



BSI Standards Publication

Low-voltage switchgear and controlgear

Part 3: Switches, disconnectors, switch-disconnectors and fuse combination units

National foreword

This British Standard is the UK implementation of EN IEC 60947-3:2021+A1:2025. It is identical to IEC 60947-3:2020, incorporating corrigendum November 2021 and amendment 1:2025. It supersedes BS EN IEC 60947-3:2021, which is withdrawn.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 November 2021 is indicated in the text by AC1 AC1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by A1 A1.

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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© The British Standards Institution 2025
Published by BSI Standards Limited 2025

ISBN 978 0 539 22671 3

ICS 29.120.40; 29.130.20

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 28 February 2021.

Amendments/corrigenda issued since publication

Date	Text affected
31 May 2022	Implementation of IEC corrigendum November 2021
31 July 2025	Implementation of IEC amendment 1:2025 with CENELEC endorsement A1:2025

English Version

Low-voltage switchgear and controlgear - Part 3: Switches,
disconnectors, switch-disconnectors and fuse-combination units
(IEC 60947-3:2020)

Appareillage à basse tension - Partie 3: Interrupteurs,
sectionneurs, interrupteurs-sectionneurs et combinés-
fusibles
(IEC 60947-3:2020)

Niederspannungsschaltgeräte - Teil 3: Lastschalter,
Trennschalter, Lasttrennschalter und Schalter-Sicherungs-
Einheiten
(IEC 60947-3:2020)

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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/340/FDIS, future edition 4 of IEC 60947-3, 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 60947-3:2021.

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 60947-3:2009 and all of its amendments and corrigenda (if any).

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For the relationship with EU Directive(s) see informative Annexes ZZA and ZZB, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 60947-3:2020 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 60364-5-52	NOTE	Harmonized as HD 60364-5-52
IEC 60447:2004	NOTE	Harmonized as EN 60447:2004 (not modified)
IEC 60664-1:2007	NOTE	Harmonized as EN 60664-1:2007 (not modified)
IEC 60898-1:2015	NOTE	Harmonized as EN 60898-1:2019
IEC 60947-2:2016	NOTE	Harmonized as EN 60947-2:2017 (not modified)
IEC 60947-4-1:2018	NOTE	Harmonized as EN IEC 60947-4-1:2019 (not modified)

Endorsement notice

The text of the corrigendum IEC 60947-3:2020/COR1:2021 was approved by CENELEC as EN IEC 60947-3:2021/AC:2021-11 without any modification.

European foreword to Amendment 1

The text of document 121A/645/FDIS, future edition 4 of IEC 60947-3/AMD1, 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 60947-3:2021/A1:2025.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2026-06-30 level by publication of an identical national standard or by endorsement
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For the relationship with EU Legislation, see informative Annex ZZ, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 60947-3:2020/AMD1:2025 was approved by CENELEC as a European Standard 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 60050-441	-	Electrotechnical Vocabulary – Switchgear, controlgear and fuses	-	-
IEC 60034-12	2016	Rotating electrical machines - Part 12: Starting performance of single-speed three-phase cage induction motors	EN IEC 60034-12	2024
IEC 60034-30-1	2014	Rotating electrical machines - Part 30-1: Efficiency classes of line operated AC motors (IE code)	EN 60034-30-1	2014
IEC 60068-2-14	2023	Environmental testing – Part 2-14: Tests – Test N: Change of temperature	EN IEC 60068-2-14	2023
IEC 60228	2004	Conductors of insulated cables	EN IEC 60228	2024
IEC 60269-1	-	Low-voltage fuses – Part 1: General requirements	EN 60269-1	2007
+ 1	-		+ A1	2009
+ 2	-		+ A2	2014
IEC 60269-3	-	Low-voltage fuses - Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)	HD 60269-3	2010
+ 1	-		+ A1	2013
			+ 2	2022
IEC 60269-4	-	Low-voltage fuses - Supplementary requirements for fuse-links for the protection of semiconductor devices	EN 60269-4	2009
+ 1	-		+ A1	2012
+ 2	-		+ A2	2016

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60269-6	-	Low-voltage fuses - Supplementary requirements for fuse-links for the protection of photovoltaic energy systems	EN 60269-6	2011
			+ 1	2023
IEC 60269-7	-	Low-voltage fuse - Part 7. Fuse links for the protection of batteries	EN IEC 60269-7	2024
IEC 60417	-	Graphical symbols for use on equipment	-	-
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 IEC 60695-2-11	2021
IEC 60947-1	2020	Low-voltage switchgear and controlgear - Part 1: General rules	EN IEC 60947-1	2021
			+ C	2023-01
			+ C	2024-05
IEC 60947-5-1	2016	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices	EN 60947-5-1	2017
+ CORR 1	2016		+ C	2020-05
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 IEC 61000-4-3	2020
+ 1	2007			
+ 2	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 61000-4-5	2014	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test	EN 61000-4-5	2014
+ 1	2017		+ 1	2017
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 IEC 61000-4-6	2023

