conductor only, and

b) except for E14 and E27 lampholders according to IEC 60238, in circuits having an earthed neutral conductor centre contact bayonet and Edison screw lampholders, the outer or screwed contacts are connected to the neutral conductor, and

c) wiring has been correctly connected to socket-outlets and similar accessories.

6.4.3.7 Protection by automatic disconnection of supply

NOTE Where RCDs are employed also for protection against fire, the verification of the conditions for protection by automatic disconnection of the supply can be considered as covering the relevant requirements of IEC 60364-4-42.

6.4.3.7.1 General

The verification of the effectiveness of the measures for fault protection by automatic disconnection of supply is effected as follows:

a) For a TN system

Compliance with the rules of IEC 60364-4-41: 2005, 411.4.4 and 411.3.2 shall be verified by:

1) Measurement of the earth fault loop impedance where possible (see 6.4.3.7.3).

   Alternatively, where the measurement of earth fault loop impedance is not possible the verification of the electrical continuity of the protective conductors (see 6.4.3.2) is sufficient provided that calculations of earth fault loop impedance or protective conductor resistance are available.

2) Verification of the characteristics and/or the effectiveness of the associated protective device. This verification shall be made:

   – for overcurrent protective devices, by visual inspection or other appropriate methods (i.e. short time or instantaneous tripping setting for circuit-breakers, current rating and type for fuses);

   – for RCDs, by visual inspection and testing.

     The effectiveness of automatic disconnection by RCDs shall be verified using suitable test equipment according to IEC 61557-6 confirming that the relevant requirements in IEC 60364-4-41 are met taking into account the operating characteristic of the device. The effectiveness of the protective measure is verified if disconnection occurs with a fault current lower than or equal to the rated residual operating current $I_{\Delta n}$.

     It is recommended that the disconnection times required by IEC 60364-4-41 be verified. However, the requirements for disconnecting times shall be verified in case of additions and alterations to an existing installation where existing RCDs are also used as disconnecting devices for such additions and alterations.

Where the effectiveness of the protective measure has been confirmed at a point located downstream of an RCD, the protection of the installation downstream from this point may be proved by confirmation of the continuity of the protective conductors.

b) For a TT system

Compliance with the rules of IEC 60364-4-41: 2005, 411.5.3 and 411.3.2 shall be verified by:

1) Measurement of the resistance R_A of the earth electrode for exposed-conductive-parts of the installation (see 6.4.3.7.2).

   Where a measurement of R_A is not practicable the measured value of external earth fault loop impedance may be used (see Annex C, Methods C2 and C3).

2) Verification of the characteristics and/or the effectiveness of the associated protective device. This verification shall be made:

   – for overcurrent protective devices, by visual inspection or other appropriate methods (i.e. short time or instantaneous tripping setting for circuit-breakers, current rating and type for fuses);

   – for RCDs, by visual inspection and testing.

     The effectiveness of automatic disconnection by RCDs shall be verified using suitable test equipment according to IEC 61557-6 confirming that the relevant requirements in IEC 60364-4-41 are met taking into account the operating characteristic of the device. The effectiveness of the protective measure is verified

if disconnection occurs with a fault current lower or equal to the rated residual operating current $I_{\Delta n}$.

It is recommended that the disconnection times required by IEC 60364-4-41 be verified. However, the requirements for disconnecting times shall be verified in case of additions and alterations to an existing installation where existing RCDs are also used as disconnecting devices for such additions and alterations.

Where the effectiveness of the protective measure has been confirmed at a point located downstream of an RCD, the protection of the installation downstream from this point may be proved by confirmation of the continuity of the protective conductors.

c) For an IT system

Compliance with the rules of IEC 60364-4-41: 2005, 411.6.2 shall be verified by calculation or measurement of the current I_d in case of a first fault of a live conductor.

The measurement is made only if the calculation is not possible, because all the parameters are not known. Precautions are to be taken while making the measurement in order to avoid the danger due to a double fault.

In the case of a double earth fault, the fault loop impedance shall be verified by calculations or by measurements. Where the condition is similar to that of a TT-system (see IEC 60364-4-41:2005, 411.6.4 item b), verification shall be made as for a TT system (see 6.4.3.7.1, item b)). Where conditions are similar to that of a TN-system (see IEC 60364-4-41:2005, 411.6.2), verification by measurement shall be made as follows.

– For IT installations supplied from a local transformer, the earth-loop impedance is measured by inserting a connection with negligible impedance between a live conductor and earth at the origin of the installation. The earth-loop impedance measurement is made between a second live conductor and protective-earth at the end of the circuit. Verification is achieved if the measured value is ≤ 50 % of the maximum allowed loop-impedance.
– For IT systems connected to a public grid, the earth fault loop impedance is determined by verification of the continuity of the protective conductor and measuring the loop-impedance between two live conductors at the end of the circuit. Verification is achieved if the measured value is ≤ 50 % of the maximum permitted loop-impedance. If verification is not achieved, more detailed measurements are necessary.

6.4.3.7.2 Measurement of the resistance of the earth electrode

Measurement of the resistance of an earth electrode, where prescribed (see IEC 60364-4-41: 2005, 411.5.3, for a TT system, 411.4.1, for a TN system, and 411.6.2, for an IT system), shall be made by an appropriate method. When measuring the resistance is not possible, the resistance may also be calculated using applicable values.

NOTE 1 Annex C, Method C1 gives, as an example, a description of a method of measurement using two auxiliary earth electrodes and the conditions to be fulfilled.

NOTE 2 Where the location of the installation (e.g. in towns) is such that it is not possible in practice to provide the two auxiliary earth electrodes, measurement of the earth fault loop impedance according to 6.4.3.7.3, or Annex C, Methods C2 and C3 will give an acceptable approximate value.

6.4.3.7.3 Measurement of the earth fault loop impedance

An electrical continuity test shall be carried out according to 6.4.3.2 before carrying out the earth fault loop impedance measurement.

The measured earth fault loop impedance shall comply with IEC 60364-4-41: 2005, 411.4.4 for TN systems and with IEC 60364-4-41: 2005, 411.6.4 for IT systems.

Where the requirements of 6.4.3.7.2 are not satisfied or in case of doubt and where supplementary bonding according to IEC 60364-4-41:2005, 415.2 is applied, the effectiveness of that bonding shall be checked according to IEC 60364-4-41:2005, 415.2.2.

6.4.3.8. Additional protection

The verification of the effectiveness of the measures applied for additional protection is fulfilled by visual inspection and test.

Where an RCD is required for additional protection, the effectiveness of automatic disconnection of supply by RCD shall be verified using suitable test equipment according to IEC 61557-6.

Where additional protection is provided by supplementary protective bonding, the effectiveness of that bonding shall be checked according to IEC 60364-4-41:2005, 415.2.2.

6.4.3.9 Phase sequence

In the case of multiphase circuits, it shall be verified that the phase sequence is maintained.

6.4.3.10 Functional testing

Equipment shall be subjected to functional testing to verify that it is properly mounted, adjusted and installed in accordance with the relevant requirements of the IEC 60364 series. Examples of such equipment are:

– switchgear and controlgear assemblies, drives, controls and interlocks,
– systems for emergency switching off and emergency stopping,
– insulation monitoring.

NOTE 1 This list is not exhaustive.

Protective devices shall be submitted to a test of their function, as necessary, to check that they are properly installed and adjusted. Where fault protection and/or additional protection is to be provided by an RCD, the effectiveness of any test facility incorporated in the device shall be verified.

NOTE 2 This functional test does not replace the functional test indicated by the relevant standards.

6.4.3.11 Verification of voltage drop

Where required to verify compliance with IEC 60364-5-52: 2009, Clause 525, the voltage drop shall be evaluated by measurement or by calculation (see IEC 60364-5-52: 2009, Annex G).

Measurement may be:

– comparison of the difference between the voltage with and without the design load connected, or
– comparison of the difference between the voltage with and without any known load connected and recalculated to the design load, or
– circuit impedance values.

6.4.4 Reporting for initial verification

6.4.4.1 Upon completion of the verification of a new installation or additions or alterations to an existing installation, an electrical installation verification report shall be provided. Such documentation shall include details of the extent of the installation covered by the report, together with a record of the inspection and the results of testing.

Any defects or omissions revealed during verification of the installation shall be corrected before the person carrying out the verification declares that the installation complies with the IEC 60364 series.

6.4.4.2 In the case of initial verification of alterations or additions of existing installations, the report may contain recommendations for repairs and improvements, as may be appropriate.

6.4.4.3 The initial report shall include records of:

– inspections;

– circuits tested and test results.

The records of circuit details and test results shall identify every circuit, including its related protective device(s) and shall record the results of the appropriate tests and measurements.

6.4.4.4 The person or persons responsible for the design, construction and verification of the installation shall give the report, which takes account of their respective responsibilities, to the person ordering the work, together with the records mentioned in 6.4.4.3.

The initial report of the electrical installation should make a recommendation for a period between initial verification and the first periodic verification.

6.4.4.5 Reports shall be compiled and signed or otherwise authenticated by a skilled person or persons competent in verification.

NOTE Annexes E, F and G contain model forms of reports and schedules that can be used for the description of initial and periodic verification of installations which are particularly suitable for domestic installations. National committees may adapt the content of these annexes to suit national conditions and practices.

6.5 Periodic verification

6.5.1 General

6.5.1.1 Where required, periodic verification of every electrical installation shall be carried out in accordance with 6.5.1.2 to 6.5.1.5.

Wherever possible, the records and recommendations of previous verifications shall be taken into account.

Where no previous report is available, a preliminary survey is necessary.

