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INTERNATIONAL STANDARD

colour inside

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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,
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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.

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The contents of the corrigendum 2 of September 2023 only applies to the French version.

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 ~~(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 ~~may~~ 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.

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 ~~new re-structured~~ IEC 61439 series, the following parts are ~~envisaged~~ 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 ~~(to supersede IEC 60439-3)~~ intended to be operated by ordinary persons (DBO)
d) IEC 61439-4: ~~ASSEMBLIES for construction sites (to supersede IEC 60439-4)~~ Particular requirements for assemblies for construction sites (ACS)
e) IEC 61439-5: Assemblies for power distribution ~~(to supersede IEC 60439-5)~~ in public networks
f) IEC 61439-6: Busbar trunking systems ~~(to supersede IEC 60439-2)~~ (busways)
f) IEC 61439-7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations
g) IEC TR 61439-0: Guidance to specifying assemblies.

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

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[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

~~NOTE 1 Throughout this standard, the term ASSEMBLY (see 3.1.1) is used for a low-voltage switchgear and controlgear assembly.~~

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

~~This standard cannot be used alone to specify an ASSEMBLY or used for a purpose of determining conformity. ASSEMBLIES shall comply with the relevant part of the IEC 61439 series, Parts 2 onwards.~~

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 ~~low-voltage switchgear and controlgear~~ assemblies ~~(ASSEMBLIES)~~ only when required by the relevant assembly standard as follows:

– assemblies for which the rated voltage does not exceed 1 000 V ~~in case of~~ AC or 1 500 V ~~in case of~~ DC;

– assemblies designed for a nominal frequency of the incoming supply or supplies not exceeding 1 000 Hz;

– assemblies intended for indoor and outdoor applications;

– stationary or movable 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.

~~– ASSEMBLIES designed for use under special service conditions, for example in ships and in rail vehicles provided that the other relevant specific requirements are complied with;~~

~~NOTE 2 Supplementary requirements for ASSEMBLIES in ships are covered by IEC 60092-302.~~

~~– ASSEMBLIES designed for electrical equipment of machines provided that the other relevant specific requirements are complied with.~~

~~NOTE 3 Supplementary requirements for ASSEMBLIES forming part of a machine are covered by the IEC 60204 series.~~

~~This standard applies to all ASSEMBLIES whether they are designed, manufactured and verified on a one-off basis or fully standardised and manufactured in quantity.~~

~~The manufacture and/or assembly may be carried out other than by the original manufacturer (see 3.10.1).~~

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~~, etc.~~ which ~~will~~ 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 60216 (all parts), *Electrical insulating materials – Properties of thermal endurance*~~

~~IEC 60227-3:1993, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 3: Non-sheathed cables for fixed wiring*~~

~~IEC 60245-3:1994, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 3: Heat resistant silicone insulated cables*~~

~~IEC 60245-4:1994, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*~~

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 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*~~

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 60364-5-53:2001, *Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control*~~

~~IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*~~

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

IEC 60445:~~2010~~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 60529:1989, *Degrees of protection provided by enclosures (IP Code)*[~~3~~4]
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

~~IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*~~

IEC 60695-2-10:~~2000~~2013, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:~~2000~~2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

~~IEC 60695-11-5:2004, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*~~

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:~~1993~~2011, *Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods*

IEC TR 60890:~~1987~~2014, *A method of temperature-rise~~ assessment by extrapolation for partially type-tested assemblies (PTTA)~~ verification of low-voltage switchgear and controlgear assemblies by calculation*

~~IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*~~

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

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* [~~5~~6]

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

~~3 There is a consolidated edition 1.1 (2001) that includes IEC 60529 (1989) and its amendment 1 (1999).~~

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

IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:~~2004~~2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:~~2005~~2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*[7]
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:~~2008~~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 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low-frequency immunity tests*[8]~~

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:~~2006~~2018, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards –Emission standard for industrial environments*[9]

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

IEC 61180~~ (all parts)~~:2016, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

~~IEC/TS 61201:2007, *Use of conventional touch voltage limits – Application guide*~~

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*

~~5 There is a consolidated edition 3.2 (2010) that includes IEC 61000-4-3 (2006) and amendment 1 (2007) and amendment 2 (2010).~~

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

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

~~8 There is a consolidated edition 1.1 (2009) that includes IEC 61000-4-13 (2002) and its amendment 1 (2009).~~

