

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Low-voltage switchgear and controlgear assemblies –
Part 5: Assemblies for power distribution in public networks**

**Ensembles d'appareillage à basse tension –
Partie 5: Ensembles pour réseaux de distribution publique**

<https://standards.iec.org/standards/sis/re7a76c75-18c1-4f79-b3dc-b5f891d8a475/iec-61439-5-2010>

INTERNATIONAL STANDARD
STANDARDS REVIEW
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –**Part 5: Assemblies for power distribution in public networks**

FOREWORD

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International Standard IEC 61439-5 has been prepared by subcommittee 17D: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

This first edition of IEC 61439-5 cancels and replaces the second edition of IEC 60439-5 (2006), and constitutes a technical revision.

This edition of IEC 61439-5 includes the following significant technical changes with respect to the latest edition of IEC 60439-5:

- alignment on IEC 61439-1 regarding the structure and technical content, as applicable;
- introduction of new verifications, accordingly;
- harmonisation of the requirements of substation cable distribution boards and cable distribution cabinets, thereby eliminating the need to identify and define two categories of assembly;
- simpler standard as a result of a reduction in the number of assembly types defined and the acronyms used to identify the different assemblies.

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

FDIS	Report on voting
17D/422/FDIS	17D/430/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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 only applicable to this standard insofar as 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 5 that are new are numbered starting with 101.

New annexes in this Part 5 are lettered AA, BB, etc.

In this standard, terms written in small capitals are defined in Clause 3.

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

The committee has decided that the contents of this 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.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 5: Assemblies for power distribution in public networks

1 Scope

This clause of Part 1 applies with the following additions.

Addition:

This standard gives specific requirements for public electricity network distribution assemblies (PENDAs), which are stationary assemblies verified by verification tests, as defined in this standard. These ASSEMBLIES are used for the distribution of electrical energy in three-phase systems (see Figure 101 for a typical distribution network). Open type ASSEMBLIES are not covered by this standard.

