IEC 61439-7

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INTERNATIONAL STANDARD

colour inside

Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations

IEC 61439-7:2022-07 RLV(en)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61439-7:2018. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61439-7 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 second edition cancels and replaces the first edition published in 2018. It constitutes a technical revision.

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

a) a general editorial review and a technical revision.

The text of this document is based on the following documents:

Draft	Report on voting
121B/138/CDV	121B/150/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document is to be read in conjunction with IEC 61439-1:2020. The provisions of the general rules dealt with in IEC 61439-1:2020 are applicable to this document where they are specifically cited. When this document states "addition", "modification" or "replacement", the relevant text in IEC 61439-1:2020 is to be adapted accordingly.

Subclauses that are numbered with a 701 (702, 703, etc.) suffix are additional to the same subclause in IEC 61439-1:2020.

Tables and figures in this document that are new are numbered starting with 701.

New annexes in this document are lettered AA, BB, etc.

In this document, the term assembly is defined in 3.1.1 of IEC 61439-1:2020.

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

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.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations

1 Scope

Clause 1 of IEC 61439-1:~~2011~~2020 is applicable except as follows.

Replacement:

This part of IEC 61439 defines the specific requirements for assemblies for the following applications: marinas, camping sites, market squares and electric vehicle charging stations as follows:

- assemblies for which the rated voltage does not exceed 1 000 V AC or 1 500 V DC;
- assemblies intended for use in connection with the generation, transmission, distribution and conversion of electric energy, and for the control of electric energy consuming equipment;
- assemblies operated by ordinary persons (e.g. to plug and unplug of electrical equipment);
- assemblies intended to be installed and used in market squares, marinas, camping sites and other similar ~~outdoor public sites~~ sites accessible to the public including temporary installations;
- assemblies intended for charging stations for electric vehicles (AEVCS) for Mode 3 and Mode 4. They are designed to integrate the functionality and additional requirements for electric vehicle conductive charging systems according to IEC 61851-1:2017.

NOTE 1 Throughout this document, the terms AMHS (see 3.1.701), ACCS (see 3.1.702), AMPS (see 3.1.703), AEVCS (see 3.1.704) are used for low-voltage switchgear and controlgear assemblies intended for use respectively in marinas and similar locations (AMHS), camping sites and similar locations (ACCS), market squares and other similar external public sites (AMPS) and charging stations (AEVCS). The term assemblies is used for indicating all these boards.

This document is not applicable to assemblies intended to be installed on board of ships, houseboats, pleasure crafts and similar vessels.

For the correct selection of the switching devices and components, the following standards apply:

- IEC 60364-7-709 (AMHS) or
- IEC 60364-7-708 (ACCS) or
- IEC 60364-7-740 (AMPS) or
- IEC 60364-7-722 (AEVCS).

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

The manufacturing and/or assembling ~~may~~ can be carried out other than by the original manufacturer (see 3.10.1 of IEC 61439-1:~~2011~~2020).

This document does not apply to individual devices and self-contained components such as circuit breakers, fuse switches, electronic equipment, which comply with their relevant product standards.

NOTE 2 Where electrical equipment is directly connected to public low-voltage supply system and equipped with an energy meter for billing of the legal provider of the low-voltage supply, additional particular requirements based on national regulations apply, if any.

This document does not apply to boxes and enclosures for electrical accessories for household and similar fixed electrical installations as defined in IEC 60670-24.

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.

Clause 2 of IEC 61439-1:~~2011~~2020 is applicable except as follows.

Addition:

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 61439-1:~~2011~~2020, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*

IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*
IEC 62262:2002/AMD1:2021

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61439-1:~~2011~~2020 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

Clause 3 of IEC 61439-1:~~2011~~2020 is applicable except as follows.

3.1 General terms

Additional terms:

3.1.701
low-voltage switchgear and controlgear assembly for marinas and harbour sites
AMHS
combination of one or more transforming or switching devices together with associated control, measuring, signaling, protective and regulating equipment, with all their internal electrical and mechanical interconnections and structural parts, designed and built for use in all marinas, harbors and similar sites

~~Note 1 to entry: This note applies to the French language only.~~

3.1.702
low-voltage switchgear and controlgear assembly for camping and caravan sites
ACCS
combination of one or more transforming or switching devices together with associated control, measuring, signaling, protective and regulating equipment, with all their internal electrical and mechanical interconnections and structural parts, designed and built for use in all camping, caravan and similar sites

~~Note 1 to entry: This note applies to the French language only.~~

3.1.703
low-voltage switchgear and controlgear assembly for markets and other outdoor public sites
AMPS
combination of one or more transforming or switching devices together with associated control, measuring, signaling, protective and regulating equipment, with all their internal electrical and mechanical interconnections and structural parts, designed and built for use in all market squares and other similar outdoor public sites

~~Note 1 to entry: This note applies to the French language only.~~

3.1.704
low-voltage switchgear and controlgear assembly for electric vehicles charging stations
AEVCS
combination of one or more transforming or switching devices together with associated control, measuring, signaling, protective and regulating equipment, with all their internal electrical and mechanical interconnections and structural parts, designed and built for electric vehicle charging stations

~~Note 1 to entry: This note applies to the French language only.~~

3.3 External design of assemblies

Modification:

3.3.1
open-type assembly

This term of IEC 61439-1:~~2011~~2020 does not apply.

3.3.2
dead-front assembly
This term of IEC 61439-1:~~2011~~2020 does not apply.

3.5 Conditions of installation of assemblies

3.5.3
stationary assembly

Additional terms and definitions:

3.5.3.701
ground and floor mounted assembly
stationary assembly permanently connected to the supply with a part embedded in the ground or intended to be fixed directly on the floor or a base

Note 1 to entry: This type of assembly includes poles and columns.

3.5.3.702
wall-mounted assembly
stationary assembly intended to be fixed directly on the wall while being permanently fixed to the supply

3.5.4
movable assembly
This term of IEC 61439-1:~~2011~~2020 does not apply.

Additional terms and definitions:

3.5.701
permanently connected assembly
assembly that can only be connected to, or disconnected from, the AC or DC supply network by the use of a tool

Note 1 to entry: This assembly corresponds to the definition of permanently connected EV supply equipment provided in 3.6.9 of IEC 61851-1:2017.

3.5.702
transportable assembly
assembly intended for use in a place where it is not permanently fixed

Note 1 to entry: When the equipment is to be moved to another place, it is first disconnected from the supply network.

3.5.703
mobile assembly
assembly which is capable to be moved while in operation or which can easily be moved from one place to another while connected to the supply network

3.5.704
assembly for locations with restricted access
assembly accessible to all persons who are authorized to have access to the location (e.g. equipment located in private housing, private parking areas or similar places)

Note 1 to entry: This assembly corresponds to the definition of equipment for locations with restricted access provided in 3.6.3 of IEC 61851-1:2017.

3.5.705
assembly for locations with non-restricted access
assembly accessible for all persons, e.g. the access is given in a public area

Note 1 to entry: This assembly corresponds to the definition of equipment for locations with non-restricted access provided in 3.6.4 of IEC 61851-1:2017.

3.5.706
water and other fluids system
part of the assembly which contains water tubes, valves, joins and taps as service to connected user

EXAMPLE Possible other fluids are compressed air, natural gasses, drinkable water and wastewater.

3.5.707
base
additional part of the arrangement used to support the assembly in any case of mounting intended to accommodate only cables

3.5.708
fixing mean
accessory intended to fix the base or the assembly to the ground, to the floor or to the wall etc.

4 Symbols and abbreviations

Clause 4 of IEC 61439-1:~~2011~~2020 is applicable except as follows.

Addition:

Symbol/ Abbreviation	Term	Subclause
AMHS	low-voltage switchgear and controlgear assembly for marinas and harbour sites	3.1.701
ACCS	low-voltage switchgear and controlgear assembly for camping and caravan sites	3.1.702
AMPS	low-voltage switchgear and controlgear assembly for markets and other outdoor public sites	3.1.703
AEVCS	low-voltage switchgear and controlgear assembly for electric vehicles charging station	3.1.704

5 Interface characteristics

Clause 5 of IEC 61439-1:~~2011~~2020 is applicable except as follows. ~~Items subject to agreement between the ASSEMBLY manufacturer and the user: see Annex AA.~~

5.1 General

Replacement:

The characteristics of the assembly shall ensure compatibility with the ratings of the circuits to which it is connected and the installation conditions and shall be declared by the assembly manufacturer using the criteria identified in 5.2 to 5.6, 5.701 and 5.702.

The specification schedule detailed in the informative Annex AA is intended to help the user and the assembly manufacturer to meet this objective, whether the user:

- selects catalogue products, the characteristics of which meet their needs, and the requirements of this document; and/or,
- makes a specific agreement with the manufacturer.

5.4 Rated diversity factor (RDF)

Addition:

In the absence of ~~information~~ an agreement between the assembly manufacturer and the user concerning the actual load currents, the assumed loading of the outgoing circuits of AMHS, ACCS, AMPS assembly or group of outgoing circuits can be based on the ~~factor~~ values in Table 701~~, may be used~~.

The assumed load current is the rated current of the protective device I_n as required by the user, multiplied with the loading factor of Table 701.

Table 701 does not apply for AEVCS. ~~For AEVCS the rated diversity factor of the outgoing circuit supplying directly the connecting point shall be taken as equal to 1. The rated diversity factor of the distribution circuit supplying multiple connecting points may be reduced if a load control is available.~~ For AECVS it is assumed that all circuits can be loaded continuously and simultaneously. Therefore, the assumed loading factor of the outgoing circuits shall be taken as equal to 1 and can be reduced if a load control is available.

NOTE Values in Table 701 represent minimum values which are reached or exceeded in tests.

5.6 Other characteristics

Replacement of the item g):

g) intended for use by ordinary persons (see 3.7.16 of IEC 61439-1:~~2011~~2020);

Additional item:

q) locations with restricted access or non-restricted access (see 3.5.704 and 3.5.705).

Additional subclauses:

5.701 According to the method of mounting

5.701.1 Stationary assembly

5.701.1.1 Ground and floor mounted assembly (see Annex DD)

5.701.1.2 Wall-mounted assembly

5.701.2 Transportable assembly

5.701.3 Mobile assembly

5.702 According to the mechanical resistance for stationary assembly (see Table 702)

5.702.1 Basic mechanical resistance

5.702.2 Medium mechanical resistance

5.702.3 High mechanical resistance

6 Information

Clause 6 of IEC 61439-1:~~2011~~2020 is applicable except as follows.

6.1 Assembly designation marking

Replacement:

The assembly manufacturer shall provide each assembly with one or more labels, marked in a durable manner and located in a place such that they are visible and legible when the assembly is installed.

Compliance is checked according to the test of 10.2.7 of IEC 61439-1:~~2011~~2020 and by inspection.

The following information regarding the assembly shall be provided on the label(s):

a) assembly manufacturer's name or trade mark (see 3.10.2 of IEC 61439-1:~~2011~~2020);
b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the assembly manufacturer;
c) means of identifying date of manufacture;
d) rated current of the assembly I_{nA} (see 3.8.10.7 and 5.3.1 of IEC 61439-1:~~2011~~2020);
e) rated voltage of the assembly U_n (see 3.8.9.1 and 5.2.1 of IEC 61439-1:~~2011~~2020);

f) rated frequency ~~in the case of AC~~ of the assembly f_n (see 3.8.12 and 5.5 of IEC 61439-1:~~2011~~2020);

g) IEC 61439-7;

h) degree of protection against contact with hazardous live parts, ingress of solid foreign bodies and water, IP code (see 8.2.2 of IEC 61439-1:2020);

i) the weight, for transportable and mobile assemblies (see 3.5.702 and 3.5.703), where it exceeds 30 kg.

6.2.1 Information relating to the assembly

~~*Replacement*~~ *Addition:*

The following additional information, where applicable, shall be provided in the assembly manufacturer's technical documentation supplied with the assembly:

~~a) rated operational voltage (U_e) of a circuit (see 5.2.2 of IEC 61439-1:2011);~~

a) rated impulse withstand voltage (U_{imp}) (see 5.2.4 of IEC 61439-1:~~2011~~2020);

b) rated insulation voltage (U_i) (see 5.2.3 of IEC 61439-1:~~2011~~2020);

c) rated current of each circuit (I_{nc}) (see 5.3.2 of IEC 61439-1:~~2011~~2020);

~~e) rated frequency (f_n) (see 5.5 of IEC 61439-1:2011);~~

d) rated diversity factor(s) (RDF) (see 5.4);

e) all necessary information relating to the other declared classifications and characteristics (see 5.6, 5.701 and 5.702);

f) overall dimensions (including projections e.g. handles, covers, doors);

g) AMHS (see 3.1.701), ACCS (see 3.1.702), AMPS (see 3.1.703), AEVCS (see 3.1.704) or equivalent terms;

h) for mobile assemblies according to 3.5.703, the mounting position during operation~~, if necessary~~.

7 Service conditions

Clause 7 of IEC 61439-1:~~2011~~2020 is applicable.

8 Constructional requirements

Clause 8 of IEC 61439-1:~~2011~~2020 is applicable except as follows.

8.2 Degree of protection and mechanical strength provided by an assembly enclosure

8.2.1 ~~Protection against mechanical impact~~ Mechanical strength for assemblies

~~*Replacement of the whole text of this subclause:*~~

8.2.1.701 Assemblies for locations with restricted access

The minimum mechanical resistance for assemblies for locations with restricted access is the basic resistance (5.702.1).

Medium or high resistance (5.702.2 and 5.702.3) ~~may~~ can be also required by the national installation rules.

For the relevant tests and severities see Table 702.

8.2.1.702 Assemblies for locations with non-restricted access

The minimum mechanical resistance for ground and floor mounting assemblies for locations with non-restricted access is the high resistance (5.702.3).

The minimum mechanical resistance for wall mounting assemblies for locations with non-restricted access is the high resistance (5.702.3).

In case of wall mounting assemblies for locations with non-restricted access intended to be installed at a height where the bottom edge of the assemblies is more or equal to 0,9 m from the ground or floor, the mechanical resistance can be decreased to medium resistance (5.702.2).

For the relevant tests and severities criteria's, see Table 702.

8.2.2 Protection against contact with live parts, ingress of solid foreign bodies and water (IP code)

Replacement of the 2nd, 3rd and 4th paragraph:

After installation in accordance with the manufacturer's instructions, the degree of protection of an indoor assembly shall be at least IP41 and of an outdoor assembly at least IP44, in accordance with IEC 60529:1989, IEC 60529:1989/AMD1:1999 and IEC 60529:1989/AMD2:2013.

The degree of protection shall be ensured also when the supply ~~cords~~ cables are plugged into the assembly.

In case of specific and more severe conditions, a higher IP degree could be required according to the installation requirements.

8.4 Protection against electric shock

8.4.3.1 Installation conditions

Replacement of the whole text of this subclause:

The assembly shall include protective measures and be suitable for installations designed to be in accordance with IEC 60364-4-41:2005 and IEC 60364-4-41:2005/AMD1:2017 as well as the applicable wiring standards.

NOTE 1 The applicable wiring standards are IEC 60364-7-709:2007 and IEC 60364-7-709:2007/AMD1:2012 (AMHS) or IEC 60364-7-708:2017 (ACCS) or IEC 60364-7-740:2000 (AMPS) or IEC 60364-7-722:2018 (AEVCS).

NOTE 2 For AEVCS, see also 8.5 of IEC 61851-1:2017.

8.5 Incorporation of switching devices and components

8.5.3 Selection of switching devices and components

Addition:

The need for overvoltage protection (SPDs) ~~conforming to a relevant IEC standard (for example IEC 61643)~~ to prevent possible damage to the installation should be considered.

8.5.6 Barriers

This subclause of IEC 61439-1:~~2011~~2020 does not apply.

Additional subclauses:

8.701 Supports and securing devices of assembly

8.701.1 Handling provisions

In case of mobile assemblies, handles (or any other equivalent system) shall be provided on the assembly and be firmly attached to the enclosure or supporting framework.

The assembly shall be verified according to 10.2.5 of IEC 61439-1:2020.

8.701.2 Water and other fluid systems

The assembly in a common enclosure with water and other fluids shall be designed according to the requirements of this document for outdoor installation.

The compartment containing the fluid system shall be separated in such a way that an improper fluid ingress is prevented.

Compliance is checked by inspection.

NOTE In the case that the fluid system could lead to a risk of explosion, additional requirements ~~may~~ can be ~~necessary~~ applicable. For details, see IEC 60364-5-52:2009, Chapter 528.

Provisions for the using of other fluids could be subject to an agreement between the manufacturer and users.

8.701.3 Other services

As other services (e.g. telecommunication, internet) ~~may~~ can be installed in the same enclosure ~~provided that any unacceptable interferences are not created~~, the assembly shall enable segregation between power circuits and this other services.

NOTE For details, see IEC 60364-5-52:2009, Chapter 528.

9 Performance requirements

Clause 9 of IEC 61439-1:~~2011~~2020 is applicable except as follows.

Additional subclause:

9.701 Inrush current withstand strength for AEVCS

In AEVCS intended for AC, if not already tested against this requirement, the individual switching device shall withstand an inrush current ~~representing a typical charger~~ of an electric vehicle as defined in Annex CC.

NOTE 1 The requirement for the inrush current of an electric vehicle is based on ISO 17409.

~~If not already tested against this requirement, the individual switching device shall be verified by the tests of Annex CC.~~

NOTE 2 The requirements for the AEVCS intended for DC are described in IEC 61851-23.

10 Design verification

Clause 10 of IEC 61439-1:~~2011~~2020 is applicable except as follows. See also Annex BB.

10.2.6 Verification of protection against mechanical impact (IK code)

This subclause of IEC 61439-1:~~2011~~2020 does not apply.

Additional subclauses:

10.2.701 Verification of mechanical strength for assemblies

10.2.701.1 General

The tests shall be carried out at an ambient temperature of between +10 °C and +40 °C.

With the exception of the test of 10.2.701.5, a new sample assembly ~~may~~ can be used for each of the independent tests. If the same sample assembly is used for more than one test of 10.2.701, the compliance check for the second numeral of the degree of protection (IP code) ~~need~~ shall only be applied when the tests on that sample have been completed.

When the base and the fixing means are not provided by the original manufacturer of the assembly, the original manufacturer ~~has to~~ shall provide all instructions useful to set this assembly in the safest way (see 6.2.2 of IEC 61439-1:~~2011~~2020).

All tests shall be carried out with the assembly mounted and installed as for normal use according to the original manufacturer's instructions.

With the exception of the test of 10.2.701.4, the door(s) of the assembly, if applicable, shall be locked at the beginning of the test and remain locked for the duration of the test.

With the exception of the test of 10.2.701.2 and 10.2.701.4, those tests do not apply to wall-mounted surface type assemblies (see 3.3.9 of IEC 61439-1:~~2011~~2020) and to wall-mounted recessed type assemblies (see 3.3.10 of IEC 61439-1:~~2011~~2020).

The following tests shall be carried out in accordance with the Table 702.

10.2.701.2 Verification of resistance to mechanical impact

Mechanical impacts shall be carried out in accordance with IEC 62262:2002 and IEC 62262:2002/AMD1:2021.

Bases as defined in 3.5.707 shall not be subjected to any mechanical tests present in this document.

Blows shall not be applied on components mounted on or in the surface of the enclosure and already tested in accordance with their own standard, e.g. socket outlets, push-buttons, displays.

After the test, the specimens shall show no damage leading to non-compliance with the document.

Damage to the finish, small dents and small chips which do not adversely affect the protection against electric shock or harmful ingress of water should be disregarded.

Cracks passing through the material not visible with normal or corrected vision without magnification, surface cracks in fiber-reinforced moldings and small indentations are disregarded.

After the test, inspection shall verify that the specified IP code and dielectric properties have been maintained and removable covers can still be removed and reinstalled, doors opened and closed.

10.2.701.3 Verification of resistance to static load

The following tests shall be carried out on assemblies classified as 5.701.1.1 (ground- and floor-mounted) intended to be installed in non-restricted access areas and restricted access areas classified as 5.702.2 (medium resistance) or 5.702.3 (high resistance).

Test 1: an evenly distributed load L_1:

– 4 500 N/m^2 for medium-resistance assembly (see 5.702.2),

– 8 500 N/m^2 for high-resistance assembly (see 5.702.3),

shall be applied for 5 min to the roof of the enclosure (see Figure 701). To distribute the force transmission on an uneven roof, a sandbag or similar device can be used.

Test 2: a force F_1:

– 600 N for medium resistance assembly (see 5.702.2),

– 1 200 N for high resistance assembly (see 5.702.3),

shall be applied for 5 min in turn to the two roof edges having the longest length (see Figure 701) except where the enclosure height exceeds 1,80 m above ground level, in which case the force shall be applied to the front and rear sides of the enclosure located at 1,80 m above ground level.

Where the shape of the roof is not rectangular, the two applications shall be as close as practical to 180° of angular displacement from each other.

The force shall be transmitted over an area of not less than 100 mm × 100 mm and not exceeding 120 mm × 120 mm.

The load/force should be applied smoothly without jerks within 30 s. The verification of the test starts when the load/force has settled.

Compliance is checked by verification after the test that the minimum degree of protection is in accordance with 8.2.2, and the operation of the door(s) and locking points are not impaired and by verification that the electrical clearances have remained satisfactory for the duration of the tests and in the case of an assembly having a metallic enclosure, that no contact between live parts and the enclosure has occurred caused by permanent or temporary distortion.

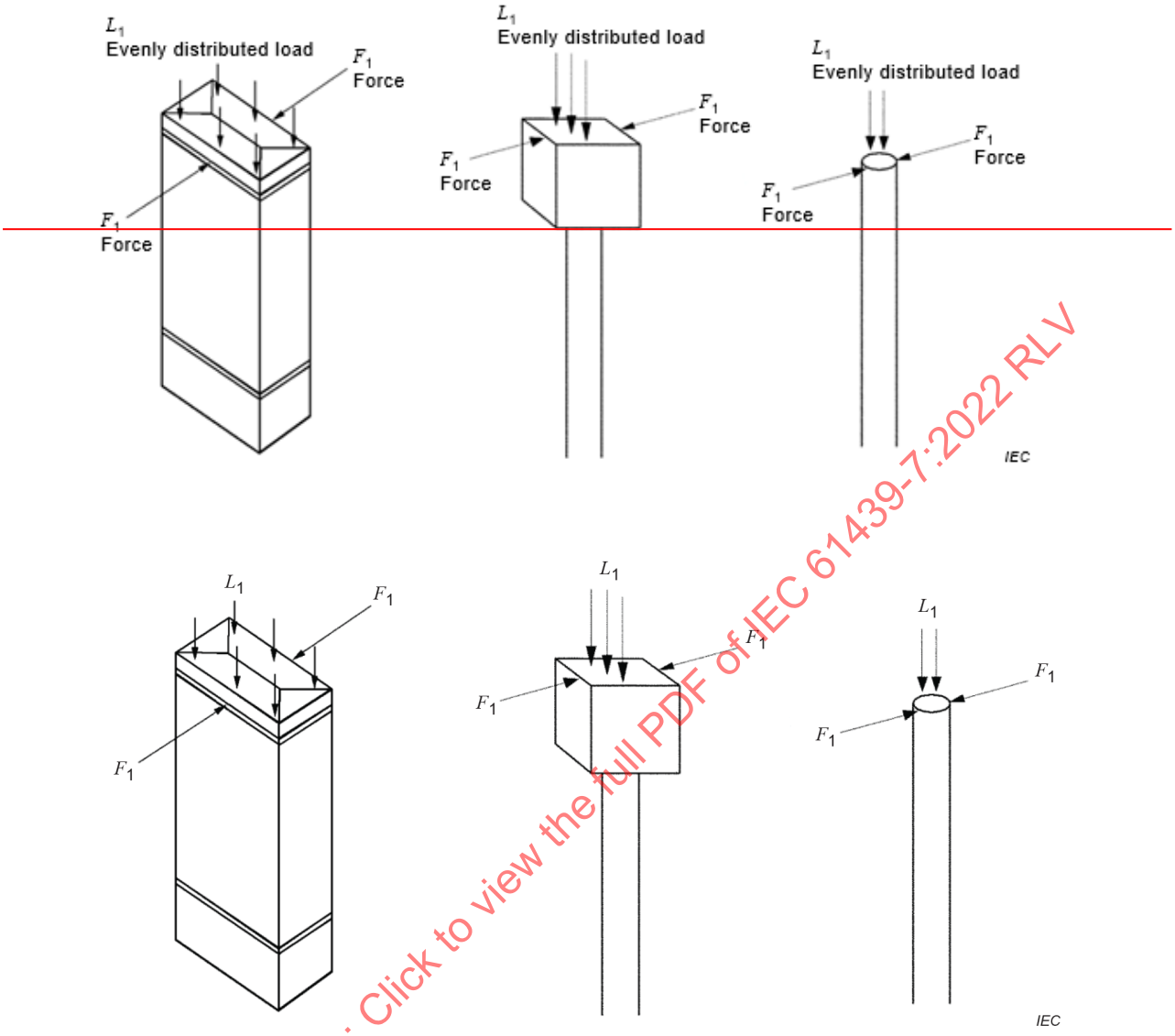


Figure 701 – Diagram of test to verify the resistance to static load

10.2.701.4 Verification of mechanical strength of doors

The test applies to all types of ~~ground mounted~~ assemblies having a door(s) hinged on a vertical edge of the enclosure.

