ICS 29.130.20 SLOVENSKÁ TECHNICKÁ NORMA Máj 2021

STN	**Nízkonapäťové spínacie a riadiace zariadenia Časť 1: Všeobecné pravidlá**	**STN EN IEC 60947-1 35 4101**

Low-voltage switchgear and controlgear - Part 1: General rules

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 04/21

Obsahuje: EN IEC 60947-1:2021, IEC 60947-1:2020

Oznámením tejto normy sa od 19.02.2024 ruší
STN EN 60947-1 (35 4101) z júna 2008

132651

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 60947-1

February 2021

ICS 29.130.20

Supersedes EN 60947-1:2007 and all of its amendments and corrigenda (if any)

English Version

Low-voltage switchgear and controlgear - Part 1: General rules (IEC 60947-1:2020)

Appareillage à basse tension - Partie 1: Règles générales (IEC 60947-1:2020)

Niederspannungsschaltgeräte - Teil 1: Allgemeine Festlegungen (IEC 60947-1:2020)

This European Standard was approved by CENELEC on 2020-05-27. 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/337/FDIS, future edition 6 of IEC 60947-1, 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 60947-1:2021.

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) 2021-08-19
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-02-19

This document supersedes EN 60947-1:2007 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 Directive(s) see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 60947-1:2020 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 60034-12:2016	NOTE	Harmonized as EN 60034-12:2017 (not modified)
IEC 60068 (series)	NOTE	Harmonized as EN 60068 (series)
IEC 60079 (series)	NOTE	Harmonized as EN IEC 60079 (series)
IEC 60112	NOTE	Harmonized as EN IEC 60112
IEC 60364-4-44:2007	NOTE	Harmonized as HD 60364-4-444:2010 (modified)
IEC 60364-4-44:2007/A1:2015	NOTE	Harmonized as HD 60364-4-443:2016 (modified)
IEC 60664-3	NOTE	Harmonized as EN 60664-3
IEC 60695-11-5:2016	NOTE	Harmonized as EN 60695-11-5:2017 (not modified)
IEC 60721 (series)	NOTE	Harmonized as EN 60721 (series)
IEC 60721-3 (series)	NOTE	Harmonized as EN 60721-3 (series)
IEC 60721-3-0	NOTE	Harmonized as EN IEC 60721-3-0
IEC 60947 (series)	NOTE	Harmonized as EN IEC 60947 (series)

IEC 60947-3	NOTE	Harmonized as EN 60947-3
IEC 60947-4-1	NOTE	Harmonized as EN IEC 60947-4-1
IEC 60947-4-3	NOTE	Harmonized as EN 60947-4-3
IEC 60947-5-2	NOTE	Harmonized as EN IEC 60947-5-2
IEC 60947-5-3	NOTE	Harmonized as EN 60947-5-3
IEC 60947-5-5	NOTE	Harmonized as EN 60947-5-5
IEC 60947-5-7	NOTE	Harmonized as EN 60947-5-7
IEC 60947-6-1	NOTE	Harmonized as EN 60947-6-1
IEC 60947-6-2	NOTE	Harmonized as EN 60947-6-2
IEC 60947-7-1:2009	NOTE	Harmonized as EN 60947-7-1:2009 (not modified)
IEC 60998-2-2:2002	NOTE	Harmonized as EN 60998-2-2:2004 (modified)
IEC 61095	NOTE	Harmonized as EN 61095
IEC 61293	NOTE	Harmonized as EN IEC 61293
IEC 61439-1:2011	NOTE	Harmonized as EN 61439-1:2011 (not modified)
IEC 61508 (series)	NOTE	Harmonized as EN 61508 (series)
IEC 61508-3	NOTE	Harmonized as EN 61508-3
IEC 61508-6	NOTE	Harmonized as EN 61508-6
IEC 62075:2012	NOTE	Harmonized as EN 62075:2012 (not modified)
IEC 62208:2011	NOTE	Harmonized as EN 62208:2011 (not modified)
IEC 62430:2009	NOTE	Harmonized as EN 62430:2009 (not modified)
IEC 62443 (series)	NOTE	Harmonized as EN IEC 62443 (series)
IEC/IEEE 82079-1	NOTE	Harmonized as EN IEC/IEEE 82079-1
ISO 13715:2017	NOTE	Harmonized as EN ISO 13715:2019 (not modified)
ISO 14001:2015	NOTE	Harmonized as EN ISO 14001:2015 (not modified)
ISO 14020	NOTE	Harmonized as EN ISO 14020
ISO 14021	NOTE	Harmonized as EN ISO 14021
ISO 14024	NOTE	Harmonized as EN ISO 14024
ISO 14025	NOTE	Harmonized as EN ISO 14025
ISO 14040:2006	NOTE	Harmonized as EN ISO 14040:2006 (not modified)
ISO 14063	NOTE	Harmonized as EN ISO 14063
ISO 50001:2018	NOTE	Harmonized as EN ISO 50001:2018 (not modified)

