



BSI Standards Publication

Low-voltage switchgear and controlgear

Part 1: General rules

National foreword

This British Standard is the UK implementation of EN IEC 60947-1:2021. It is identical to IEC 60947-1:2020, incorporating corrigenda December 2022 and April 2024. It supersedes BS EN 60947-1:2007+A2:2014, which is withdrawn.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum December 2022 is indicated in the text by AC₁ AC₁. Text altered by IEC corrigendum April 2024 is indicated in the text by AC₂ AC₂.

The UK participation in its preparation was entrusted to Technical Committee PEL/121/1, Low voltage switchgear and controlgear.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of www.gov.uk.

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31 May 2024	Implementation of IEC corrigendum April 2024

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)

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European Committee for Electrotechnical Standardization
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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 (dop) 2021-08-19 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-02-19 document have to be withdrawn

This document supersedes EN 60947-1:2007 and all of its amendments and corrigenda (if any).

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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)

Endorsement notice to IEC corrigendum December 2022

The text of the corrigendum IEC 60947-1:2020/COR1:2022 was approved by CENELEC as EN IEC 60947-1:2021/AC:2023-01 without any modification.

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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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

EN IEC 60947-1:2021 (E)

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 mm ² up to 35 mm ² (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 mm ² up to 300 mm ² (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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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

EN IEC 60947-1:2021 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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: <i>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"</i> .
Annex I. 1(b) (electromagnetic compatibility), immunity	8.3.1, 8.3.2, 9.4.1, 9.4.2	

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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	

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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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)*

AC1 IEC 60068-2-52:2017, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)* AC1

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*

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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*

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 mm² up to 35 mm² (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 mm² up to 300 mm² (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*

3 Terms, definitions, symbols and reference clauses

3.1 General

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

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3.3 General terms and definitions

3.3.1

switchgear and controlgear

general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures

[SOURCE: IEC 60050-441:2000, 441-11-01]

3.3.2

switchgear

general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for use in connection with generation, transmission, distribution and conversion of electric energy

[SOURCE: IEC 60050-441:2000, 441-11-02]

3.3.3

controlgear

general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment, also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for the control of electric energy consuming equipment

[SOURCE: IEC 60050-441:2000, 441-11-03]

3.3.4

overcurrent

current exceeding the rated current

[SOURCE: IEC 60050-441:2000, 441-11-06]

3.3.5

short-circuit

accidental or intentional conductive path between two or more conductive parts forcing the electric potential differences between these conductive parts to be equal to or close to zero

[SOURCE: IEC 60050-195:1998, 195-04-11]

3.3.6

short-circuit current

overcurrent resulting from a short-circuit due to a fault or an incorrect connection in an electric circuit

[SOURCE: IEC 60050-441:2000, 441-11-07]

3.3.7

overload

operating conditions in an electrically undamaged circuit, which cause an overcurrent

[SOURCE: IEC 60050-441:2000, 441-11-08]

3.3.8

overload current

overcurrent occurring in an electrically undamaged circuit

3.3.9

ambient air temperature

temperature, determined under prescribed conditions, of the air surrounding the complete switching device or fuse

Note 1 to entry: For switching devices or fuses installed inside an enclosure, it is the temperature of the air outside the enclosure.

[SOURCE: IEC 60050-441:2000, 441-11-13, modified – “the” has been deleted.]

3.3.10

conductive part

part which is capable of conducting current although it may not necessarily be used for carrying service current

[SOURCE: IEC 60050-441:2000, 441-11-09, modified – “a” has been deleted.]

3.3.11

exposed conductive part

conductive part which can readily be touched and which is not normally alive, but which may become alive under fault conditions

Note 1 to entry: Typical exposed conductive parts are walls of enclosures, operating handles, etc.

[SOURCE: IEC 60050-441:2000, 441-11-10, modified – “a” has been deleted.]

3.3.12

extraneous-conductive-part

conductive part not forming part of the electrical installation and liable to introduce an electric potential, generally the electric potential of a local earth

[SOURCE: IEC 60050-195:1998, 195-06-11]

3.3.13

live part

conductive part intended to be energized in normal conditions, including a neutral conductor or mid-point conductor, but by convention not a PEN conductor or PEM conductor or PEL conductor

Note 1 to entry: This concept does not necessarily imply a risk of electric shock.

[SOURCE: IEC 60050-195:1998, 195-02-19, modified – “conductor or” deleted, “normal conditions, including a neutral conductor or mid-point conductor” replaces “normal operation, including a neutral conductor.”]