6.5.1.2 Periodic verification shall be carried out without dismantling, or with partial dismantling, as required, supplemented by appropriate tests and measurements from Clause 6.4, to provide for:

a) the safety of persons and livestock against the effects of electric shock and burns,

b) protection against damage to property by fire and heat arising from an electrical installation defect,

c) confirmation of correct rating and setting of protective devices required by IEC 60364-4-41,

d) confirmation of correct rating and setting of monitoring devices,

e) confirmation that the installation is not damaged or deteriorated so as to impair safety,

f) the identification of installation defects and non-compliances with the requirements of the relevant parts of the IEC 60364 series, that may give rise to danger,

g) confirmation of correct rating and setting of protective devices, and

h) confirmation of correct rating and setting of monitoring devices.

Where a circuit is permanently monitored by an RCM in accordance with IEC 62020 or an IMD in accordance with IEC 61557-8 it is not necessary to measure the insulation resistance if the functioning of the IMD or RCM is correct.

The functioning of the RCM or IMD shall be verified.

NOTE Existing installations may have been designed and installed to conform to previous editions of IEC 60364, applicable at the time of their design and erection. This does not necessarily mean that they are unsafe.

6 5.1.3 Precautions shall be taken to ensure that the periodic verification shall not cause danger to persons or livestock and shall not cause damage to property and equipment even if the circuit is defective.

Measuring instruments and monitoring equipment and methods shall be chosen in accordance with the relevant parts of IEC 61557. If other measuring equipment is used, it shall provide no less a degree of performance and safety.

6.5.1.4 Details of any damage, deterioration, defects or dangerous conditions shall be recorded in the report.

6.5.1.5 The verification shall be made by a skilled person, competent in verification.

NOTE Requirements concerning qualifications are a matter for national consideration.

6.5.2 Frequency of periodic verification

6.5.2.1 The frequency of periodic verification of an installation shall be determined having regard to the type of installation and equipment, its use and operation, the frequency and quality of maintenance and the external influences to which it will be subjected.

The maximum interval between periodic verifications may be laid down by legal or national regulations.

The interval may be, for instance several years (e.g. four years), with the exception of the following cases where a higher risk may exist and shorter periods may be required:

– workplaces or locations where risks of electric shock, fire or explosion exist due to degradation;
– workplaces or locations where both high and low voltage installations exist;
– communal facilities;
– construction sites;
– safety installations (e.g. emergency luminaires).

For dwellings, longer periods (e.g. ten years) may be appropriate. When occupancy of a dwelling has changed, a verification of the electrical installation is strongly recommended.

The results and recommendations of previous reports should also be taken into account.

6.5.2.2 In the case of an installation under an effective management system for preventative maintenance in normal use, periodic verification may be replaced by an adequate regime of continuous monitoring and maintenance of the installation and all its constituent equipment by skilled persons. Appropriate records shall be kept.

6.5.3 Reporting for periodic verification

6.5.3.1 Upon completion of the periodic verification of an existing installation, an electrical installation condition report shall be provided.

6.5.3.2 The report shall include the following:

– details of those parts of the installation that have been inspected;
– any limitations of the inspection and testing;
– any damage, deterioration, defects or dangerous conditions;
– any non-compliance with the requirements of the IEC 60364 series which may give rise to danger;
– schedules of inspection;
– schedules of results of the appropriate tests detailed in 6.4.3.

6.5.3.3 The report may contain recommendations for repairs and improvements, such as upgrading the installation to comply with the current standard, as may be appropriate.

6.5.3.4 The report shall contain a recommendation for the interval until the next periodic inspection.

6.5.3.5 The report shall be compiled and signed or otherwise authenticated by a skilled person or persons, competent in verification.

6.5.3.6 The report shall be given by the person responsible for carrying out the verification, or a person authorized to act on their behalf, to the person ordering the verification.

NOTE 1 Annexes E, F and G contain model forms of reports and schedules that can be used for the description of initial and periodic verification of installations which are particularly suitable for domestic installations.

NOTE 2 National committees may adapt the content of these annexes to suit national conditions and practices.

Annex A
(informative)

Estimation of the resistance value likely to be obtained during continuity testing

Table A.1 – Specific conductor resistance R for copper wiring at 30 °C dependent on the nominal cross-sectional area S for rough calculation of conductor resistances

Nominal cross-sectional area S mm^2	Specific conductor resistance R at 30 °C mΩ/m
1,5	12,575 5
2,5	7,566 1
4	4,739 2
6	3,149 1
10	1,881 1
16	1,185 8
25	0,752 5
35	0,546 7
50	0,404 3
70	0,281 7
95	0,204 7
120	0,163 2
150	0,134 1
185	0,109 1

The specific conductor resistance values are related to a conductor temperature of 30 °C. For other temperatures Θ the conductor resistances R_Θ can be calculated by the use of the following formula:

$$R\Theta = R30°C\left[1+\alpha\left(\Theta - 30°C\right)\right]$$

where α is the temperature coefficient (for copper α = 0,003 93 K^{-1})

Annex B
(informative)

Methods for measuring the insulation resistance/impedance of floors and walls to earth or to the protective conductor

B.1 General

Measurement of impedance or resistance of insulating floors and walls should be carried out with the system voltage to earth and nominal frequency, or with a lower voltage of the same nominal frequency combined with a measurement of insulation resistance.

The insulation resistance test should be made using measuring equipment in accordance with IEC 61557-2.

The test may be carried out, for example, in accordance with the following methods of measurement:

1) a.c. systems
   - by measurement with lower a.c. voltages (minimum 25 V) and additionally by an insulation resistance test using a minimum test voltage of 500 V (d.c.) for nominal system voltages not exceeding 500 V and a minimum test voltage of 1 000 V (d.c.) for nominal system voltages above 500 V.

     The following voltage sources may be used optionally:

     a) the earthed system voltage (voltage to earth) that exists at the measuring point;

     b) the secondary voltage of a double-wound transformer;

     c) an independent voltage source at the nominal frequency of the system.

     In cases as specified under b) and c), the measuring voltage shall be earthed for the measurement.

     For safety reasons, when using test voltages above 50 V, the maximum output current shall be limited to 3,5 mA.

2) d.c. systems
   - insulation resistance test using a maximum test voltage of 500 V (d.c.) for nominal system voltages not exceeding 500 V;
   - insulation resistance test using a minimum test voltage of 1 000 V (d.c) for nominal system voltages above 500 V.

B.2 Test method for measuring the impedance of floors and walls with a.c. voltage

Current I is fed through an ammeter to the test electrode from the output of the voltage source or from the phase conductor L. The voltage U_x at the electrode is measured by means of a voltmeter with internal resistance of at least 1 MΩ towards PE.

The impedance of the floor insulation will then be $Z_x = U_x / I$.

The measurement for ascertaining the impedance shall be carried out at as many points as deemed necessary, selected at random, with a minimum of three.

The test electrode may be either of the following types. In case of dispute, the use of test electrode 1 is the reference method.

B.3 Test electrode 1

Test electrode 1 is shown in Figure B.1. The electrode comprises a metallic tripod of which the parts resting on the floor form the points of an equilateral triangle. Each supporting point is provided with a flexible base to ensure that, when loaded, close contact is made with the surface being tested over an area of approximately 900 mm^2. The electrode should present a resistance of 5 000 Ω.

A square of dampened, water-absorbent paper or cloth, with sides that measure approximately 270 mm from which surplus water has been removed is placed between the test electrode and the surface being tested.

While measurements are being made, a force of approximately 750 N for floors or 250 N for walls is applied to the tripod.

Dimensions in millimeters

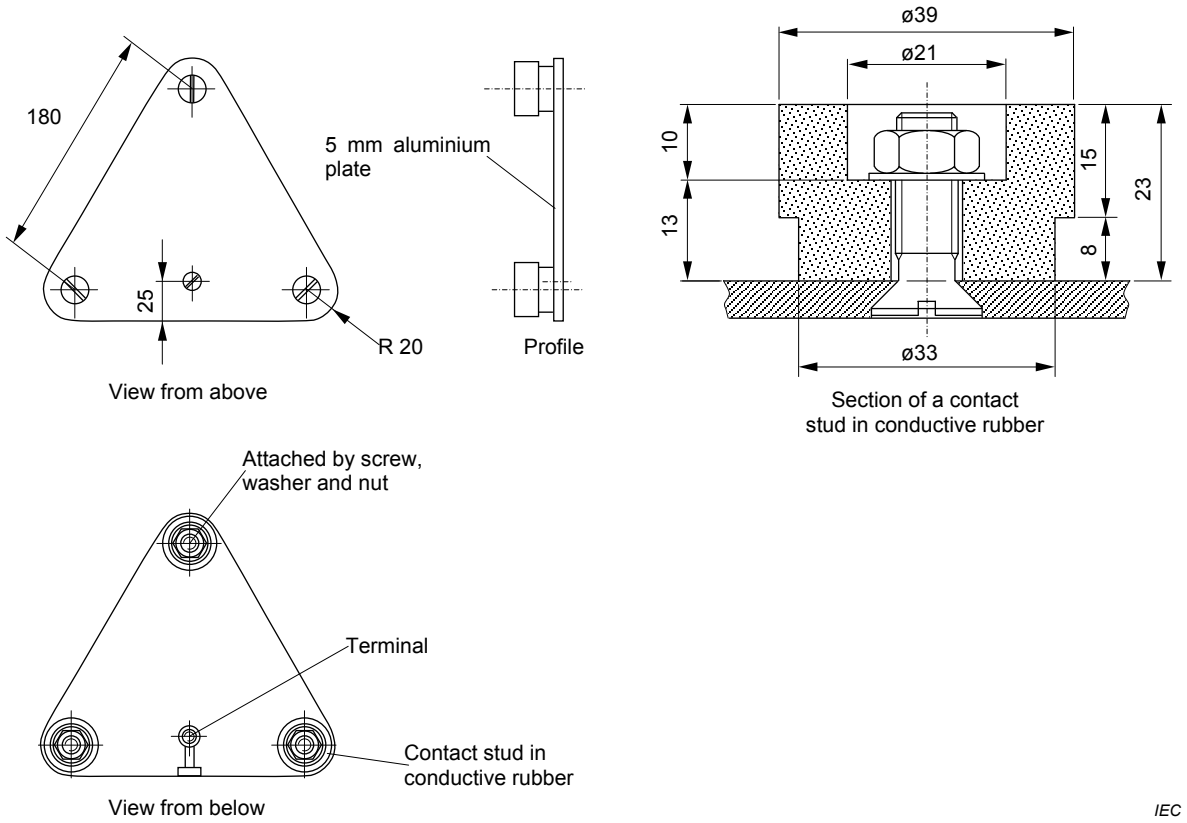
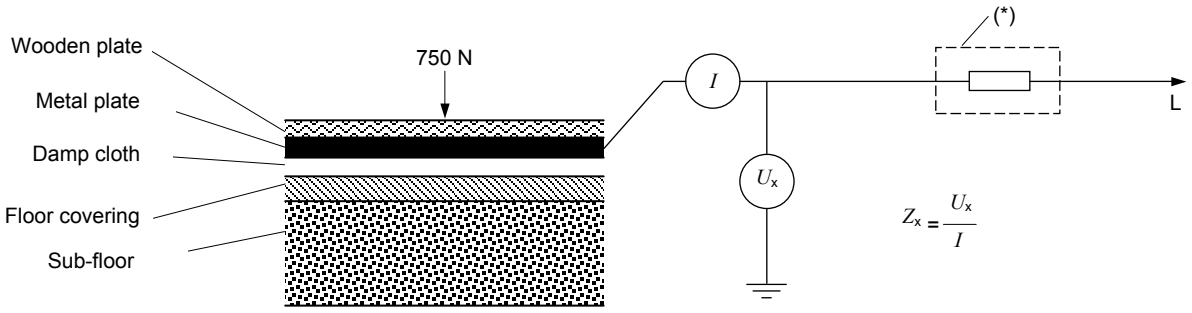


