IEC 61439-3

Edition 2.0 2024-03
COMMENTED VERSION

INTERNATIONAL STANDARD

colour inside

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

IEC 61439-3:2024-03 CMV(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 3: Distribution boards intended to be operated by ordinary persons (DBO)

FOREWORD

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9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

This commented version (CMV) of the official standard IEC 61439-3:2024 edition 2.0 allows the user to identify the changes made to the previous IEC 61439-3:2012 edition 1.0. Furthermore, comments from IEC TC SC 121B experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 61439-3 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. It is an International Standard.

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

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

a) alignment with the structure of IEC 61439-1:2020;
b) inclusion in the scope of more examples of the type of protection and control devices;
c) deletion of type A and type B DBOs;
d) addition of a new Annex BB related to DBOs used in a prosumer's electrical installation (PEI);
e) addition of a new Annex CC related to rated current of a DBO with additional source of supply in parallel/simultaneously with another source that is connected to the DBO e.g. PV.

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

Draft	Report on voting
121B/193/FDIS	121B/195/RVD

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 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/publications.

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 are only applicable to this document insofar as 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 101 (102, 103, 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 101.

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

The reader's attention is drawn to the fact that Annex DD 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 in the IEC 61439 series, published under the general title *Low-voltage switchgear and controlgear assemblies,* can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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 3: Distribution boards intended to be operated by ordinary persons (DBO)

1 Scope

This part of IEC 61439 defines the specific requirements for distribution boards intended to be operated by ordinary persons (abbreviated DBO throughout this document, see 3.1.101) as follows:

– assemblies intended to be operated by ordinary persons (e.g. switching operations and replacing fuse-links), e.g. in domestic (household) applications;

– assemblies containing outgoing circuits with protective devices intended to be operated by ordinary persons, complying e.g. with IEC 60898-1, the IEC 61008 series, the IEC 61009 series, IEC 62606, IEC 62423 and IEC 60269-3;

– assemblies for applications where the ~~rated~~ nominal **1** voltage to earth does not exceed 300 V AC (see Table G.1 of IEC 61439-1:2020);

NOTE The voltage limits for DC applications are under consideration.

– assemblies with a rated current (I_{nc}) of the outgoing circuits not exceeding 125 A and a rated current (I_{nA}) not exceeding 250 A;

– assemblies intended for use in connection with the generation, transmission, distribution and conversion of electrical energy, and for the control of equipment consuming electrical energy and for associated data processing; **2**

– enclosed, stationary assemblies;

– assemblies for indoor or outdoor use.

~~DBOs may also include control and/or signaling devices associated with the distribution of electrical energy.~~

~~DBOs may be assembled outside the factory of the original manufacturer.~~ **3**

DBOs can contain protection devices, control devices, signalling devices alone or a combination of devices e.g. circuit-breakers, load shedding relay, energy management, communication devices, lighting control. **4**

This document does not apply to an empty enclosure nor to individual devices and self-contained components, such as circuit-breakers, fuse-switches, electronic equipment~~, etc~~. which comply with the relevant product standards, it describes the integration of devices, or self-contained components, or both, into a DBO or into an empty enclosure forming a DBO.

This document applies to DBOs designed, manufactured, and verified on a one-off basis or fully standardized and manufactured in quantity.

This document does not apply to the specific types of assemblies covered by other parts of the IEC 61439 series.

NOTE Enclosures for electrical accessories for household and similar fixed electrical installations are covered 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 in addition to the following.

Addition:

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

IEC 60269-3, *Low-voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications) – Examples of standardized systems of fuses A to F*

IEC 60364-8-82, *Low-voltage electrical installations – Part 8-82: Functional aspects – Prosumer's low-voltage electrical installations*

IEC 60898-1~~:2010~~, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation*

IEC 60669-2-4, *Switches for household and similar fixed electrical installations – Part 2-4: Particular requirements – Isolating switches*

IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 61008 (all parts), *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)*

IEC 61009 (all parts), *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs)*

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

IEC 62423:2009, *Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses*

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

IEC 62606, *General requirements for arc fault detection devices*

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 terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/

- ISO Online browsing platform: available at https://www.iso.org/obp

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

3.1 General terms

Additional terms and definitions:

3.1.101
distribution board intended to be operated by ordinary persons
DBO
~~ASSEMBLY used to distribute electrical energy in domestic (household) applications and other places where operation is intended by ordinary persons~~

assembly used to distribute and control electrical energy for all types of electrical supplies and loads, intended for operation by ordinary persons **5**

Note 1 to entry: For operation by ordinary persons, see 8.4.6.1 of IEC 61439-1:2020.

Note 2 to entry: Switching operations and replacing fuse-links are examples of operations intended to be carried out by ordinary persons.

Note 3 to entry: Definition 3.1.101 does not preclude the DBO from being operated by skilled or instructed persons, and also being used in non-domestic installations. **6**

Note 4 to entry: DBOs can be assembled outside the factory of the original manufacturer. DBOs can be assembled by the original manufacturer or by an assembly manufacturer.

~~**3.1.102**~~ **7**
~~**type A DBO**~~
~~DBO designed to accept single pole devices~~

~~Note 1 to entry: In the UK, a type A DBO used principally for domestic (household) installations and having a maximum incoming unit rating of 100 A and a maximum outgoing circuit rating of 63 A, is known as a "consumer unit" or "customer distribution board".~~

~~**3.1.103**~~
~~**type B DBO**~~
~~DBO designed to accept multi-pole and/or single pole devices~~

4 Symbols and abbreviations

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

5 Interface characteristics

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

5.1 General

Addition:

This objective can be achieved through one of two typical processes; the user will either select a catalogue product, the characteristics of which meet the required user needs, or make a specific agreement with the manufacturer.

In both cases, the specification schedule according to Annex AA is intended to help the user to provide all data necessary to specify, and to help the manufacturer to provide the actual DBO characteristics. In some cases information declared by the DBO manufacturer may take the place of an agreement.

5.2.4 Rated impulse withstand voltage (U_{imp}) (of the assembly)

Replacement:

The rated impulse withstand voltage of the assembly shall be equal to or higher than the values stated for the transient overvoltages occurring in the electrical system(s) to which the circuit is designed to be connected.

DBOs shall comply with a minimum overvoltage category III (see IEC 60364-4-44) according to Table G.1 of IEC 61439-1:2020.

5.3.1 Rated current of an assembly (I_{nA})

Addition:

See Annex CC for examples of when a generator, for example a photovoltaic system, wind turbine, battery is used as additional source(s) of supply in parallel with another source that is connected to the DBO. **8**

5.4 Rated diversity factor (RDF)

Addition:

In the absence of an agreement between the DBO manufacturer and user concerning the actual load currents, the type of load, the assumed loading of the outgoing circuits of the DBO or group of outgoing circuits ~~may~~ can be based on the values in Table 101.

The assumed load current is the rated current of the protective device I_n, as required by the user, multiplied with the assumed loading factor of Table 101. **9**

NOTE 101 The rated current I_n of a protective device is defined in their product standard.

~~**5.6 Other characteristics**~~

~~*Addition:*~~

~~q) type A or type B DBO (see 3.1.102 and 3.1.103).~~

6 Information

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

6.1 Assembly designation marking

Addition to the first paragraph:

The test of 10.2.7.1 only applies to DBOs intended for outdoor installation.

~~NOTE In Germany and Sweden, 10.2.7 applies to DBOs intended for indoor installation.~~ **10**

Addition of the following new item:

~~e) rated current of the DBO using the symbol I_{nA} e.g. I_{nA} 250 A;~~ **11**

~~f~~h) degree of protection if greater than IP2XC.

6.2.2 Instructions for handling, installation, operation and maintenance

Addition to the first paragraph:

The original or assembly manufacturer shall provide in their documentation, any routine verification required to be carried out by the installer for the DBO to conform to IEC 61439-3. 12

6.3 Device and/or component identification

Addition:

For RCDs supplying more than one final circuit, it shall be possible for ordinary persons to identify which outgoing circuits the RCD supplies, for example when the RCD is adjacent to the outgoing group of circuits it supplies or by providing labels for the installer to apply to the DBO after installation. The identification means shall be visible without accessing live parts. 13

7 Service conditions

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

7.1.~~3~~2 Pollution degree

Addition:

A minimum pollution degree 2 applies.

7.2 Special service conditions

Addition:

NOTE 101 The effects upon a DBO design and related ratings, instructions, etc. when used in a prosumer's electrical installation (PEI) can take account of the relevant requirements in IEC 60364-8-82. See Annex BB. 14

8 Constructional requirements

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

8.1.3.2.2 Resistance of insulating materials to normal heat

Addition:

NOTE 101 This Subclause 8.1.3.2.2 also applies to covers and enclosures made of insulating materials. 15

8.2.1 Protection against mechanical impact (IK code)

Replacement:

The DBO shall comply with the following IK codes according to IEC 62262:

– IK05 for a DBO for indoor use;
– IK07 for a DBO for outdoor use.

Compliance shall be verified according to 10.2.6.

~~NOTE In the USA, no IK code is required as the requirements applicable to a "type" designation (see Note 1 in 8.2.2 of IEC 61439-1:2011) cover this consideration.~~

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

Replacement of the second paragraph:

The degree of protection of a DBO ~~for indoor installation~~ shall be at least IP2XC after installation in accordance with the DBO manufacturer's instructions. **16**

IP2XC shall be maintained when operating devices e.g. switching and operating test buttons in normal use. The degree of protection can be temporarily reduced when permitted in a product standard for use by ordinary or unskilled persons e.g. IEC 60269-3 for replacing a fuse-link.

NOTE 101 A DBO can have more than one IP rating e.g. door open IP2XC and door closed IP3X or drain holes IPXXD. **17**

Paragraphs 5 and 6 and the associated examples in IEC 61439-1 do not apply to this document.

8.4.2.3 Barriers or enclosures

Replacement of the first paragraph:

Bare live parts shall be inside enclosures or behind barriers. The enclosures or barriers shall provide a degree of protection of at least IPXXC. **18**

~~**8.4.6.2.5 Obstacles**~~

~~This subclause of Part 1 does not apply.~~ **19**

8.5.3 Selection of switching devices and components

Addition:

When a switch-disconnector, circuit-breaker without overcurrent protection or an isolating switch is incorporated in the DBO, it shall conform to IEC 60947-3, IEC 60947-2 or IEC 60669-2-4 as appropriate to the DBO ratings. **20**

Outgoing circuits shall contain protective devices, intended to be operated by ordinary persons, for example conforming to IEC 60898-1, the IEC 61008 series, the IEC 61009 series, IEC 62423, IEC 62606 and IEC 60269-3.

~~Re-closing of the incoming protective device when incorporated within the DBO not complying with the above standards, shall require a key or tool. Alternatively a label stating re-closing of a tripped device shall only be carried out by an instructed or skilled person shall be located in the vicinity of the incoming protective device.~~

An incoming protective device incorporated within the DBO not conforming to a product standard intended to be operated by ordinary persons, shall require a key or tool for re-closing after tripping and for the replacement of a fuse-link. Alternatively, a label shall be located in the vicinity of the incoming protective device stating that re-closing of the tripped device and the replacement of a fuse-link shall only be carried out by an instructed or skilled person. **21**

Circuit-breakers shall be designed or installed in a way that it shall not be possible to modify their settings or calibration without a deliberate act involving the use of a key or tool~~, and resulting in a visible indication of their setting or calibration~~.

~~When an incoming protective device incorporated within the DBO contains fuses having fuse-links not complying with IEC 60269-3, a key or tool shall be required for access to replace the fuse-links.~~

~~NOTE In Norway, protective devices in outgoing circuits used for wiring protection in building shall comply with IEC 60898-1, IEC 61008, IEC 61009, IEC 60269-3 or IEC 60947-2 as long as the requirements in IEC 60898-1 or IEC 61009 are met for all tests except the test for time-current characteristic B, C and D as specified in IEC 60898-1:2001, 9.10.1 or IEC 61009-1:2010, clause 9.9.2.1.~~

NOTE 101 These requirements reflect that protective device product standards for ordinary people are limited to a maximum rated current of 125 A. Household premises can require electrical supplies greater than 125 A and the use of DBOs therefore, these particular installations are within the scope of IEC 61439-3. **22**

8.6.1 Main circuits

Replacement of the second paragraph:

Each of the conductors between the incoming unit and outgoing unit as well as the components included in these units ~~may~~ can be rated on the basis of the reduced short-circuit stresses occurring on the load side of the respective outgoing short-circuit protective device, provided that these conductors are arranged so that ~~under normal operation~~ an internal short-circuit between ~~phases~~ live parts and ~~/or~~ between ~~phases~~ live parts and earth is not to be expected as required by 8.6.4 and Table 4 of IEC 61439-1:2020.

~~*Addition:*~~

~~NOTE UK Electricity, Safety and Quality Regulations S.I. 2002 No. 2965 require electricity suppliers to state the maximum prospective short circuit current at the supply terminals. In the UK the maximum prospective short circuit current at the supply terminals of household and similar electrical installations declared by the supply authority in accordance with the Electricity Association Publication P 25 is 16 kA for single phase supplies up to and including 100 A.~~

8.8 Terminals for external ~~conductors~~ cables

Addition:

When a device or component in an outgoing circuit does not incorporate a neutral terminal, the number of neutral terminals of a DBO shall be not less than one outgoing terminal for each outgoing circuit requiring a neutral terminal. These terminals shall be located or identified in the same sequence as their respective ~~phase~~ line conductor terminals. **23**

The maximum number of neutral conductors that are permitted to be connected to each device or component neutral terminal, shall be as stated in the manufacturer's instructions.

DBOs shall have a minimum of two terminals for electrical installation protective bonding conductors.

~~NOTE In the USA, the neutral conductor is identified by the colour white and the protective earth conductor may be either green/yellow or solid green.~~

9 Performance requirements

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

9.1.1 General

Addition:

NOTE IEC 60664-1:2020 contains the requirements for supplementary and reinforced insulation (Class II). **24**

10 Design verification

Clause 10 of IEC 61439-1:2020 is applicable except as follows.

10.2.2.2 Severity test A

Addition:

The following is an alternative test.

All grease is removed from the parts or representative samples of the steel enclosures of the DBO to be tested, by immersion in a cold chemical degreaser such as methyl chloroform or refined petrol for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water at a temperature of (20 ± 5) °C.

Without drying but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of (20 ± 5) °C.

After the parts have dried for 10 min in a heating cabinet at a temperature of (100 ± 5) °C and have been left at room temperature for 24 h, their surfaces shall show no signs of iron oxidization.

Traces of iron oxide on sharp edges and any yellowish film removable by rubbing are ignored.

For small helical springs and the like, and for inaccessible parts exposed to abrasion, a layer of grease ~~may~~ can provide sufficient protection against iron oxidization. Such parts are subjected to the test only if there is doubt about the effectiveness of the grease film, and the test is then made without previous removal of the grease.

10.2.2.4 Results to be obtained

The first paragraph of 10.2.2.4 of IEC 61439-1:2020 does not apply to the alternative test of this document.

~~**10.2.3.2 Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects**~~

~~The last paragraph of Part 1 does not apply.~~

10.2.3.2.1 Verification by test 25

Addition:

NOTE 101 850 °C does not apply to accessible parts of the enclosure after mounting in hollow walls e.g. covers, doors.

10.2.6 Verification of protection against mechanical impact (IK code)

Replacement:

Verification of the degree of protection against mechanical impacts shall be carried out in accordance with IEC 62262.

The test shall be carried out by means of a hammer test apparatus as described in IEC 60068-2-75, for example an impact spring hammer at an ambient air temperature between 10 °C and 40 °C immediately after the DBO has been kept for 2 h at a temperature of −5 °C ± 1 K for indoor use and −25 °C ± 1 K for outdoor use. ~~The test is made after the sample(s) has been for 2 h at a temperature of −5 °C ± 1 K for indoor use and -25 °C ± 1 K for outdoor use.~~ A test at −25 °C for outdoor use also validates the −5 °C for indoor use, so only one test at −25 °C is required.

Compliance is checked on those exposed parts of the DBO which ~~may~~ can be subjected to mechanical impact when mounted as in normal use.

The sample with a cover, or the enclosure, if any, shall be fixed as in normal use or placed against a rigid support.

Three blows shall be applied on separate places of each of the accessible faces and door (if provided). The impacts shall be evenly distributed on the faces of the enclosure(s) under test. In no case shall the impacts be applied in the surrounding area of the same point of the enclosure. A new sample for each accessible face is used, unless the previous test has not influenced the results of the subsequent test(s), then the sample may be reused. The blows shall not be applied to knock-outs, built-in components complying with other standards, or other fastening means which are recessed below the surface so as not to be subjected to an actual impact.

Cable entries which are not provided with knock-outs shall be left open. If they are provided with knock-outs, two of them shall be opened.

Before applying the blows, fixing screws of bases, covers and the like shall be tightened with a torque equal to that specified in Table 102.

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

After the test, a visual inspection shall verify that:

– the degree of protection (IP code) of the enclosure is not impaired, where doubt exists the appropriate IP test according to 10.3 should be carried out;

– dielectric properties have been maintained, where doubt exists the appropriate dielectric tests according to 10.9 of IEC 61439-1:2020 as modified in this document, should be carried out; **26**

– removable covers can be removed and reinstalled;

– doors can be opened and closed. **27**

10.2.7 Marking

10.2.7.1 Verification by test

Addition of a new first paragraph:

This test only applies to DBOs intended for outdoor installation.

10.2.8 Mechanical operation

10.2.8.1 Verification by test

Replacement of the first and second sentences of the second paragraph:

For parts, required to be verified by test e.g. mobile parts such as doors (see 8.1.5 of IEC 61439-1:2020), satisfactory mechanical operation shall be verified after installation in the DBO. The number of operating cycles shall be 50. **28**

10.3 Degree of protection of assemblies (IP Code)

Replacement of the second paragraph and dashed items:

Degree of protection (IP code) tests shall be carried out:

- for the test of protection against contact with live parts, all covers and doors which are required to be opened or removed without the use of a key or tool shall be opened or removed;
- for the test of protection against contact with live parts, all covers and doors which are required to be opened or removed to provide access for operating devices by ordinary

persons, for example resetting circuit-breakers, RCDs or pressing an RCD test button, shall be opened or removed; **29**

- with all covers and doors in place and closed as in normal service, irrespective of whether they can be opened or removed, with or without the use of a key or tool;
- tests shall be carried out in a de-energized state (main and auxiliary circuits).

Where the assembly is made up of multiple sections or is described as extendable, joined sections shall be included.

10.10.2.2.3 Functional units

Replacement of the second and third paragraphs of 10.10.2.2.3 b):

Where outgoing devices for the DBO have a range of rated currents, a single I_{nc} test can be used to establish the I_{nc} ratings for the complete range without further testing where: **30**

1) the ranges covered are from the same manufacturer's series;
2) the ranges covered all have the same physical dimensions;
3) the ranges covered have the same electrical connection arrangements line and load;
4) using the data given by the device manufacturer, the device with the highest total power loss within the product range is used for the test;
5) the device is placed in the most onerous position with respect to mutual heating, and insulating effects.

10.10.2.3.1 General

Addition after the ~~third~~ fourth paragraph:

In the absence of manufacturer's instructions, the tightening torque applied to terminals shall be in accordance with those specified for the temperature rise test in the relevant device product standard.

10.10.2.3.2 Test conductors

Modification:

Bullet points b), c) and d) do not apply to this document. **31**

10.10.2.3.6 Verification considering individual functional units separately and the complete assembly

Addition to ~~fourth~~ the second paragraph:

~~One method to determine the most onerous group, is for the rated current of the DBO (I_{nA}), to be distributed amongst the smallest possible number of outgoing circuits, so that each of these circuits is loaded with its rated current multiplied by the assumed loading factor shown in Table 101 of this standard or a diversity factor stated by the manufacturer. For an example considering a complete DBO, see Figure 101.~~

A method to determine the most onerous group for continuously loaded and adjacent circuits to be tested, so that the highest possible temperature-rise is obtained, is for the rated current of the DBO (I_{nA}), to be distributed amongst the smallest possible number of adjacent, continually and simultaneously loaded outgoing circuits, so that each of these circuits is loaded with: **32**

(i) I_{ng} or I_{nc} × RDF; I_{ng} and RDF being estimated values by the manufacturer so as to estimate the test currents. If verified by the test, this produces a rated value I_{ng} and provides the possibility to calculate the RDF; or

(ii) I_{nc} × the assumed loading factor in Table 101. This method uses the assumed loading factor as a means to estimate the RDF to use for the test. If verified by the test, this produces a rated value I_{ng}.

In both (i) and (ii), the actual RDF per circuit is calculated by dividing I_{ng} by I_{nc} from their verified tested values.

10.10.2.3.7 Verification considering ~~individual~~ functional units and the main and distribution busbars separately as well as the complete assembly

Addition to item c):

Where the device tested achieves an I_{nc} equal to its rated current I_n, all other devices in the same constructional range have an I_{nc} equal to their I_n. **33**

Where the device tested achieves an I_{nc} lower than its rated current I_n, the same reduction is applied to all other devices in the constructional range. For example, a device with an I_n of 63 A achieves an I_{nc} of 55 A: 55 / 63 = 0,874. The I_{nc} of the other devices in the same constructional range is I_n × 0,874. **34**

Addition to item d):

~~One method to determine the most onerous group, is for the rated current of the DBO (I_{nA}), to be distributed amongst the smallest possible number of outgoing circuits, so that each of these circuits is loaded with its rated current multiplied by the rated diversity factor shown in Table 101 of this standard or a diversity factor stated by the manufacturer.~~

A method to determine the most onerous group for continuously loaded and adjacent circuits to be tested, so that the highest possible temperature-rise is obtained, is for the rated current of the DBO (I_{nA}), to be distributed amongst the smallest possible number of adjacent, continually and simultaneously loaded outgoing circuits, so that each of these circuits is loaded with: **35**

(i) I_{ng} or I_{nc} × RDF; I_{ng} and RDF being estimated values by the manufacturer so as to estimate the test currents. If verified by the test, this produces a rated value I_{ng} and provides the possibility to calculate the RDF; or

(ii) I_{nc} × the assumed loading factor in Table 101. This method uses the assumed loading factor as a means to estimate the RDF to use for the test. If verified by the test, this produces a rated value I_{ng}.

In both (i) and (ii), the actual RDF per circuit is calculated by dividing I_{ng} by I_{nc} from their verified tested values.

10.10.3.2 Assemblies

Addition:

DBOs with synthetic enclosures are considered representative of DBOs with metallic enclosures, if the highest ~~air~~ temperature rise on the inside surfaces of the synthetic enclosure does not exceed the maximum surface temperature rise for the accessible external metal surfaces according to Table 6 of IEC 61439-1:2020. When it has been verified that the highest surface of the enclosure is the hottest location, the internal air thermocouple located at the top of the enclosure can be used to establish the highest temperature rise on the inside surfaces.

10.10.4.2.3 Results to be obtained

Addition:

NOTE Guidance is in the form of a publication of the maximum rated current at a specified ambient air temperature in the immediate vicinity of the device.