3.3.14

protective conductor

PE (identification)

conductor provided for purposes of safety, for example protection against electric shock

[SOURCE: IEC 60050-195:1998, 195-02-09]

3.3.15

neutral conductor

N (identification)

conductor electrically connected to the neutral point and capable of contributing to the distribution of electrical energy

[SOURCE: IEC 60050-195:1998, 195-02-06, modified – alternative term “N (identification)” has been added.]

3.3.16

enclosure

part providing a specified degree of protection of equipment against certain external influences and a specified degree of protection against approach to or contact with hazardous live parts and hazardous mechanical parts

[SOURCE: IEC 60050-441:2000, 441-13-01, modified – references to “of an assembly” deleted from term and definition, “hazardous live parts and hazardous mechanical parts” replaces “live parts and against contact with moving parts”.]

3.3.17

integral enclosure

enclosure which forms an integral part of the equipment

3.3.18

utilization category

<for a switching device or a fuse> combination of specified requirements related to the condition in which the switching device or the fuse fulfils its purpose, selected to represent a characteristic group of practical applications

Note 1 to entry: The specified requirements can concern e.g. the values of making capacities (if applicable), breaking capacities and other characteristics, the associated circuits and the relevant conditions of use and behaviour.

[SOURCE: IEC 60050-441:2000, 441-17-19, modified – In Note 1 to entry, “may” changed to “can”.]

3.3.19

isolation

disconnection of an installation or its discrete section from any source of the electric energy for purposes of electrical safety

3.3.20**electric shock**

physiological effect resulting from an electric current passing through a human or animal body

[SOURCE: IEC 60050-195:1998, 195-01-04]

3.3.21**manufacturer**

for the purposes of this document, any person, company or organisation with ultimate responsibility as follows:

- to verify compliance with the appropriate standard or standards;
- to provide the product information according to Clause 6

Note 1 to entry: For instance, in the case of “protected starters” assembled according to the instructions of the component providers, the manufacturer will be the entity that undertook the assembly.

3.3.22**solid insulation**

solid insulating material interposed between two conductive parts

3.3.23**insulation coordination barrier**

solid insulating material that is not an integral part, provided for the purpose of increasing either creepage distances or clearance distances or both

3.3.24**isolating distance**

<of a pole of a mechanical switching device> clearance between open contacts meeting the safety requirements specified for disconnectors

[SOURCE: IEC 60050-441:2000, 441-17-35, modified – “the” has been deleted.]

3.3.25**protective separation****electrically protective separation**

separation of one electric circuit from another by means of:

- double insulation, or
- basic insulation and electrically protective screen, or
- reinforced insulation

[SOURCE: IEC 60050-195:1998, 195-06-19, modified – “screen” replaces “screening”.]

3.3.26**line conductor**

phase conductor (in AC systems) (deprecated)

pole conductor (in DC systems) (deprecated)

conductor which is energized in normal operation and capable of contributing to the transmission or distribution of electric energy but which is not a neutral or mid-point conductor

[SOURCE: IEC 60050-195:1998, 195-02-08]

3.3.27**mid-point conductor**

conductor electrically connected to the mid-point and capable of contributing to the distribution of electric energy

[SOURCE: IEC 60050-195:1998, 195-02-07]

3.3.28

PEM conductor

conductor combining the functions of both a protective earthing conductor and a mid-point conductor

[SOURCE: IEC 60050-195:1998, 195-02-13]

3.3.29

PEN conductor

conductor combining the functions of both a protective earthing conductor and a neutral conductor

[SOURCE: IEC 60050-195:1998, 195-02-12]

3.3.30

PEL conductor

conductor combining the functions of both a protective earthing conductor and a line conductor

[SOURCE: IEC 60050-195:1998, 195-02-14]

3.3.31

maintenance

combination of all technical actions intended to retain an item in, or restore it to, a state in which it can perform as required

[SOURCE: IEC 60050-192:2015, 192-06-01, modified – “and management” and Note 1 to entry have been deleted.]

3.4 Switching devices

3.4.1

switching device

device designed to make or break the current in one or more electric circuits

Note 1 to entry: A switching device can perform one or both of these operations.

[SOURCE: IEC 60050-441:2000, 441-14-01, modified – Note 1 to entry has been added.]

3.4.2

mechanical switching device

switching device designed to close and open one or more electric circuits by means of separable contacts

Note 1 to entry: Any mechanical switching device can be designated according to the medium in which its contacts open and close, e.g.: air, SF₆, oil.

[SOURCE: IEC 60050-441:2000, 441-14-02, modified – In Note 1 to entry, “may” changed to “can”.]