Figure B.1 – Test electrode 1

B.4 Test electrode 2

Test electrode 2 is shown in Figure B.2. The electrode comprises a square metallic plate with sides that measure 250 mm, and a square of dampened, water-absorbent paper, or cloth, from which surplus water has been removed with sides that measure approximately 270 mm. The paper is placed between the metal plate and the surface being tested.

During measurement a force of approximately 750 N for floors or 250 N for walls is applied on the plate.



(*) Protection against unintentional contact by a resistance limiting the current to 3,5 mA.

IEC

Figure B.2 – Test electrode 2

Annex C
(informative)

Measurement of earth electrode resistance – Methods C1, C2 and C3

C.1 Method C1 – Measurement of earth electrode resistance using an earth electrode test instrument

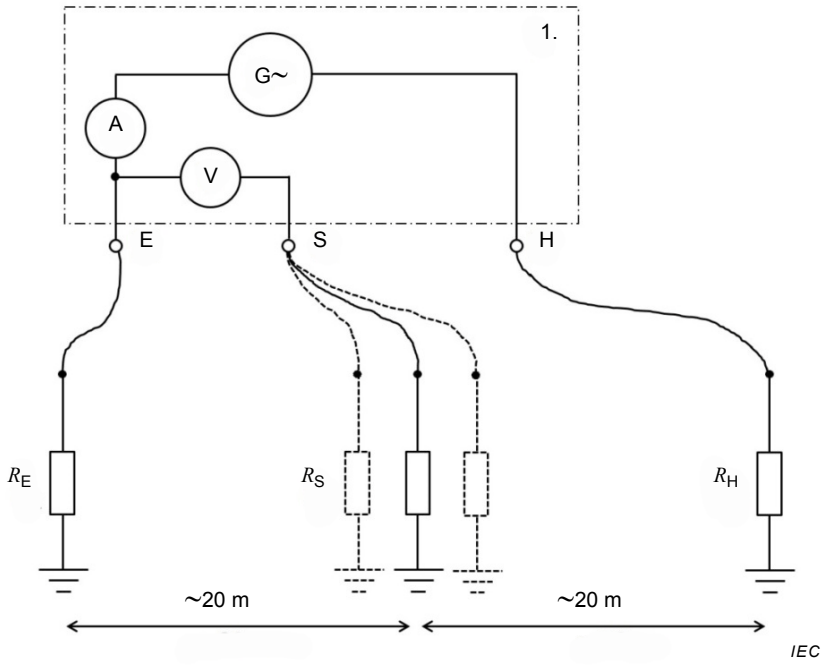
The following procedure may be adopted when measurement of the earth resistance is necessary.

An alternating current of a steady value is passed between the disconnected earth electrode, E, and a temporary auxiliary earth electrode, H, placed at a distance from E such that the resistance areas of the two electrodes do not overlap.

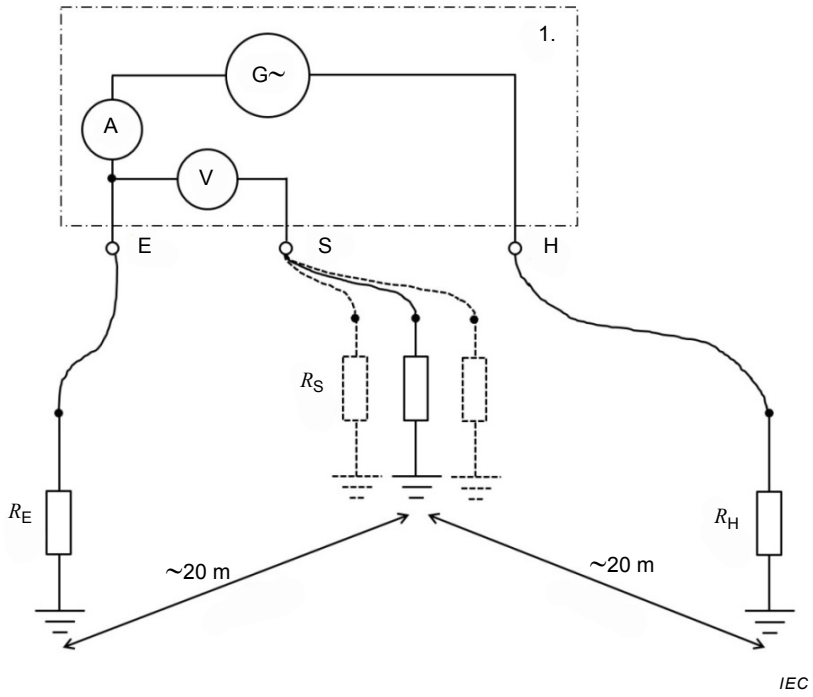
A second temporary probe electrode, S, which may be a metal spike driven into the ground, is then inserted half-way between E and H, and the voltage drop between E and S is measured. In most cases S should be placed at a distance of approximately 20 m from E and H. The electrodes may be arranged in a linear formation (see Figure C.1 a)) or triangular formation (see Figure C.1 b)) to suit available space.

The resistance of the earth electrode is then the voltage between E and S, divided by the current flowing between E and H, provided there is no overlap of the resistance areas.

To check that the resistance of the earth electrode is a true value, two further readings are taken with the second electrode, S, moved approximately 10 % of the linear distance between E and H from the original position. If the three results are substantially in agreement, the mean of the three readings is taken as the resistance of the earth electrode E. If there is no such agreement, the tests are repeated with the distance between E and H increased.



a) Electrodes arranged in linear formation



b) Electrodes arranged in triangular formation

Key

1 Earth electrode test instrument according to IEC 61557-5

R_E Earth electrode resistance

R_S Temporary probe electrode resistance (voltage)

R_H Temporary auxiliary probe earth electrode resistance (current)

Figure C.1 – Measurement of the earth electrode resistance

C.2 Method C2 – Measurement of earth electrode resistance using a fault loop impedance test instrument

Measurement of the earth fault loop impedance at the origin of the electrical installation may be carried out with a test instrument according to IEC 61557-3.

The test should be performed on the live side of the main switch with the supply to the installation switched OFF and with the earthing conductor temporarily disconnected from the main earthing terminal (MET).

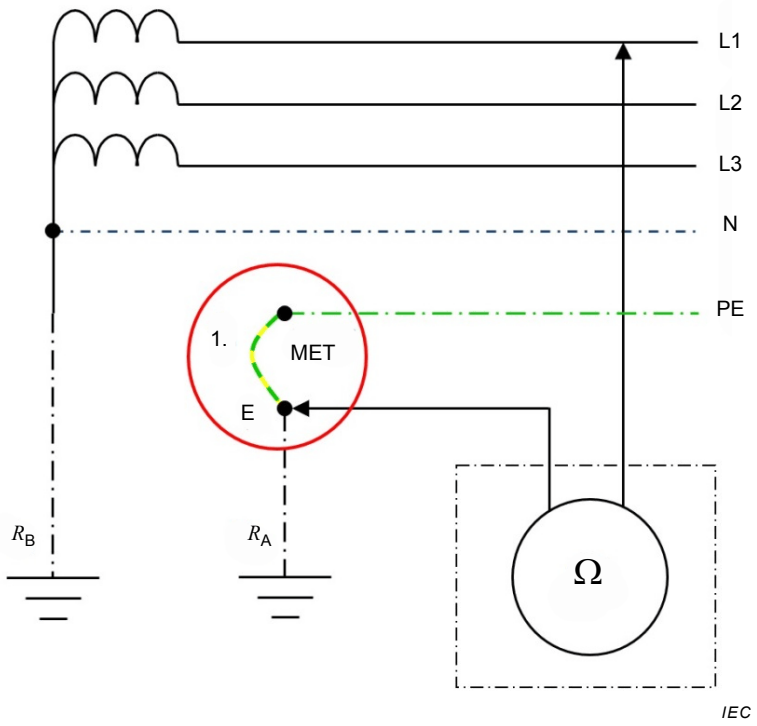
The test instrument should be set to a range appropriate for the value of earth fault loop impedance likely to be expected for a given system earthing arrangement (typically in the region of 0 Ω to 20 Ω).