EN IEC 60947-3:2021+A1:2025 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61238-1-1	-	Compression and mechanical connectors for power cables - Part 1-1: Test methods and requirements for compression and mechanical connectors for power cables for rated voltages up to 1 kV (Um = 1,2 kV) tested on non-insulated conductors	EN IEC 61238-1-1	2019
IEC 61545	1996	Connecting devices - Devices for the connection of aluminium conductors in clamping units of any material and copper conductors in aluminium bodied clamping units	-	-
IEC 62208	2023	Empty enclosures for low-voltage switchgear and controlgear assemblies - General requirements	EN IEC 62208	2023
IEC 62475	2010	High-current test techniques - Definitions and requirements for test currents and measuring systems	EN 62475	2010
ISO 2859-1	1999	Sampling procedures for inspection by attributes - Part 1: Sampling 551 schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection	-	-
+ 1	2011			
CISPR 11 (mod)	2015	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement	EN 55011	2016
+ 1	2016		+ 1	2017
CISPR 32	2015	Electromagnetic compatibility of multimedia equipment - Emission requirements	EN 55032	2015
			+ C	2016-07
+ 1	2019		+ 1	2020
			+ 11	2020

Annex ZZ (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 standardisation request relating to harmonised 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 harmonisation 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 ZZ.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 ZZ.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)	6.2, 6.3, Annex D, Annex E, Annex G	
1 b)	6.2, 6.3, Annex C, Annex D, Annex E, Annex G	
1 c)	5, 6, 7, A.1, A.2, C.1, D.1, D.2, E.1, E.6.3	Also refer to 2 a) to 2 d) and 3 a) to 3 c) in this table
2 a)	8.1, 8.2, 9.1, 9.3, 9.5, Annex A, Annex C, Annex D, Annex G.	
2 b)	5, 8.1, 8.2.2, 9.3, Annex A, Annex C, Annex D, Annex E, Annex G.	
2 c)	6, 8.1, 8.2, 8.3, 9.1, 9.2, 9.3, Annex A, Annex C, Annex D, Annex E, Annex G.	
2 d)	4.3, 5, 6.2, 6.3, 8.1, 8.2, 9.1, 9.2, 9.3, 9.5, Annex A, Annex C, Annex D, Annex E, Annex G	
3 a)	5, 6, 8.2, 8.3, 9.1, 9.2, 9.3, 9.5, Annex A, Annex C, Annex D, Annex E, Annex G	
3 b)	6.2, 6.3, 7, Annex D, Annex G	
3 c)	6.3, 8.3, 9.3, Annex D, Annex E, Annex G.	

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 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 the European Commission standardization request C(2016) 7641 final of 30.11.2016¹, ('M/552'), as regards harmonized standards in support of Directive 2014/30/EU relating to electromagnetic compatibility, 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 harmonization 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 the Essential Requirements set out in 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 disturbances)	8.3.3, 9.4.3, D.9.4	
Annex I. 1(b) (electromagnetic immunity)	8.3.2, 9.4.2, D.9.4	

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.

¹ COMMISSION IMPLEMENTING DECISION C(2016) 7641 final of 30.11.2016 on a standardisation request to the European Committee for Standardisation, to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards harmonised standards in support 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.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units

FOREWORD

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International Standard IEC 60947-3 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 2008, Amendment 1:2012 and Amendment 2:2015. This edition constitutes a technical revision.

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

- addition of critical load current tests for DC switches (see 9.3.9);
- addition of requirements for a conditional short-circuit rating for disconnectors, switches, and switch-disconnectors protected by circuit-breakers (see 9.3.7.2);
- addition of new categories for high-efficiency motors switching (see Annex A);

- addition of new Annex E for connection to aluminium conductors;
- addition of new Annex F for power losses measurement.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
121A/340/FDIS	121A/354/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 parts in the IEC 60947 series, published under the general title *Low-voltage switchgear and controlgear*, can be found on the IEC website.

This part is to be used in conjunction with the sixth edition of IEC 60947-1:2020. The numbering of the subclauses is sometimes not continuous because it is based on IEC 60947-1:2020.

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.