EXAMPLE

~~a) I_{th} = 200 A at 40 °C local ambient air temperature, therefore 0,8 × 200 A = 160 A.~~

~~b) The calculated air temperature within the enclosure is 60 °C. The manufacturer's information limits the device I_{th} to 150 A at 60 °C local ambient air temperature.~~

~~Conclusion: the lower value from a) and b) is the continuous permissible load, in this case 150 A at the calculated local air temperature.~~

a) As a starting point, data identifies that the I_{th} = 125 A at 50 °C free air ambient temperature of the device therefore, it is derated by 0,8 × 125 A = 100 A. 100 A is used in the calculation to avoid hot spots and the limiting ambient temperature is 50 °C. If the enclosure is capable of dissipating power losses equal to or greater than those generated based on 100 A and the calculated internal air temperature does not exceed 50 °C, it is verified that the continuous permissible load is 100 A.

b) However, if for the same 125 A device derated to 100 A, the calculated air temperature within the enclosure is 60 °C thus exceeding the 50 °C limit, and the 125 A device manufacturer's information limits the device I_{th} to 80 A at 60 °C free air ambient temperature, to avoid hot spots, a safety margin is applied i.e. 0,8 × 80 A = 64 A, it is verified that the continuous permissible load is 64 A. No further calculation would be required, as 64 A accounts for both the 0,8 factor and ambient temperature limits.

If a continuous permissible load of 100 A is required, then: an enclosure with higher dissipating power losses, or a device with lower power losses, or a device with a higher rated current for ambient temperature can be used, or a combination to achieve conformity. **36**

10.10.4.3.2 Results to be obtained

Addition:

NOTE Guidance is in the form of a publication of the maximum rated current at a specified ambient air temperature in the immediate vicinity of the device.

EXAMPLE **37**

~~a) I_{th} = 200 A at 40 °C local ambient air temperature, therefore 0,8 × 200 A = 160 A.~~

~~b) The calculated air temperature within the enclosure is 60 °C. The manufacturer's information limits the device I_{th} to 150 A at 60 °C local ambient air temperature.~~

~~Conclusion: the lower value from a) and b) is the continuous permissible load, in this case 150 A at the calculated local air temperature.~~

a) As a starting point, data identifies that the I_{th} = 125 A at 50 °C free air ambient temperature of the device therefore, it is derated by 0,8 × 125 A = 100 A. 100 A is used in the calculation to avoid hot spots and the limiting ambient temperature is 50 °C. If the enclosure is capable of dissipating power losses equal to or greater than those generated based on 100 A and the calculated internal air temperature does not exceed 50 °C, it is verified that the continuous permissible load is 100 A.

b) However, if for the same 125 A device derated to 100 A, the calculated air temperature within the enclosure is 60 °C thus exceeding the 50 °C limit, and the 125 A device manufacturer's information limits the device I_{th} to 80 A at 60 °C free air ambient temperature, to avoid hot spots, a safety margin is applied i.e. 0,8 × 80 A = 64 A, it is verified that the continuous permissible load is 64 A. No further calculation would be required, as 64 A accounts for both the 0,8 factor and ambient temperature limits.

If a continuous permissible load of 100 A is required, then: an enclosure with higher dissipating power losses, or a device with lower power losses, or a device with a higher rated current for ambient temperature can be used, or a combination to achieve conformity.

10.11.5.3.3 Incoming circuit and main busbars

Addition:

A rated conditional short-circuit current can be assigned where the distance of the main and distribution busbar between the load terminals of the incoming device connected to the main busbar and the supply terminals of the outgoing functional unit does not exceed 3 m. The main busbar, distribution busbar and incoming device may be tested and rated on the basis of the reduced short-circuit stresses occurring on the load side of the respective short-circuit protective device within each unit, provided that these conductors are arranged so that an internal short-circuit between ~~phases and/~~live parts or between ~~phases~~ live parts and earth is not to be expected (see 8.6.4 of IEC 61439-1:2020).

NOTE Examples of conductor types and installation requirements are given in Table 4 of IEC 61439-1:2020.

~~**10.13 Mechanical operation**~~

~~*Replacement of second paragraph:*~~

~~For parts, which need verification by test, satisfactory mechanical operation shall be verified after installation in the DBO. The number of operating cycles shall be 50.~~

11 Routine verification

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

11.9 Dielectric properties

Addition after the first paragraph:

A dielectric test is not required on a DBO containing busbars ~~and/~~or prefabricated main circuit wiring only, ~~nor on simple constructions~~ where inspection of the conductors and cables, including proper laying is sufficient to validate clearances. **38**

Table 6 – Temperature-rise limits (9.2)

Replacement of footnote c:

[c] When specified in the device manufacturer's instructions, manual operating means for miniature circuit-breakers, residual current operated circuit-breakers with integral overcurrent protection, residual current operated circuit-breakers without integral overcurrent protection, arc-fault detection devices etc. within the DBO, which are only accessible after a cover or door is opened, are permitted to sustain a 25 K increase on these temperature-rise limits. **39**

Additional tables and figure:

Table 101 – Values of assumed loading 40

Number of outgoing circuits for general purpose and other specific 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
Circuits such as for EV charging equipment or PV, unless load control load reduction is included in the associated equipment or installed in the DBO or a combination of both.	1

Table 102 – Tightening torque values for the verification of mechanical strength

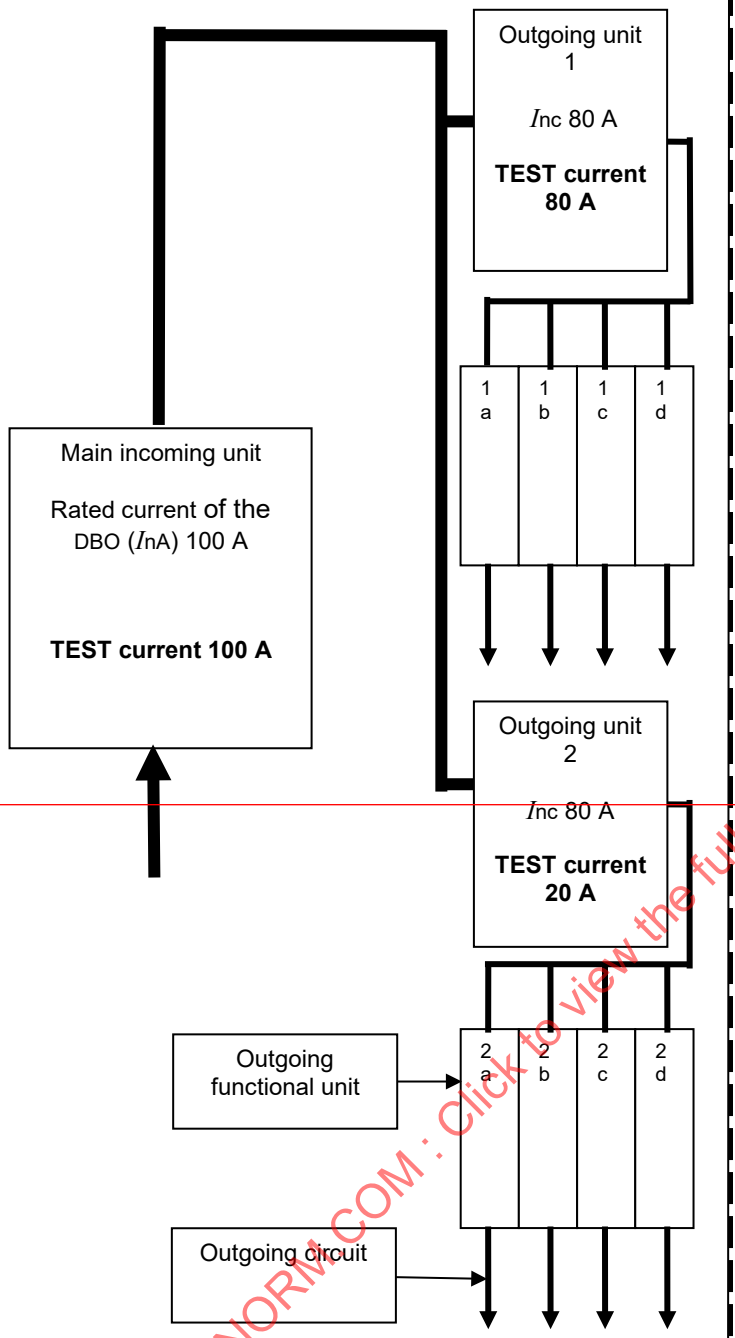
Diameter of thread		Tightening torque		
mm		Nm [a]		
Metric standard values	Range of diameters "d"	I [b]	II [c]	III [d]
mm	mm			
2,5	$d \leq 2,8$	0,13	0,26	0,26
3,0	$2,8 < d \leq 3,0$	0,16	0,33	0,33
–	$3,0 < d \leq 3,2$	0,20	0,40	0,40
3,5	$3,2 < d \leq 3,6$	0,26	0,53	0,53
4	$3,6 < d \leq 4,1$	0,47	0,80	0,80
4,5	$4,1 < d \leq 4,7$	0,53	1,20	1,20
5	$4,7 < d \leq 5,3$	0,53	1,33	1,33
6	$5,3 < d \leq 6,0$	0,80	1,66	2,00
8	$6 < d \leq 8$	1,66	2,33	4,00
10	$8 < d \leq 10$	–	2,66	6,66
12	$10 < d \leq 12$	–	–	9,33
14	$12 < d \leq 15$	–	–	12,6
16	$15 < d \leq 20$	–	–	16,6
20	$20 < d \leq 24$	–	–	24
24	$24 < d$	–	–	33

[a] For screws and fasteners made of plastic, the tightening torque applied shall be the value specified in the manufacturer's instructions. 90° locking mechanisms not containing a thread are not subjected to the tightening torques ~~prescribed~~ specified in this table, they are operated so as to engage in normal use.

[b] Column I applies to screws without heads which, when tightened, do not protrude from the hole and to other screws which cannot be tightened by means of a screwdriver with a blade wider than the root diameter of the screw.

[c] Column II applies to nuts and screws, which are tightened by means of a screwdriver.

[d] Column III applies to nuts and screws, which can be tightened by means other than a screwdriver.



Rated current of the DBO: I_{nA} 100 A

Outgoing unit 1 I_{nc} 80 A

Outgoing unit 2 I_{nc} 80 A

Outgoing functional units I_{nc} 63 A maximum

Total outgoing circuits in DBO = 8

From Table 101 assumed loading factor for 8 outgoing circuits = 0,6

Test currents:

Main incoming unit = 100 A

Outgoing unit 1 = test current 80 A

Test current 1a = 63 A × 0,6 = 37,8 A

Test current 1b = 63 A × 0,6 = 37,8 A

Test current 1c = 6 A = 4,4 A

Total 80 A

Circuit 1c is the balance current to load the outgoing unit 1 to its rated circuit current (I_{nc}), so as to achieve the highest temperature rise.

Outgoing unit 2 = test current 20 A, which is the balance to obtain incoming circuit I_{nA} so as to achieve the highest temperature rise. Therefore outgoing circuit 2a = 32 A × 0,6 = 19,2 A

and 2b = 2 A loaded to 0,8 A (balance)

NOTE 1

This is one example where the DBO is loaded to its rated

IEC 177/02

Figure 101 – Example of temperature rise verification by test of a complete DBO as in 10.10.2.3.6

Annexes

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

Annex C and Annex D of IEC 61439-1:2020 are not applicable.

Addition of Annex AA, Annex BB and Annex CC:

Annex AA
(informative)

Items subject to agreement between the ~~assembly~~ DBO manufacturer and the user

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

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

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in ~~standard~~ IEC 61439-3[b]	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 of the power supply (V)	3.8.9.1, 5.2.1, 8.5.3	Local, according to installation conditions	~~Rated~~ Nominal voltage to earth ≤ 300 V AC	
Transient overvoltages	5.2.4, 8.5.3, 9.1, Annex G	Determined by the electrical system	Overvoltage category III	
Temporary overvoltages	9.1	Nominal system voltage + 1 200 V	None	
Rated frequency f_n (Hz)	3.8.~~11~~12, 5.~~4~~5, 8.5.3, 10.10.~~2.~~3.1, 10.11.5.4	According to local installation conditions	50 Hz / 60 Hz	
Additional onsite 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 conductor	10.11.5.3.5	Min. 60 % of phase values	None	
Prospective short-circuit current in the protective circuit	10.11.5.6	Min. 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 61439-1:2020	Default arrangement[a]	Options listed in ~~standard~~ IEC 61439-3[b]	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 / ~~Total~~Double or reinforced insulation	
Installation environment				
Location type	3.5, 8.1.4, 8.2	Manufacturer's standard, according to application	Indoors / Outdoors	
Protection against live parts, ingress of solid foreign bodies and water	8.2.2, 8.2.3	Indoors (enclosed): IP2XC Outdoors (min.): IP23	~~2XC, 3X, 4X, 5X, 6X~~ After removal of removable parts: As for connected position / Reduced protection to manufacturer's standard	
External mechanical impact (IK code)	8.2.1, 10.2.6	Indoors IK05 Outdoors IK07	None	
Resistance to UV radiation (applies for outdoor assemblies only unless specified otherwise)	10.2.4	Indoors: Not applicable Outdoors: Temperate climate	None	
Resistance to corrosion	10.2.2	Normal Indoor/Outdoor arrangements	None	
Ambient air temperature – Lower limit	7.1.1	Indoors: –5 °C Outdoors: –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	

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in ~~standard~~ IEC 61439-3[b]	User requirement[c]
Maximum relative humidity	7.1.~~2~~1	Indoors: ~~50 % at 40 °C~~ 95 % at −5°C to +30 °C 70 % at +35 °C 57 % at +40 °C Outdoors: ~~100 % at 25 °C~~ 100 % at −25 °C to +27 °C 60 % at 35 °C 46 % at 40 °C	None	
Pollution degree (of the installation environment)	7.1.~~3~~2	2	3, 4	
Altitude	7.1.~~4~~1	≤ 2 000 m	None	
EMC environment (A or B)	9.4, 10.12, Annex J	~~A/~~B	A~~/~~ or 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				
Type	3.3, 5.6	Manufacturer's standard	Various e.g. floor-standing / wall-mounted	
Stationary/Movable	3.5	Stationary	None	
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~~ line conductor, cross-sections, and terminations	8.8	As defined within the standard	None	
~~External PE, N, PEN conductors cross sections, and terminations~~ External protective, neutral, mid-point, PEL, PEM, PEN conductor cross-sections and terminations	8.8	As defined within the standard	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	

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in ~~standard~~ IEC 61439-3[b]	User requirement[c]
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~~, 8.5.3~~	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 energized	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	
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) **41**	3.8.~~9~~10.1, 5.3, 8.4.3.2.3, 8.5.3, 8.8, 10.10.2, 10.10.3, 10.11.5, Annex E	$I_{nA} \leq 250$ A	None	
~~Rated current of circuits I_{nc} (amperes)~~	~~5.3.2~~	~~≤ 125 A~~		

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in ~~standard~~ IEC 61439-3[b]	User requirement[c]
~~Rated diversity factor~~	~~5.4, 10.10.2.3, Annex E~~	~~As defined within the standard~~	~~RDF for groups of circuits / RDF for whole ASSEMBLY~~	~~Rated diversity factor~~
Design current I_B and nature / type of load e.g. EV, PV or alternatively, I_n of the devices and nature of the load (in such cases, the assumed loading factors as given in Table 101 can be used.) **42**	3.8.10.8	$I_{nc} \leq 125$ A Assumed loading factor as given in Table 101	None	
Ratio of cross-section of the neutral conductor to ~~phase~~ line conductors: ~~phase~~ line conductors up to and including 16 mm^2	8.6.1	100 %	None	
Ratio of cross-section of the neutral conductor to ~~phase~~ line conductors: phase conductors above 16 mm^2	8.6.1	50 % (min. 16 mm^2)	None	

a In some cases the information declared by the ~~ASSEMBLY~~ DBO manufacturer may take the place of an agreement.

b 'None' in this column means that there are no options in IEC 61439-3 other than the default condition or value.

c For exceptionally onerous applications, the user may need to specify more stringent requirements to those in this document.

Annex BB
(informative)

Effects upon a DBO design and related ratings, instructions, etc. when used in a prosumer's electrical installation (PEI) 43

The effects upon a DBO design and related ratings, instructions, etc. when used in a prosumer's electrical installation (PEI) shall take account of the relevant requirements in IEC 60364-8-82, for example the installation with a local generator, photovoltaic systems, wind turbines, batteries, and potentially with energy management (e.g. load shedding equipment, monitoring device).

A non-exhaustive list of some aspects that should be considered are:

– the maximum short-circuit level (typically PEI in parallel with distribution system);

– the minimum short-circuit level (typically island mode) to achieve related disconnection times including thermal constraints for cables, busbars and shock protection. This is because the I^2t can be higher at lower fault levels; see IEC TR 61912-1. The DBO should have suitable short-circuit protection and ratings based on the information provided by the user;

– circuits potentially supplied by both sides and reverse connected; protection devices should be able to function with respect to whatever the direction of the current flow. Protection devices with line and load terminals such as a polarized circuit-breaker should not be reverse connected;

– transient overvoltages in a PEI which can be more frequent than in a usual installation (e.g. due to the switching between sources, load shedding, load shifting) and therefore requiring the use of SPDs to be evaluated.

Annex CC
(informative)

Rated current of an assembly (I_{nA}) 44

When a generator, for example a photovoltaic system, wind turbine, battery is used as an additional source of supply in parallel and simultaneously with another source that is connected to the DBO, the DBO should be selected such that:

$$I_{nA} \geq I_n + I_{gen(s)},$$

where

I_{nA} is the rated current of the assembly;

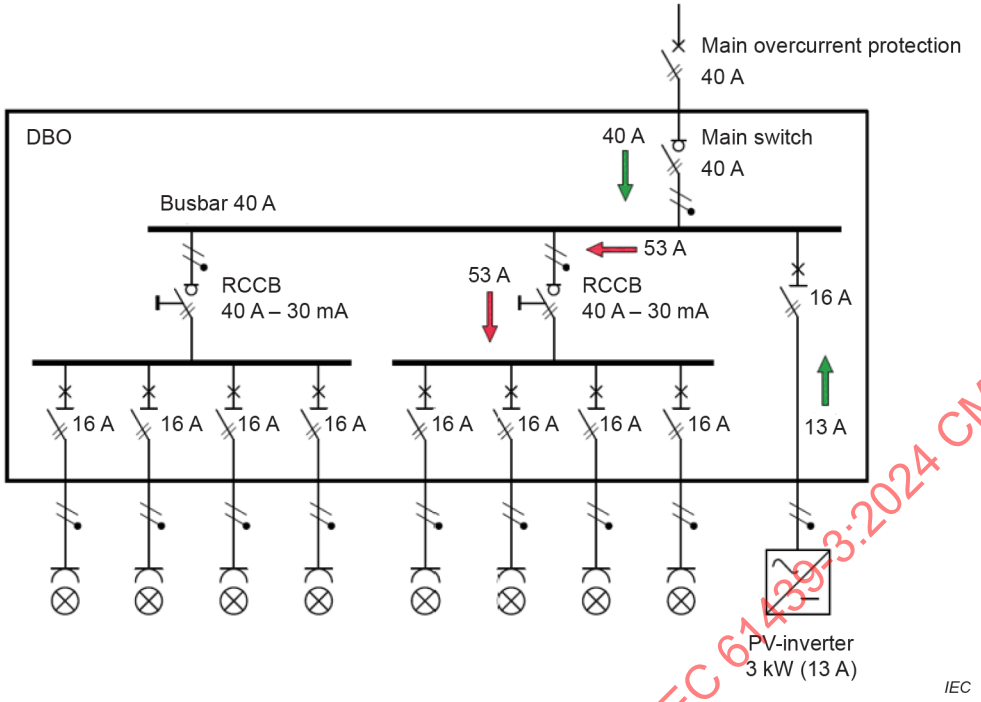
I_n is the rated current of the incoming circuit overcurrent protective device either incorporated within the DBO or upstream of it;

$I_{gen(s)}$ is the rated output current of the generating set or sets supplied through separate incoming overcurrent protective devices.

See Figure CC.1.

Alternatively, where the generating set or sets are supplied in parallel with the main incoming supply through a single overcurrent protective device within the DBO, the I_{nA} should be greater than or equal to this single overcurrent protective device and the specific arrangements shall be verified.

When a power supply is not arranged to be operated in parallel and simultaneously with other sources, for example a back-up generator connected through a transfer switch, the minimum rated current of the DBO (I_{nA}) should be the highest value of the mains power supply or generator aligned with the rated current of the incoming circuit overcurrent protective device, either incorporated within the DBO or upstream of it.



SOURCE: NPR 5310, reproduced with permission of the authors.

Figure CC.1 – Example of overloading where I_n + $I_{gen(s)}$ is greater than I_{nA}

The required I_{nA} is: I_{nA} ≥ 40 A circuit-breaker + I_{gen} 13 A therefore, I_{nA} ≥ 40 + 13 = 53 A.