This test does not apply for doors inside the enclosure and for hinged lids inside the enclosure.

The tests shall be carried out with the door(s) fully open and in contact with the designed restraint (see Figure 702). A load of 50 N shall be applied at the top edge of the door perpendicular to the plane of the door(s) and at a distance of maximum 300 mm from the hinged edge and maintained for 3 s. The test is not applicable if the doors are less than 300 mm wide.

Unless the door(s) are designed to be unhinged without the use of a tool for maintenance or operational use, the test shall then be repeated with the force F_2 increased to

- 250 N for medium resistance assembly (see 5.702.2);
- 450 N for high resistance assembly (see 5.702.3).

Compliance is checked by verification that the door(s) have not become unhinged and the operation of the door(s), hinges and locking points are not impaired by the application of a force of 50 N. In addition, by verification that the degree of protection remains in accordance with 8.2.2 after the door(s) have been closed following tests. If the door(s) become unhinged during the F_2 test, this is not regarded as a failure if it is possible to reinstall the same door(s) without the use of a tool.

NOTE Small cracks, created by air bubbles that were visible before the test, but not affected by the application of the axial load, are ignored.

Dimensions in millimetres

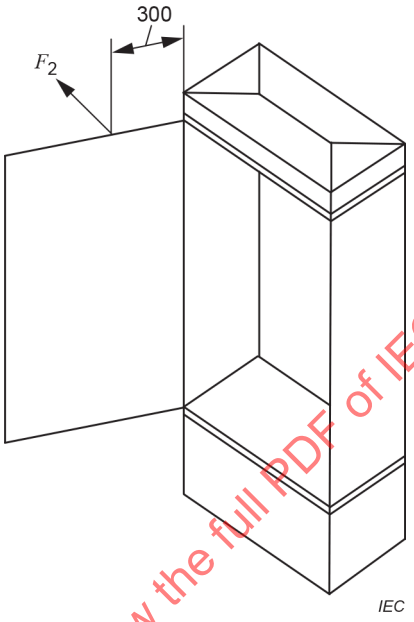
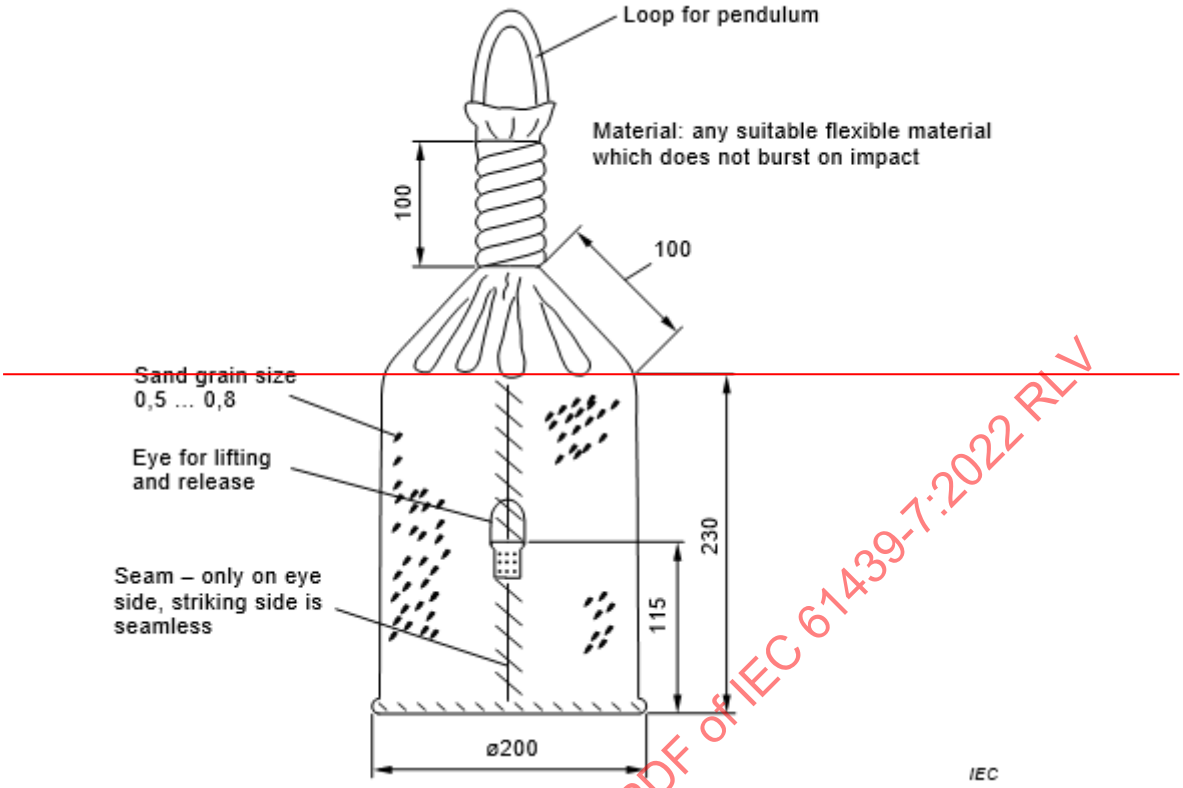


Figure 702 – Diagram of test to verify the mechanical strength of doors

10.2.701.5 Verification of resistance to shock load

The following tests shall be carried out on ground and floor-mounted assemblies intended to be installed in non-restricted access areas. A bag in accordance with Figure 703 containing dry sand and having a total mass of 15 kg shall be hung from an overhead support vertically above the surface under test ~~and at least 1 m above the highest point of the ASSEMBLY~~.

This test shall be made on new samples.



Dimensions in millimetres

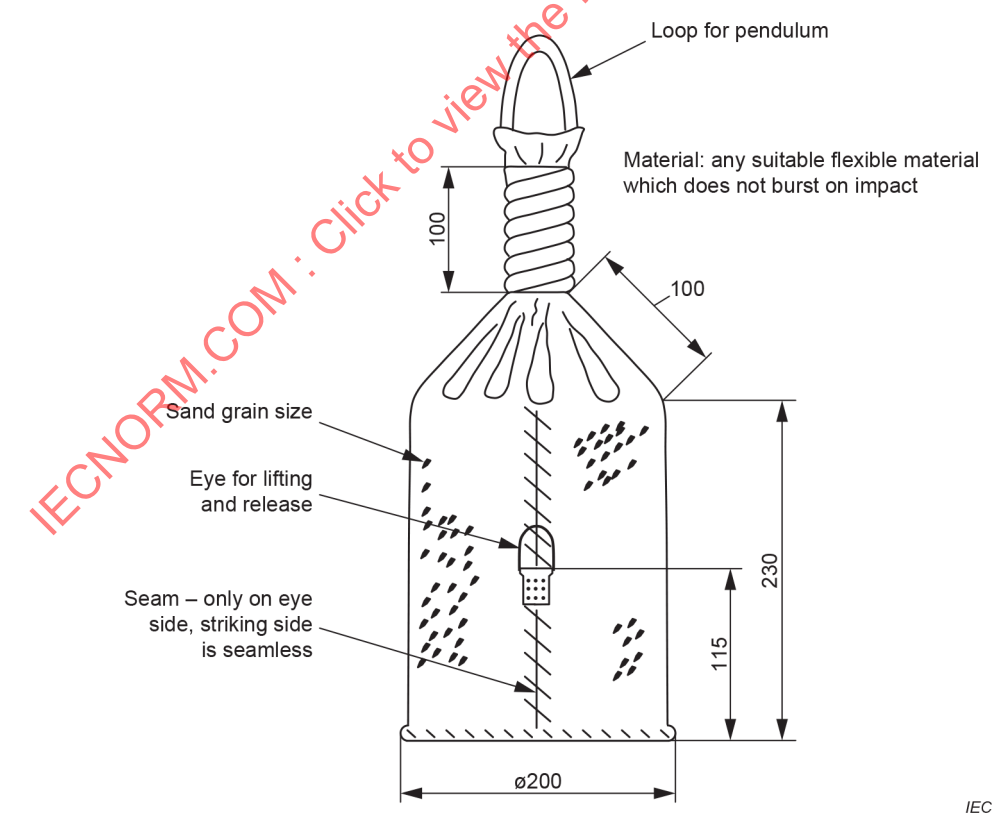


Figure 703 – Sandbag for test to verify the resistance to shock load

Each test shall consist of one blow aimed at the upper part of each at least three of the vertical surfaces of the assembly at 0,5 m above ground level which are visible when the assembly is installed as for normal use according to the original manufacturer's instructions.

Separate enclosures ~~may~~ can be used for each of the test blows.

If the enclosure is of cylindrical form, the test consists of three blows positioned with an angular displacement of 120°.

A test shall consist of raising the lifting eye through a height of 1 m and allowing the sandbag to fall through a vertical arc to impact the approximate centre of the upper part of the surface below the roof of the assembly under test (see Figures 704a and 704b).

Compliance is checked by verification that, after the test, the degree of protection ~~remains~~ is maintained in accordance with 8.2.2 and that the operation of the door(s) and locking points are not impaired~~. All ASSEMBLIES are checked, regarding and the operation of the door(s) and locking points are not impaired; also~~ and by verification that the electrical clearances have remained satisfactory for the duration of the tests and, in the case of an assembly having a metallic enclosure, that no contact between live parts and the enclosure has occurred caused by permanent or temporary distortion.

In the case of an assembly having an insulating enclosure, if the appropriate conditions are satisfied, then damage such as small dents or small degrees of surface cracking or flaking are disregarded, provided that there are no associated cracks detrimental to the service ability of the assembly.

Detachments, cracks or deterioration of aesthetical parts or components shall be disregarded.

Dimensions in millimetres

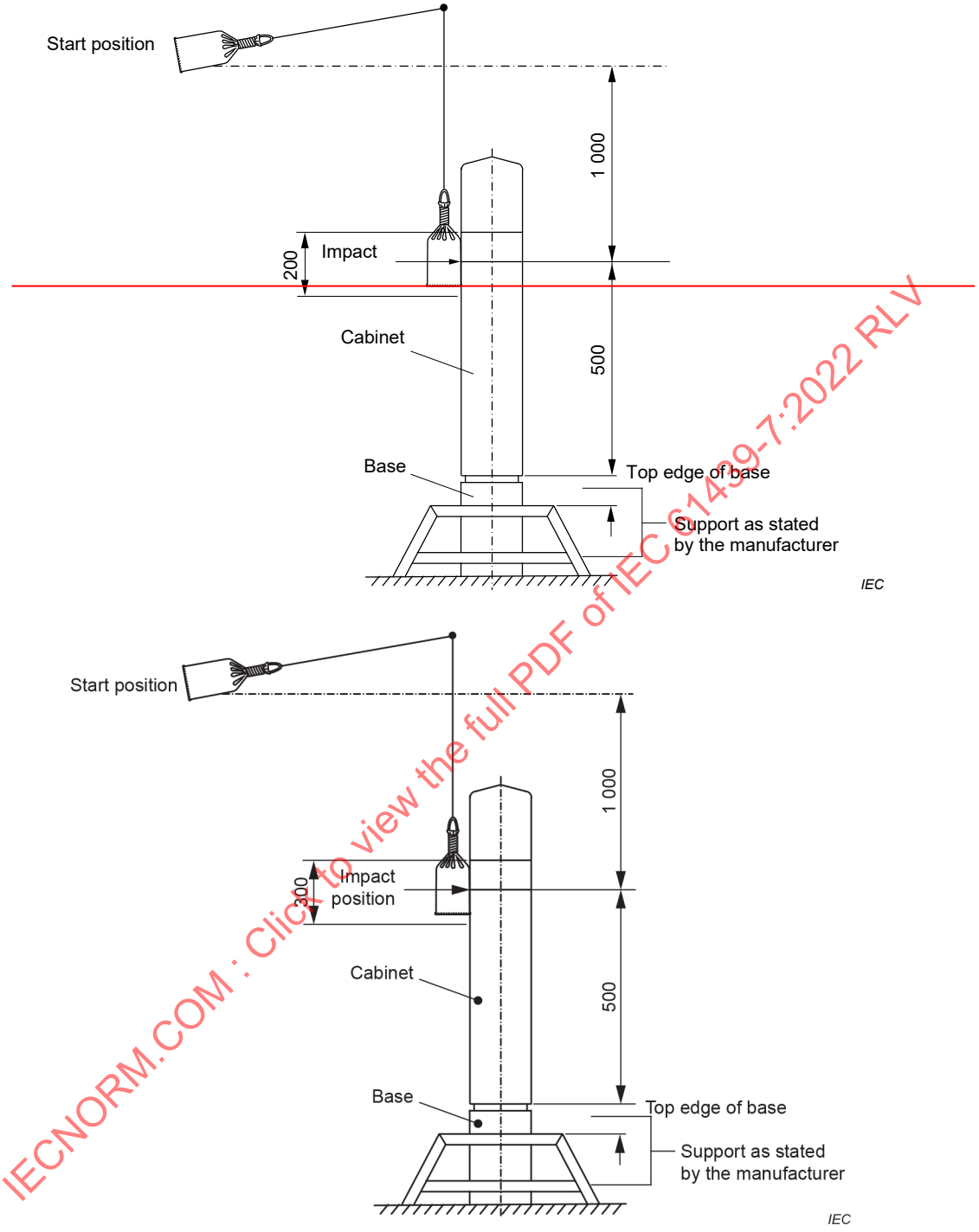


Figure 704a – Diagram of test to verify the resistance to shock load of a ground-mounted assembly with embedded base

Dimensions in millimetres

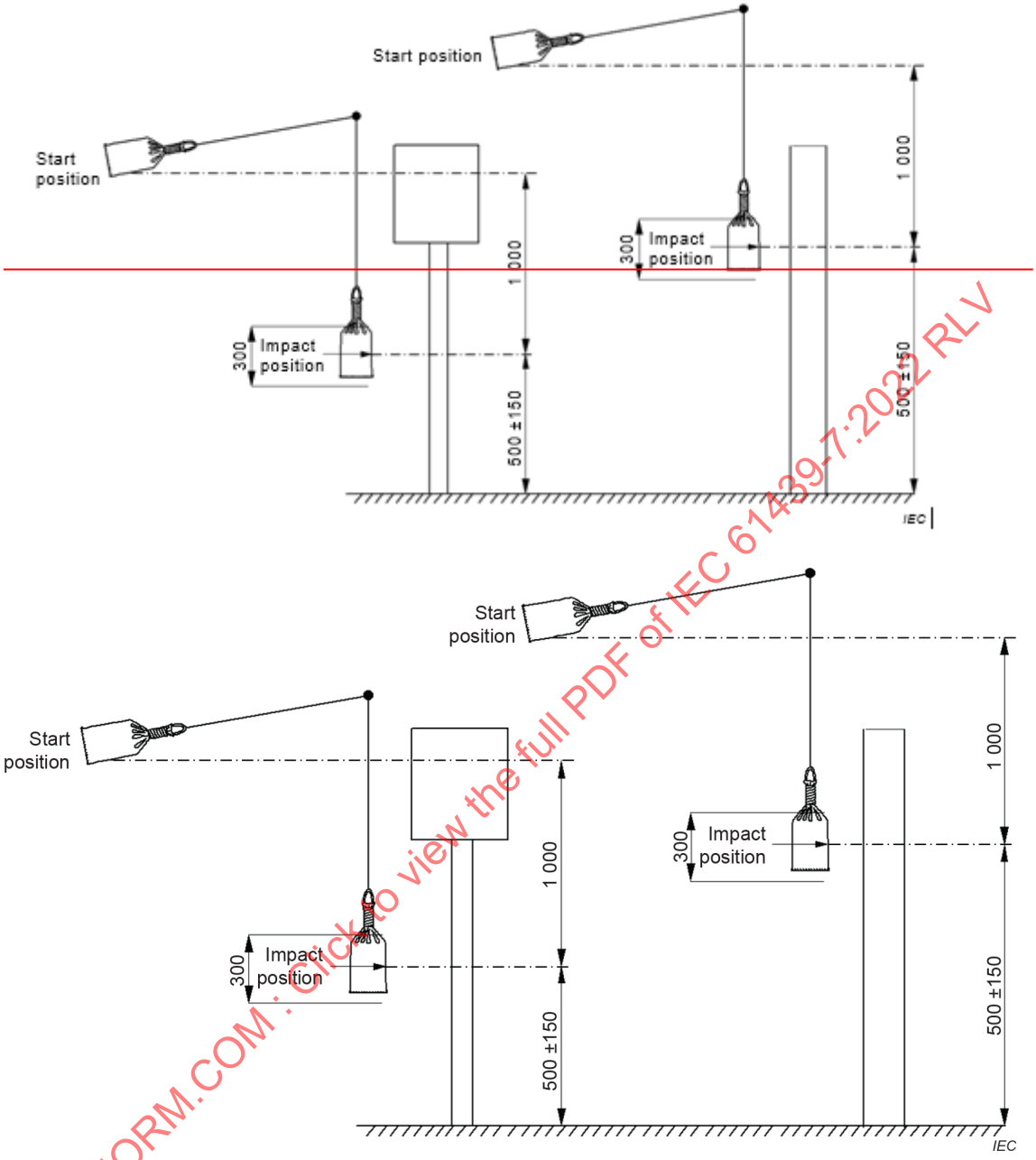


Figure 704b – Diagram of test to verify the resistance to shock load of a ground-mounted assembly without embedded base

Figure 704 – Diagram of test to verify resistance to shock load

10.2.701.6 Verification of resistance to torsional stress

The following tests shall be carried out on all types of ground-mounted stationary assemblies intended to be installed in non-restricted access areas.

The test is carried out using a horizontally rotatable frame constructed from 60 mm × 60 mm × 5 mm angle iron, having vertical locations 100 mm long at the frame arm's extremities. The assembly under test is rigidly fixed at its base and the frame closely fitted over it, so that the end locations of the frame arm are in contact with the roof and sides of the assembly.

The ASSEMBLY, with the door(s) closed shall have a torsional force of 2 × 1 000 N applied for 30 s as shown in Figures 705a and 705b or an equivalent test arrangement.

The load/force should be applied smoothly without jerks within 30 s.

Compliance is checked by verifying that the doors(s) remain closed for the duration of the test and by verification after the test that the degree of protection ~~remains~~ is maintained in accordance with 8.2.2.

Detachments, cracks or deterioration of aesthetical par

ts or components shall be disregarded.

NOTE If the angle iron cannot apply the force to the assembly for constructional reasons, small contact surface or flexible material, the test can be omitted if the test is repeated once more with the same result.

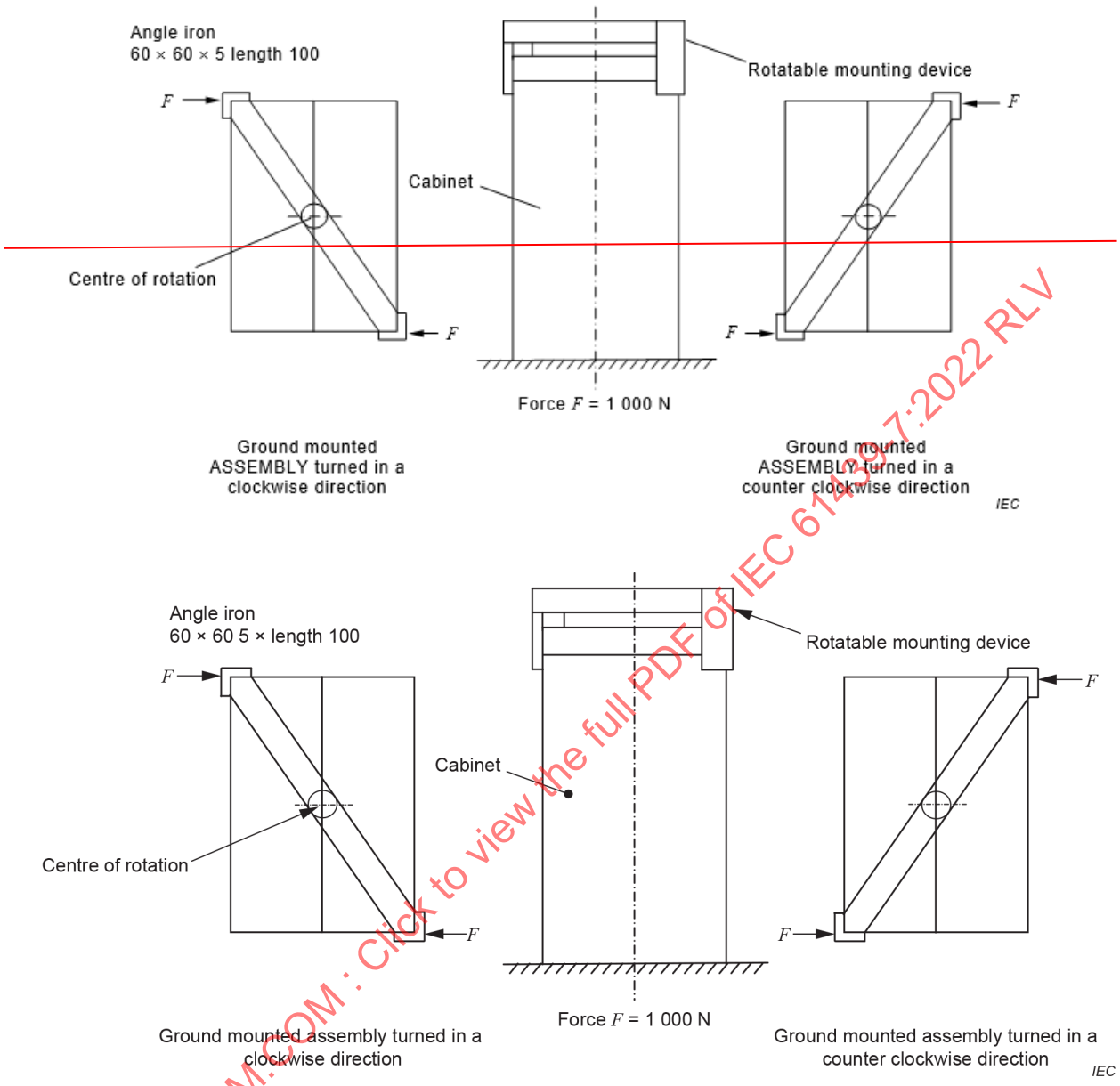


Figure 705a – Diagram of test to verify the resistance to torsional stress of a ground-mounted assembly without embedded base

