

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

standards.iteh.ai

Ensembles d'appareillage à basse tension –
Partie 1: Règles générales

[IEC 61439-1:2020](https://standards.iteh.ai/catalog/standards/sist/03e728f3-e415-4fd0-a2cf-2b3c74c977a4/iec-61439-1-2020)

<https://standards.iteh.ai/catalog/standards/sist/03e728f3-e415-4fd0-a2cf-2b3c74c977a4/iec-61439-1-2020>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 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 It also gives information on projects, replaced and withdrawn publications.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

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

(standards.iteh.ai)

Ensembles d'appareillage à basse tension –
Partie 1: Règles générales

IEC 61439-1:2020
<https://standards.iteh.ai/catalog/standards/sist/03e728f3-e415-4fd0-a2cf-2b3c74c977a4/iec-61439-1-2020>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.130.20

ISBN 978-2-8322-8154-3

**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.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references	11
3 Terms and definitions	14
3.1 General terms	14
3.2 Constructional units of assemblies.....	16
3.3 External design of assemblies.....	18
3.4 Structural parts of assemblies.....	19
3.5 Conditions of installation of assemblies	20
3.6 Insulation characteristics	20
3.7 Protection against electric shock.....	23
3.8 Characteristics.....	27
3.9 Verification	31
3.10 Manufacturer	32
3.11 User.....	32
4 Symbols and abbreviations.....	32
5 Interface characteristics	33
5.1 General.....	33
5.2 Voltage ratings.....	33
5.2.1 Rated voltage (U_n) (of the assembly).....	33
5.2.2 Rated operational voltage (U_e) (of a circuit of an assembly).....	34
5.2.3 Rated insulation voltage (U_i) (of a circuit of an assembly).....	34
5.2.4 Rated impulse withstand voltage (U_{imp}) (of the assembly)	34
5.3 Current ratings.....	34
5.3.1 Rated current of an assembly (I_{nA})	34
5.3.2 Rated current of a main outgoing circuit (I_{nC}).....	34
5.3.3 Group rated current of a main circuit (I_{ng}).....	35
5.3.4 Rated peak withstand current (I_{pk}).....	35
5.3.5 Rated short-time withstand current (I_{cw}) (of a main circuit of an assembly).....	36
5.3.6 Rated conditional short-circuit current (I_{cc}) (of an assembly or a circuit of an assembly).....	36
5.4 Rated diversity factor (RDF).....	36
5.5 Rated frequency (f_n)	36
5.6 Other characteristics.....	37
6 Information	37
6.1 Assembly designation marking.....	37
6.2 Documentation.....	37
6.2.1 Information relating to the assembly	37
6.2.2 Instructions for handling, installation, operation and maintenance.....	38
6.3 Device and/or component identification.....	38
7 Service conditions	38
7.1 Normal service conditions	38
7.1.1 Climatic conditions	38
7.1.2 Pollution degree	39

7.2	Special service conditions.....	39
7.3	Conditions during transport, storage and installation.....	40
8	Constructional requirements.....	40
8.1	Strength of materials and parts.....	40
8.1.1	General.....	40
8.1.2	Protection against corrosion.....	41
8.1.3	Properties of insulating materials.....	41
8.1.4	Resistance to ultra-violet (UV) radiation.....	41
8.1.5	Mechanical strength.....	41
8.1.6	Lifting provision.....	42
8.2	Degree of protection provided by an assembly enclosure.....	42
8.2.1	Protection against mechanical impact (IK code).....	42
8.2.2	Protection against contact with live parts, ingress of solid foreign bodies and water (IP code).....	42
8.2.3	Assembly with removable parts.....	43
8.3	Clearances and creepage distances.....	43
8.3.1	General.....	43
8.3.2	Clearances.....	43
8.3.3	Creepage distances.....	44
8.4	Protection against electric shock.....	44
8.4.1	General.....	44
8.4.2	Basic protection.....	44
8.4.3	Fault protection.....	45
8.4.4	Additional requirements for class II assemblies.....	48
8.4.5	Limitation of steady-state touch currents and charge.....	49
8.4.6	Operating and servicing conditions.....	49
8.5	Incorporation of switching devices and components.....	50
8.5.1	Fixed parts.....	50
8.5.2	Removable parts.....	51
8.5.3	Selection of switching devices and components.....	51
8.5.4	Installation of switching devices and components.....	51
8.5.5	Accessibility.....	52
8.5.6	Barriers.....	52
8.5.7	Direction of operation and indication of switching positions.....	52
8.5.8	Indicator lights and push-buttons.....	52
8.5.9	Power factor correction banks.....	52
8.6	Internal electrical circuits and connections.....	52
8.6.1	Main circuits.....	52
8.6.2	Auxiliary circuits.....	53
8.6.3	Bare and insulated conductors.....	53
8.6.4	Selection and installation of non-protected live conductors to reduce the possibility of short-circuits.....	55
8.6.5	Identification of the conductors of main and auxiliary circuits.....	55
8.6.6	Identification of the protective conductor (PE, PEL, PEM, PEN) and of the neutral conductor (N) and the mid-point conductor (M) of the main circuits.....	55
8.6.7	Conductors in AC circuits passing through ferromagnetic enclosures or plates.....	55
8.7	Cooling.....	55
8.8	Terminals for external cables.....	55

