

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electromechanical switches for use in electrical and electronic equipment –
Part 1: Generic specification**

**Interrupteurs électromécaniques pour équipements électriques et électroniques –
Partie 1: Spécification générique**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2019 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
info@iec.ch
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.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

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

IEC Customer Service Centre - 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: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 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.

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.

Recherche de publications IEC - webstore.iec.ch/advsearchform

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

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

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 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.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electromechanical switches for use in electrical and electronic equipment –
Part 1: Generic specification**

**Interrupteurs électromécaniques pour équipements électriques et électroniques –
Partie 1: Spécification générique**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.220.20

ISBN 978-2-8322-6388-4

**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.**

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references.....	9
3 Terms, definitions, units and symbols.....	11
3.1 Terms and definitions.....	11
3.2 Units and symbols.....	13
4 Test and measurement procedures.....	14
4.1 General.....	14
4.1.1 General requirements to tests and measuring procedures.....	14
4.1.2 Tolerances.....	14
4.1.3 Preconditioning.....	14
4.1.4 Mounting.....	14
4.2 Standard atmospheric conditions.....	14
4.3 General examination.....	15
4.3.1 Visual examination.....	15
4.3.2 Dimensions.....	15
4.3.3 Dimensions, gauging.....	16
4.3.4 Mass.....	16
4.3.5 Functional operation.....	17
4.3.6 Operating characteristics.....	17
4.3.7 Contact bounce.....	21
4.4 Resistance measurements.....	23
4.4.1 Contact resistance – Millivolt level.....	23
4.4.2 Contact resistance – Specified current.....	26
4.4.3 Resistance from actuator to mounting bushing (surface).....	27
4.4.4 Insulation resistance.....	28
4.5 Withstand voltage.....	29
4.5.1 Withstand voltage at standard atmospheric conditions.....	29
4.5.2 Withstand voltage at low air pressure.....	30
4.6 Heating.....	31
4.6.1 Object.....	31
4.6.2 Method.....	31
4.6.3 Requirement.....	31
4.6.4 Items to be specified in the detail specification.....	31
4.7 Dynamic stress.....	32
4.7.1 Shock.....	32
4.7.2 Vibration.....	32
4.7.3 Contact disturbance.....	33
4.8 Mechanical strength.....	34
4.8.1 Robustness of actuator.....	34
4.8.2 Robustness of mounting bushing.....	37
4.8.3 Robustness of screw mounting.....	37
4.8.4 Robustness of terminations.....	37
4.9 Mechanical endurance.....	38
4.9.1 Mechanical endurance – Standard atmospheric conditions.....	38
4.9.2 Mechanical endurance – Category temperature range.....	39

4.10	Electrical endurance	40
4.10.1	Electrical endurance – Standard atmospheric conditions	40
4.10.2	Electrical endurance – Upper category temperature.....	42
4.10.3	Electrical endurance – Category temperature range	43
4.10.4	Electrical endurance – low air pressure	43
4.10.5	Logic loads (TTL).....	44
4.10.6	Low level endurance test	45
4.11	Overload	46
4.11.1	Electrical overload	46
4.11.2	Capacitive load switching	47
4.12	Environmental testing	48
4.12.1	Climatic sequence	48
4.12.2	Dry heat	50
4.12.3	Cold.....	51
4.12.4	Damp heat, steady state	53
4.12.5	Damp heat, cyclic	54
4.12.6	Rapid change of temperature.....	56
4.12.7	Mould growth (resistance).....	57
4.12.8	Corrosion, industrial atmosphere	58
4.12.9	Dust and sand	62
4.12.10	Salt mist	64
4.12.11	Contact resistance stability	65
4.13	Soldering	66
4.13.1	Solderability, wetting, solder bath method.....	66
4.13.2	Solderability, wetting, soldering iron method	67
4.13.3	Solderability, dewetting.....	68
4.13.4	Resistance to soldering heat, solder bath method	68
4.13.5	Resistance to soldering heat, soldering iron method	69
4.14	Panel seal.....	70
4.14.1	General	70
4.14.2	Drip – Proof	70
4.14.3	Splash – Proof	70
4.14.4	Immersion	71
4.14.5	Submersion	72
4.15	Enclosure seal	73
4.15.1	General	73
4.15.2	Watertight immersion	73
4.15.3	Resilient or hermetic seal	74
4.16	Fluid resistance – Immersion in cleaning solvents (marking)	74
4.16.1	Object.....	74
4.16.2	Method	74
4.16.3	Requirement.....	75
4.16.4	Items to be specified in the detail specification	75
4.17	Fire hazard	75
4.18	Capacitance.....	75
4.18.1	Object.....	75
4.18.2	Method	75
4.18.3	Requirement.....	75
4.18.4	Items to be specified in the detail specification	75