Annex DD
(informative)

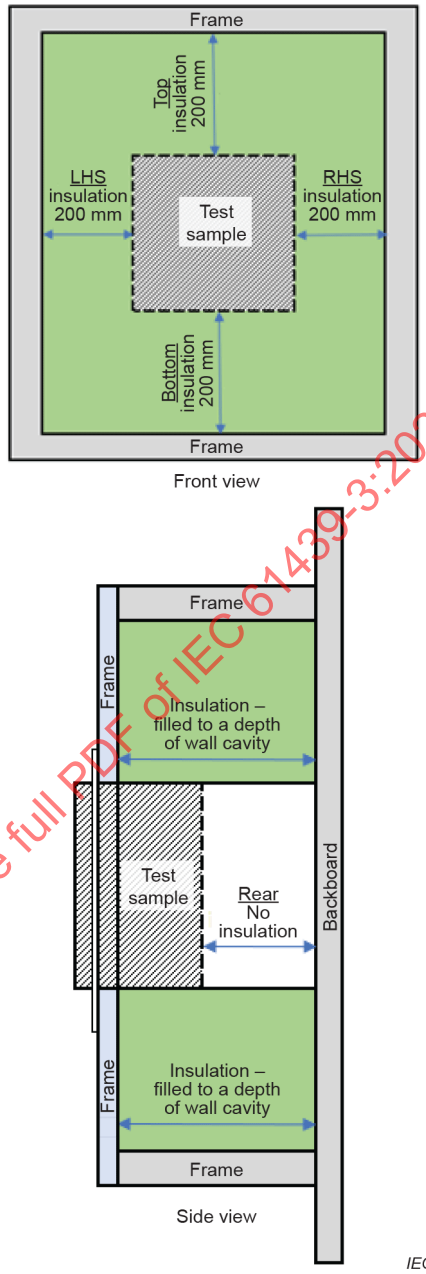
List of notes concerning certain countries

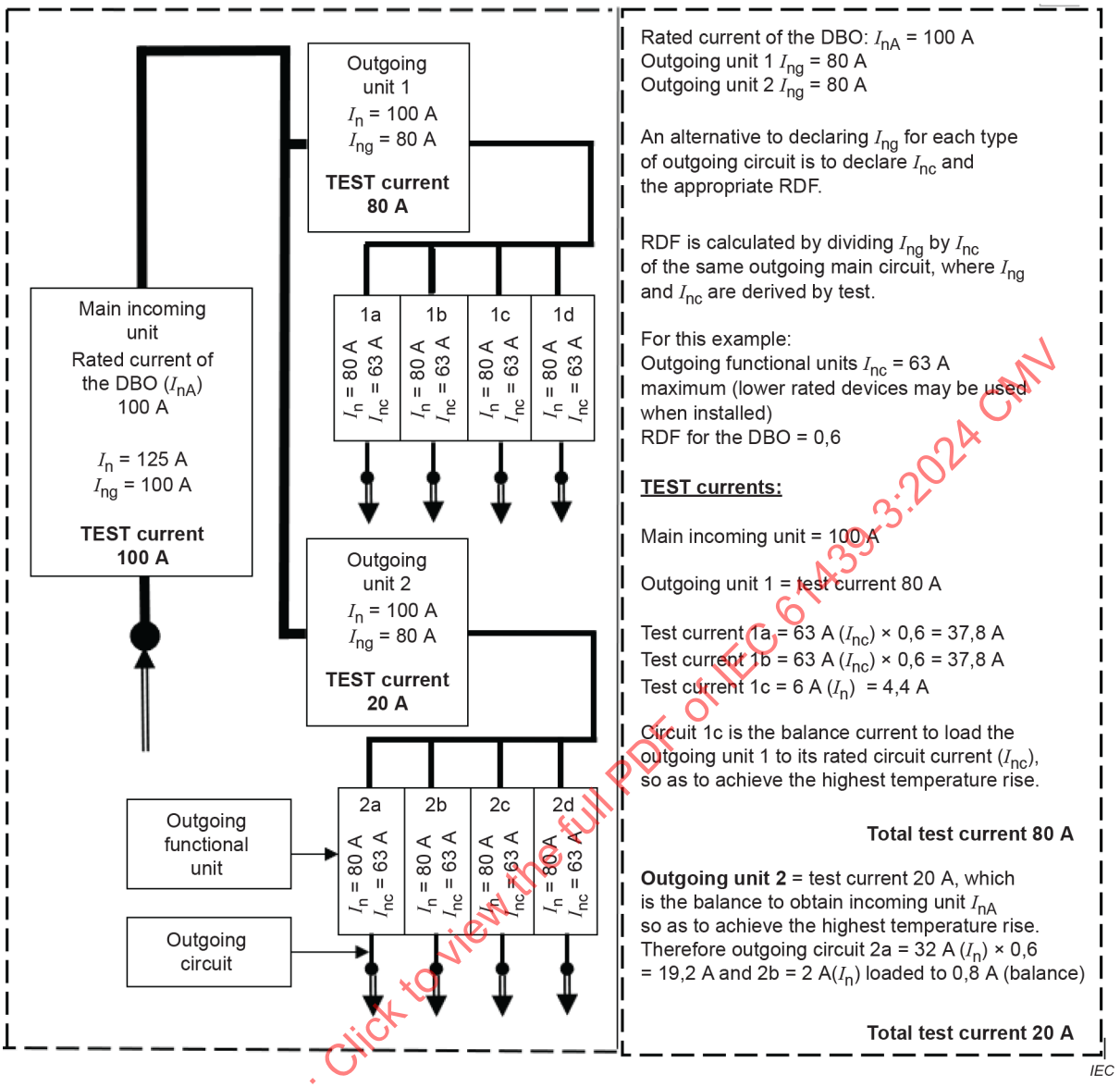
Country	Clause/Subclause	Text
IT	1	Add the following: In Italy, the standard CEI 23 51 is applicable for domestic household installations with maximum incoming unit of 125 A and rated voltage up to 440 V.
FR	1	Add the following to the end of the Scope before the note: In France, this standard does not apply to a meter board which is covered by a local network operator requirement.
GB	3.1	Add the following terms and definitions which are used in the United Kingdom: **3.1.102** **type A DBO** DBO designed for single-phase outgoing circuits only, the incoming supply possibly being single or three-phase Note 1 to entry: A type A DBO can have single-phase outgoing devices which have switched or unswitched neutral connections and may be arranged horizontally and/or vertically. Note 2 to entry: In the United Kingdom, a type A DBO used principally for domestic (household) installations and having a maximum incoming unit rating of 100 A and a maximum outgoing circuit rating of 63 A, is known as a "consumer unit". **3.1.103** **type B DBO** DBO designed for single-phase and/or poly-phase outgoing circuits, the incoming supply being poly-phase Note 1 to entry: A type B DBO can have outgoing devices which have switched or unswitched neutral connections and may be arranged horizontally and/or vertically. **3.1.104** **blank** component used for closing an opening in the external enclosure to provide basic protection **3.1.105** **consumer unit** **CU** integrated assembly, for the control and distribution of electrical energy, principally in a household or similar premise, incorporating manual means of double-pole isolation on the incoming circuit(s), with polarity observed throughout Note 1 to entry: Consumer units are designed for use exclusively with specific protective devices on the outgoing circuits, and type-tested for use when energized through a BS 88-3 fuse having an I_{cc} of 16 kA rating under the specific test arrangements according to 10.11.5.101
ZA	5.2	Add the following: In South Africa, see IEC 60038 and SANS 1019 for further details on the nominal system voltage.
GB	5.6 of IEC 61439-1:2020	Add the following item q) to 5.6: q) type A or type B DBO (see 3.1.102 and 3.1.103 which are applicable for the United Kingdom).
DE, SE	6.1	Add the following note after the first paragraph: NOTE In Germany and Sweden, 10.2.7 applies to DBOs intended for indoor installation.

Country	Clause/Subclause	Text
GB	6.2.1 of IEC 61439-1:2020	In the United Kingdom, add the following additional subclause. 6.2.1.101 Assembly outgoing unit and outgoing circuit marking Each DBO shall be marked with the I_{nc}, RDF and/or I_{ng} of each outgoing unit and each outgoing circuit/functional unit for its specific arrangement/location in the DBO. The marking can be by a single label covering various rated currents and/or RDF. Verification shall be fulfilled by: a) Where an outgoing unit and outgoing circuit/functional unit is supplied fitted in the DBO, the assembly manufacturer shall apply the relevant label to the DBO or device. b) Where an outgoing unit and outgoing circuit/functional unit is fitted in the DBO on site by the installer, the DBO manufacturer shall provide labels and instructions with the DBO so that the I_{nc}, RDF and/or I_{ng} of each outgoing unit and each outgoing circuit/functional unit can be marked by the installer on the DBO or device. For both a) and b): • The marking shall be readily visible after installation. It can be visible after a hinged/sliding cover or door is opened but not located behind covers designed to be held in place by screws or similar means.
US	8.2.1	Add the following note after the last paragraph: NOTE In the United States of America, no IK code is required as the requirements applicable to an "enclosure type" designation cover this consideration. The United States of America (USA) uses enclosure "Type" designations according to UL 50 and UL 50E. The enclosure Type designations incorporate constructional requirements as well as additional environmental requirements for conditions such as corrosion, dust, icing, oil, and coolants. For this reason, the IEC Enclosure Classification Designations IP are used with an enclosure Type designation number appropriate for these markets.

Country	Clause/Subclause	Text
GB	8.2.2	Add the following: For parts of the United Kingdom, the Building Regulations Approved Document P and Approved Document M require consumer units e.g. DBOs to be easily reached and accessible. Therefore, in the United Kingdom, a blank used for closing an opening in the external enclosure to provide basic protection, must be securely retained in position. To meet this condition the following requirements are to be verified by the following additional test: Verification of blank retention in a DBO A blank shall be securely retained in position. Conformity is verified by complying with both the push and pull tests. The blank shall be tested when fitted as in normal use. The tests shall be applied to each construction type and size of blank. Separate samples may be used for each of the tests below. **Push test** A push force of 50 N is applied by test probe 11 of IEC 61032 (rigid test finger) for 10 s without jerks in the centre of the blank. During and after the push test the blank shall remain in position and not become detached. Any apertures which are present around the blank after the test shall pass a test of IP2XC. **Pull test using IEC 60335-1:2020, Figure 7 test fingernail** a) The test fingernail tip is located at the centre of the shortest side of the blank and applied with a force of 10 N. If the fingernail tip does not engage under the edge of the blank at any angle, the pull test below is not required. The test fingernail is then pulled for 10 s without jerks, by means of the loop (eyelet), with a force of 30 N in the direction of removal. b) The test fingernail tip is located at the centre of the longest side of the blank and applied with a force of 10 N. If the fingernail tip does not engage under the edge of the blank at any angle, the pull test below is not required. The test fingernail is then pulled for 10 s without jerks, by means of the loop (eyelet), with a force of 30 N in the direction of removal. During and after the pull test the blank shall remain in position and not become detached. Any apertures which are present around the blank after the test shall pass a test of IP2XC.
NO	8.5.3	Add the following: In Norway, the alternative of labelling protective devices that re-closing shall only be carried out by skilled or instructed persons shall not be applied. Add the following note after the last paragraph: NOTE In Norway, protective devices in outgoing circuits used for wiring protection in building shall comply with IEC 60898-1, IEC 61008, IEC 61009, IEC 60269-3 or IEC 60947-2 as long as the requirements in IEC 60898-1 or IEC 61009 are met for all tests except the test for time-current characteristic B, C and D as specified in IEC 60898-1:2002, 9.10.1 or IEC 61009-1:2010, 9.9.2.1.
NL	8.5.3	Add the following: In the Netherlands, it is allowed to install a socket outlet in accordance with IEC 60884-1 (NEN 1020) in the DBO without shutters, in such a way that the minimum degree of protection (IP2XC) is not met only at the location of the holes where the plug-pins are inserted to establish the electrical contact. The verification test report that is published shall record the presence of the socket outlet and exception to the requirement in the paragraph of the degree of protection (IP) test.

Country	Clause/Subclause	Text
GB	8.6.1	Add the following note after the last paragraph: NOTE In the United Kingdom, the UK Electricity, Safety and Quality Regulations S.I. 2002 No. 2965 require electricity suppliers to state the maximum prospective short-circuit current at the supply terminals. In the United Kingdom, the maximum prospective short-circuit current at the supply terminals of household and similar electrical installations declared by the supply authority in accordance with the Electricity Association Publication P 25 is 16 kA for single-phase supplies up to and including 100 A.
ZA	8.8	Add the following: In South Africa, conductor colour coding is covered in SANS 10142-1.
AT	8.8	Add the following: In Austria, terminals, or components to connect neutral conductors of more than one outgoing circuit must consist of independent terminations for every single circuit to be able to disconnect single circuits independently from others.
US	8.8	Add the following note after the last paragraph: NOTE In the United States of America, the neutral conductor is identified by the colour white and the protective earth conductor may be either green/yellow or solid green.
GB	10.10.1 of IEC 61439-1:2020	In the United Kingdom, building regulations require thermal insulation and/or sound proofing material which influences the temperature rise verification; therefore, replace the second paragraph of 10.10.1 of IEC 61439-1:2020 with the following: Verification of DBOs: a) Surface mounting shall be made with one or more of the following in IEC 61439-1:2020: testing (10.10.2), comparison with a reference design (10.10.3), or assessment (calculation) (10.10.4). b) Flush mounting in hollow walls shall be made with one or more of the following: testing (10.10.2) or comparison with a reference design (10.10.3). The hollow wall test(s) shall be made in a test wall with a width of 200 mm ± 10 mm of thermal insulation in contact with the top, bottom and both sides of the DBO filled to the depth of the wall cavity. The maximum thermal conductivity of the thermal insulation shall be 0,044 W/mK. The rear of the DBO is not required to have any thermal insulation other than air or the typical finishing material of the mounting wall. The DBO manufacturer's instructions supplied with the DBO shall specify for flush mounting arrangements the location of the thermal insulation. c) Suitability for flush mounting in solid walls e.g. brick, stone, concrete is covered by testing in accordance with b) above. All temperature rise tests shall be applied with holes for both test cable entries and spare entries closed or sealed. Annex L of IEC 61439-1:2020 provides guidance on the verification of temperature rise. Flush mounting hollow wall test arrangements are as follows: Test wall with a width of 200 mm ± 10 mm of thermal insulation in contact with the top, bottom and both sides of the DBO.

Country	Clause/Subclause	Text
		
GB	10.10.2.3.6	Add the following to the second paragraph: In the United Kingdom, for an example considering a complete split-load DBO, see Figure DD.1.



Functional unit	Main incoming unit	1	1a	1b	1c	1d	2	2a	2b	2c	2d
Rating of the device, I_n	125 A	100 A	80 A	80 A	6 A	0	100 A	32 A	2 A	NA	NA
Functional unit rated current, I_{nc}	NA	NA	63 A	63 A	63 A	0	NA	63 A	63 A	NA	NA
RDF	NA	NA	0,6	0,6	NA	0	NA	0,6	0,6	NA	NA
Group rated current I_{ng} and test current	100 A	80 A	37,8 A	37,8 A	4,4 A*	0	20 A*	19,2 A*	0,8 A*	0	0
* Test current balance not I_{ng}.											

NOTE 1 This Figure DD.1 is one example where the DBO is loaded to its rated current (I_{nA}). More tests in different configurations may be required.

NOTE 2 The 80 A outgoing units shown are an example of I_{nc} ratings as a means of verification of temperature rise under normal operation of the outgoing unit at the rated current assigned by the manufacturer. The I_{nc} ratings are not restricted to 80 A.

NOTE 3 In DBOs, where the total of the rated currents of the outgoing circuits operating at rated diversity factor, exceeds the capacity of the incoming circuit, the diversity factor applies to any combination of outgoing circuits used to distribute the incoming current.

In this Figure DD.1, 1a to 1d, each 63 A = (63 × 4) × 0,6 = 151,2 A, which exceeds the capacity of the 100 A incoming circuit.

Therefore, in this example, outgoing circuits are loaded to the I_{ng} of outgoing unit 1 i.e. 80 A, with outgoing unit 2 loaded to the balance of the incoming circuit i.e. 20 A.

NOTE 4 The rated current of a functional unit (the circuit) is the value of current declared by the assembly manufacturer, which may be equal to, or lower than the rated current of the device according to the respective device standard.

NOTE 5 The following overload requirements could influence the I_{nc} of the switch and RCCB assigned by the assembly manufacturer.

Switches and RCCBs should be protected against overload. When using an overcurrent protective device (OCPD) for the overload protection, the OCPD is typically installed upstream of the switch and RCCB in the service/supply cut-out.

Overload coordination can be achieved when the switch/RCCB I_{nc} is greater than or equal to the upstream OCPD rated current (I_n). Overload protection cannot solely be based on the use of diversity factors of the downstream circuits.

BS 7671 requires the electrical installation designer to arrange the circuits in the installation so that they are appropriately divided across the RCCBs to minimize unwanted operation and inconvenience.

Figure DD.1 – Example of temperature rise verification by test of a complete split-load DBO as in 10.10.2.3.6

Country	Clause/Subclause	Text
GB	10.11.5 of IEC 61439-1:2020	Add the following additional paragraph: In the United Kingdom, a DBO designated as a consumer unit shall have an I_{cc} of 16 kA verified by test to additional subclause 10.11.5.101.
GB	10.11.5 of IEC 61439-1:2020	The UK Electricity, Safety and Quality Regulations S.I. 2002 No. 2965 require electricity suppliers to state the maximum prospective short-circuit current at the supply terminals. This information is given in Electricity Association publication P25. To meet this condition the following requirements are to be incorporated and also aligned with BS 7671 combined short-circuit protection and back-up protection: Add the following Subclause 10.11.5.101: 10.11.5.101 16 kA combined short-circuit and back-up protection verification 10.11.5.101.1 General Verification of the CU I_{cc} 16 kA rating using combined short-circuit protection and back-up protection as defined in BS 7671. Co-ordination, in short-circuit conditions of two OCPDs in series, using an upstream BS 88-3 fuse (formerly BS 1361) and an outgoing OCPD in the CU to achieve a higher capability than the CU OCPD alone and providing back-up protection to devices such as a switch or RCCB. This verifies the performance of the incoming device and its connections, and any other item in the CU not separately rated in excess of 16 kA, verifying the complete CU with a conditional rating I_{cc} of 16 kA. The following test(s) are applied to a CU as covered by the definition in 3.1.104. 10.11.5.101.2 Test arrangements The CU shall be set up as in normal use. It will be sufficient to test a single functional unit if the remaining functional units are constructed in the same way and cannot affect the test result. 10.11.5.101.3 Short-circuit test procedure a) It shall be verified that the representative samples of the final circuit protective devices used for the test comply with Table DD.1 and Table DD.2 where applicable.

Country	Clause/Subclause	Text
		b) The reference fuse shall be a 100 A fuse-link complying with type II of BS 88-3. Details of the fuse-links used for the test, i.e. manufacturer's name, reference, rated current, rated voltage and pre-arcing (I^2t), shall be given in the test report. Where BS 1361 type II fuse-links are available for test/certification purposes, they may be used in place of BS 88-3 fuse-links as key performance characteristics are identical. This test using a 100 A fuse-link is deemed to cover 60 A and 80 A ratings. c) The final circuit protective device shall be mounted as in service in the manufacturer's smallest recommended enclosure (metal if offered in the catalogue). The connection on the load side of the protective device under test shall be in accordance with Table DD.3 and 0,6 m ± 0,05 m in length. d) The test circuit shall be connected as shown in Figure DD.3. The relative positions of the closing switch, inductive reactor and resistor are not obligatory, but the inductive reactor and resistor shall be in series with the master circuit-breaker. e) The impedance used for limiting the prospective short-circuit fault current to the required value shall be inserted on the supply side of the circuit. Resistors shall be connected between line and neutral, after the impedances for adjusting the prospective current, so as to draw current of 10 A per phase at rated voltage from the supply. If an air-cored inductor is used, a resistor taking approximately 1 % of the current through the inductor shall be connected in parallel with it. A lower value of shunt current may be used with the consent of the manufacturer.

Table DD.1 – Requirements for final circuit protective devices: Circuit-breakers complying with BS EN 60898 and RCBOs complying with BS EN 61009

Circuit-breaker or RCBO type	Time h	Test current in multiples of rated current (I_n)	Result
B, C, D	1	1,13	No trip
	1[a]	1,45	Trip

NOTE Test to be conducted at specified reference ambient temperature.

[a] This test shall commence within 5 s of the end of the test at 1,13 I_n.

Table DD.2 – Requirements for final circuit protective devices: Semi-enclosed fuses complying with BS 3036 and cartridge fuses complying with BS 88.3

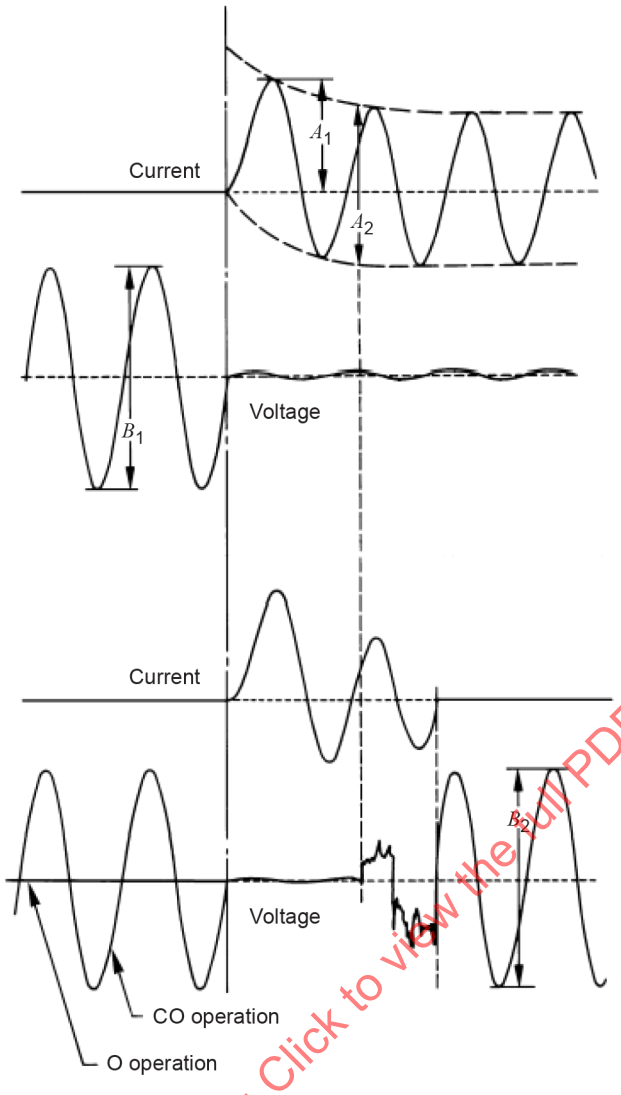
Test current A	Time h	Test current in multiples of rated current (I_n)	Result
5(6)	0,75	1,0	Fuse intact
15(16)	1		
20	1		
30(32)	1,25		
45	1,5		
5(6)	0,75	2.0	Fuse melted
15(16)	1		
20	1		
30(32)	1,25		
45	1,5		
Where BS 1361 fuse-links are available for test/certification purposes, they may be used in place of BS 88-3 fuse-links as key performance characteristics are identical.			

Table DD.3 – Cross-sections of copper conductors on load side of protective device under test

Device rating		Conductor
A		mm^2
	≤ 6	1,0
> 6	≤ 10	1,5
> 10	≤20	2,5
> 20	≤ 32	6,0
> 32	≤ 50	10,0
> 50	≤ 63	16,0

Country	Clause/Subclause	Text
		10.11.5.101.4 Circuit conditions The applied voltage shall be that which is necessary to produce the necessary power frequency recovery voltage. The value of the power frequency voltage shall be equal to 110 % (0, −5 %) of the rated recovery voltage of the CU. The voltage on the supply side shall be measured during the first complete cycle after arc extinction and after all high frequency phenomena have subsided. NOTE The value of 110 % (0, −5 %) of the rated voltage is deemed to cover the variations of system supply voltage under normal service conditions. The upper limit may be increased with the approval of the manufacturer. The value of the prospective short-circuit current shall be 16 kA −0 % + 5 % at a power factor of 0,6 ± 0,05 determined from a calibration oscillogram taken with a link of negligible impedance positioned as shown in Figure DD.3. All parts of the equipment normally earthed in service, including its enclosure, shall be insulated from earth, but shall be connected to the neutral of the supply or to a substantially inductive artificial neutral, permitting a prospective fault current of at least 100 A. This connection shall include a reliable device, such as a fuse consisting of a copper wire of 0,1 mm diameter and not less than 50 mm in length for the detection of the fault current and, if necessary, a resistor to limit the value of the prospective fault current to approximately 100 A.

Country	Clause/Subclause	Text



a) = *Calibration of circuit*

A_1 = Prospective peak making current

$\frac{A_2}{2\sqrt{2}}$ = Prospective symmetrical breaking current (RMS value)

$\frac{B_1}{2\sqrt{2}}$ = Applied voltage (RMS value)

b) = O or CO operation

$\frac{A_2}{2\sqrt{2}}$ = Breaking capacity (RMS value)

A_1 = Making capacity (RMS value)

$\frac{B_2}{2\sqrt{2}}$ = Recovery voltage (RMS value)

NOTE The amplitude of the voltage trace, after initiation of the test current, varies according to the relative positions of the closing device, the adjustable impedances, and the voltage sensing devices, and according to the test diagram.

