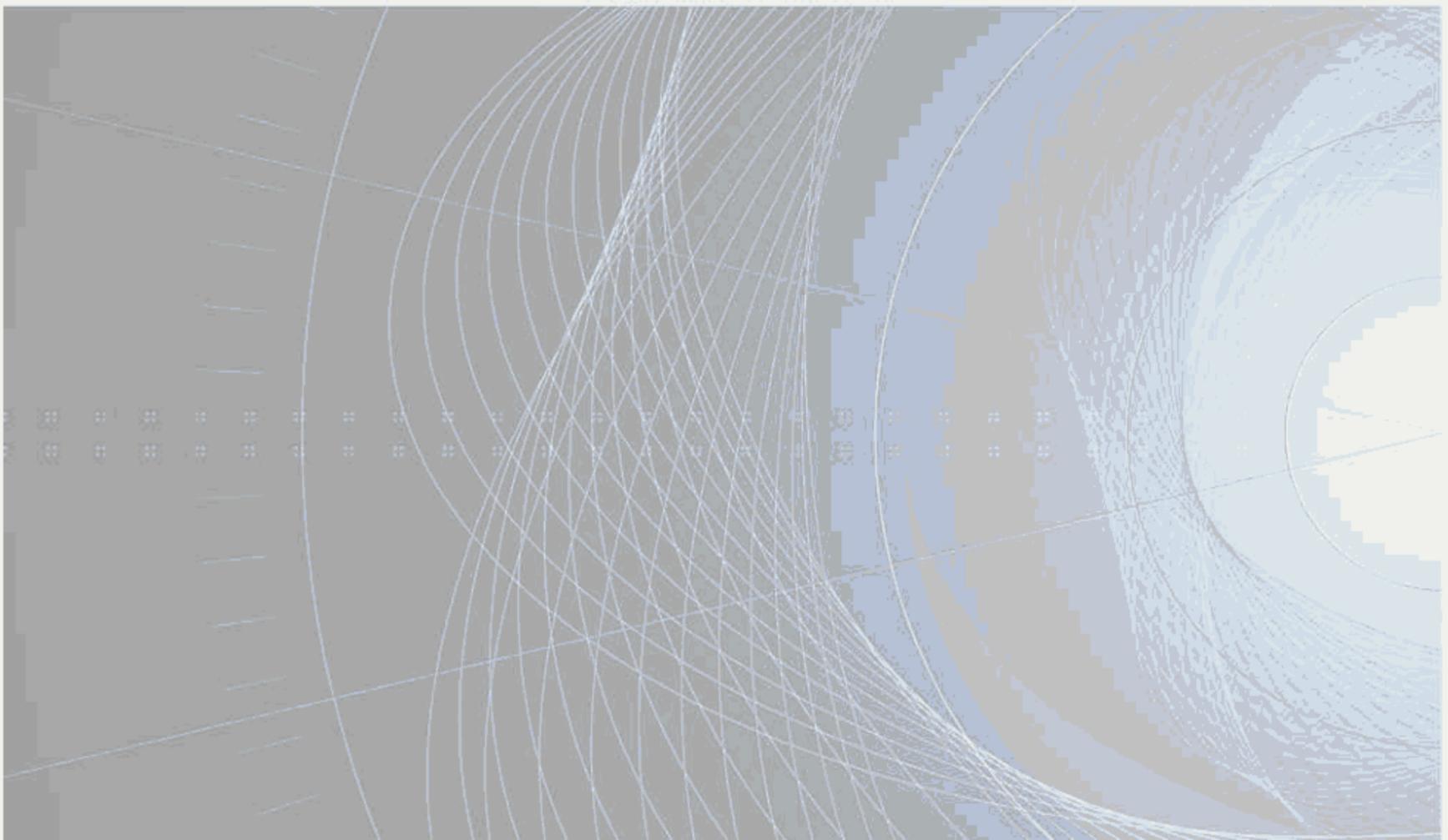


INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Low-voltage switchgear and controlgear assemblies –
Part 2: Power switchgear and controlgear assemblies**

**Ensembles d'appareillage à basse tension –
Partie 2: Ensembles d'appareillage de puissance**





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IEC 61439-2

Edition 2.0 2011-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Low-voltage switchgear and controlgear assemblies –
Part 2: Power switchgear and controlgear assemblies**

**Ensembles d'appareillage à basse tension –
Partie 2: Ensembles d'appareillage de puissance**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

T

ICS 29.130.20

ISBN 978-2-88912-605-7

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND
CONTROLGEAR ASSEMBLIES –

Part 2: Power switchgear and controlgear assemblies

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International Standard IEC 61439-2 has been prepared by subcommittee 17D: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

This second edition cancels and replaces the first edition published in 2009. It constitutes a technical revision.