4.19	Illumination	76
4.19.1	Chromaticity	76
4.19.2	Transmittancy.....	76
4.19.3	Temperature of illuminated surface.....	77
4.20	Soldering for surface mounting switches	77
4.20.1	Solderability, solder bath method (surface mounting switches)	77
4.20.2	Solderability, reflow method (surface mounting switches)	78
4.20.3	Solderability, soldering iron method (surface mounting switches).....	79
4.20.4	Resistance to soldering heat, solder bath method (surface mounting switches)	80
4.20.5	Resistance to soldering heat, reflow method (surface mounting switches).....	80
4.20.6	Resistance to soldering heat, soldering iron method (surface mounting switches)	81
4.21	Mechanical strength (surface mounting switches)	82
4.21.1	Substrate bending (surface mounting switches)	82
4.21.2	Pull-off and push-off (surface mounting switches).....	82
4.21.3	Shear (surface mounting switches)	83
4.21.4	Body strength (surface mounting switches).....	84
5	Preferred values	84
5.1	General.....	84
5.2	Clearance and creepage distances	84
6	Marking	85
6.1	Markings on switch body.....	85
6.2	Markings on packaging	85
	Bibliography.....	86
	Figure 1 – Measuring direction of operating force and torque.....	18
	Figure 2 – Example of measuring points specified in detail specifications	20
	Figure 3 – Contact bounce test circuit.....	22
	Figure 4 – Typical trace of contact bounce.....	22
	Figure 5 – Low voltage and current method (by DC)	25
	Figure 6 – Low voltage and current method (by AC).....	25
	Figure 7 – Specified current method (by DC)	27
	Figure 8 – Specified current method (by AC).....	27
	Figure 9 – Application of forces and torques for 4.8.1	36
	Figure 10 – Composition of one cycle	56
	Figure 11 – Composition of cycle of test procedure	63
	Figure 12 – Submersion seal enclosure	73
	Table 1 – Torque values for mounting screws	37
	Table 2 – Climatic sequence	49
	Table 3 –Remain cycles.....	49
	Table 4 – Concentration of H ₂ S	59
	Table 5 – Test temperature	59
	Table 6 – Test duration.....	59
	Table 7 – Concentration of SO ₂	61

Table 8 – Test temperature 61
Table 9 – Test duration 61
Table 10 – Solderability, bath method: Test severities (duration and temperature)..... 67

Currently in preview, click buy full version

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROMECHANICAL SWITCHES
FOR USE IN ELECTRICAL AND ELECTRONIC EQUIPMENT –****Part 1: Generic specification**

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 Publications”). 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.

International Standard IEC 61020-1 has been prepared by subcommittee 23J: Switches for appliances, of IEC technical committee 23: Electrical accessories.

This third edition cancels and replaces the second edition published in 2009.

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

- a) In accordance with the ISO/IEC Directives, Part 2:2016, Clause 2 General has been replaced by two new clauses: Clause 2 Normative references and Clause 3 Terms, definitions, units and symbols.
 - 2.4 Preferred values and 2.5 Marking have been moved to Clauses 5 and 6. In addition, 6.2 Markings on packaging has been added.
- b) Clause 3 Quality assurance procedures and Annex A have been deleted.
- c) 4.3.6.3 Returning force has been added.
- d) 4.3.6.4 Travel (movement of the actuator) has been added.
- e) 4.12 Environmental testing:

4.12.1.3 and 4.12.1.5 have been renumbered 4.12.2 and 4.12.3, respectively. 4.12.1.4 and 4.12.1.7 have been integrated in 4.12.5. 4.12.10 Salt mist has been added.

- f) Following publication of IEC 61058-1-1:2016, some cross-references to IEC 61058-1 have been updated.
- g) The following items have been updated with respect to the second edition.
- Tables and figures:

Tables 1 and 3 have been deleted, Table 4 has been renumbered to Table 10. New Tables 2, 3, 4, 5, 6, 7, 8 and 9 have been added.

Figure 1 has been renumbered to Figure 3, Figure 2 renumbered to Figure 4, Figure 3 renumbered to Figure 9 and Figure 4 renumbered to Figure 12. Added new Figures 1, 2, 5, 6, 7, 8, 10 and 11 have been added.
 - Specific words and common names have been unified.

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

CDV	Report on voting
23J/443/CDV	23J/448/RVC

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 61020 series, published under the general title *Electromechanical switches for use in electrical and electronic equipment*, can be found on the IEC website.

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

This document covers the general requirements and test methods for electromechanical switches with optional quality assurance procedures. It provides the general requirements and test methods for use in any detail specifications for pushbutton switches, rotary switches, sensitive switches, toggle switches, and other electromechanical switches.

Where it is intended that an electromechanical switch comply with requirements related to safety, the specific safety requirements will be specified in IEC 61058-1.

Currently in preview, click buy full version

ELECTROMECHANICAL SWITCHES FOR USE IN ELECTRICAL AND ELECTRONIC EQUIPMENT –

Part 1: Generic specification

1 Scope

This part of IEC 61020 specifies the terminology, symbols, test methods and other necessary information to provide consistency in detail specifications for electromechanical switches.

This document relates to electromechanical switches intended for use in electrical and electronic appliances. Switches covered by this document:

- a) are devices which open, close, or change the connection of a circuit by the mechanical motion of conducting parts (contacts);
- b) have a maximum rated voltage of 480 V;
- c) have a maximum rated current of 63 A.

This document does not include keyboards and keypads which are intended for use in information-handling systems. Electromechanical key switches can be included under the scope of this document.

Switch families will be described in any detail specifications that reference this document.

This document is a performance standard intended to describe evaluation methods to better clarify the capabilities of a switch.

NOTE 1 Safety requirements for switches for household and similar fixed electrical installations are given in IEC 60669 (all parts).

NOTE 2 Safety requirements for appliance switches are given in IEC 61058 (all parts).

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 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050-581, *International Electrotechnical Vocabulary – Part 581: Electromechanical components for electronic equipment*

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

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

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

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

IEC 60068-2-10, *Environmental testing – Part 2-10: Tests – Test J and guidance: Mould growth*