IEC

Figure DD.2 – Calibration of the test circuit

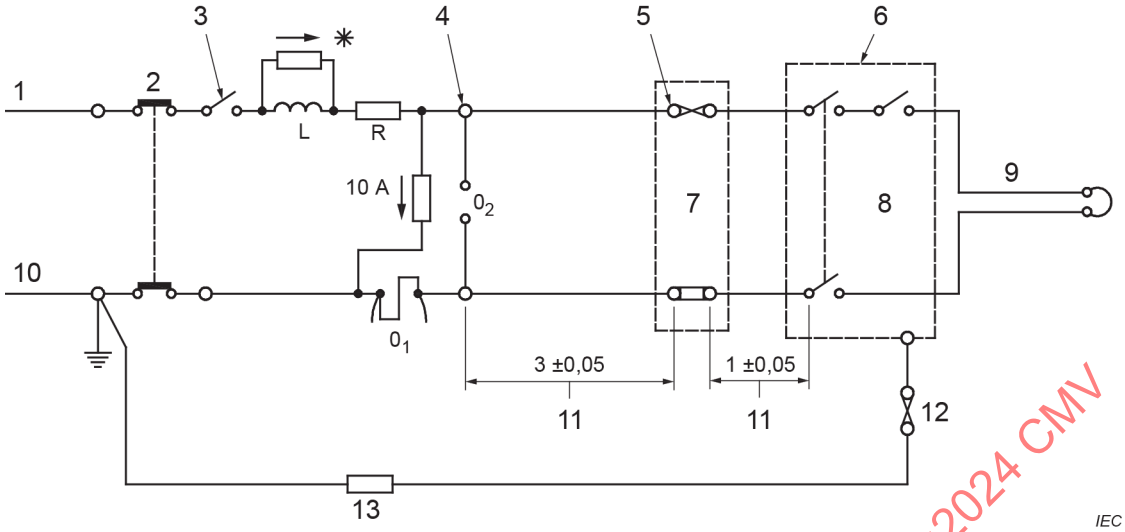
		10.11.5.101.5 Test sequence The CU shall be subject to the following tests A and B with the outgoing way fitted with a final circuit protective device of the maximum thermal current rating. If the final circuit protective devices have a short-circuit rating less than 16 kA, further tests A and B shall be carried out with a device of the minimum thermal rating fitted. In addition, if the CU is designed to accept different types or ranges of outgoing devices, each type or range shall be further tested separately.

Country	Clause/Subclause	Text
		The tests are as follows: a) Test A1. With the circuit connected as described above, with the service cut-out fuse in place and a new outgoing fuse, cartridge or fuse wire, installed, the test voltage is applied with the point on wave controlled to provide initiation of the fault at between 0° and 20° (electrical) on the rising voltage wave. b) Test A2. With the circuit connected as described above, with the service cut-out fuse in place and all circuit breakers closed, the test voltage is applied with the point on wave controlled to provide initiation of the fault at between 55° and 65° (electrical) on the rising voltage wave. c) Test B. A further short-circuit operation shall be applied after suitable preparation as indicated in Table DD.4 dependent on which of the alternative results of test A1 is achieved. If circuit-breakers are included in the CU, the test shall be applied by reclosing the circuit-breaker with the test circuit energized. If fuses are used, the test shall be as in Test A1. During the tests a cheesecloth shall be placed on the outside of the enclosure at all openings, e.g. arc vents and handles. There shall be no ignition of the cheesecloth. The cheesecloth shall be clean and dry bleached plain cotton of approximately 30 g to 40 g per square metre. When placed into position the cheesecloth shall be folded loosely in such a manner that cut and torn edges will not be exposed directly to the arc or flash. Ignition of the cheesecloth is considered to have occurred when a flame is visible. Smouldering is not considered to be evidence of ignition. The cheesecloth may be changed following each Test B. Details of the I^2t let through by the combination of devices during the test shall be given in the test report. A new CU of the same design may be used for each of the two test sequences. An alternative to cheesecloth is to use clear polyethylene foil placed in front of the circuit-breaker for Test A2 only. The polyethylene foil shall show no holes visible with normal or corrected vision without additional magnification. The clear polyethylene foil shall be 200 mm × 200 mm reasonably stretched in a frame, placed 10 mm from the front of the circuit-breaker. The foil should have the following physical properties: • Thickness (0,05 ± 0,01) mm • Density at 23 °C (0,92 ± 0,05) g/m^3 • Melting point (110 to 120) °C

Table DD.4 – Preparation for Test B

		Result of Test A1 or Test A2		
Reference fuse complying with BS 88-3 (formerly BS 1361)		Intact	Blown	
Protective device in the CU		Operated		Not operated
Final circuit preparation for Test B	Circuit-breaker complying with BS EN 60898 or RCBO complying with BS EN 61009	No action (circuit breaker or RCBO ready for Test B closing test)	Replace reference fuse	Replace reference fuse, open circuit breaker or RCBO
	Fuse complying with BS 3036	Rewire test fuse	Replace reference fuse Rewire test fuse	Replace reference fuse
	Fuse complying with BS 88-3 (formerly BS 1361)	Replace test fuse	No action	No action

Country	Clause/Subclause	Text
		10.11.5.101.6 Conditions after test Where the incoming switch is a protective device, the test report shall state which of the protective devices operated during the test, i.e. the incoming and/or outgoing devices. The earth fault indicating device shall be intact and the degree of protection of the enclosure shall not be impaired. The insulation resistance a) shall be measured within 3 min of the conclusion of the series of tests. The insulation resistance for b) and c) shall be measured as soon as practical after measurement of a), the times of measurement of b) and c) being recorded in the test report. The values shall be measured at 500 V DC and shall not be less than the following: a) 0,10 MΩ between the final circuit protective device incoming terminal and the corresponding outgoing terminal, with the isolating device open and with the blown fuse in position or the circuit-breaker or RCBO opened, whichever is applicable. b) 0,25 MΩ between the final circuit protective device terminals and earth, with the final circuit fuse rewired, the final circuit cartridge fuse replaced, or the circuit-breaker or RCBO reclosed, whichever is applicable, and with the incoming isolating device open. c) 0,25 MΩ between the final circuit protective device incoming terminals and any other metal parts which are unearthed and exposed in service. The condition of the incoming isolating device shall comply with its product specification with regard to isolating properties. The conductors shall not be deformed such that the clearance and creepage distances specified in 8.3 of IEC 61439-1:2020 are impaired. There shall be no loosening of parts used for the connection of the conductors. Where an RCCB/RCBO is included in the CU its operation shall be checked. With the RCCB/RCBO closed and connected to a supply at 0,85 times the rated voltage ± 5 % the test device shall be operated. The RCCB/RCBO shall open.



Key

1	line conductor
2	circuit breaker
3	closing switch
4	calibration point
5	100 A Fuse-link complying with type II of BS88.3 or BS 1361
6	consumer unit (metalclad, if applicable (see 10.11.5.101.3))
7	house service cut-out
8	device under test
9	0,6 m of twin cable (see Table DD.3)
10	neutral conductor
11	25 mm^2 copper cable
12	fine wire fuse 0,1 mm in diameter and at least 50 mm long tinned copper wire
13	resistor to limit earth fault current to 100 A
*	shunt resistor
o_1,o_2	oscillograph connections

Figure DD.3 – Test circuit to prove coordination of characteristics

Bibliography

The bibliography of IEC 61439-1:2020 is applicable in addition to the following:

Addition:

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems Part 1: Principles, requirements and tests*

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 60947-2, *low-voltage switchgear and controlgear – Part 2: Circuit-breakers*~~

IEC 61009-1:2010, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*

NPR 5310: Netherlands interpretation guide for NEN 1010

List of comments

1 Nominal voltage is used to align with Table G.1 for the correlation between nominal supply system voltages and the corresponding rated impulse withstand voltage of the equipment.

2 This bullet point highlights that a DBO can be utilized for different aspects related to electrical energy distribution.

3 This text was moved to Subclause 3.1.101 as Note 4 to clarify the definition of a DBO.

4 This paragraph uses examples to clarify the varied range of devices that a DBO can contain for many different applications.

5 The modification highlights that the term DBO relates to the operator and doesn't define the location of application e.g. as explained in Note 3.

6 This note clarifies that a DBO can be used in non-domestic installations e.g. offices, hospitals, public buildings.

7 These terms are limited to certain countries therefore, they have been moved to Annex DD.

8 This addition links to Annex CC which highlights specific points for consideration when determining the rated current of a DBO with an additional and simultaneous parallel supply. This has a synergy with prosumer's electrical installations (PEI).

9 This text explains how, in the absence of specific information, an assumption of design current of the circuit IB can be derived from the protective device In, and the assumed loading factor of Table 101.

10 All country notes are moved into Annex DD List of notes concerning certain countries.

11 The requirement to mark the rated current of the assembly is now in IEC 61439-1:2020.

12 This text highlights the need to provide details in documentation of any routine verification that is necessary to be carried out by the installer for conformity with IEC 61439-3.

13 This text clarifies the requirement for an ordinary person to be able to identify which circuits an RCD supplies. It explains the requirement can be met by the location of the RCD in relation to the circuits it serves or labels provided, and which can be applied by the installer.

14 This new note highlights the importance to refer to Annex BB and consider the implications of a prosumer's electrical installation (PEI) in relation to the DBO design and related ratings, instructions, etc. It reflects the growing market related to renewable energy sources and the relationship between installation rules in IEC 60364-8-82 and a DBO.

15 This new note removes any ambiguity by stating that this clause for resistance of insulating materials to normal heat applies to covers and enclosures made of insulating materials.

16 Indoor installations is deleted, as it does not relate to the objective of IP2XC and applies to all DBOs indoor or outdoor.

17 This note explains how it is permissible and possible, to have more than one IP rating.

18 This modification clarifies the requirement of with IPXXC in relation to barriers and enclosures for a DBO.

19 This deletion reflects that IEC 61439-1:2020 has removed reference to obstacles.

20 Subclause 8.5.3 second paragraph contains a requirement pertaining to outgoing circuits containing protective devices for operation by ordinary persons. The first paragraph now clarifies that this requirement does not relate to a switch-disconnector or isolating switch and specifies the related product standards for such devices to avoid any ambiguity.

21 This paragraph represents editorial changes that replaces the above paragraph relating to the re-closing of the incoming protective device, where the device product standard is not intended for the operation by ordinary persons.

22 This new note explains why Subclause 8.5.3 contains requirements for an incoming protective device incorporated within the DBO not conforming to a product standard intended to be operated by ordinary persons.

23 The new text qualifies that some devices/components have terminals for external neutral cables therefore, if these are utilised, the number of neutral terminals provided in the DBO can be appropriately reduced.

24 This note references the 2020 version of IEC 60664-1 and replaces the note in the corrigendum to IEC 61439-1:2020 which specifies IEC 60664-1: 2007.

25 Subclause 10.2.3.2.1 is editorially aligned with IEC 61439-1:2020.

26 A new requirement is introduced that qualifies where doubt exists relating to IP and dielectric properties being maintained, appropriate tests shall be applied.

27 The verification methods are bulleted for clarity.

28 Subclause 10.2.8.1 is editorially aligned with IEC 61439-1:2020 and was previously Subclause 10.13.

29 Note 101 in Subclause 8.2.2 explains that a DBO can have more than one IP rating e.g. door open IP2XC and door closed IP3X. This second bullet highlights that the test to verify a minimum IP2XC must be applied with all doors and covers open/removed where they facilitate access to devices for operation by ordinary persons.

30 These new bullets provide a detailed method as an option to apply a single Inc test to cover a complete range.

31 These bullet points in Part 1 are not applicable to a DBO as they exceed the 250 A rated current limit by this standard.

32 This paragraph describes a method of derivation for test arrangements for mutual thermal influences producing the highest possible temperature-rise for adjacent circuits that are simultaneously and continually loaded. The two new bullet points describe methods that can be applied.

This approach could be utilized for a DBO range of varied configurations to minimize the number of temperature rise tests to verify the range.

33 This paragraph qualifies that a single tested device achieving an Inc equal to its rated current In can be used to verify an Inc for all other devices in the same constructional range.

34 This paragraph introduces a method to enable the Inc of the same constructional range to be derived from a single tested device where the rated current Inc in the DBO cannot achieve the device rated current In.

35 This paragraph describes a method of derivation for test arrangements for mutual thermal influences producing the highest possible temperature-rise for adjacent circuits that are simultaneously and continually loaded. The two new bullet points describe methods that can be applied.

This approach could be utilized for a DBO range of varied configurations to minimize the number of temperature rise tests to verify the range.

36 These examples provide additional information to the previous ones. In particular, b) provides a more detailed example of the application of the 80 % safety margin when the calculated air temperature exceeds the device manufacturers specification having already been derated.

37 These examples provide additional information to the previous ones. In particular, b) provides a more detailed example of the application of the 80 % safety margin when the calculated air temperature exceeds the device manufacturers specification having already been derated.

38 The text “nor on simple constructions” is deleted because “simple construction” is ambiguous and open to interpretation. The text “to validate clearances” is added to highlight the objective of the inspection.

39 This replacement note uses specific terms as examples to clarify the types of devices to which this note applies to. Also, it now explains that the note only applies to devices within the DBO which are only accessible after a cover or door is opened.

40 Table 101 is expanded beyond general circuits to include specific circuits such as EV charging equipment or PV and highlights that load control can be used to influence the assumed loading of a DBO. This links to IEC 60364 installation requirements, particularly in prosumer’s electrical installation (PEI) and renewables.

41 This is a change to highlight the need to clearly specify the maximum installation load current the DBO can distribute i.e. the DBO rated current InA.

42 This text emphasizes the importance of establishing/specifying the design current of the circuit together with the load characteristics, to enable the DBO manufacturer to determine the most precise device and arrangement in the DBO for the application. It qualifies that alternatively, the rated current of a specified device In and the assumed loading factors as given in Table 101 can be used.

43 This new annex reflects the rapidly evolving market of prosumer’s electrical installations (PEI). Its objective is informative in terms of raising awareness of some potential aspects of influence by the electrical installation upon the DBO characteristics. It is not an exhaustive list of all aspects for consideration of a PEI.

44 This new annex highlights arrangements that could result in the overloading of a DBO as illustrated in Figure CC.1. and is particularly relevant to prosumer’s electrical installations (PEI). Some methods to mitigate this overloading are provided.

IEC 61439-3

Edition 2.0 2024-03

INTERNATIONAL STANDARD

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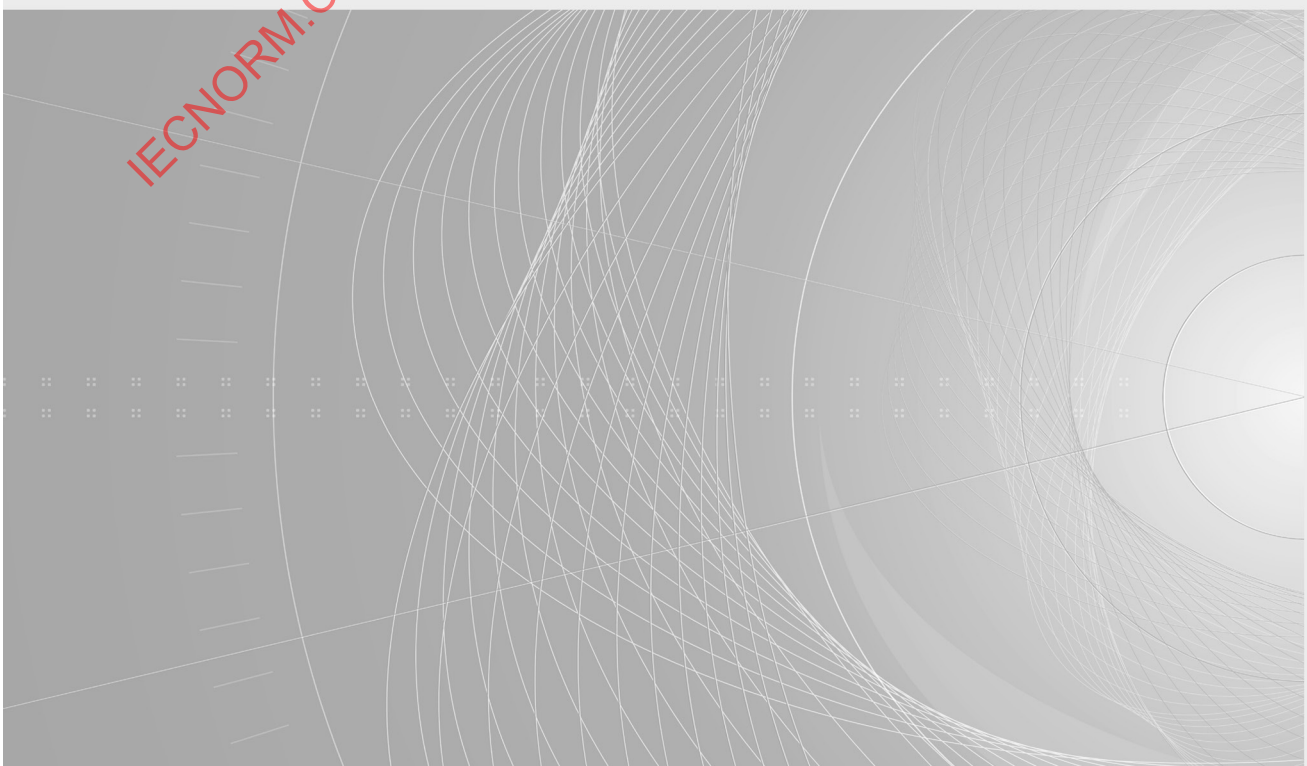
Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)

Ensembles d'appareillage à basse tension – Partie 3: Tableaux de répartition destinés à être utilisés par des personnes ordinaires (DBO)



IEC 61439-3:2024-03(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 3: Distribution boards intended to be operated by ordinary persons (DBO)

FOREWORD

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IEC 61439-3 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. It is an International Standard.

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

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

a) alignment with the structure of IEC 61439-1:2020;
b) inclusion in the scope of more examples of the type of protection and control devices;
c) deletion of type A and type B DBOs;

d) addition of a new Annex BB related to DBOs used in a prosumer's electrical installation (PEI);

e) addition of a new Annex CC related to rated current of a DBO with additional source of supply in parallel/simultaneously with another source that is connected to the DBO e.g. PV.

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

Draft	Report on voting
121B/193/FDIS	121B/195/RVD

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 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/publications.

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 are only applicable to this document insofar as 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 101 (102, 103, 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 101.

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

The reader's attention is drawn to the fact that Annex DD 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 in the IEC 61439 series, published under the general title *Low-voltage switchgear and controlgear assemblies,* can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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 3: Distribution boards intended to be operated by ordinary persons (DBO)

1 Scope

This part of IEC 61439 defines the specific requirements for distribution boards intended to be operated by ordinary persons (abbreviated DBO throughout this document, see 3.1.101) as follows:

– assemblies intended to be operated by ordinary persons (e.g. switching operations and replacing fuse-links), e.g. in domestic (household) applications;

– assemblies containing outgoing circuits with protective devices intended to be operated by ordinary persons, complying e.g. with IEC 60898-1, the IEC 61008 series, the IEC 61009 series, IEC 62606, IEC 62423 and IEC 60269-3;

– assemblies for applications where the nominal voltage to earth does not exceed 300 V AC (see Table G.1 of IEC 61439-1:2020);

NOTE The voltage limits for DC applications are under consideration.

– assemblies with a rated current (I_{nc}) of the outgoing circuits not exceeding 125 A and a rated current (I_{nA}) not exceeding 250 A;

– assemblies intended for use in connection with the generation, transmission, distribution and conversion of electrical energy, and for the control of equipment consuming electrical energy and for associated data processing;

– enclosed, stationary assemblies;

– assemblies for indoor or outdoor use.

DBOs can contain protection devices, control devices, signalling devices alone or a combination of devices e.g. circuit-breakers, load shedding relay, energy management, communication devices, lighting control.

This document does not apply to an empty enclosure nor to individual devices and self-contained components, such as circuit-breakers, fuse-switches, electronic equipment. which comply with the relevant product standards, it describes the integration of devices, or self-contained components, or both, into a DBO or into an empty enclosure forming a DBO.

This document applies to DBOs designed, manufactured, and verified on a one-off basis or fully standardized and manufactured in quantity.

This document does not apply to the specific types of assemblies covered by other parts of the IEC 61439 series.

NOTE Enclosures for electrical accessories for household and similar fixed electrical installations are covered 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 in addition to the following.

Addition:

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

IEC 60269-3, *Low-voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications) – Examples of standardized systems of fuses A to F*

IEC 60364-8-82, *Low-voltage electrical installations – Part 8-82: Functional aspects – Prosumer's low-voltage electrical installations*

IEC 60898-1, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation*

IEC 60669-2-4, *Switches for household and similar fixed electrical installations – Part 2-4: Particular requirements – Isolating switches*

IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 61008 (all parts), *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)*

IEC 61009 (all parts), *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs)*

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

IEC 62423:2009, *Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses*

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

IEC 62606, *General requirements for arc fault detection devices*

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 terminology databases for use in standardization at the following addresses:

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

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

3.1 General terms

Additional terms and definitions:

3.1.101
distribution board intended to be operated by ordinary persons
DBO
assembly used to distribute and control electrical energy for all types of electrical supplies and loads, intended for operation by ordinary persons

Note 1 to entry: For operation by ordinary persons, see 8.4.6.1 of IEC 61439-1:2020.

Note 2 to entry: Switching operations and replacing fuse-links are examples of operations intended to be carried out by ordinary persons.

Note 3 to entry: Definition 3.1.101 does not preclude the DBO from being operated by skilled or instructed persons, and also being used in non-domestic installations.

Note 4 to entry: DBOs can be assembled outside the factory of the original manufacturer. DBOs can be assembled by the original manufacturer or by an assembly manufacturer.

4 Symbols and abbreviations

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

5 Interface characteristics

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

5.1 General

Addition:

This objective can be achieved through one of two typical processes; the user will either select a catalogue product, the characteristics of which meet the required user needs, or make a specific agreement with the manufacturer.

In both cases, the specification schedule according to Annex AA is intended to help the user to provide all data necessary to specify, and to help the manufacturer to provide the actual DBO characteristics. In some cases information declared by the DBO manufacturer may take the place of an agreement.

5.2.4 Rated impulse withstand voltage (U_{imp}) (of the assembly)

Replacement:

The rated impulse withstand voltage of the assembly shall be equal to or higher than the values stated for the transient overvoltages occurring in the electrical system(s) to which the circuit is designed to be connected.

DBOs shall comply with a minimum overvoltage category III (see IEC 60364-4-44) according to Table G.1 of IEC 61439-1:2020.

5.3.1 Rated current of an assembly (I_{nA})

Addition:

See Annex CC for examples of when a generator, for example a photovoltaic system, wind turbine, battery is used as additional source(s) of supply in parallel with another source that is connected to the DBO.

5.4 Rated diversity factor (RDF)

Addition:

In the absence of an agreement between the DBO manufacturer and user concerning the actual load currents, the type of load, the assumed loading of the outgoing circuits of the DBO or group of outgoing circuits can be based on the values in Table 101.

The assumed load current is the rated current of the protective device I_n, as required by the user, multiplied with the assumed loading factor of Table 101.

NOTE 101 The rated current I_n of a protective device is defined in their product standard.

