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## **Kopplingsapparater för högst 1000 V – Del 5-2: Manöverkretsapparater och kopplingselement – Beröringsfria lägesomkopplare**

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

Som svensk standard gäller europastandarden EN IEC 60947-5-2:2020. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 60947-5-2:2020.

### **Nationellt förord**

Europastandarden EN IEC 60947-5-2:2020

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60947-5-2, Fourth edition, 2019 - Low-voltage switchgear and controlgear - Part 5-2: Control circuit devices and switching elements - Proximity switches**

utarbetad inom International Electrotechnical Commission, IEC.

Standarden ska användas tillsammans med SS-EN 60947-1, utgåva 5, 2008 och dess separat utgivna tillägg.

Tidigare fastställd svensk standard SS-EN 60947-5-2, utgåva 3, 2008 och SS-EN 60947-5-2/A1, utgåva 1, 2013, gäller ej fr o m 2023-03-27.

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English Version

**Low-voltage switchgear and controlgear - Part 5-2: Control  
circuit devices and switching elements - Proximity switches  
(IEC 60947-5-2:2019)**

Appareillage à basse tension - Partie 5-2: Appareils et  
éléments de commutation pour circuits de commande -  
DéTECTEURS de proximité  
(IEC 60947-5-2:2019)

Niederspannungsschaltgeräte - Teil 5-2: Steuergeräte und  
Schaltelemente - Näherungsschalter  
(IEC 60947-5-2:2019)

This European Standard was approved by CENELEC on 2019-11-22. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

## European foreword

The text of document 121A/313/FDIS, future edition 4 of IEC 60947-5-2, prepared by SC 121A "Low-voltage switchgear and controlgear" of IEC/TC 121 "Switchgear and controlgear and their assemblies for low voltage" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60947-5-2:2020.

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) 2020-09-27
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-03-27

This document supersedes EN 60947-5-2:2007 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directives see informative Annexes ZZA and ZZB, which are an integral part of this document.

## Endorsement notice

The text of the International Standard IEC 60947-5-2:2019 was approved by CENELEC as a European Standard without any modification.

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

IEC 60825 (series)	NOTE	Harmonized as EN 60825 (series)
IEC 61000-3-2:2018	NOTE	Harmonized as EN IEC 61000-3-2:2019 (not modified)
IEC 61000-3-3:2013	NOTE	Harmonized as EN 61000-3-3:2013 (not modified)
IEC 61000-3-3:2013/A1:2017	NOTE	Harmonized as EN 61000-3-3:2013/A1:2019 (not modified)
IEC 61076-2-101	NOTE	Harmonized as EN 61076-2-101
IEC 61076-2-104	NOTE	Harmonized as EN 61076-2-104
IEC 61076-2-105	NOTE	Harmonized as EN 61076-2-105
IEC 62471:2006	NOTE	Harmonized as EN 62471:2008 (modified)
IEC 62683-1:2017	NOTE	Harmonized as EN 62683-1:2017 (not modified)
ISO 7010	NOTE	Harmonized as EN ISO 7010

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where 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](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-6	2007	Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60068-2-14	2009	Environmental testing – Part 2-14: Tests – Test N: Change of temperature	EN 60068-2-14	2009
IEC 60068-2-27	2008	Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock	EN 60068-2-27	2009
IEC 60068-2-30	2005	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)	EN 60068-2-30	2005
IEC 60364	series	Low-voltage electrical installations	HD 60364	series
IEC 60445	2017	Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors	EN 60445	2017
IEC 60695-2-10	2013	Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods - Glow-wire apparatus and common test procedure	EN 60695-2-10	2013
IEC 60695-2-11	2014	Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end-products (GWEPT)	EN 60695-2-11	2014
IEC 60695-2-12	2010	Fire hazard testing - Part 2-12: Glowing/hot-wire based test methods - Glow-wire flammability index (GWFI) test method for materials	EN 60695-2-12	2010
+ A1	2014		+ A1	2014