9	Performance requirements	57
9.1	Dielectric properties	57
9.1.1	General	57
9.1.2	Power-frequency withstand voltage	57
9.1.3	Impulse withstand voltage	57
9.1.4	Protection of surge protective devices	58
9.2	Temperature-rise limits	58
9.2.1	General	58
9.2.2	Adjustment of rated currents for alternative ambient air temperatures.....	58
9.3	Short-circuit protection and short-circuit withstand strength	59
9.3.1	General	59
9.3.2	Information concerning short-circuit withstand strength.....	59
9.3.3	Relationship between peak current and short-time current.....	60
9.3.4	Coordination of protective devices	60
9.4	Electromagnetic compatibility (EMC).....	60
10	Design verification	60
10.1	General.....	60
10.2	Strength of materials and parts	62
10.2.1	General	62
10.2.2	Resistance to corrosion	62
10.2.3	Properties of insulating materials	64
10.2.4	Resistance to ultraviolet (UV) radiation.....	65
10.2.5	Lifting	66
10.2.6	Verification of protection against mechanical impact (IK code).....	67
10.2.7	Marking.....	67
10.2.8	Mechanical operation.....	67
10.3	Degree of protection of assemblies (IP Code)	68
10.4	Clearances and creepage distances.....	69
10.5	Protection against electric shock and integrity of protective circuits	69
10.5.1	General	69
10.5.2	Effective earth continuity between the exposed-conductive-parts of the class I assembly and the protective circuit.....	69
10.5.3	Short-circuit withstand strength of the protective circuit	69
10.6	Incorporation of switching devices and components	70
10.6.1	General	70
10.6.2	Electromagnetic compatibility	70
10.7	Internal electrical circuits and connections	70
10.8	Terminals for external conductors	70
10.9	Dielectric properties	71
10.9.1	General	71
10.9.2	Power-frequency withstand voltage	71
10.9.3	Impulse withstand voltage	72
10.9.4	Testing of enclosures made of insulating material.....	74
10.9.5	External door or cover mounted operating handles of insulating material	74
10.9.6	Testing of conductors and hazardous live parts covered by insulating material to provide protection against electric shock.....	74
10.10	Temperature-rise	74
10.10.1	General	74
10.10.2	Verification by testing	75

10.10.3	Verification by comparison.....	81
10.10.4	Verification assessment.....	84
10.11	Short-circuit withstand strength.....	86
10.11.1	General.....	86
10.11.2	Circuits of assemblies which are exempted from the verification of the short-circuit withstand strength.....	86
10.11.3	Verification by comparison with a reference design – Using a checklist.....	87
10.11.4	Verification by comparison with a reference design(s) – Using calculation.....	87
10.11.5	Verification by test.....	87
10.12	Electromagnetic compatibility (EMC).....	93
11	Routine verification.....	93
11.1	General.....	93
11.2	Degree of protection against contact with hazardous live parts, ingress of solid foreign bodies and water of enclosures.....	94
11.3	Clearances and creepage distances.....	94
11.4	Protection against electric shock and integrity of protective circuits.....	94
11.5	Incorporation of built-in components.....	95
11.6	Internal electrical circuits and connections.....	95
11.7	Terminals for external conductors.....	95
11.8	Mechanical operation.....	95
11.9	Dielectric properties.....	95
11.10	Wiring, operational performance and function.....	95
Annex A	(normative) Minimum and maximum cross-section of copper cables suitable for connection to terminals for external cables (see 8.8).....	105
Annex B	(normative) Method of calculating the cross-sectional area of protective conductors with regard to thermal stresses due to currents of short duration.....	106
Annex C	(informative) User information template.....	107
Annex D	(informative) Design verification.....	111
Annex E	(informative) Rated diversity factor.....	112
E.1	General.....	112
E.2	Rated diversity factor for outgoing circuits within an assembly.....	112
E.2.1	General.....	112
E.2.2	Example of an assembly with an RDF of 0,68.....	115
E.2.3	Example of an assembly with RDF declared for each section.....	116
Annex F	(normative) Measurement of clearances and creepage distances.....	117
F.1	Basic principles.....	117
F.2	Use of ribs.....	117
Annex G	(normative) Correlation between the nominal voltage of the supply system and the rated impulse withstand voltage of the equipment.....	122
Annex H	(informative) Operating current and power loss of copper cables.....	124
Annex I	(informative) Thermal equivalent of an intermittent current.....	126
Annex J	(normative) Electromagnetic compatibility (EMC).....	127
J.1	General.....	127
Annex K	(normative) Operating current and power loss of bare copper bars.....	134
Annex L	(informative) Guidance on verification of temperature-rise.....	137
L.1	General.....	137
L.1.1	Principles.....	137