INTRODUCTION

The provisions of the general rules dealt with in IEC 60947-1 are applicable to this document, where specifically called for. Clauses and subclauses, tables, figures and annexes of the general rules thus applicable are identified by reference to the sixth edition of IEC 60947-1:2020, for example, 5.3.4.1 of IEC 60947-1:2020, Table 4 of IEC 60947-1:2020, or Annex A of IEC 60947-1:2020.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units

1 Scope

This part of IEC 60947 applies to switches, disconnectors, switch-disconnectors and fuse-combination units and their dedicated accessories to be used in distribution circuits and motor circuits of which the rated voltage does not exceed 1 000 V AC or 1 500 V DC.

NOTE 1 Accessories are interconnecting units, extended terminals, internal coils, auxiliary contacts, motor operator, etc. offered as options with the basic unit.

This document does not apply to equipment coming within the scope of IEC 60947-2, IEC 60947-4-1 and IEC 60947-5-1.

Particular requirements for switches, disconnectors, switch-disconnectors and fuse-combination units for use in photovoltaic (PV) DC applications are given in Annex D.

Specific requirements for LV switchgear intended for the connections of aluminium conductors are given in Annex E.

Guidance on measurement of power loss is provided in Annex F.

This document does not include the additional requirements necessary for electrical apparatus for explosive gas atmospheres.

NOTE 2 Depending on its design, a switch (or disconnector) can be referred to as "a rotary switch (disconnector)", "cam-operated switch (disconnector)", "knife-switch (disconnector)", etc.

NOTE 3 In this document, the word "switch" also applies to the apparatus referred to in French as "commutateurs", intended to modify the connections between several circuits and *inter alia* to substitute a part of a circuit for another.

NOTE 4 In general, throughout this document, switches, disconnectors, switch-disconnectors and fuse-combination units will be referred to as "equipment".

The object of this document is to state:

- a) the characteristics of the equipment;
- b) the conditions that apply to the equipment with reference to:
 - 1) operation and behaviour in normal service;
 - 2) operation and behaviour in case of specified abnormal conditions, e.g. short-circuit;
 - 3) dielectric properties;
- c) the tests for confirming that these conditions have been met and the methods that are adopted for these tests;
- d) the information relevant to the marking of the equipment or made available by the manufacturer, e.g. in the catalogue.

Specific items requiring agreement between the user and the manufacturer are identified in Annex B.

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 60050-441, *International Electrotechnical Vocabulary – Part 441: Switchgear, controlgear and fuses* (available at <http://www.electropedia.org>)

IEC 60034-12:2016, *Rotating electrical machines – Part 12: Starting performance of single-speed three-phase cage induction motors*

IEC 60034-30-1:2014, *Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code)*

IEC 60068-2-14:2023, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 62208:2023, *Empty enclosures for low-voltage switchgear and controlgear assemblies – General requirements* ^{A1}

IEC 60228:2004, *Conductors of insulated cable*

IEC 60269 (all parts), *Low-voltage fuses*

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

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 60947-1:2020, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-5-1:2016, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

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 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

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 61545:1996, *Connecting devices – Devices for the connection of aluminium conductors in clamping units of any material and copper conductors in aluminium bodied clamping units*

IEC 62208:2011, *Empty enclosures for low-voltage switchgear and controlgear assemblies – General requirements*

IEC 62475:2010, *High-current test techniques – Definitions and requirements for test currents and measuring systems*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*
ISO 2859-1:1999/AMD1:2011

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms, definitions and index of terms

3.1 General

For the purposes of this document, the terms and definitions given in IEC 60050-441 and IEC 60947-1 and the following 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>

3.2 Alphabetical index of terms

References

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3.3 General terms

3.3.1

disconnecter

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

Note 1 to entry: A disconnector is capable of opening and closing a circuit when either a negligible current is broken or made, or when no significant change in the voltage across the terminals of each of the poles of the disconnector occurs. It is also capable of carrying currents under normal circuit conditions and carrying, for a specified time, currents under abnormal conditions such as those of short-circuit.

[SOURCE: IEC 60050-441:2000, 441-14-05, modified – Reference to isolating function instead of isolating distance.]

3.3.2

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 his instructions

[SOURCE: IEC 60050-441:2000, 441-14-04, modified – The note has been deleted.]

3.3.3

switch-fuse

switch in which one or more poles have a fuse in series in a composite unit

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

3.3.3.1

switch-fuse single opening

switch-fuse which provides an interruption in the circuit on one side of the fuse-link only

Note 1 to entry: With this arrangement, safety precautions may be necessary when removing fuse-links.

3.3.3.2

switch-fuse double opening

switch-fuse which provides an interruption in the circuit on both sides of the fuse-link

Note 1 to entry: With this arrangement, safety precautions may be necessary when removing fuse-links.