3.4.3

semiconductor switching device

switching device designed to make and/or break the current in an electric circuit by means of the controlled conductivity of a semiconductor

[SOURCE: IEC 60050-441:2000, 441-14-03, modified – Addition of “and/or break”.]

3.4.4**fuse**

device that, by the fusing of one or more of its specifically designed and proportioned components, opens the circuit in which it is inserted by breaking the current when this exceeds a given value for a sufficient time

Note 1 to entry: The fuse comprises all the parts that form the complete device.

[SOURCE: IEC 60050-441:2000, 441-18-01]

3.4.5**fuse-link**

part of a fuse (including the fuse-element(s)) intended to be replaced after the fuse has operated

[SOURCE: IEC 60050-441:2000, 441-18-09]

3.4.6**fuse-element**

part of the fuse-link designed to melt under the action of current exceeding some definite value for a definite period of time

[SOURCE: IEC 60050-441:2000, 441-18-08]

3.4.7**fuse-combination unit**

combination of a mechanical switching device and one or more fuses in a composite unit, assembled by the manufacturer or in accordance with their instructions

[SOURCE: IEC 60050-441:2000, 441-14-04, modified – “his instructions” has been replaced by “their instructions” and Note 1 to entry has been deleted.]

3.4.8**disconnecter**

mechanical switching device which, in the open position, complies with the requirements specified for isolation

3.4.9**switch****mechanical switch**

mechanical switching device capable of making, carrying and breaking currents under normal circuit conditions which may include specified operating overload conditions and also carrying for a specified time currents under specified abnormal circuit conditions such as those of short-circuit

Note 1 to entry: A switch can be capable of making but not breaking short-circuit currents.

[SOURCE: IEC 60050-441:2000, 441-14-10, modified – In Note 1 to entry, “may” changed to “can”.]

3.4.10**switch-disconnector**

switch which, in the open position, satisfies the isolating requirements specified for a disconnecter

[SOURCE: IEC 60050-441:2000, 441-14-12]

3.4.11

circuit-breaker

mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions such as those of short-circuit

[SOURCE: IEC 60050-441:2000, 441-14-20, modified – "time" replaced "duration".]

3.4.12

contactor

mechanical contactor

mechanical switching device having only one position of rest, operated otherwise than by hand, capable of making, carrying and breaking currents under normal circuit conditions including operating overload conditions

Note 1 to entry: Contactors can be designated according to the method by which the force for closing the main contacts is provided.

[SOURCE: IEC 60050-441:2000, 441-14-33, modified – In term, "mechanical" in parenthesis, and in Note 1 to entry, "Mechanical" has been deleted and "may" changed to "can".]

3.4.13

semiconductor contactor

solid-state contactor

device which performs the function of a contactor by utilizing a semiconductor switching device

Note 1 to entry: A semiconductor contactor can also contain mechanical switching devices.

3.4.14

contactor relay

contactor used as a control switch

[SOURCE: IEC 60050-441:2000, 441-14-35]

3.4.15

starter

combination of all the switching means necessary to start and stop a motor, in combination with suitable overload protection

Note 1 to entry: Starters can be designated according to the method by which the force for closing the main contacts is provided.

[SOURCE: IEC 60050-441:2000, 441-14-38, modified – In Note 1 to entry, "may" changed to "can".]

3.4.16

control circuit device

electrical device, intended for the controlling, signalling, interlocking, etc. of switchgear and controlgear

Note 1 to entry: Control circuit devices can include associated devices dealt with in other standards, such as instruments, potentiometers, relays, in so far as such associated devices are used for the purposes specified.

3.4.17

control switch

<for control and auxiliary circuits> mechanical switching device which serves the purpose of controlling the operation of switchgear or controlgear, including signalling, electrical interlocking, etc.

Note 1 to entry: A control switch consists of one or more contact elements with a common actuating system.

[SOURCE: IEC 60050-441:2000, 441-14-46]

3.4.18

pilot switch

non-manual control switch actuated in response to specified conditions of an actuating quantity

Note 1 to entry: The actuating quantity can be pressure, temperature, velocity, liquid level, elapsed time, etc.

[SOURCE: IEC 60050-441:2000, 441-14-48, modified – In Note 1 to entry, “may” changed to “can”.]