L.1.2	Current ratings of assemblies	137
L.2	Temperature-rise limits	138
L.3	Test	139
L.3.1	General	139
L.3.2	Method a) – Verification of the complete assembly (10.10.2.3.5)	139
L.3.3	Method b) – Verification considering individual functional units separately and the complete assembly (10.10.2.3.6)	139
L.3.4	Method c) – Verification considering individual functional units and the main and distribution busbars separately as well as the complete assembly (10.10.2.3.7)	140
L.4	Verification assessment	140
L.4.1	General	140
L.4.2	Single compartment assembly with a rated current (I_{nA}) not exceeding 630 A	140
L.4.3	Assembly with rated currents (I_{nA}) not exceeding 1 600 A	140
L.5	Verification by comparison with a reference design	140
Annex M (normative) Verification of the short-circuit withstand strength of busbar structures by comparison with a reference design by calculation		142
M.1	General	142
M.2	Terms and definitions	142
M.3	Method of verification	143
M.4	Conditions for application	144
M.4.1	General	144
M.4.2	Peak short-circuit current	144
M.4.3	Thermal short-circuit strength	144
M.4.4	Busbar supports	144
M.4.5	Busbar connections	144
M.4.6	Angular busbar configurations	144
M.4.7	Calculations with special regard to conductor oscillation	145
Annex N (informative) List of notes concerning certain countries		146
Bibliography		152
Figure E.1 – Typical assembly		113
Figure E.2 – Example 1: Table E.1 – Functional unit loading for an assembly with a rated diversity factor of 0,68		115
Figure E.3 – Example 2: Table E.1 – Functional unit loading for an assembly with a rated diversity factor of 0,6 in Section B and 0,68 in Section C		116
Figure F.1 – Measurement of clearance and creepage distances		121
Figure I.1 – Example of average heating effect calculation		126
Figure J.1 – Examples of ports		127
Figure L.1 – Verification of temperature-rise		141
Figure M.1 – Tested busbar structure (TS)		142
Figure M.2 – Non tested busbar structure (NTS)		143
Figure M.3 – Angular busbar configuration with supports at the corners		144
Table 1 – Minimum clearances in air (8.3.2)		96
Table 2 – Minimum creepage distances (8.3.3)		97
Table 3 – Cross-sectional area of a copper protective conductor (8.4.3.2.2)		98