3.3.4

fuse-switch

switch in which a fuse-link or a fuse-carrier with fuse-link forms the moving contact

[SOURCE: IEC 60050-441:2000, 441-14-17]

3.3.4.1

fuse-switch single opening

fuse-switch which provides an interruption in the circuit on one side of the fuse-link only

Note 1 to entry: With this arrangement, safety precautions may be necessary when removing fuse-links.

3.3.4.2

fuse-switch double opening

fuse-switch which provides an interruption in the circuit on both sides of the fuse-link

Note 1 to entry: With this arrangement, safety precautions may be necessary when removing fuse-links.

3.3.5

disconnecter-fuse

disconnecter in which one or more poles have a fuse in series in a composite unit

[SOURCE: IEC 60050-441:2000, 441-14-15]

3.3.5.1

disconnecter-fuse single opening

disconnecter-fuse which provides an opening in the circuit on at least one side of the fuse-link, that satisfies the requirements specified for the isolating function

Note 1 to entry: With this arrangement, safety precautions may be necessary when removing fuse-links.

3.3.5.2

disconnecter-fuse double opening

disconnecter-fuse which provides an opening in the circuit that satisfies the requirements specified for the isolating function on both sides of the fuse-link

3.3.6

fuse-disconnector

disconnecter in which a fuse-link or fuse-carrier with fuse-link forms the moving contact

[SOURCE: IEC 60050-441:2000, 441-14-18]

3.3.6.1

fuse-disconnector single opening

fuse-disconnector which provides an opening in the circuit on at least one side of the fuse-link that satisfies the requirements specified for the isolating function

Note 1 to entry: With this arrangement, safety precautions may be necessary when removing fuse-links.

3.3.6.2

fuse-disconnector double opening

fuse-disconnector which provides an opening in the circuit, that satisfies the requirements specified for the isolating function, on both sides of the fuse-link

3.3.7

switch-disconnector-fuse

switch-disconnector in which one or more poles have a fuse in series in a composite unit

[SOURCE: IEC 60050-441:2000, 441-14-16]

3.3.7.1

switch-disconnector-fuse single opening

switch-disconnector-fuse which provides an interruption in the circuit on at least one side of the fuse-link that satisfies the requirements specified for the isolating function

Note 1 to entry: With this arrangement, safety precautions may be necessary when removing fuse-links.

3.3.7.2

switch-disconnector-fuse double opening

switch-disconnector-fuse which provides an interruption in the circuit on both sides of the fuse-link that satisfies the requirements specified for the isolating function

3.3.8

fuse-switch-disconnector

switch-disconnector in which a fuse-link or a fuse-carrier with fuse-link forms the moving contact

[SOURCE: IEC 60050-441:2000, 441-14-19]

3.3.8.1

fuse-switch-disconnector single opening

fuse-switch-disconnector which provides an interruption in the circuit on at least one side of the fuse-link that satisfies the requirements specified for the isolating function

Note 1 to entry: With this arrangement, safety precautions may be necessary when removing fuse-links.

3.3.8.2

fuse-switch-disconnector double opening

fuse-switch-disconnector which provides an interruption in the circuit on both sides of the fuse-link that satisfies the requirements specified for the isolating function

3.3.9

single pole operated three-pole device

mechanical unit consisting of three individually operable single pole switches and/or disconnecting units according to this document, rated as a complete unit for use in a three-phase system

Note 1 to entry: These mechanical units are intended for power distribution systems where switching and/or isolation of an individual phase may be necessary and they should not be used for the switching of the primary circuit of three-phase equipment.

3.3.10

semi-independent manual operation

operation solely by means of directly applied manual energy such that the manual force is increased up to a threshold value beyond which the independent switching operation is achieved unless deliberately delayed by the operator

3.3.11

remotely operated equipment

switching equipment that is electrically operated from a point distant from the controlled switching device

Note 1 to entry: A remotely operated switch can have an additional feature for either local or manual (non-electrical) operation, or both.

Note 2 to entry: Remote operation can be performed by an integral device or an auxiliary device associated with the switching device, for example, motor operator or coils.

Note 3 to entry: Remote operation can be achieved via physical wiring, wifi, Bluetooth, etc., as defined in the product documentation.

3.3.12

operating time of a remotely operated equipment

time measured from the instant when the switching operation is initiated at the switching device to (i) the closing of the main contacts or (ii) the opening of the main contacts

Note 1 to entry: Operating times from closed to open (opening time) and from open to closed (closing time) can be different.

Note 2 to entry: For a definition of closing time, see 3.7.44 of IEC 60947-1:2020 and for a definition of opening time, see 3.7.39 of IEC 60947-1:2020. 

