SLOVENSKI STANDARD
SIST EN 60947-5-2:1998

01-september-1998

Low-voltage switchgear and controlgear - Part 5: Control circuit devices and switching elements - Section 2: Proximity switches (IEC 60947-5-2:1992+A1:1994+A2:1995, modified)

Low-voltage switchgear and controlgear -- Part 5: Control circuit devices and switching elements -- Section 2: Proximity switches

Niederspannungsschaltgeräte -- Teil 5: Steuergeräte und Schaltelemente -- Hauptabschnitt 2: Näherungsschalter

Appareillage à basse tension -- Partie 5: Appareils et éléments de commutation pour circuits de commande -- Section 2: Détecteurs de proximité

Ta slovenski standard je istoveten z: **EN 60947-5-2:1997**

ICS:

29.130.20	Nizkonapetostne stikalne in krmilne naprave	Low voltage switchgear and controlgear

SIST EN 60947-5-2:1998 **en**

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Descriptors: Low-voltage switchgear and controlgear, control circuit devices, switching elements, proximity switches

English version

Low-voltage switchgear and controlgear
Part 5: Control circuit devices and switching elements
Section 2: Proximity switches
(IEC 947-5-2:1992 + A1:1994 + A2:1995, modified)

Appareillage à basse tension
Partie 5: Appareils et éléments
de commutation pour circuits de
commande
Section 2: Détecteurs de proximité
(CEI 947-5-2:1992 + A1:1994 +
A2:1995, modifiée)

Niederspannungsschaltgeräte
Teil 5: Steuergeräte und Schaltelemente
Hauptabschnitt 2: Näherungsschalter
(IEC 947-5-2:1992 + A1:1994 +
A2:1995, modifiziert)

This European Standard was approved by CENELEC on 1996-07-02. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard 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 European Standard 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
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Foreword

The text of the International Standard IEC 947-5-2:1992 and its amendments 1:1994 and 2:1995, prepared by SC 17B, Low-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, together with common modifications prepared by the Technical Committee CENELEC TC 17B, Low-voltage switchgear and controlgear including dimensional standardization, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60947-5-2 on 1996-07-02.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1999-06-01

Annexes designated "normative" are part of the body of the standard.
In this standard all annexes are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 947-5-2:1992 and its amendments 1:1994 and 2:1995 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

CONTENTS

Add the title of the following new annexe:

ZA Normative references to international publications with their corresponding European publications

1 General

1.2 *Replace the references to IEC 801-2, IEC 801-3 and IEC 801-4 by :*

IEC 1000-4-2:1995, *Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test*

IEC 1000-4-3:1995, *Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic field immunity test*

IEC 1000-4-4:1995, *Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test*

Add:

IEC 1000-3-2:1995, *Electromagnetic compatibility (EMC) - Part 3: Limits - Section 2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)*

IEC 1000-3-3:1994, *Electromagnetic compatibility (EMC) - Part 3: Limits - Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16 A*

CISPR 11:1990, *Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment*

EN 50081-2:1993, *Electromagnetic compatibility - Generic emission standard - Part 2: Industrial environment*

7 Constructional and performance requirements

7.1.5 *Replace by this subclause by* :

7.1.5 *Indicating means*

Proximity switches may incorporate one or more colour indicators.

The meaning of the colours shall be:

a) continuous GREEN: power ON;

b) continuous YELLOW: output ON;

c) continuous RED: fault;

d) any other continuous colour or any colour in flashing mode: other functions (e.g. short-circuit).

7.1.7.3 *Add, at the end of this subclause, the following text*:

For plug-in type proximity switches, the built-in connector shall be in accordance with annex D (normative).

7.2.3 *Dielectric properties*

Add, at the end of this subclause, the following new subclause:

7.2.3.1 *Impulse voltage withstand*

In accordance with IEC 255-5.

The minimum test voltage shall be 1kV.

The characteristics of the impulse generator are:
- 1,2/50 μs impulse;
- source impedance: 500 Ω ;
- source energy: 0,5 J.

NOTE: For proximity devices with sizes below M12 it is permissible to specify external protection components to achieve this requirement.

7.2.6 *Electromagnetic compatibility (EMC)*

Replace the contents of the entire subclause up to and including 7.2.6.4 by :

The operating characteristics of the proximity switch shall be maintained at all levels of electromagnetic interferences (EMI) up to and including the maximum level stated by the manufacturer.

The proximity device to be tested shall have all the essential design details of the type which it represents and shall be in a clean and new condition.

Maintenance or replacement of parts during or after a testing cycle is not permitted.