6 Information

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

6.1 Assembly designation marking

Addition to the first paragraph:

The test of 10.2.7.1 only applies to DBOs intended for outdoor installation.

Addition of the following new item:

h) degree of protection if greater than IP2XC.

6.2.2 Instructions for handling, installation, operation and maintenance

Addition to the first paragraph:

The original or assembly manufacturer shall provide in their documentation, any routine verification required to be carried out by the installer for the DBO to conform to IEC 61439-3.

6.3 Device and/or component identification

Addition:

For RCDs supplying more than one final circuit, it shall be possible for ordinary persons to identify which outgoing circuits the RCD supplies, for example when the RCD is adjacent to the outgoing group of circuits it supplies or by providing labels for the installer to apply to the DBO after installation. The identification means shall be visible without accessing live parts.

7 Service conditions

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

7.1.2 Pollution degree

Addition:

A minimum pollution degree 2 applies.

7.2 Special service conditions

Addition:

NOTE 101 The effects upon a DBO design and related ratings, instructions, etc. when used in a prosumer's electrical installation (PEI) can take account of the relevant requirements in IEC 60364-8-82. See Annex BB.

8 Constructional requirements

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

8.1.3.2.2 Resistance of insulating materials to normal heat

Addition:

NOTE 101 This Subclause 8.1.3.2.2 also applies to covers and enclosures made of insulating materials.

8.2.1 Protection against mechanical impact (IK code)

Replacement:

The DBO shall comply with the following IK codes according to IEC 62262:

– IK05 for a DBO for indoor use;
– IK07 for a DBO for outdoor use.

Compliance shall be verified according to 10.2.6.

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

Replacement of the second paragraph:

The degree of protection of a DBO shall be at least IP2XC after installation in accordance with the DBO manufacturer's instructions.

IP2XC shall be maintained when operating devices e.g. switching and operating test buttons in normal use. The degree of protection can be temporarily reduced when permitted in a product standard for use by ordinary or unskilled persons e.g. IEC 60269-3 for replacing a fuse-link.

NOTE 101 A DBO can have more than one IP rating e.g. door open IP2XC and door closed IP3X or drain holes IPXXD.

Paragraphs 5 and 6 and the associated examples in IEC 61439-1 do not apply to this document.

8.4.2.3 Barriers or enclosures

Replacement of the first paragraph:

Bare live parts shall be inside enclosures or behind barriers. The enclosures or barriers shall provide a degree of protection of at least IPXXC.

8.5.3 Selection of switching devices and components

Addition:

When a switch-disconnector, circuit-breaker without overcurrent protection or an isolating switch is incorporated in the DBO, it shall conform to IEC 60947-3, IEC 60947-2 or IEC 60669-2-4 as appropriate to the DBO ratings.

Outgoing circuits shall contain protective devices, intended to be operated by ordinary persons, for example conforming to IEC 60898-1, the IEC 61008 series, the IEC 61009 series, IEC 62423, IEC 62606 and IEC 60269-3.

An incoming protective device incorporated within the DBO not conforming to a product standard intended to be operated by ordinary persons, shall require a key or tool for re-closing after tripping and for the replacement of a fuse-link. Alternatively, a label shall be located in the vicinity of the incoming protective device stating that re-closing of the tripped device and the replacement of a fuse-link shall only be carried out by an instructed or skilled person.

Circuit-breakers shall be designed or installed in a way that it shall not be possible to modify their settings or calibration without a deliberate act involving the use of a key or tool.

NOTE 101 These requirements reflect that protective device product standards for ordinary people are limited to a maximum rated current of 125 A. Household premises can require electrical supplies greater than 125 A and the use of DBOs therefore, these particular installations are within the scope of IEC 61439-3.

8.6.1 Main circuits

Replacement of the second paragraph:

Each of the conductors between the incoming unit and outgoing unit as well as the components included in these units can be rated on the basis of the reduced short-circuit stresses occurring on the load side of the respective outgoing short-circuit protective device, provided that these conductors are arranged so that an internal short-circuit between live parts and between live parts and earth is not to be expected as required by 8.6.4 and Table 4 of IEC 61439-1:2020.

8.8 Terminals for external cables

Addition:

When a device or component in an outgoing circuit does not incorporate a neutral terminal, the number of neutral terminals of a DBO shall be not less than one outgoing terminal for each outgoing circuit requiring a neutral terminal. These terminals shall be located or identified in the same sequence as their respective line conductor terminals.

The maximum number of neutral conductors that are permitted to be connected to each device or component neutral terminal, shall be as stated in the manufacturer's instructions.

DBOs shall have a minimum of two terminals for electrical installation protective bonding conductors.

9 Performance requirements

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

9.1.1 General

Addition:

NOTE IEC 60664-1:2020 contains the requirements for supplementary and reinforced insulation (Class II).

10 Design verification

Clause 10 of IEC 61439-1:2020 is applicable except as follows.

10.2.2.2 Severity test A

Addition:

The following is an alternative test.

All grease is removed from the parts or representative samples of the steel enclosures of the DBO to be tested, by immersion in a cold chemical degreaser such as methyl chloroform or refined petrol for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water at a temperature of (20 ± 5) °C.

Without drying but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of (20 ± 5) °C.

After the parts have dried for 10 min in a heating cabinet at a temperature of (100 ± 5) °C and have been left at room temperature for 24 h, their surfaces shall show no signs of iron oxidization.

Traces of iron oxide on sharp edges and any yellowish film removable by rubbing are ignored.

For small helical springs and the like, and for inaccessible parts exposed to abrasion, a layer of grease can provide sufficient protection against iron oxidization. Such parts are subjected to the test only if there is doubt about the effectiveness of the grease film, and the test is then made without previous removal of the grease.

10.2.2.4 Results to be obtained

The first paragraph of 10.2.2.4 of IEC 61439-1:2020 does not apply to the alternative test of this document.

10.2.3.2.1 Verification by test

Addition:

NOTE 101 850 °C does not apply to accessible parts of the enclosure after mounting in hollow walls e.g. covers, doors.

10.2.6 Verification of protection against mechanical impact (IK code)

Replacement:

Verification of the degree of protection against mechanical impacts shall be carried out in accordance with IEC 62262.

The test shall be carried out by means of a hammer test apparatus as described in IEC 60068-2-75, for example an impact spring hammer at an ambient air temperature between 10 °C and 40 °C immediately after the DBO has been kept for 2 h at a temperature of −5 °C ± 1 K for indoor use and −25 °C ± 1 K for outdoor use. A test at −25 °C for outdoor use also validates the −5 °C for indoor use, so only one test at −25 °C is required.

Compliance is checked on those exposed parts of the DBO which can be subjected to mechanical impact when mounted as in normal use.

The sample with a cover, or the enclosure, if any, shall be fixed as in normal use or placed against a rigid support.

Three blows shall be applied on separate places of each of the accessible faces and door (if provided). The impacts shall be evenly distributed on the faces of the enclosure(s) under test. In no case shall the impacts be applied in the surrounding area of the same point of the enclosure. A new sample for each accessible face is used, unless the previous test has not influenced the results of the subsequent test(s), then the sample may be reused. The blows shall not be applied to knock-outs, built-in components complying with other standards, or other fastening means which are recessed below the surface so as not to be subjected to an actual impact.

Cable entries which are not provided with knock-outs shall be left open. If they are provided with knock-outs, two of them shall be opened.

Before applying the blows, fixing screws of bases, covers and the like shall be tightened with a torque equal to that specified in Table 102.

After the test, a visual inspection shall verify that:

– the degree of protection (IP code) of the enclosure is not impaired, where doubt exists the appropriate IP test according to 10.3 should be carried out;
– dielectric properties have been maintained, where doubt exists the appropriate dielectric tests according to 10.9 of IEC 61439-1:2020 as modified in this document, should be carried out;
– removable covers can be removed and reinstalled;
– doors can be opened and closed.

10.2.7.1 Verification by test

Addition of a new first paragraph:

This test only applies to DBOs intended for outdoor installation.

10.2.8 Mechanical operation

10.2.8.1 Verification by test

Replacement of the first and second sentences of the second paragraph:

For parts, required to be verified by test e.g. mobile parts such as doors (see 8.1.5 of IEC 61439-1:2020), satisfactory mechanical operation shall be verified after installation in the DBO. The number of operating cycles shall be 50.

10.3 Degree of protection of assemblies (IP Code)

Replacement of the second paragraph and dashed items:

Degree of protection (IP code) tests shall be carried out:

- for the test of protection against contact with live parts, all covers and doors which are required to be opened or removed without the use of a key or tool shall be opened or removed;
- for the test of protection against contact with live parts, all covers and doors which are required to be opened or removed to provide access for operating devices by ordinary persons, for example resetting circuit-breakers, RCDs or pressing an RCD test button, shall be opened or removed;
- with all covers and doors in place and closed as in normal service, irrespective of whether they can be opened or removed, with or without the use of a key or tool;
- tests shall be carried out in a de-energized state (main and auxiliary circuits).

Where the assembly is made up of multiple sections or is described as extendable, joined sections shall be included.

10.10.2.2.3 Functional units

Replacement of the second and third paragraphs of 10.10.2.2.3 b):

Where outgoing devices for the DBO have a range of rated currents, a single I_{nc} test can be used to establish the I_{nc} ratings for the complete range without further testing where:

1) the ranges covered are from the same manufacturer's series;
2) the ranges covered all have the same physical dimensions;
3) the ranges covered have the same electrical connection arrangements line and load;
4) using the data given by the device manufacturer, the device with the highest total power loss within the product range is used for the test;
5) the device is placed in the most onerous position with respect to mutual heating, and insulating effects.

10.10.2.3.1 General

Addition after the fourth paragraph:

In the absence of manufacturer's instructions, the tightening torque applied to terminals shall be in accordance with those specified for the temperature rise test in the relevant device product standard.

10.10.2.3.2 Test conductors

Modification:

Bullet points b), c) and d) do not apply to this document.

10.10.2.3.6 Verification considering individual functional units separately and the complete assembly

Addition to the second paragraph:

A method to determine the most onerous group for continuously loaded and adjacent circuits to be tested, so that the highest possible temperature-rise is obtained, is for the rated current of the DBO (I_{nA}), to be distributed amongst the smallest possible number of adjacent, continually and simultaneously loaded outgoing circuits, so that each of these circuits is loaded with:

(i) I_{ng} or I_{nc} × RDF; I_{ng} and RDF being estimated values by the manufacturer so as to estimate the test currents. If verified by the test, this produces a rated value I_{ng} and provides the possibility to calculate the RDF; or

(ii) I_{nc} × the assumed loading factor in Table 101. This method uses the assumed loading factor as a means to estimate the RDF to use for the test. If verified by the test, this produces a rated value I_{ng}.

In both (i) and (ii), the actual RDF per circuit is calculated by dividing I_{ng} by I_{nc} from their verified tested values.

10.10.2.3.7 Verification considering functional units and the main and distribution busbars separately as well as the complete assembly

Addition to item c):

Where the device tested achieves an I_{nc} equal to its rated current I_n, all other devices in the same constructional range have an I_{nc} equal to their I_n.

Where the device tested achieves an I_{nc} lower than its rated current I_n, the same reduction is applied to all other devices in the constructional range. For example, a device with an I_n of 63 A achieves an I_{nc} of 55 A: 55 / 63 = 0,874. The I_{nc} of the other devices in the same constructional range is I_n × 0,874.

Addition to item d):

A method to determine the most onerous group for continuously loaded and adjacent circuits to be tested, so that the highest possible temperature rise is obtained, is for the rated current of the DBO (I_{nA}), to be distributed amongst the smallest possible number of adjacent, continually and simultaneously loaded outgoing circuits, so that each of these circuits is loaded with:

(i) I_{ng} or I_{nc} × RDF; I_{ng} and RDF being estimated values by the manufacturer so as to estimate the test currents. If verified by the test, this produces a rated value I_{ng} and provides the possibility to calculate the RDF; or

(ii) I_{nc} × the assumed loading factor in Table 101. This method uses the assumed loading factor as a means to estimate the RDF to use for the test. If verified by the test, this produces a rated value I_{ng}.

In both (i) and (ii), the actual RDF per circuit is calculated by dividing I_{ng} by I_{nc} from their verified tested values.

10.10.3.2 Assemblies

Addition:

DBOs with synthetic enclosures are considered representative of DBOs with metallic enclosures, if the highest temperature rise on the inside surfaces of the synthetic enclosure does not exceed the maximum surface temperature rise for the accessible external metal surfaces according to Table 6 of IEC 61439-1:2020. When it has been verified that the highest surface of the enclosure is the hottest location, the internal air thermocouple located at the top of the enclosure can be used to establish the highest temperature rise on the inside surfaces.

10.10.4.2.3 Results to be obtained

Addition:

NOTE Guidance is in the form of a publication of the maximum rated current at a specified ambient air temperature in the immediate vicinity of the device.

EXAMPLE

a) As a starting point, data identifies that the I_{th} = 125 A at 50 °C free air ambient temperature of the device therefore, it is derated by 0,8 × 125 A = 100 A. 100 A is used in the calculation to avoid hot spots and the limiting ambient temperature is 50 °C. If the enclosure is capable of dissipating power losses equal to or greater than those generated based on 100 A and the calculated internal air temperature does not exceed 50 °C, it is verified that the continuous permissible load is 100 A.

b) However, if for the same 125 A device derated to 100 A, the calculated air temperature within the enclosure is 60 °C thus exceeding the 50 °C limit, and the 125 A device manufacturer's information limits the device I_{th} to 80 A at 60 °C free air ambient temperature, to avoid hot spots, a safety margin is applied i.e. 0,8 × 80 A = 64 A, it is verified that the continuous permissible load is 64 A. No further calculation would be required, as 64 A accounts for both the 0,8 factor and ambient temperature limits.

If a continuous permissible load of 100 A is required, then: an enclosure with higher dissipating power losses, or a device with lower power losses, or a device with a higher rated current for ambient temperature can be used, or a combination to achieve conformity.

10.10.4.3.2 Results to be obtained

Addition:

NOTE Guidance is in the form of a publication of the maximum rated current at a specified ambient air temperature in the immediate vicinity of the device.

EXAMPLE

a) As a starting point, data identifies that the I_{th} = 125 A at 50 °C free air ambient temperature of the device therefore, it is derated by 0,8 × 125 A = 100 A. 100 A is used in the calculation to avoid hot spots and the limiting ambient temperature is 50 °C. If the enclosure is capable of dissipating power losses equal to or greater than those generated based on 100 A and the calculated internal air temperature does not exceed 50 °C, it is verified that the continuous permissible load is 100 A.

b) However, if for the same 125 A device derated to 100 A, the calculated air temperature within the enclosure is 60 °C thus exceeding the 50 °C limit, and the 125 A device manufacturer's information limits the device I_{th} to 80 A at 60 °C free air ambient temperature, to avoid hot spots, a safety margin is applied i.e. 0,8 × 80 A = 64 A, it is verified that the continuous permissible load is 64 A. No further calculation would be required, as 64 A accounts for both the 0,8 factor and ambient temperature limits.

If a continuous permissible load of 100 A is required, then: an enclosure with higher dissipating power losses, or a device with lower power losses, or a device with a higher rated current for ambient temperature can be used, or a combination to achieve conformity.

10.11.5.3.3 Incoming circuit and main busbars

Addition:

A rated conditional short-circuit current can be assigned where the distance of the main and distribution busbar between the load terminals of the incoming device connected to the main busbar and the supply terminals of the outgoing functional unit does not exceed 3 m. The main busbar, distribution busbar and incoming device may be tested and rated on the basis of the reduced short-circuit stresses occurring on the load side of the respective short-circuit protective device within each unit, provided that these conductors are arranged so that an internal short-circuit between live parts or between live parts and earth is not to be expected (see 8.6.4 of IEC 61439-1:2020).

NOTE Examples of conductor types and installation requirements are given in Table 4 of IEC 61439-1:2020.

11 Routine verification

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

11.9 Dielectric properties

Addition after the first paragraph:

A dielectric test is not required on a DBO containing busbars or prefabricated main circuit wiring only, where inspection of the conductors and cables, including proper laying is sufficient to validate clearances.

Table 6 – Temperature-rise limits (9.2)

Replacement of footnote c:

[c] When specified in the device manufacturer's instructions, manual operating means for miniature circuit-breakers, residual current operated circuit-breakers with integral overcurrent protection, residual current operated circuit-breakers without integral overcurrent protection, arc-fault detection devices etc. within the DBO, which are only accessible after a cover or door is opened, are permitted to sustain a 25 K increase on these temperature-rise limits.

Additional tables and figure:

Table 101 – Values of assumed loading

Number of outgoing circuits for general purpose and other specific 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
Circuits such as for EV charging equipment or PV, unless load control load reduction is included in the associated equipment or installed in the DBO or a combination of both.	1

Table 102 – Tightening torque values for the verification of mechanical strength

Diameter of thread		Tightening torque		
mm		Nm [a]		
Metric standard values	**Range of diameters "*d*"**	**I [b]**	**II [c]**	**III [d]**
mm	mm			
2,5	$d \leq 2{,}8$	0,13	0,26	0,26
3,0	$2{,}8 < d \leq 3{,}0$	0,16	0,33	0,33
–	$3{,}0 < d \leq 3{,}2$	0,20	0,40	0,40
3,5	$3{,}2 < d \leq 3{,}6$	0,26	0,53	0,53
4	$3{,}6 < d \leq 4{,}1$	0,47	0,80	0,80
4,5	$4{,}1 < d \leq 4{,}7$	0,53	1,20	1,20
5	$4{,}7 < d \leq 5{,}3$	0,53	1,33	1,33
6	$5{,}3 < d \leq 6{,}0$	0,80	1,66	2,00
8	$6 < d \leq 8$	1,66	2,33	4,00
10	$8 < d \leq 10$	–	2,66	6,66
12	$10 < d \leq 12$	–	–	9,33
14	$12 < d \leq 15$	–	–	12,6
16	$15 < d \leq 20$	–	–	16,6
20	$20 < d \leq 24$	–	–	24
24	$24 < d$	–	–	33

[a] For screws and fasteners made of plastic, the tightening torque applied shall be the value specified in the manufacturer's instructions. 90° locking mechanisms not containing a thread are not subjected to the tightening torques specified in this table, they are operated so as to engage in normal use.

[b] Column I applies to screws without heads which, when tightened, do not protrude from the hole and to other screws which cannot be tightened by means of a screwdriver with a blade wider than the root diameter of the screw.

[c] Column II applies to nuts and screws, which are tightened by means of a screwdriver.

[d] Column III applies to nuts and screws, which can be tightened by means other than a screwdriver.

Annexes

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

Annex C and Annex D of IEC 61439-1:2020 are not applicable.

Addition of Annex AA, Annex BB and Annex CC:

Annex AA
(informative)

Items subject to agreement between the DBO manufacturer and the user

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

Table AA.1 – Items subject to agreement between the DBO manufacturer and the user

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in IEC 61439-3[b]	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 of the power supply (V)	3.8.9.1, 5.2.1, 8.5.3	Local, according to installation conditions	Nominal voltage to earth ≤ 300 V AC	
Transient overvoltages	5.2.4, 8.5.3, 9.1, Annex G	Determined by the electrical system	Overvoltage category III	
Temporary overvoltages	9.1	Nominal system voltage + 1 200 V	None	
Rated frequency f_n (Hz)	3.8.12, 5.5, 8.5.3, 10.10.3.1, 10.11.5.4	According to local installation conditions	50 Hz / 60 Hz	
Additional onsite 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 conductor	10.11.5.3.5	Min. 60 % of phase values	None	
Prospective short-circuit current in the protective circuit	10.11.5.6	Min. 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 61439-1:2020	Default arrangement[a]	Options listed in IEC 61439-3[b]	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	
Protection against live parts, ingress of solid foreign bodies and water	8.2.2, 8.2.3	Indoors (enclosed): IP2XC Outdoors (min.): IP23	After removal of removable parts: As for connected position / Reduced protection to manufacturer's standard	
External mechanical impact (IK code)	8.2.1, 10.2.6	Indoors IK05 Outdoors IK07	None	
Resistance to UV radiation (applies for outdoor assemblies only unless specified otherwise)	10.2.4	Indoors: Not applicable Outdoors: Temperate climate	None	
Resistance to corrosion	10.2.2	Normal Indoor/Outdoor arrangements	None	
Ambient air temperature – Lower limit	7.1.1	Indoors: –5 °C Outdoors: –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	Indoors: 95 % at −5°C to +30 °C 70 % at +35 °C 57 % at +40 °C Outdoors: 100 % at −25 °C to +27 °C 60 % at 35 °C 46 % at 40 °C	None	

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in IEC 61439-3[b]	User requirement[c]
Pollution degree (of the installation environment)	7.1.2	2	3, 4	
Altitude	7.1.1	≤ 2 000 m	None	
EMC environment (A or B)	9.4, 10.12, Annex J	B	A or 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				
Type	3.3, 5.6	Manufacturer's standard	Various e.g. floor-standing / wall-mounted	
Stationary/Movable	3.5	Stationary	None	
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 line conductor, cross-sections, and terminations	8.8	As defined within the standard	None	
External protective, neutral, mid-point, PEL, PEM, PEN conductor cross-sections and terminations	8.8	As defined within the standard	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	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	

Characteristics	Reference clause or subclause of IEC 61439-1:2020	Default arrangement[a]	Options listed in IEC 61439-3[b]	User requirement[c]
Maintenance and upgrade capabilities				
Requirements related to accessibility in service by ordinary persons; requirement to operate devices or change components while the assembly is energized	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	
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)	3.8.10.1, 5.3, 8.4.3.2.3, 8.5.3, 8.8, 10.10.2, 10.10.3, 10.11.5, Annex E	$I_{nA} \leq 250$ A	None	
Design current I_B and nature / type of load e.g. EV, PV or alternatively, I_n of the devices and nature of the load (in such cases, the assumed loading factors as given in Table 101 can be used.)	3.8.10.8	$I_{nc} \leq 125$ A Assumed loading factor as given in Table 101	None	
Ratio of cross-section of the neutral conductor to line conductors: line conductors up to and including 16 mm^2	8.6.1	100 %	None	
Ratio of cross-section of the neutral conductor to line conductors: phase conductors above 16 mm^2	8.6.1	50 % (min. 16 mm^2)	None	

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

[b] 'None' in this column means that there are no options in IEC 61439-3 other than the default condition or value.

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

Annex BB
(informative)

Effects upon a DBO design and related ratings, instructions, etc. when used in a prosumer's electrical installation (PEI)

The effects upon a DBO design and related ratings, instructions, etc. when used in a prosumer's electrical installation (PEI) shall take account of the relevant requirements in IEC 60364-8-82, for example the installation with a local generator, photovoltaic systems, wind turbines, batteries, and potentially with energy management (e.g. load shedding equipment, monitoring device).

A non-exhaustive list of some aspects that should be considered are:

– the maximum short-circuit level (typically PEI in parallel with distribution system);

– the minimum short-circuit level (typically island mode) to achieve related disconnection times including thermal constraints for cables, busbars and shock protection. This is because the I^2t can be higher at lower fault levels; see IEC TR 61912-1. The DBO should have suitable short-circuit protection and ratings based on the information provided by the user;

– circuits potentially supplied by both sides and reverse connected; protection devices should be able to function with respect to whatever the direction of the current flow. Protection devices with line and load terminals such as a polarized circuit-breaker should not be reverse connected;

– transient overvoltages in a PEI which can be more frequent than in a usual installation (e.g. due to the switching between sources, load shedding, load shifting) and therefore requiring the use of SPDs to be evaluated.