# EN IEC 60947-5-2:2020 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60825-1	2014	Safety of laser products - Part 1: Equipment classification and requirements	EN 60825-1	2014
			+ AC	2017
IEC 60947-1	2007	Low-voltage switchgear and controlgear - Part 1: General rules	EN 60947-1	2007
+ A1	2010		+ A1	2011
+ A2	2014		+ A2	2014
IEC 61000-4-2	2008	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	2009
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
+ A1	2007		+ A1	2008
+ A2	2010		+ A2	2010
IEC 61000-4-4	2012	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2012
IEC 61000-4-6	2013	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio- frequency fields	EN 61000-4-6	2014
			+ AC	2015
IEC 61000-4-8	2009	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EC 61000-4-8	2010
IEC 61000-4-11	2004	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	2004
+ A1	2017		+ A1	2017
IEC 61000-4-13	2002	Electromagnetic compatibility (EMC) - Part 4-13: Testing and measurement techniques - Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests	EN 61000-4-13	2002
+ A1	2009		+ A1	2009
+ A2	2015		+ A2	2016
IEC 61076-2	series	Connectors for electronic equipment – Product requirements – Part 2: Circular connectors	EN 61076-2	series
IEC 61140	-	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2016

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62443	series	Security for industrial automation and control systems	EN 62443	series
IEC 62471	series	Photobiological safety of lamps and lamp systems	EN 62471	series
IEC TR 62471-2	2009	Photobiological safety of lamps and lamp systems - Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety	-	-
CISPR 11 (mod)	2015	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement	EN 55011	2016
+ A1	2016		+ A1	2017
IEC Guide 117	2010	Electrotechnical equipment - Temperatures of touchable hot surfaces	CLC Guide 29	2007

## CONTENTS

FOREWORD .....	9
1 Scope .....	12
2 Normative references .....	13
3 Terms and definitions .....	14
3.1 Basic terms and definitions .....	17
3.2 Parts of a proximity switch .....	18
3.3 Operation of a proximity switch .....	20
3.4 Switching element characteristics .....	22
4 Classification .....	24
4.1 General .....	24
4.2 Classification according to sensing means .....	26
4.3 Classification according to the mechanical installation .....	26
4.4 Classification according to the construction form and size .....	26
4.5 Classification according to switching element function .....	26
4.6 Classification according to type of output .....	26
4.7 Classification according to method of connection .....	26
5 Characteristics .....	26
5.1 General .....	26
5.1.1 Summary of characteristics .....	26
5.1.2 Operation of an inductive or capacitive proximity switch .....	26
5.1.3 Operation of an ultrasonic proximity switch .....	27
5.1.4 Operation of a photoelectric proximity switch .....	27
5.1.5 Operation of a magnetic proximity switch .....	27
5.2 Operating conditions .....	27
5.2.1 Operating conditions of inductive and capacitive proximity switches .....	27
5.2.2 Operating distance (s) of an ultrasonic proximity switch .....	28
5.2.3 Operating distance (s) of a photoelectric proximity switch .....	29
5.3 Rated and limiting values for the proximity switch and switching element(s) .....	31
5.3.1 Voltages .....	31
5.3.2 Currents .....	31
5.3.3 Rated supply frequency .....	32
5.3.4 Frequency of operating cycles (f) .....	32
5.3.5 Normal load and abnormal load characteristics .....	32
5.3.6 Short-circuit characteristics .....	32
5.4 Utilization categories for the switching element .....	32
6 Product information .....	33
6.1 Nature of information – Identification .....	33
6.2 Marking .....	34
6.2.1 General .....	34
6.2.2 Terminal identification and marking .....	34
6.2.3 Functional markings .....	34
6.3 Instructions for installation, operation and maintenance .....	34
6.4 Environmental information .....	35
6.4.1 Environmentally conscious design process (ECD process) .....	35