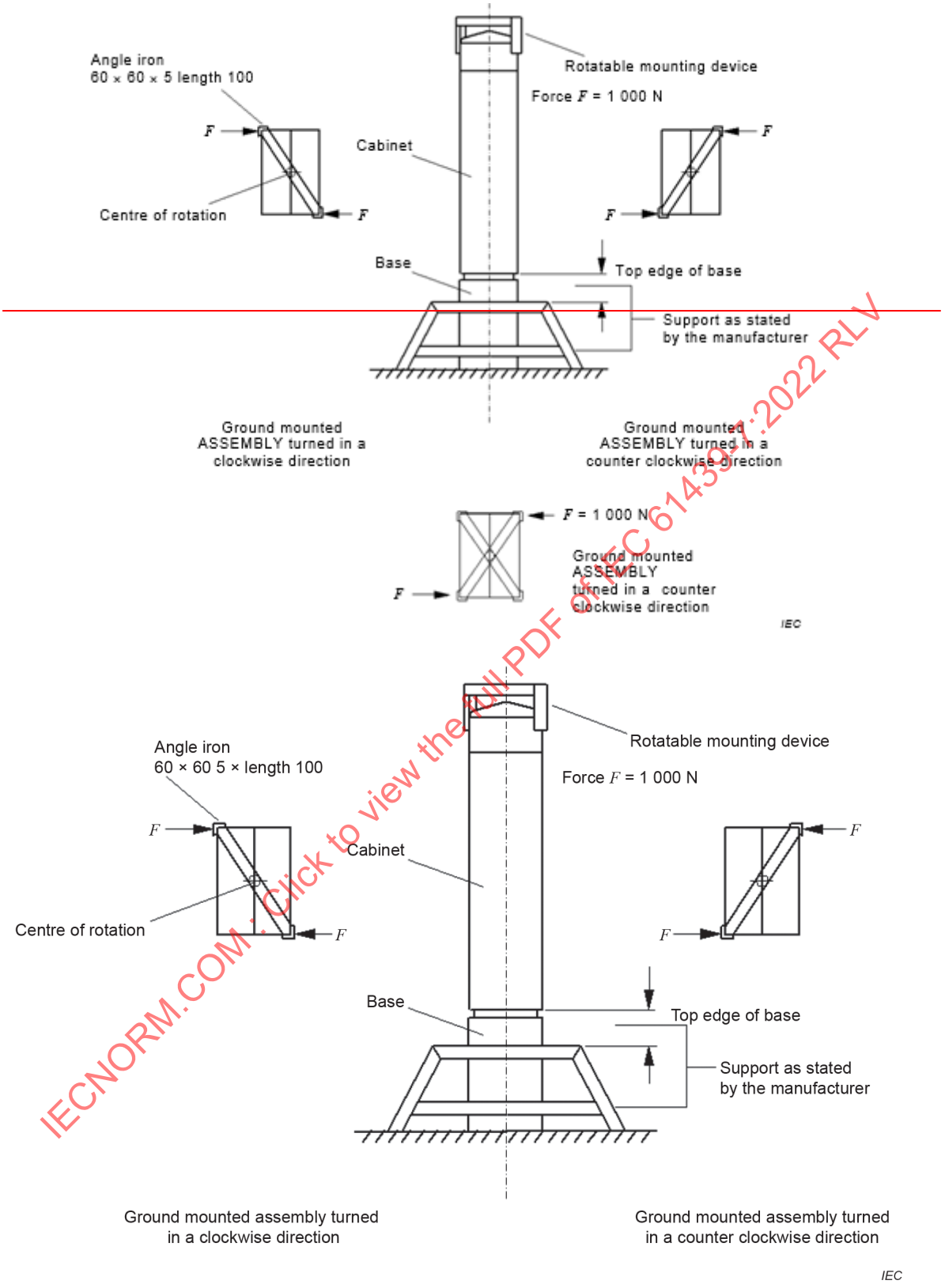


Figure 705b – Diagram of test to verify the resistance to torsional stress of a ground-mounted assembly with embedded base

Figure 705 – Diagram of test to verify resistance to torsional stress

10.2.701.7 Shock test for mobile and transportable assembly

Mobile and transportable assemblies shall be subjected to a single pulse half-sine wave, the shock test having a severity of 500 m/s^2 (50 g) peak acceleration and a duration of 11 ms.

The assembly in working order shall be tested in accordance with IEC 60068-2-27. Subject to agreement between manufacturer and user, the test ~~may~~ can be carried out at separate sections of the assembly.

After the test, the enclosure shall continue to provide the degrees of protection specified in 8.2.2, any distortions or deformations of the enclosure and components shall neither be detrimental to the proper functioning of the assembly nor decrease creepage distances and clearances below the required values; actuators, handles, etc., shall still be operable.

Distortion or deformation of plastic parts that can return in correct position by simple action (such as opening and reclosing of the cover) are not considered to be detrimental to the proper functioning of the assembly.

Superficial damage, paint removal, small indentations, cracks not visible with normal or corrected vision without further magnification, or surface cracks shall not constitute failure of the test.

10.10 Verification of temperature rise

10.10.1 General

Modification:

Item c) of this subclause of IEC 61439-1:~~2011~~2020 does not apply for AEVCS.

10.10.4 Verification assessment

This subclause of IEC 61439-1:~~2011~~2020 does not apply for AEVCS.

11 Routine verification

Clause 11 of IEC 61439-1:~~2011~~2020 is applicable.

Table 701 – Values of assumed loading

Number of main circuits	Assumed loading factor
2 and 3	0,8
4 and 5	0,7
6 to 9 inclusive	0,6
10 (and above)	0,5

Table 702 – Mechanical tests

Name of the test	Subclause	Sub test	Basic resistance (5.702.1)	Medium resistance (5.702.2)	High resistance (5.702.3)	Test of assemblies
Resistance to mechanical impact (IK)	10.2.701.2		IK07	IK08	IK10	All type of assemblies
Resistance to static load	10.2.701.3	Test 1: "Evenly distributed load test"	No	4 500 N/m^2 shall be applied for 5 min	8 500 N/m^2 shall be applied for 5 min	Ground and floor mounted assembly
		Test 2: "Lateral force test"	No	600 N applied for 5 min in turn	1 200 N applied for 5 min in turn	Ground and floor mounted assembly
Mechanical strength of doors	10.2.701.4		No	A load of 50 N + load increased to 250 N	A load of 50 N + load increased to 450 N	All type of assembly
Resistance to shock load	10.2.701.5		No	No	Total mass of 15 kg	Ground and floor mounted assembly
Resistance to torsional stress	10.2.701.6		No	No	2 × 1 000 N applied for 30 s	Ground and floor mounted assembly
~~Sharp edged objects~~	~~10.2.701.7~~		~~Optional~~	~~Optional~~	~~Optional~~	~~All type of ASSEMBLIES~~
Shock test	10.2.701.7		Mobile and transportable assemblies			

NOTE 1 Depending on the applications, assemblies classified as medium resistance (5.702.2) can be used to increase the degree of safety in comparison with the basic resistance (5.702.1).

NOTE 2 Where additional mechanical protection can be applicable, see Annex EE.

Annexes

Annexes of IEC 61439-1:~~2011~~2020 are applicable except as follows.

Annexes C and ~~P~~ M of IEC 61439-1:~~2011~~2020 are not applicable.

Addition of Annexes AA to FF:

Annex AA
(informative)

~~Items subject to agreement between the ASSEMBLY manufacturer and the user~~ User information template

~~The information given in Table AA.1 is subject to an agreement between the ASSEMBLY manufacturer and the user. In some cases, information declared by the ASSEMBLY manufacturer may take the place of an agreement.~~

Table AA.1 is intended as a template for the identification of items necessary for the assembly manufacturer which is to be provided by the user.

Table AA.1 – ~~Items subject to agreement between the ASSEMBLY manufacturer and the user~~ User information template

Characteristics	Reference clause or subclause of IEC 61439-1:~~2011~~2020	Default arrangement[a]	Options listed in ~~standard~~[b] IEC 61439-7	User requirement[c]
Electrical system				
Earthing system	5.6, 8.4.3.1, 8.4.3.2.3, 8.6.2, 10.5, 11.4	Manufacturer's standard, selected to suit local requirements	TT / TN-C / TN-C-S / IT / TN-S	
Nominal voltage (V)	3.8.9.1, 5.2.1, 8.5.3	Local, according to installation conditions	Max. 1 000 V AC or 1 500 V DC	
Transient overvoltages	5.2.4, 8.5.3, 9.1, Annex G.	Determined by the electrical system	Overvoltage category I / II / III / IV	
Temporary overvoltages	9.1	Nominal system voltage + 1 200 V	None	
Rated frequency f_n (Hz)	3.8.12, 5.5, 8.5.3, 10.10.2.3, 10.11.5.4	According to local installation conditions	DC/50 Hz/60 Hz	
Additional on-site testing requirements: wiring, operational performance and function	11.10	Manufacturer's standard, according to application	None	
Short-circuit withstand capability				
Prospective short-circuit current at supply terminals I_{cp} (kA)	3.8.7	Determined by the electrical system	None	
Prospective short-circuit current in the neutral	10.11.5.3.5	Max. 60 % of phase values	None	
Prospective short-circuit current in the protective circuit	10.11.5.6	Max. 60 % of phase values	None	
SCPD in the incoming functional unit requirement	9.3.2	According to local installation conditions	Yes / No	
Co-ordination of short-circuit protective devices including external short-circuit protective device details.	9.3.4	According to local installation conditions	None	
Data associated with loads likely to contribute to the short-circuit current	9.3.2	No loads likely to make a significant contribution allowed for	None	

Characteristics	Reference clause or subclause of IEC 61439-1:~~2011~~2020	Default arrangement[a]	Options listed in ~~standard~~[b] IEC 61439-7	User requirement[c]
Protection of persons against electric shock in accordance with IEC 60364-4-41				
Type of protection against electric shock – Basic protection (protection against direct contact)	8.4.2	Basic protection	According to local installation regulations	
Type of protection against electric shock – Fault protection (protection against indirect contact)	8.4.3	According to local installation conditions	Automatic disconnection of supply / Electrical separation / Double or reinforced insulation	
Installation environment				
Location type	3.5, 8.1.4, 8.2	Manufacturer's standard, according to application	Indoors/ outdoors/ restricted access/non restricted access	
Protection against ingress of solid foreign bodies and ingress of water	8.2.2, 8.2.3	Indoor (enclosed): IP 41 Outdoor (min.): IP 44	None	
External mechanical impact (IK)	8.2.1, 10.2.701.2	Restricted access IK07 Non restricted access IK08	None	
Resistance to UV radiation (applies for outdoor assemblies only unless specified otherwise)	10.2.4	Indoor: Not applicable. Outdoor: Temperate climate	None	
Resistance to corrosion	10.2.2	Normal Indoor/Outdoor arrangements	None	
~~Resistance to mechanical shock impacts induced by sharp edged objects~~	~~10.2.701.7~~	~~As defined within the document~~	~~None~~	
Ambient air temperature – Lower limit	7.1.1	Indoor: −5 °C Outdoor: −25 °C	None	
Ambient air temperature – Upper limit	7.1.1	+40 °C	None	
Ambient air temperature – Daily average maximum	7.1.1, 9.2	+35 °C	None	
Maximum relative humidity	7.1.1	Indoor: 50 % at +40 °C Outdoor: 100 % at +25 °C	None	
Pollution degree (of the installation environment)	7.1.2	Indoors: 2 Outdoors: manufacturer's standard	None	
Altitude	7.1.1	≤ 2 000 m	None	
EMC environment (A or B)	9.4, 10.12, Annex J	A/B	A/B	

Characteristics	Reference clause or subclause of IEC 61439-1:~~2011~~2020	Default arrangement[a]	Options listed in ~~standard~~[b] IEC 61439-7	User requirement[c]
Special service conditions (e.g. vibration, exceptional condensation, heavy pollution, corrosive environment, strong electric or magnetic fields, fungus, small creatures, explosion hazards, heavy vibration and shocks, earthquakes)	7.2, 8.5.4, 9.3.3, Table 7	No special service conditions	None	
Installation method				
Stationary/Mobile	3.5	Stationary	Stationary / Mobile /transportable	
Maximum overall dimensions and weight	5.6, 6.2.1	Manufacturer's standard, according to application	None	
External conductor type(s)	8.8	Manufacturer's standard	Cable / Busbar Trunking System	
Direction(s) of external conductors	8.8	Manufacturer's standard	None	
External conductor material	8.8	Copper	Copper / aluminium	
External phase conductor, cross sections, and terminations	8.8	As defined within the document	None	
External PE, N, PEN conductors cross sections, and terminations	8.8	As defined within the document	None	
Special terminal identification requirements	8.8	Manufacturer's standard	None	
Storage and handling				
Maximum dimensions and weight of transport units	6.2.2, 10.2.5	Manufacturer's standard	None	
Methods of transport (e.g. forklift, crane)	6.2.2, 8.1.6	Manufacturer's standard	None	
Environmental conditions different from the service conditions	7.3	As service conditions	None	
Packing details	6.2.2	Manufacturer's standard	None	
Operating arrangements				
Access to manually operated devices	8.4	Ordinary persons	None	
Location of manually operated devices	8.5.5	Easily accessible	None	
Isolation of load installation equipment items	8.4.2, 8.4.3.3, 8.4.6.2	Manufacturer's standard	Individual / groups / all	
Maintenance and upgrade capabilities				
Requirements related to accessibility in service by ordinary persons; requirement to operate devices or change components while the assembly is energised	8.4.6.1	Basic protection	None	
Requirements related to accessibility for inspection and similar operations	8.4.6.2.2	No requirements for accessibility	None	
Requirements related to accessibility for maintenance in service by authorized persons	8.4.6.2.3	No requirements for accessibility	None	
Requirements related to accessibility for extension in service by authorized persons	8.4.6.2.4	No requirements for accessibility	None	
Method of functional units connection	8.5.1, 8.5.2	Manufacturer's standard	None	

Characteristics	Reference clause or subclause of IEC 61439-1:~~2011~~2020	Default arrangement[a]	Options listed in ~~standard~~[b] IEC 61439-7	User requirement[c]
Protection against direct contact with hazardous live internal parts during maintenance or upgrade (e.g. functional units, main busbars, distribution busbars)	8.4	No requirements for protection during maintenance or upgrade	None	
Current carrying capability				
Maximum total load current to be supplied by the assembly (from which the rated current of the assembly I_{nA} (A) will be determined	3.8.9.1, 5.3, 8.4.3.2.3, 8.5.3, 8.8, 10.10.2, 10.10.3, 10.11.5, Annex E	Manufacturer's standard, according to application	None	
~~Rated current of circuits I_{nc} (A)~~	~~5.3.2~~	~~Manufacturer's standard, according to application~~	~~None~~	
~~Rated diversity factor~~	~~5.4, 10.10.2.3, Annex E~~	~~As defined within the document~~	~~RDF for groups of circuits / RDF for whole ASSEMBLY~~	
Design current I_B and nature of load for each circuit; alternatively, I_n of the devices and nature of the load (in such cases, the assumed loading factors can be used based on the relevant part of IEC 61439)	3.8.10.8	None	None	
Ratio of cross section of the neutral conductor to phase conductors: phase conductors up to and including 16 mm^2	8.6.1	100 %	None	
Ratio of cross section of the neutral conductor to phase conductors: phase conductors above 16 mm^2	8.6.1	50 % (min. 16 mm^2)	None	

[a] In some cases information declared by the assembly manufacturer ~~may~~ can take the place of an agreement.

[b] "None" in this column means that there are no options in the ~~standard~~ IEC 61439-7 other than the default condition or value.

[c] For exceptionally onerous applications, it is possible that the user ~~may need to~~ specify more stringent requirements to those in this document.

Annex BB
(informative)

Design verification

Table BB.1 provides a list of design verifications to be performed.

Table BB.1 – List of design verifications to be performed

No.	Characteristic to be verified	Clauses or subclauses of IEC 61439-1:~~2011~~2020	Verification options available		
			Testing	Comparison with a reference design	Assessment
1	Strength of material and parts:	10.2			
	Resistance to corrosion	10.2.2	YES	NO	NO
	Properties of insulating materials:	10.2.3			
	Thermal stability	10.2.3.1	YES	NO	NO
	Resistance to abnormal heat and fire due to internal electric effects	10.2.3.2	YES	NO	YES
	Resistance to ultra-violet (UV) radiation	10.2.4	YES	NO	YES
	Lifting	10.2.5	YES	NO	NO
	Marking	10.2.7	YES	NO	NO
	Verification of mechanical strength for assemblies	10.2.701	YES	NO	NO
2	Degree of protection of enclosures	10.3	YES	NO	YES
3	Clearances	10.4	YES	NO	NO
4	Creepage distances	10.4	YES	NO	NO
5	Protection against electric shock and integrity of protective circuits:	10.5			
	Effective continuity between the exposed conductive parts of the assembly and the protective circuit	10.5.2	YES	NO	NO
	Short-circuit withstand strength of the protective circuit	10.5.3	YES	YES	NO
6	Incorporation of switching devices and components	10.6	NO	NO	YES
7	Internal electrical circuits and connections	10.7	NO	NO	YES
8	Terminals for external conductors	10.8	NO	NO	YES
9	Dielectric properties:	10.9			
	Power-frequency withstand voltage	10.9.2	YES	NO	NO
	Impulse withstand voltage	10.9.3	YES	NO	YES
10	Temperature-rise limits	10.10	YES	YES	YES [a]
11	Short-circuit withstand strength	10.11	YES	YES	NO
12	Electromagnetic compatibility (EMC)	10.12	YES	NO	YES
13	Mechanical operation	10.2.8	YES	NO	NO

[a] Assessment does not apply for AEVCS.

Annex CC
(normative)

Endurance of the individual switching device

CC.1 General

The test is made in a test circuit as shown in Figure CC.1.

Endurance tests are made at the rate of four operating cycles per minute, if the conditioning of the individual switching device does not allow this, the test shall be made at the shortest possible time, given by the manufacturer.

Switching of S2 shall not be synchronized with the phase angle of the supply. The ON period shall have a duration of 1,9 s to 2,1 s.

The individual switching device (e.g. contactors or relay) is subjected to a total number of 10 000 operating cycles, each operating cycle consisting of a closing operation followed by an opening operation.

The test is made at rated operational voltage.

Adjustment of the test circuit:

a) The current is recorded through the current sensor A;

b) When supplied at the test voltage the following adjustments are made:

   1) ~~Adjustment~~ Calibration of inrush current (R3 and C1): The individual switching device is replaced by a link BC having negligible impedance compared with that of the test circuit. S3 and S4 are in open position. R3 and C1 are adjusted so that after closing S1 at a phase angle of 90° the current through the current sensor reaches a peak value of 200 A ± 10 A with a rise time tr (10 % to 90 % of the peak value) of maximum 20 µs and declines to a value of 66 A ± 3 A at 30 µs + 20 µs after the peak;

   2) ~~Adjustment~~ Calibration of rated current (X1): With BC removed, S1, S2 and S3 in closed position and S4 in open position, X1 is adjusted so that the current through the current sensor equals the rated current. X1 consists of resistors and reactors in series (X1). If air-core reactors are used, a resistor taking approximately 0,6 % of the current through the reactors is connected in parallel with each reactor. If iron-core reactors are used, the iron-power losses of these reactors shall not appreciably influence the recovery voltage. The current shall have substantially sine-wave form and the power factor shall be at least 0,95;

   3) ~~Adjustment~~ Calibration of pre-charge current (R2) if the rated current of the device is lower than 30 A: with the individual switching device replaced by link BC, having negligible impedance compared with that of the test circuit and S1, S2, S3 and S4 in closed position, R2 is adjusted so that the current through the current sensor equals 30 A RMS. If the rated current of the device is higher than 30 A, R2 is replaced by an open circuit.

The inrush current consists of two superimposed components:

- The resulting test current has a peak of maximum 230 A and corresponds to the Event 1 of ISO 17409:2020, 8.2.2.
- This peak value decays to 30 A RMS. This (sinusoidal) current remains up to 1 s and corresponds to the Event 2 of ISO 17409:~~2015~~2020, 8.2.2.

A principal wave shape is shown in Figure CC.2.

CC.2 Test procedure for on-load test

The opening operations shall be effected as follows:

- 2 500 operations are carried out by closing S4 and S3, applying the supply voltage to the individual switching device by closing S1, closing S2, and opening S4 1 s ± 100 ms after closing of the main circuit by the individual switching device.
- 2 s ± 100 ms after closing of the main circuit by the individual switching device, the opening operation is initiated by opening S2. After that, the new operation cycle is started. After 1 000 operations have been carried out, S1 shall be opened.

CC.3 Test procedure for making without breaking test

The remaining operating cycles between the required 10 000 operating cycles and the operating cycles are done by closing S4 and S3, applying the supply voltage to the individual switching device by closing S1, and closing S2.

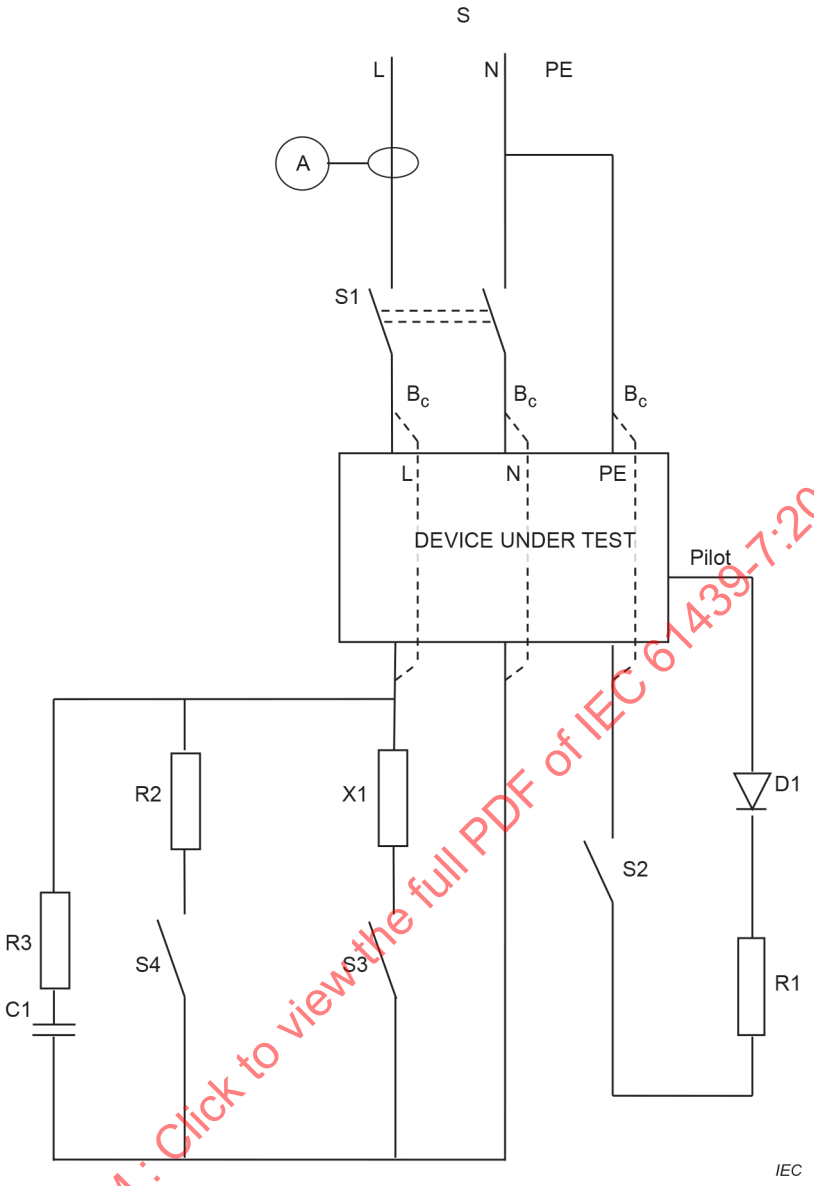
1 s ± 100 ms after closing of the main circuit by the individual switching device, the switches S4 and S3 shall be opened. 2 s ± 100 ms after closing of the main circuit by the individual switching device, the opening operation is initiated by opening S2. After that, the new operation cycle is started. After the full 10 000 operations have been carried out, S1 shall be opened.

