



**SLOVENSKI STANDARD**  
**SIST EN 60947-2:1998/A11:1998**  
**01-junij-1998**

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**Low-voltage switchgear and controlgear assemblies - Part 2: Circuit-breakers - Amendment A11**

Low-voltage switchgear and controlgear -- Part 2: Circuit-breakers

Niederspannungsschaltgeräte -- Teil 2: Leistungsschalter

Appareillage à basse tension -- Partie 2: Disjoncteurs

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**Ta slovenski standard je istoveten z: EN 60947-2:1996/A11:1997**

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**ICS:**

29.130.20	Niskonapetostne stikalne in krmilne naprave	Low voltage switchgear and controlgear
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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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EN 60947-2/A11

June 1997

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Descriptors: Low-voltage switchgear and controlgear, circuit-breaker, definition, classification, characteristics, test

English version

## Low-voltage switchgear and controlgear Part 2: Circuit-breakers

Appareillage à basse tension  
Partie 2: Disjoncteurs

Niederspannung-Schaltgeräte  
Teil 2: Leistungsschalter

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This amendment A11 modifies the European Standard EN 60947-2:1996; it was approved by CENELEC on 1997-04-22. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

# 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

This amendment was prepared by the Technical Committee CENELEC TC 17B, Low-voltage switchgear and controlgear including dimensional standardization.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A11 to EN 60947-2:1991 on 1996-07-02. As EN 60947-2:1991 and its amendments have been consolidated into EN 60947-2:1996, this amendment A11 has been editorially updated to apply to this latest edition of the European Standard, as approved by CENELEC on 1997-04-22.

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) 1997-10-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 1997-10-01

This amendment covers the requirements of EMC for circuit-breakers. It contains additional requirements corresponding to subclause 7.3 of EN 60947-1 and an additional annex ZB to provide an index of the EMC requirements in the standard. Additions to annex B are in line with work in TC 23E and further requirements including emission are added to annex F.

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## CONTENTS

Add the titles of the new subclauses as follows :

- [SIST EN 60947-2:1998/A11:1998](https://standards.iteh.ai/catalog/standards/sist/d018e095-06fa-43d2-8a4c-238dbe6Bc99/sist-en-60947-2-1998-a11-1998)
- 7.3 Electromagnetic compatibility (EMC)
- 8.5 Immunity tests for circuit-breakers incorporating electronic circuits, other than CBRs to annex B and circuit-breakers with electronic overloads to annex F

Add the title of the new annex :

- ZB Index of electromagnetic compatibility (EMC) requirements and tests for circuit-breakers



## 7 Constructional and performance requirements

Add new subclauses :

### 7.3 Electromagnetic compatibility (EMC)

NOTE: An index of the relevant requirements and tests is given in annex ZB.

#### 7.3.1 General

Subclause 7.3.1 of Part 1 applies. Both Environment 1 and Environment 2 as defined in Part 1 may apply to circuit-breakers according to this standard.

#### 7.3.2 Immunity

Circuit-breakers shall have satisfactory immunity to electromagnetic disturbances.

##### 7.3.2.1 Circuit-breakers not incorporating electronic circuits

Subclause 7.3.2.1 of Part 1 applies

NOTE: The need for requirements for highly sensitive releases for circuit-breakers according to annex B not associated with electronic circuits is under consideration.

##### 7.3.2.2 Circuit-breakers incorporating electronic circuits

Annex F includes the immunity requirements and tests for circuit-breakers with electronic overcurrent protection.

In all other cases (except for CBRs, see 7.3.2.3 below), subclause 7.3.2.2 of Part 1 applies, tests shall be made in accordance with 8.5 of this standard.

##### 7.3.2.3 Circuit-breakers incorporating residual current protection (CBRs)

Annex B includes the immunity requirements and tests for CBRs.

#### 7.3.3 Emission

NOTE: The case of remotely controlled circuit-breakers is under consideration.

##### 7.3.3.1 Circuit-breakers not incorporating electronic circuits

Subclause 7.3.3.1 of Part 1 applies.

