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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

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

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International Standard IEC 61439-3 has been prepared by subcommittee 17D: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

This first edition cancels and replaces the first edition of IEC 60439-3 (1990), Amendment 1 (1993) and Amendment 2 (2001). It constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 60439-3 (including the amendments):

– alignment with IEC 61439-1:2011.

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

FDIS	Report on voting
17D/448/FDIS	17D/450/RVD

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

This standard is to be read in conjunction with IEC 61439-1. The provisions of the general rules dealt with in IEC 61439-1 (hereinafter referred to as Part 1) are applicable to this standard where they are specifically cited. When this standard states “addition” “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

Subclauses that are numbered with a 101 (102, 103, etc.) suffix are additional to the same subclause in Part 1.

Tables and figures in this Part 3 that are new are numbered starting with 101.

New annexes in this Part 3 are lettered AA, BB, etc.

The “in some countries” notes regarding differing national practices are contained in the following subclauses:

3.1.102

6.1

8.2.1

8.5.3

8.6.1

8.8

A list of all parts of the IEC 61439 series, under the general title *Low-voltage switchgear and controlgear assemblies* can be found on the IEC website.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigenda of September 2013 and March 2019 have been included in this copy.

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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 (DBO).

DBOs have the following criteria:

- intended to be operated by ordinary persons (e.g. switching operations and replacing fuse-links), e.g. in domestic (household) applications;
- outgoing circuits contain protective devices, intended to be operated by ordinary persons, complying e.g. with IEC 60898-1, IEC 61008, IEC 61009, IEC 62423 and IEC 60269-3;
- rated voltage to earth does not exceed 300 V a.c.;
- rated current (I_{nc}) of the outgoing circuits does not exceed 125 A and the rated current (I_{nA}) of the DBO does not exceed 250 A;
- intended for the distribution of electrical energy;
- enclosed, stationary;
- for indoor or outdoor use.

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

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

DBOs may be assembled outside the factory of the original manufacturer.

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

This standard does not apply to the specific types of ASSEMBLIES covered by other parts of IEC 61439.

2 Normative references

This clause of Part 1 applies except as follows.

Addition:

IEC 60068-2-75, *Environmental testing – Part 2: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*

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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 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, *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*

3 Terms and definitions

This clause of Part 1 applies except as follows.

3.1 General terms

Additional terms:

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

Note 1 to entry Switching operations and replacing fuse-links are examples of operations intended to be carried out by normal persons.

3.1.102
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

This clause of Part 1 applies.

5 Interface characteristics

This clause of Part 1 applies except as follows.

5.1 General

Addition:

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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 characterize the actual DBO. 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 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.

DBO's shall comply with a minimum overvoltage category III (see IEC 60364-4-44) according to Table G.1 of Annex G of Part 1.

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 assumed loading of the outgoing circuits of the DBO or group of outgoing circuits may be based on the values in Table 101.

5.6 Other characteristics

Addition:

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

6 Information

This clause of Part 1 applies except as follows.

6.1 ASSEMBLY designation marking

Addition to first paragraph:

The test of 10.2.7 only applies to DBOs intended for outdoor installation.

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

Addition of the following new items:

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

f) degree of protection if greater than IP 2XC.

7 Service conditions

This clause of Part 1 applies except as follows.

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7.1.3 Pollution degree

Addition:

A minimum pollution degree 2 applies.

8 Constructional requirements

This clause of Part 1 applies except as follows.

8.2.1 Protection against mechanical impact

Replacement:

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

– IK 05 for a DBO for indoor use,
– IK 07 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

Replacement of the second paragraph:

The degree of protection of a DBO for indoor installation shall be at least IP 2XC after installation in accordance with the DBO manufacturer’s instructions.

8.4.6.2.5 Obstacles

This subclause of Part 1 does not apply.

8.5.3 Selection of switching devices and components

Addition:

Outgoing circuits shall contain protective devices, intended to be operated by ordinary persons, complying e.g. with IEC 60898-1, IEC 61008, IEC 61009, IEC 62423 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.

Circuit-breakers shall be so designed or installed 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.

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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.

8.6.1 Main circuits

Replacement of second paragraph:

Each of the conductors between the incoming unit and outgoing unit as well as the components included in these units may 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 and/or between phases and earth is not to be expected (see 8.6.4 of Part 1).

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

Addition:

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 conductor terminals.

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

This clause of Part 1 applies.

10 Design verification

This clause of Part 1 applies 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 methylchloroform 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.

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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 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 Part 1 does not apply to the alternative test of this standard.

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.

Addition:

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

10.2.6 Mechanical impact

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, e.g. impact spring hammer. 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.

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

The sample with 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 surroundings 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. They 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 subject to 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.

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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.

10.2.7 Marking

Addition of new first paragraph:

This test only applies to DBO's intended for outdoor installation.

10.10.2.3.1 General

Addition after the third 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.

10.10.2.3.6 Verification considering individual functional units separately and the complete ASSEMBLY

Addition to fourth 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.

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 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.

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 Part 1.

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.

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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.

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) 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.

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/or between phases and earth is not to be expected (see 8.6.4 of Part 1).

NOTE Examples of conductor types and installation requirements are given in Table 4 of Part 1.

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

This clause of Part 1 applies 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.

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