Annex CC
(informative)

Rated current of an assembly (I_{nA})

When a generator, for example a photovoltaic system, wind turbine, battery is used as an additional source of supply in parallel and simultaneously with another source that is connected to the DBO, the DBO should be selected such that:

$$I_{nA} \geq I_n + I_{gen(s)},$$

where

I_{nA} is the rated current of the assembly;

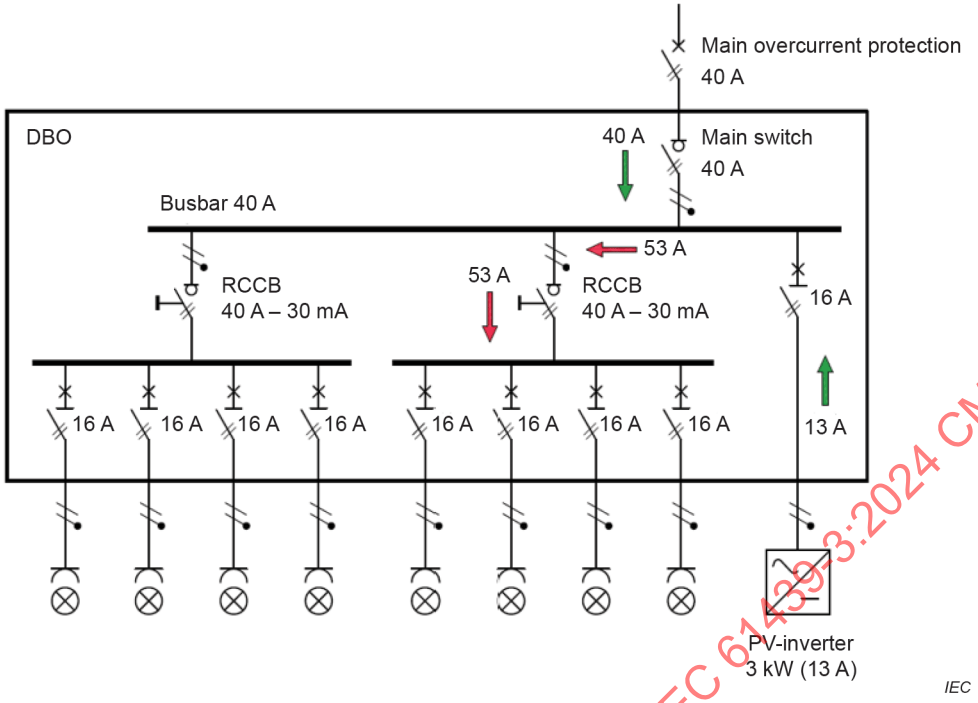
I_n is the rated current of the incoming circuit overcurrent protective device either incorporated within the DBO or upstream of it;

$I_{gen(s)}$ is the rated output current of the generating set or sets supplied through separate incoming overcurrent protective devices.

See Figure CC.1.

Alternatively, where the generating set or sets are supplied in parallel with the main incoming supply through a single overcurrent protective device within the DBO, the I_{nA} should be greater than or equal to this single overcurrent protective device and the specific arrangements shall be verified.

When a power supply is not arranged to be operated in parallel and simultaneously with other sources, for example a back-up generator connected through a transfer switch, the minimum rated current of the DBO (I_{nA}) should be the highest value of the mains power supply or generator aligned with the rated current of the incoming circuit overcurrent protective device, either incorporated within the DBO or upstream of it.



SOURCE: NPR 5310, reproduced with permission of the authors.

Figure CC.1 – Example of overloading where I_n + $I_{gen(s)}$ is greater than I_{nA}

The required I_{nA} is: I_{nA} ≥ 40 A circuit-breaker + I_{gen} 13 A therefore, I_{nA} ≥ 40 + 13 = 53 A.

Annex DD
(informative)

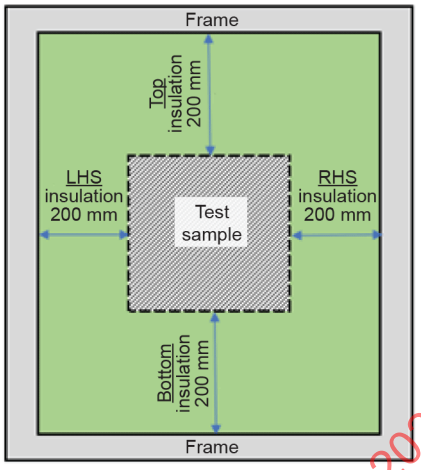
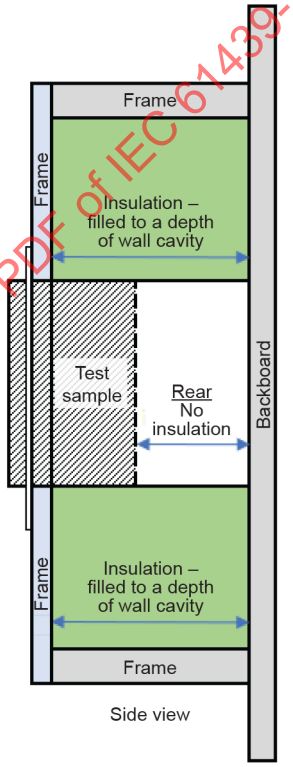
List of notes concerning certain countries

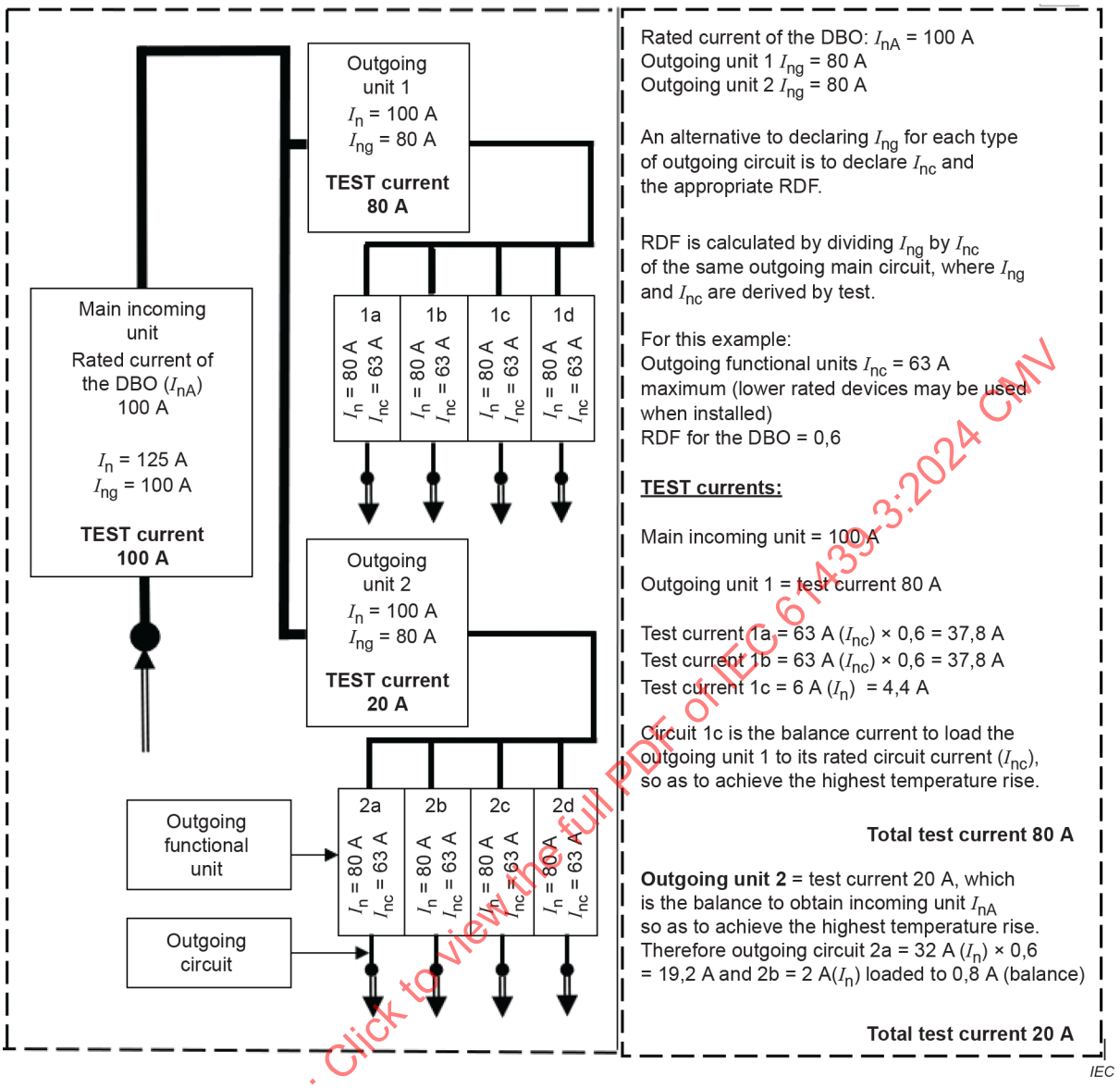
Country	Clause/Subclause	Text
IT	1	Add the following: In Italy, the standard CEI 23 51 is applicable for domestic household installations with maximum incoming unit of 125 A and rated voltage up to 440 V.
FR	1	Add the following to the end of the Scope before the note: In France, this standard does not apply to a meter board which is covered by a local network operator requirement.
GB	3.1	Add the following terms and definitions which are used in the United Kingdom: **3.1.102** **type A DBO** DBO designed for single-phase outgoing circuits only, the incoming supply possibly being single or three-phase Note 1 to entry: A type A DBO can have single-phase outgoing devices which have switched or unswitched neutral connections and may be arranged horizontally and/or vertically. Note 2 to entry: In the United Kingdom, a type A DBO used principally for domestic (household) installations and having a maximum incoming unit rating of 100 A and a maximum outgoing circuit rating of 63 A, is known as a "consumer unit". **3.1.103** **type B DBO** DBO designed for single-phase and/or poly-phase outgoing circuits, the incoming supply being poly-phase Note 1 to entry: A type B DBO can have outgoing devices which have switched or unswitched neutral connections and may be arranged horizontally and/or vertically. **3.1.104** **blank** component used for closing an opening in the external enclosure to provide basic protection **3.1.105** **consumer unit** **CU** integrated assembly, for the control and distribution of electrical energy, principally in a household or similar premise, incorporating manual means of double-pole isolation on the incoming circuit(s), with polarity observed throughout Note 1 to entry: Consumer units are designed for use exclusively with specific protective devices on the outgoing circuits, and type-tested for use when energized through a BS 88-3 fuse having an I_{cc} of 16 kA rating under the specific test arrangements according to 10.11.5.101
ZA	5.2	Add the following: In South Africa, see IEC 60038 and SANS 1019 for further details on the nominal system voltage.
GB	5.6 of IEC 61439-1:2020	Add the following item q) to 5.6: q) type A or type B DBO (see 3.1.102 and 3.1.103 which are applicable for the United Kingdom).
DE, SE	6.1	Add the following note after the first paragraph: NOTE In Germany and Sweden, 10.2.7 applies to DBOs intended for indoor installation.

Country	Clause/Subclause	Text
GB	6.2.1 of IEC 61439-1:2020	In the United Kingdom, add the following additional subclause. 6.2.1.101 Assembly outgoing unit and outgoing circuit marking Each DBO shall be marked with the I_{nc}, RDF and/or I_{ng} of each outgoing unit and each outgoing circuit/functional unit for its specific arrangement/location in the DBO. The marking can be by a single label covering various rated currents and/or RDF. Verification shall be fulfilled by: a) Where an outgoing unit and outgoing circuit/functional unit is supplied fitted in the DBO, the assembly manufacturer shall apply the relevant label to the DBO or device. b) Where an outgoing unit and outgoing circuit/functional unit is fitted in the DBO on site by the installer, the DBO manufacturer shall provide labels and instructions with the DBO so that the I_{nc}, RDF and/or I_{ng} of each outgoing unit and each outgoing circuit/functional unit can be marked by the installer on the DBO or device. For both a) and b): • The marking shall be readily visible after installation. It can be visible after a hinged/sliding cover or door is opened but not located behind covers designed to be held in place by screws or similar means.
US	8.2.1	Add the following note after the last paragraph: NOTE In the United States of America, no IK code is required as the requirements applicable to an "enclosure type" designation cover this consideration. The United States of America (USA) uses enclosure "Type" designations according to UL 50 and UL 50E. The enclosure Type designations incorporate constructional requirements as well as additional environmental requirements for conditions such as corrosion, rust, icing, oil, and coolants. For this reason, the IEC Enclosure Classification Designations IP are used with an enclosure Type designation number appropriate for these markets.

Country	Clause/Subclause	Text
GB	8.2.2	Add the following: For parts of the United Kingdom, the Building Regulations Approved Document P and Approved Document M require consumer units e.g. DBOs to be easily reached and accessible. Therefore, in the United Kingdom, a blank used for closing an opening in the external enclosure to provide basic protection, must be securely retained in position. To meet this condition the following requirements are to be verified by the following additional test: Verification of blank retention in a DBO A blank shall be securely retained in position. Conformity is verified by complying with both the push and pull tests. The blank shall be tested when fitted as in normal use. The tests shall be applied to each construction type and size of blank. Separate samples may be used for each of the tests below. **Push test** A push force of 50 N is applied by test probe 11 of IEC 61032 (rigid test finger) for 10 s without jerks in the centre of the blank. During and after the push test the blank shall remain in position and not become detached. Any apertures which are present around the blank after the test shall pass a test of IP2XC. **Pull test using IEC 60335-1:2020, Figure 7 test fingernail** a) The test fingernail tip is located at the centre of the shortest side of the blank and applied with a force of 10 N. If the fingernail tip does not engage under the edge of the blank at any angle, the pull test below is not required. The test fingernail is then pulled for 10 s without jerks, by means of the loop (eyelet), with a force of 30 N in the direction of removal. b) The test fingernail tip is located at the centre of the longest side of the blank and applied with a force of 10 N. If the fingernail tip does not engage under the edge of the blank at any angle, the pull test below is not required. The test fingernail is then pulled for 10 s without jerks, by means of the loop (eyelet), with a force of 30 N in the direction of removal. During and after the pull test the blank shall remain in position and not become detached. Any apertures which are present around the blank after the test shall pass a test of IP2XC.
NO	8.5.3	Add the following: In Norway, the alternative of labelling protective devices that re-closing shall only be carried out by skilled or instructed persons shall not be applied. Add the following note after the last paragraph: NOTE In Norway, protective devices in outgoing circuits used for wiring protection in building shall comply with IEC 60898-1, IEC 61008, IEC 61009, IEC 60269-3 or IEC 60947-2 as long as the requirements in IEC 60898-1 or IEC 61009 are met for all tests except the test for time-current characteristic B, C and D as specified in IEC 60898-1:2002, 9.10.1 or IEC 61009-1:2010, 9.9.2.1.
NL	8.5.3	Add the following: In the Netherlands, it is allowed to install a socket outlet in accordance with IEC 60884-1 (NEN 1020) in the DBO without shutters, in such a way that the minimum degree of protection (IP2XC) is not met only at the location of the holes where the plug-pins are inserted to establish the electrical contact. The verification test report that is published shall record the presence of the socket outlet and exception to the requirement in the paragraph of the degree of protection (IP) test.

Country	Clause/Subclause	Text
GB	8.6.1	Add the following note after the last paragraph: NOTE In the United Kingdom, the UK Electricity, Safety and Quality Regulations S.I. 2002 No. 2965 require electricity suppliers to state the maximum prospective short-circuit current at the supply terminals. In the United Kingdom, the maximum prospective short-circuit current at the supply terminals of household and similar electrical installations declared by the supply authority in accordance with the Electricity Association Publication P 25 is 16 kA for single-phase supplies up to and including 100 A.
ZA	8.8	Add the following: In South Africa, conductor colour coding is covered in SANS 10142-1.
AT	8.8	Add the following: In Austria, terminals, or components to connect neutral conductors of more than one outgoing circuit must consist of independent terminations for every single circuit to be able to disconnect single circuits independently from others.
US	8.8	Add the following note after the last paragraph: NOTE In the United States of America, the neutral conductor is identified by the colour white and the protective earth conductor may be either green/yellow or solid green.
GB	10.10.1 of IEC 61439-1:2020	In the United Kingdom, building regulations require thermal insulation and/or sound proofing material which influences the temperature rise verification, therefore, replace the second paragraph of 10.10.1 of IEC 61439-1:2020 with the following: Verification of DBOs: a) Surface mounting shall be made with one or more of the following in IEC 61439-1:2020: testing (10.10.2), comparison with a reference design (10.10.3), or assessment (calculation) (10.10.4). b) Flush mounting in hollow walls shall be made with one or more of the following: testing (10.10.2) or comparison with a reference design (10.10.3). The hollow wall test(s) shall be made in a test wall with a width of 200 mm ± 10 mm of thermal insulation in contact with the top, bottom and both sides of the DBO filled to the depth of the wall cavity. The maximum thermal conductivity of the thermal insulation shall be 0,044 W/mK. The rear of the DBO is not required to have any thermal insulation other than air or the typical finishing material of the mounting wall. The DBO manufacturer's instructions supplied with the DBO shall specify for flush mounting arrangements the location of the thermal insulation. c) Suitability for flush mounting in solid walls e.g. brick, stone, concrete is covered by testing in accordance with b) above. All temperature rise tests shall be applied with holes for both test cable entries and spare entries closed or sealed. Annex L of IEC 61439-1:2020 provides guidance on the verification of temperature rise. Flush mounting hollow wall test arrangements are as follows: Test wall with a width of 200 mm ± 10 mm of thermal insulation in contact with the top, bottom and both sides of the DBO.

Country	Clause/Subclause	Text
		 Front view  Side view IEC
GB	10.10.2.3.6	Add the following to the second paragraph: In the United Kingdom, for an example considering a complete split-load DBO, see Figure DD.1.



Functional unit	Main incoming unit	1	1a	1b	1c	1d	2	2a	2b	2c	2d
Rating of the device, I_n	125 A	100 A	80 A	80 A	6 A	0	100 A	32 A	2 A	NA	NA
Functional unit rated current, I_{nc}	NA	NA	63 A	63 A	63 A	0	NA	63 A	63 A	NA	NA
RDF	NA	NA	0,6	0,6	NA	0	NA	0,6	0,6	NA	NA
Group rated current I_{ng} and test current	100 A	80 A	37,8 A	37,8 A	4,4 A*	0	20 A*	19,2 A*	0,8 A*	0	0
* Test current balance not I_{ng}.											

NOTE 1 This Figure DD.1 is one example where the DBO is loaded to its rated current (I_{nA}). More tests in different configurations may be required.

NOTE 2 The 80 A outgoing units shown are an example of I_{nc} ratings as a means of verification of temperature rise under normal operation of the outgoing unit at the rated current assigned by the manufacturer. The I_{nc} ratings are not restricted to 80 A.

NOTE 3 In DBOs, where the total of the rated currents of the outgoing circuits operating at rated diversity factor, exceeds the capacity of the incoming circuit, the diversity factor applies to any combination of outgoing circuits used to distribute the incoming current.

In this Figure DD.1, 1a to 1d, each 63 A = (63 × 4) × 0,6 = 151,2 A, which exceeds the capacity of the 100 A incoming circuit.

Therefore, in this example, outgoing circuits are loaded to the I_{ng} of outgoing unit 1 i.e. 80 A, with outgoing unit 2 loaded to the balance of the incoming circuit i.e. 20 A.

NOTE 4 The rated current of a functional unit (the circuit) is the value of current declared by the assembly manufacturer, which may be equal to, or lower than the rated current of the device according to the respective device standard.

NOTE 5 The following overload requirements could influence the I_{nc} of the switch and RCCB assigned by the assembly manufacturer.

Switches and RCCBs should be protected against overload. When using an overcurrent protective device (OCPD) for the overload protection, the OCPD is typically installed upstream of the switch and RCCB in the service/supply cut-out.

Overload coordination can be achieved when the switch/RCCB I_{nc} is greater than or equal to the upstream OCPD rated current (I_n). Overload protection cannot solely be based on the use of diversity factors of the downstream circuits.

BS 7671 requires the electrical installation designer to arrange the circuits in the installation so that they are appropriately divided across the RCCBs to minimize unwanted operation and inconvenience.

Figure DD.1 – Example of temperature rise verification by test of a complete split-load DBO as in 10.10.2.3.6

Country	Clause/Subclause	Text
GB	10.11.5 of IEC 61439-1:2020	Add the following additional paragraph: In the United Kingdom, a DBO designated as a consumer unit shall have an I_{cc} of 16 kA verified by test to additional subclause 10.11.5.101.
GB	10.11.5 of IEC 61439-1:2020	The UK Electricity, Safety and Quality Regulations S.I. 2002 No. 2965 require electricity suppliers to state the maximum prospective short-circuit current at the supply terminals. This information is given in Electricity Association publication P25. To meet this condition the following requirements are to be incorporated and also aligned with BS 7671 combined short-circuit protection and back-up protection: Add the following Subclause 10.11.5.101: 10.11.5.101 16 kA combined short-circuit and back-up protection verification 10.11.5.101.1 General Verification of the CU I_{cc} 16 kA rating using combined short-circuit protection and back-up protection as defined in BS 7671. Co-ordination, in short-circuit conditions of two OCPDs in series, using an upstream BS 88-3 fuse (formerly BS 1361) and an outgoing OCPD in the CU to achieve a higher capability than the CU OCPD alone and providing back-up protection to devices such as a switch or RCCB. This verifies the performance of the incoming device and its connections, and any other item in the CU not separately rated in excess of 16 kA, verifying the complete CU with a conditional rating I_{cc} of 16 kA. The following test(s) are applied to a CU as covered by the definition in 3.1.104. 10.11.5.101.2 Test arrangements The CU shall be set up as in normal use. It will be sufficient to test a single functional unit if the remaining functional units are constructed in the same way and cannot affect the test result. 10.11.5.101.3 Short-circuit test procedure a) It shall be verified that the representative samples of the final circuit protective devices used for the test comply with Table DD.1 and Table DD.2 where applicable.

Country	Clause/Subclause	Text
		b) The reference fuse shall be a 100 A fuse-link complying with type II of BS 88-3. Details of the fuse-links used for the test, i.e. manufacturer's name, reference, rated current, rated voltage and pre-arcing (I^2t), shall be given in the test report. Where BS 1361 type II fuse-links are available for test/certification purposes, they may be used in place of BS 88-3 fuse-links as key performance characteristics are identical. This test using a 100 A fuse-link is deemed to cover 60 A and 80 A ratings. c) The final circuit protective device shall be mounted as in service in the manufacturer's smallest recommended enclosure (metal if offered in the catalogue). The connection on the load side of the protective device under test shall be in accordance with Table DD.3 and 0,6 m ± 0,05 m in length. d) The test circuit shall be connected as shown in Figure DD.3. The relative positions of the closing switch, inductive reactor and resistor are not obligatory, but the inductive reactor and resistor shall be in series with the master circuit-breaker. e) The impedance used for limiting the prospective short-circuit fault current to the required value shall be inserted on the supply side of the circuit. Resistors shall be connected between line and neutral, after the impedances for adjusting the prospective current, so as to draw current of 10 A per phase at rated voltage from the supply. If an air-cored inductor is used, a resistor taking approximately 1 % of the current through the inductor shall be connected in parallel with it. A lower value of shunt current may be used with the consent of the manufacturer.