6.4.2	Procedure to establish material declaration .....	35
7	Normal service, mounting and transport conditions .....	35
7.1	Normal service conditions .....	35
7.1.1	General .....	35
7.1.2	Ambient air temperature .....	35
7.1.3	Altitude .....	36
7.1.4	Climatic conditions .....	36
7.2	Conditions during transport and storage .....	36
7.3	Mounting .....	36
8	Constructional and performance requirements .....	36
8.1	Constructional requirements .....	36
8.1.1	Materials .....	36
8.1.2	Current-carrying parts and their connections .....	37
8.1.3	Clearances and creepage distances .....	38
8.1.4	Actuation .....	38
8.1.5	Void .....	38
8.1.6	Void .....	38
8.1.7	Terminals .....	38
8.1.8	Void .....	40
8.1.9	Provisions for protective earthing .....	40
8.1.10	Degree of protection .....	40
8.1.11	Requirements for proximity switches with integrally connected cables .....	40
8.1.12	Class II proximity switches .....	41
8.1.13	Chemical stress .....	41
8.1.14	Equipment design .....	41
8.1.15	Protection against artificial optical radiation .....	41
8.1.16	Biological and chemical effects .....	42
8.1.17	Unattended operation .....	42
8.1.18	Safety related security .....	42
8.1.19	Requirements for embedded software .....	42
8.2	Performance requirements .....	42
8.2.1	Operating conditions .....	42
8.2.2	Temperature-rise .....	46
8.2.3	Dielectric properties .....	47
8.2.4	Ability to make and break under normal load and abnormal load conditions .....	48
8.2.5	Conditional short-circuit current .....	49
8.2.6	Electromagnetic compatibility (EMC) .....	49
8.3	Physical dimensions .....	53
8.4	Shock and vibration and special environmental conditions .....	53
8.4.1	Shock .....	53
8.4.2	Vibration .....	53
8.4.3	Results to be obtained .....	53
8.4.4	Special environmental conditions – damp heat, salt mist, vibration and shock .....	54
9	Tests .....	54
9.1	Kinds of tests .....	54
9.1.1	General .....	54
9.1.2	Type tests .....	54

9.1.3	Routine tests .....	54
9.1.4	Sampling tests .....	54
9.1.5	Special tests .....	54
9.2	Compliance with constructional requirements .....	55
9.2.1	General .....	55
9.2.2	Materials .....	55
9.3	Performances .....	55
9.3.1	Test sequences .....	55
9.3.2	General test conditions .....	56
9.3.3	Performance under no load, normal load and abnormal load condition .....	58
9.3.4	Performance under short-circuit current conditions .....	64
9.4	Testing of operating distances .....	65
9.4.1	Inductive, capacitive, non-mechanical magnetic and ultrasonic proximity switches .....	65
9.4.2	Photoelectric proximity switches .....	66
9.5	Testing for the frequency of operating cycles .....	69
9.5.1	General .....	69
9.5.2	Method for measuring the frequency of operating cycles .....	70
9.5.3	Results to be obtained .....	72
9.5.4	Photoelectric proximity switches .....	72
9.6	Verification of the electromagnetic compatibility .....	74
9.6.1	General .....	74
9.6.2	Immunity .....	74
9.6.3	Emission .....	75
9.7	Test results and test report .....	75
Annex A (informative)	Typical dimensions and operating distances of proximity switches .....	76
A.1	MODEL IA, IB – INDUCTIVE CYLINDRICAL PROXIMITY SWITCHES WITH THREADED BARREL (IA) OR SMOOTH BARREL (IB) WITH CABLE OR CONNECTOR .....	76
A.1.1	(IA, IB) Dimensions .....	76
A.1.2	(IA, IB) Rated operating distances .....	79
A.1.3	(IA, IB) Installation (mounting) threaded barrel (IA) and smooth barrel (IB) .....	80
A.1.4	(IA, IB) Frequency of operating cycles ( <i>f</i> ) .....	80
A.2	MODEL IC – INDUCTIVE RECTANGULAR PROXIMITY SWITCHES WITH SQUARE CROSS-SECTION .....	81
A.2.1	(IC) Dimensions .....	81
A.2.2	(IC) Rated operating distance .....	83
A.2.3	(IC) Installation (mounting) .....	84
A.2.4	(IC) Frequency of operating cycles ( <i>f</i> ) .....	85
A.3	MODEL ID – INDUCTIVE RECTANGULAR PROXIMITY SWITCHES WITH RECTANGULAR CROSS-SECTION .....	86
A.3.1	(ID) Dimensions .....	86
A.3.2	(ID) Installation (mounting) .....	87
A.3.3	(IC) Frequency of operating cycles ( <i>f</i> ) .....	88
A.4	MODEL IX (IN, IS, FLATPACK, CUBICAL INDUCTIVE RECTANGULAR AND CUBICAL PROXIMITY SWITCHES WITH SMALL SIZES) .....	88