The test instrument should be connected as shown in Figure C.2. Where any doubt exists the instrument should be connected as described in the manufacturer's instructions.

Only a small proportion of the measured earth fault loop impedance is derived from those parts of the loop other than the electrode and so the result obtained from this test can be taken as a reasonable approximation of the earth electrode resistance.

The test result should not exceed the product of 50 V / $I_{\Delta n}$ (see IEC 60364-4-41:2005, Clause 411).

It is important that the earthing conductor is reconnected to the MET of the installation before the supply is reinstated.



Key

1 Earthing conductor temporarily disconnected from the main earthing terminal (MET).

Figure C.2 – Measurement of the earth electrode resistance using an earth fault loop impedance test instrument

C.3 Method C3 – Measurement of earth electrode resistance using current clamps

The following procedure may be adopted as an alternative method for the measurement of the earth resistance.

With reference to Figure C.3 the first clamp induces a measuring voltage U into the loop, the second clamp measures the current I within the loop. The loop resistance is calculated by dividing the voltage U by the current I.

As the resulting value of parallel resistances $R_1 \ldots R_n$ is normally negligible, the unknown resistance is equal to, or slightly lower than, the measured loop resistance.

The voltage and current coils may be in individual clamps separately connected to an instrument or in a single combined clamp.

This method is directly applicable to TN systems and within meshed earthing of TT systems.

In TT systems, where only the unknown earth connection is available, the loop can be closed by a temporary connection between earth electrode and neutral conductor (quasi TN system) during measurement.

To avoid possible risks due to currents caused by potential differences between neutral and earth, the system should be switched off during connection and disconnection.

It should be noted that the values of resistance obtained using Method C3 will typically be higher than those obtained using Method C1 because of the earth loop measurement.

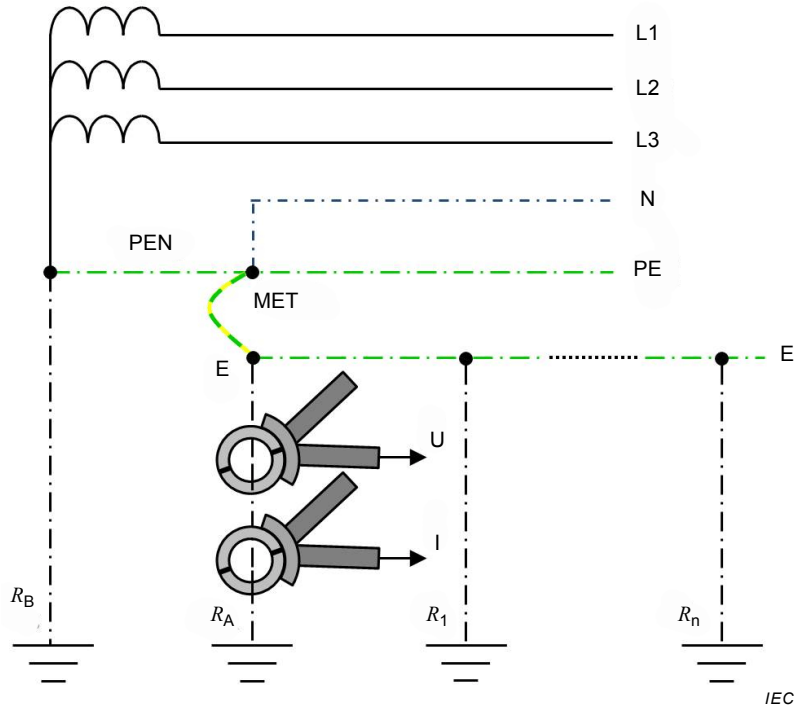


Figure C.3 – Measurement of earth electrode resistance using current clamps

Annex D
(informative)

Guidance on the application of the rules of Clause 6.4 – Initial verification

The numbering of the clauses and subclauses of Annex D follows the numbering of Clause 6.4.

The absence of reference of clauses or subclauses means that no additional explanation is given to them.

D.6.4.2 Inspection

D.6.4.2.2 This inspection is also intended to check that the installation of the equipment has taken account of the manufacturer's instructions in order that its performance is not adversely affected.

D.6.4.2.3

b) presence of fire barriers and other precautions against propagation of fire and protection against thermal effects

- presence of fire barriers (IEC 60364-5-52:2009, 527.2)

  The installation of seals is verified to confirm compliance with the erection instructions associated with the IEC type test for the relevant product (under consideration by ISO).

  No other test is required after this verification.

- protection against thermal effects (IEC 60364-4-42)

  The rules of IEC 60364-4-42 concerning protection against thermal effects apply for normal service, i.e. in the absence of a fault.

  The overcurrent protection is the object of IEC 60364-4-43 and IEC 60364-5-53:2001, Clause 533.

  The operation of a protective device resulting from a fault, including short circuits, or from overloads, is considered as normal service.

- protection against fire (IEC 60364-4-42:2010, Clause 422)

  The requirements of Clause 422 for locations with fire hazards assume that protection against overcurrent is in compliance with the rules of IEC 60364-4-43.

c) and d) selection of conductors for current-carrying capacity and choice, setting, selectivity and coordination of protective and monitoring devices

The selection of conductors including their materials, installation and cross-sectional area, their erection and the setting of protective devices is verified according to the calculations of the designer of the installation in compliance with the rules of the IEC 60364 series, and in particular IEC 60364-4-41, IEC 60364-4-43, IEC 60364-5-52, IEC 60364-5-53 and IEC 60364-5-54.

i) presence of diagrams, warning notices or similar information

A diagram, as specified in IEC 60364-5-51:2005, 514.5 is particularly necessary when the installation comprises several distribution boards.

k) adequacy of termination and connection of cables and conductors

The purpose of this verification is to check whether the clamping means are adequate for the conductors to be connected and whether the connection is properly made.

In case of doubt, it is recommended to measure the resistance of the connections. This resistance should not exceed the resistance of a conductor having a length of 1 m and a cross-sectional area equal to the smallest cross-sectional area of the conductors connected.

m) accessibility of equipment for convenience of operation, identification and maintenance

It shall be verified that the operating devices are so arranged that they are easily accessible to the operator.

For devices for emergency switching, see IEC 60364-5-53:2001, 536.4.2.

For devices for switching for mechanical maintenance, see IEC 60364-5-53:2001, 536.3.2.

D.6.4.3 Testing

D.6.4.3.2 Continuity of conductors

This testing is required for the verification of the protection conditions by means of automatic disconnection of supply (see 6.4.3.7) and is considered as satisfactory if the device used for the test gives an appropriate indication.

D.6.4.3.3 Insulation resistance of the electrical installation

The measurements shall be carried out with the installation isolated from the supply.

Generally, the insulation measurement is carried out at the origin of the installation.

If the value measured is less than that specified in Table 6.1, the installation may be divided into several circuit groups and the insulation resistance of each group should be measured.

When some circuits or parts of circuits are disconnected by undervoltage devices (for instance contactors) interrupting all live conductors, the insulation resistance of these circuits or parts of circuits is measured separately.

D.6.4.3.4.3 Protection by electrical separation

Where equipment includes both a separated circuit and other circuits, the required insulation is obtained by the construction of the equipment in accordance with the safety requirements of the relevant standards.

D.6.4.3.7 Protection by automatic disconnection of supply

D.6.4.3.7.1 General

According to IEC 60364-4-41, where automatic disconnection of supply is provided by an RCD, the disconnecting times for RCDs relate to prospective residual fault currents significantly higher than the rated residual operating current (typically 5 $I_{\Delta n}$). Testing at $I_{\Delta n}$ may be sufficient.

D.6.4.3.7.3 Measurement of the earth fault loop impedance: Consideration of the increase of the resistance of the conductors with the increase of temperature

As the measurements are made at room temperature, with low currents, the procedure described here may be followed to take into account the increase of the resistance of the conductors with the increase of temperature due to faults, to verify, for TN systems, the compliance of the measured value of the earth fault loop impedance with the requirements of IEC 60364-4-41:2005, 411.4.

The requirements are considered to be met when the measured value of the fault loop impedance satisfies the following equation:

$$Z_s(m) \leq \frac{2}{3} \times \frac{U_0}{I_a}$$

where

$Z_s(m)$ is the measured impedance of the fault current loop starting and ending at the point of fault (Ω);

U_0 is the line conductor to earthed neutral voltage (V);

I_a is the current causing the automatic disconnection of the protective device within the time stated in IEC 60364-4-41:2005, 411.3.2.2 or 411.3.2.3 or 411.3.2.4.

Where the measured value of the fault loop impedance exceeds $2U_0 / 3I_a$, a more precise assessment of compliance with IEC 60364-4-41:2005, Clause 411.4 may be made, evaluating the value of fault loop impedance according to the following procedure:

a) the supply line conductor-earthed neutral loop impedance, Z_e. is first measured at the origin of the installation;

b) the resistance of the line conductor and protective conductor of the distribution circuit(s) are then measured;

c) the resistance of the line conductor and protective conductor of the final circuit are then measured;

d) the values of the resistance measured in accordance with b) and c) are increased on the basis of the increase of the temperature, taking into consideration, in the case of fault currents, the energy let-through of the protective device;

e) the values of the resistance increased in accordance with d) are finally added to the value of the supply line conductor-earthed neutral impedance, Z_e, so obtaining a realistic value of Z_s under fault conditions.

Annex E
(informative)

Model forms for reporting

NOTE 1 Annex E contains recommendations for reporting on the verification of electrical installations (see Tables E.1 and E.2). National committees may adapt the content to suit national conditions and practices.

NOTE 2 These forms are particularly suitable for domestic installations.