~~9 There is a consolidated edition 2.1 (2011) that includes IEC 61000-6-4 (2006) and its amendment 1 (2010).~~

~~IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*~~

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*

CISPR 11:~~2009~~2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*~~10~~
CISPR 11:2015/AMD1:2016
CISPR 11:2015/AMD2:2019

~~CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*~~

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*
CISPR 32:2015/AMD1:2019

ISO 178:~~2001~~2010, *Plastics – Determination of flexural properties*
ISO 178:2010/AMD1:2013

~~ISO 179 (all parts) *Plastics – Determination of Charpy impact strength*~~

ISO 179-1:2010, *Plastics – Determination of Charpy impact properties – Part 1: Non-instrumented impact test*

ISO 179-2:1997, *Plastics – Determination of Charpy impact properties – Part 2: Instrumented impact test*
ISO 179-2:1997/AMD1:2011

ISO 2409:~~2007~~2013, *Paints and varnishes – Cross-cut test*

ISO 4628-3:~~2003~~2016, *Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 3: Assessment of degree of rusting*

ISO 4892-2:~~2006~~2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

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~~10 There is a consolidated edition 5.1 (2010) that includes CISPR 11 (2009) and its amendment 1 (2010).~~

IEC 61439-1

Edition 3.0 2020-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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

IEC 61439-1:2020-05(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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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 1 000 V AC or 1 500 V DC;
– assemblies designed for a nominal frequency of the incoming supply or supplies not exceeding 1 000 Hz;
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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 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*

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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: Rule*s

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*

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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).

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016
CISPR 11:2015/AMD2:2019

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*
CISPR 32:2015/AMD1:2019

ISO 178:2010, *Plastics – Determination of flexural properties*
ISO 178:2010/AMD1:2013

ISO 179-1:2010, *Plastics – Determination of Charpy impact properties – Part 1: Non-instrumented impact test*

ISO 179-2:1997, *Plastics – Determination of Charpy impact properties – Part 2: Instrumented impact test*
ISO 179-2:1997/AMD1:2011

ISO 2409:2013, *Paints and varnishes – Cross-cut test*

ISO 4628-3:2016, *Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 3: Assessment of degree of rusting*

ISO 4892-2:2013, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

SOMMAIRE

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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ENSEMBLES D'APPAREILLAGE À BASSE TENSION –

Partie 1: Règles générales

AVANT-PROPOS

1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
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7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 61439-1 a été établie par le sous-comité 121B: Ensembles d'appareillages à basse tension, du comité d'études 121 de l'IEC: Appareillages et ensembles d'appareillages basse tension.

Cette troisième édition annule et remplace la deuxième édition parue en 2011. Elle constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) clarification du fait que les systèmes et matériels électroniques de conversion de puissance, les alimentations à découpage, les alimentations sans interruption et les systèmes d'entraînements électriques de puissance à vitesse variable sont soumis à essai

conformément à leur propre norme de produit, mais que lorsqu'ils sont incorporés dans des ensembles, l'incorporation est conforme à la série de normes IEC 61439;

b) introduction d'un courant assigné de groupe pour les circuits au sein d'un ensemble chargé et recentrage de la vérification de l'échauffement sur cette nouvelle caractéristique;

c) ajout d'exigences relatives au courant continu;

d) introduction du concept d'ensembles de classe I et de classe II en matière de protection contre les chocs électriques.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
121B/99/FDIS	121B/103/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

L'attention du lecteur est attirée sur le fait que l'Annexe N énumère tous les articles traitant des différences à caractère moins permanent inhérentes à certains pays, relatifs au présent document.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 61439, publiées sous le titre général *Ensembles d'appareillage à basse tension*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

Le contenu des corrigenda de décembre 2021 et septembre 2023 a été pris en considération dans cet exemplaire.

INTRODUCTION

Le but du présent document est d'harmoniser, autant que possible, l'ensemble des règles et des exigences de nature générale qui sont applicables aux ensembles d'appareillage à basse tension afin d'obtenir l'uniformité des exigences et de la vérification pour les ensembles et pour éviter toute vérification nécessaire selon d'autres normes. Toutes ces exigences relatives aux différentes normes applicables aux ensembles qui peuvent être considérées comme d'ordre général ont ainsi été rassemblées dans le présent document avec des aspects spécifiques présentant une portée et une application étendues, par exemple l'échauffement, les propriétés diélectriques, etc.