Table DD.1 – Requirements for final circuit protective devices: Circuit-breakers complying with BS EN 60898 and RCBOs complying with BS EN 61009

Circuit-breaker or RCBO type	Time h	Test current in multiples of rated current (I_n)	Result
B, C, D	1	1,13	No trip
	1[a]	1,45	Trip

NOTE Test to be conducted at specified reference ambient temperature.

[a] This test shall commence within 5 s of the end of the test at 1,13 I_n.

Table DD.2 – Requirements for final circuit protective devices: Semi-enclosed fuses complying with BS 3036 and cartridge fuses complying with BS 88.3

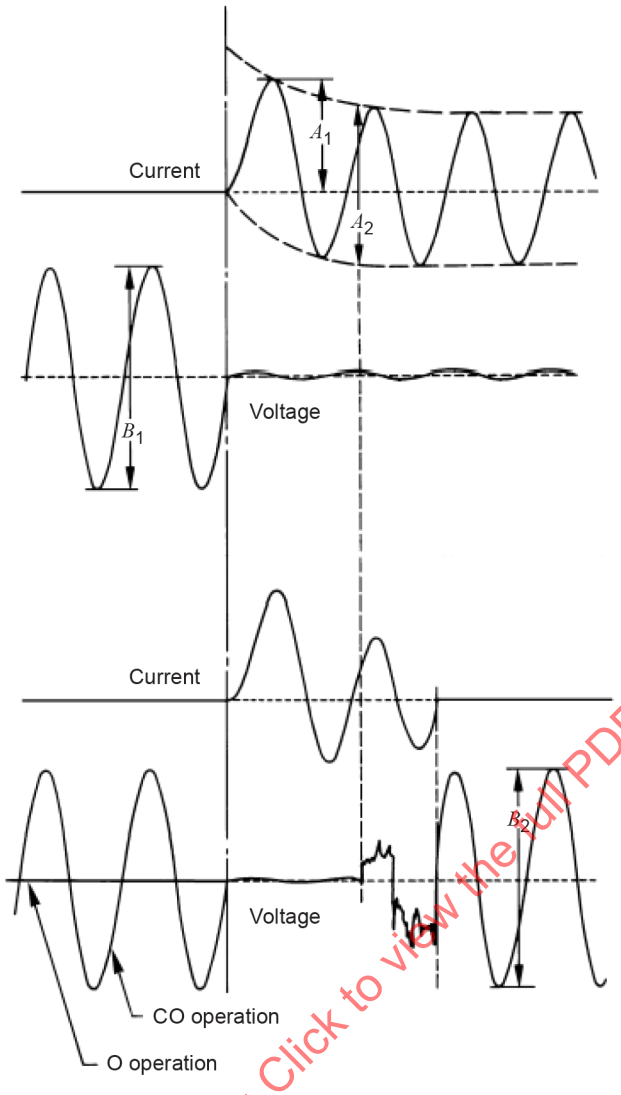
Test current A	Time h	Test current in multiples of rated current (I_n)	Result
5(6)	0,75	1,0	Fuse intact
15(16)	1		
20	1		
30(32)	1,25		
45	1,5		
5(6)	0,75	2.0	Fuse melted
15(16)	1		
20	1		
30(32)	1,25		
45	1,5		
Where BS 1361 fuse-links are available for test/certification purposes, they may be used in place of BS 88-3 fuse-links as key performance characteristics are identical.			

Table DD.3 – Cross-sections of copper conductors on load side of protective device under test

Device rating		Conductor
A		mm^2
	≤ 6	1,0
> 6	≤ 10	1,5
> 10	≤20	2,5
> 20	≤ 32	6,0
> 32	≤ 50	10,0
> 50	≤ 63	16,0

Country	Clause/Subclause	Text
		10.11.5.101.4 Circuit conditions The applied voltage shall be that which is necessary to produce the necessary power frequency recovery voltage. The value of the power frequency voltage shall be equal to 110 % (0, −5 %) of the rated recovery voltage of the CU. The voltage on the supply side shall be measured during the first complete cycle after arc extinction and after all high frequency phenomena have subsided. NOTE The value of 110 % (0, −5 %) of the rated voltage is deemed to cover the variations of system supply voltage under normal service conditions. The upper limit may be increased with the approval of the manufacturer. The value of the prospective short-circuit current shall be 16 kA −0 % + 5 % at a power factor of 0,6 ± 0,05 determined from a calibration oscillogram taken with a link of negligible impedance positioned as shown in Figure DD.3. All parts of the equipment normally earthed in service, including its enclosure, shall be insulated from earth, but shall be connected to the neutral of the supply or to a substantially inductive artificial neutral, permitting a prospective fault current of at least 100 A. This connection shall include a reliable device, such as a fuse consisting of a copper wire of 0,1 mm diameter and not less than 50 mm in length for the detection of the fault current and, if necessary, a resistor to limit the value of the prospective fault current to approximately 100 A.

Country	Clause/Subclause	Text



a) = *Calibration of circuit*

A_1 = Prospective peak making current

$\frac{A_2}{2\sqrt{2}}$ = Prospective symmetrical breaking current (RMS value)

$\frac{B_1}{2\sqrt{2}}$ = Applied voltage (RMS value)

b) = O or CO operation

$\frac{A_2}{2\sqrt{2}}$ = Breaking capacity (RMS value)

A_1 = Making capacity (RMS value)

$\frac{B_2}{2\sqrt{2}}$ = Recovery voltage (RMS value)

NOTE The amplitude of the voltage trace, after initiation of the test current, varies according to the relative positions of the closing device, the adjustable impedances, and the voltage sensing devices, and according to the test diagram.

IEC

Figure DD.2 – Calibration of the test circuit

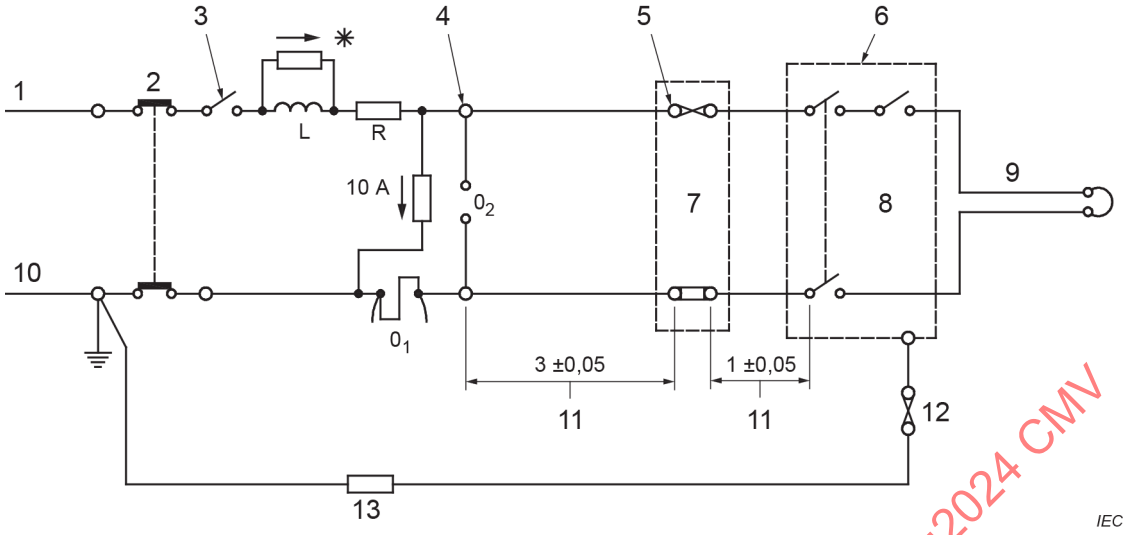
		10.11.5.101.5 Test sequence The CU shall be subject to the following tests A and B with the outgoing way fitted with a final circuit protective device of the maximum thermal current rating. If the final circuit protective devices have a short-circuit rating less than 16 kA, further tests A and B shall be carried out with a device of the minimum thermal rating fitted. In addition, if the CU is designed to accept different types or ranges of outgoing devices, each type or range shall be further tested separately.

Country	Clause/Subclause	Text
		The tests are as follows: a) Test A1. With the circuit connected as described above, with the service cut-out fuse in place and a new outgoing fuse, cartridge or fuse wire, installed, the test voltage is applied with the point on wave controlled to provide initiation of the fault at between 0° and 20° (electrical) on the rising voltage wave. b) Test A2. With the circuit connected as described above, with the service cut-out fuse in place and all circuit breakers closed, the test voltage is applied with the point on wave controlled to provide initiation of the fault at between 55° and 65° (electrical) on the rising voltage wave. c) Test B. A further short-circuit operation shall be applied after suitable preparation as indicated in Table DD.4 dependent on which of the alternative results of test A1 is achieved. If circuit-breakers are included in the CU, the test shall be applied by reclosing the circuit-breaker with the test circuit energized. If fuses are used, the test shall be as in Test A1. During the tests a cheesecloth shall be placed on the outside of the enclosure at all openings, e.g. arc vents and handles. There shall be no ignition of the cheesecloth. The cheesecloth shall be clean and dry bleached plain cotton of approximately 30 g to 40 g per square metre. When placed into position the cheesecloth shall be folded loosely in such a manner that cut and torn edges will not be exposed directly to the arc or flash. Ignition of the cheesecloth is considered to have occurred when a flame is visible. Smouldering is not considered to be evidence of ignition. The cheesecloth may be changed following each Test B. Details of the I^2t let through by the combination of devices during the test shall be given in the test report. A new CU of the same design may be used for each of the two test sequences. An alternative to cheesecloth is to use clear polyethylene foil placed in front of the circuit-breaker for Test A2 only. The polyethylene foil shall show no holes visible with normal or corrected vision without additional magnification. The clear polyethylene foil shall be 200 mm × 200 mm reasonably stretched in a frame, placed 10 mm from the front of the circuit-breaker. The foil should have the following physical properties: • Thickness (0,05 ± 0,01) mm • Density at 23 °C (0,92 ± 0,05) g/m^3 • Melting point (110 to 120) °C

Table DD.4 – Preparation for Test B

		Result of Test A1 or Test A2		
Reference fuse complying with BS 88-3 (formerly BS 1361)		Intact	Blown	
Protective device in the CU		Operated		Not operated
Final circuit preparation for Test B	Circuit-breaker complying with BS EN 60898 or RCBO complying with BS EN 61009	No action (circuit breaker or RCBO ready for Test B closing test)	Replace reference fuse	Replace reference fuse, open circuit breaker or RCBO
	Fuse complying with BS 3036	Rewire test fuse	Replace reference fuse Rewire test fuse	Replace reference fuse
	Fuse complying with BS 88-3 (formerly BS 1361)	Replace test fuse	No action	No action

Country	Clause/Subclause	Text
		10.11.5.101.6 Conditions after test Where the incoming switch is a protective device, the test report shall state which of the protective devices operated during the test, i.e. the incoming and/or outgoing devices. The earth fault indicating device shall be intact and the degree of protection of the enclosure shall not be impaired. The insulation resistance a) shall be measured within 3 min of the conclusion of the series of tests. The insulation resistance for b) and c) shall be measured as soon as practical after measurement of a), the times of measurement of b) and c) being recorded in the test report. The values shall be measured at 500 V DC and shall not be less than the following: a) 0,10 MΩ between the final circuit protective device incoming terminal and the corresponding outgoing terminal, with the isolating device open and with the blown fuse in position or the circuit-breaker or RCBO opened, whichever is applicable. b) 0,25 MΩ between the final circuit protective device terminals and earth, with the final circuit fuse rewired, the final circuit cartridge fuse replaced, or the circuit-breaker or RCBO reclosed, whichever is applicable, and with the incoming isolating device open. c) 0,25 MΩ between the final circuit protective device incoming terminals and any other metal parts which are unearthed and exposed in service. The condition of the incoming isolating device shall comply with its product specification with regard to isolating properties. The conductors shall not be deformed such that the clearance and creepage distances specified in 8.3 of IEC 61439-1:2020 are impaired. There shall be no loosening of parts used for the connection of the conductors. Where an RCCB/RCBO is included in the CU its operation shall be checked. With the RCCB/RCBO closed and connected to a supply at 0,85 times the rated voltage ± 5 % the test device shall be operated. The RCCB/RCBO shall open.



Key

1	line conductor
2	circuit breaker
3	closing switch
4	calibration point
5	100 A Fuse-link complying with type II of BS88.3 or BS 1361
6	consumer unit (metalclad, if applicable (see 10.11.5.101.3))
7	house service cut-out
8	device under test
9	0,6 m of twin cable (see Table DD.3)
10	neutral conductor
11	25 mm^2 copper cable
12	fine wire fuse 0,1 mm in diameter and at least 50 mm long tinned copper wire
13	resistor to limit earth fault current to 100 A
*	shunt resistor
o_1,o_2	oscillograph connections

Figure DD.3 – Test circuit to prove coordination of characteristics

Bibliography

The bibliography of IEC 61439-1:2020 is applicable in addition to the following:

Addition:

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems Part 1: Principles, requirements and tests*

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 61009-1:2010, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*

NPR 5310: Netherlands interpretation guide for NEN 1010

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SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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ENSEMBLES D'APPAREILLAGE À BASSE TENSION –

Partie 3: Tableaux de répartition destinés à être utilisés par des personnes ordinaires (DBO)

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L'IEC 61439-3 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. Il s'agit d'une Norme internationale.

Cette seconde édition annule et remplace la première édition parue en 2012. Cette édition constitue une révision technique.

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

a) alignement sur la structure de l'IEC 61439-1:2020;
b) inclusion dans le domaine d'application de plus d'exemples de types de dispositifs de protection et de commande;
c) suppression des DBO de type A et de type B;
d) ajout d'une nouvelle Annexe BB relative aux DBO utilisés dans une installation électrique de prosommateur (PEI);
e) ajout d'une nouvelle Annexe CC relative au courant assigné d'un DBO avec une source d'alimentation supplémentaire parallèlement/simultanément avec une autre source reliée au DBO, par exemple un panneau photovoltaïque (PV).

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

Projet	Rapport de vote
121B/193/FDIS	121B/195/RVD

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.

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.

Le présent document doit être lu conjointement avec l'IEC 61439-1:2020. Les dispositions des règles générales traitées dans l'IEC 61439-1 s'appliquent uniquement au présent document dans la mesure où 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 un suffixe 101 (102, 103, etc.) sont ajoutés au même paragraphe de l'IEC 61439-1:2020.

Les nouveaux tableaux et figures du présent document sont numérotés à partir de 101.

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

L'attention du lecteur est attirée sur le fait que l'Annexe DD 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.

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

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ENSEMBLES D'APPAREILLAGE À BASSE TENSION –

Partie 3: Tableaux de répartition destinés à être utilisés par des personnes ordinaires (DBO)

1 Domaine d'application

La présente partie de l'IEC 61439 définit les exigences spécifiques pour les tableaux de répartition destinés à être utilisés par des personnes ordinaires (abrégés DBO dans l'ensemble du présent document, voir 3.1.101) ci-après:

– ensembles destinés à être utilisés par des personnes ordinaires (par exemple, pour manœuvrer des appareils de commande et remplacer des éléments de fusible), par exemple dans des applications domestiques;

– ensembles qui contiennent des circuits de départ avec des dispositifs de protection, destinés à être utilisés par des personnes ordinaires, qui satisfont par exemple à l'IEC 60898-1, à la série IEC 61008, à la série IEC 61009, à l'IEC 62606, à l'IEC 62423 et à l'IEC 60269-3;

– ensembles destinés à des applications pour lesquelles la tension nominale à la terre ne dépasse pas 300 V en courant alternatif (voir Tableau G.1 de l'IEC 61439-1:2020);

NOTE Les limites de tension pour les applications en courant continu sont à l'étude.

– ensembles dans lesquels le courant assigné (I_{nc}) des circuits de départ est inférieur ou égal à 125 A et dont le courant assigné (I_{nA}) est inférieur ou égal à 250 A;

– ensembles destinés à être utilisés avec des équipements conçus pour la production, le transport, la distribution et la conversion de l'énergie électrique, la commande des matériels qui consomment de l'énergie électrique et le traitement des données associées;

– ensembles fixes sous enveloppe;

– ensembles pour utilisation en intérieure ou en extérieur.

Les DBO peuvent contenir des dispositifs de protection, des dispositifs de commande, des dispositifs de signalisation seuls ou une combinaison de dispositifs, par exemple, disjoncteurs, relais de délestage, dispositifs de gestion de l'énergie et de communication, commandes d'éclairage.

Le présent document ne s'applique pas aux enveloppes vides ni aux dispositifs individuels ou composants autonomes tels que les disjoncteurs, interrupteurs à fusibles, matériels électroniques, qui satisfont aux normes de produits pertinentes. Il décrit l'intégration de dispositifs ou de composants autonomes, ou les deux, dans un DBO ou dans une enveloppe vide qui constitue un DBO.

Le présent document s'applique aux DBO qu'ils soient conçus, fabriqués et vérifiés individuellement ou qu'ils soient complètement normalisés et fabriqués en masse.

Le présent document ne s'applique pas aux types d'ensembles spécifiques couverts par d'autres parties de la série IEC 61439.

NOTE Les enveloppes pour appareillages électriques pour installations électriques fixes domestiques et analogues sont traitées 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 ajouts suivants.

Addition:

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

IEC 60269-3, *Fusibles basse tension – Partie 3: Exigences supplémentaires pour les fusibles destinés à être utilisés par des personnes non qualifiées (fusibles pour usages essentiellement domestiques et analogues) – Exemples de systèmes de fusibles normalisés A à F*

IEC 60364-8-82, *Installations électriques à basse tension – Partie 8-82: Aspects fonctionnels – Installations électriques à basse tension du prosommateur*

IEC 60898-1, *Petit appareillage électrique – Disjoncteurs pour la protection contre les surintensités pour installations domestiques et analogues – Partie 1: Disjoncteurs pour le fonctionnement en courant alternatif*

IEC 60669-2-4, *Interrupteurs pour installations électriques fixes domestiques et analogues – Parte 2-4: Prescriptions particulières – Interrupteurs-sectionneurs*

IEC 60947-3, *Appareillage à basse tension – Partie 3: Interrupteurs, sectionneurs, interrupteurs-sectionneurs et combinés-fusibles*

IEC 61008 (toutes les parties), *Interrupteurs automatiques à courant différentiel résiduel sans dispositif de protection contre les surintensités incorporé pour usages domestiques et analogues (ID)*

IEC 61009 (toutes les parties), *Interrupteurs automatiques à courant différentiel résiduel avec dispositif de protection contre les surintensités incorporé pour usages domestiques et analogues (DD)*

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

IEC 62423:2009, *Interrupteurs automatiques à courant différentiel résiduel de type B et de type F avec et sans protection contre les surintensités incorporée pour usages domestiques et analogues*

IEC 62262, *Degrés de protection procurés par les enveloppes de matériels électriques contre les impacts mécaniques externes (code IK)*

IEC 62606, *Exigences générales des dispositifs pour la détection de défaut d'arcs*

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

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

3.1 Termes généraux

Termes et définitions supplémentaires:

3.1.101
tableau de répartition destiné à être utilisé par des personnes ordinaires
DBO
ensemble utilisé afin de distribuer et contrôler l'énergie électrique pour tous les types d'alimentations et de charges électriques, destiné à être utilisé par des personnes ordinaires

Note 1 à l'article: Pour l'utilisation par des personnes ordinaires, voir 8.4.6.1 de l'IEC 61439-1:2020.

Note 2 à l'article: La manœuvre d'appareils de commande et le remplacement d'éléments de fusible sont des exemples d'opérations prévues pour être exécutées par des personnes ordinaires.

Note 3 à l'article: La définition 3.1.101 n'exclut pas l'utilisation du DBO par des personnes qualifiées ou averties, notamment dans des installations non domestiques.

Note 4 à l'article: Les DBO peuvent être assemblés en dehors de l'usine du constructeur d'origine. Les DBO peuvent être assemblés par le constructeur d'origine ou par un constructeur d'ensembles.

Note 5 à l'article: L'abréviation "DBO" est dérivée du terme anglais développé correspondant "distribution board intended to be operated by ordinary persons".

4 Symboles et abréviations

L'Article 4 de l'IEC 61439-1:2020 s'applique.

5 Caractéristiques d'interface

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

5.1 Généralités

Addition:

Cet objectif peut être atteint de deux manières: soit l'utilisateur choisit dans le catalogue un produit dont les caractéristiques satisfont aux besoins exigés, soit il conclut un accord particulier avec le constructeur.

Dans les deux cas, la liste de spécifications selon l'Annexe AA a pour objet d'aider l'utilisateur à fournir l'ensemble des données nécessaires à spécifier et d'aider le constructeur à fournir les caractéristiques réelles du DBO. Dans certains cas, les informations déclarées par le constructeur du DBO peuvent se substituer à un accord.

5.2.4 Tension assignée de tenue aux chocs (U_{imp}) (de l'ensemble)

Remplacement:

La tension assignée de tenue aux chocs de l'ensemble doit être supérieure ou égale aux valeurs fixées pour les surtensions transitoires qui apparaissent dans le ou les systèmes électriques auxquels le circuit est destiné à être connecté.

Les DBO doivent au minimum satisfaire à la catégorie de surtension III (voir l'IEC 60364-4-44) conformément au Tableau G.1 de l'IEC 61439-1:2020.

5.3.1 Courant assigné d'un ensemble (I_{nA})

Addition:

Lorsqu'un générateur (par exemple, système photovoltaïque, éolienne ou batterie) est utilisé comme source d'alimentation supplémentaire parallèlement avec une autre source reliée au DBO, voir l'Annexe CC.

5.4 Facteur de diversité assigné (RDF)

Addition:

En l'absence d'un accord entre le constructeur de DBO et l'utilisateur concernant les courants de charge réels, le type de charge et la charge présumée des circuits de départ du DBO ou du groupe de circuits de départ peuvent être fondés sur les valeurs du Tableau 101.

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 présumé du Tableau 101.

NOTE 101 Le courant assigné I_n d'un dispositif de protection est défini dans la norme de produit correspondante.

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

Ajout au premier alinéa:

L'essai du 10.2.7.1 s'applique uniquement aux DBO destinés à une installation extérieure.

Ajout du nouveau point suivant:

h) degré de protection, si celui-ci est supérieur à IP2XC.

6.2.2 Instructions de manutention, d'installation, d'exploitation et de maintenance

Ajout au premier alinéa:

Le constructeur d'origine ou le constructeur de l'ensemble doit indiquer dans sa documentation toute vérification individuelle de série qu'il est nécessaire que l'installateur effectue afin que le DBO soit conforme à l'IEC 61439-3.