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.

Publication	Year	Title	EN/HD	Year
IEC 60038 (mod)	2009	IEC standard voltages	EN 60038	2011
IEC 60068-1	2013	Environmental testing - Part 1: General and guidance	EN 60068-1	2014
IEC 60068-2-1	2007	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	2007
IEC 60068-2-2	2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	2007
IEC 60068-2-6	2007	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	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 60068-2-52	1996	Environmental testing - Part 2: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)	EN 60068-2-52	1996
IEC 60068-2-78	2012	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	EN 60068-2-78	2013
IEC 60073	2002	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators	EN 60073	2002
IEC 60085	2007	Electrical insulation - Thermal evaluation and designation	EN 60085	2008
IEC 60092-504	2016	Electrical installations in ships - Part 504: Automation, control and instrumentation	-	-

Publication	Year	Title	EN/HD	Year
IEC 60216-2	-	Electrical insulating materials - Thermal endurance properties - Part 2: Determination of thermal endurance properties of electrical insulating materials - Choice of test criteria	EN 60216-2	2005
IEC 60228	2004	Conductors of insulated cables	EN 60228	2005
-	-		+AC	2005
IEC 60269-1	2006	Low-voltage fuses - Part 1: General requirements	EN 60269-1	2007
+ A1	2009		+ A1	2009
+ A2	2014		+ A2	2014
IEC 60300-3-5	2001	Dependability management - Part 3-5: Application guide - Reliability test conditions and statistical test principles	-	-
IEC/TR 60344	2007	Calculation of d.c. resistance of plain and coated copper conductors of low-frequency cables and wires – Application guide	-	-
IEC 60417	-	Graphical symbols for use on equipment	-	-
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 60447	2004	Basic and safety principles for man-machine interface, marking and identification – Actuating principles	EN 60447	2004
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
+ A1	1999		+ A1	2000
+ A2	2013		+ A2	2013
-	-		+ AC	1993
-	-		+ AC	2016
IEC 60617	-	Graphical symbols for diagrams	-	-
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
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) (IEC 60695-2-11:2014)	EN 60695-2-11	2014

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Publication	Year	Title	EN/HD	Year
IEC 60695-2-12	-	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
IEC 60695-11-10	2013	Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods	EN 60695-11-10	2013
-	-		+ AC	2014
IEC 60947-2	2016	Low-voltage switchgear and controlgear - Part 2: Circuit-breakers	EN 60947-2	2017
+ CORR1	2016		-	-
+A1	2019		-	
IEC 60947-4-2	-	Low-voltage switchgear and controlgear - Part 4-2: Contactors and motor-starters - AC semiconductor motor controllers and starters	EN 60947-4-2	2012
IEC 60947-5	all parts	Low-voltage switchgear and controlgear –: Control circuit devices and switching elements	EN 60947-5	series
IEC 60947-5-1	-	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices	EN 60947-5-1	2017
IEC 60947-8	-	Low-voltage switchgear and controlgear - Part 8: Control units for built-in thermal protection (PTC) for rotating electrical machines	EN 60947-8	2003
-	-		+ A1	2006
-	-		+ A2	2012
IEC 60981	2019	Extra heavy-duty electrical rigid steel conduits	-	-
IEC 60999-1	1999	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)	EN 60999-1	2000
IEC 60999-2	2003	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units - Part 2: Particular requirements for clamping units for conductors above 35 mm² up to 300 mm² (included)	EN 60999-2	2003
IEC 61000-4-2	2008	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	2009