Table 4 – Conductor selection and installation requirements (8.6.4).....	98
Table 5 – Minimum terminal capacity for copper protective conductors (PE) (8.8).....	98
Table 6 – Temperature-rise limits (9.2).....	99
Table 7 – Values for the factor n (9.3.3).....	100
Table 8 – Power-frequency withstand voltage for main circuits (10.9.2).....	100
Table 9 – Power-frequency withstand voltage for auxiliary circuits (10.9.2).....	100
Table 10 – Impulse withstand test voltages (10.9.3).....	100
Table 11 – Copper test conductors for rated currents up to 400 A inclusive (10.10.2.3.2) ...	101
Table 12 – Copper test conductors for rated currents from 400 A to 7 000 A (10.10.2.3.2).....	102
Table 13 – Short-circuit verification by comparison with reference designs: checklist (10.5.3.3, 10.11.3 and 10.11.4).....	103
Table 14 – Relationship between prospective fault current and diameter of copper wire	104
Table 15 – Climatic conditions.....	104
Table A.1 – Cross-section of copper cables suitable for connection to terminals for external cables.....	105
Table B.1 – Values of k for insulated protective conductors not incorporated in cables or bare protective conductors in contact with cable covering.....	106
Table C.1 – User information template.....	107
Table D.1 – List of design verifications to be performed.....	111
Table E.1 – Examples of loading for an assembly.....	114
Table F.1 – Minimum width of grooves.....	117
Table G.1 – Correspondence between the nominal voltage of the supply system and the equipment rated impulse withstand voltage.....	123
Table H.1 – Operating current and power loss of single-core copper cables with a permissible conductor temperature of 70 °C (ambient temperature inside the assembly: 55 °C).....	124
Table H.2 – Reduction factor k_1 for cables with a permissible conductor temperature of 70 °C (extract from IEC 60364-5-52:2009, Table B.52.14).....	125
Table J.1 – Tests for EMC immunity for environment A (see J.10.12.2).....	131
Table J.2 – Tests for EMC immunity for environment B (see J.10.12.2).....	132
Table J.3 – Acceptance criteria when electromagnetic disturbances are present.....	133
Table K.1 – Operating current and power loss of bare copper bars with rectangular cross-section, run horizontally and arranged with their largest face vertical, frequency 50 Hz to 60 Hz (ambient air temperature inside the assembly: 55 °C, temperature of the conductor 70 °C).....	134
Table K.2 – Factor k_4 for different temperatures of the air inside the assembly and/or for the conductors.....	135

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –**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.
- 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.
<http://standards.iteh.ai/catalog/standards/sist/03e72867-e415-46d0-a26f-8e8a7a0c122c/iec-61439-1-2020>
- 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 61439-1 has been prepared by subcommittee 121B: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage.

This third edition cancels and replaces the second edition published in 2011. It constitutes a technical revision.

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

- a) clarification that power electric converter systems, switch mode power supplies, uninterruptable power supplies and adjustable speed power drive systems are tested to their particular products standard, but when they are incorporated in assemblies the incorporation is in accordance with the IEC 61439 series of standards;
- b) introduction of a group rated current for circuits within a loaded assembly and the refocusing of temperature-rise verification on this new characteristic;

- c) addition of requirements in respect of DC;
- d) introduction of the concept of class I and class II assemblies regarding protection against electric shock.

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

FDIS	Report on voting
121B/99/FDIS	121B/103/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.

The reader's attention is drawn to the fact that Annex N lists all the "in-some-countries" clauses on differing practices of a less permanent nature regarding this document.

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

A list of all parts of the IEC 61439 series, under the general title *Low-voltage switchgear and controlgear assemblies*, 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 [IEC 61439-1:2020](https://standards.iteh.ai/catalog/standards/sist/03e728f3-e415-4fd0-a2cf-2b3c74c977a4/iec-61439-1-2020)
- amended. <https://standards.iteh.ai/catalog/standards/sist/03e728f3-e415-4fd0-a2cf-2b3c74c977a4/iec-61439-1-2020>

iteh STANDARD PREVIEW
(standards.iteh.ai)

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 assemblies, in order to obtain uniformity of requirements and verification for assemblies and to avoid the need for verification in other standards. All those requirements for the various assembly 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 assembly, only two main standards are necessary to determine all requirements and the corresponding methods of verification:

- the basic standard, (this document) referred to as “IEC 61439-1” in the specific standards, covering the various types of low-voltage switchgear and controlgear assemblies;
- the specific assembly standard hereinafter also referred to as the relevant assembly standard.

For a general rule to apply to a specific assembly standard, it should be explicitly referred to by quoting this document followed by the relevant clause or subclause number e.g. “IEC 61439-1:2020, 9.1.3”.

A specific assembly standard may not require, and hence need not call up, a general rule where it is not applicable, or it can add requirements if the general rule is deemed inadequate in the particular case, but it may not deviate from it unless there is substantial technical justification detailed in the specific assembly standard.

Where, in this document, a cross-reference is made to another clause, the reference is to be taken to apply to that clause as amended by the specific assembly standard, where applicable.

