SLOVENSKI STANDARD
SIST EN 60947-1:1999/A2:2000

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Low-voltage switchgear and controlgear - Part 1: General rules - Amendment A2 (IEC 60947-1:1996/A2:1998)

Low-voltage switchgear and controlgear -- Part 1: General rules - Amendment A2 (IEC 60947-1:1996/A2:1998)

Niederspannungsschaltgeräte -- Teil 1: Allgemeine Festlegungen

Appareillage à basse tension -- Partie 1: Règles générales

Ta slovenski standard je istoveten z: **EN 60947-1:1997/A2:1998**

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Low-voltage switchgear and controlgear
Part 1: General rules
(IEC 60947-1:1996/A2:1998)

Appareillage à basse tension
Partie 1: Règles générales
(CEI 60947-1:1996/A2:1998)

Niederspannungsschaltgeräte
Teil 1: Allgemeine Festlegungen
(IEC 60947-1:1996/A2:1998)

This amendment A2 modifies the European Standard EN 60947-1:1997; it was approved by CENELEC on 1998-08-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 17B/898/FDIS, future amendment 2 to IEC 60947-1:1996, prepared by SC 17B, Low-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60947-1:1997 on 1998-08-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-05-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2001-05-01

Endorsement notice

The text of amendment 2:1998 to the International Standard IEC 60947-1:1996 was approved by CENELEC as an amendment to the European Standard without any modification.

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1996

AMENDEMENT 2
AMENDMENT 2

1998-06

Amendement 2

Appareillage à basse tension –

Partie 1: Règles générales

Amendment 2

Low-voltage switchgear and controlgear –

Part 1: General rules

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FOREWORD

This amendment has been prepared by subcommittee 17B: Low-voltage switchgear and controlgear, of IEC technical committee 17: Switchgear and controlgear.

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

FDIS	Report on voting
17B/898/FDIS	17B/931/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

Page 77

4.9 Switching overvoltages

First paragraph, second line, replace words: "when tested according to 8.3.3.5.4." *by* "when required by the product standard.".

Page 95

7.1.10.1 Design

Replace, on page 97, the text of the last paragraph by the following text:

If the enclosure is used for mounting push-buttons, removal of buttons should be from the inside of the enclosure. Removal from the outside shall only be by use of a tool intended for this purpose.

Page 103

7.2.3 Dielectric properties

Replace the text of this subclause by the following text:

a) The following requirements are based on the principles of the IEC 60664 series and provide the means of achieving co-ordination of insulation of equipment with the conditions within the installation.

b) The equipment shall be capable of withstanding:

- the rated impulse withstand voltage (see 4.3.1.3) in accordance with the overvoltage category given in annex H;
- the impulse withstand voltage across the contact gaps of devices suitable for isolation as given in table 14;
- the power-frequency withstand voltage.

NOTE – The correlation between the nominal voltage of the supply system and the rated impulse withstand voltage of the equipment is given in annex H.

The rated impulse withstand voltage for a given rated operational voltage (see notes 1 and 2 to 4.3.1.1.) shall be not less than that corresponding in annex H to the nominal voltage of the supply system of the circuit at the point where the equipment is to be used, and the appropriate overvoltage category.

c) The requirements of this subclause shall be verified by the tests of 8.3.3.4.

7.2.3.1 Impulse withstand voltage

1) Main circuit

   a) Clearances from live parts to parts intended to be earthed and between poles shall withstand the test voltage given in table 12 appropriate to the rated impulse withstand voltage.

   b) Clearances across the open contacts shall withstand:

      – the impulse withstand voltage specified, where applicable, in the relevant product standard;

      – for equipment designated as suitable for isolation, the test voltage given in table 14 appropriate to the rated impulse withstand voltage.

NOTE – Solid insulation of equipment associated with clearances a) and/or b) above should be subjected to the impulse voltage specified in a) and/or b), as applicable.

2) Auxiliary and control circuits

   a) Auxiliary and control circuits which operate directly from the main circuit at the rated operational voltage shall comply with the requirements of item 1) a) of 7.2.3.1 (see also the note of 7.2.3.1 1)).

   b) Auxiliary and control circuits which do not operate directly from the main circuit may have an overvoltage withstand capacity different from that of the main circuit. Clearances and associated solid insulation of such circuits, whether a.c. or d.c., shall withstand the appropriate voltage in accordance with annex H.