6.3 Identification des appareils et/ou des composants

Addition:

Pour les dispositifs à courant différentiel résiduel (DDR) qui alimentent plusieurs circuits terminaux, les personnes ordinaires doivent pouvoir identifier les circuits de départ alimentés par le DDR, lorsque le DDR est adjacent au groupe de circuits de départ qu'il alimente ou au moyen d'étiquettes que l'installateur applique sur le DBO après l'installation, par exemple. Les moyens d'identification doivent être visibles sans accéder aux parties actives.

7 Conditions d'emploi

L'Article 7 de l'IEC 61439-1:2020 s'applique, avec les exceptions suivantes.

7.1.2 Degré de pollution

Addition:

Un degré de pollution 2, au minimum, s'applique.

7.2 Conditions spéciales d'emploi

Addition:

NOTE 101 Les incidences sur la conception et les caractéristiques assignées d'un DBO, les instructions, etc. lorsque le DBO est utilisé dans une installation électrique de prosommateur (PEI, *Prosumer's Electrical Installation*) doivent tenir compte des exigences applicables spécifiées dans l'IEC 60364-8-82. Voir Annexe BB.

8 Exigences de construction

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

8.1.3.2.2 Résistance des matériaux isolants à la chaleur normale

Addition:

NOTE 101 Le présent 8.1.3.2.2 s'applique également aux couvercles et enveloppes fabriqués en matériaux isolants.

8.2.1 Protection contre les impacts mécaniques (code IK)

Remplacement:

Le DBO doit être conforme aux codes IK suivants, conformément à l'IEC 62262:

– IK05 pour un DBO pour utilisation en intérieur;
– IK07 pour un DBO pour utilisation en extérieur.

La conformité doit être vérifiée conformément au 10.2.6.

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

Remplacement du deuxième alinéa:

Le degré de protection d'un DBO doit être au moins égal à IP2XC, après installation conformément aux instructions du constructeur du DBO.

Le degré de protection IP2XC doit être maintenu lors de la manœuvre des dispositifs, par exemple lors de la manœuvre des boutons d'essai en usage normal. Le degré de protection peut être temporairement réduit lorsqu'une norme de produit l'autorise pour une utilisation par des personnes ordinaires ou non qualifiées, par exemple l'IEC 60269-3 pour le changement d'un élément de remplacement.

NOTE 101 Un DBO peut avoir plusieurs classifications IP, par exemple IP2XC porte ouverte et IP3X porte fermée ou IPXXD avec des orifices de vidange.

Les 5e et 6e alinéas ainsi que les exemples associés de l'IEC 61439-1 ne s'appliquent pas au présent document.

8.4.2.3 Barrières ou enveloppes

Remplacement du premier alinéa:

Les parties actives nues doivent être contenues à l'intérieur d'enveloppes ou derrière des barrières. Les enveloppes ou les barrières doivent procurer un degré de protection au moins équivalent à IPXXC.

8.5.3 Choix des appareils de connexion et des composants

Addition:

Lorsqu'un interrupteur-sectionneur, un disjoncteur sans protection contre les surintensités ou un interrupteur d'isolement est intégré au DBO, il doit être conforme à l'IEC 60947-3, à l'IEC 60947-2 ou à l'IEC 60669-2-4, selon les caractéristiques assignées du DBO.

Les circuits de départ doivent contenir des dispositifs de protection, destinés à être utilisés par des personnes ordinaires, qui satisfont par exemple à l'IEC 60898-1, à la série IEC 61008, à la série IEC 61009, à l'IEC 62423, à l'IEC 62606 et à l'IEC 60269-3.

Si un dispositif de protection d'entrée intégré au DBO non conforme à une norme de produit est destiné à être utilisé par des personnes ordinaires, une clé ou un outil doit être exigé pour effectuer la refermeture après un déclenchement et réaliser le changement d'un élément de remplacement. Une étiquette qui indique que la refermeture du dispositif déclenché et le changement d'un élément de remplacement ne doivent être réalisés que par une personne avertie ou qualifiée doit être apposée à proximité du dispositif de protection d'entrée.

Les disjoncteurs doivent être conçus ou installés de telle sorte qu'il ne soit pas possible de modifier leurs réglages ou leur étalonnage sans une action volontaire nécessitant l'utilisation d'une clé ou d'un outil.

NOTE 101 Ces exigences témoignent du fait que les normes de produits des dispositifs de protection pour personnes ordinaires sont limitées à un courant assigné maximal de 125 A. Les locaux domestiques peuvent exiger des alimentations électriques supérieures à 125 A et l'utilisation de DBO; par conséquent, ces installations particulières sont comprises dans le domaine d'application de l'IEC 61439-3.

8.6.1 Circuits principaux

Remplacement du deuxième alinéa:

Chacun des conducteurs entre l'unité d'arrivée et l'unité de départ, ainsi que les composants de celles-ci, peuvent être conçus en fonction des contraintes réduites de court-circuit qui surviennent en aval de chacun des dispositifs de protection contre les courts-circuits, sous réserve que la disposition des conducteurs ne soit pas susceptible d'engendrer un court-circuit interne entre parties actives et entre parties actives et terre, comme cela est exigé en 8.6.4 et dans le Tableau 4 de l'IEC 61439-1:2020.

8.8 Bornes pour câbles externes

Addition:

Lorsqu'un dispositif ou un composant d'un circuit de départ ne contient pas de borne neutre, le nombre de bornes neutres d'un DBO ne doit pas être inférieur à une borne de départ pour chaque circuit de départ qui nécessite une borne neutre. Ces bornes doivent être situées ou identifiées dans le même ordre que leurs conducteurs de phase respectifs.

Le nombre maximal de conducteurs de neutre qu'il est admis de relier à la borne de neutre de chaque dispositif ou composant doit être indiqué dans les instructions du constructeur.

Les DBO doivent comporter au minimum deux bornes pour les conducteurs de liaison de protection de l'installation électrique.

9 Exigences relatives aux performances

L'Article 9 de l'IEC 61439-1:2020 s'applique, avec l'exception suivante.

9.1.1 Généralités

Addition:

NOTE L'IEC 60664-1:2020 contient les exigences relatives à l'isolation supplémentaire et l'isolation renforcée (Classe II).

10 Vérification de la conception

L'Article 10 de l'IEC 61439-1:2020 s'applique, avec les exceptions suivantes.

10.2.2.2 Essai de sévérité A

Addition:

L'essai suivant est une variante.

Toute la graisse est éliminée des parties ou des échantillons représentatifs des enveloppes d'acier du DBO à soumettre aux essais, par immersion dans un dégraissant chimique à froid tel que du chlorure de méthyle ou de l'essence raffinée pendant 10 min. Les parties sont ensuite immergées pendant 10 min dans une solution à 10 % de chlorure d'ammonium dans l'eau à une température de (20 ± 5) °C.

Sans séchage, mais après avoir secoué les éventuelles gouttes, les parties sont placées pendant 10 min dans une atmosphère saturée d'humidité à une température de (20 ± 5) °C.

Après avoir été séchées pendant 10 min dans une étuve à une température de (100 ± 5) °C et laissées à température ambiante pendant 24 h, les pièces ne doivent présenter aucune trace d'oxydation de fer sur leurs surfaces.

Les traces d'oxyde de fer sur les arêtes vives ou un voile jaunâtre qui disparaît par simple frottement ne sont pas pris en considération.

Pour les petits ressorts hélicoïdaux et organes analogues, et pour les parties inaccessibles exposées à l'abrasion, une couche de graisse peut constituer une protection suffisante contre l'oxydation du fer. De telles parties ne sont soumises à l'essai que s'il existe un doute au sujet de l'efficacité du film de graisse, et l'essai doit alors être effectué sans dégraissage préalable.

10.2.2.4 Résultats à obtenir

Le premier alinéa du 10.2.2.4 de l'IEC 61439-1:2020 ne s'applique pas à l'essai de remplacement du présent document.

10.2.3.2.1 Vérification par essai

Addition:

NOTE 101 La température de 850 °C ne s'applique pas aux parties accessibles de l'enveloppe après installation dans des parois creuses, par exemple les panneaux et les portes.

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

Remplacement:

Une vérification du degré de protection contre les impacts mécaniques doit être effectuée conformément à l'IEC 62262.

L'essai doit être réalisé au moyen d'un appareillage d'essai au marteau décrit dans l'IEC 60068-2-75 (par exemple, un marteau à ressort à une température de l'air ambiant comprise entre 10 °C et 40 °C) immédiatement après avoir conservé le DBO pendant 2 h à une température de −5 °C ± 1 K pour une utilisation en intérieur et de −25 °C ± 1 K pour une utilisation en extérieur. Un essai à −25 °C pour une utilisation en extérieur valide également un essai à −5 °C pour une utilisation en intérieur. Un seul essai à −25 °C est donc exigé.

La conformité est vérifiée sur les parties exposées du DBO qui peuvent être soumises à des impacts mécaniques lorsqu'elles sont installées comme en usage normal.

L'échantillon avec un couvercle, ou l'enveloppe, le cas échéant, doit être fixé comme en usage normal ou placé contre un support rigide.

Trois coups doivent être appliqués sur des emplacements différents de chacune des faces accessibles et sur la porte (si une porte est fournie). Les impacts doivent être répartis uniformément sur les faces de l'enveloppe ou des enveloppes à l'essai. En aucun cas, les impacts ne doivent être appliqués aux environs d'un même point de l'enveloppe. Un nouvel échantillon pour chaque face accessible est utilisé, sauf si l'essai précédent n'a pas influencé les résultats de l'essai ou des essais ultérieurs, auquel cas l'échantillon peut être réutilisé. Les coups ne doivent pas être appliqués sur des prédécoupes, sur des composants intégrés conformes à d'autres normes ou sur d'autres dispositifs de fixation en retrait par rapport à la surface de manière à n'être soumis à aucun impact réel.

Les entrées de câbles qui ne comportent pas de prédécoupes doivent être laissées ouvertes. Si elles comportent des prédécoupes, deux d'entre elles doivent être ouvertes.

Avant d'appliquer les coups, les vis de fixation des embases, couvercles et éléments analogues doivent être serrées à un couple égal à celui spécifié dans le Tableau 102.

Après l'essai, un examen visuel doit vérifier que:

– le degré de protection (code IP) de l'enveloppe n'est pas altéré, en sachant qu'il convient d'effectuer l'essai IP approprié spécifié au 10.3 en cas de doute;
– les propriétés diélectriques ont été préservées. En cas de doute, il convient d'effectuer les essais diélectriques appropriés spécifiés au 10.9 de l'IEC 61439-1:2020 en appliquant les modifications indiquées dans le présent document;
– les couvercles amovibles peuvent être retirés et réinstallés;
– les portes peuvent être ouvertes et fermées.

10.2.7.1 Vérification par essai

Ajout d'un nouveau premier alinéa:

Cet essai s'applique uniquement aux DBO destinés à une installation extérieure.

10.2.8 Fonctionnement mécanique

10.2.8.1 Vérification par essai

Remplacement des première et deuxième phrases du deuxième alinéa:

Pour les parties qui exigent une vérification par essai, par exemple les parties mobiles comme les portes (voir 8.1.5 de l'IEC 61439-1:2020), il doit être vérifié que leur fonctionnement mécanique est satisfaisant après leur installation dans le DBO. Le nombre de cycles de manœuvres doit être de 50.

10.3 Degré de protection des ensembles (code IP)

Remplacement du deuxième alinéa et des tirets:

Les essais de degré de protection (code IP) doivent être réalisés:

- pour l'essai de protection contre les contacts avec des parties actives, tous les couvercles et portes qu'il est nécessaire d'ouvrir ou de déposer sans l'aide d'une clé ou d'un outil doivent être ouverts ou déposés;
- pour l'essai de protection contre les contacts avec des parties actives, tous les couvercles et portes qu'il est nécessaire d'ouvrir ou de déposer pour permettre aux personnes ordinaires d'accéder aux dispositifs de manœuvre (réarmement des disjoncteurs et des DDR ou pression sur le bouton d'essai d'un DDR, par exemple) doivent être ouverts ou retirés;
- avec tous les couvercles et portes en place et fermés comme en usage normal, qu'ils puissent être ouverts ou déposés avec ou sans l'aide d'une clé ou d'un outil;
- hors tension (circuits principaux et auxiliaires).

Si l'ensemble est constitué de plusieurs sections ou est décrit comme étant extensible, les sections assemblées doivent être incluses.

10.10.2.2.3 Unités fonctionnelles

Remplacement des deuxième et troisième alinéas du 10.10.2.2.3 b):

Si les dispositifs de départ du DBO ont une plage de courants assignés, un seul essai I_{nc} peut être utilisé afin d'établir les caractéristiques I_{nc} assignées pour l'ensemble de la plage sans procéder à des essais supplémentaires lorsque:

1) les plages couvertes proviennent de la même série du constructeur;
2) les plages couvertes ont toutes les mêmes dimensions physiques;
3) les plages couvertes ont les mêmes dispositifs de ligne et de charge de connexion électrique;
4) en consultant les données fournies par le constructeur de l'appareil, le dispositif qui a la perte de puissance totale la plus élevée de la gamme de produits est utilisé pour l'essai;
5) le dispositif est placé dans la position la plus sévère en ce qui concerne l'échauffement mutuel et les effets d'isolation.

10.10.2.3.1 Généralités

Ajout après le quatrième alinéa:

En l'absence d'instructions du constructeur, le couple de serrage appliqué aux bornes doit être conforme aux valeurs spécifiées pour l'essai d'échauffement dans la norme de produit applicable.

10.10.2.3.2 Conducteurs d'essai

Modification:

Les points b), c) et d) ne s'appliquent pas au présent document.

10.10.2.3.6 Vérification de chaque unité fonctionnelle séparément et de l'ensemble complet

Ajout au deuxième alinéa:

Une méthode pour déterminer le groupe le plus sévère de circuits adjacents et chargés en continu à soumettre à l'essai de manière à obtenir l'échauffement le plus élevé possible consiste à distribuer le courant assigné du DBO (I_{nA}) au nombre le plus faible possible de circuits de départ adjacents chargés en continu et simultanément, de sorte que chacun de ces circuits soit chargé avec:

(i) I_{ng} ou I_{nc} × RDF; I_{ng} et RDF étant des valeurs estimées par le constructeur pour déterminer les courants d'essai. Si la vérification repose sur un essai, le résultat obtenu est une valeur assignée I_{ng} et le RDF peut être calculé; ou

(ii) I_{nc} × le facteur de charge présumé indiqué dans le Tableau 101. Cette méthode utilise le facteur de charge présumé afin d'estimer le RDF à utiliser pour l'essai. Si la vérification repose sur un essai, le résultat obtenu est une valeur assignée I_{ng}.

En (i) et (ii), le RDF réel par circuit est calculé en divisant I_{ng} par I_{nc} en s'appuyant sur leurs valeurs vérifiées par essai.

10.10.2.3.7 Vérification de chaque unité fonctionnelle, des jeux de barres principaux, des jeux de barres de distribution séparément et de l'ensemble complet

Ajout au point c):

Lorsque l'appareil soumis à l'essai obtient une valeur I_{nc} égale à son courant assigné I_n, tous les autres appareils de la même gamme de fabrication ont une valeur I_{nc} égale à leur I_n.

Lorsque l'appareil soumis à l'essai obtient une valeur I_{nc} inférieure à son courant assigné I_n, la même réduction s'applique aux autres appareils de la même gamme de fabrication. Par exemple, un appareil qui a un courant I_n de 63 A obtient un courant I_{nc} de 55 A: 55 / 63 = 0 874. Le courant I_{nc} des autres appareils de la même gamme de fabrication est égal à I_n × 0,874.

Ajout au point d):

Une méthode pour déterminer le groupe le plus sévère de circuits adjacents et chargés en continu à soumettre à l'essai de manière à obtenir l'échauffement le plus élevé possible consiste à distribuer le courant assigné du DBO (I_{nA}) au nombre le plus faible possible de circuits de départ adjacents chargés en continu et simultanément, de sorte que chacun de ces circuits soit chargé avec:

(i) I_{ng} ou I_{nc} × RDF; I_{ng} et RDF étant des valeurs estimées par le constructeur pour déterminer les courants d'essai. Si la vérification repose sur un essai, le résultat obtenu est une valeur assignée I_{ng} et le RDF peut être calculé; ou

(ii) I_{nc} × le facteur de charge présumé indiqué dans le Tableau 101. Cette méthode utilise le facteur de charge présumé afin d'estimer le RDF à utiliser pour l'essai. Si la vérification repose sur un essai, le résultat obtenu est une valeur assignée I_{ng}.

En (i) et (ii), le RDF réel par circuit est calculé en divisant I_{ng} par I_{nc} en s'appuyant sur leurs valeurs vérifiées par essai.

10.10.3.2 Ensembles

Addition:

Les DBO avec enveloppe synthétique sont considérés comme représentatifs des DBO avec enveloppe métallique si l'échauffement le plus élevé à la surface interne de l'enveloppe synthétique ne dépasse pas l'échauffement maximal des surfaces métalliques externes accessibles, conformément au Tableau 6 de l'IEC 61439-1:2020. Après avoir vérifié que la surface la plus haute de l'enveloppe est le point le plus chaud, le couple thermoélectrique utilisé pour déterminer la température de l'air intérieur et situé au sommet de l'enveloppe peut être utilisé pour déterminer l'échauffement le plus élevé sur les surfaces internes.

10.10.4.2.3 Résultats à obtenir

Addition:

NOTE Les recommandations sont la publication du courant assigné maximal à une température spécifiée de l'air ambiant au voisinage immédiat de l'appareil.

EXEMPLE

a) Pour commencer, les données mettent en évidence que le courant I_{th} = 125 A à une température ambiante à l'air libre de l'appareil de 50 °C. L'intensité est donc réduite de 0,8 × 125 A = 100 A. La valeur de 100 A est utilisée dans le calcul pour éviter les points chauds et la température ambiante limite est de 50 °C. Si l'enveloppe est capable de dissiper des pertes de puissance supérieures ou égales à celles générées avec une valeur de 100 A et si la température de l'air intérieur calculée ne dépasse pas 50 °C, il est vérifié que la charge continue admissible est de 100 A.

b) En revanche, si, pour le même appareil de 125 A réduit à 100 A, la température de l'air calculée à l'intérieur de l'enveloppe est de 60 °C, ce qui dépasse la limite de 50 °C, et que les informations du constructeur de l'appareil de 125 A limitent le courant I_{th} de l'appareil à 80 A à une température ambiante à l'air libre de 60 °C (pour éviter les points chauds, une marge de sécurité 0,8 × 80 A = 64 A est appliquée), il est vérifié que la charge continue admissible est de 64 A. Aucun autre calcul n'est exigé, car la valeur de 64 A tient compte du facteur de 0,8 et des limites de température ambiante.

Si une charge continue admissible de 100 A est exigée, une enveloppe capable de dissiper des pertes de puissance supérieures ou un appareil qui produit des pertes de puissance inférieures ou un appareil dont le courant assigné est supérieur pour la température ambiante (ou une combinaison de ceux-ci) peut être utilisé pour assurer la conformité.

10.10.4.3.2 Résultats à obtenir

Addition:

NOTE Les recommandations sont la publication du courant assigné maximal à une température spécifiée de l'air ambiant au voisinage immédiat de l'appareil.

EXEMPLE

a) Pour commencer, les données mettent en évidence que le courant I_{th} = 125 A à une température ambiante à l'air libre de l'appareil de 50 °C. L'intensité est donc réduite de 0,8 × 125 A = 100 A. La valeur de 100 A est utilisée dans le calcul pour éviter les points chauds et la température ambiante limite est de 50 °C. Si l'enveloppe est capable de dissiper des pertes de puissance supérieures ou égales à celles générées avec une valeur de 100 A et si la température de l'air intérieur calculée ne dépasse pas 50 °C, il est vérifié que la charge continue admissible est de 100 A.

b) En revanche, si, pour le même appareil de 125 A réduit à 100 A, la température de l'air calculée à l'intérieur de l'enveloppe est de 60 °C, ce qui dépasse la limite de 50 °C, et que les informations du constructeur de l'appareil de 125 A limitent le courant I_{th} de l'appareil à 80 A à une température ambiante à l'air libre de 60 °C (pour éviter les points chauds, une marge de sécurité 0,8 × 80 A = 64 A est appliquée), il est vérifié que la charge continue admissible est de 64 A. Aucun autre calcul n'est exigé, car la valeur de 64 A tient compte du facteur de 0,8 et des limites de température ambiante.

Si une charge continue admissible de 100 A est exigée, une enveloppe capable de dissiper des pertes de puissance supérieures ou un appareil qui produit des pertes de puissance inférieures ou un appareil dont le courant assigné est supérieur pour la température ambiante (ou une combinaison de ceux-ci) peut être utilisé pour assurer la conformité.

10.11.5.3.3 Circuit d'arrivée et jeux de barres principaux

Addition:

Un courant assigné de court-circuit conditionnel peut être déclaré si la longueur du jeu de barres principal et de distribution entre les bornes de sortie de l'appareil d'arrivée connecté au jeu de barres principal et les bornes d'entrée de l'unité fonctionnelle de départ ne dépasse pas 3 m. Le jeu de barres principal, le jeu de barres de distribution et l'appareil d'arrivée peuvent être soumis à l'essai et caractérisés en fonction des contraintes réduites de court-circuit qui surviennent en aval de chacun des dispositifs de protection contre les courts-circuits, dans chaque unité, sous réserve que la disposition de ces conducteurs ne soit pas susceptible d'engendrer un court-circuit interne entre parties actives ou entre parties actives et terre (voir 8.6.4 de l'IEC 61439-1:2020).

NOTE Le Tableau 4 de l'IEC 61439-1:2020 fournit des exemples de types de conducteurs et les exigences d'installation.

11 Vérification individuelle de série

L'Article 11 de l'IEC 61439-1:2020 s'applique, avec les exceptions suivantes.

11.9 Propriétés diélectriques

Ajout après le premier alinéa:

Un essai diélectrique n'est pas exigé pour les DBO qui comportent des jeux de barres ou un câblage préfabriqué du circuit principal uniquement, où un examen des conducteurs et câbles, y compris le cheminement approprié, est suffisant pour valider les distances d'isolement.

Tableau 6 – Limites d'échauffement (9.2)

Remplacement de la note de bas de tableau c:

[c] Lorsque cela est spécifié dans les instructions du constructeur de l'appareil, les organes manuels de commande des disjoncteurs miniatures, des interrupteurs automatiques à courant différentiel résiduel avec dispositif de protection contre les surintensités incorporé, des interrupteurs automatiques à courant différentiel résiduel sans dispositif de protection contre les surintensités incorporé, dispositifs pour la détection de défaut d'arcs, etc. à l'intérieur du DBO, qui ne sont accessibles qu'après l'ouverture d'un couvercle ou d'une porte, peuvent supporter une augmentation de 25 K de ces limites d'échauffement.

Tableaux et figure supplémentaires:

Tableau 101 – Valeurs de charge présumée

Nombre de circuits de départ à usage général et autres circuits spécifiques	Facteur de charge présumé
2 et 3	0,8
4 et 5	0,7
6 à 9 inclus	0,6
10 et plus	0,5
Circuits, comme un matériel de recharge de véhicule électrique (VE) ou un panneau photovoltaïque (PV), sauf si un dispositif de régulation de charge/réduction de la charge est inclus dans le matériel associé ou installé dans le DBO, ou une combinaison des deux.	1