This second edition includes the following significant technical changes with respect to the last edition of IEC 61439-2:

- clarification of the scope;
- revision of requirements for withdrawable and removable parts;
- revision of mechanical impact test (10.2.6);
- extension of Table 101;

- review of Table BB.1 to reflect modified requirements and verifications;
- general editorial review.

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

| | |
|--------------|------------------|
| FDIS | Report on voting |
| 17D/440/FDIS | 17D/445/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 2 that are new are numbered starting with 101.

New annexes in this Part 2 are lettered AA, BB, etc.

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

NOTE Throughout the IEC 61439 series of standards, the term ASSEMBLY (see 3.1.1 of Part 1) is used for a low-voltage switchgear and controlgear assembly.

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 2: Power switchgear and controlgear assemblies

1 Scope

NOTE 1 Throughout this part, the abbreviation PSC-ASSEMBLY (see 3.1.101) is used for a power switchgear and controlgear ASSEMBLY.

This part of IEC 61439 defines the specific requirements of power switchgear and controlgear assemblies (PSC-ASSEMBLIES) as follows:

- ASSEMBLIES for which the rated voltage does not exceed 1 000 V in case of a.c. or 1 500 V in case of d.c.;
- stationary or movable ASSEMBLIES with or without enclosure;
- ASSEMBLIES intended for use in connection with the generation, transmission, distribution and conversion of electric energy, and for the control of electric energy consuming equipment;
- ASSEMBLIES designed for use under special service conditions, for example in ships and in rail vehicles provided that the other relevant specific requirements are complied with;

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

- ASSEMBLIES designed for electrical equipment of machines. Supplementary requirements for ASSEMBLIES forming part of a machine are covered by the IEC 60204 series.

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

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

This standard does not apply to individual devices and self-contained components, such as motor starters, 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. For ASSEMBLIES not covered by other parts this part applies.

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60947-3:2008, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

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

3 Terms and definitions

This clause of Part 1 is applicable except as follows.

3.1 General terms

Additional definitions:

3.1.101

power switchgear and controlgear assembly

PSC-ASSEMBLY

low-voltage switchgear and controlgear assembly used to distribute and control energy for all types of loads, intended for industrial, commercial and similar applications where operation by ordinary persons is not intended

NOTE It is not excluded for a PSC-ASSEMBLY to be located in an area accessible to ordinary persons.

3.1.102

test situation

condition of a PSC-ASSEMBLY or part of it in which the relevant main circuits are open on its supply side but not necessarily isolated whilst the associated auxiliary circuits are connected, allowing operation tests of the incorporated devices

3.1.103

form of internal separation

classification of physical separation within a PSC-ASSEMBLY

3.2 Constructional units of ASSEMBLIES

Replacement of the title:

3.2 Constructional units of PSC-ASSEMBLIES

Additional definitions:

3.2.101

withdrawable part

removable part intended to be moved from the connected position to the isolated position and to a test position, if any, whilst remaining mechanically attached to the PSC-ASSEMBLY

3.2.102

test position

position of a withdrawable part in which the relevant main circuits are open on its supply side but not necessarily isolated and in which the auxiliary circuits are connected allowing operation tests of the incorporated devices, the withdrawable part remaining mechanically attached to the PSC-ASSEMBLY

NOTE The opening may also be achieved without any mechanical movement of the withdrawable part by operation of a suitable device.

¹ To be published.

3.2.103

isolated position

position of a withdrawable part in which an isolating distance is established in main and auxiliary circuits on its supply side, the withdrawable part remaining mechanically attached to the PSC-ASSEMBLY

NOTE The isolating distance may also be established without any mechanical movement of the withdrawable part by operation of a suitable device.

3.2.104

isolating distance (of a withdrawable part)

clearance between open contacts meeting the safety requirements specified for disconnectors

[IEC 60050-441:1984, 441-17-35, modified]

Addition:

3.101 Electrical connections of functional units

3.101.1

disconnectable connection

connection which is connected or disconnected by manual operation of the connecting means without a tool

3.101.2

withdrawable connection

connection which is connected or disconnected by bringing the functional unit into the connected or isolated position

3.102 Gangways within PSC-ASSEMBLIES

3.102.1

operating gangway within a PSC-ASSEMBLIES

space to be used by the operator for the proper operation and supervision of the PSC-ASSEMBLY

3.102.2

maintenance gangway within a PSC-ASSEMBLIES

space which is accessible to authorized personnel only and primarily intended for use when servicing the installed equipment

4 Symbols and abbreviations

This clause of Part 1 is applicable.