4 Classification

4.1 According to the utilization category

See 5.4.

4.2 According to the method of operation

4.2.1 Manually operated equipment

- dependent manual operation (see 3.6.12 of IEC 60947-1:2020);
- independent manual operation (see 3.6.15 of IEC 60947-1:2020);
- semi-independent manual operation (see 3.3.10).

4.2.2 Remotely operated equipment

-  – remotely operated:
 - self-powered remotely operated equipment;
 - externally powered remotely operated equipment;
- type of remote operation:
 - opening and closing: both opening and close operation controllable from remote;
 - opening only: only opening operation controllable from remote. 

4.3 According to suitability for isolation

- suitable for isolation (see 8.1.7 of IEC 60947-1:2020);
- not suitable for isolation.

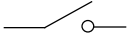
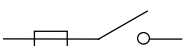
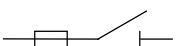
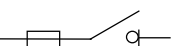
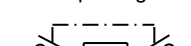
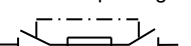
4.4 According to the degree of protection provided

See 8.1.12 of IEC 60947-1:2020.

4.5 Summary of symbols for equipment types

A summary of equipment definitions and relevant diagrams is given in Table 1.

Table 1 – Summary of equipment definitions

Functions		
Making and breaking current	Isolating	Making, breaking and isolating
Switch 	Disconnecter 	Switch-disconnector 
Fuse-combination units		
Switch-fuse single opening ^a 	Disconnecter-fuse single opening ^a 	Switch-disconnector-fuse single opening ^a 
Switch-fuse double opening ^b 	Disconnecter-fuse double opening 	Switch-disconnector-fuse double opening ^b 

Fuse-switch single opening ^a 	Fuse-disconnector single opening ^a 	Fuse-switch-disconnector single opening ^a
Fuse-switch double opening ^b 	Fuse-disconnector double opening 	Fuse-switch-disconnector double opening ^b
NOTE Equipment shown as single opening can comprise multiple openings in series.		
^a The fuse may be on either side of the contacts of the equipment. ^b Depending on the design, breaking may take place on one or both sides of the fuse-link.		

5 Characteristics

5.1 Summary of characteristics

The relevant characteristics from 3.10 of IEC 60947-1:2020 apply, with the following addition.

The characteristics of the equipment shall be stated in terms of the following as applicable:

- type of equipment (see 5.2);
- rated and limiting values for the main circuit (see 5.3);
- utilization category (see 5.4);
- control circuits (see 5.5);
- auxiliary circuits (see 5.6);

5.2 Type of equipment

The following information shall be stated.

- number of poles;
- kind of current (alternating current or direct current);
- in the case of alternating current, number of phases and rated frequency;
- number of positions of the main contacts (if more than two);
- breaking arrangement for fused devices (single opening or double opening);

A1 – control method of the device. **A1**

5.3 Rated and limiting values for the main circuit

5.3.1 General

Rated values are assigned by the manufacturer. They shall be stated in accordance with 5.3.2 to 5.3.7.4 noting that some of the listed values may not apply.

5.3.2 Rated voltages

5.3.2.1 Rated operational voltage (U_e)

Subclause 5.3.1.1 of IEC 60947-1:2020 applies.

5.3.2.2 Rated insulation voltage (U_i)

Subclause 5.3.1.2 of IEC 60947-1:2020 applies.

5.3.2.3 Rated impulse withstand voltage (U_{imp})

Subclause 5.3.1.3 of IEC 60947-1:2020 applies.

5.3.3 Currents

5.3.3.1 General

An equipment is defined by the following currents.

5.3.3.2 Conventional free air thermal current (I_{th})

Subclause 5.3.2.1 of IEC 60947-1:2020 applies.

5.3.3.3 Conventional enclosed thermal current (I_{the})

Subclause 5.3.2.2 of IEC 60947-1:2020 applies.

5.3.3.4 Rated operational current (I_e) or rated operational power

Subclause 5.3.2.3 of IEC 60947-1:2020 applies.

5.3.3.5 Rated uninterrupted current (I_u)

Subclause 5.3.2.4 of IEC 60947-1:2020 applies.

5.3.4 Rated frequency

Subclause 5.3.3 of IEC 60947-1:2020 applies.

5.3.5 Rated duty

5.3.5.1 General

The rated duties considered as normal are as follows.

5.3.5.2 Eight-hour duty

Subclause 5.3.4.1 of IEC 60947-1:2020 applies.

5.3.5.3 Uninterrupted duty

Subclause 5.3.4.2 of IEC 60947-1:2020 applies.

5.3.6 Normal load and overload characteristics

5.3.6.1 Ability to withstand motor switching overload currents

See Annex A.