CC.4 Condition of the individual switching device after the tests

Following the tests of Clause CC.2 and Clause CC.3, the individual switching device shall not show during inspection

- undue wear;
- damage of the enclosure permitting access to live parts by the 1,0 mm standard test wire;
- loosening of electrical or mechanical connections;
- seepage of the sealing compound, if any.

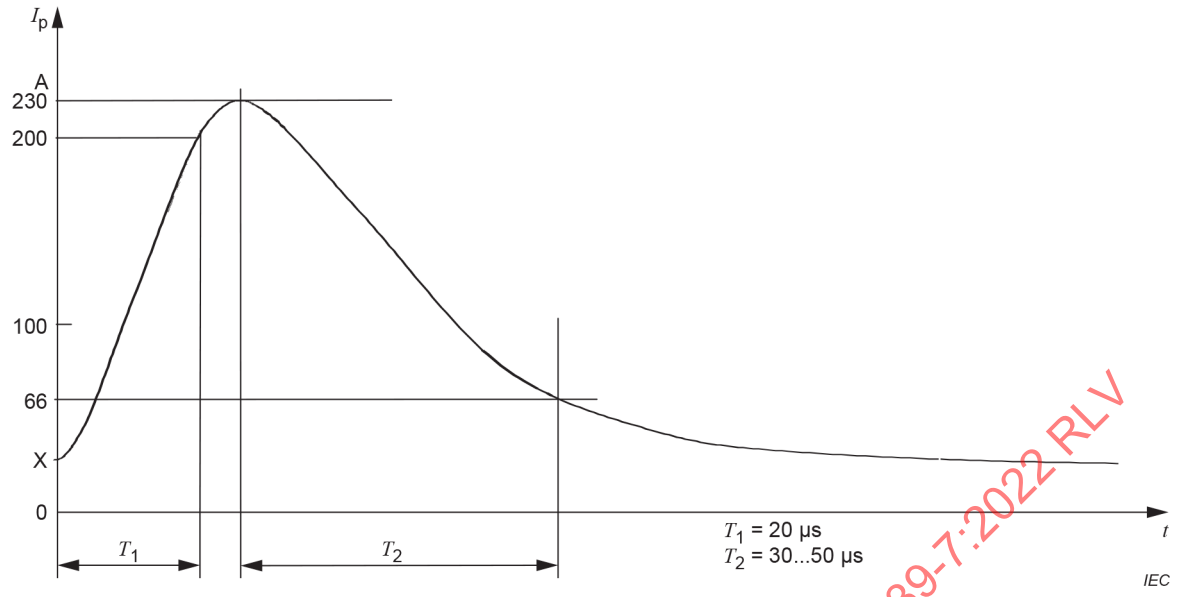
The individual switching device shall then satisfactorily perform the dielectric strength test specified in the relevant product standard, but at a voltage equal to 900 V for 1 min and without previous humidity treatment.



Key

S1, S2, S3, S4	switch
S	supply
D	device under test
R_1	resistor value 882 Ω ± 3 %
R_2	resistor
R_3	resistor
X1	resistor and reactor to adjust rated current
C1	capacitor
D1	diode

Figure CC.1 – Test circuit for endurance of the individual switching device test



Key

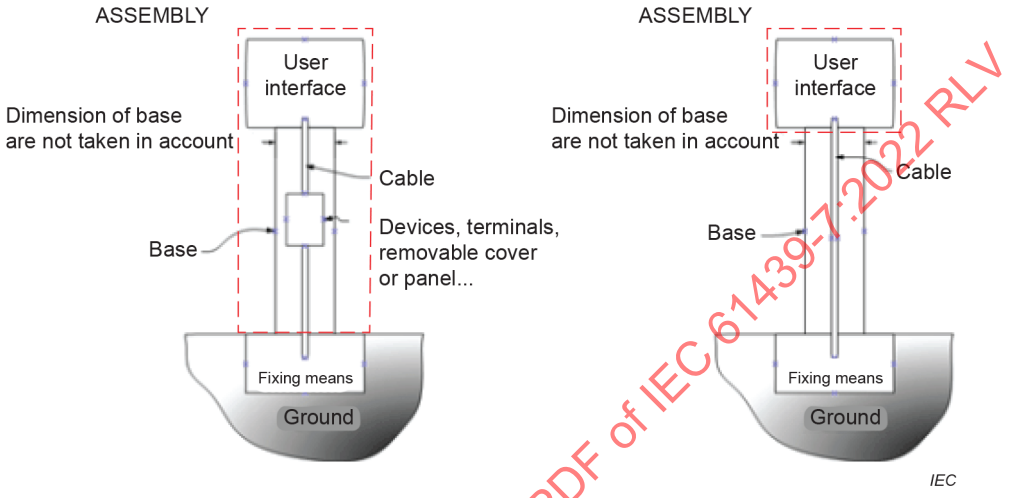
X Starting value for the inrush current (0… 42 A)
depending on the phase angle of the sinusoidal current of 30 A RMS

Figure CC.2 – Informative wave shape of inrush current for tests in accordance with Annex CC

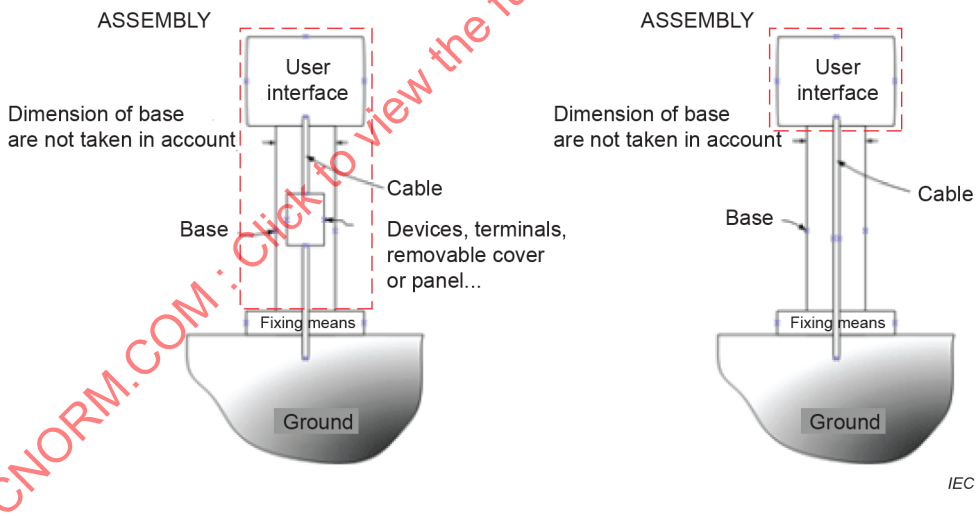
Annex DD
(informative)

Examples of assemblies in accordance with 5.701.1.1

Examples of assemblies in accordance with 5.701.1.1 are given in Figure DD.1.



a) Stationary ground mounted installation



b) Stationary floor mounted installation

Figure DD.1 – Examples of assemblies according to 5.701.1.1

Annex EE
(informative)

Verification of resistance to mechanical shock impacts induced by sharp edged objects

This test is subjected to an agreement between manufacturers and users.

If agreed between the manufacturer and user, the following tests shall be carried out on all ground-mounted stationary assemblies intended to be installed outdoors.

The test shall be carried out using an impact apparatus as described in IEC 60068-2-75 but having at the end a steel striker element profiled as shown in Figure ~~706~~ EE.1.

Dimensions in millimetres

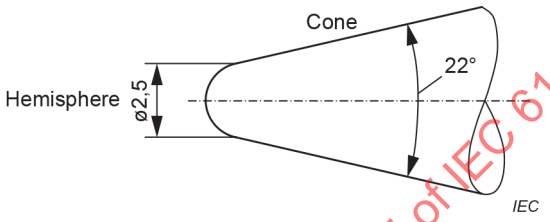


Figure ~~706~~ EE.1 – Striker element for test of resistance to mechanical shock impacts induced by sharp-edged objects

The striker element shall be raised through a height of 0,4 m and allowed to drop and impact the surface of the assembly under test, thus providing an impact energy of 20 J.

Each test shall consist of one blow aimed at the center of at least three of the vertical surfaces of the assembly which are visible when the assembly is installed as for normal use in accordance with the original manufacturer's instructions.

Blows shall not be applied on components mounted on or in the surface of the enclosure, e.g. socket outlets, push-buttons, displays.

Separate enclosures ~~may~~ can be used for each of the test blows.

If the enclosure is of a cylindrical form, the test consists of three blows positioned with an angular displacement of 120°.

Test 1 shall be carried out at an ambient air temperature between +10 °C and +40 °C after the assembly has been kept within these temperatures for not less than 12 h.

Test 2 shall be carried out at an ambient air temperature between +10 °C and +40 °C immediately after the assembly has been kept at a temperature of $^{0}_{-5}$ °C for a period of not less than 12 h.

Compliance is checked by inspection that cracks resulting from the blows are contained within a circle of diameter not exceeding 15 mm. ~~If the tip of the striker element has penetrated the enclosure of the ASSEMBLY, it shall not be possible to insert a gauge of 4 mm diameter having a hemispherical tip, applied to the hole with a force of 5 N.~~ After the test, inspection shall verify that a minimum degree of protection of IP XXB is maintained.

Annex FF
(informative)

List of notes concerning certain countries

Clause/ Subclause	Text
1	Add the following note at the end of the 4th bulleted item: NOTE In the UK, the text of the 4th bullet does not apply and assemblies in this document intended to be operated by ordinary persons, shall also comply with the relevant specific requirements of IEC 61439-3.
6.1	Add the following note at the end of item d): NOTE 1 In some countries there are different lower temperature limits. FI, SE.
6.1	In Norway, the lower temperature limit applicable for the assembly shall be provided: NO.
7.1.1 of IEC 61439-1:2020	Add the following note at the end of this subclause: NOTE In some countries assemblies suitable for normal operation at a lower ambient temperature than −25 °C shall also comply with the requirements of this document. FI, NO, SE.
8.2.1.702	Add the following note at the end of this subclause: NOTE In the following countries it is possible to use assemblies with other classifications of resistance in locations with non-restricted access. FI, SE.
8.2.2	Add the following note at the end of this subclause: NOTE In the United States of America (USA), Canada and in Mexico, enclosure "type" designations are used to specify "the degree of protection" provided to the assembly. For applications in the USA, the appropriate enclosure type designation is specified in NEMA 250. For applications in Canada, the appropriate enclosure type designation is specified in CSA standard C22.2 No. 94.1 and 94.2. For applications in Mexico, the appropriate enclosure type designation is specified in NMX-J-235/1-ANCE and NMX-J-235/2-ANCE.
8.4.3.1	Add the following note at the end of this subclause: NOTE ~~2~~3 In the UK, the applicable wiring standard is BS 7671.
10.2.701.1	Add the following note after the first paragraph of this subclause: NOTE In some countries, the tests shall be carried out at an ambient temperature (20 ± 5) °C immediately after the assembly has been kept at a temperature, corresponding to the minimum ambient temperature specified for the assembly, for a period of not less than 12 h. FI, NO, SE.
10.2.701.2	After the test, a visual inspection should be done, to confirm that no damage that will impair the electrical safety has occurred. The degrees of protection shall be at least IP XXB. SE
10.2.701.2	Add the following note at the end of this subclause: NOTE In some countries, regarding the level of mechanical strength, when the products have to fulfil requirements for any particular surroundings, the test and design is subject to an agreement between manufacturers and users. FI SE.
10.2.701.3	Add the following notes at the end of this subclause: NOTE 1 In some countries requirements regarding the level of resistance to static load in normal use, are referred to the maximum prospective short-circuit current from the net. In the case of a product type cabinet, compliance shall be checked by verification after the test that a minimum degree of protection of IP XXB is maintained. NOTE 2 In the case of a product type pole/pipe/column, a force of 8 500 N/m^2, with a minimum value of 800 N and a maximum of 1 200 N, shall be applied for 5 min in turn to the front and back upper edges of the roof of the enclosure (see Figure 701). Separate enclosures ~~may~~ can be used for each of the forces. Compliance is checked by verification after the test that a minimum degree of protection of IPXXB is maintained. SE.
10.2.701.4	After the test, a visual inspection should be done to confirm that no damage that will impair the electrical safety has occurred. The degrees of protection shall be at least IP XXB. SE.
10.2.701.5	After the test, a visual inspection should be done to confirm that no damage that will impair the electrical safety has occurred. The degrees of protection shall be at least IP XXB. SE.
10.2.701.8	After the test, a visual inspection should be done to confirm that no damage that will impair the electrical safety has occurred. The degrees of protection shall be at least IP XXB. SE.

Clause/ Subclause	Text
Table 702	Add the following notes at the end of the table: NOTE ~~2~~3 Regarding the values for the test of resistance to static load, see 10.2.701.3, Note 2. SE. NOTE ~~3~~4 In some countries, the assembly's allowed prospective short-circuit current up to 10 kA refers to requirements according to basic and medium resistances. The assembly's allowed prospective short-circuit current up to 50 kA refers to requirements according to high resistance level. Other requirements can be subject to an agreement between manufacturers and users. SE. NOTE ~~4~~5 Regarding the test of resistance to shock load, in some countries, products type pole/pipe/column shall be checked by verification after the test that a minimum degree of protection of IP XXB is maintained. SE.

Bibliography

The bibliography of IEC 61439-1:~~2011~~2020 is applicable except as follows.

Addition:

IEC 60364-7-708:2017, *Low-voltage electrical installations – Part 7-708: Requirements for special installations or locations - Caravan parks, camping parks and similar locations*

IEC 60364-7-709:2007, *Low-voltage electrical installations – Part 7-709: Requirements for special installations or locations – Marinas and similar locations*
IEC 60364-7-709:2007/AMD1:2012

IEC 60364-7-722:2018, *Low-voltage electrical installations – Part 7-722: Requirements for special installations or locations – Supplies for electric vehicle*

IEC 60364-7-740:2000, *Electrical installations of buildings – Part 7-740: Requirements for special installations or locations – Temporary electrical installations for structures, amusement devices and booths at fairgrounds, amusement parks and circuses*

IEC 60670-24, *Boxes and enclosures for electrical accessories for household and similar fixed electrical installations – Part 24: Particular requirements for enclosures for housing protective devices and other power dissipating electrical equipment*

IEC 61439-3, *Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)*

IEC 61643 (all parts), *Low-voltage surge protective devices*

IEC 61851-1:2017, *Electric vehicle conductive charging system – Part 1: General requirements*

IEC 61851-23, *Electric vehicle conductive charging system – Part 23: DC electrical vehicle charging station*

ISO 17409:~~2015~~2020, *Electrically propelled road vehicles – ~~Connection to an external electric power supply~~ Conductive power transfer – Safety requirements*

CSA standard C22.2 No. 94.1, *Enclosures for Electrical Equipment, Non-Environmental Considerations*

CSA standard C22.2 No. 94.2, *Enclosures for electrical equipment, environmental considerations*

NMX-J-235/1, *Envolventes – Envolventes para uso en equipo eléctrico – Parte 1: Consideraciones no Ambientales – Especificaciones y Métodos de Prueba*

NMX-J-235/2-ANCE, *Envolventes – Envolventes para uso en equipo eléctrico – Parte 2: consideraciones ambientales – Especificaciones y Métodos de Prueba*

BS 7671, *Requirements for Electrical Installations*

IEC 61439-7

Edition 2.0 2022-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations

Ensembles d'appareillage à basse tension – Partie 7: Ensembles pour les applications spécifiques comme les marinas, les terrains de camping, les marchés et pour les bornes de charge de véhicules électriques

IEC 61439-7:2022-07(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations

FOREWORD

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IEC 61439-7 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 second edition cancels and replaces the first edition published in 2018. It constitutes a technical revision.

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

a) a general editorial review and a technical revision.

The text of this document is based on the following documents:

Draft	Report on voting
121B/138/CDV	121B/150/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document is to be read in conjunction with IEC 61439-1:2020. The provisions of the general rules dealt with in IEC 61439-1:2020 are applicable to this document where they are specifically cited. When this document states "addition", "modification" or "replacement", the relevant text in IEC 61439-1:2020 is to be adapted accordingly.

Subclauses that are numbered with a 701 (702, 703, etc.) suffix are additional to the same subclause in IEC 61439-1:2020.

Tables and figures in this document that are new are numbered starting with 701.

New annexes in this document are lettered AA, BB, etc.

In this document, the term assembly is defined in 3.1.1 of IEC 61439-1:2020.

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

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.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

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

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations

1 Scope

Clause 1 of IEC 61439-1:2020 is applicable except as follows.

Replacement:

This part of IEC 61439 defines the specific requirements for assemblies for the following applications: marinas, camping sites, market squares and electric vehicle charging stations as follows:

- assemblies for which the rated voltage does not exceed 1 000 V AC or 1 500 V DC;
- assemblies intended for use in connection with the generation, transmission, distribution and conversion of electric energy, and for the control of electric energy consuming equipment;
- assemblies operated by ordinary persons (e.g. to plug and unplug of electrical equipment);
- assemblies intended to be installed and used in market squares, marinas, camping sites and other similar sites accessible to the public including temporary installations;
- assemblies intended for charging stations for electric vehicles (AEVCS) for Mode 3 and Mode 4. They are designed to integrate the functionality and additional requirements for electric vehicle conductive charging systems according to IEC 61851-1:2017.

NOTE 1 Throughout this document, the terms AMHS (see 3.1.701), ACCS (see 3.1.702), AMPS (see 3.1.703), AEVCS (see 3.1.704) are used for low-voltage switchgear and controlgear assemblies intended for use respectively in marinas and similar locations (AMHS), camping sites and similar locations (ACCS), market squares and other similar external public sites (AMPS) and charging stations (AEVCS). The term assemblies is used for indicating all these boards.

This document is not applicable to assemblies intended to be installed on board of ships, houseboats, pleasure crafts and similar vessels.

For the correct selection of the switching devices and components, the following standards apply:

- IEC 60364-7-709 (AMHS) or
- IEC 60364-7-708 (ACCS) or
- IEC 60364-7-740 (AMPS) or
- IEC 60364-7-722 (AEVCS).

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

The manufacturing and/or assembling can be carried out other than by the original manufacturer (see 3.10.1 of IEC 61439-1:2020).

This document does not apply to individual devices and self-contained components such as circuit breakers, fuse switches, electronic equipment, which comply with their relevant product standards.

NOTE 2 Where electrical equipment is directly connected to public low-voltage supply system and equipped with an energy meter for billing of the legal provider of the low-voltage supply, additional particular requirements based on national regulations apply, if any.

This document does not apply to boxes and enclosures for electrical accessories for household and similar fixed electrical installations as defined in IEC 60670-24.

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.

Clause 2 of IEC 61439-1:2020 is applicable except as follows.

Addition:

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 61439-1:2020, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*

IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*
IEC 62262:2002/AMD1:2021

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61439-1:2020 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

Clause 3 of IEC 61439-1:2020 is applicable except as follows.

3.1 General terms

Additional terms:

3.1.701
low-voltage switchgear and controlgear assembly for marinas and harbour sites
AMHS
combination of one or more transforming or switching devices together with associated control, measuring, signaling, protective and regulating equipment, with all their internal electrical and mechanical interconnections and structural parts, designed and built for use in all marinas, harbors and similar sites

3.1.702
low-voltage switchgear and controlgear assembly for camping and caravan sites
ACCS
combination of one or more transforming or switching devices together with associated control, measuring, signaling, protective and regulating equipment, with all their internal electrical and mechanical interconnections and structural parts, designed and built for use in all camping, caravan and similar sites

3.1.703
low-voltage switchgear and controlgear assembly for markets and other outdoor public sites
AMPS
combination of one or more transforming or switching devices together with associated control, measuring, signaling, protective and regulating equipment, with all their internal electrical and mechanical interconnections and structural parts, designed and built for use in all market squares and other similar outdoor public sites

3.1.704
low-voltage switchgear and controlgear assembly for electric vehicles charging stations
AEVCS
combination of one or more transforming or switching devices together with associated control, measuring, signaling, protective and regulating equipment, with all their internal electrical and mechanical interconnections and structural parts, designed and built for electric vehicle charging stations

3.3 External design of assemblies

Modification:

3.3.1
open-type assembly

This term of IEC 61439-1:2020 does not apply.

3.3.2
dead-front assembly
This term of IEC 61439-1:2020 does not apply.

3.5 Conditions of installation of assemblies

3.5.3
stationary assembly

Additional terms and definitions:

3.5.3.701
ground and floor mounted assembly
stationary assembly permanently connected to the supply with a part embedded in the ground or intended to be fixed directly on the floor or a base

Note 1 to entry: This type of assembly includes poles and columns.

3.5.3.702
wall-mounted assembly
stationary assembly intended to be fixed directly on the wall while being permanently fixed to the supply

3.5.4
movable assembly
This term of IEC 61439-1:2020 does not apply.

Additional terms and definitions:

3.5.701
permanently connected assembly
assembly that can only be connected to, or disconnected from, the AC or DC supply network by the use of a tool

Note 1 to entry: This assembly corresponds to the definition of permanently connected EV supply equipment provided in 3.6.9 of IEC 61851-1:2017.

3.5.702
transportable assembly
assembly intended for use in a place where it is not permanently fixed

Note 1 to entry: When the equipment is to be moved to another place, it is first disconnected from the supply network.

3.5.703
mobile assembly
assembly which is capable to be moved while in operation or which can easily be moved from one place to another while connected to the supply network

3.5.704
assembly for locations with restricted access
assembly accessible to all persons who are authorized to have access to the location (e.g. equipment located in private housing, private parking areas or similar places)

Note 1 to entry: This assembly corresponds to the definition of equipment for locations with restricted access provided in 3.6.3 of IEC 61851-1:2017.

3.5.705
assembly for locations with non-restricted access
assembly accessible for all persons, e.g. the access is given in a public area

Note 1 to entry: This assembly corresponds to the definition of equipment for locations with non-restricted access provided in 3.6.4 of IEC 61851-1:2017.

3.5.706
water and other fluids system
part of the assembly which contains water tubes, valves, joins and taps as service to connected user

EXAMPLE Possible other fluids are compressed air, natural gasses, drinkable water and wastewater.

3.5.707
base
additional part of the arrangement used to support the assembly in any case of mounting intended to accommodate only cables

3.5.708
fixing mean
accessory intended to fix the base or the assembly to the ground, to the floor or to the wall etc.

4 Symbols and abbreviations

Clause 4 of IEC 61439-1:2020 is applicable except as follows.

Addition:

Symbol/ Abbreviation	Term	Subclause
AMHS	low-voltage switchgear and controlgear assembly for marinas and harbour sites	3.1.701
ACCS	low-voltage switchgear and controlgear assembly for camping and caravan sites	3.1.702
AMPS	low-voltage switchgear and controlgear assembly for markets and other outdoor public sites	3.1.703
AEVCS	low-voltage switchgear and controlgear assembly for electric vehicles charging station	3.1.704

5 Interface characteristics

Clause 5 of IEC 61439-1:2020 is applicable except as follows.

5.1 General

Replacement:

The characteristics of the assembly shall ensure compatibility with the ratings of the circuits to which it is connected and the installation conditions and shall be declared by the assembly manufacturer using the criteria identified in 5.2 to 5.6, 5.701 and 5.702.