Pour chaque type d'ensemble d'appareillage à basse tension, seules deux normes principales sont nécessaires pour déterminer toutes les exigences et toutes les méthodes correspondantes de vérification:

– la norme de base (le présent document) désignée sous l'appellation "IEC 61439-1" dans les normes particulières couvrant les différents types d'ensembles d'appareillage à basse tension;
– la norme particulière applicable à un ensemble désignée ci-après également sous l'appellation norme d'ensemble applicable.

Pour qu'une règle générale s'applique à une norme d'ensemble, il convient de citer celle-ci explicitement en indiquant le présent document suivi du numéro de l'article ou du paragraphe correspondant, par exemple "IEC 61439-1:2020, 9.1.3".

Une norme d'ensemble particulière peut ne pas exiger et donc ne pas renvoyer à une règle générale lorsque cette règle n'est pas applicable, ou elle peut ajouter des exigences si la règle générale est considérée comme inappropriée dans le cas particulier traité, mais elle ne peut pas introduire de divergences sauf si une justification technique importante est donnée dans la norme d'ensemble particulière.

Lorsque, dans le présent document, des références de mise en correspondance sont faites à un autre article, la référence doit s'appliquer à l'article considéré tel que modifié par la norme d'ensemble particulière, le cas échéant.

Les exigences du présent document qui sont sujettes à un accord entre le constructeur d'ensembles et l'utilisateur sont rassemblées à l'Annexe C (informative). Cette liste facilite également la fourniture des informations sur les conditions de base et les spécifications supplémentaires de l'utilisateur afin de permettre la conception, la mise en œuvre et l'utilisation correctes de l'ensemble.

Pour la série IEC 61439, les parties suivantes sont publiées:

a) IEC 61439-1: Règles générales;
b) IEC 61439-2: Ensembles d'appareillage de puissance (ensembles EAP) [1];
c) IEC 61439-3: Tableaux de répartition destinés à être utilisés par des personnes ordinaires (DBO);
d) IEC 61439-4: Exigences particulières pour ensembles de chantiers (EC);
e) IEC 61439-5: Ensembles pour réseaux de distribution publique;
f) IEC 61439-6: Systèmes de canalisation préfabriquée;
g) IEC 61439-7: Ensembles pour installations publiques particulières telles que les marinas, les terrains de camping, les marchés et les emplacements analogues, et pour les bornes de charge de véhicules électriques;

[1] L'IEC 61439-2 comprend les exigences pour les ensembles destinés aux installations photovoltaïques.

h) IEC TR 61439-0: Guidance to specifying assemblies (disponible en anglais seulement).

Cette liste n’est pas exhaustive; des parties supplémentaires peuvent être élaborées en fonction des besoins.

ENSEMBLES D'APPAREILLAGE À BASSE TENSION –

Partie 1: Règles générales

1 Domaine d'application

La présente partie de l'IEC 61439 formule les définitions générales et les conditions d'emploi, les exigences de construction, les caractéristiques techniques et les exigences de vérification pour les ensembles d'appareillage à basse tension.

NOTE Dans le présent document, le terme ensemble(s) (voir 3.1.1) est utilisé pour désigner un ou des ensembles d'appareillage à basse tension.

Dans le but de déterminer la conformité de l'ensemble, les exigences de la partie applicable de la série IEC 61439 (à partir de la Partie 2), s'appliquent, de même que les exigences citées dans le présent document. Pour les ensembles non couverts par les parties à partir de la Partie 3, la Partie 2 s'applique.

Le présent document s'applique, uniquement lorsque la norme d'ensemble applicable l'exige, aux ensembles tels que décrits ci-après:

– les ensembles dont la tension assignée ne dépasse pas 1 000 V en courant alternatif ou 1 500 V en courant continu;
– les ensembles conçus pour une fréquence nominale de l'alimentation ou des alimentations d'entrée ne dépassant pas 1 000 Hz;
– les ensembles conçus pour des applications d'intérieur ou d'extérieur;
– les ensembles fixes ou mobiles, avec ou sans enveloppe;
– les ensembles destinés à être utilisés avec des équipements conçus pour la production, le transport, la distribution et la conversion de l'énergie électrique et la commande des matériels consommant de l'énergie électrique.

