

# CONSOLIDATED VERSION

# VERSION CONSOLIDÉE



---

**Low-voltage switchgear and controlgear –  
Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination  
units**

**Appareillage à basse tension –  
Partie 3: Interrupteurs, sectionneurs, interrupteurs-sectionneurs et combinés-  
fusibles**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

---

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### Recherche de publications IEC - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# CONSOLIDATED VERSION

# VERSION CONSOLIDÉE



---

**Low-voltage switchgear and controlgear –  
Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination  
units**

**Appareillage à basse tension –  
Partie 3: Interrupteurs, sectionneurs, interrupteurs-sectionneurs et combinés-  
fusibles**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 29.120.40, 29.130.20

ISBN 978-2-8322-2823-4

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**



# REDLINE VERSION

# VERSION REDLINE



---

**Low-voltage switchgear and controlgear –  
Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination  
units**

**Appareillage à basse tension –  
Partie 3: Interrupteurs, sectionneurs, interrupteurs-sectionneurs et combinés-  
fusibles**

## CONTENTS

FOREWORD.....	4
1 General .....	6
1.1 Scope and object.....	6
1.2 Normative references .....	7
2 Terms, definitions <b>and index of terms</b> .....	8
<b>2.1 General .....</b>	<b>8</b>
<b>2.2 Alphabetical index of terms .....</b>	<b>8</b>
<b>2.3 Terms and definitions .....</b>	<b>9</b>
<b>2.4 Summary of the equipment types .....</b>	<b>12</b>
3 Classification .....	13
3.1 According to the utilization category .....	13
3.2 According to the method of operation of manually operated equipment.....	14
3.3 According to suitability for isolation .....	14
3.4 According to the degree of protection provided.....	14
4 Characteristics.....	14
4.1 Summary of characteristics.....	14
4.2 Type of equipment.....	14
4.3 Rated and limiting values for the main circuit .....	14
4.4 Utilization category .....	16
4.5 Control circuits .....	17
4.6 Auxiliary circuits .....	17
4.7 Relays and releases .....	17
<b>4.8 Co-ordination with short circuit protective devices (SCPD).....</b>	<b>17</b>
5 Product information.....	18
5.1 Nature of information .....	18
5.2 Marking .....	18
5.3 Instructions for installation, operation and maintenance.....	19
6 Normal service, mounting and transport conditions.....	19
7 Constructional and performance requirements .....	19
7.1 Constructional requirements .....	19
7.2 Performance requirements.....	21
7.3 Electromagnetic compatibility.....	25
8 Tests.....	27
8.1 Kind of tests .....	27
8.2 Type tests for constructional requirements .....	28
8.3 Performance.....	32
8.4 Electromagnetic compatibility tests .....	49
8.5 Special tests.....	50
Annex A (normative) Equipment for direct switching of a single motor.....	51
Annex B (informative) Items subject to agreement between manufacturer and user.....	57
Annex C (normative) Single pole operated three pole switches .....	58
<b>Annex D (normative) Switches, disconnectors, switch-disconnectors and fuse-</b> <b>combination units for use in photovoltaic (PV) d.c. applications.....</b>	<b>61</b>
Bibliography .....	73