##### 7.3.3.2 Circuit-breakers incorporating electronic circuits

Subclause 7.3.3.2 of Part 1 applies with the following additions:

###### 7.3.3.2.1 Circuit-breakers incorporating electronic circuits not including oscillators operating for extended periods

NOTE: An extended period is a period greater than 40 ms.

These circuit-breakers do not generate continuous disturbances and only generate transient disturbances during switching. The frequency and the consequences of these transient disturbances are considered for the time being as part of the normal electromagnetic environment of low-voltage installations and therefore no measurements are needed at present time.

###### 7.3.3.2.2 Circuit-breakers incorporating electronic circuits including oscillators operating for extended periods

Annex B details the emission requirements and tests for CBRs.

Annex F details the emission requirements and tests for circuit-breakers with electronic overcurrent protection.

## 8 Tests

Add new subclause :

### 8.5 Immunity tests for circuit-breakers incorporating electronic circuits, other than CBRs to annex B and circuit-breakers with electronic overloads to annex F

Subclause 8.4 of Part 1 applies. Test methods and performance criteria are under consideration.

## Annex B Circuit-breakers incorporating residual current protection

### B.1.1 Scope and object

Add at the end of the first paragraph: "This annex also covers requirements for CBRs concerning electromagnetic compatibility (EMC)".

#### B.7.2.11 Additional requirements for CBRs functionally dependent on line voltage

Add:

Where a CBR has more than one rated frequency or a range of rated frequencies the CBR shall be capable of operating in accordance with this subclause at all rated frequencies. Compliance is verified by carrying out the tests of B.8.2 and B.8.4.

Add new subclauses:

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#### B.7.2.12 Immunity to high frequency electromagnetic phenomena

##### B.7.2.12.1 Fast transient (bursts) - common mode

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The CBR shall satisfy the requirements of Level 4, common mode, in accordance with IEC 1000-4-4. Tests are made in accordance with B.8.12.1.

##### B.7.2.12.2 Radiated high frequency phenomena

Reference standard: IEC 1000-4-3.

Tests are made in accordance with B.8.12.2.

##### B.7.2.12.3 Immunity to electrostatic discharges

Reference standard: IEC 1000-4-2.

The CBR shall be immune to electrostatic discharges generated, for example, by an operator touching the CBR.

Tests are made in accordance with B.8.13.

### B.7.3 Verification of high frequency emissions

A test is performed in accordance with B.8.14.

#### B.8.1.2 Additional test sequences

Add in table B.4 under Sequence B I:

EMC - fast transient (bursts) and radiated h.f. phenomena	B.8.12
EMC - electrostatic discharges	B.8.13
EMC - emission	B.8.14

**B.8.2.3** *Test voltage for CBRs functionally independent on line voltage*

Add:

CBRs with more than one rated frequency or a range of rated frequencies shall be tested at the highest and lowest rated frequency in each case. However for CBRs rated at 50... 60 Hz, tests at 50 Hz or 60 Hz are considered to cover the requirements.

Add new subclauses:

**B.8.12** *Verification of immunity to fast transient (bursts) and high frequency phenomena***B.8.12.1** *Tests for immunity to fast transient (bursts)*

The tests are made in accordance with F.5.2.1 and F.5.2.2.1.

**B.8.12.2** *Surge immunity tests*

Reference standard: IEC 1000-4-5.

The tests are made in accordance with F.5.2.1 and F.5.2.2.2.

**B.8.12.3** *Tests for immunity to high frequency phenomena*

The tests are made in accordance with F.7.2.1 and F.7.2.2.

While sweeping the frequency band 26 MHz to 1 GHz (level 3) the CBR shall comply with the following :

- the CBR shall not trip;

- at each of the three dwell frequencies per octave the CBR operation characteristics shall conform to the requirements of B.8.2.4.3.

**B.8.13** *Tests for immunity to electrostatic discharges*

Tests are made in accordance with F.6.2.1 and F.6.2.2.

During the application of the discharges no tripping of the CBR shall occur, in the case of CBRs dependent on the supply voltage, when energised at rated voltage and frequency. After the application of the discharges the CBR shall operated in accordance with B.8.2.4.1.