The specification schedule detailed in the informative Annex AA is intended to help the user and the assembly manufacturer to meet this objective, whether the user:

- selects catalogue products, the characteristics of which meet their needs, and the requirements of this document; and/or,
- makes a specific agreement with the manufacturer.

5.4 Rated diversity factor (RDF)

Addition:

In the absence of an agreement between the assembly manufacturer and the user concerning the actual load currents, the assumed loading of the outgoing circuits of AMHS, ACCS, AMPS assembly or group of outgoing circuits can be based on the values in Table 701.

The assumed load current is the rated current of the protective device I_n as required by the user, multiplied with the loading factor of Table 701.

Table 701 does not apply for AEVCS. For AECVS it is assumed that all circuits can be loaded continuously and simultaneously. Therefore, the assumed loading factor of the outgoing circuits shall be taken as equal to 1 and can be reduced if a load control is available.

NOTE Values in Table 701 represent minimum values which are reached or exceeded in tests.

5.6 Other characteristics

Replacement of the item g):

g) intended for use by ordinary persons (see 3.7.16 of IEC 61439-1:2020);

Additional item:

q) locations with restricted access or non-restricted access (see 3.5.704 and 3.5.705).

Additional subclauses:

5.701 According to the method of mounting

5.701.1 Stationary assembly

5.701.1.1 Ground and floor mounted assembly (see Annex DD)

5.701.1.2 Wall-mounted assembly

5.701.2 Transportable assembly

5.701.3 Mobile assembly

5.702 According to the mechanical resistance for stationary assembly (see Table 702)

5.702.1 Basic mechanical resistance

5.702.2 Medium mechanical resistance

5.702.3 High mechanical resistance

6 Information

Clause 6 of IEC 61439-1:2020 is applicable except as follows.

6.1 Assembly designation marking

Replacement:

The assembly manufacturer shall provide each assembly with one or more labels, marked in a durable manner and located in a place such that they are visible and legible when the assembly is installed.

Compliance is checked according to the test of 10.2.7 of IEC 61439-1:2020 and by inspection.

The following information regarding the assembly shall be provided on the label(s):

a) assembly manufacturer's name or trade mark (see 3.10.2 of IEC 61439-1:2020);
b) type designation or identification number or any other means of identification, making it possible to obtain relevant information from the assembly manufacturer;
c) means of identifying date of manufacture;
d) rated current of the assembly I_{nA} (see 3.8.10.7 and 5.3.1 of IEC 61439-1:2020);
e) rated voltage of the assembly U_n (see 3.8.9.1 and 5.2.1 of IEC 61439-1:2020);
f) rated frequency of the assembly f_n (see 3.8.12 and 5.5 of IEC 61439-1:2020);
g) IEC 61439-7;
h) degree of protection against contact with hazardous live parts, ingress of solid foreign bodies and water, IP code (see 8.2.2 of IEC 61439-1:2020);

i) the weight, for transportable and mobile assemblies (see 3.5.702 and 3.5.703), where it exceeds 30 kg.

6.2.1 Information relating to the assembly

Addition:

The following additional information, where applicable, shall be provided in the assembly manufacturer's technical documentation supplied with the assembly:

a) rated impulse withstand voltage (U_{imp}) (see 5.2.4 of IEC 61439-1:2020);

b) rated insulation voltage (U_i) (see 5.2.3 of IEC 61439-1:2020);

c) rated current of each circuit (I_{nc}) (see 5.3.2 of IEC 61439-1: 2020);

d) rated diversity factor(s) (RDF) (see 5.4);

e) all necessary information relating to the other declared classifications and characteristics (see 5.6, 5.701 and 5.702);

f) overall dimensions (including projections e.g. handles, covers, doors);

g) AMHS (see 3.1.701), ACCS (see 3.1.702), AMPS (see 3.1.703), AEVCS (see 3.1.704) or equivalent terms;

h) for mobile assemblies according to 3.5.703, the mounting position during operation.

7 Service conditions

Clause 7 of IEC 61439-1:2020 is applicable.

8 Constructional requirements

Clause 8 of IEC 61439-1:2020 is applicable except as follows.

8.2 Degree of protection and mechanical strength provided by an assembly enclosure

8.2.1 Mechanical strength for assemblies

8.2.1.701 Assemblies for locations with restricted access

The minimum mechanical resistance for assemblies for locations with restricted access is the basic resistance (5.702.1).

Medium or high resistance (5.702.2 and 5.702.3) can be also required by the national installation rules.

For the relevant tests and severities see Table 702.

8.2.1.702 Assemblies for locations with non-restricted access

The minimum mechanical resistance for ground and floor mounting assemblies for locations with non-restricted access is the high resistance (5.702.3).

The minimum mechanical resistance for wall mounting assemblies for locations with non-restricted access is the high resistance (5.702.3).

In case of wall mounting assemblies for locations with non-restricted access intended to be installed at a height where the bottom edge of the assemblies is more or equal to 0,9 m from the ground or floor, the mechanical resistance can be decreased to medium resistance (5.702.2).

For the relevant tests and severities criteria's, see Table 702.

8.2.2 Protection against contact with live parts, ingress of solid foreign bodies and water (IP code)

Replacement of the 2nd, 3rd and 4th paragraph:

After installation in accordance with the manufacturer's instructions, the degree of protection of an indoor assembly shall be at least IP41 and of an outdoor assembly at least IP44, in accordance with IEC 60529:1989, IEC 60529:1989/AMD1:1999 and IEC 60529:1989/AMD2:2013.

The degree of protection shall be ensured also when the supply cables are plugged into the assembly.

In case of specific and more severe conditions, a higher IP degree could be required according to the installation requirements.

8.4 Protection against electric shock

8.4.3.1 Installation conditions

Replacement of the whole text of this subclause:

The assembly shall include protective measures and be suitable for installations designed to be in accordance with IEC 60364-4-41:2005 and IEC 60364-4-41:2005/AMD1:2017 as well as the applicable wiring standards.

NOTE 1 The applicable wiring standards are IEC 60364-7-709:2007 and IEC 60364-7-709:2007/AMD1:2012 (AMHS) or IEC 60364-7-708:2017 (ACCS) or IEC 60364-7-740:2000 (AMPS) or IEC 60364-7-722:2018 (AEVCS).

NOTE 2 For AEVCS, see also 8.5 of IEC 61851-1:2017.

8.5 Incorporation of switching devices and components

8.5.3 Selection of switching devices and components

Addition:

The need for overvoltage protection (SPDs) to prevent possible damage to the installation should be considered.

8.5.6 Barriers

This subclause of IEC 61439-1:2020 does not apply.

Additional subclauses:

8.701 Supports and securing devices of assembly

8.701.1 Handling provisions

In case of mobile assemblies, handles (or any other equivalent system) shall be provided on the assembly and be firmly attached to the enclosure or supporting framework.

The assembly shall be verified according to 10.2.5 of IEC 61439-1:2020.

8.701.2 Water and other fluid systems

The assembly in a common enclosure with water and other fluids shall be designed according to the requirements of this document for outdoor installation.

The compartment containing the fluid system shall be separated in such a way that an improper fluid ingress is prevented.

Compliance is checked by inspection.

NOTE In the case that the fluid system could lead to a risk of explosion, additional requirements can be applicable. For details, see IEC 60364-5-52:2009, Chapter 528.

Provisions for the using of other fluids could be subject to an agreement between the manufacturer and users.

8.701.3 Other services

As other services (e.g. telecommunication, internet) can be installed in the same enclosure, the assembly shall enable segregation between power circuits and this other services.

NOTE For details, see IEC 60364-5-52:2009, Chapter 528.

9 Performance requirements

Clause 9 of IEC 61439-1:2020 is applicable except as follows.

Additional subclause:

9.701 Inrush current withstand strength for AEVCS

In AEVCS intended for AC, if not already tested against this requirement, the individual switching device shall withstand an inrush current of an electric vehicle as defined in Annex CC.

NOTE 1 The requirement for the inrush current of an electric vehicle is based on ISO 17409.

NOTE 2 The requirements for the AEVCS intended for DC are described in IEC 61851-23.

10 Design verification

Clause 10 of IEC 61439-1:2020 is applicable except as follows. See also Annex BB.

10.2.6 Verification of protection against mechanical impact (IK code)

This subclause of IEC 61439-1:2020 does not apply.

Additional subclauses:

10.2.701 Verification of mechanical strength for assemblies

10.2.701.1 General

The tests shall be carried out at an ambient temperature of between +10 °C and +40 °C.

With the exception of the test of 10.2.701.5, a new sample assembly can be used for each of the independent tests. If the same sample assembly is used for more than one test of 10.2.701, the compliance check for the second numeral of the degree of protection (IP code) shall only be applied when the tests on that sample have been completed.

When the base and the fixing means are not provided by the original manufacturer of the assembly, the original manufacturer shall provide all instructions useful to set this assembly in the safest way (see 6.2.2 of IEC 61439-1:2020).

All tests shall be carried out with the assembly mounted and installed as for normal use according to the original manufacturer's instructions.

With the exception of the test of 10.2.701.4, the door(s) of the assembly, if applicable, shall be locked at the beginning of the test and remain locked for the duration of the test.

With the exception of the test of 10.2.701.2 and 10.2.701.4, those tests do not apply to wall-mounted surface type assemblies (see 3.3.9 of IEC 61439-1:2020) and to wall-mounted recessed type assemblies (see 3.3.10 of IEC 61439-1:2020).

The following tests shall be carried out in accordance with the Table 702.

10.2.701.2 Verification of resistance to mechanical impact

Mechanical impacts shall be carried out in accordance with IEC 62262:2002 and IEC 62262:2002/AMD1:2021.

Bases as defined in 3.5.707 shall not be subjected to any mechanical tests present in this document.

Blows shall not be applied on components mounted on or in the surface of the enclosure and already tested in accordance with their own standard, e.g. socket outlets, push-buttons, displays.

After the test, the specimens shall show no damage leading to non-compliance with the document.

Damage to the finish, small dents and small chips which do not adversely affect the protection against electric shock or harmful ingress of water should be disregarded.

Cracks passing through the material not visible with normal or corrected vision without magnification, surface cracks in fiber-reinforced moldings and small indentations are disregarded.

After the test, inspection shall verify that the specified IP code and dielectric properties have been maintained and removable covers can still be removed and reinstalled, doors opened and closed.

10.2.701.3 Verification of resistance to static load

The following tests shall be carried out on assemblies classified as 5.701.1.1 (ground- and floor-mounted) intended to be installed in non-restricted access areas and restricted access areas classified as 5.702.2 (medium resistance) or 5.702.3 (high resistance).

Test 1: an evenly distributed load L_1:

– 4 500 N/m^2 for medium-resistance assembly (see 5.702.2),

– 8 500 N/m^2 for high-resistance assembly (see 5.702.3),

shall be applied for 5 min to the roof of the enclosure (see Figure 701). To distribute the force transmission on an uneven roof, a sandbag or similar device can be used.

Test 2: a force F_1:

– 600 N for medium resistance assembly (see 5.702.2),
– 1 200 N for high resistance assembly (see 5.702.3),

shall be applied for 5 min in turn to the two roof edges having the longest length (see Figure 701) except where the enclosure height exceeds 1,80 m above ground level, in which case the force shall be applied to the front and rear sides of the enclosure located at 1,80 m above ground level.

Where the shape of the roof is not rectangular, the two applications shall be as close as practical to 180° of angular displacement from each other.

The force shall be transmitted over an area of not less than 100 mm × 100 mm and not exceeding 120 mm × 120 mm.

The load/force should be applied smoothly without jerks within 30 s. The verification of the test starts when the load/force has settled.

Compliance is checked by verification after the test that the minimum degree of protection is in accordance with 8.2.2, and the operation of the door(s) and locking points are not impaired and by verification that the electrical clearances have remained satisfactory for the duration of the tests and in the case of an assembly having a metallic enclosure, that no contact between live parts and the enclosure has occurred caused by permanent or temporary distortion.

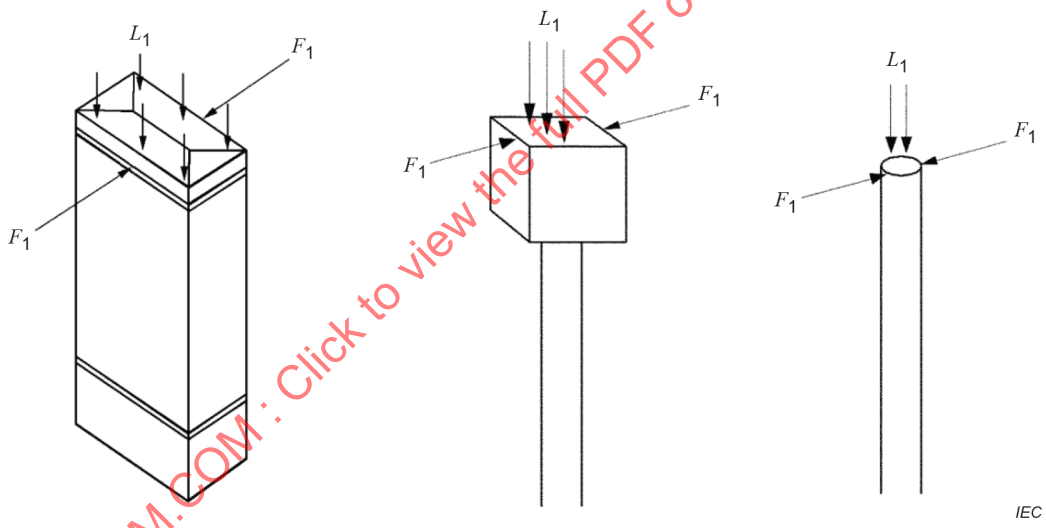


Figure 701 – Diagram of test to verify the resistance to static load

10.2.701.4 Verification of mechanical strength of doors

The test applies to all types of assemblies having a door(s) hinged on a vertical edge of the enclosure.

This test does not apply for doors inside the enclosure and for hinged lids inside the enclosure.

The tests shall be carried out with the door(s) fully open and in contact with the designed restraint (see Figure 702). A load of 50 N shall be applied at the top edge of the door perpendicular to the plane of the door(s) and at a distance of maximum 300 mm from the hinged edge and maintained for 3 s. The test is not applicable if the doors are less than 300 mm wide.

Unless the door(s) are designed to be unhinged without the use of a tool for maintenance or operational use, the test shall then be repeated with the force F_2 increased to

- 250 N for medium resistance assembly (see 5.702.2);
- 450 N for high resistance assembly (see 5.702.3).

Compliance is checked by verification that the door(s) have not become unhinged and the operation of the door(s), hinges and locking points are not impaired by the application of a force of 50 N. In addition, by verification that the degree of protection remains in accordance with 8.2.2 after the door(s) have been closed following tests. If the door(s) become unhinged during the F_2 test, this is not regarded as a failure if it is possible to reinstall the same door(s) without the use of a tool.

NOTE Small cracks, created by air bubbles that were visible before the test, but not affected by the application of the axial load, are ignored.

Dimensions in millimetres

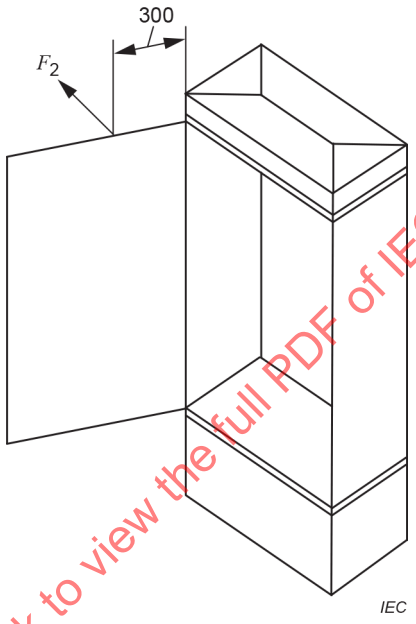


Figure 702 – Diagram of test to verify the mechanical strength of doors

10.2.701.5 Verification of resistance to shock load

The following tests shall be carried out on ground and floor-mounted assemblies intended to be installed in non-restricted access areas. A bag in accordance with Figure 703 containing dry sand and having a total mass of 15 kg shall be hung from an overhead support vertically above the surface under test.

This test shall be made on new samples.

Dimensions in millimetres

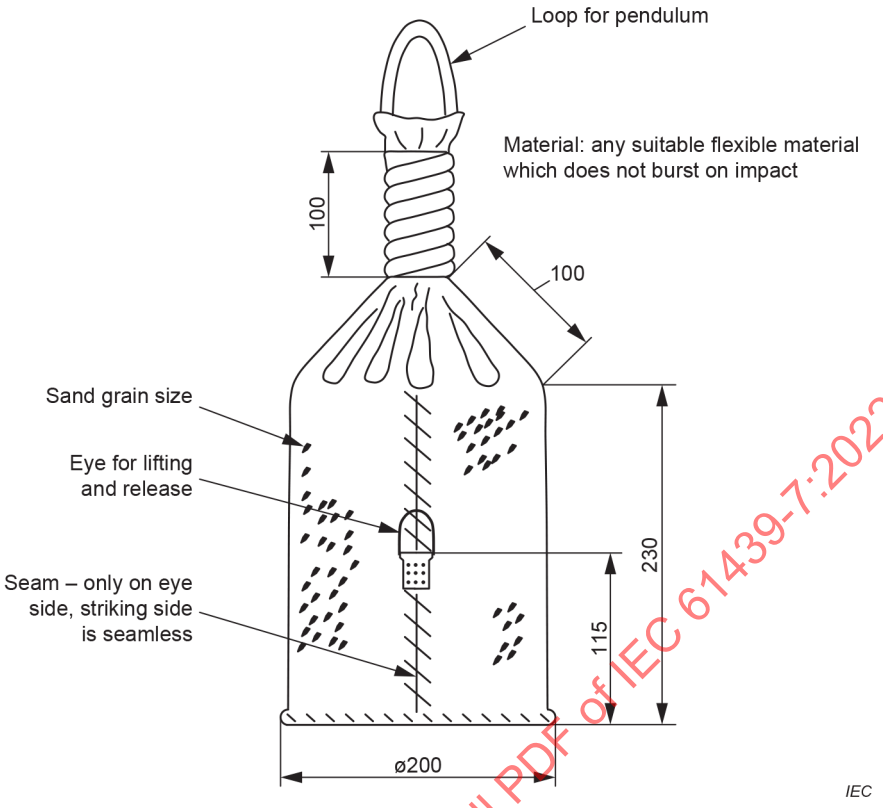


Figure 703 – Sandbag for test to verify the resistance to shock load

Each test shall consist of one blow aimed at the upper part of each at least three of the vertical surfaces of the assembly at 0,5 m above ground level which are visible when the assembly is installed as for normal use according to the original manufacturer's instructions.

Separate enclosures can be used for each of the test blows.

If the enclosure is of cylindrical form, the test consists of three blows positioned with an angular displacement of 120°.

A test shall consist of raising the lifting eye through a height of 1 m and allowing the sandbag to fall through a vertical arc to impact the approximate centre of the upper part of the surface below the roof of the assembly under test (see Figures 704a and 704b).

Compliance is checked by verification that, after the test, the degree of protection is maintained in accordance with 8.2.2 and that the operation of the door(s) and locking points are not impaired and by verification that the electrical clearances have remained satisfactory for the duration of the tests and, in the case of an assembly having a metallic enclosure, that no contact between live parts and the enclosure has occurred caused by permanent or temporary distortion.

In the case of an assembly having an insulating enclosure, if the appropriate conditions are satisfied, then damage such as small dents or small degrees of surface cracking or flaking are disregarded, provided that there are no associated cracks detrimental to the service ability of the assembly.

Detachments, cracks or deterioration of aesthetical parts or components shall be disregarded.

Dimensions in millimetres

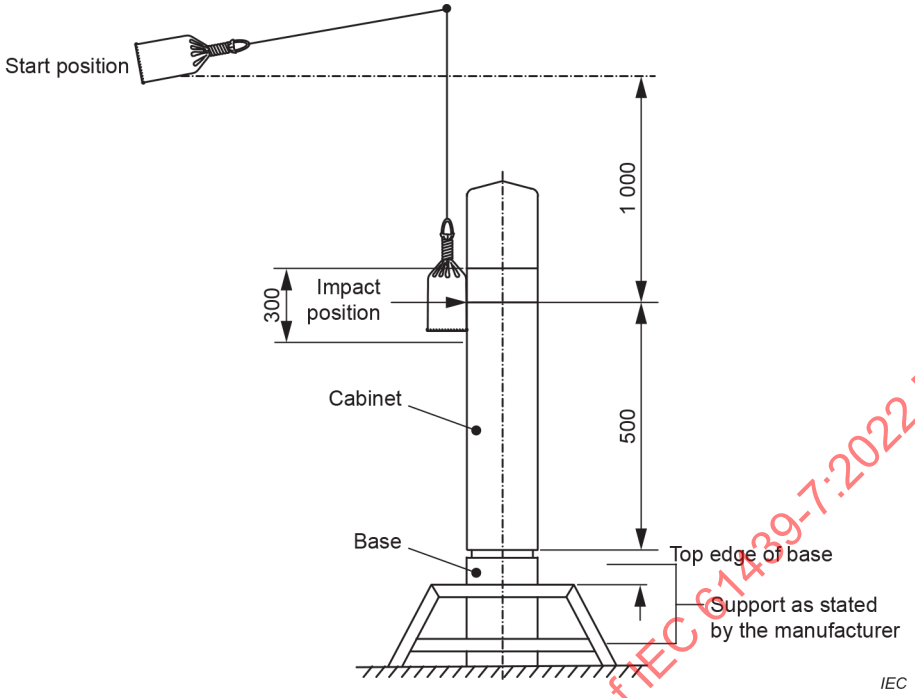


Figure 704a – Diagram of test to verify the resistance to shock load of a ground-mounted assembly with embedded base

Dimensions in millimetres

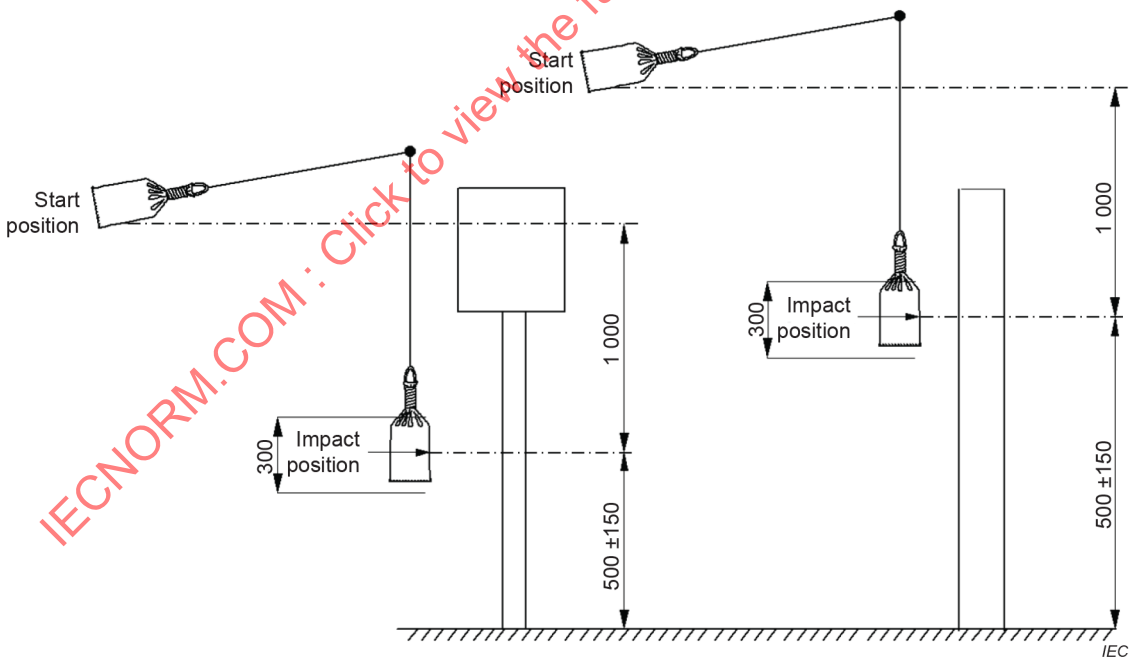


Figure 704b – Diagram of test to verify the resistance to shock load of a ground-mounted assembly without embedded base

Figure 704 – Diagram of test to verify resistance to shock load

10.2.701.6 Verification of resistance to torsional stress

The following tests shall be carried out on all types of ground-mounted stationary assemblies intended to be installed in non-restricted access areas.