5 Interface characteristics

This clause of Part 1 is applicable except as follows.

5.4 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 in Table 101.

5.6 Other characteristics

Replacement of item l):

- l) the type of construction – fixed, removable or withdrawable parts (see 8.5.1 and 8.5.2 of Part 1);

Addition:

- m) the form of internal separation (see 8.101);
- n) the types of electrical connections of functional units (see 8.5.101).

6 Information

This clause of Part 1 is applicable except as follows.

6.1 ASSEMBLY designation marking

Replacement of the title and item d):

6.1 PSC-ASSEMBLY designation marking

- d) IEC 61439-2;

7 Service conditions

This clause of Part 1 is applicable.

8 Constructional requirements

This clause of Part 1 is applicable except as follows.

8.2 Degree of protection provided by an ASSEMBLY enclosure

Replacement of the title:

8.2 Degree of protection provided by a PSC-ASSEMBLY enclosure

8.2.1 Protection against mechanical impact

Replacement of text:

Where a degree of protection provided by a PSC-ASSEMBLY enclosure against mechanical impact is declared by the original manufacturer this shall be verified in accordance with IEC 62262 (see 10.2.6).

Additional subclause:

8.2.101 PSC-ASSEMBLY with withdrawable parts

The degree of protection indicated for PSC-ASSEMBLIES normally applies to the connected position (see 3.2.3) of withdrawable parts. The ASSEMBLY manufacturer shall indicate the degree of protection obtained in the other positions and during the transfer between positions.

PSC-ASSEMBLIES with withdrawable parts may be so designed that the degree of protection applying to the connected position is also maintained in the test and isolated positions and during transfer from one position to another.

If, after the removal of a withdrawable part, it is not possible to maintain the original degree of protection e.g. by closing a door, an agreement shall be reached between the ASSEMBLY manufacturer and user as to what measures shall be taken to ensure adequate protection. Information provided by the ASSEMBLY manufacturer may take the place of such an agreement.

8.3.2 Clearances

Addition:

For withdrawable parts, the isolation provided in the isolated position shall at least comply with the requirements in the relevant specification for disconnectors (see IEC 60947-3). This applies with the equipment in new condition, taking account of the manufacturing tolerances and anticipated changes in dimensions due to wear.

The isolating distance between the withdrawable unit main contacts and their associated fixed contacts in the isolated position shall be capable of withstanding the test voltage for the declared impulse withstand voltage as specified in Table 102.

8.4.3.2.2 Requirements for earth continuity providing protection against the consequences of faults within the ASSEMBLY

Replacement of the title:

8.4.3.2.2 Requirements for earth continuity providing protection against the consequences of faults within the PSC-ASSEMBLY

Replacement of last paragraph:

When removable or withdrawable parts are equipped with a metal supporting surface, these surfaces shall be considered sufficient for ensuring earth continuity of protective circuits provided that the pressure exerted on them is sufficiently high. The continuity of the protective circuit of a withdrawable part shall remain effective from the connected position to the isolated position inclusively.

8.4.6.1 Devices to be operated or components to be replaced by ordinary persons

This subclause of Part 1 is not applicable.

8.4.6.2 Requirements related to accessibility in service by authorized persons

Additional subclause:

8.4.6.2.101 Operating and maintenance gangways within a PSC-ASSEMBLY

Operating and maintenance gangways (see 3.102.1 and 3.102.2) within an ASSEMBLY shall comply with the requirements for basic protection as specified in IEC 61140. The design and construction of such gangways shall be agreed upon between ASSEMBLY manufacturer and user.

Recesses within a PSC-ASSEMBLY of limited depth, in the order of 1 m, are not considered to be gangways.

8.5.2 Removable parts

Replacement of the title:

8.5.2 Removable and withdrawable parts

Replacement of text:

The removable and withdrawable parts shall be so constructed that their electrical equipment can be safely removed and/or isolated from or connected to the main circuit whilst this circuit is live. The removable and withdrawable parts may be provided with an insertion interlock (see 3.2.5 of Part 1).

Clearances and creepage distances (see 8.3 of Part 1 and 8.3.2 above) shall be complied with in the different positions as well as during transfer from one position to another.