7.2.6.1 *Radiated electromagnetic field immunity*

In accordance with IEC 1000-4-3.

The minimum test field strength shall be 3 V/m.

Frequency band: 80 MHz to 1000 MHz.

7.2.6.2 *Electrostatic discharge (ESD) immunity*

In accordance with IEC 1000-4-2.

The test voltage shall be applied by the contact discharge method to proximity devices with metallic enclosures.

The minimum test voltage shall be 4 kV.

The test voltage shall be applied by the air gap discharge method to proximity devices with non-metallic enclosures.

The minimum test voltage shall be 8 kV.

7.2.6.3 *Fast transient immunity*

In accordance with IEC 1000-4-4.

The minimum test voltage shall be 1 kV.

For process industry and when cables are longer than 2 m the minimum test voltage shall be 2 kV.

7.2.6.4 *Surge immunity*

For proximity devices it is not necessary to test for surge immunity. The operating environment of these devices is considered to be well protected against surge voltages caused by lightning strikes.

7.2.6.5 *Immunity to conducted disturbances inducted by R F fields*

Provisionally and until further study no tests are required.

7.2.6.6 *Immunity to voltage dips*

Provisionally and until further study no tests are required.

Add the following new subclause:

7.2.7 *Emission requirements*

7.2.7.1 *Conditions during measurement*

The measurement shall be made in the operating mode including grounding conditions producing the highest emission in the frequency band being investigated which is consistent with normal applications (see clause 4).

Each measurement shall be performed in defined and reproducible conditions.

Descriptions of the tests, test methods and setups are given in the standards listed in table 6. The contents of these standards are not reproduced here, however modifications or additional information needed for the practical application of the tests are given in this annex.

Proximity devices which are intended to be powered by public mains supply, therefore within the scope of IEC 1000-3-2 and IEC 1000-3-3, regarding low frequency emission shall also comply with the requirements of these standards.

7.2.7.2 *Emission limits*

Table 6 gives the limit values for proximity devices installed in normal service conditions.

Table 6: Emission limits for proximity devices

Port	Frequency range	Limits	Standard
Enclosure	30 to 230 MHz 230 to 1000 MHz	40 dB (μV/m) quasi peak, measured at 10 m distance 47 dB (μV/m) quasi peak, measured at 10 m distance	EN 55011
a.c. power	0,15 to 0,50 MHz 0,50 to 30 MHz	79 dB (μV) quasi peak 66 dB (μV) average. 73 dB (μV) quasi peak, 60 dB (μV) average	EN 55011

These limits are given for proximity devices exclusively used in industrial environment. When they may be used in domestic environment, the following warning shall be included in the instructions for use:

Warning
This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

8 Tests

Add after the clause heading:

Unless otherwise stated the tests shall be carried out at an ambient air temperature of 23 °C ± 5 °C.

8.3.3.4 *Dielectric properties*

Add after the second dashed paragraph:

- in accordance with 8.3.3.4.4, whether U_{imp} is declared or not.

Add the following new subclause after 8.3.3.4.3:

8.3.3.4.4 *Impulse voltage withstand test*

The test is performed according to IEC 255-5 and 7.2.3.1 with the following additional requirements:

- The proximity device is not powered during the test.
- The impulse test shall be applied:

  a) between terminals connected together and earth;

  b) between terminals intended to be connected to the power supply;

  c) between each output terminal and each terminal intended to be connected to the power supply.

- Three positive and three negative pulses shall be applied between each two points at intervals of not less than 5 s.

NOTE: The impulse voltage withstand test is designed as a type test.

8.6 *Verification of the electromagnetic compatibility*

Replace the contents of the entire subclause up to and including 8.6.4 by :

The tests shall be performed under the following conditions:

- the proximity device mounted in free air shall be connected to a load corresponding to the rated operational current (I_e) and supplied with is rated operational voltage (or the maximum voltage of its voltage range) (U_e);

- the connecting leads shall be $2_0^{-0,1}$ m. For proximity devices not having integral cables the type of cable used shall be specified by the manufacturer and recorded in the test report.

- the test shall be performed:

  a) with the target set at a positive such that the switching element is in the OFF-state;

  b) with the target set at a position such that the switching element is in the ON-state.

- for inductive and capacitive proximity devices, the target shall be positioned at 1/3 s_n or 3 s_n.

For the test according to 7.2.6.3 the following additional mounting conditions apply:

Cylindrical proximity devices shall be mounted in a non-embedded manner. A metal washer clamped between the locknuts of the device shall be connected to the reference ground plane.