The test is carried out using a horizontally rotatable frame constructed from 60 mm × 60 mm × 5 mm angle iron, having vertical locations 100 mm long at the frame arm's extremities. The assembly under test is rigidly fixed at its base and the frame closely fitted over it, so that the end locations of the frame arm are in contact with the roof and sides of the assembly.

The ASSEMBLY, with the door(s) closed shall have a torsional force of 2 × 1 000 N applied for 30 s as shown in Figures 705a and 705b or an equivalent test arrangement.

The load/force should be applied smoothly without jerks within 30 s.

Compliance is checked by verifying that the doors(s) remain closed for the duration of the test and by verification after the test that the degree of protection is maintained in accordance with 8.2.2.

Detachments, cracks or deterioration of aesthetical parts or components shall be disregarded.

NOTE If the angle iron cannot apply the force to the assembly for constructional reasons, small contact surface or flexible material, the test can be omitted if the test is repeated once more with the same result.

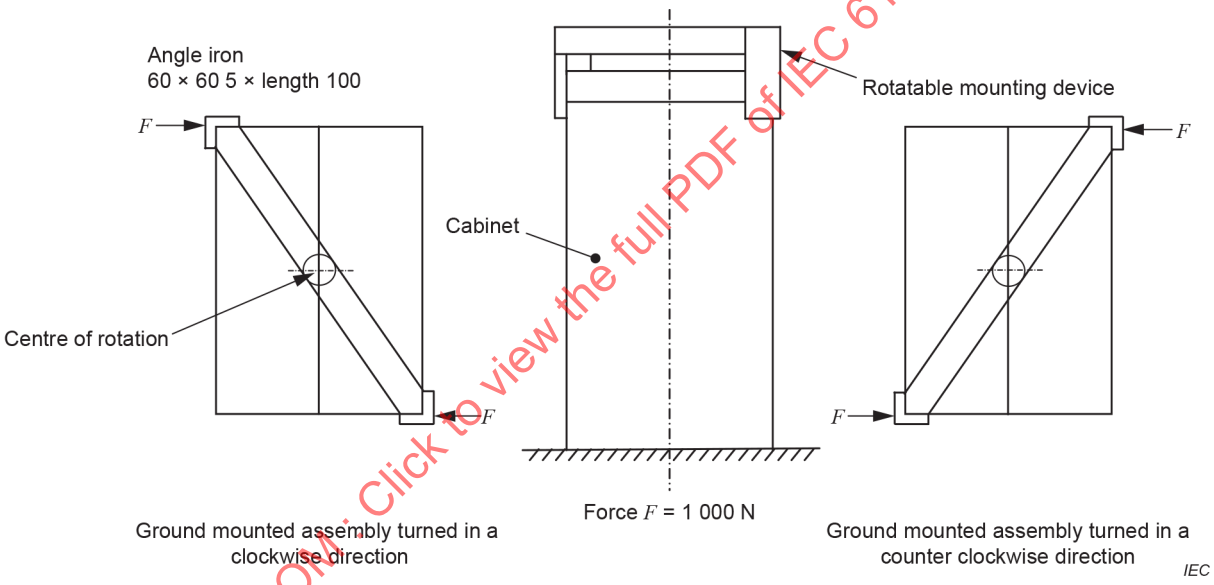


Figure 705a – Diagram of test to verify the resistance to torsional stress of a ground-mounted assembly without embedded base

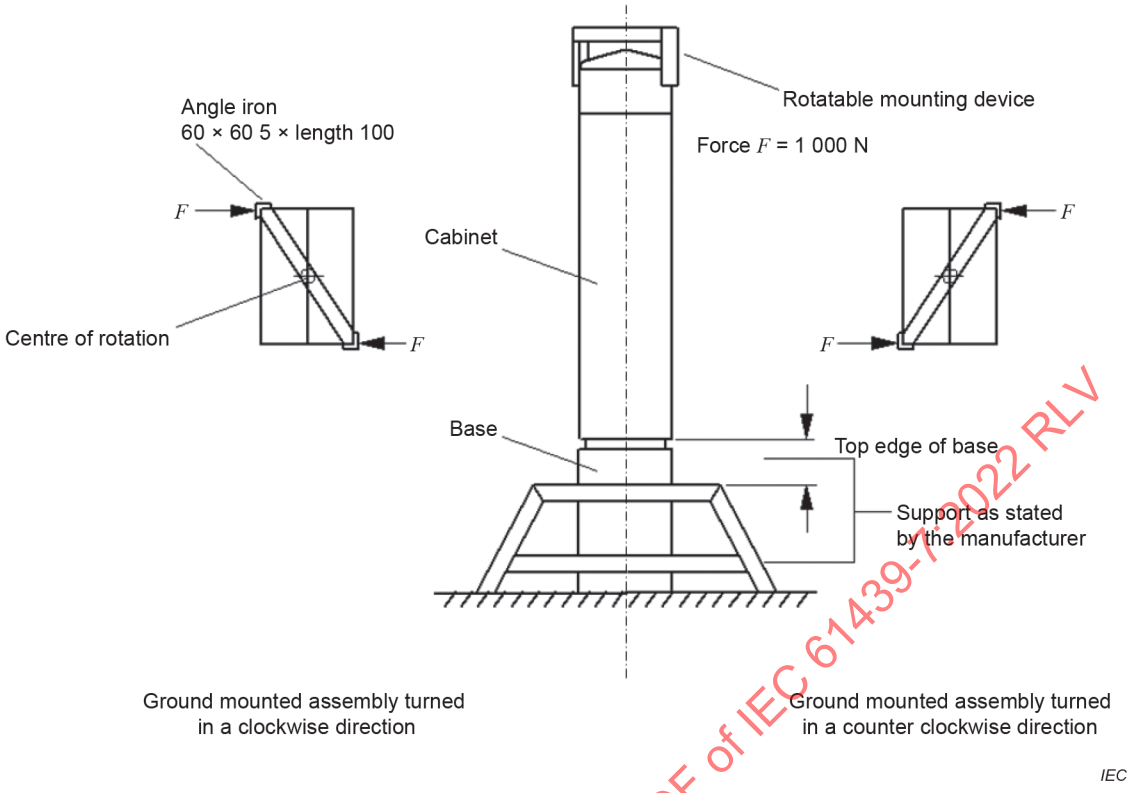


Figure 705b – Diagram of test to verify the resistance to torsional stress of a ground-mounted assembly with embedded base

Figure 705 – Diagram of test to verify resistance to torsional stress

10.2.701.7 Shock test for mobile and transportable assembly

Mobile and transportable assemblies shall be subjected to a single pulse half-sine wave, the shock test having a severity of 500 m/s^2 (50 g) peak acceleration and a duration of 11 ms.

The assembly in working order shall be tested in accordance with IEC 60068-2-27. Subject to agreement between manufacturer and user, the test can be carried out at separate sections of the assembly.

After the test, the enclosure shall continue to provide the degrees of protection specified in 8.2.2, any distortions or deformations of the enclosure and components shall neither be detrimental to the proper functioning of the assembly nor decrease creepage distances and clearances below the required values; actuators, handles, etc., shall still be operable.

Distortion or deformation of plastic parts that can return in correct position by simple action (such as opening and reclosing of the cover) are not considered to be detrimental to the proper functioning of the assembly.

Superficial damage, paint removal, small indentations, cracks not visible with normal or corrected vision without further magnification, or surface cracks shall not constitute failure of the test.

10.10 Verification of temperature rise

10.10.1 General

Modification:

Item c) of this subclause of IEC 61439-1:2020 does not apply for AEVCS.

10.10.4 Verification assessment

This subclause of IEC 61439-1:2020 does not apply for AEVCS.

11 Routine verification

Clause 11 of IEC 61439-1:2020 is applicable.

Table 701 – Values of assumed loading

Number of main circuits	Assumed loading factor
2 and 3	0,8
4 and 5	0,7
6 to 9 inclusive	0,6
10 (and above)	0,5

Table 702 – Mechanical tests

Name of the test	Subclause	Sub test	Basic resistance (5.702.1)	Medium resistance (5.702.2)	High resistance (5.702.3)	Test of assemblies
Resistance to mechanical impact (IK)	10.2.701.2		IK07	IK08	IK10	All type of assemblies
Resistance to static load	10.2.701.3	Test 1: "Evenly distributed load test"	No	4 500 N/m^2 shall be applied for 5 min	8 500 N/m^2 shall be applied for 5 min	Ground and floor mounted assembly
		Test 2: "Lateral force test"	No	600 N applied for 5 min in turn	1 200 N applied for 5 min in turn	Ground and floor mounted assembly
Mechanical strength of doors	10.2.701.4		No	A load of 50 N + load increased to 250 N	A load of 50 N + load increased to 450 N	All type of assembly
Resistance to shock load	10.2.701.5		No	No	Total mass of 15 kg	Ground and floor mounted assembly
Resistance to torsional stress	10.2.701.6		No	No	2 × 1 000 N applied for 30 s	Ground and floor mounted assembly
Shock test	10.2.701.7		Mobile and transportable assemblies			

NOTE 1 Depending on the applications, assemblies classified as medium resistance (5.702.2) can be used to increase the degree of safety in comparison with the basic resistance (5.702.1).

NOTE 2 Where additional mechanical protection can be applicable, see Annex EE.

Annexes

Annexes of IEC 61439-1:2020 are applicable except as follows.

Annexes C and M of IEC 61439-1:2020 are not applicable.

Addition of Annexes AA to FF:

Annex AA
(informative)

User information template

Table AA.1 is intended as a template for the identification of items necessary for the assembly manufacturer which is to be provided by the user.

Table AA.1 – User information template

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in IEC 61439-7	User requirement[c]
Electrical system				
Earthing system	5.6, 8.4.3.1, 8.4.3.2.3, 8.6.2, 10.5, 11.4	Manufacturer's standard, selected to suit local requirements	TT / TN-C / TN-C-S / IT / TN-S	
Nominal voltage (V)	3.8.9.1, 5.2.1, 8.5.3	Local, according to installation conditions	Max. 1 000 V AC or 1 500 V DC	
Transient overvoltages	5.2.4, 8.5.3, 9.1, Annex G.	Determined by the electrical system	Overvoltage category I / II / III / IV	
Temporary overvoltages	9.1	Nominal system voltage + 1 200 V	None	
Rated frequency f_n (Hz)	3.8.12, 5.5, 8.5.3, 10.10.2.3, 10.11.5.4	According to local installation conditions	DC/50 Hz/60 Hz	
Additional on-site testing requirements: wiring, operational performance and function	11.10	Manufacturer's standard, according to application	None	
Short-circuit withstand capability				
Prospective short-circuit current at supply terminals I_{cp} (kA)	3.8.7	Determined by the electrical system	None	
Prospective short-circuit current in the neutral	10.11.5.3.5	Max. 60 % of phase values	None	
Prospective short-circuit current in the protective circuit	10.11.5.6	Max. 60 % of phase values	None	
SCPD in the incoming functional unit requirement	9.3.2	According to local installation conditions	Yes / No	
Co-ordination of short-circuit protective devices including external short-circuit protective device details.	9.3.4	According to local installation conditions	None	
Data associated with loads likely to contribute to the short-circuit current	9.3.2	No loads likely to make a significant contribution allowed for	None	
Protection of persons against electric shock in accordance with IEC 60364-4-41				
Type of protection against electric shock – Basic protection (protection against direct contact)	8.4.2	Basic protection	According to local installation regulations	

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in IEC 61439-7	User requirement[c]
Type of protection against electric shock – Fault protection (protection against indirect contact)	8.4.3	According to local installation conditions	Automatic disconnection of supply / Electrical separation / Double or reinforced insulation	
Installation environment				
Location type	3.5, 8.1.4, 8.2	Manufacturer's standard, according to application	Indoors/ outdoors/ restricted access/non restricted access	
Protection against ingress of solid foreign bodies and ingress of water	8.2.2, 8.2.3	Indoor (enclosed): IP 41 Outdoor (min.): IP 44	None	
External mechanical impact (IK)	8.2.1, 10.2.701.2	Restricted access IK07 Non restricted access IK08	None	
Resistance to UV radiation (applies for outdoor assemblies only unless specified otherwise)	10.2.4	Indoor: Not applicable. Outdoor: Temperate climate	None	
Resistance to corrosion	10.2.2	Normal Indoor/Outdoor arrangements	None	
Ambient air temperature – Lower limit	7.1.1	Indoor: −5 °C Outdoor: −25 °C	None	
Ambient air temperature – Upper limit	7.1.1	+40 °C	None	
Ambient air temperature – Daily average maximum	7.1.1, 9.2	+35 °C	None	
Maximum relative humidity	7.1.1	Indoor: 50 % at +40 °C Outdoor: 100 % at +25 °C	None	
Pollution degree (of the installation environment)	7.1.2	Indoors: 2 Outdoors: manufacturer's standard	None	
Altitude	7.1.1	≤ 2 000 m	None	
EMC environment (A or B)	9.4, 10.12, Annex J	A/B	A/B	
Special service conditions (e.g. vibration, exceptional condensation, heavy pollution, corrosive environment, strong electric or magnetic fields, fungus, small creatures, explosion hazards, heavy vibration and shocks, earthquakes)	7.2, 8.5.4, 9.3.3, Table 7	No special service conditions	None	
Installation method				
Stationary/Mobile	3.5	Stationary	Stationary / Mobile /transportable	

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in IEC 61439-7	User requirement[c]
Maximum overall dimensions and weight	5.6, 6.2.1	Manufacturer's standard, according to application	None	
External conductor type(s)	8.8	Manufacturer's standard	Cable / Busbar Trunking System	
Direction(s) of external conductors	8.8	Manufacturer's standard	None	
External conductor material	8.8	Copper	Copper / aluminium	
External phase conductor, cross sections, and terminations	8.8	As defined within the document	None	
External PE, N, PEN conductors cross sections, and terminations	8.8	As defined within the document	None	
Special terminal identification requirements	8.8	Manufacturer's standard	None	
Storage and handling				
Maximum dimensions and weight of transport units	6.2.2, 10.2.5	Manufacturer's standard	None	
Methods of transport (e.g. forklift, crane)	6.2.2, 8.1.6	Manufacturer's standard	None	
Environmental conditions different from the service conditions	7.3	As service conditions	None	
Packing details	6.2.2	Manufacturer's standard	None	
Operating arrangements				
Access to manually operated devices	8.4	Ordinary persons	None	
Location of manually operated devices	8.5.5	Easily accessible	None	
Isolation of load installation equipment items	8.4.2, 8.4.3.3, 8.4.6.2	Manufacturer's standard	Individual / groups / all	
Maintenance and upgrade capabilities				
Requirements related to accessibility in service by ordinary persons; requirement to operate devices or change components while the assembly is energised	8.4.6.1	Basic protection	None	
Requirements related to accessibility for inspection and similar operations	8.4.6.2.2	No requirements for accessibility	None	
Requirements related to accessibility for maintenance in service by authorized persons	8.4.6.2.3	No requirements for accessibility	None	
Requirements related to accessibility for extension in service by authorized persons	8.4.6.2.4	No requirements for accessibility	None	
Method of functional units connection	8.5.1, 8.5.2	Manufacturer's standard	None	
Protection against direct contact with hazardous live internal parts during maintenance or upgrade (e.g. functional units, main busbars, distribution busbars)	8.4	No requirements for protection during maintenance or upgrade	None	

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in IEC 61439-7	User requirement[c]
Current carrying capability				
Maximum total load current to be supplied by the assembly (from which the rated current of the assembly I_{nA} (A) will be determined	3.8.9.1, 5.3, 8.4.3.2.3, 8.5.3, 8.8, 10.10.2, 10.10.3, 10.11.5, Annex E	Manufacturer's standard, according to application	None	
Design current I_B and nature of load for each circuit; alternatively, I_n of the devices and nature of the load (in such cases, the assumed loading factors can be used based on the relevant part of IEC 61439)	3.8.10.8	None	None	
Ratio of cross section of the neutral conductor to phase conductors: phase conductors up to and including 16 mm^2	8.6.1	100 %	None	
Ratio of cross section of the neutral conductor to phase conductors: phase conductors above 16 mm^2	8.6.1	50 % (min. 16 mm^2)	None	

[a] In some cases information declared by the assembly manufacturer can take the place of an agreement.

[b] "None" in this column means that there are no options in the IEC 61439-7 other than the default condition or value.

[c] For exceptionally onerous applications, it is possible that the user specify more stringent requirements to those in this document.

Annex BB
(informative)

Design verification

Table BB.1 provides a list of design verifications to be performed.

Table BB.1 – List of design verifications to be performed

No.	Characteristic to be verified	Clauses or subclauses of IEC 61439-1:2020	Verification options available		
			Testing	Comparison with a reference design	Assessment
1	Strength of material and parts:	10.2			
	Resistance to corrosion	10.2.2	YES	NO	NO
	Properties of insulating materials:	10.2.3			
	Thermal stability	10.2.3.1	YES	NO	NO
	Resistance to abnormal heat and fire due to internal electric effects	10.2.3.2	YES	NO	YES
	Resistance to ultra-violet (UV) radiation	10.2.4	YES	NO	YES
	Lifting	10.2.5	YES	NO	NO
	Marking	10.2.7	YES	NO	NO
	Verification of mechanical strength for assemblies	10.2.701	YES	NO	NO
2	Degree of protection of enclosures	10.3	YES	NO	YES
3	Clearances	10.4	YES	NO	NO
4	Creepage distances	10.4	YES	NO	NO
5	Protection against electric shock and integrity of protective circuits:	10.5			
	Effective continuity between the exposed conductive parts of the assembly and the protective circuit	10.5.2	YES	NO	NO
	Short-circuit withstand strength of the protective circuit	10.5.3	YES	YES	NO
6	Incorporation of switching devices and components	10.6	NO	NO	YES
7	Internal electrical circuits and connections	10.7	NO	NO	YES
8	Terminals for external conductors	10.8	NO	NO	YES
9	Dielectric properties:	10.9			
	Power-frequency withstand voltage	10.9.2	YES	NO	NO
	Impulse withstand voltage	10.9.3	YES	NO	YES
10	Temperature-rise limits	10.10	YES	YES	YES [a]
11	Short-circuit withstand strength	10.11	YES	YES	NO
12	Electromagnetic compatibility (EMC)	10.12	YES	NO	YES
13	Mechanical operation	10.2.8	YES	NO	NO

[a] Assessment does not apply for AEVCS.

Annex CC
(normative)

Endurance of the individual switching device

CC.1 General

The test is made in a test circuit as shown in Figure CC.1.

Endurance tests are made at the rate of four operating cycles per minute, if the conditioning of the individual switching device does not allow this, the test shall be made at the shortest possible time, given by the manufacturer.

Switching of S2 shall not be synchronized with the phase angle of the supply. The ON period shall have a duration of 1,9 s to 2,1 s.

The individual switching device (e.g. contactors or relay) is subjected to a total number of 10 000 operating cycles, each operating cycle consisting of a closing operation followed by an opening operation.

The test is made at rated operational voltage.

Adjustment of the test circuit:

a) The current is recorded through the current sensor A;

b) When supplied at the test voltage the following adjustments are made:

   1) Calibration of inrush current (R3 and C1): The individual switching device is replaced by a link BC having negligible impedance compared with that of the test circuit. S3 and S4 are in open position. R3 and C1 are adjusted so that after closing S1 at a phase angle of 90° the current through the current sensor reaches a peak value of 200 A ± 10 A with a rise time tr (10 % to 90 % of the peak value) of maximum 20 µs and declines to a value of 66 A ± 3 A at 30 µs + 20 µs after the peak;

   2) Calibration of rated current (X1): With BC removed, S1, S2 and S3 in closed position and S4 in open position, X1 is adjusted so that the current through the current sensor equals the rated current. X1 consists of resistors and reactors in series (X1). If air-core reactors are used, a resistor taking approximately 0,6 % of the current through the reactors is connected in parallel with each reactor. If iron-core reactors are used, the iron-power losses of these reactors shall not appreciably influence the recovery voltage. The current shall have substantially sine-wave form and the power factor shall be at least 0,95;

   3) Calibration of pre-charge current (R2) if the rated current of the device is lower than 30 A: with the individual switching device replaced by link BC, having negligible impedance compared with that of the test circuit and S1, S2, S3 and S4 in closed position, R2 is adjusted so that the current through the current sensor equals 30 A RMS. If the rated current of the device is higher than 30 A, R2 is replaced by an open circuit.

The inrush current consists of two superimposed components:

- The resulting test current has a peak of maximum 230 A and corresponds to the Event 1 of ISO 17409:2020, 8.2.2.
- This peak value decays to 30 A RMS. This (sinusoidal) current remains up to 1 s and corresponds to the Event 2 of ISO 17409:2020, 8.2.2.

A principal wave shape is shown in Figure CC.2.

CC.2 Test procedure for on-load test

The opening operations shall be effected as follows:

- 2 500 operations are carried out by closing S4 and S3, applying the supply voltage to the individual switching device by closing S1, closing S2, and opening S4 1 s ± 100 ms after closing of the main circuit by the individual switching device.
- 2 s ± 100 ms after closing of the main circuit by the individual switching device, the opening operation is initiated by opening S2. After that, the new operation cycle is started. After 1 000 operations have been carried out, S1 shall be opened.

CC.3 Test procedure for making without breaking test

The remaining operating cycles between the required 10 000 operating cycles and the operating cycles are done by closing S4 and S3, applying the supply voltage to the individual switching device by closing S1, and closing S2.

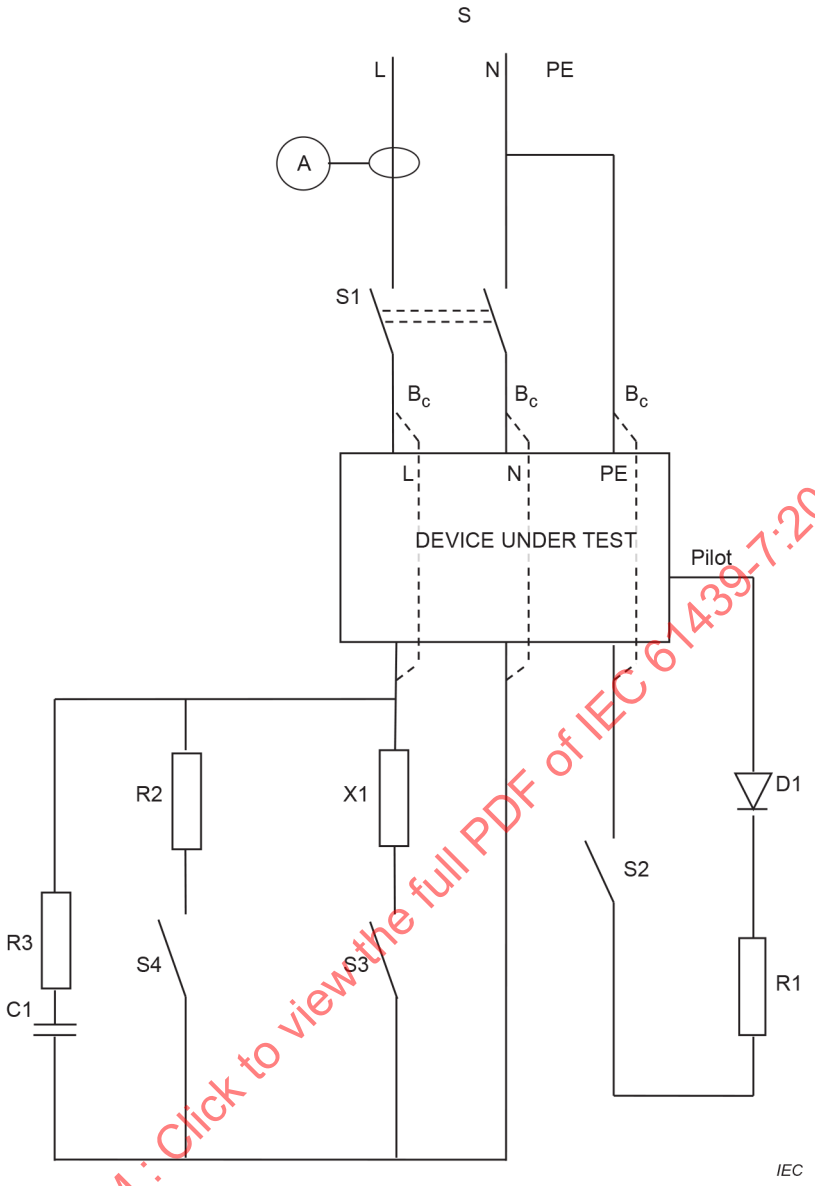
1 s ± 100 ms after closing of the main circuit by the individual switching device, the switches S4 and S3 shall be opened. 2 s ± 100 ms after closing of the main circuit by the individual switching device, the opening operation is initiated by opening S2. After that, the new operation cycle is started. After the full 10 000 operations have been carried out, S1 shall be opened.