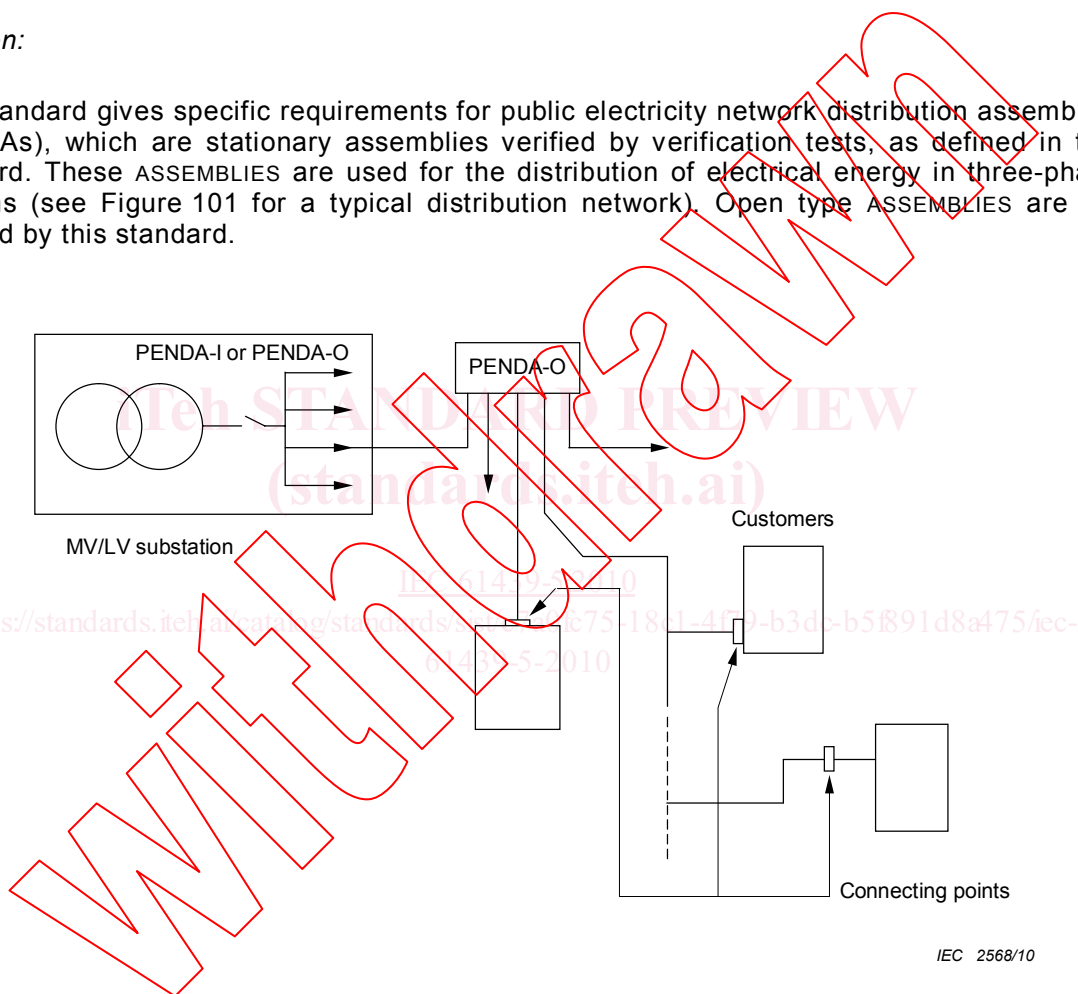


Figure 101 – Typical distribution network

The object of this standard is to state the definitions and to specify the service conditions, construction requirements, technical characteristics and tests for PENDAs. Network parameters may require tests at higher performance levels.

NOTE 1 If a PENDA is equipped with additional equipment (for example meters), in such a way that the main function is changed considerably, then other standards may also apply as agreed between user and manufacturer (see 8.5).

NOTE 2 Where local regulations and practices permit, a PENDA according to this standard may be used in other than public networks.

PENDAs are suitable for installation in places where only skilled persons have access for their use, however, outdoor types may be installed in situations that are accessible to ordinary persons.

2 Normative references

This clause of Part 1 applies with the following additions.

Addition:

IEC 60269-1, *Low-voltage fuses – Part 1: General requirements*

IEC 60695-11-10:1999, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 61439-1:2009, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*

ISO 6506-1, *Metallic materials – Brinell hardness test – Part 1: Test method*

ISO 9223:1992, *Corrosion of metals and alloys – Corrosivity of atmospheres – Classification*

3 Terms and definitions

This clause of Part 1 applies with the following modifications.

3.1 General terms

Additional terms:

3.1.101

public electricity network distribution ASSEMBLY PENDA

ASSEMBLY, generally for installation in a public electricity network which in use, receives electrical energy from one or more supplies and distributes that energy through one or more cables to other equipment.

NOTE 1 A PENDA is installed, operated and maintained solely by skilled persons.

NOTE 2 Some forms of a PENDA were previously known as a cable distribution cabinet (CDC).

3.1.101.1

outdoor public electricity network distribution ASSEMBLY PENDA-O

cubicle type public electricity network distribution ASSEMBLY that is suitable for outdoor installation in places that may, or may not, be accessible to the public

3.1.101.2

indoor public electricity network distribution ASSEMBLY PENDA-I

public electricity network distribution ASSEMBLY suitable for installation indoors, generally without an enclosure, but including all structural parts necessary to support busbars, functional units and other ancillary devices, necessary to complete the ASSEMBLY

3.3 External design of ASSEMBLIES

3.3.1

open-type ASSEMBLY

This term of Part 1 does not apply.

3.9 Verification

This subclause of Part 1 applies with the following modifications.

Modifications:

3.9.1 design verification

The note is not applicable, the only method of verification permitted for a PENDA is by test(s) made in accordance with Clause 10 of this standard.

3.9.3 verification assessment

Not applicable for PENDAs complying with this standard.

3.9.4 design rule

Not applicable for PENDAs complying with this standard.

4 Symbols and abbreviations

This clause of Part 1 applies.

5 Interface characteristics

This clause of Part 1 applies with the following modifications.

5.3.3 Rated diversity factor (RDF)

Addition:

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

Table 101 – Values of assumed loading

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

6 Information

This clause of Part 1 applies with the following modifications.

6.1 ASSEMBLY designation marking

Addition to first paragraph:

Designation plates may be placed inside an enclosure of an ASSEMBLY provided their intended place ensures good legibility and visibility when the door(s) is open or the cover is removed.

Replacement of item d):

d) IEC 61439-5.

Replacement of the note:

NOTE Further information may be included by agreement between the user and the manufacturer.

6.3 Device and/or component identification

Additional paragraph:

In the case of removeable fuse-carriers which are specific to a fuseway, a label shall be placed on the fuse carrier as well as on the fuse base, to avoid incorrect interchangeability of the fuse-carrier.

Additional subclause:

6.101 Circuit identification

It shall be possible to identify each functional unit in a clearly visible manner.

7 Service conditions

This clause of Part 1 applies with the following modifications.

7.1.1.2 Ambient air temperature for outdoor installations

Replacement of last paragraph with:

Unless the user specifies a PENDA shall be suitable for use in an arctic climate, the lower limit of ambient air temperature is $-25\text{ }^{\circ}\text{C}$. For an arctic climate the lower limit of ambient temperature is $-50\text{ }^{\circ}\text{C}$.