Table E.1 – Electrical installation verification report (new or altered installation)

ELECTRICAL INSTALLATION VERIFICATION REPORT (New or altered installation) (IEC 60364 Low voltage electrical installations)	
DETAILS OF THE CLIENT	
INSTALLATION ADDRESS	
DESCRIPTION AND EXTENT OF THE INSTALLATION Tick boxes as appropriate Description of installation: Extent of installation covered by this report: (Use continuation sheet if necessary) see continuation sheet No:	New installation ☐ Addition to an existing installation ☐ Alteration to an existing installation ☐
FOR DESIGN I/We being the person(s) responsible for the design of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the design hereby DECLARE that the design work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with IEC 60364 except for the departures, if any, detailed as follows:	
Details of departures from IEC 60364:(clauses to be inserted)	
The extent of liability of the signatory or the signatories is limited to the work described above as the subject of this report. For the DESIGN of the installation: **(Where there is mutual responsibility for the design) Signature:..... Date: ..... Name (IN BLOCK LETTERS):. ..... Designer No 1 Signature:..... Date: ..... Name (IN BLOCK LETTERS): ..... Designer No 2**	
FOR CONSTRUCTION I/We being the person(s) responsible for the construction of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the construction hereby DECLARE that the construction work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with IEC 60364 except for the departures, if any, detailed as follows:	
Details of departures from IEC 60364 (clauses to be inserted):	
The extent of liability of the signatory is limited to the work described above as the subject of this report. For CONSTRUCTION of the installation: Signature:..... .Date: .. .. Name (IN BLOCK LETTERS):..... Constructor	
FOR INSPECTION & TESTING I/We being the person(s) responsible for the inspection & testing of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the inspection & testing hereby DECLARE that the work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with IEC 60364 except for the departures, if any, detailed as follows:	
Details of departures from IEC 60364 (clauses to be inserted):	
The extent of liability of the signatory is limited to the work described above as the subject of this report. For INSPECTION AND TESTING of the installation: Signature: ..... Date: .... Name (IN BLOCK LETTERS):..... Inspector.	
NEXT INSPECTION I/We the designer(s), recommend that this installation is further inspected and tested after an interval of not more than.....years/months.	

PARTICULARS OF SIGNATORIES TO THE ELECTRICAL INSTALLATION VERIFICATION REPORT		
Designer (No 1)		
Name:	Company:	
Address:	Postcode:	Tel No: .....
Designer (No 2) (if applicable)		
Name:	Company:	
Address:	Postcode:	Tel No: .....
Constructor		
Name:	Company:	
Address:	Postcode:	Tel No: .....
Inspector		
Name:	Company:	
Address:	Postcode:	Tel No:.....

SUPPLY CHARACTERISTICS AND EARTHING ARRANGEMENTS – Tick boxes and enter details, as appropriate

Earthing arrangements	**Number and type of live conductors**	**Nature of supply parameters**	**Supply protective device characteristics**
TN-C	a.c. ☐ d.c. ☐		
TN-S	1-phase, 2-wire ☐ 2 pole ☐	Nominal voltage, U/U_0 (1) V	Type:
		Nominal frequency, f (1)..... Hz	
TN-C-S	2-phase, 3-wire ☐ 3 pole ☐	Prospective fault current, I_{pf} (2) .....kA	Rated current: A
TT	3-phase, 3-wire ☐ other ☐	External loop impedance, Z_e (2).....Ω	
IT	3-phase, 4-wire ☐	*(Note: (1) by enquiry, (2) by enquiry calculation or measurement)*	
Alternative source of supply (to be detailed on attached schedules) ☐			

PARTICULARS OF INSTALLATION REFERRED TO IN THE REPORT – Tick boxes and enter details, as appropriate

Means of Earthing Supplier's facility ☐	**Maximum demand** Maximum demand (load) ..... kVA / A Delete as appropriate
Installation earth electrode ☐	**Details of installation earth electrode** (*where applicable*) Type (e.g. rod(s), tape etc) ..... Electrode resistance to earth ..... Ω Location .....

Main protective conductors			
Earthing conductor:	material	csa ..... mm^2	Continuity and connection verified ☐
Main protective bonding conductors:	material:	csa ..... mm^2	Continuity and connection ☐
Main switch or circuit-breaker			
Type and No. of poles	Current rating ..... . A		Voltage rating V
Location			Fuse rating or setting ..... A
Rated residual operating current $I_{\Delta n}$ = ... mA, and operating time of ..... ms (at $I_{\Delta n}$)			
(applicable only where an RCD is suitable and is used as a main circuit-breaker)			
RECOMMENDATIONS RELATING TO EXISTING INSTALLATION – (in the case of an addition or alteration see 61.4.2):			
SCHEDULES			
The attached schedules are part of this document and this report is valid only when they are attached to it.			
..... Schedules of inspections and ..... Schedules of test results are attached.			
(Enter quantities of schedules attached).			

Table E.2 – Electrical installation condition report (existing installations)

ELECTRICAL INSTALLATION CONDITION REPORT (existing installations)

Section A. Details of the client / person ordering the report

Name:.....

Address .....
.....

Section B. Reason for producing this report.

Date(s) on which inspection and testing was carried out .....

Section C. Details of the installation which is the subject of this report

Occupier:.. .....

Address: .....

Description of premises (tick as appropriate)

Domestic ☐ Commercial ☐ Industrial ☐ Other (include brief description)..☐.....

Estimated age of wiring system ..... years

Evidence of additions / alterations Yes ☐ No ☐ Not apparent ☐ If yes, estimate age ..... years

Installation records available? Yes ☐ No ☐ Date of last inspection ..... (date)

Section D. Extent and limitations of inspection and testing

Extent of the electrical installation covered by this report (see 62.1.4)

Agreed limitations including the reasons (see 62.1.5).. .....

Agreed with: .....

Operational limitations including the reasons (see page no .....) .....

.....

The inspection and testing detailed in this report and accompanying schedules have been carried out in accordance with IEC 60364.

It should be noted that cables concealed within trunking and conduits, under floors and generally within the fabric of the building or underground, have **not** been inspected unless specifically agreed between the client and inspector prior to the inspection.

Section E. Summary of the condition of the installation

General condition of the installation (in terms of electrical safety).....

Overall assessment of the installation in terms of its suitability for continued use

SATISFACTORY / UNSATISFACTORY* (Delete as appropriate)

*An unsatisfactory assessment indicates that dangerous and/or potentially dangerous conditions have been identified.

Section F. Recommendations

Where the overall assessment of the suitability of the installation for continued use above is stated as UNSATISFACTORY, I / we recommend that any observations classified as *'Danger present'* (Code C1) or *'Potentially dangerous'* (Code C2) are acted upon as a matter of urgency.

Investigation without delay is recommended for observations identified as *'Requiring further investigation'*.

Observations classified as *'Improvement recommended'* (Code C3) should be given due consideration.

Subject to the necessary remedial action being taken, I / we recommend that the installation is further inspected and tested by ..... (date)

Section G. Declaration

I/We, being the person(s) responsible for the inspection and testing of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the inspection and testing, hereby declare that the information in this report, including the observations and the attached schedules, provides an accurate assessment of the condition of the electrical installation taking into account the stated extent and limitations in section D of this report.

INSPECTED AND TESTED BY:	REPORT AUTHORISED FOR ISSUE BY:
Name (Capitals)	Name (Capitals) .....
Signature	Signature .....
For/on behalf of	For/on behalf of.....
Position	Position .....
Address	Address .....
Date	Date .....

Section H. Schedule(s)

..... schedule(s) of inspection and ..... schedule(s) of test results are attached.

The attached schedule(s) are part of this document and this report is valid only when they are attached to it

Section I. Supply characteristics and earthing arrangements

Earthing arrangements	**Number and type of live conductors**	**Nature of supply parameters**	**Supply protective device**
TN-C	a.c. ☐ d.c. ☐	Nominal voltage, U/U_0 (1) V	Type: .....
TN-S	1-phase, 2-wire ☐ 2- pole ☐	Nominal frequency, f (1) .....Hz	Rated current .....A
TN-C-S	2-phase, 3-wire ☐ 3- pole ☐	Prospective fault current, I_{pf} (2) .....kA	
TT	3-phase, 3-wire ☐ other ☐	External loop impedance, Z_e (2)..... Ω	
IT	3-phase, 4-wire ☐ ☐	(*Note: (1) by enquiry, (2) by enquiry, calculation or measurement)*	
	Confirmation of supply polarity ☐		

Alternative source of supply (as detailed on attached schedule)

Section J. Particulars of installation referred to in report

Means of earthing	**Details of installation earth electrode** (where applicable)
Supplier's facility ☐	Type .....
Installation earth electrode ☐	Location .....
	Resistance to earth .. .. Ω

Section K. Main protective conductors

Earthing conductor	Material	Csa .....mm^2	Connection / continuity verified ☐
Main protective bonding conductors	Material	Csa .....mm^2	Connection / continuity verified ☐
To incoming water service	To incoming gas service	To incoming oil service	To structural steel
To lightning protection	To other incoming service(s) Specify		

Section L. Main switch / switch-fuse / circuit-breaker / RCD

Location	Current rating ..... A	**If RCD main switch**
Type)	Voltage rating V	Rated residual operating current ($I_{\Delta n}$) ..... mA
No of poles		Rated time delay ..... ms
		Measured operating time(at ($I_{\Delta n}$).....ms

Section M. Observations

Referring to the attached schedules of inspection and test results, and subject to the limitations specified at the *Extent and limitations of the inspection and testing* section

No remedial action is required ☐ The following observations are made ☐

Observation(s)	Classification code	Further Investigation required (yes / no)
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

One of the following codes, as appropriate, has been allocated to each of the observations made above to indicate to the person(s) responsible for the installation the degree of urgency for remedial action.

C1 – Danger present. Risk of injury. Immediate remedial action required
C2 – Potentially dangerous – urgent remedial action required
C3 – Improvement recommended

Notes for the person producing the report:

1) This report should only be used for the reporting on the condition of an existing electrical installation.