CC.4 Condition of the individual switching device after the tests

Following the tests of Clause CC.2 and Clause CC.3, the individual switching device shall not show during inspection

- undue wear;
- damage of the enclosure permitting access to live parts by the 1,0 mm standard test wire;
- loosening of electrical or mechanical connections;
- seepage of the sealing compound, if any.

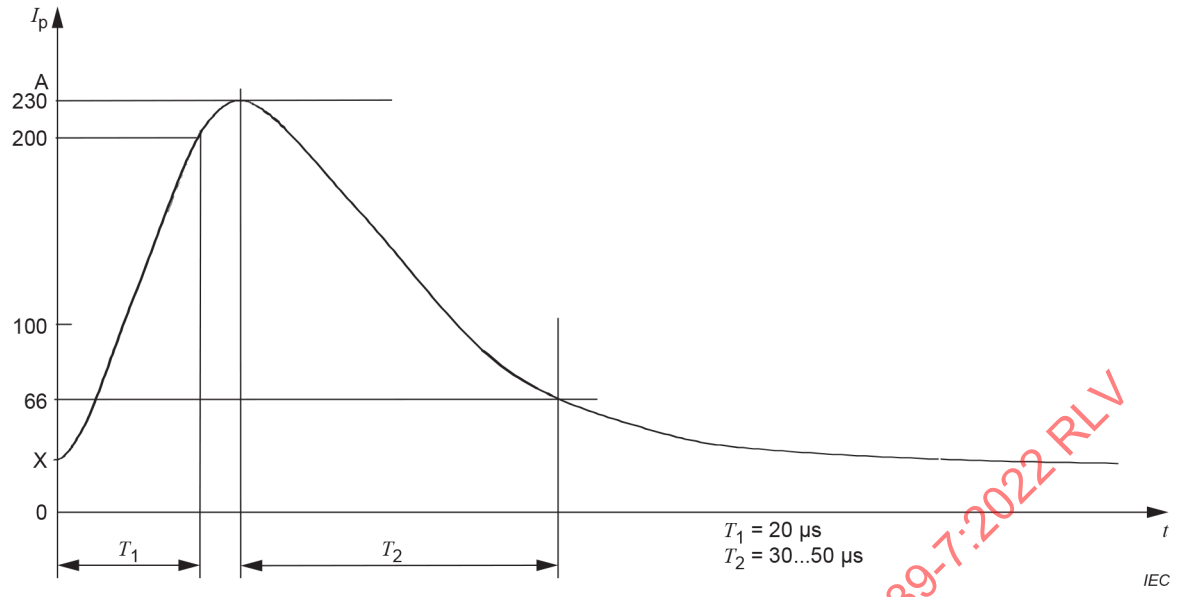
The individual switching device shall then satisfactorily perform the dielectric strength test specified in the relevant product standard, but at a voltage equal to 900 V for 1 min and without previous humidity treatment.



Key

S1, S2, S3, S4	switch
S	supply
D	device under test
R_1	resistor value 882 Ω ± 3 %
R_2	resistor
R_3	resistor
X1	resistor and reactor to adjust rated current
C1	capacitor
D1	diode

Figure CC.1 – Test circuit for endurance of the individual switching device test



Key

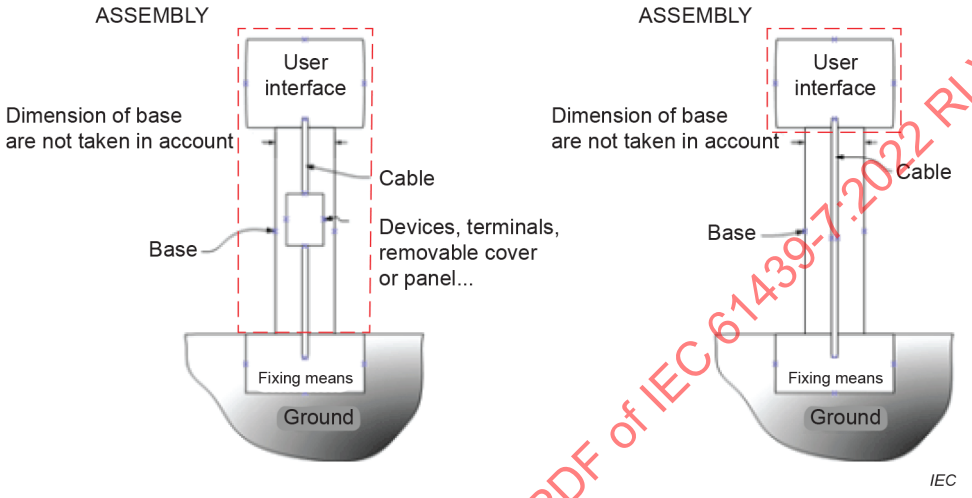
X Starting value for the inrush current (0… 42 A)
depending on the phase angle of the sinusoidal current of 30 A RMS

Figure CC.2 – Informative wave shape of inrush current for tests in accordance with Annex CC

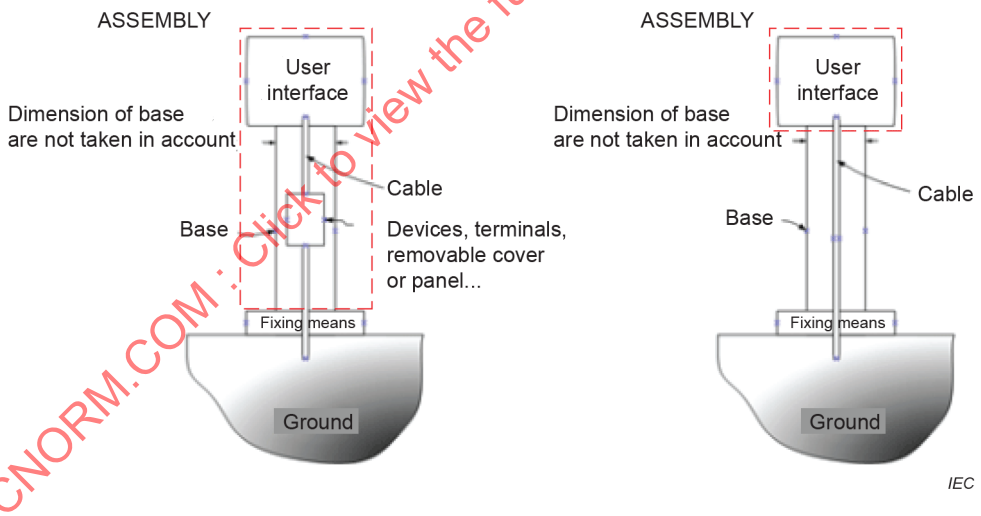
Annex DD
(informative)

Examples of assemblies in accordance with 5.701.1.1

Examples of assemblies in accordance with 5.701.1.1 are given in Figure DD.1.



a) Stationary ground mounted installation



b) Stationary floor mounted installation

Figure DD.1 – Examples of assemblies according to 5.701.1.1

Annex EE
(informative)

Verification of resistance to mechanical shock impacts induced by sharp edged objects

This test is subjected to an agreement between manufacturers and users.

If agreed between the manufacturer and user, the following tests shall be carried out on all ground-mounted stationary assemblies intended to be installed outdoors.

The test shall be carried out using an impact apparatus as described in IEC 60068-2-75 but having at the end a steel striker element profiled as shown in Figure EE.1.

Dimensions in millimetres

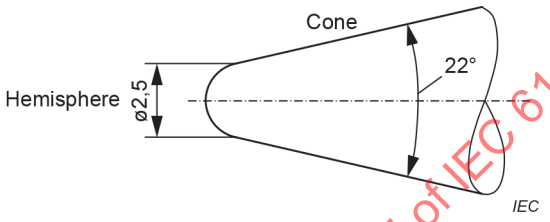


Figure EE.1 – Striker element for test of resistance to mechanical shock impacts induced by sharp-edged objects

The striker element shall be raised through a height of 0,4 m and allowed to drop and impact the surface of the assembly under test, thus providing an impact energy of 20 J.

Each test shall consist of one blow aimed at the center of at least three of the vertical surfaces of the assembly which are visible when the assembly is installed as for normal use in accordance with the original manufacturer's instructions.

Blows shall not be applied on components mounted on or in the surface of the enclosure, e.g. socket outlets, push-buttons, displays.

Separate enclosures can be used for each of the test blows.

If the enclosure is of a cylindrical form, the test consists of three blows positioned with an angular displacement of 120°.

Test 1 shall be carried out at an ambient air temperature between +10 °C and +40 °C after the assembly has been kept within these temperatures for not less than 12 h.

Test 2 shall be carried out at an ambient air temperature between +10 °C and +40 °C immediately after the assembly has been kept at a temperature of $_{-25}{}^{0}_{-5}$ °C for a period of not less than 12 h.

Compliance is checked by inspection that cracks resulting from the blows are contained within a circle of diameter not exceeding 15 mm. After the test, inspection shall verify that a minimum degree of protection of IP XXB is maintained.

Annex FF
(informative)

List of notes concerning certain countries

Clause/ Subclause	Text
1	Add the following note at the end of the 4th bulleted item: NOTE In the UK, the text of the 4th bullet does not apply and assemblies in this document intended to be operated by ordinary persons, shall also comply with the relevant specific requirements of IEC 61439-3.
6.1	Add the following note at the end of item d): NOTE 1 In some countries there are different lower temperature limits. FI, SE.
6.1	In Norway, the lower temperature limit applicable for the assembly shall be provided: NO.
7.1.1 of IEC 61439-1:2020	Add the following note at the end of this subclause: NOTE In some countries assemblies suitable for normal operation at a lower ambient temperature than −25 °C shall also comply with the requirements of this document. FI, NO, SE.
8.2.1.702	Add the following note at the end of this subclause: NOTE In the following countries it is possible to use assemblies with other classifications of resistance in locations with non-restricted access. FI, SE.
8.2.2	Add the following note at the end of this subclause: NOTE In the United States of America (USA), Canada and in Mexico, enclosure "type" designations are used to specify "the degree of protection" provided to the assembly. For applications in the USA, the appropriate enclosure type designation is specified in NEMA 250. For applications in Canada, the appropriate enclosure type designation is specified in CSA standard C22.2 No. 94.1 and 94.2. For applications in Mexico, the appropriate enclosure type designation is specified in NMX-J-235/1-ANCE and NMX-J-235/2-ANCE.
8.4.3.1	Add the following note at the end of this subclause: NOTE 3 In the UK, the applicable wiring standard is BS 7671.
10.2.701.1	Add the following note after the first paragraph of this subclause: NOTE In some countries, the tests shall be carried out at an ambient temperature (20 ± 5) °C immediately after the assembly has been kept at a temperature, corresponding to the minimum ambient temperature specified for the assembly, for a period of not less than 12 h. FI, NO, SE.
10.2.701.2	After the test, a visual inspection should be done, to confirm that no damage that will impair the electrical safety has occurred. The degrees of protection shall be at least IP XXB. SE
10.2.701.2	Add the following note at the end of this subclause: NOTE In some countries, regarding the level of mechanical strength, when the products have to fulfil requirements for any particular surroundings, the test and design is subject to an agreement between manufacturers and users. FI SE.
10.2.701.3	Add the following notes at the end of this subclause: NOTE 1 In some countries requirements regarding the level of resistance to static load in normal use, are referred to the maximum prospective short-circuit current from the net. In the case of a product type cabinet, compliance shall be checked by verification after the test that a minimum degree of protection of IP XXB is maintained. NOTE 2 In the case of a product type pole/pipe/column, a force of 8 500 N/m^2, with a minimum value of 800 N and a maximum of 1 200 N, shall be applied for 5 min in turn to the front and back upper edges of the roof of the enclosure (see Figure 701). Separate enclosures can be used for each of the forces. Compliance is checked by verification after the test that a minimum degree of protection of IPXXB is maintained. SE.
10.2.701.4	After the test, a visual inspection should be done to confirm that no damage that will impair the electrical safety has occurred. The degrees of protection shall be at least IP XXB. SE.
10.2.701.5	After the test, a visual inspection should be done to confirm that no damage that will impair the electrical safety has occurred. The degrees of protection shall be at least IP XXB. SE.
10.2.701.8	After the test, a visual inspection should be done to confirm that no damage that will impair the electrical safety has occurred. The degrees of protection shall be at least IP XXB. SE.

Clause/ Subclause	Text
Table 702	Add the following notes at the end of the table: NOTE 3 Regarding the values for the test of resistance to static load, see 10.2.701.3, Note 2. SE. NOTE 4 In some countries, the assembly's allowed prospective short-circuit current up to 10 kA refers to requirements according to basic and medium resistances. The assembly's allowed prospective short-circuit current up to 50 kA refers to requirements according to high resistance level. Other requirements can be subject to an agreement between manufacturers and users. SE. NOTE 5 Regarding the test of resistance to shock load, in some countries, products type pole/pipe/column shall be checked by verification after the test that a minimum degree of protection of IP XXB is maintained. SE.

Bibliography

The bibliography of IEC 61439-1:2020 is applicable except as follows.

Addition:

IEC 60364-7-708:2017, *Low-voltage electrical installations – Part 7-708: Requirements for special installations or locations - Caravan parks, camping parks and similar locations*

IEC 60364-7-709:2007, *Low-voltage electrical installations – Part 7-709: Requirements for special installations or locations – Marinas and similar locations*
IEC 60364-7-709:2007/AMD1:2012

IEC 60364-7-722:2018, *Low-voltage electrical installations – Part 7-722: Requirements for special installations or locations – Supplies for electric vehicle*

IEC 60364-7-740:2000, *Electrical installations of buildings – Part 7-740: Requirements for special installations or locations – Temporary electrical installations for structures, amusement devices and booths at fairgrounds, amusement parks and circuses*

IEC 60670-24, *Boxes and enclosures for electrical accessories for household and similar fixed electrical installations – Part 24: Particular requirements for enclosures for housing protective devices and other power dissipating electrical equipment*

IEC 61439-3, *Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)*

IEC 61643 (all parts), *Low-voltage surge protective devices*

IEC 61851-1:2017, *Electric vehicle conductive charging system – Part 1: General requirements*

IEC 61851-23, *Electric vehicle conductive charging system – Part 23: DC electrical vehicle charging station*

ISO 17409:2020, *Electrically propelled road vehicles – Conductive power transfer – Safety requirements*

CSA standard C22.2 No. 94.1, *Enclosures for Electrical Equipment, Non-Environmental Considerations*

CSA standard C22.2 No. 94.2, *Enclosures for electrical equipment, environmental considerations*

NMX-J-235/1, *Envolventes – Envolventes para uso en equipo eléctrico – Parte 1: Consideraciones no Ambientales – Especificaciones y Métodos de Prueba*

NMX-J-235/2-ANCE, *Envolventes – Envolventes para uso en equipo eléctrico – Parte 2: consideraciones ambientales – Especificaciones y Métodos de Prueba*

BS 7671, *Requirements for Electrical Installations*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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ENSEMBLES D'APPAREILLAGE À BASSE TENSION –

Partie 7: Ensembles pour les applications spécifiques comme les marinas, les terrains de camping, les marchés et pour les bornes de charge de véhicules électriques

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9) L'attention est attirée sur le fait que certains des éléments du présent document 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.

L'IEC 61439-7 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 deuxième édition annule et remplace la première édition parue en 2018. Elle constitue une révision technique.

Cette édition inclut les modifications suivantes par rapport à la spécification technique précédente:

a) une revue rédactionnelle générale et une révision technique ont été effectuées.

Le texte du présent document est issu des documents suivants:

Projet	Rapport de vote
121B/138/CDV	121B/150/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Le présent document doit être lu conjointement avec l'IEC 61439-1:2020. Les dispositions des règles générales traitées dans l'IEC 61439-1:2020 s'appliquent uniquement au présent document lorsqu'elles sont spécifiquement citées. Lorsque le présent document mentionne "addition", "modification" ou "remplacement", le texte correspondant de l'IEC 61439-1:2020 doit être adapté en conséquence.

Les paragraphes qui sont numérotés avec le suffixe 701 (702, 703, etc.) s'ajoutent aux mêmes paragraphes de l'IEC 61439-1:2020.

Les nouveaux tableaux et nouvelles figures du présent document sont numérotés à partir de 701.

Les nouvelles annexes du présent document sont désignées AA, BB, etc.

Dans le présent document, le terme "ensemble" est défini en 3.1.1 de l'IEC 61439-1:2020.

L'attention du lecteur est attirée sur le fait que l'Annexe FF énumère tous les articles qui traitent des différences à caractère moins permanent inhérentes à certains pays, concernant le sujet du présent document.

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

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications/.

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ENSEMBLES D'APPAREILLAGE À BASSE TENSION –

Partie 7: Ensembles pour les applications spécifiques comme les marinas, les terrains de camping, les marchés et pour les bornes de charge de véhicules électriques

1 Domaine d'application

L'Article 1 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes.

Remplacement:

La présente partie de l'IEC 61439 définit les exigences spécifiques applicables aux ensembles destinés aux applications suivantes: marinas, terrains de camping, marchés et emplacements analogues et bornes de charge de véhicules électriques, comme suit:

- ensembles dont la tension assignée ne dépasse pas 1 000 V en courant alternatif ou 1 500 V en courant continu;
- 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 qui consomment de l'énergie électrique;
- ensembles actionnés par des personnes ordinaires (par exemple, brancher ou débrancher du matériel électrique);
- ensembles destinés à être installés et utilisés dans les marchés, marinas, des terrains de camping et autres lieux analogues accessibles au public, y compris les installations temporaires;
- ensembles destinés aux bornes de charge de véhicules électriques (AEVCS) de Mode 3 et de Mode 4. Ils sont conçus pour intégrer la fonctionnalité et les exigences supplémentaires des systèmes de charge conductive pour véhicules électriques conformément à l'IEC 61851-1:2017.

NOTE 1 Dans le présent document, les termes AMHS (voir 3.1.701), ACCS (voir 3.1.702), AMPS (voir 3.1.703), AEVCS (voir 3.1.704) sont utilisés pour désigner les ensembles d'appareillage à basse tension destinés à être utilisés respectivement dans les marinas et emplacements analogues (AMHS), terrains de camping et emplacements analogues (ACCS), marchés et autres lieux publics extérieurs analogues (AMPS), et les bornes de charge (AEVCS). Le terme ensembles est utilisé pour désigner tous ces types de tableaux.

Le présent document ne s'applique pas aux ensembles destinés à être installés à bord des navires, péniches, bateaux de plaisance et embarcations analogues.

Pour le choix approprié des appareils de connexion et des composants, les normes suivantes s'appliquent:

- IEC 60364-7-709 (AMHS); ou
- IEC 60364-7-708 (ACCS); ou
- IEC 60364-7-740 (AMPS); ou
- IEC 60364-7-722 (AEVCS).

Le présent document s'applique à tous les ensembles qu'ils soient conçus, fabriqués et vérifiés individuellement ou qu'ils soient complètement normalisés et fabriqués en masse.

La fabrication et/ou l'assemblage peuvent être réalisés par un tiers qui n'est pas le constructeur d'origine (voir 3.10.1 de l'IEC 61439-1:2020).

Le présent document ne s'applique pas aux appareils pris en considération individuellement ni aux composants autonomes tels que les disjoncteurs, les fusibles-interrupteurs, les matériels électroniques, qui sont conformes aux normes de produits qui les concernent.

NOTE 2 Lorsque le matériel électrique est directement raccordé au réseau d'alimentation public à basse tension et équipé d'un compteur d'énergie aux fins de facturation du fournisseur légal de l'alimentation à basse tension, des exigences particulières supplémentaires fondées sur les réglementations nationales s'appliquent, le cas échéant.

Le présent document ne s'applique pas aux boîtes et enveloppes pour appareillage électrique pour installations électriques fixes pour usages domestiques et analogues, comme cela est défini dans l'IEC 60670-24.

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).

L'Article 2 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes.

Addition:

IEC 60068-2-27, *Essais d'environnement – Partie 2-27: Essais – Essai Ea et guide: Chocs*

IEC 60068-2-75, *Essais d'environnement – Partie 2-75: Essais – Essai Eh: Essais au marteau*

IEC 61439-1:2020, *Ensembles d'appareillage à basse tension – Partie 1: Règles générales*

IEC 62262:2002, *Degrés de protection procurés par les enveloppes de matériels électriques contre les impacts mécaniques externes (Code IK)*
IEC 62262:2002/AMD1:2021

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions de l'IEC 61439-1:2020 ainsi que les suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

L'Article 3 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes.

3.1 Termes généraux

Termes supplémentaires:

3.1.701
ensemble d'appareillage à basse tension pour marinas et zones portuaires
AMHS
combinaison d'un ou de plusieurs appareils de transformation ou de connexion avec les matériels associés de commande, de mesure, de signalisation, de protection, de régulation, avec toutes leurs liaisons internes électriques et mécaniques et leurs éléments de construction,

conçue et construite pour être utilisée dans toutes les marinas, zones portuaires et lieux analogues

Note 1 à l'article: L'abréviation "AMHS" est dérivée du terme anglais développé correspondant "assembly for marinas and harbors sites".

3.1.702
ensemble d'appareillage à basse tension pour terrains de camping et parcs de caravanes
ACCS
combinaison d'un ou de plusieurs appareils de transformation ou de connexion avec les matériels associés de commande, de mesure, de signalisation, de protection, de régulation, avec toutes leurs liaisons internes électriques et mécaniques et leurs éléments de construction, conçue et construite pour être utilisée dans tous les terrains de camping, les parcs de caravanes et lieux analogues

Note 1 à l'article: L'abréviation "ACCS" est dérivée du terme anglais développé correspondant "assembly for camping and caravan sites".

3.1.703
ensemble d'appareillage à basse tension pour marchés et autres lieux publics extérieurs
AMPS
combinaison d'un ou de plusieurs appareils de transformation ou de connexion avec les matériels associés de commande, de mesure, de signalisation, de protection, de régulation, avec toutes leurs liaisons internes électriques et mécaniques et leurs éléments de construction, conçue et construite pour être utilisée dans tous les marchés et autres lieux publics extérieurs analogues

Note 1 à l'article: L'abréviation "AMPS" est dérivée du terme anglais développé correspondant "assembly for markets and other outdoor public sites".