Publication	Year	Title	EN/HD	Year
IEC 61000-4-3	-	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
-	-		+ A1	2008
-	-		+ A2	2010
IEC 61000-4-4	-	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2012
IEC 61000-4-5	-	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2014
-	-		+ A1	2017
IEC 61000-4-6	-	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	-	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8	2010
IEC 61000-4-11	-	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
IEC 61000-4-34	-	Electromagnetic compatibility (EMC) - Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase	EN 61000-4-34	2007
			+ A1	2009
IEC 61000-6-2	2016	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments	EN IEC 61000-6-2	2019
IEC 61000-6-5	-	Electromagnetic compatibility (EMC) - Part 6-5: Generic standards - Immunity for equipment used in power station and substation environment	EN 61000-6-5	2015
-	-		+ AC	2018
IEC 61131-2	2017	Programmable controllers - Part 2: Equipment requirements and tests	EN 61131-2	2007
IEC 61140	2016	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2016

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Publication	Year	Title	EN/HD	Year
IEC 61180	2016	High-voltage test techniques for low-voltage equipment - Definitions, test and procedure requirements, test equipment	EN 61180	2016
IEC 61439	all parts	Low-voltage switchgear and controlgear assemblies	EN 61439	series
IEC 61508	all parts	Functional safety of electrical/electronic/programmable electronic safety-related systems	EN 61508	series
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	EN 61557-2	2007
IEC 61649	2008	Weibull analysis	EN 61649	2008
IEC 62061	2005	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems	EN 62061	2005
+ A1	2012		+ A1	2013
+ A2	2015		+ A2	2016
IEC 62474	2018	Material declaration for products of and for the electrotechnical industry	EN IEC 62474	2019
CISPR 11 (mod)	-	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	EN 55011	2016
			+ A1	2017
CISPR 32	-	Electromagnetic compatibility of multimedia equipment - Emission Requirements	EN 55032	2015
-	-		+ AC	2016
ISO 3864-2	2016[1]	Graphical symbols - Safety colours and safety signs - Part 2: Design principles for product safety labels	-	-
ISO 7000	2019	Graphical symbols for use on equipment -- Registered symbols	-	-
ISO 13849-1	2015	Safety of machinery -- Safety-related parts of control systems -- Part 1: General principles for design	-	-

[1] Dated, as no equivalent European Standard exists.

Annex ZZA
(informative)

Relationship between this European standard and the essential requirements of Directive 2014/30/EU [2014 OJ L96] aimed to be covered

This European standard has been prepared under a Commission's standardisation request as regards harmonised standards in support of Directive 2014/30/EU relating to electromagnetic compatibility, 'M/552' / C(2016) 7641 final of 30.11.2016, to provide one voluntary means of conforming to essential requirements of Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZZA.1 — Correspondence between this European standard and Annex I of Directive 2014/30/EU [2014 OJ L96]

Essential requirements of Directive 2014/30/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
Annex I. 1(a) (electromagnetic compatibility), disturbances	8.3.1, 8.3.3, 9.4.1, 9.4.3, Q.3.1; Table Q.1[m]	When this standard in sub-clause 8.3.3 normatively references EN 55032 for emission requirements the following applies: *With respect to Clause 11 of EN 55032 (Measurement uncertainty), the following shall not be applied if Clause 5 of EN 55032 (Requirements) is applied for the purposes of the presumption of conformity: "Refer to CISPR TR 16-4-3 for guidance on the applicability of the limits to a series production MME*"".
Annex I. 1(b) (electromagnetic compatibility), immunity	8.3.1, 8.3.2, 9.4.1, 9.4.2	

WARNING 1: Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2: Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Annex ZZB
(informative)

Relationship between this European standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European standard has been prepared under a Commission's standardization request relating to harmonized standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZB.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.