5.3.6.2 Rated making capacity

Subclause 5.3.5.2 of IEC 60947-1:2020 applies with the following additions.

The rated making capacity is stated by reference to the rated operational voltage and rated operational current and to the utilization category according to Table 4.

Not applicable to AC-20 or DC-20 equipment.

5.3.6.3 Rated breaking capacity

Subclause 5.3.5.3 of IEC 60947-1:2020 applies with the following additions.

The rated breaking capacity is stated by reference to the rated operational voltage and rated operational current and to the utilization category according to Table 4.

Not applicable to AC-20 or DC-20 equipment.

5.3.7 Short-circuit characteristics

5.3.7.1 Rated short-time withstand current (I_{cw})

The rated short-time withstand current of a switch, a disconnecter or a switch-disconnector is the value of short-time withstand current, assigned by the manufacturer, that the equipment can carry without any damage under the test conditions of 9.3.6.2.

The value of the rated short-time withstand current shall be not less than twelve times the maximum rated operational current. The duration of the current shall be 1 s, unless otherwise stated by the manufacturer.

For alternating current, the value of the current I_{cw} is the RMS value of the AC component and it is assumed that the highest peak value likely to occur does not exceed n times this RMS value, the factor n being given by Table 16 of IEC 60947-1:2020.

5.3.7.2 Rated short-circuit making capacity (I_{cm})

Subclause 5.3.6.2 of IEC 60947-1:2020 applies with the addition of the following note.

NOTE I_{cm} is not applicable to fused devices.

5.3.7.3 Void

5.3.7.4 Rated conditional short-circuit current (I_q , alternatively I_{cc})

Subclause 5.3.6.4 of IEC 60947-1:2020 applies.

5.4 Utilization category

The utilization categories define the intended applications and are given in Table 2.

Each utilization category is characterized by the values of the currents and voltages, expressed as multiples of the rated operational current and the rated operational voltage, as well as the power-factors or time-constants of the circuit. The conditions for making and breaking given in Table 4 correspond in principle to the applications listed in Table 2.

The designation of utilization categories is completed by the suffix A or B according to whether the intended applications require frequent or infrequent operations (see Table 5).

Utilization categories with suffix B are appropriate for devices which, due to design or application, are only intended for infrequent operation. This could apply, for example, to disconnectors normally only operated to provide isolation for maintenance work or switching devices where the fuse-link blade forms the moving contact.

The distinction between frequent and infrequent operation is based on the manufacturer's rated operation and the number of operating cycles used as a test criterion in Table 5.

For a particular rated operational current I_e , a device will be designated for frequent use (category A) if the manufacturer's declared number of operating cycles is equal to or more than the number of operating cycles indicated in columns 3, 4 and 5 of Table 5.

Table 2 – Utilization categories

Nature of current	Utilization categories		Typical application
	Category A	Category B	
Alternating current	AC-20A ^a	AC-20B ^a	– Connecting and disconnecting under no-load conditions
	AC-21A	AC-21B	– Switching of resistive loads including moderate overloads
	AC-22A	AC-22B	– Switching of mixed resistive and inductive loads, including moderate overloads
	AC-23A	AC-23B	– Switching of motor loads or other highly inductive loads
	AC-23Ae	AC-23Be	– Switching of motor loads with higher locked rotor currents ^b
Direct current	DC-20A ^a	DC-20B ^a	– Connecting and disconnecting under no-load conditions
	DC-21A	DC-21B	– Switching of resistive loads including moderate overloads
	DC-22A	DC-22B	– Switching of mixed resistive and inductive loads, including moderate overloads (e.g. shunt motors)
	DC-23A	DC-23B	– Switching of highly inductive loads (e.g. series motors)
^a The use of these utilization categories is not permitted in the USA. ^b Requirements given by asynchronous motors of design NE and HE, according to IEC 60034-12, having extended/higher locked rotor apparent power and current than design N and H respectively, to achieve a higher efficiency class according to the requirements of IEC 60034-30-1.			

Category AC-23 includes occasional switching of individual motors. The switching of capacitors or of tungsten filament lamps shall be subject to agreement between manufacturer and user.

The utilization categories referred to in Table 2 and Table 4 do not apply to an equipment normally used to start, accelerate and/or stop individual motors. The utilization categories for such equipment are dealt with in Annex A.

5.5 Control circuits

Subclause 5.5 of IEC 60947-1:2020 applies.

5.6 Auxiliary circuits

Subclause 5.6 of IEC 60947-1:2020 applies.

5.7 Relays and releases

Subclause 5.7 of IEC 60947-1:2020 applies.