A.4.1	(IX) Dimensions .....	88
A.4.2	(Flatpack) Dimensions .....	89
A.4.3	(Cubical) Dimensions .....	90
A.4.4	(IX) Rated operating distance .....	92
A.4.5	(IX) Installation (mounting) .....	92
A.4.6	(IX) Frequency of operating cycles ( $f$ ) .....	92
A.5	MODEL CA – CAPACITIVE CYLINDRICAL PROXIMITY SWITCHES WITH THREADED BARREL .....	93
A.5.1	(CA) Dimensions .....	93
A.5.2	(CA) Rated operating distance ( $s_n$ ) .....	94
A.5.3	(CA) Installation (mounting) .....	94
A.5.4	(CA) Frequency of operating cycles ( $f$ ) .....	95
A.6	MODEL CB – CAPACITIVE PROXIMITY SWITCHES WITH SMOOTH BARREL .....	95
A.7	MODEL CC – CAPACITIVE RECTANGULAR PROXIMITY SWITCHES WITH SQUARE CROSS-SECTION .....	95
A.7.1	(CC) Dimensions .....	95
A.7.2	(CC) Rated operating distances ( $s_n$ ) .....	96
A.7.3	(CC) Installation (mounting) .....	97
A.7.4	(CC) Frequency of operating cycles ( $f$ ) .....	97
A.8	MODEL CD – CAPACITIVE RECTANGULAR PROXIMITY SWITCHES WITH RECTANGULAR CROSS-SECTION .....	98
A.8.1	(CD) Dimensions .....	98
A.8.2	(CD) Rated operating distance ( $s_n$ ) .....	98
A.8.3	(CD) Installation (mounting) .....	98
A.8.4	(CD) Frequency of operating cycles ( $f$ ) .....	99
A.9	MODEL CX – CAPACITIVE PROXIMITY SWITCHES WITH OTHER FORMS, DIMENSIONS AND SMALL SIZES .....	99
A.10	MODEL UA – THREADED BARREL ULTRASONIC CYLINDRICAL PROXIMITY SWITCHES .....	99
A.10.1	(UA) Dimensions .....	99
A.10.2	(UA) Sensing range .....	100
A.10.3	(UA) Installation (mounting) .....	100
A.10.4	(UA) Frequency of operating cycles ( $f$ ) .....	100
A.11	MODEL UD – ULTRASONIC RECTANGULAR PROXIMITY SWITCHES WITH RECTANGULAR CROSS-SECTION .....	101
A.11.1	(UD) Dimensions .....	101
A.11.2	(UD) Sensing range .....	101
A.11.3	(UD) Installation (mounting) .....	101
A.11.4	(UD) Frequency of operating cycles ( $f$ ) .....	101
Annex B (normative)	Class II proximity switches insulated by encapsulation – Requirements and tests .....	102
B.1	General .....	102
B.2	Terms and definitions .....	102
B.6	Marking .....	102
B.8	Constructional and functional requirements .....	103
B.9	Tests .....	103
Annex C (normative)	Additional requirements for proximity switches with integrally connected cables .....	106
C.1	General .....	106