Table ZZB.1 — Correspondence between this European standard and Annex I of Directive 2014/35/EU [2014 OJ L96]

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks/note
1 a)	2, 3, 4, 5, 6, 8, Annex A, Annex C, Annex D, Annex E, Annex H, Annex K, Annex L, Annex O, Annex P, Annex Q, Annex S, Annex T, Annex U, Annex V, Annex W, Annex X	
1 b)	2, 3, 5, 6, 7, 8, 9, Annex A, Annex C, Annex D, Annex G, Annex H, Annex L, Annex N, Annex P, Annex S, Annex U, Annex V, Annex X	
1 c)	1, 2, 3, 5, 6, 7, 8, 9, Annex A, Annex D, Annex J, Annex K, Annex L, Annex P, Annex Q, Annex W, Annex X	
2 a)	2, 3, 5, 6, 8, 9, Annex C, Annex G, Annex H, Annex N, Annex R	
2 b)	2, 3, 5, 6, 8.1, 9, Annex E, Annex M	
2 c)	1, 2, 3, 5, 6, 7, 8, Annex K, Annex M, Annex O, Annex Q, Annex W	
2 d)	2, 3, 5, 6, 8, 9, Annex C, Annex G, Annex H, Annex K, Annex M, Annex N, Annex Q, Annex R, Annex T	
3 a)	2, 3, 5, 6, 7, 8, 9, Annex C, Annex Q	

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks/note
3 b)	2, 3, 5, 6, 7, 8, 9, Annex C, Annex G, Annex H, Annex J, Annex K, Annex M, Annex S, Annex X	
3 c)	2, 3, 5, 6, 8, 9, Annex D, Annex E, Annex F, Annex J, Annex M, Annex P, Annex X	

WARNING 1: Presumption of conformity stays valid only as long as a reference to this European standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2: Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

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Edition 6.0 2020-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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Appareillage à basse tension – Partie 1: Règles générales

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Edition 6.0 2020-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Low-voltage switchgear and controlgear – Part 1: General rules

Appareillage à basse tension – Partie 1: Règles générales

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 1: General rules

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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8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
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 60947-1 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 sixth edition cancels and replaces the fifth edition published in 2007, Amendment 1:2010 and Amendment 2:2014. This edition constitutes a technical revision.

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

– DC values testing improvement;
– update of EMC tests;
– Annex B deletion;
– update of requirements for environmental tests (Table Q.1);
– improvement of Annex R (new examples);

– deletion of digital input Type 2, and introduction of Type 3 in Annex S;

– example for materials declaration (Annex W);

– new Annex X (co-ordination between short-circuit protective devices associated in the same circuit) created.

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

FDIS	Report on voting
121A/337/FDIS	121A/344/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 the parts in the IEC 60947 series, under the general title *Low-voltage switchgear and controlgear,* can be found on the IEC website.

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

5.3.6.4 Rated conditional short-circuit current (I_q, alternatively I_{cc}) (North America)

6.2 Marking (USA and Canada)

8.1.3 Current-carrying parts and their connections (USA)

8.1.7.1 Additional constructional requirements (USA)

8.1.10.1 (North America)

9.2.6.2.2 Dependent power operation (USA)

9.2.6.2.3 Independent power operation (Canada and USA)

Figure 4 (USA and Canada)

Figure 5 (USA and Canada)

Figure 10 (USA and Canada)

Figure 11 (USA and Canada)

Figure X.4 (USA and Canada)

Figure X.5 (USA and Canada)

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website 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 publication using a colour printer.

INTRODUCTION

The purpose of this document is to harmonize as far as practicable all rules and requirements of a general nature applicable to low-voltage switchgear and controlgear in order to obtain uniformity of requirements and tests throughout the corresponding range of equipment and to avoid the need for testing to different standards.

All those parts of the various equipment standards which can be considered as general have therefore been gathered in this document together with specific subjects of wide interest and application, e.g. temperature-rise, dielectric properties, etc.

For each type of low-voltage switchgear and controlgear, only two main documents are necessary to determine all requirements and tests:

1) this document, referred to as "Part 1" or “IEC 60947-1” in the specific standards covering the various types of low-voltage switchgear and controlgear;
2) the relevant equipment standard hereinafter referred to as the "relevant product standard" or "product standard of this series".

For a general rule to apply to a specific product standard, it will be explicitly referred to by the latter, by quoting the relevant clause or subclause number of this document followed by "IEC 60947-1" e.g. "7.2.3 of IEC 60947-1:20xx".