5.8 Co-ordination with short-circuit protective devices (SCPD)

Subclause 5.8 of IEC 60947-1:2020 applies.

5.9 Remote operation

The manufacturer shall declare the following:

- a) minimum and maximum values of voltage operating limits for the control supply and, as applicable, corresponding frequency;
- b) the closing time, when applicable (3.7.44 of IEC 60947-1:2020);
- c) the opening time (3.7.39 of IEC 60947-1:2020);
- d) the type of operating signal:
 - i) permanent signal;
 - ii) single impulse;
- e) information on power consumption for remote operation:
 - iii) nominal power consumption and duration;
 - iv) inrush power consumption and duration, if applicable;
- f) connection arrangement for remote operation. **A1**

6 Product information

6.1 Nature of information

A1 Subclause 6.1 of IEC 60947-1:2020 applies with the following modification:

Replace, under “Characteristics”, the 7th dash, “rated impulse withstand voltage (see 5.3.1.3)”, with the following:

- rated impulse withstand voltage (see 5.3.1.3);
 - a) main power circuit of the equipment.
 - b) control circuits. **A1**

6.2 Marking

Product information shall be provided in a durable and legible manner as indicated in Table 3.

Table 3 – Product information

A1 Item	Information	Marking location
1.1	Indication of the open and close position. If symbols are used, the open position shall be indicated by graphical symbol IEC 60417-5008:2002-10 and the closed position by graphical symbol IEC 60417-5007:2002-10 (see 8.1.6.1 of IEC 60947-1:2020).	Visible
1.2	Suitability for isolation. The appropriate symbols of Table 1 shall be used.	Visible
1.3	Additional marking for disconnectors. Devices of utilization category AC-20A, AC-20B, DC-20A, DC-20B, DC-PV0 and DC-BPS0 shall be marked "Do not operate under load" adjacent to these categories, unless the device has interlocking means to prevent such an operation.	Visible
1.4	Additional marking for remotely operated equipment. When remote closing is provided this mode of operation shall be clearly indicated on the product if a locking means in the OFF position is not provided.	Visible
2.1	Manufacturer's name or trademark.	Marked
2.2	Type designation or catalogue reference.	Marked
2.3	Rated operational currents (or rated powers) with the corresponding rated operational voltage and utilization category, (see 5.3.2, 5.3.3 and as applicable, 5.4, D.5.4 or G.5.4).	Marked

Item	Information	Marking location
2.4	Value (or range) of the rated frequency or the indication "DC" (or the symbol ) IEC 60417-5031:2002-10).	Marked
2.5	For fuse-combination units, the fuse type characteristics and maximum rated current and the maximum power loss of the fuse-link.	Marked ^a
2.6	IEC 60947-3, if the manufacturer claims compliance with this document.	Marked
2.7	Degree of protection of enclosed equipment (see Annex C of IEC 60947-1:2020).	Marked
2.8	Terminals shall be identified "load" and "line", unless the connection is immaterial (see 9.3.4.4.1).	Marked
2.9	Neutral pole terminal, if applicable, shall be identified by the letter "N" (see 8.1.8.4 of IEC 60947-1:2020).	Marked
2.10	When a protective earth terminal is provided, it shall be identified by the symbol  IEC 60417-5019:2006-08 (see 8.1.10.3 of IEC 60947-1:2020).	Marked
2.11	"+" and "-" polarities, if applicable.	Marked
3.1	Classification of equipment if remotely controlled: – Remotely operated.	Literature
3.2	Rated insulation voltage.	Literature
3.3	Rated impulse withstand voltage: – Main power circuit of the equipment. – Control circuits.	Literature
3.4	Pollution degree, if different from 3.	Literature
3.5	Rated duty (see 5.3.5 and Clause A.2).	Literature
3.6	Rated short-time withstand current and duration, where applicable.	Literature
3.7	Rated short-circuit making capacity, where applicable.	Literature
3.8	Rated conditional short-circuit current, where applicable.	Literature
3.9	Diagram and method of series connecting poles of mechanical switching devices for each operational rating, if applicable.	Literature
3.10	For switches in accordance with Annex D and Annex G – appropriate connections to the PV generator or supply and load, if applicable.	Literature
3.11	For devices in accordance with Annex D and Annex G – suitable for indoor or outdoor use.	Literature
3.12	Closing time for equipment that can be closed remotely (see 3.3.12 operating time of a remotely operated equipment).	Literature
3.13	Opening time of a remotely operated equipment (see 3.3.12 operating time of a remotely operated equipment).	Literature
3.14	Connection arrangement for remote operation.	Literature
3.15	Type of operating signal if remotely operated: – Permanent signal. – Single impulse.	Literature
3.16	Details of power consumption for remote operation – Nominal power consumption and duration – Inrush power consumption and maximum duration, if applicable.	Literature
3.17	Minimum and maximum values of voltage operating limits for the control supply and, as applicable, corresponding frequency.	Literature