C.2	Terms and definitions.....	106
C.8	Constructional and performance requirements .....	106
C.9	Tests .....	107
Annex D (normative)	Integral connectors for plug-in proximity switches .....	111
Annex E (normative)	Additional requirements for proximity switches suitable for use in strong magnetic fields .....	119
E.1	Preamble .....	119
E.3	Terms and definitions.....	119
E.4	Classification .....	119
E.8	Construction and performance requirements .....	120
E.9	Tests .....	121
Annex F (informative)	Symbols for proximity switches .....	124
F.1	General.....	124
F.2	Standard symbols for proximity switches .....	124
F.3	Additional symbols for photoelectric proximity switches.....	126
F.3.1	Sensor principles .....	126
F.3.2	Optical actuation means .....	126
F.3.3	Functional symbol definitions .....	126
Bibliography	.....	128
Figure 1	Relationship between operating distances of inductive and capacitive proximity switches (see 8.2.1.3 and 9.4.1) .....	28
Figure 2	Ultrasonic proximity switch operating distances.....	28
Figure 3	Relationship between operating distances of ultrasonic proximity switches (see 8.2.1.3 and 9.4.1).....	29
Figure 4	Sensing range and operating range of photoelectric proximity switches (see 8.2.1.3 and 9.4) .....	30
Figure 5	Relationship between $U_e$ and $U_B$ .....	31
Figure 6	Method of measuring the operating distance (see 9.3.2.1 and 9.4.1) .....	57
Figure 7	Test circuit for the verification of time delay before availability (see 8.2.1.7 and 9.3.3.2.1) .....	59
Figure 8	Signal output across load in Figure 7 (see 9.3.3.2.1).....	60
Figure 9	Test circuit for the verification of minimum operational current OFF-state current, voltage drop and independent action (see 9.3.3.2.2, 9.3.3.2.3, 9.3.3.2.4 and 9.3.3.2.5) .....	61
Figure 10	Test circuit for the verification of making and breaking capability (see 9.3.3.5) .....	64
Figure 11	Short-circuit testing (see 9.3.4.2) .....	65
Figure 12	Testing of the sensing range (see 9.4.2) .....	68
Figure 13	Methods for measuring the frequency of operating cycle of inductive, capacitive and non-mechanical magnetic proximity switches (if applicable).....	70
Figure 14	Methods for measuring the frequency of operating cycles ( $f$ ), ultrasonic proximity switch .....	71
Figure 15	Output signal of direct current proximity switch during the measurement of frequency of operating cycles ( $f$ ) .....	71
Figure 16	Measurement means for turn-on time $t_{on}$ and turn-off time $t_{off}$ .....	72
Figure 17	Turn-on time $t_{on}$ measurement.....	73

Figure 18 – Turn-off time $t_{off}$ measurement .....	73
Figure A.1 – (IA) – Dimensions for threaded barrel – cable type .....	76
Figure A.2 – (IB) – Dimensions for smooth barrel – cable type .....	77
Figure A.3 – Type A dimensions – Body M5x0,5, M8x1, Ø 4, Ø 6,5 with connector M5/M8 .....	78
Figure A.4 – Type B dimensions – Body M5x0,5, M8x1, Ø 4, Ø 6,5 with connector M8/M12 .....	78
Figure A.5 – Type C dimensions – Body M12x1, M18x1, M30x1,5 with connector M12 .....	79
Figure A.6 – (IA, IB) – Installation (mounting) <sup>a</sup> .....	80
Figure A.7 – Dimensions of Type I1C26 (in millimetres) .....	82
Figure A.8 – Dimensions of Types I2C40 and I1C40 (in millimetres) .....	82
Figure A.9 – Dimensions of Types I2IMC and I1IMC (IMC) 40 x 40 (cube) .....	83
Figure A.10 – Installation of a I1C proximity switch in damping material.....	84
Figure A.11 – (IC) Installation of I2C in damping material <sup>a</sup> .....	85
Figure A.12 – (ID) Dimensions .....	86
Figure A.13 – (IDC) Dimensions.....	87
Figure A.14 – (ID) Installation in damping material.....	88
Figure A.15 – (IN) with cable or connector M8 entry.....	89
Figure A.16 – (IS) with cable or connector M8 entry.....	89
Figure A.17 – (Flatpack) with cable or connector M8 entry.....	90
Figure A.18 – (5 mm x 5 mm) Cubical with cable.....	91
Figure A.19 – (8 mm x 8 mm) Cubical with cable.....	91
Figure A.20 – (8 mm x 8 mm) Cubical with M8 connector.....	92
Figure A.21 – (CA) Dimensions.....	93
Figure A.22 – (CA) Installation (mounting) .....	95
Figure A.23 – Model CC Dimensions.....	96
Figure A.24 – (CC) Installation (mounting) .....	97
Figure A.25 – (CD) Dimensions in millimetres .....	98
Figure A.26 – (CD) Installation (mounting) .....	99
Figure A.27 – (UA) Dimensions.....	100
Figure A.28 – (UD) Dimensions of Type D80.....	101
Figure B.1 – Encapsulated device.....	103
Figure B.2 – Test device .....	105
Figure D.1 – M12 thread 3-pin integral connector for AC proximity switches .....	111
Figure D.2 – M12 thread 5-pin integral connector for DC proximity switches .....	112
Figure D.3 – 8 mm thread 3-pin integral connector for DC proximity switches .....	113
Figure D.4 – 8 mm thread 4-pin integral connector for DC proximity switches .....	114
Figure D.5 – M12 thread 4-pin integral connector for AC proximity switches .....	115
Figure D.6 – M12 thread 5-pin integral connector for AC proximity switches .....	116
Figure D.7 – M12 thread 6-pin integral connector for AC proximity switches .....	117
Figure D.8 – M5 thread 4-pin/3-pin integral connector for DC proximity switches .....	118
Figure E.1 – Examples of test configuration for verification of the immunity to an alternating field.....	122