Additional subclauses:

8.5.2.101 Withdrawable parts

Withdrawable parts shall have in addition an isolated position (see 3.2.103) and may have a test position (see 3.2.102), or a test situation (see 3.1.102). They shall be distinctly located in these positions. These positions shall be clearly discernible.

In PSC-ASSEMBLIES with withdrawable parts all live parts shall be protected in such a manner that they cannot unintentionally be touched when the door, if any, is open and the withdrawable part is withdrawn from the connected position or removed. Where an obstacle or shutter is used they shall meet the requirements of 8.4.6.2.5 of Part 1.

For the electrical conditions associated with the different positions of withdrawable parts, see Table 103.

8.5.2.102 Interlocking and padlocking of removable and withdrawable parts

Unless otherwise specified the removable and withdrawable parts shall be fitted with a device, which ensures that the apparatus can only be removed/withdrawn and/or re-inserted after its main circuit has been interrupted.

In order to prevent unauthorized operation the removable and withdrawable parts or their associated ASSEMBLY location may be provided with a lockable means to secure them in one or more of their positions.

Addition:

8.5.101 Description of the types of electrical connections of functional units

The types of electrical connections of functional units within PSC-ASSEMBLIES or parts of PSC-ASSEMBLIES can be denoted by a three-letter code:

- the first letter denotes the type of electrical connection of the main incoming circuit;
- the second letter denotes the type of electrical connection of the main outgoing circuit;
- the third letter denotes the type of electrical connection of the auxiliary circuits.

The following letters shall be used:

- F for fixed connections (see 3.2.6 of Part 1);
- D for disconnectable connections (see 3.101.1);
- W for withdrawable connections (see 3.101.2).

Addition:

8.101 Internal separation of PSC-ASSEMBLIES

Typical arrangements of internal separation by barriers or partitions are described in Table 104 and are classified as forms (for examples, see Annex AA).

The form of separation and higher degrees of protection shall be the subject of an agreement between ASSEMBLY manufacturer and user.

Internal separation may be used to attain one or more of the following conditions between functional units, separate compartments or enclosed protected spaces:

- protection against contact with hazardous parts. The degree of protection shall be at least IP XXB (see 8.4.2.3);
- protection against the passage of solid foreign bodies. The degree of protection shall be at least IP 2X.

NOTE 1 The degree of protection IP 2X covers the degree of protection IP XXB. Separation may be achieved by means of partitions or barriers (metallic or non-metallic), insulation of live parts or the integral housing of a device e.g. a moulded case circuit breaker.

See 8.4.2.3 of Part 1 with regard to stability and durability of barriers and partitions.

See 8.4.6.2 of Part 1 and above with regard to accessibility for maintenance on isolated functional units.

NOTE 2 The internal separation described is not intended to guarantee the integrity of the ASSEMBLY in the event of an arcing fault.

9 Performance requirements

This clause of Part 1 is applicable.

10 Design verification

This clause of Part 1 is applicable except as follows.

10.2.6 Mechanical impact

Replacement:

When a mechanical impact test is performed, it shall be carried out according to 9.6 of IEC 62208:2002.

10.3 Degree of protection of ASSEMBLIES

Addition:

The degree of protection associated with withdrawable parts as specified in accordance with 8.2.101 and associated with internal separation in accordance with 8.101 shall be verified in accordance with IEC 60529.

10.9.3.2 Impulse withstand voltage test

Addition:

The impulse withstand voltage capability of the isolating distance between the withdrawable units' main contacts and their associated fixed contacts shall be verified to confirm compliance with 8.3.2.

10.13 Mechanical operation

Addition:

In the case of withdrawable parts, the operating cycle includes any physical movements from the connected to the isolated position and back to the connected position.

11 Routine verification

This clause of Part 1 is applicable except as follows.

11.8 Mechanical operation

Replacement:

Verification shall include the checking of interlocking and locking arrangements associated with removable and withdrawable parts.