A specific product standard will only deviate from the general rules when there is substantial technical justification.

NOTE All references to “product standards” in this document means “product standards of IEC 60947 series”.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 1: General rules

1 Scope

This document applies, when required by the relevant product standard, to low-voltage switchgear and controlgear hereinafter referred to as "equipment" or “device” and intended to be connected to circuits, the rated voltage of which does not exceed 1 000 V AC or 1 500 V DC.

This document states the general rules and common safety requirements for low-voltage switchgear and controlgear, including:

– definitions;
– characteristics;
– information supplied with the equipment;
– normal service, mounting and transport conditions, decommissioning and dismantling;
– constructional and performance requirements;
– verification of characteristics and performance;
– energy efficiency aspects (see Annex V);
– environmental aspects.

This document does not apply to:

– low-voltage switchgear and controlgear assemblies which are dealt with in IEC 61439 series, as applicable;
– terminals for connection of aluminium conductors;

NOTE Terminals for aluminium conductors are under consideration for the next revision.

– use within explosive atmospheres (see IEC 60079 series);
– software and firmware requirements for functional safety application (see IEC 61508-3);
– cyber security aspects (see IEC 62443 series).

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 60038:2009, *IEC standard voltages*

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

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

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 60068-2-52:1996, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*[1]

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60073:2002, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators*

IEC 60085:2007, *Electrical insulation – Thermal evaluation and designation*

IEC 60092-504:2016, *Electrical installations in ships – Part 504: Automation, control and instrumentation*

IEC 60216-2, *Electrical insulating materials – Thermal endurance properties – Part 2: Determination of thermal endurance properties of electrical insulating materials – Choice of test criteria*

IEC 60228:2004, *Conductors of insulated cables*

IEC 60269-1:2006, *Low-voltage fuses – Part 1: General requirements*
IEC 60269-1:2006/AMD1:2009
IEC 60269-1:2006/AMD2:2014

IEC 60300-3-5:2001, *Dependability management – Part 3-5: Application guide – Reliability test conditions and statistical test principles*

IEC TR 60344:2007, *Calculation of d.c. resistance of plain and coated copper conductors of low-frequency cables and wires – Application guide*

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 60447:2004, *Basic and safety principles for man-machine interface, marking and identification – Actuating principles*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60617, *Graphical symbols for diagrams* (available at http://std.iec.ch/iec60617)

IEC 60664-1:2007*, Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

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[1] Second edition (1996). This 2nd edition was replaced in 2017 by a 3rd Edition IEC 60068-2-52:2017, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*.

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

IEC 60695-11-10:2013, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60947-2:2016, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*
IEC 60947-2:2016/AMD1:2019

IEC 60947-4-2, *Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters*

IEC 60947-5 (all parts), *Low-voltage switchgear and controlgear – Part 5: Control circuit devices and switching elements*

IEC 60947-5-1, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 60947-8, *Low-voltage switchgear and controlgear – Part 8: Control units for built-in thermal protection (PTC) for rotating electrical machines*

IEC 60981:2019, *Extra heavy-duty electrical rigid steel conduits*

IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm^2 up to 35 mm^2 (included)*

IEC 60999-2:2003, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm^2 up to 300 mm^2 (included)*

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

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

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

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

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

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

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

IEC 61000-4-34, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase*

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-5, *Electromagnetic compatibility (EMC) – Part 6-5: Generic standards – Immunity for equipment used in power station and substation environment*

IEC 61131-2:2017, *Industrial-process measurement and control – Programmable controllers – Part 2: Equipment requirements and tests*

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61180:2016, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

IEC 61439 (all parts), *Low-voltage switchgear and controlgear assemblies*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61557-2, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 2: Insulation resistance*

IEC 61649:2008, *Weibull analysis*

IEC 62061:2005, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*
IEC 62061:2005/AMD1:2012
IEC 62061:2005/AMD2:2015

IEC 62474:2018, *Material declaration for products of and for the electrotechnical industry*

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

CISPR 32, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

ISO 3864-2, *Graphical symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels*

ISO 7000, *Graphical symbols for use on equipment – Registered symbols* (available at http://www.graphical-symbols.info/equipment)

ISO 13849-1:2015, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*