Figure E.2 – Example of test configuration for verification of the immunity in a constant magnetic field .....	123
Figure F.1 – Examples of symbols for proximity switches .....	125
Figure F.2 – Examples of symbols for proximity switches .....	127
Table 1 – Classification of proximity switches .....	25
Table 2 – Cross reference between active optical signal and output function .....	27
Table 3 – Utilization categories for switching elements .....	33
Table 4 – Test conditions for glow-wire test .....	37
Table 5 – Connection and wiring identification .....	39
Table 6 – Burn threshold .....	47
Table 7 – Verification of making and breaking capacities of switching elements under normal conditions corresponding to the utilization categories <sup>a</sup> .....	48
Table 8 – Verification of making and breaking capacities of switching elements under abnormal conditions corresponding to the utilization categories <sup>a</sup> .....	49
Table 9 – Acceptance criteria .....	50
Table 10 – Immunity tests (1 of 2) .....	51
Table 11 – Target sizes of ultrasonic proximity switches .....	57
Table 12 – Test voltages .....	63
Table A.1 – (IA, IB) – Preferred and secondary series smooth and threaded barrel cable types .....	77
Table A.2 – (IA) – Dimensions of nuts .....	77
Table A.3 – (Types A, B, C) – Preferred and secondary series, smooth and threaded barrel connector types .....	79
Table A.4 – (IA, IB) – Rated operating distances .....	80
Table A.5 – (IA, IB) – Frequency of operating cycles ( <i>f</i> ) in operating cycles per second – Minimum requirements .....	81
Table A.6 – (IC) – Rated operating distance .....	84
Table A.7 – (IC) – Frequency of operating cycles ( <i>f</i> ) in operating cycles per second – Minimum requirements .....	85
Table A.8 – (ID) – Dimensions .....	86
Table A.9 – (IC) – Frequency of operating cycles ( <i>f</i> ) in operating cycles per second – Minimum requirements .....	88
Table A.10 – (IX) – Rated operating distances IN, IS, flatpack, cubical .....	92
Table A.11 – (IX) – Frequency of operating cycles IN, IS, flatpack and cubical ( <i>f</i> ) in operating cycles per second .....	93
Table A.12 – (CA) – Dimensions .....	94
Table A.13 – (CA) – Rated operating distances .....	94
Table A.14 – (CC) – Rated operational distance .....	97
Table A.15 – (UA) – Dimensions .....	100
Table C.1 – Material characteristics .....	107
Table C.2 – Examples of standard cable types .....	108
Table C.3 – Tensile forces .....	109

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –****Part 5-2: Control circuit devices and switching elements –  
Proximity switches**

## FOREWORD

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International Standard IEC 60947-5-2 has been prepared by subcommittee 121A: Low-voltage switchgear and controlgear, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage.

This fourth edition cancels and replaces the third edition published in 2007 and Amendment 1:2012. This edition constitutes a technical revision.