7.2.3.2 Power-frequency withstand voltage of the main, auxiliary and control circuits

a) Power-frequency tests are used in the following cases:

   – dielectric tests as type tests for the verification of solid insulation;

   – dielectric withstand verification, as a criterion of failure, after switching or short-circuit type tests;

   – dielectric withstand after humidity treatment (under consideration);

   – routine tests.

b) Type tests of dielectric properties

The tests of dielectric properties, as type tests, shall be made in accordance with 8.3.3.4.

For equipment suitable for isolation, the maximum leakage current shall be in accordance with 7.2.7 and shall be tested according to 8.3.3.4.

c) Verification of dielectric withstand after switching or short-circuit tests

The verification of dielectric withstand after switching and short-circuit tests as a criterion of failure, is always made at power-frequency voltage in accordance with item 4) of 8.3.3.4.1.

For equipment suitable for isolation, the maximum leakage current shall be in accordance with 7.2.7, shall be tested according to 8.3.3.4 and shall not exceed the values specified in the relevant product standard.

d) Dielectric withstand verification after humidity treatment

Under consideration.

e) Verification of dielectric withstand during routine tests

Tests to detect faults in materials and workmanship are made at power-frequency voltage, in accordance with item 2) of 8.3.3.4.2.

7.2.3.3 Clearances

Clearances shall be sufficient to enable the equipment to withstand the rated impulse withstand voltage, according to 7.2.3.1.

Clearances shall be higher than the values given in table 13, for case B (homogeneous field) (see 2.5.62) and verified by a sampling test according to 8.3.3.4.3. This test is not required if the clearances, related to the rated impulse withstand voltage and pollution degree, are higher than the values given in table 13 for case A (inhomogeneous field).

The method of measuring clearances is given in annex G.

7.2.3.4 Creepage distances

a) Dimensioning

For pollution degrees 1 and 2, creepage distances shall be not less than the associated clearances selected according to 7.2.3.3. For pollution degrees 3 and 4, the creepage distances shall be not less than the case A clearances (table 13) to reduce the risk of disruptive discharge due to overvoltages, even if the clearances are smaller than the values of case A as permitted in 7.2.3.3.

The method of measuring creepage distances is given in annex G.

Creepage distances shall correspond to a pollution degree as specified in 6.1.3.2 or to that defined in the relevant product standard and to the corresponding material group at the rated insulation or working voltage given in table 15.

Material groups are classified as follows, according to the range of values of the comparative tracking index (CTI) (see 2.5.65):

– Material Group I	600 ≤ CTI
– Material Group II	400 ≤ CTI < 600
– Material Group IIIa	175 ≤ CTI < 400
– Material Group IIIb	100 ≤ CTI < 175

NOTE 1 – The CTI values refer to the values obtained in accordance with IEC 60112, method A, for the insulating material used.

NOTE 2 – For inorganic insulating materials, for example glass or ceramics, which do not track, creepage distances need not be greater than their associated clearances. However, the risk of disruptive discharge should be considered.

b) Use of ribs

A creepage distance can be reduced to 0,8 of the relevant value of table 15 by using ribs of 2 mm minimum height, irrespective of the number of ribs. The minimum base of the rib is determined by mechanical requirements (see G.2).

c) Special applications

Equipment intended for certain applications where severe consequences of an insulation fault have to be taken into account shall have one or more of the influencing factors of table 15 (distances, insulating materials, pollution in the micro-environment) utilized in such a way as to achieve a higher insulation voltage than the rated insulation voltage given to the equipment according to table 15.

7.2.3.5 Solid insulation

Solid insulation shall be verified by either power-frequency tests, in accordance with item 3) of 8.3.3.4.1, or d.c. tests in the case of d.c. equipment.

Dimensioning rules for solid insulation and d.c. test voltages are under consideration.

7.2.3.6 Spacing between separate circuits

For dimensioning clearances, creepage distances and solid insulation between separate circuits, the highest voltage ratings shall be used (rated impulse withstand voltage for clearances and associated solid insulation and rated insulation voltage or working voltage for creepage distances).

Page 111

7.2.6 Switching overvoltages

Replace the text of this subclause by the following text:

Product standards may specify switching overvoltage tests if applicable.

In this case the test procedure and the requirements shall be defined in the product standard.

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8.3.3.4 Dielectric properties

Replace the text of this subclause by the following text:

8.3.3.4.1 Type tests

1) General conditions for withstand voltage tests

The equipment to be tested shall comply with the general requirements of 8.3.2.1.

If the equipment is to be used without an enclosure, it shall be mounted on a metal plate and all exposed conductive parts (frame, etc.) intended to be connected to the protective earth in normal service shall be connected to that plate.