2) The report, normally comprising at least six pages, should include schedules of both the inspection and the test results. Additional pages may be necessary for other than a simple installation. The number of each page should be indicated, together with the total number of pages involved.

3) The reason for producing this report, such as change of occupancy or landlord's periodic maintenance, should be identified in Section B.

4) The maximum prospective fault current (I_{pf}) recorded should be the greater of either the short-circuit current or the earth fault current.

5) Those elements of the installation that are covered by the report and those that are not should be identified in Section D (Extent and limitations). These aspects should have been agreed with the person ordering the report and other interested parties before the inspection and testing is carried out. Any operational limitations, such as inability to gain access to parts of the installation or an item of equipment, should also be recorded in Section D.

6) The summary of condition of the installation in terms of safety should be clearly indicated in Section E.

   Observation(s), if any, should be categorised in Section M using the coding C1 to C3 as appropriate. Any observation given a C1 or C2 classification should result in the overall condition of the installation being reported as unsatisfactory.

7) Where an installation has an alternative source of supply a further schedule of supply characteristics and earthing details based upon Section I of this report should be provided.

8) Where an observation requires further investigation because the inspection has revealed an apparent deficiency which could not, owing to the extent or limitations of this inspection, be fully identified, this should be indicated in the column headed "Further investigation required" within Section M.

9) The date by which the next electrical installation condition report is required should be given in Section F. The interval between inspections should take into account the type and usage of the installation and its overall condition.

10) If the space available for observations in Section M is insufficient, additional pages should be provided as necessary.

11) Wherever practicable, items classified as 'Danger present' (C1) should be made safe on discovery. Where this is not practical the owner or user should be given written notification as a matter of urgency.

GUIDANCE FOR RECIPIENTS (to be appended to the report)

This report is an important and valuable document which should be retained for future reference.

This report form is for reporting on the condition of an existing electrical installation.

1) The purpose of this condition report is to confirm, so far as reasonably practicable, whether or not the electrical installation is in a satisfactory condition for continued service (see Section E). The report should identify any damage, deterioration, defects and/or conditions which may give rise to danger (see Section M).
2) The person ordering the report should have received the original report and the inspector should have retained a duplicate.
3) The original report should be retained in a safe place and be made available to any person inspecting or undertaking work on the electrical installation in the future. If the property is vacated, this report will provide the new owner /occupier with details of the condition of the electrical installation at the time the report was issued.
4) Section D (Extent and limitations) should identify fully the extent of the installation covered by this report and any limitations on the inspection and testing. The inspector should have agreed these aspects with the person ordering the report and with other interested parties (licensing authority, insurance company, mortgage provider and the like) before the inspection was carried out.
5) Some operational limitations such as inability to gain access to parts of the installation or an item of equipment may have been encountered during the inspection. The inspector should have noted these in Section D.
6) For items classified in Section M as C1 (“Danger present”), **the safety of those using the installation is at risk,** and it is recommended that a competent person undertakes the necessary remedial work immediately.
7) For items classified in Section M as C2 (“Potentially dangerous”), **the safety of those using the installation may be at risk** and it is recommended that a competent person undertakes the necessary remedial work as a matter of urgency.
8) Where it has been stated in Section M that an observation requires further investigation the inspection has revealed an apparent deficiency which could result in a code C1 or C2 item that could not, due to the extent or limitations of the inspection, be fully identified. In such cases a further examination of the installation will be necessary, without delay, to determine the nature and extent of the apparent deficiency. (see Section F).
9) For safety reasons, the electrical installation will need to be re-inspected at appropriate intervals by a competent person. The recommended date by which the next inspection is due is stated in Section F of the report under ‘Recommendations’.

Annex F
(informative)

Model forms for inspection of electrical installations

NOTE Annex F contains recommendations for reporting on the verification of electrical installations. National committees may adapt the content to suit national conditions and practices.

F.1 Model schedule for items requiring inspection for initial verification of an electrical installation.

All items inspected in order to confirm compliance with the relevant clauses in the IEC 60364 series. The list of items is not exhaustive.

ELECTRICAL INTAKE EQUIPMENT

☐ Service cable
☐ Service cut-out / fuse
☐ Meter tails – Distributor
☐ Meter tails – Consumer
☐ Metering equipment
☐ Isolator

PARALLEL OR SWITCHED ALTERNATIVE SOURCES OF SUPPLY

☐ Dedicated earthing arrangement independent to that of the public supply
☐ Presence of adequate arrangements where generator to operate in parallel with the public supply system
☐ Correct connection of generator in parallel
☐ Compatibility of characteristics of means of generation
☐ Means to provide automatic disconnection of generator in the event of loss of public supply system or voltage or frequency deviation beyond declared values
☐ Means to prevent connection of generator in the event of loss of public supply system or voltage or frequency deviation beyond declared values
☐ Means to isolate generator from the public supply system

AUTOMATIC DISCONNECTION OF SUPPLY

☐ Main earthing / bonding arrangements

Presence and adequacy of

☐ Distributor’s earthing arrangement or installation earth electrode arrangement
☐ Earthing conductor and connections
☐ Main protective bonding conductors and connections
☐ Earthing / bonding labels at all appropriate locations

Accessibility of

☐ Earthing conductor connections
☐ All protective bonding connections
☐ FELV – requirements satisfied

OTHER METHODS OF PROTECTION

(Where any of the methods listed below are employed details should be provided on separate pages)

BASIC AND FAULT PROTECTION where used, confirmation that the requirements are satisfied:

☐ SELV
☐ PELV
☐ Double insulation
☐ Reinforced insulation

BASIC PROTECTION:

☐ Insulation of live parts
☐ Barriers or enclosures
☐ Obstacles
☐ Placing out of reach

FAULT PROTECTION:

☐ Non-conducting location – earth-free local equipotential bonding
☐ Electrical separation

ADDITIONAL PROTECTION:

☐ RCDs not exceeding 30 mA as specified
☐ Supplementary bonding

SPECIFIC INSPECTION EXAMPLES as appropriate to the installation

DISTRIBUTION EQUIPMENT

☐ Adequacy of working space / accessibility to equipment
☐ Security of fixing
☐ Insulation of live parts not damaged during erection
☐ Adequacy / security of barriers
☐ Suitability of enclosures for IP and fire ratings
☐ Enclosures not damaged during installation
☐ Presence and effectiveness of obstacles
☐ Placing out of reach
☐ Presence of main switch(es), linked where required
☐ Operation of main switch(es) (functional check)
☐ Manual operation of circuit-breakers and RCDs to prove functionality
☐ Confirmation that integral test button / switch causes RCD(s) to trip when operated (functional check)
☐ RCD(s) provided for fault protection, where specified
☐ RCD(s) provided for additional protection, where specified
☐ Confirmation over-voltage protection (SPDs) provided where specified
☐ Confirmation of indication that SPD is functional

☐ Presence of RCD quarterly test notice at or near the origin

☐ Presence of diagrams, charts or schedules at or near each distribution board, where required

☐ Presence of non-standard (mixed) cable colour warning notice at or near the appropriate distribution board, where required

Presence of alternative supply warning notice at or near

☐ The origin

☐ The meter position, if remote form origin

☐ The distribution board to which the alternative/additional sources are connected

☐ All points of isolation of ALL sources of supply

☐ Presence of next inspection recommendation label

☐ Presence of other required labelling

☐ Selection of protective device(s) and base(s); correct type and rating

☐ Single-pole protective devices in line conductor only

☐ Protection against mechanical damage where cables enter equipment

☐ Protection against electromagnetic effects where cables enter ferromagnetic enclosures

☐ Confirmation that all conductor connections, including connections to busbars are correctly located in terminals and are tight and secure

CIRCUITS

☐ Identification of conductors

☐ Cables correctly supported throughout

☐ Examination of cables for signs of mechanical damage during installation

☐ Examination of insulation of live parts, not damaged during erection

☐ Non-sheathed cables protected by enclosure in conduit, ducting or trunking

☐ Suitability of containment systems (including flexible conduit)

☐ Correct temperature rating of cable insulation

☐ Cables correctly terminated in enclosures

☐ Adequacy of cables for current-carrying capacity with regard for the type and nature of installation

☐ Adequacy of protective devices: type and fault current rating for fault protection

☐ Presence and adequacy of circuit protective conductors

☐ Coordination between conductors and overload protective devices

☐ Wiring systems and cable installation methods / practices with regard to the type and nature of installation and external influences

☐ Cables concealed under floors, above ceilings, in walls adequately protected against damage by contact with fixings

Provision of additional protection by RCD s having residual rated operating current ($I_{\Delta n}$) not exceeding 30mA

☐ For circuits used to supply mobile equipment not exceeding 32 A rating for use outdoors in all cases

☐ For all socket-outlets of rating 20 A or less provided for use by ordinary persons unless exempt

☐ For cables concealed in walls at a depth of less than 50 mm

☐ Provision of fire barriers, sealing arrangements so as to minimize the spread of fire

☐ Band II cables segregated / separated from Band I cables

☐ Cables segregated / separated from non-electrical services

Termination of cables at enclosures

☐ Connections under no undue strain

☐ No basic insulation of a conductor visible outside enclosure

☐ Connections of live conductors adequately enclosed

☐ Adequately connected at point of entry to enclosure (glands, bushes etc.)