Item	Information	Marking location
Key Visible: visible from the front when the device is installed as in service in accordance with the manufacturer's instructions and the actuator is accessible and operable. Marked: marked on the product but need not be visible when the device is installed as in service in accordance with the manufacturer's instructions. Literature: in the manufacturer's literature. (A visible digital link, for example a QR-code, may be added on the product to guide user to literature in electronic/digital format). In information relating to auxiliaries shall be marked on the auxiliary or the product. If space is insufficient the data shall be given in the manufacturer's literature. ^a Shall be visible after the product is installed in accordance with the manufacturer's instructions but need not necessarily be visible from the front. 		

6.3 Instructions for installation, operation and maintenance, decommissioning and dismantling

Subclause 6.3 of IEC 60947-1:2020 applies with the following addition.

When hazardous emissions including optical emissions are produced during switching operations, the recommendations as given in the manufacturer's instructions in respect of installation and/or the use of personal protective equipment (PPE) shall be observed.

7 Normal service, mounting and transport conditions

Clause 7 of IEC 60947-1:2020 applies with the replacement of the paragraph under the heading "Standard pollution degree of industrial applications:" in 7.1.3.2 "Pollution degree" with the following:

Unless otherwise stated by the manufacturer, the equipment is intended for installation under environmental conditions of pollution degree 3.

8 Constructional and performance requirements

8.1 Constructional requirements

8.1.1 General

Subclause 8.1 of IEC 60947-1:2020 applies, with the following additions.

Specific requirements for LV switchgear intended for the connections of aluminium conductors is given in Annex E.

When switches and fuse-combination units coming into the scope of this document are normally used to start, accelerate and/or stop an individual motor, they shall also comply with the additional requirements given in Annex A.

The requirements for single pole operated three-pole switches are included in Annex C.

Auxiliary switches fitted to equipment within the scope of this document shall comply with the requirements of IEC 60947-5-1.

8.1.2.2 Glow wire testing

Subclause 8.1.2.2 of IEC 60947-1:2020 applies with the following changes and additions:

Parts of insulating material necessary to retain current-carrying parts in position shall conform to the glow-wire tests of 9.2.2.1 of IEC 60947-1:2020 for test temperatures as follows:

- main current carrying parts: 960 °C.
- auxiliary current carrying parts: 850 °C.

The requirements of 8.1.2.2 of IEC 60947-1:2020 do not apply to parts with a mass lower than 2 g (insignificant mass as defined in 3.14 of IEC 60695-2-11:2014). For products containing a plurality of small parts, the total mass of non-tested parts located in close proximity to each other shall not exceed 10 g. Proximity shall be based on engineering judgment considering the risk of propagation of fire.

8.1.7 Additional requirements for equipment suitable for isolation

8.1.7.1 General

Subclause 8.1.7 of IEC 60947-1:2020 applies with the following additions.

8.1.7.2 Additional constructional requirements

The equipment shall be marked according to Table 3, item 2.

When no indication of the position of the contacts is provided, for example by the actuator or a separate indicator, all the main contacts shall be clearly visible in the open position.

The strength of the actuating mechanism and the reliability of the indication of the open position shall be checked according to 9.2.6. Moreover, when means are provided by the manufacturer to lock the equipment in the open position, locking shall only be possible when the main contacts are in the open position (see 9.2.6).

This requirement does not apply to equipment where the main contact position is visible in the open position and/or the open position is indicated by other means than the actuator.

NOTE Locking in the closed position can be required for particular applications.

The clearance across the open contacts of the same pole when in the open position shall not be less than the minimum clearance given in Table 13 of IEC 60947-1:2020 and shall also comply with the requirements of 8.2.3.2 item 1) b) of IEC 60947-1:2020.

8.1.9 Additional requirements for equipment provided with a neutral pole

Subclause 8.1.9 of IEC 60947-1:2020 applies except the fourth paragraph.

A1 8.1.10 Additional requirements for remotely operated equipment

All remotely operated equipment with an isolation function shall have a manual means of opening when operating power is not available. A1

8.2 Performance requirements

8.2.1 Operating conditions

8.2.1.1 General

Subclause 8.2.1.1 of IEC 60947-1:2020 applies with the following additions.

The following requirements apply to fuse-switches, fuse-disconnectors and fuse-switch-disconnectors with a rated short-circuit making capacity exceeding 10 kA and for which the closing operation is by direct manual operation without an interposing mechanism (for