Rectangular proximity devices shall be mounted in a non-embedded manner on a flat metal plate which shall be connected to the reference ground plane

The method of connection to the reference ground plane shall be in accordance with the manufacturer's instructions, if given, and shall be stated in the test report.

Performance criteria: During the tests the state of the switching element shall not change for more than 1 ms for d.c. devices and one half wave of supply frequency for a.c. devices.

8.6.1 *Electromagnetic field immunity*

The test is performed according to IEC 1000-4-3, and to 7.2.6.1.

8.6.2 *Electrostatic discharge immunity*

The test is performed according to IEC 1000-4-2, and to 7.2.6.2 and shall be repeated ten times at each measuring point, with a minimum time interval of 1s between pulses.

8.6.3 *Fast transient immunity*

The test is performed according IEC 1000-4-4, and to 7.2.6.3, with all the connecting leads placed in the capacitive coupling clamp.

8.6.5 *Emission requirements*

The test is performed according to EN 55011, group I, level A, and to 7.2.7.

Add the following new subclause:

8.7 *Test results and test report*

The test results shall be documented in a comprehensive test report. The test report shall present the objective, the results and all relevant information of the tests. The test report shall define the proximity device under test, including the cable layout and the necessary auxiliary equipment. Any deviation from the test plan shall be mentioned.

Where a range of proximity devices are made according to the same principle and design, and using the same type of components, tests may be performed on representative samples. Furthermore, based on first results the testing laboratory may limit the tested frequency range for radiation or conduction tests and shall include in the report the frequency range used.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
-	-	Electromagnetic compatibility - Generic emission standard Part 2: Industrial environment	EN 50081-2	1993
CISPR 11 (mod)	1990	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment	EN 55011	1991
IEC 50(441)	1984	International Electrotechnical Vocabulary (IEV) Chapter 441: Switchgear, controlgear and fuses	-	-
IEC 68-2-6	1982	Basic environmental testing procedures Part 2: Tests - Test Fc and guidance: Vibration (Sinusoidal)	HD 323.2.6 S2[1)]	1988
IEC 68-2-14	1984	Part 2: Tests - Test N: Change of temperature	HD 323.2.14 S2[2)]	1987
IEC 68-2-27	1987	Part 2: Tests - Test Ea and guidance: Shock	EN 60068-2-27	1993
IEC 68-2-30	1980	Part 2: Tests - Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)	HD 323.2.30 S3[3)]	1988
IEC 255-5	1977	Electrical relays Part 5: Insulation tests for electrical relays	-	-
IEC 364 (mod)	series	Electrical installations of buildings	HD 384	series

1) HD 323.2.6 S2 is superseded by EN 60068-2-6:1995, which is based on IEC 68-2-6:1995 + corrigendum March 1995.

2) HD 323.2.14 S2 includes A1:1986 to IEC 68-2-14.

3) HD 323.2.30 S3 includes A1:1985 to IEC 68-2-30.

Publication	Year	Title	EN/HD	Year
IEC 446	1989[4)]	Identification of conductors by colours or numerals	-	-
IEC 536	1976	Classification of electrical and electronic equipment with regard to protection against electric shock	HD 366 S1	1977
IEC 947-1 (mod)	1988	Low-voltage switchgear and controlgear Part 1: General rules	EN 60947-1 + corr. June	1991 1997
IEC 947-5-1	1990	Low-voltage switchgear and controlgear Part 5: Control circuit devices and switching elements Section 1: Electromechanical control circuit devices	EN 60947-5-1 + corr. June	1991 1997
IEC 1000-3-2	1995	Electromagnetic compatibility (EMC) Part 3: Limits Section 2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)	EN 61000-3-2 + A12	1995 1996
IEC 1000-3-3	1994	Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16 A	EN 61000-3-3	1995
IEC 1000-4-2	1995	Part 4: Testing and measurement techniques Section 2: Electrostatic discharge immunity test	EN 61000-4-2	1995
IEC 1000-4-3 (mod)	1995	Section 3: Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	1996
IEC 1000-4-4	1995	Section 4: Electrical fast transient/burst immunity test	EN 61000-4-4	1995
IEC 1020-5-1	1991	Electromechanical switches for use in electronic equipment Part 5: Sectional specification for pushbutton switches Section 1: Blank detail specification	-	-
ISO 630	1980	Structural steels	-	-

4) IEC 446:1973 is harmonized as HD 324 S1:1977

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Partie 5:
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Section 2: Détecteurs de proximité

Low-voltage switchgear and controlgear

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