Le présent document ne s'applique pas aux appareils considérés individuellement et aux composants indépendants, tels que démarreurs de moteur, fusibles-interrupteurs, systèmes et appareils électroniques de conversion de puissance (SECP), alimentations à découpage (SMPS, *Switch Mode Power Supplies*), alimentations sans interruption (ASI), modules d'entraînement principaux (MEP), modules d'entraînement complets (MEC), entraînements électriques de puissance (PDS, *Power Drive System*) à vitesse variable et autres matériels électroniques qui sont conformes aux normes de produit les concernant. Le présent document décrit l'intégration d'appareils et de constituants indépendants dans un ensemble ou dans une enveloppe vide formant un ensemble.

Pour certaines applications impliquant, par exemple, des atmosphères explosives ou la sécurité fonctionnelle, il peut être nécessaire de satisfaire aux exigences d'autres normes ou d'une autre législation, en plus de celles spécifiées dans la série IEC 61439.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60068-2-2:2007, *Essais d'environnement – Partie 2-2: Essais – Essai B: Chaleur sèche*

IEC 60068-2-11:1981, *Essais fondamentaux climatiques et de robustesse mécanique – Partie 2-11: Essais – Essai Ka: Brouillard salin*

IEC 60068-2-30:2005*, Essais d'environnement – Partie 2-30: Essais – Essai Db: Essai cyclique de chaleur humide (cycle de 12 h + 12 h)*

IEC 60073:2002, *Principes fondamentaux et de sécurité pour l'interface homme-machine, le marquage et l'identification – Principes de codage pour les indicateurs et les organes de commande*

IEC 60085:2007*, Isolation électrique – Evaluation et désignation thermiques*

IEC 60364 (toutes les parties), *Installations électriques à basse tension*

IEC 60364-4-41:2005, *Installations électriques à basse tension – Partie 4-41: Protection pour assurer la sécurité – Protection contre les chocs électriques*
IEC 60364-4-41:2005/AMD1:2017

IEC 60364-5-51:2005, *Installations électriques des bâtiments – Partie 5-51: Choix et mise en œuvre des matériels électriques – Règles communes*

IEC 60364-5-52:2009*, Installations électriques à basse tension – Partie 5-52: Choix et mise en œuvre des matériels électriques – Canalisations*

IEC 60439 (toutes les parties), *Ensembles d'appareillage à basse tension* [2]

IEC 60445:2017, *Principes fondamentaux et de sécurité pour les interfaces homme-machines, le marquage et l'identification – Identification des bornes de matériels, des extrémités de conducteurs et des conducteurs*

IEC 60447:2004, *Principes fondamentaux et de sécurité pour l'interface homme-machine, le marquage et l'identification – Principes de manœuvre*

IEC 60529:1989, *Degrés de protection procurés par les enveloppes (Code IP*) [3]
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60695-2-10:2013, *Essais relatifs aux risques du feu – Partie 2-10: Essais au fil incandescent/chauffant – Appareillage et méthode commune d'essai*

IEC 60695-2-11:2014, *Essais relatifs aux risques du feu – Partie 2-11: Essais au fil incandescent/chauffant – Méthode d'essai d'inflammabilité pour produits finis (GWEPT)*

IEC 60695-2-12, *Essais relatifs aux risques du feu – Partie 2-12: Essais au fil incandescent/chauffant – Méthode d'essai d'indice d'inflammabilité au fil incandescent (GWFI) pour matériaux*

IEC 60865-1:2011, *Courants de court-circuit – Calcul des effets – Partie 1: Définitions et méthodes de calcul*

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2 Supprimée. La série IEC 60439 a été annulée et remplacée par la série IEC 61439.

3 Il existe une édition 2.2 consolidée (2013) de ce document, qui comprend l'IEC 60529 (1989), son Amendement 1 (1999) et son Amendement 2 (2013).