☐ Suitability of circuit accessories for external influences

☐ Circuit accessories not damaged during erection

☐ Single-pole devices for switching in line conductor only

☐ Adequacy of connections, including CPCs, within accessories and fixed and stationary equipment

☐ Presence, operation and correct location of appropriate devices for isolation and switching

ISOLATION AND SWITCHING

Isolators

☐ Presence and location of appropriate devices

☐ Capable of being secured in the OFF position

☐ Correct operation verified (functional check)

☐ The installation, circuit or part thereof that will be isolated is clearly identified by location and / or durable marking

☐ Warning label posted in situations where live parts cannot be isolated by the operation of a single device

Switching off for mechanical maintenance

☐ Presence of appropriate devices

☐ Acceptable location – state if local or remote from equipment in question

☐ Capable of being secured in the OFF position

☐ Correct operation verified (functional check)

☐ The circuit or part thereof that will be disconnected clearly identified by location and / or durable marking

Emergency switching / stopping

☐ Presence and location of appropriate devices

☐ Readily accessible for operation where danger might occur

☐ Correct operation verified (functional check)

☐ The installation, circuit or part thereof that will be disconnected clearly identified by location and / or durable marking

Functional switching

☐ Presence and location of appropriate devices

☐ Correct operation verified (functional check)

CURRENT–USING EQUIPMENT (PERMANENTLY CONNECTED)

☐ Suitability of equipment in terms of IP and fire ratings

☐ Enclosure not damaged / deteriorated during installation so as to impair safety

☐ Suitability for the environment and external influences

☐ Security of fixing

☐ Cable entry holes in ceilings above luminaires, sized or sealed so as to restrict the spread of fire

☐ Provision of under-voltage protection, where specified

☐ Provision of overload protection, where specified

Recessed luminaires (downlighters)

☐ Correct type of lamps fitted

☐ Installed to minimise build-up of heat by use of “fire rated” fittings, insulation displacement box or similar

PART 7 SPECIAL INSTALLATIONS OR LOCATIONS

If any special installations or locations are present, list the particular inspections applied.

F.2 Model inspection schedule of items requiring inspection for an existing electrical installation

A visual inspection should firstly be made of the external condition of all electrical equipment which is not concealed.

Further detailed inspection, including partial dismantling of equipment as required, should be carried out as agreed with the person ordering the work.

The list of items is not exhaustive.

ELECTRICAL INTAKE EQUIPMENT

☐ Service cable

☐ Service cut-out / fuse

☐ Meter tails – Distributor

☐ Meter tails – Consumer

☐ Metering equipment

☐ Isolator

Where inadequacies in distributor’s equipment are encountered, it is recommended that the person ordering the report informs the appropriate authority.

PRESENCE OF ADEQUATE ARRANGEMENTS FOR PARALLEL OR SWITCHED ALTERNATIVE SOURCES

AUTOMATIC DISCONNECTION OF SUPPLY

☐ Main earthing / bonding arrangements

☐ Presence of distributor’s earthing arrangement or presence of installation earth electrode arrangement

☐ Presence and adequacy of earthing conductor

☐ Main protective earthing conductor connections
☐ Accessibility of earthing conductor connections
☐ Presence and adequacy of main protective bonding conductors
☐ Main protective bonding conductor connections
☐ Accessibility of all protective bonding connections
☐ Provision of earthing / bonding labels at all appropriate locations
☐ FELV

OTHER METHODS OF PROTECTION

(Where any of the methods listed below are employed, details should be provided on separate sheets)

BASIC AND FAULT PROTECTION:

☐ SELV
☐ PELV
☐ Double insulation
☐ Reinforced insulation

BASIC PROTECTION:

☐ Insulation of live parts
☐ Barriers or enclosures
☐ Obstacles
☐ Placing out of reach

FAULT PROTECTION:

☐ Non-conducting location – earth-free local equipotential bonding
☐ Electrical separation

ADDITIONAL PROTECTION:

☐ RCDs 30 mA or less as specified
☐ Supplementary bonding

SPECIFIC INSPECTION EXAMPLES

DISTRIBUTION EQUIPMENT

☐ Adequacy of working space / accessibility to equipment
☐ Security of fixing
☐ Condition of insulation of live parts
☐ Adequacy / security of barriers
☐ Condition of enclosure(s) in terms of IP and fire ratings
☐ Enclosure not damaged / deteriorated so as to impair safety
☐ Presence and effectiveness of obstacles
☐ Placing out of reach
☐ Presence of main switch(es), linked where required
☐ Operation of main switch(es) (functional check)
☐ Manual operation of circuit-breakers and RCDs to prove disconnection

☐ Confirmation that integral test button / switch causes RCD(s) to trip when operated (functional check)

☐ RCD(s) provided for fault protection

☐ RCD(s) provided for additional protection, where required

☐ Confirmation of indication that over-voltage protection (SPDs) is functional, where installed

☐ Presence of RCD quarterly test notice at or near equipment, where required

☐ Presence of diagrams, charts or schedules at or near equipment, where required

☐ Presence of non-standard (mixed) cable colour warning notice at or near equipment, where required

☐ Presence of alternative supply warning notice at or near equipment, where required

☐ Presence of next inspection recommendation label

☐ Presence of other required labelling (please specify)

☐ Examination of protective device(s) and base(s); correct type and rating (no signs of unacceptable thermal damage, arcing or overheating)

☐ Single-pole protective devices in line conductor only

☐ Protection against mechanical damage where cables enter equipment

☐ Protection against electromagnetic effects where cables enter ferromagnetic enclosures

☐ Confirmation that all conductor connections, including connections to busbars are correctly located in terminals and are tight and secure

CIRCUITS

☐ Identification of conductors

☐ Cables correctly supported throughout

☐ Condition of cables

☐ Condition of insulation of live parts

☐ Non-sheathed cables protected by enclosure in conduit, ducting or trunking

☐ Suitability of containment systems for continued use (including flexible conduit)

☐ Cables correctly terminated in enclosures

☐ Examination of cables for signs of unacceptable thermal or mechanical damage / deterioration

☐ Adequacy of cables for current-carrying capacity with regard for the type and nature of installation

☐ Adequacy of protective devices: type and rated current for fault protection

☐ Presence and adequacy of circuit protective conductors

☐ Coordination between conductors and overload protective devices

☐ Wiring systems and cable installation methods / practices with regard to the type and nature of installation and external influences

☐ Where exposed to direct sunlight, cable of a suitable type

☐ Cables concealed under floors, above ceilings, in walls adequately protected against damage by contact with fixings

Provision of additional protection by RCDs having residual rated operating current ($I_{\Delta n}$) not exceeding 30 mA

☐ For circuits used to supply mobile equipment not exceeding 32 A rating for use outdoors in all cases

☐ For all socket-outlets of rating 20 A or less provided for use by ordinary persons unless exempt

☐ For cables concealed in walls at a depth of less than 50 mm
☐ Provision of fire barriers, sealing arrangements and protection against thermal effects
☐ Band II cables segregated / separated from Band I cables
☐ Cables segregated / separated from non-electrical services
☐ Condition of circuit accessories

Termination of cables at enclosures – identify / record numbers and locations of items inspected

☐ Connections under no undue strain
☐ No basic insulation of a conductor visible outside enclosure
☐ Connections of live conductors adequately enclosed
☐ Adequately connected at point of entry to enclosure (glands, bushes etc.)
☐ Suitability of circuit accessories for external influences
☐ Condition of accessories including socket-outlets, switches and joint boxes
☐ Single-pole devices for switching in line conductor only
☐ Adequacy of connections, including CPCs, within accessories and fixed and stationary equipment
☐ Presence, operation and correct location of appropriate devices for isolation and switching
☐ General condition of wiring systems
☐ Temperature rating of cable insulation

ISOLATION AND SWITCHING

Isolators

☐ Presence and condition of appropriate devices
☐ Acceptable location – state if local or remote from equipment in question
☐ Capable of being secured in the OFF position
☐ Correct operation verified
☐ Clearly identified by position and /or durable marking
☐ Warning label posted in situations where live parts cannot be isolated by the operation of a single device

Switching off for mechanical maintenance

☐ Presence and condition of appropriate devices
☐ Acceptable location – state if local or remote from equipment in question
☐ Capable of being secured in the OFF position
☐ Correct operation verified
☐ Clearly identified by position and /or durable marking

Emergency switching / stopping

☐ Presence and condition of appropriate devices
☐ Readily accessible for operation where danger might occur
☐ Correct operation verified
☐ Clearly identified by position and /or durable marking

Functional switching

☐ Presence and condition of appropriate devices

☐ Correct operation verified

CURRENT–USING EQUIPMENT (PERMANENTLY CONNECTED)

☐ Condition of equipment in terms of IP and fire ratings

☐ Enclosure not damaged / deteriorated so as to impair safety

☐ Suitability for the environment and external influences

☐ Security of fixing

☐ Cable entry holes in ceiling above luminaires, sized or sealed so as to restrict the spread of fire

☐ Condition and provision of under-voltage protection, where required

☐ Condition and provision of over-load protection, where required

Recessed luminaires (downlighters)

☐ Correct type of lamps fitted

☐ Installed to minimise build-up of heat by use of “fire rated” fittings, insulation displacement box or similar