7.2 Special service conditions

Addition of the following note to item h):

NOTE Exposure to vibration arising from traffic and/or occasional ground excavation is a normal service condition for PENDAS.

Additional paragraph:

Additional requirements for a PENDA-O, to be installed where heavy snowfalls occur and where they are adjacent to areas where there is snow clearance by ploughing, are subject to agreement between manufacturer and user.

8 Constructional requirements

This clause of Part 1 applies with the following modifications.

8.1 Strength of materials and parts

8.1.1 General

Addition:

A PENDA-O shall be arranged for ground mounting, transformer mounting, pole mounting, surface wall mounting or mounting within a recess within a wall, as agreed between user and manufacturer.

A PENDA may be direct coupled to a transformer by means of a flange coupling or it may connect to its supply by means of cable or via busbars as agreed between user and manufacturer. Outgoing circuits shall be suitable for connection by means of cables.

A reliable locking device shall be provided on outdoor enclosures which prevents access by unauthorized persons. Doors, lids and covers shall be so designed that, after they are locked, they do not open due to subsequent moderate ground settlement, nor due to exposure to vibration arising from traffic and/or ground excavation and reinstatement works.

8.1.5 Resistance of insulating materials to heat and fire

Additional subclause:

8.1.5.101 Verification of category of flammability

The insulating materials used for enclosures, barriers and other insulating parts shall have flame retardant properties in accordance with 10.2.3.102 of this standard.

8.1.6 Mechanical strength

Additional subclause:

8.1.6.101 Verification of mechanical strength

The mechanical properties of a PENDA-O shall comply with 10.2.101 of this standard.

Parts of the PENDA-O intended to be embedded in the ground shall withstand the stresses imposed on them during installation and normal service and comply with 10.2.101.6.

Additional subclause:

8.1.101 Thermal stability

The thermal stability of a PENDA shall be verified according to 10.2.3.101.

8.2 Degree of protection provided by an ASSEMBLY enclosure

8.2.1 Protection against mechanical impact

Subclause 8.2.1 of Part 1 does not apply.

8.2.2 Protection against contact with live parts, ingress of solid foreign bodies and liquids

Addition:

Open type ASSEMBLIES (IP 00) are not covered by this standard.

When a PENDA-O is intended to be installed in places accessible to the public, its enclosure shall, when fully-installed in accordance with the manufacturer's instructions, provide a degree of protection of at least IP 34D according to IEC 60529. In other locations, the minimum level of protection shall be at least IP33.

PENDA-O's that are intended to be installed in places accessible to the public shall, unless otherwise stated by the user, be designed such that when any temporary cables are connected, the enclosure shall provide a degree of protection of at least IP 23C according to IEC 60529. See 8.8 of this standard.

8.4 Protection against electric shock

8.4.2.1 General

The third paragraph does not apply.

Additional subclause:

8.4.2.101 Earthing and short-circuiting means

The outgoing units in an ASSEMBLY shall be so constructed that they can be earthed and short-circuited in a secure manner by means of a device(s) recommended by the manufacturer, which ensures the manufacturer's indicated degree of protection (IP code) is maintained for all parts of the ASSEMBLY. This requirement is not applicable if it could cause a safety hazard arising from the system conditions and/or operational practice.

8.4.3.1 Installation conditions

Additional paragraph:

For an ASSEMBLY that is expected to feed overhead cable lines, outgoing units shall be designed in such a way that an attached cable(s) can be earthed at the termination(s).

8.5 Incorporation of switching devices and components

Additional paragraph:

Individual components, such as fuses and switching devices that are in compliance with others standards, shall also comply with the supplementary requirements of this standard.

8.5.3 Selection of switching devices and components

Additional paragraph:

Fuses shall comply with the general requirements of IEC 60269-1 or with the relevant national standard where it is an established practice for such use.

8.8 Terminals for external conductors

Replacement of the first three paragraphs with the following:

In the absence of a special agreement between user and manufacturer, terminals shall be capable of accommodating cables having copper or aluminium conductors from the smallest to the largest cross-sectional area corresponding to the appropriate rated current (see Table AA.1).

The terminations for outgoing circuits shall be located so that adequate spacing is provided and to facilitate terminating the phase conductors of a cable irrespective of their lay.

Where specified by the user, the incoming circuit shall be suitable for connection by means of either bare or insulated bars.

Additional subclauses:

8.101 Marking as an obstacle to snow clearance

Where a PENDA-O is intended for use in regions where heavy snowfalls occur in accordance with 7.2, or alternatively, if required by the user, it shall be possible to mark it as an obstacle to snow clearance. Holders shall be provided, attached to the PENDA-O, to accommodate marking rods and it shall be possible to install and make adjustments to the position of the marking rod from outside the PENDA. The holders shall be constructed in a manner which ensures that the holder or marking rod will give way to a mechanical force before the transmitted force to the PENDA-O's enclosure reaches the value which would adversely affect the degree of protection (IP code).