<https://standards.iteh.ai/catalog/standards/sist/03e728f3-e415-4fd0-a2cf-2b1-74c977a46a61/iec-61439-1-2020>

Requirements in this document that are subject to agreement between the assembly manufacturer and the user are summarized in Annex C (informative). This schedule also facilitates the supply of information on basic conditions and additional user specifications to enable proper design, application and utilization of the assembly.

For the IEC 61439 series, the following parts are published:

- a) IEC 61439-1: General rules
- b) IEC 61439-2: Power switchgear and controlgear assemblies (PSC-assemblies)¹
- c) IEC 61439-3: Distribution boards intended to be operated by ordinary persons (DBO)
- d) IEC 61439-4: Particular requirements for assemblies for construction sites (ACS)
- e) IEC 61439-5: Assemblies for power distribution in public networks
- f) IEC 61439-6: Busbar trunking systems (busways)
- g) IEC 61439-7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations
- h) IEC TR 61439-0: Guidance to specifying assemblies.

This list is not exhaustive; additional parts can be developed as the need arises.

¹ IEC 61439-2 includes requirements for assemblies for use in photovoltaic installations.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 1: General rules

1 Scope

This part of IEC 61439 lays down the general definitions and service conditions, construction requirements, technical characteristics and verification requirements for low-voltage switchgear and controlgear assemblies.

NOTE Throughout this document, the term assembly(s) (see 3.1.1) is used for a low-voltage switchgear and controlgear assembly(s).

For the purpose of determining assembly conformity, the requirements of the relevant part of the IEC 61439 series, Part 2 onwards, apply together with the cited requirements of this document. For assemblies not covered by Part 3 onward, Part 2 applies.

This document applies to assemblies only when required by the relevant assembly standard as follows:

- assemblies for which the rated voltage does not exceed 1000 V AC or 1500 V DC;
- assemblies designed for a (nominal frequency of the incoming supply or supplies not exceeding 1000 Hz;
- assemblies intended for indoor and outdoor applications;
- stationary or mobile assemblies with or without an enclosure;
- assemblies intended for use in connection with the generation, transmission, distribution and conversion of electric energy, and for the control of electrical energy consuming equipment.

This document does not apply to individual devices and self-contained components such as motor starters, fuse switches, power electronic converter systems and equipment (PECS), switch mode power supplies (SMPS), uninterruptable power supplies (UPS), basic drive modules (BDM), complete drive modules (CDM), adjustable speed power drives systems (PDS), and other electronic equipment which comply with their relevant product standards. This document describes the integration of devices and self-contained components into an assembly or into an empty enclosure forming an assembly.

For some applications involving, for example, explosive atmospheres, functional safety, there can be a need to comply with the requirements of other standards or legislation in addition to those specified in the IEC 61439 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 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-11:1981, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

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 60364 (all parts), *Low-voltage electrical installations*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*
IEC 60364-4-41:2005/AMD1:2017

IEC 60364-5-51:2005, *Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules*

IEC 60364-5-52:2009, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60439 (all parts), *Low-voltage switchgear and controlgear assemblies*²

IEC 60445:2017, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

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

[IEC 61439-1:2020](https://standards.iteh.ai/catalog/standards/sist/03c728f3-e415-46f0-a2c6-2b3c74c977a4/iec-61439-1-2020)

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*³
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

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 60865-1:2011, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*

IEC TR 60890:2014, *A method of temperature-rise verification of low-voltage switchgear and controlgear assemblies by calculation*

IEC 60947-4-1:2018, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*

² Withdrawn. The IEC 60439 series has been cancelled and replaced by the IEC 61439 series.

³ There is a consolidated document edition 2.2 (2013) that includes IEC 60529 (1989) and its Amendment 1 (1999) and Amendment 2 (2013).

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*⁴

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*⁵

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 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-11:2004/AMD1:2017

IEC 61000-6-3:2006, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*

IEC 61000-6-3:2006/AMD1:2010

IEC 61000-6-4:2018, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61082-1:2014, *Preparation of documents used in electrotechnology – Part 1: Rules*

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 61921:2017, *Power capacitors – Low-voltage power factor correction banks*

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

IEC 81346-1:2009, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules*

IEC 81346-2:2019, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 2: Classification of objects and codes for classes*

⁴ There is a consolidated edition 3.2 (2010) that includes IEC 61000-4-3 (2006) and Amendment 1 (2007) and Amendment 2 (2010).

⁵ There is consolidated edition 3.1 (2017) that includes IEC 61000-4-5 (2014) and its Amendment 1 (2017).