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

- update of the scope;
- adaptation and update of the construction requirements according to IEC Guide 116 (e.g. material requirements, artificial optical radiation, instruction requirements, hot surface, unattended operation, foreseeable misuse...);
- modification of the specifications concerning the sensing range and operating distance;

- new definitions for photoelectric proximity switch type D with background suppression;
- integration of the requirements and test procedures of photoelectric proximity switch type D with background suppression;
- update of EMC requirements in Table 9 and Table 10;
- integration of environmental information requirements and environmental condition by referencing Annexes O, W and Q of IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010 and IEC 60947-1:2007/AMD2:2014;
- modification of impulse withstand voltage test (5.3.1.3, 9.3.3.4.5);
- modification of the references in the (normative) standard body to the (informative) Annex A;
- major update of Annex A (definitions update, new dimensions and shapes);
- update of C.9.1.1;
- update of Annex D in order to consider new connector types and normative references;
- update of Annex F (additional symbols for photoelectric proximity switches).

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

FDIS	Report on voting
121A/313/FDIS	121A/322/RVD

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 60947 series, under the general title *Low-voltage switchgear and controlgear*, can be found on the IEC website.

This International Standard should be used in conjunction with IEC 60947-1:2007, IEC 60947-1:2007/AMD1:2010 and IEC 60947-1:2007/AMD2:2014.

The provisions of the general rules, IEC 60947-1, are applicable to this document, where specifically called for. General rules, clauses and subclauses thus applicable, as well as tables, figures and annexes are identified by a reference to IEC 60947-1, for example 1.2.3, Table 4 or Annex A of IEC 60947-1:2007.

The following differing practices of a less permanent nature exist in the countries indicated below.

- 8.1.7.3: recommendations are given in the National US Electrical Code about connections means;
- 8.1.7.4: in the United States of America, there are other documents that define conductor colour coding schemes that can apply to the installation of proximity switches;
- 8.1.15.2: for European Union Countries: in certain ranges the defined limits of exposure values in IEC 60825-1:2014 exceed the requirements of the European directive 2006/25/EC Directive on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation).



The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document 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 SWITCHGEAR AND CONTROLGEAR –**

### **Part 5-2: Control circuit devices and switching elements – Proximity switches**

#### **1 Scope**

This part of IEC 60947 applies to inductive and capacitive proximity switches that sense the presence of metallic and/or non-metallic objects, ultrasonic proximity switches that sense the presence of sound reflecting objects, photoelectric proximity switches that sense the presence of objects and non-mechanical magnetic proximity switches that sense the presence of objects with a magnetic field.

Products covered by the scope of this document are not subjected to defined behaviours under fault conditions. Proximity switches with defined behaviour are covered by IEC 60947-5-3 and have to fulfil additional requirements.

These proximity switches are self-contained, have semiconductor switching element(s) and are intended to be connected to circuits, the rated voltage of which does not exceed 250 V 50 Hz/60 Hz AC RMS or 300 V DC.

Examples of typical applications for in-scope products:

- factory automation and machinery industry;
- logistic and packaging industry;
- conveyor belts, lifts;
- process industry;
- power plants.

Special applications (e.g. corrosive atmosphere) can cause additional requirements.

This document is not intended to cover proximity switches with analogue outputs.

The object of this document is to state for proximity switches:

- definitions;
- classification;
- characteristics;
- product information;
- normal service, mounting and transport conditions;
- constructional and performance requirements;
- tests to verify rated characteristics.

Products covered by the scope of this document are expected to be selected, installed, and maintained by skilled personnel only.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

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

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 60445:2017, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC 60695-2-10:2013, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-2-12:2010, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability index (GWFI) test method for materials*

IEC 60695-2-12:2010/AMD1:2014

IEC 60825-1:2014, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-1:2007/AMD1:2010

IEC 60947-1:2007/AMD2:2014

IEC 60947-5-3, *Low-voltage switchgear and controlgear – Part 5-3: Control circuit devices and switching elements – Requirements for proximity devices with defined behaviour under fault conditions (PDDB)*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-3:2006/AMD1:2007

IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-11:2004/AMD1:2017

IEC 61076-2 (all parts), *Connectors for electronic equipment – Product requirements – Part 2: Circular connectors*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 62443 (all parts), *Industrial communication networks – Network and system security*

IEC 62471 (all parts), *Photobiological safety of lamps and lamp systems*

IEC TR 62471-2:2009, *Photobiological safety of lamps and lamp systems – Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 11:2015/AMD1:2016

IEC Guide 117:2010, *Electrotechnical equipment – Temperatures of touchable hot surfaces*

EN 10084:2008, *Case hardening steels – Technical delivery conditions*