<del>Figure 1 – Actuate applied force <math>F</math></del> .....	
Figure C.1 – Typical arrangements.....	59
Table 1 – Summary of equipment definitions.....	13
Table 2 – Utilization categories.....	17
Table 3 – Verification of rated making and breaking capacities (see 8.3.3.3) – Conditions for making and breaking corresponding to the various utilization categories.....	23
Table 4 – Verification of operational performance – Number of operating cycles corresponding to the rated operational current.....	24
Table 5 – Test circuit parameters for Table 4.....	24
Table 6 – Immunity tests.....	26
Table 7 – Emission limits.....	27
<del>Table 8 – Actuator test forces</del> .....	
Table 9 – List of type tests applicable to a given equipment.....	32
Table 10 – Overall scheme of test sequences.....	33
Table 11 – Test sequence I: general performance characteristics.....	37
Table 12 – Temperature-rise limits for terminals and accessible parts.....	40
Table 13 – Test sequence II: operational performance capability.....	40
Table 14 – Test sequence III: short-circuit performance capability.....	42
Table 15 – Test sequence IV: conditional short-circuit current.....	47
Table 16 – Test sequence V: overload performance capability.....	49
Table A.1 – Utilization categories.....	52
Table A.2 – Rated making and breaking capacity conditions corresponding to several utilization categories.....	52
Table A.3 – Relationship between current broken $I_C$ and off-time for the verification of the rated making and breaking capacities.....	53
Table A.4 – Operational performance – Conditions for making and breaking corresponding to several utilization categories.....	53
Table A.5 – Verification of the number of on-load operating cycles – Conditions for making and breaking corresponding to several utilization categories.....	56
<del>Table D.1 – Utilization categories</del> .....	<del>63</del>
<del>Table D.2 – Service arrangements</del> .....	<del>63</del>
<del>Table D.3 – Environmental conditions</del> .....	<del>64</del>
<del>Table D.4 – Rated impulse withstand levels for PV switches, PV disconnectors, PV switch-disconnectors or PV fuse-combination units</del> .....	<del>65</del>
<del>Table D.5 – Verification of rated making and breaking capacities (see 8.3.3.3) – Conditions for making and breaking corresponding to the DC-PV category</del> .....	<del>65</del>
<del>Table D.6 – Number of operating cycles</del> .....	<del>66</del>
<del>Table D.7 – Test circuit parameters for Table D.6</del> .....	<del>66</del>
<del>Table D.8 – Overall scheme of test sequences (addition)</del> .....	<del>67</del>
<del>Table D.9 – Number of operating cycles corresponding to the critical load current</del> .....	<del>70</del>
<del>Table D.10 – Test circuit parameters for Table D.9</del> .....	<del>70</del>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –****Part 3: Switches, disconnectors, switch-disconnectors  
and fuse-combination units**

## 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

**DISCLAIMER**

**This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.**

**This Consolidated version of IEC 60947-3 bears the edition number 3.2. It consists of the third edition (2008-08) [documents 17B/1601/FDIS and 17B/1608/RVD], its amendment 1 (2012-02) [documents 17B/1758/FDIS and 17B/1763/RVD] and its amendment 2 (2015-07) [documents 121A/42/FDIS and 121A/46/RVD]. The technical content is identical to the base edition and its amendments.**

**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions and deletions are displayed in red, with deletions being struck through. A separate Final version with all changes accepted is available in this publication.**

International Standard IEC 60947-3 has been prepared by subcommittee 17B: Low-voltage switchgear and controlgear, of IEC technical committee 17: Switchgear and controlgear.

The document 17B/1601/FDIS, circulated to the National Committees as amendment 3, led to the publication of the new edition.

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

- alignment with the fifth edition of IEC 60947-1;
- a switching operation without current allowed between making and breaking operation (Table 3);
- increased number of operations for AC-23 allowed with agreement of the manufacturer (Table 3);
- simplified test procedure amended, f) added to 8.3.2.1.3;
- temperature rise test shall be made at the rated operational current  $I_e$  instead of the conventional enclosed thermal current  $I_{the}$  (8.3.3.1).

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

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

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site 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.

The contents of the corrigenda 1 (September 2012) and 2 (November 2013) have been included in this copy.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

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

#### 1 General

The provisions of the general rules dealt with in IEC 60947-1 are applicable to this part, where specifically called for. Clauses and subclauses, tables, figures and appendices of the general rules thus applicable are identified by reference IEC 60947-1, e.g., 4.3.4.1 of IEC 60947-1, Table 4 of IEC 60947-1, or Annex A of IEC 60947-1.

##### 1.1 Scope and object

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

The manufacturer shall specify the type, ratings and characteristics according to the relevant standard of any incorporated fuses.

This part does not apply to equipment coming within the scope of IEC 60947-2, IEC 60947-4-1 and IEC 60947-5-1; however, when switches and fuse-combination units coming into the scope of this part 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 part shall comply with the requirements of IEC 60947-5-1.

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

NOTE 1 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 2 In this part, 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 3 In general, throughout this part switches, disconnectors, switch-disconnectors and fuse-combination units will be referred to as "equipment".

The object of this part is to state

- a) the characteristics of the equipment;
- b) the conditions with which the equipment shall comply 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 to be adopted for these tests;