When the base of the equipment is of insulating material, metallic parts shall be placed at all of the fixing points in accordance with the conditions of normal installation of the equipment and these parts shall be considered as part of the frame of the equipment.

Any actuator of insulating material and any integral non-metallic enclosure of equipment intended to be used without an additional enclosure shall be covered by a metal foil and connected to the frame or the mounting plate. The foil shall be applied to all surfaces where these can be touched with the standard test finger in normal use. If the insulation part of an integral enclosure cannot be touched by the standard test finger due to the presence of an additional enclosure, no foil shall be required.

NOTE – This corresponds to accessible parts by the operator in normal use (for example, actuator of a push-button in normal use).

When the dielectric strength of the equipment is dependent upon the taping of leads or the use of special insulation, such taping or special insulation shall also be used during the tests.

NOTE – Dielectric tests for semiconductor devices are under consideration.

2) Verification of impulse withstand voltage

a) General

The equipment shall comply with the requirements stated in 7.2.3.1.

The verification of the insulation is made by a test at the rated impulse withstand voltage.

Clearances equal to or larger than the values of class A of table 13 may be verified by measurement, according to the method described in annex G.

b) Test voltage

The test voltage shall be that specified in 7.2.3.1.

For equipment incorporating overvoltage suppressing means, the energy content of the test current shall not exceed the energy rating of the overvoltage suppressing means. The latter shall be suitable for the application.

NOTE – Such ratings are under consideration.

The 1,2/50 µs impulse voltage shall be applied five times for each polarity at intervals of 1 s minimum.

If, in the course of a test procedure, repeated dielectric testing is required, the relevant product standard shall state the dielectric test conditions.

NOTE – An example of test equipment is under consideration.

c) Application of test voltage

With the equipment mounted and prepared as specified in item a) above, the test voltage is applied as follows:

i) between all the terminals of the main circuit connected together (including the control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation;

ii) between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation;

iii) between each control and auxiliary circuit not normally connected to the main circuit and:

- the main circuit,
- the other circuits,
- the exposed conductive parts,
- the enclosure or mounting plate,

which, wherever appropriate, may be connected together;

iv) for equipment suitable for isolation, across the poles of the main circuit, the line terminals being connected together and the load terminals connected together.

The test voltage shall be applied between the line and load terminals of the equipment with the contacts in the open position and its value shall be as specified in item 1) b) of 7.2.3.1.

For equipment not suitable for isolation, the requirements for testing with the contacts in the open position shall be stated in the relevant product standard.

d) Acceptance criteria

There shall be no unintentional disruptive discharge during the tests.

NOTE 1 – An exception is an intentional disruptive discharge, for example by transient overvoltage suppressing means.

NOTE 2 – The term "disruptive dicharge" related to phenomena associated with the failure of insulation under electrical stress, in which the discharge completely bridges the insulation under test, reducing the voltage between the electrodes to zero or nearly to zero.

NOTE 3 – The term "sparkover" is used when a disruptive discharge occurs in a gaseous or liquid dielectric.

NOTE 4 – The term "flashover" is used when a disruptive discharge occurs over the surface of a dielectric in a gaseous or liquid medium.

NOTE 5 – The term "puncture" is used when a disruptive discharge occurs through a solid dielectric.

NOTE 6 – A disruptive discharge in a solid dielectric produces permanent loss of dielectric strength, in a liquid or gaseous dielectric, the loss may be only temporary.

3) Power-frequency withstand verification of solid insulation

a) General

This test applies to the verification of solid insulation and the ability to withstand temporary overvoltages.

b) Test voltage

The test voltage shall have a practically sinusoidal waveform and a frequency between 45 Hz and 65 Hz.

The high-voltage transformer used for the test shall be so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current shall be at least 200 mA.

The overcurrent relay shall not trip when the output current is less than 100 mA.

The value of the test voltage shall be as follows:

i) for the main circuit and for the control and auxiliary circuits which are not covered by item ii) below, in accordance with table 12A;

ii) for control circuits and auxiliary circuits which are indicated by the manufacturer as unsuitable for connection to the main circuit:

– 1 000 V r.m.s., where the rated insulation voltage U_i does not exceed 60 V,

– 2 U_i + 1 000 V with a minimum of 1 500 V r.m.s., where the rated insulation voltage U_i exceeds 60 V.

The test voltage applied shall be within ± 3 %.

c) Application of test voltage

When the circuits of equipment include devices such as motors, instruments, snap switches, capacitors and solid state devices which, according to their relevant specifications, have been subjected to dielectric test voltages lower than those specified in b) above, such devices shall be disconnected for the test. Circuits which perform a protective function shall not be disconnected for the test.