☐ No signs of overheating to surrounding building fabric

☐ No signs of overheating to conductors / terminations

PART 7 SPECIAL INSTALLATIONS OR LOCATIONS

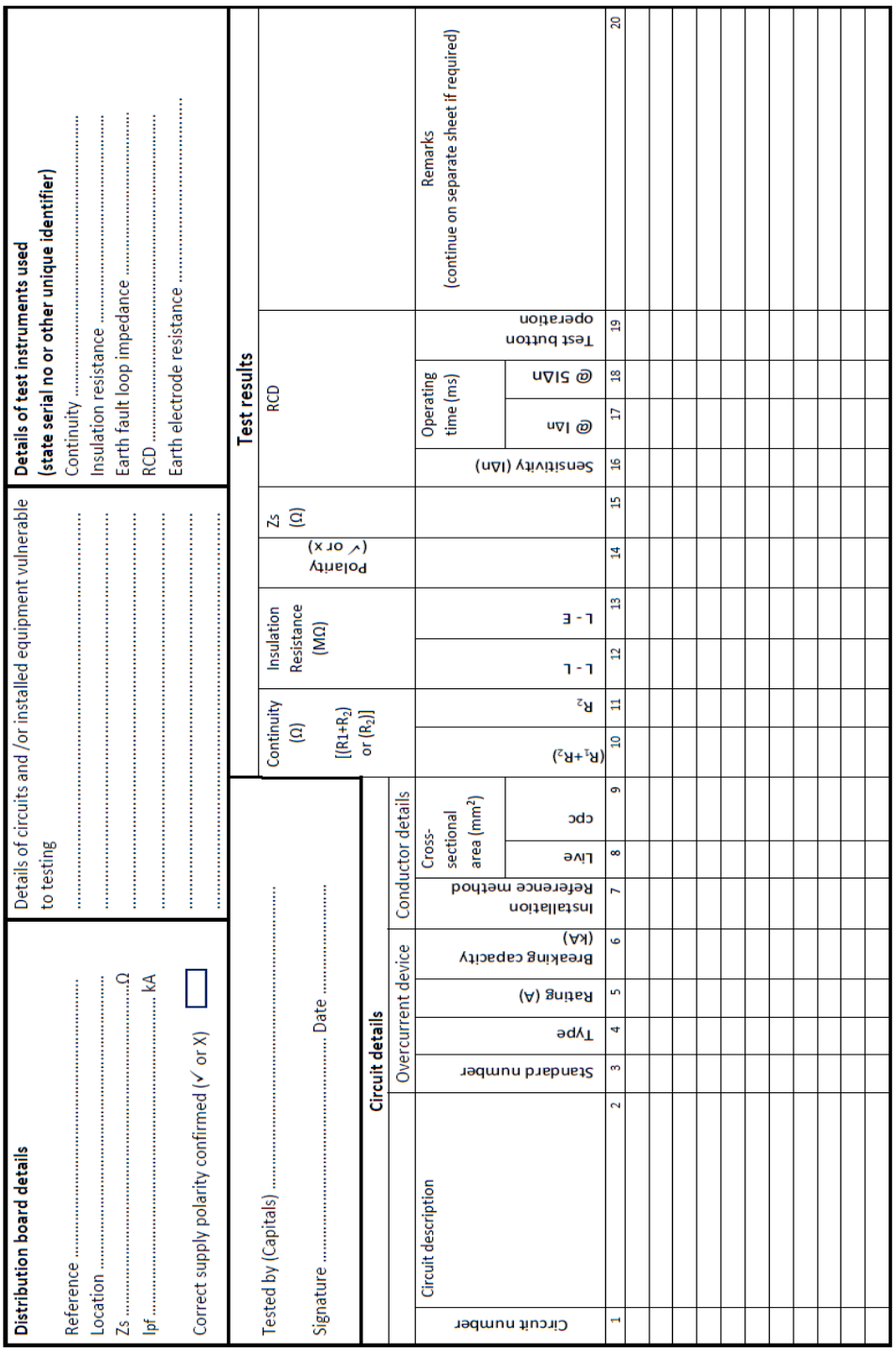
If any special installations or locations are present, list the particular inspections applied.

Annex G
(informative)

Model schedule of circuit details and test results

NOTE Annex G contains recommendations for reporting on the verification of electrical installations. National committees may adapt the content to suit national conditions and practices.

Table G.1 – Model schedule of circuit details and test results



Distribution board details

Reference .....

Location .....

Zs ..... Ω

Ipf ..... kA

Correct supply polarity confirmed (✓ or X) ☐

Details of circuits and /or installed equipment vulnerable to testing

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Details of test instruments used
(state serial no or other unique identifier)

Continuity .....

Insulation resistance .....

Earth fault loop impedance .....

RCD .....

Earth electrode resistance .....

Tested by (Capitals) .....

Signature ..... Date .....

Circuit number	Circuit description	Circuit details: Overcurrent device: Standard number	Overcurrent device: Type	Overcurrent device: Rating (A)	Overcurrent device: Breaking capacity (kA)	Conductor details: Installation Reference method	Conductor details: Cross-sectional area (mm²): Live	Conductor details: Cross-sectional area (mm²): cpc	Test results: Continuity (Ω) [(R1+R2) or (R2)]: (R1+R2)	Test results: Continuity (Ω) [(R1+R2) or (R2)]: R2	Test results: Insulation Resistance (MΩ): L - L	Test results: Insulation Resistance (MΩ): L - E	Test results: Polarity (✓ or x)	Test results: Zs (Ω)	Test results: RCD: Sensitivity (IΔn)	Test results: RCD: Operating time (ms): @ IΔn	Test results: RCD: Operating time (ms): @ 5IΔn	Test results: RCD: Test button operation	Remarks (continue on separate sheet if required)
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Annex H
(informative)

List of notes concerning certain countries

Country	Clause/subclause	Text
FR	General	In France initial and periodic verifications are requested and defined by law: "décret n°2010-1016 du 30 août 2010" and "arrêté du 26 décembre 2011"
US	6.4.2.3	In the US, the following installation aspects should be verified: 1) Adequacy of wire bending space for conductors installed at the installation. 2) Mechanical strength of the devices and their support is sufficient for the application. 3) Suitability of devices for the voltage, current and frequency and conductor (size and material) to which they will be connected. 4) Installation of conductors and devices does not create a short-circuit between phase conductors and does not make connection from phase conductors to earth or earthing conductors except where specifically required. 5) Labels should be applied to indicate dangers of arc flash where the equipment is likely to be maintained while energized and identification of the disconnecting device.
IE	6.4.3.1.	In Ireland, the following additional test is made to verify erroneous connections between circuits: for each circuit, its protective device is disconnected and a test voltage in accordance with Table 6.1 applied between the line conductors of that circuit and the line conductors of the other circuits.
SE	6.4.3.2	In Sweden replace the first paragraph of the subclause with: An electrical continuity test shall be made on:
ES	6.4.3.3	In Spain the minimum insulation resistance for circuits up to and including 500 V is 0,5 MΩ.
ES	6.4.3.3	In Spain, the insulation values given in Table 6.1 are designed for an installation in which the total length of the wiring systems, irrespective of the number of conductors it contains, does not exceed 100 m. Where the length of the wiring systems exceeds such a value and the installation may be divided, by isolation, into segments of approximately 100 m, each of the parts in which the installation has been divided shall comply with the relevant minimum insulation resistance. Where it is not possible to divide the installation as indicated above, the insulation resistance value of the entire installation may, with respect to the corresponding minimum, be inversely proportional to the overall length, in hectometres, of the wiring systems.
SE	6.4.3.6.1	In Sweden, the verification of the effectiveness of a protective device may be carried out by means of inspection only.
SE	6.4.3.7	In Sweden, the verification of the effectiveness of measures applied for additional protection is carried out by visual inspection only.
FR	6.4.3.7.1 a) and b)	In France, the following does not apply: The effectiveness of automatic disconnection by RCDs shall be verified using suitable test equipment according to IEC 61557-6 confirming that the relevant requirements in IEC 60364-4-41 are met taking into account the operating characteristic of the device. The effectiveness of the protective measure is verified if disconnection occurs with a fault current lower than or equal to the rated residual operating current $I_{\Delta n}$. It is recommended that the disconnection times required by IEC 60364-4-41 be verified. However, the requirements for disconnecting times shall be verified in case of additions and alterations to an existing installation where existing RCDs are also used as disconnecting devices for such additions and alterations.

Country	Clause/subclause	Text
GB	6.4.3.7.1	In Great Britain, for TN and TT systems verification of the characteristics and/or the effectiveness of a general type AC RCCB according to IEC 61008 or RCBO according to IEC 61009 providing automatic disconnection of supply is achieved by the following procedure: – visual inspection to confirm adequacy in terms of rated current (I) and rated residual operating current ($I_{\Delta n}$) – using an RCD test instrument according to IEC 61557-6, the device should trip within 300 ms when a test current of $I_{\Delta n}$ is applied.
NO	6.4.3.7.1.a) and b)	In Norway, where an RCD is used for protection against electric shock by automatic disconnection of supply, the function of the “TEST”-button of the device shall be verified. If verification of the effectiveness of automatic disconnection of supply is required by the owner of the installations, such effectiveness shall be verified by using suitable test equipment according to IEC 61557-6. The effectiveness of the protective measure is then verified if disconnection occurs with a fault current lower or equal to the rated residual operating current $I_{\Delta n}$. It is recommended that the disconnection times required by IEC 60364-4-41 be verified.
NO	6.4.3.8	In Norway, where an RCD is required for additional protection, the function of the “TEST” button of the device shall be verified.
GB	6.4.3.8	In Great Britain, for TN and TT systems verification of the characteristics and/or the effectiveness of a general type AC RCCB according to IEC 61008 or RCBO according to IEC 61009 providing additional protection is achieved by the following procedure: – visual inspection to confirm adequacy in terms of rated current (I) and rated residual operating current ($I_{\Delta n}$) – using an RCD test instrument according to IEC 61557-6: – the device should trip within 40 ms when a test current of 5 $I_{\Delta n}$ is applied.
FI; SE	6.4.3.6	In Finland and Sweden, the verification of polarity may be achieved by inspection only.
SE	6.4.4.4	In Sweden the delivery of verification documents is subject to an agreement between the contractor and the customer. For this reason, the first paragraph is not published in the Swedish standard.
AT; DE; FI; HU; IT; NL; NO	6.4.4.5	In Austria, Germany, Finland, Hungary, Italy, the Netherlands and Norway Annexes E, F and G are replaced by amended national annexes with a required national minimum.

Bibliography

IEC 60238, *Edison screw lampholders*

IEC 60364-4-43, *Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent*

IEC 61557-2, *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 2: Insulation resistance*

IEC 61557-3, *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*

IEC 61557-5, *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 61557-8, *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 8: Insulation monitoring devices for IT systems*

IEC 62020, *Electrical accessories. Residual current monitors for household and similar uses (RCMs).*

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(prazna stranica)

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