3.1.704
ensemble d'appareillage à basse tension pour bornes de charge de véhicules électriques
AEVCS
combinaison d'un ou de plusieurs appareils de transformation ou de connexion avec les matériels associés de commande, de mesure, de signalisation, de protection, de régulation, avec toutes leurs liaisons internes électriques et mécaniques et leurs éléments de construction, conçue et construite pour être utilisée comme borne de charge

Note 1 à l'article: L'abréviation "AEVCS" est dérivée du terme anglais développé correspondant "assembly for electric vehicles charging stations".

3.3 Présentation extérieure des ensembles

Modification:

3.3.1
ensemble ouvert

Ce terme de l'IEC 61439-1:2020 ne s'applique pas.

3.3.2
ensemble ouvert à protection frontale
Ce terme de l'IEC 61439-1:2020 ne s'applique pas.

3.5 Conditions d'installation des ensembles

3.5.3
ensemble fixe

Termes et définitions supplémentaires:

3.5.3.701
ensemble installé dans le sol ou sur le sol
ensemble fixe connecté en permanence à l'alimentation dont une partie est encastrée dans le sol ou destinée à être fixée directement au sol ou à un socle

Note 1 à l'article: Ce type d'ensemble inclut les poteaux et les colonnes.

3.5.3.702
ensemble à montage mural
ensemble fixe destiné à être fixé directement au mur tout en étant connecté en permanence à l'alimentation

3.5.4
ensemble mobile
Ce terme de l'IEC 61439-1:2020 ne s'applique pas.

Termes et définitions supplémentaires:

3.5.701
ensemble relié en permanence
ensemble qui ne peut être connecté au réseau d'alimentation à courant alternatif ou à courant continu, ou en être déconnecté, qu'à l'aide d'un outil

Note 1 à l'article: Cet ensemble correspond à la définition de "système d'alimentation pour VE relié en permanence" fournie dans le 3.6.9 de l'IEC 61851-1:2017.

3.5.702
ensemble transportable
ensemble prévu pour être utilisé à un emplacement donné auquel il n'est pas fixé définitivement.

Note 1 à l'article: Lorsqu'il doit être déplacé vers un autre emplacement, le matériel est d'abord déconnecté du réseau d'alimentation électrique.

3.5.703
ensemble mobile
ensemble qui peut être déplacé pendant son fonctionnement ou qui peut être facilement déplacé tout en restant connecté au réseau d'alimentation électrique

3.5.704
ensemble pour emplacements à accès limité
ensemble accessible à toutes les personnes autorisées à avoir accès à l'emplacement (équipements qui se trouvent dans des bâtiments privés, parkings privés ou endroits analogues, par exemple)

Note 1 à l'article: Cet ensemble correspond à la définition d'"équipements pour des zones d'accès limité" fournie dans le 3.6.3 de l'IEC 61851-1:2017.

3.5.705
ensemble pour emplacements à accès non limité
ensemble accessible à toutes les personnes, par exemple dans un espace public

Note 1 à l'article: Cet ensemble correspond à la définition d'"équipements pour des zones d'accès non limité" fournie dans le 3.6.4 de l'IEC 61851-1:2017.

3.5.706
système d'alimentation en eau et autres fluides
partie de l'ensemble qui comprend des canalisations d'eau, vannes, joints et robinets en tant que service à l'utilisateur raccordé

EXEMPLE L'air comprimé, les gaz naturels, l'eau potable et les eaux usées sont des exemples d'autres fluides.

3.5.707
socle
partie supplémentaire du dispositif utilisée pour retenir l'ensemble dans tout type de montage destiné à ne contenir que des câbles

3.5.708
moyen de fixation
accessoire destiné à fixer le socle ou l'ensemble dans le sol, sur le sol ou au mur, etc.

4 Symboles et abréviations

L'Article 4 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes.

Addition:

Symbole/ Abréviation	Terme	Paragraphe
AMHS	ensemble d'appareillage à basse tension pour marinas et zones portuaires	3.1.701
ACCS	ensemble d'appareillage à basse tension pour terrains de camping et parcs de caravanes	3.1.702
AMPS	ensemble d'appareillage à basse tension pour marchés et autres lieux publics extérieurs	3.1.703
AEVCS	ensemble d'appareillage à basse tension pour bornes de charge de véhicules électriques	3.1.704

5 Caractéristiques d'interface

L'Article 5 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes.

5.1 Généralités

Remplacement:

Les caractéristiques de l'ensemble doivent assurer la compatibilité avec les caractéristiques assignées des circuits auxquels il est raccordé et avec les conditions d'installation, et elles doivent être déclarées par le constructeur d'ensembles en utilisant les critères identifiés du 5.2 au 5.6, en 5.701 et en 5.702.

La liste de spécifications donnée à l'Annexe AA informative a pour objet d'aider l'utilisateur et le constructeur d'ensembles à atteindre cet objectif, que l'utilisateur:

- choisisse les produits du catalogue dont les caractéristiques répondent à ses besoins et respectent les exigences du présent document; et/ou qu'il
- établisse un accord spécifique avec le constructeur.

5.4 Facteur de diversité assigné (RDF)

Addition:

En l'absence d'accord entre le constructeur d'ensembles et l'utilisateur concernant les courants de charge réels, la charge présumée des circuits de départ de l'ensemble AMHS, ACCS ou AMPS ou du groupe de circuits de départ peut être fondée sur les valeurs du Tableau 701.

Le courant de charge présumé est le courant assigné du dispositif de protection, I_n, comme cela est exigé par l'utilisateur, multiplié par le facteur de charge du Tableau 701.

Le Tableau 701 ne s'applique pas aux AEVCS. Pour les AEVCS, il est admis par hypothèse que tous les circuits peuvent être chargés en continu et de façon simultanée. Par conséquent, le facteur de charge présumé des circuits de départ doit être pris égal à 1 et peut être réduit si un contrôle de charge est disponible.

NOTE Les valeurs du Tableau 701 représentent les valeurs minimales qui sont atteintes ou dépassées au cours des essais.

5.6 Autres caractéristiques

Remplacement du point g):

g) destiné à être utilisé par des personnes ordinaires (voir 3.7.16 de l'IEC 61439-1:2020);

Point supplémentaire:

q) emplacements à accès limité ou emplacements à accès non limité (voir 3.5.704 et 3.5.705).

Paragraphes supplémentaires:

5.701 Selon le mode d'installation

5.701.1 Ensemble fixe

5.701.1.1 Ensemble installé dans le sol ou sur le sol (voir l'Annexe DD)

5.701.1.2 Ensemble à montage mural

5.701.2 Ensemble transportable

5.701.3 Ensemble mobile

5.702 Selon la résistance mécanique de l'ensemble fixe (voir Tableau 702)

5.702.1 Résistance mécanique de base

5.702.2 Résistance mécanique moyenne

5.702.3 Résistance mécanique élevée

6 Informations

L'Article 6 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes.

6.1 Marquage pour l'identification des ensembles

Remplacement:

Le constructeur d'ensembles doit fournir chaque ensemble avec une ou plusieurs étiquettes, marquées d'une manière durable et disposées à un emplacement qui leur permet d'être visibles et lisibles lorsque l'ensemble est installé.

La conformité est vérifiée par l'essai du 10.2.7 de l'IEC 61439-1:2020 et par un examen.

Les renseignements suivants concernant l'ensemble doivent être fournis sur l'étiquette ou les étiquettes:

a) le nom du constructeur d'ensembles ou sa marque de fabrique (voir 3.10.2 de l'IEC 61439-1:2020);

b) la désignation du type ou un numéro d'identification, ou tout autre moyen d'identification, qui permet d'obtenir du constructeur d'ensembles les renseignements appropriés;

c) les moyens d'identification de la date de fabrication;

d) le courant assigné I_{nA} de l'ensemble (voir 3.8.10.7 et 5.3.1 de l'IEC 61439-1:2020);

e) la tension assignée U_n de l'ensemble (voir 3.8.9.1 et 5.2.1 de l'IEC 61439-1:2020);

f) la fréquence assignée f_n de l'ensemble (voir 3.8.12 et 5.5 de l'IEC 61439-1:2020);

g) l'IEC 61439-7;

h) le degré de protection contre les contacts avec des parties actives dangereuses, contre la pénétration de corps étrangers solides et d'eau, code IP (voir 8.2.2 de l'IEC 61439-1:2020);

i) le poids, pour les ensembles transportables et les ensembles mobiles (voir 3.5.702 et 3.5.703), si celui-ci dépasse 30 kg.

6.2.1 Renseignements concernant l'ensemble

Addition:

Les renseignements supplémentaires suivants doivent, le cas échéant, être fournis dans la documentation technique du constructeur d'ensembles, livrée avec l'ensemble:

a) la tension assignée de tenue aux chocs (U_{imp}) (voir 5.2.4 de l'IEC 61439-1:2020);

b) la tension assignée d'isolement (U_i) (voir 5.2.3 de l'IEC 61439-1:2020);

c) le courant assigné de chaque circuit (I_{nc}) (voir 5.3.2 de l'IEC 61439-1:2020);

d) le(s) facteur(s) de diversité assigné(s) (RDF, *Rated Diversity Factor*) (voir 5.4);

e) tous les renseignements nécessaires concernant les autres classifications et caractéristiques déclarées (voir 5.6, 5.701 et 5.702);

f) les dimensions hors tout (y compris les saillies, par exemple les poignées, les panneaux, les portes);

g) l'indication AMHS (voir 3.1.701), ACCS (voir 3.1.702), AMPS (voir 3.1.703), AEVCS (voir 3.1.704) ou des termes équivalents;

h) La position d'installation des ensembles mobiles conformes au 3.5.703 pendant le fonctionnement.

7 Conditions d'emploi

L'Article 7 de l'IEC 61439-1:2020 s'applique.

8 Exigences de construction

L'Article 8 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes.

8.2 Degré de protection et résistance mécanique procurés par l'enveloppe d'un ensemble

8.2.1 Résistance mécanique des ensembles

8.2.1.701 Ensembles pour emplacements à accès limité

La résistance mécanique minimale procurée par les ensembles pour emplacements à accès limité est la résistance de base (5.702.1).

Une résistance moyenne ou une résistance élevée (5.702.2 et 5.702.3) peut aussi être exigée par les règles d'installation nationales.

Pour les essais et les critères de sévérité correspondants, voir Tableau 702.

8.2.1.702 Ensembles pour emplacements à accès non limité

La résistance mécanique minimale procurée par les ensembles installés dans le sol ou sur le sol pour emplacements à accès non limité est la résistance élevée (5.702.3).

La résistance mécanique minimale procurée par les ensembles à montage mural pour emplacements à accès non limité est la résistance élevée (5.702.3).

Dans le cas des ensembles à montage mural pour emplacements à accès non limité destinés à être installés à une hauteur à laquelle le bord inférieur des ensembles se trouve à une distance supérieure ou égale à 0,9 m de la terre ou du sol, la résistance mécanique peut être réduite à la résistance moyenne (5.702.2).

Pour les essais et les critères de sévérité correspondants, voir Tableau 702.

8.2.2 Protection contre les contacts avec des parties actives, contre la pénétration de corps étrangers solides et d'eau (code IP)

Remplacement des 2e, 3e et 4e alinéas:

Après installation conformément aux instructions du constructeur, un ensemble à usage intérieur doit procurer au moins le degré de protection IP41 et un ensemble à usage extérieur doit procurer au moins le degré de protection IP44, conformément à l'IEC 60529:1989, l'IEC 60529:1989/AMD1:1999 et l'IEC 60529:1989/AMD2:2013.

Le degré de protection doit également être procuré lorsque les câbles d'alimentation sont enfichés dans l'ensemble.

Dans le cas de conditions spécifiques et plus strictes, un degré de protection IP supérieur peut être exigé conformément aux exigences d'installation.

8.4 Protection contre les chocs électriques

8.4.3.1 Conditions d'installation

Remplacement d'ensemble du texte de ce paragraphe:

L'ensemble doit comprendre des mesures de protection et être adapté aux installations conçues pour être conformes à l'IEC 60364-4-41:2005/AMD1:2017 et aux normes de câblage applicables.

NOTE 1 L'IEC 60364-7-709:2007 et l'IEC 60364-7-709:2007/AMD1:2012 (AMHS), l'IEC 60364-7-708:2017 (ACCS), l'IEC 60364-7-740:2000 (AMPS) ou l'IEC 60364-7-722:2018 (AEVCS) sont les normes de câblage applicables.

NOTE 2 Pour les AEVCS, se reporter également au 8.5 de l'IEC 61851-1:2017.

8.5 Intégration des appareils de connexion et des composants

8.5.3 Choix des appareils de connexion et des composants

Addition:

Il convient de prendre en compte le besoin d'une protection contre les surtensions (parafoudre) afin d'éviter d'endommager l'installation.

8.5.6 Barrières

Le paragraphe de l'IEC 61439-1:2020 ne s'applique pas.

Paragraphes supplémentaires:

8.701 Supports et dispositifs de fixation de l'ensemble

8.701.1 Dispositifs de manutention

Dans le cas des ensembles mobiles, des poignées (ou tout autre système équivalent) doivent être prévues sur l'ensemble et être fermement fixées à l'enveloppe ou au cadre support.

L'ensemble doit être vérifié conformément au 10.2.5 de l'IEC 61439-1:2020.

8.701.2 Systèmes d'alimentation en eau et autres fluides

L'ensemble placé dans une même enceinte avec de l'eau et d'autres fluides doit être conçu conformément aux exigences du présent document concernant l'installation à l'extérieur.

Le compartiment qui contient le système d'alimentation en fluides doit être séparé de manière à éviter toute pénétration intempestive de fluide.

La conformité est vérifiée par examen.

NOTE Des exigences supplémentaires peuvent s'appliquer lorsqu'il est possible que le système d'alimentation en fluides génère un risque d'explosion. Pour plus d'informations, voir l'IEC 60364-5-52:2009, Chapitre 528.

Les mesures relatives à l'emploi d'autres fluides peuvent faire l'objet d'un accord entre le constructeur et les utilisateurs.

8.701.3 Autres services

Etant donné que d'autres services (télécommunications, Internet, par exemple) peuvent être installés dans la même enveloppe, l'ensemble doit permettre une séparation entre les circuits de puissance et ces autres services.

NOTE Pour plus d'informations, voir l'IEC 60364-5-52:2009, Chapitre 528.

9 Exigences relatives aux performances

L'Article 9 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes.

Paragraphe supplémentaire:

9.701 Tenue des AEVCS au courant d'appel

Dans les AEVCS destinés à être alimentés par du courant alternatif, s'ils n'ont pas déjà été soumis à l'essai concernant cette exigence, l'appareil de connexion doit supporter le courant d'appel d'un véhicule électrique, comme cela est défini à l'Annexe CC.

NOTE 1 L'exigence de courant d'appel d'un véhicule électrique est issue de l'ISO 17409.

NOTE 2 Les exigences applicables aux AEVCS destinés à être alimentés par du courant continu sont décrites dans l'IEC 61851-23.

10 Vérification de la conception

L'Article 10 de l'IEC 61439-1:2020 s'applique avec les exceptions suivantes. Voir également l'Annexe BB.

10.2.6 Vérification de la protection contre les impacts mécaniques (code IK)

Le paragraphe de l'IEC 61439-1:2020 ne s'applique pas.

Paragraphes supplémentaires:

10.2.701 Vérification de la résistance mécanique des ensembles

10.2.701.1 Généralités

Les essais doivent être réalisés à une température ambiante comprise entre +10 °C et +40 °C.

A l'exception de l'essai du 10.2.701.5, un nouvel échantillon d'ensemble peut être utilisé pour chacun des essais indépendants. Si le même échantillon d'ensemble est utilisé pour plusieurs essais du 10.2.701, la conformité pour le deuxième chiffre du degré de protection (code IP) ne doit être vérifiée qu'à l'issue des essais réalisés sur l'échantillon concerné.

Lorsque le socle et les moyens de fixation ne sont pas fournis par le constructeur d'origine de l'ensemble, il doit fournir toutes les instructions utiles à l'installation en toute sécurité de l'ensemble (voir 6.2.2 de l'IEC 61439-1:2020).

Tous les essais doivent être réalisés sur l'ensemble installé et fixé comme en utilisation normale, conformément aux instructions du constructeur d'origine.

A l'exception de l'essai du 10.2.701.4, la ou les portes de l'ensemble, le cas échéant, doivent être verrouillées au début de l'essai et doivent rester verrouillées tout au long de l'essai.

A l'exception de l'essai du 10.2.701.2 et du 10.2.701.4, ces essais ne s'appliquent pas aux ensembles pour fixation en saillie sur un mur (voir 3.3.9 de l'IEC 61439-1:2020) ni aux ensembles à encastrer dans un mur (voir 3.3.10 de l'IEC 61439-1:2020).

Les essais suivants doivent être effectués conformément au Tableau 702.

10.2.701.2 Vérification de la résistance aux impacts mécaniques

L'échantillonnage doit être effectué conformément à l'IEC 62262:2002 et à l'IEC 62262:2002/AMD1:2021.

Les socles définis en 3.5.707 ne doivent être soumis à aucun essai mécanique décrit dans le présent document.

Les coups ne doivent pas être appliqués sur les composants installés à l'intérieur ou sur la surface de l'enveloppe et qui ont déjà été soumis à l'essai conformément à la norme applicable, tels que les socles de prise de courant, les boutons-poussoirs, les afficheurs.

Après l'essai, les échantillons ne doivent présenter aucun dommage qui conduit à la non-conformité au document.

Il convient de ne pas prendre en compte toute détérioration de la finition ni les petites ébréchures ou petits éclats qui n'altèrent pas la protection contre les chocs électriques ou contre la pénétration nuisible d'eau.

Les fissures dans le matériau, non visibles à la vision normale ou corrigée sans grossissement, les fissures superficielles dans les moulages renforcés de fibres et les petites entailles ne sont pas prises en compte.

L'examen effectué à l'issue de l'essai doit vérifier que le code IP spécifié et les propriétés diélectriques ont été conservés et que les panneaux amovibles peuvent toujours être enlevés et réinstallés, que les portes soient ouvertes ou fermées.

10.2.701.3 Vérification de la résistance à la charge statique

Les essais suivants doivent être réalisés sur les ensembles classés en 5.701.1.1 (installés dans le sol et sur le sol) destinés à être utilisés dans des zones à accès non limité et dans des zones à accès limité classées en 5.702.2 (résistance moyenne) ou 5.702.3 (résistance élevée).

Essai 1: une charge uniformément répartie L_1:

– de 4 500 N/m^2 pour l'ensemble à résistance moyenne (voir 5.702.2);
– de 8 500 N/m^2 pour l'ensemble à résistance élevée (voir 5.702.3);

doit être appliquée pendant 5 min sur le toit de l'enveloppe (voir Figure 701). Pour répartir la transmission des forces sur un toit non uniforme, un sac de sable ou un dispositif analogue peut être utilisé.

Essai 2: une force F_1:

– de 600 N pour l'ensemble à résistance moyenne (voir 5.702.2);
– de 1 200 N pour l'ensemble à résistance élevée (voir 5.702.3);

doit être appliquée pendant 5 min tour à tour sur les deux bords les plus longs du toit (voir Figure 701), sauf si la hauteur de l'enveloppe dépasse le niveau du sol de 1,80 m, auquel cas la force doit être appliquée à l'avant et à l'arrière de l'enveloppe située à 1,80 m au-dessus du niveau du sol.

Lorsque la forme du toit n'est pas rectangulaire, les deux coups doivent être appliqués avec un déplacement angulaire le plus proche possible de 180°.

La force doit être transmise sur une zone de dimensions supérieures ou égales à 100 mm × 100 mm et inférieures ou égales à 120 mm × 120 mm.

Il convient d'appliquer la force/charge de manière régulière, sans à-coups, pendant les 30 s. La vérification de l'essai commence dès l'établissement de la force/charge.

La conformité est vérifiée en contrôlant après l'essai que le degré de protection minimal est conforme au 8.2.2, que le fonctionnement de la ou des portes ainsi que les points de verrouillage ne sont pas altérés, et en vérifiant que les distances d'isolement électrique restent satisfaisantes pendant la durée des essais et, dans le cas d'un ensemble à enveloppe métallique, qu'aucun contact ne s'est produit entre les parties actives et l'enveloppe par suite d'une déformation permanente ou temporaire.

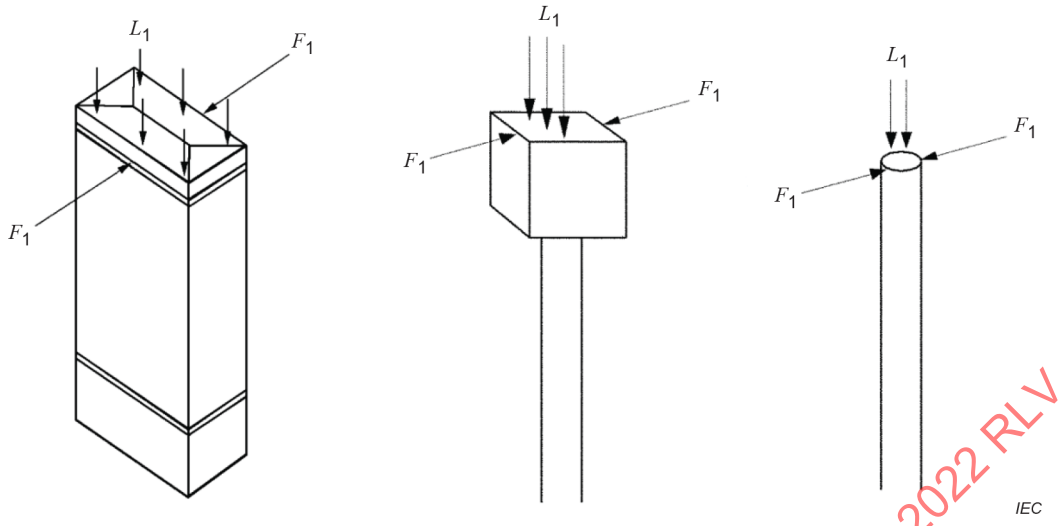

Figure 701 – Schéma de l'essai de vérification de la résistance à la charge statique

10.2.701.4 Vérification de la résistance mécanique des portes

L'essai s'applique à tous les types d'ensembles à porte(s) à charnières sur un bord vertical de l'enveloppe.

Cet essai ne s'applique pas aux portes à l'intérieur de l'enveloppe ni aux couvercles à charnières à l'intérieur de l'enveloppe.

Les essais doivent être réalisés avec la ou les portes totalement ouvertes et en contact avec le dispositif de retenue correspondant (voir Figure 702). Une force de 50 N doit être appliquée au bord supérieur de la porte perpendiculairement au plan de la ou des portes et à une distance maximale de 300 mm du bord à charnières et maintenue pendant 3 s. L'essai ne s'applique pas si la largeur des portes est inférieure à 300 mm.

Sauf si la ou les portes ont été conçues pour être dégondées sans l'aide d'un outil à des fins d'entretien ou de fonctionnement, l'essai doit alors être répété en portant la force F_2 à:

- 250 N pour l'ensemble à résistance moyenne (voir 5.702.2);
- 450 N pour l'ensemble à résistance élevée (voir 5.702.3).

La conformité est vérifiée en contrôlant que la ou les portes ne se sont pas dégondées et que le fonctionnement de la ou des portes, des charnières et des fermetures n'est pas altéré par l'application d'une force de 50 N, et en contrôlant que le degré de protection reste conforme au 8.2.2 après la fermeture de la ou des portes à l'issue des essais. Si la ou les portes se dégondent pendant l'essai F_2, ce dégondage n'est pas considéré comme un échec si la ou les mêmes portes peuvent être remises en place sans l'aide d'un outil.

NOTE Les petites fissures créées par des bulles d'air et visibles avant l'essai, mais qui ne sont pas consécutives à l'application de la charge axiale ne sont pas prises en compte.