**B.8.14** *Test for high frequency electromagnetic emissions beyond an enclosure port.*

Tests are made in accordance with F.10.1 and F.10.2.

**Annex F****F.1** **Scope**

Delete the last sentence.

## F.2 List of tests

Add:

### F.2.5 Verification of high frequency emissions

A test is performed in accordance with F.10.

### F.2.6 Verification of resistance to unwanted tripping in the case of current oscillatory transients

A test is performed in accordance with F.5.3.

## F.3 General test conditions

Add before the paragraph starting with "For CBR's (see annex B):":

For the verification of high frequency emissions of F.10 one circuit-breaker shall be tested, under the most unfavourable conditions, for each type and size of circuit-breaker.

## F.5 Immunity test regarding conducted transients and high-frequency disturbances

Add new subclause:

### F.5.3 Verification of resistance to unwanted tripping in the case of loading of the network capacitance (current oscillatory transient)

The circuit-breaker is tested in accordance with B.8.6.1.

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Add new clause: <https://standards.iteh.ai/catalog/standards/sist/d018e095-06fa-43d2-8a4c-238dbe63c99/sist-en-60947-2-1998-a11-1998>

## F.10 Tests for high frequency radiated emissions

The objective of these tests is to verify compliance with the limits of electromagnetic emissions which may be generated by the circuit-breakers normal operation. These emissions may cause interference in other devices.

Tests for conducted radiofrequency emissions are not applicable because annex F deals with circuit-breakers providing overcurrent protection by electronic means incorporated and independent of the line voltage or any auxiliary supply (see F.1).

### F.10.1 Reference standard

CISPR 22:1993 - Limits and methods of measurement of radio disturbance characteristics of information technology equipment.

### F.10.2 Tests

#### F.10.2.1 Test conditions

The circuit-breaker shall be mounted on an insulating support, at a distance of 1m from the ground plane (see figure F.9).

The test current corresponds to the current setting of the overload release and is applied to any one pair of poles, at any convenient voltage.



For practical reasons, the two poles under test are short-circuited at the upper terminals, as close to the circuit-breaker as possible. The supply cables are connected at the lower terminals and shall remain parallel for 1 metre, then twisted up to the power supply.

In order to limit the power supply for a given circuit-breaker the minimum rated current of the frame size may be used, the current setting of the overload release being adjusted to its minimum value.

The measurements shall be made according to subclause 11.2.1 of CISPR 22. The relative position of the circuit-breaker and of the antenna shall be such as to maximize the emission level.

If electronic means intended for functions other than overcurrent protection are installed, they shall not impair the emission level measurement.

If those means have an influence, they shall be either shielded or placed outside the test room, the connecting wires being filtered.

The test configuration shall be noted in the test report.

#### F.10.2.2 Test procedure

Prior to energizing the circuit-breaker, the ambient noise level is measured; The suitability of the site can be determined by ensuring that the ambient noise level is at least 6dB below the limits specified in F.10.2.3.

If the power supply is installed within the test room, it shall be energized during this measurement.

The measurements of high frequency emissions are made in the 30 MHz to 1000 MHz range, by using a quasi-peak detector. However, in order to accelerate the tests, a peak detector can be used for a duration of at least 0,1 second as a first step. Then, if the measurements at certain frequencies are equal or greater than those specified, the test is repeated by using a quasi-peak detector for a duration of at least 1 second.

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#### F.10.2.3 Test requirements

LV circuit-breakers may be used in industrial environment but also in commercial and light industrial environments and therefore the limits of high frequency emissions shall be of the following values, measured at 10 meters with a quasi-peak detector.

Environment	Frequency range (MHz)	Limits dB ( $\mu$ V/m)
Commercial and light industry	from 30 to 230	30
	from 230 to 1000	37
Industry	from 30 to 230	40
	from 230 to 1000	47

NOTE: If the measurement is made at a smaller distance (e.g. 3 meters) the limits shall be increased according to subclause 11.2.1 of CISPR 22.