IEC TR 60890:2014, *Méthode de vérification par calcul des échauffements pour les ensembles d'appareillage à basse tension*

IEC 60947-4:1:2018, *Appareillage à basse tension – Partie 4-1: Contacteurs et démarreurs de moteurs – Contacteurs et démarreurs électromécaniques*

IEC 61000-4-2:2008*, Compatibilité électromagnétique (CEM) – Partie 4-2: Techniques d'essai et de mesure – Essai d'immunité aux décharges électrostatiques*

IEC 61000-4-3:2006, *Compatibilité électromagnétique (CEM) – Partie 4-3: Techniques d'essai et de mesure – Essai d'immunité aux champs électromagnétiques rayonnés aux fréquences radioélectriques* [4]
IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Compatibilité électromagnétique (CEM) – Partie 4-4: Techniques d'essai et de mesure – Essais d'immunité aux transitoires électriques rapides en salves*

IEC 61000-4-5:2014, *Compatibilité électromagnétique (CEM) – Partie 4-5: Techniques d'essai et de mesure – Essai d'immunité aux ondes de choc* [5]
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Compatibilité électromagnétique (CEM) – Partie 4-6: Techniques d'essai et de mesure – Immunité aux perturbations conduites, induites par les champs radioélectrique*s

IEC 61000-4-8:2009, *Compatibilité électromagnétique (CEM) – Partie 4-8: Techniques d'essai et de mesure – Essai d'immunité au champ magnétique à la fréquence du réseau*

IEC 61000-4-11:2004, *Compatibilité électromagnétique (CEM) – Partie 4-11: Techniques d'essai et de mesure – Essais d'immunité aux creux de tension, coupures brèves et variations de tension*
IEC 61000-4-11:2004/AMD1:2017

IEC 61000-6-3:2006, *Compatibilité électromagnétique (CEM) – Partie 6-3: Normes génériques – Norme sur l'émission pour les environnements résidentiels, commerciaux et de l'industrie légère*
IEC 61000-6-3:2006/AMD1:2010

IEC 61000-6-4:2018, *Compatibilité électromagnétique (CEM) – Partie 6-4: Normes génériques – Norme sur l'émission pour les environnements industriels*

IEC 61082-1:2014, *Etablissement des documents utilisés en électrotechnique – Partie 1: Règles*

IEC 61180:2016, *Techniques des essais à haute tension pour matériel à basse tension – Définitions, exigences relatives aux essais, matériel d'essai*

IEC 61439 (toutes les parties*), Ensembles d'appareillage à basse tension*

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4 Il existe une édition 3.2 consolidée (2010) qui comprend l'IEC 61000-4-3 (2006), l'Amendement 1 (2007) et l'Amendement 2 (2010).

5 Il existe une édition 3.1 consolidée (2017) qui comprend l'IEC 61000-4-5 (2014) et son Amendement 1 (2017).

IEC 61921:2017, *Condensateurs de puissance – Batteries de compensation du facteur de puissance basse tension*

IEC 62208:2011, *Enveloppes vides destinées aux ensembles d'appareillage à basse tension – Règles générales*

IEC 81346-1:2009, *Systèmes industriels, installations et appareils, et produits industriels – Principes de structuration et désignations de référence – Partie 1: Règles de base*

IEC 81346-2:2019, *Systèmes industriels, installations et appareils, et produits industriels – Principes de structuration et désignations de référence – Partie 2: Classification des objets et codes pour les classes*

CISPR 11:2015, *Appareils industriels, scientifiques et médicaux – Caractéristiques de perturbations radioélectriques – Limites et méthodes de mesure*
CISPR 11:2015/AMD1:2016
CISPR 11:2015/AMD2:2019

CISPR 32:2015, *Compatibilité électromagnétique des équipements multimédia – Exigences d'émission*
CISPR 32:2015/AMD1:2019

ISO 178:2010, *Plastiques – Détermination des propriétés en flexion*
ISO 178:2010/AMD1:2013

ISO 179-1:2010, *Plastiques – Détermination des caractéristiques au choc Charpy – Partie 1: Essai de choc non instrumenté*

ISO 179-2:1997, *Plastiques – Détermination des caractéristiques au choc Charpy – Partie 2: Essai de choc instrumenté*
ISO 179-2:1997/AMD1:2011

ISO 2409:2013, *Peintures et vernis – Essai de quadrillage*

ISO 4628-3:2016, *Peintures et vernis – Evaluation de la dégradation des revêtements – Désignation de la quantité et de la dimension des défauts, et de l'intensité des changements uniformes d'aspect – Partie 3: Evaluation du degré d'enrouillement*

ISO 4892-2:2013, *Plastiques – Méthodes d'exposition à des sources lumineuses de laboratoire – Partie 2: Lampes à arc au xénon*

ISO 7010*, Symboles graphiques – Couleurs de sécurité et signaux de sécurité – Signaux de sécurité enregistrés*