3.4.19

push-button

control switch having an actuator intended to be operated by force exerted by a part of the human body, usually the finger or palm of the hand, and having stored energy (spring) return

[SOURCE: IEC 60050-441:2000, 441-14-53]

3.4.20

terminal block

insulating part carrying one or more mutually insulated terminal assemblies and intended to be fixed to a support

3.4.21

short-circuit protective device

SCPD

device intended to protect a circuit or parts of a circuit against short-circuit currents by interrupting them

3.4.22

surge arrester

device designed to protect the electrical apparatus from high transient overvoltages and to limit the duration and frequently the amplitude of the follow-on current

3.4.23

individual enclosure

enclosure designed and dimensioned to contain one equipment only

3.4.24

control and protective switching device

CPS

mechanical switching device operated other than by hand, but with or without local manual operating means, capable of:

- making, carrying and breaking currents under normal conditions, including specified operating overload conditions
- making, carrying for a specified time, and breaking currents under specified abnormal conditions such as those of short-circuits

3.5 Parts of switching devices

3.5.1

pole of a switching device

portion of a switching device associated exclusively with one electrically separated conducting path of its main circuit and excluding those portions which provide a means for mounting and operating all poles together

Note 1 to entry: A switching device is called single-pole if it has only one pole. If it has more than one pole, it can be called multipole (two-pole, three-pole, etc.) provided the poles are or can be coupled in such a manner as to operate together.

[SOURCE: IEC 60050-441:2000, 441-15-01, modified – In Note 1 to entry, “may” changed to “can”.]

3.5.2

main circuit

<of a switching device> all the conductive parts of a switching device included in the circuit which it is designed to close or open

[SOURCE: IEC 60050-441:2000, 441-15-02]

3.5.3

control circuit

<of a switching device> all the conductive parts (other than the main circuit) of a switching device which are included in a circuit used for the closing operation or opening operation, or both, of the device

[SOURCE: IEC 60050-441:2000, 441-15-03]

3.5.4

auxiliary circuit

<of a switching device> all the conductive parts of a switching device which are intended to be included in a circuit other than the main circuit and the control circuits of the device

Note 1 to entry: Some auxiliary circuits fulfil supplementary functions such as signalling, interlocking, etc., and, as such, they can be part of the control circuit of another switching device.

[SOURCE: IEC 60050-441:2000, 441-15-04, modified – In Note 1 to entry, “may” changed to “can”.]

3.5.5

contact

<of a mechanical switching device> conductive parts designed to establish circuit continuity when they touch and which, due to their relative motion during an operation, open or close a circuit or, in the case of hinged or sliding contacts, maintain circuit continuity

[SOURCE: IEC 60050-441:2000, 441-15-05]

3.5.6

contact

contact piece

one of the conductive parts forming a contact

[SOURCE: IEC 60050-441:2000, 441-15-06]

3.5.7

main contact

contact included in the main circuit of a mechanical switching device, intended to carry, in the closed position, the current of the main circuit

[SOURCE: IEC 60050-441:2000, 441-15-07]

3.5.8

arcing contact

contact on which the arc is intended to be established

Note 1 to entry: An arcing contact can serve as a main contact; it can be a separate contact so designed that it opens after and closes before another contact which it is intended to protect from deterioration.

[SOURCE: IEC 60050-441:2000, 441-15-08, modified – “injury” has been replaced by “deterioration” and In Note 1 to entry, “may” changed to “can”.]

3.5.9

control contact

contact included in a control circuit of a mechanical switching device and mechanically operated by this device

[SOURCE: IEC 60050-441:2000, 441-15-09]

3.5.10

auxiliary contact

contact included in an auxiliary circuit and mechanically operated by the switching device

[SOURCE: IEC 60050-441:2000, 441-15-10]

3.5.11

auxiliary switch

<of a mechanical switching device> switch containing one or more control and/or auxiliary contacts mechanically operated by a switching device

[SOURCE: IEC 60050-441:2000, 441-15-11]

3.5.12

"a" contact

make contact

control or auxiliary contact which is closed when the main contacts of the mechanical switching device are closed and open when they are open

[SOURCE: IEC 60050-441:2000, 441-15-12]

3.5.13

"b" contact

break contact

control or auxiliary contact which is open when the main contacts of the mechanical switching device are closed and closed when they are open

[SOURCE: IEC 60050-441:2000, 441-15-13]

3.5.14

relay

electrical relay

device designed to produce sudden, predetermined changes in one or more electric output circuits when certain conditions are fulfilled in the electric input circuits controlling the device

[SOURCE: IEC 60050-151:2001, 151-13-31]

3.5.15

release

<of a mechanical switching device> device, mechanically connected to a mechanical switching device, which releases the holding means and permits the opening or the closing of the switching device

Note 1 to entry: A release can have instantaneous, time-delay, etc., operation. The various types of releases are defined in 3.6.24 to 3.6.35.