8.102 Ease of operation and maintenance

All parts of the ASSEMBLY shall, as far as practicable, be readily accessible and replaceable without excessive dismantling. The conditions for interchangeability of parts of the ASSEMBLY may be subject to an agreement between the user and the manufacturer.

The design shall be such that the cables can be readily connected from the front.

When an PENDA does not have a means of measurement incorporated, it shall be possible, by the use of a portable instrument, to readily and safely measure voltages in all phases of incoming units and on both sides of all current breaking and/or switch devices of outgoing units, also the current in one phase of all outgoing units. During this operation all live parts of the PENDA shall be protected sufficiently to retain the required degree of protection in accordance with 8.2. Instructions concerning the procedure to be adopted shall be provided by the manufacturer.

If the ASSEMBLY is intended to be connected to a live reserve power, for example a standby generator, the switchgear connecting device shall be designed so that connection can be made with the live parts having a degree of protection of IP 10 according to IEC 60529.

Locking arrangements shall be provided on a PENDA to secure the door(s) and prevent unauthorised access. The fixings of any covers etc. which are removable for installation or maintenance operations shall only be accessible while the door(s) are open.

9 Performance requirements

This clause of Part 1 applies.

10 Design verification

This clause of Part 1 applies with the following modifications.

10.1 General

Delete from the 2nd paragraph:

'prior to the publication of the relevant product standard in the IEC 61439 series,'

Replacement of 4th paragraph with:

Design verification shall only be achieved by the application of tests in accordance with Clause 10 of this standard. Alternative methods of verification by calculation and validation of design rules are not applicable to PENDAs complying with this standard.

Additional last paragraph:

Where necessary to suit their particular network parameters, users may specify more onerous or additional test requirements.

10.2 Strength of materials and parts

10.2.2 Resistance to corrosion

10.2.2.1 Test procedure

Replacement of last paragraph with the following:

When the corrosion resistance properties and projected life, as agreed between manufacturer and user, can be confirmed by reference to ISO 9223, the tests detailed herein need not be performed.

In all other cases the corrosion resistance of each design of ASSEMBLY shall be verified by severity test A or B, as applicable and as detailed in 10.2.2.2 and 10.2.2.3 of Part 1.

10.2.2.2 Severity test A

Replacement of the test specification (paragraph 2) with the following:

Damp heat cycling test of IEC 60068-2-30: Severity – temperature 55 °C, 6 cycles and variant 1.

At the end of the test, the specimens are removed from the test chamber.

Compliance is checked by visual inspection. The parts tested shall not show rust, cracking or other deterioration. However, surface corrosion of the protective coating is allowed.

10.2.2.4 Results to be obtained

Subclause 10.2.2.4 of Part 1 is not applicable in respect of tests carried out in accordance with 10.2.2.2.

10.2.3 Properties of insulating materials

Additional subclauses:

10.2.3.101 Dry heat test

The complete ASSEMBLY shall be placed in an oven, the internal temperature of which is raised to (100 ± 2) °C over a period of 2 h to 3 h and maintained at this temperature for 5 h.

Compliance is checked by inspection that there are no visible signs of deterioration. Deformation of protective covers manufactured from insulating materials is acceptable if they are more than 6 mm distant from parts which may have a temperature rise in excess of 40 K and do not support live components.

10.2.3.102 Verification of category of flammability

Representative specimens of each of the materials of enclosures, barriers and other insulating parts shall be subjected to a flammability test in accordance with test method A – horizontal burning test of IEC 60695-11-10.

NOTE When agreed between user and manufacturer, other tests to check the resistance to fire of materials of enclosures, barriers and other insulating parts may be carried out.

Compliance is checked by inspection that each set of specimens can be classified to category HB40 criteria a) or b) in accordance with 8.4.1 of IEC 60695-11-10.

10.2.6 Mechanical impact

10.2.6 of Part 1 is not applicable to ASSEMBLIES complying with this standard.

Additional subclauses:

10.2.101 Verification of mechanical strength

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

With the exception of the test of 10.2.101.2.1, a new sample ASSEMBLY may be used for each of the independent tests. If the same sample ASSEMBLY is used for more than one test of 10.2.101, the compliance check for the second numeral of the degree of protection (IP code) need only be applied when the tests on that sample have been completed.

All tests shall be carried out with the ASSEMBLY fixed at its normal service mounting and where appropriate, added support at normal ground level as indicated in Figures 102a, 102b, 103a, and 103b.

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