Table 101 – Values of assumed loading

| Type of load | Assumed loading factor |
|------------------------------------|------------------------|
| Distribution – 2 and 3 circuits | 0,9 |
| Distribution – 4 and 5 circuits | 0,8 |
| Distribution – 6 to 9 circuits | 0,7 |
| Distribution – 10 or more circuits | 0,6 |
| Electric actuator | 0,2 |
| Motors ≤ 100 kW | 0,8 |
| Motors > 100 kW | 1,0 |

Table 102 – Test voltages across the open contacts of equipment suitable for isolation

| Rated impulse withstand voltage U_{imp} kV | Test voltages and corresponding altitudes during test | | | | | | | | | |
|--|---|-------|-------|---------|---------|-------------------|-------|-------|---------|---------|
| | $U_{1,2/50}$, a.c. peak and d.c. kV | | | | | a.c. r.m.s. kV | | | | |
| | Sea level | 200 m | 500 m | 1 000 m | 2 000 m | Sea level | 200 m | 500 m | 1 000 m | 2 000 m |
| 0,33 | 1,8 | 1,7 | 1,7 | 1,6 | 1,5 | 1,3 | 1,2 | 1,2 | 1,1 | 1,06 |
| 0,5 | 1,8 | 1,7 | 1,7 | 1,6 | 1,5 | 1,3 | 1,2 | 1,2 | 1,1 | 1,06 |
| 0,8 | 1,8 | 1,7 | 1,7 | 1,6 | 1,5 | 1,3 | 1,2 | 1,2 | 1,1 | 1,06 |
| 1,5 | 2,3 | 2,3 | 2,2 | 2,2 | 2,0 | 1,6 | 1,6 | 1,55 | 1,55 | 1,42 |
| 2,5 | 3,5 | 3,5 | 3,4 | 3,2 | 3,0 | 2,47 | 2,47 | 2,40 | 2,26 | 2,12 |
| 4 | 6,2 | 6,0 | 5,8 | 5,6 | 5,0 | 4,38 | 4,24 | 4,10 | 3,96 | 3,54 |
| 6 | 9,8 | 9,6 | 9,3 | 9,0 | 8,0 | 7,00 | 6,80 | 6,60 | 6,40 | 5,66 |
| 8 | 12,3 | 12,1 | 11,7 | 11,1 | 10,0 | 8,70 | 8,55 | 8,27 | 7,85 | 7,07 |
| 12 | 18,5 | 18,1 | 17,5 | 16,7 | 15,0 | 13,10 | 12,80 | 12,37 | 11,80 | 10,60 |

Table 103 – Electrical conditions for the different positions of withdrawable parts

| Circuit | Method of connection | Position | | | |
|--|--|---|--|------------------------------------|---|
| | | Connected position (see 3.2.3 of Part 1) | Test situation/position (see 3.1.102/3.2.102) | Isolated position (see 3.2.103) | Removed position (see 3.2.4 of Part 1) |
| Incoming main circuit | Incoming line plug and socket or other connection facilities | | | | |
| Outgoing main circuit | Outgoing line plug and socket or other connection facilities | | or | or | |
| Auxiliary circuit | Plug and socket or similar connection facilities | | | | |
| Condition of circuits within withdrawable parts | | Live | Live Auxiliary circuits ready for operational testing | Dead if no backfeed is present | |
| Condition of outgoing PSC-ASSEMBLY terminals of main circuits | | Live | Live or not disconnected ^b | Dead if no backfeed is present | Dead if no backfeed is present |
| The requirements of 8.4.5 of Part 1 shall be complied with. | | | | | |
| Earth continuity shall be in accordance with 8.4.3.2.2 and maintained until the isolating distance is established. | | | | | |
| ^a Depending on design. | | | | | |
| ^b Depending on the terminals being fed from alternative sources of supply such as a standby supply. | | | | | |
| = connected = isolated = open, but not necessarily isolated | | | | | |

Table 104 – Forms of internal separation

| Main criteria | Subcriteria | Form |
|--|---|---------|
| No internal separation. | | Form 1 |
| Separation of busbars from all functional units. | Terminals for external conductors not separated from busbars | Form 2a |
| | Terminals for external conductors separated from busbars | Form 2b |
| <ul style="list-style-type: none"> - Separation of busbars from all functional units. - Separation of all functional units from one another. - Separation of terminals for external conductors and the external conductors from the functional units, but not from the terminals of other functional units. | Terminals for external conductors not separated from busbars | Form 3a |
| | Terminals for external conductors and external conductors separated from busbars | Form 3b |
| <ul style="list-style-type: none"> - Separation of busbars from all functional units - Separation of all functional units from one another. - Separation of terminals for external conductors associated with a functional unit from the terminals of any other functional unit and the busbars. - Separation of the external conductors from the busbars. - Separation of the external conductors associated with a functional unit from other functional units and their terminals. - External conductors need not be separated from each other. | Terminals for external conductors in the same compartment as the associated functional unit | Form 4a |
| | Terminals for external conductors not in the same compartment as the associated functional unit, but in individual, separate, enclosed protected spaces or compartments | Form 4b |

Annexes

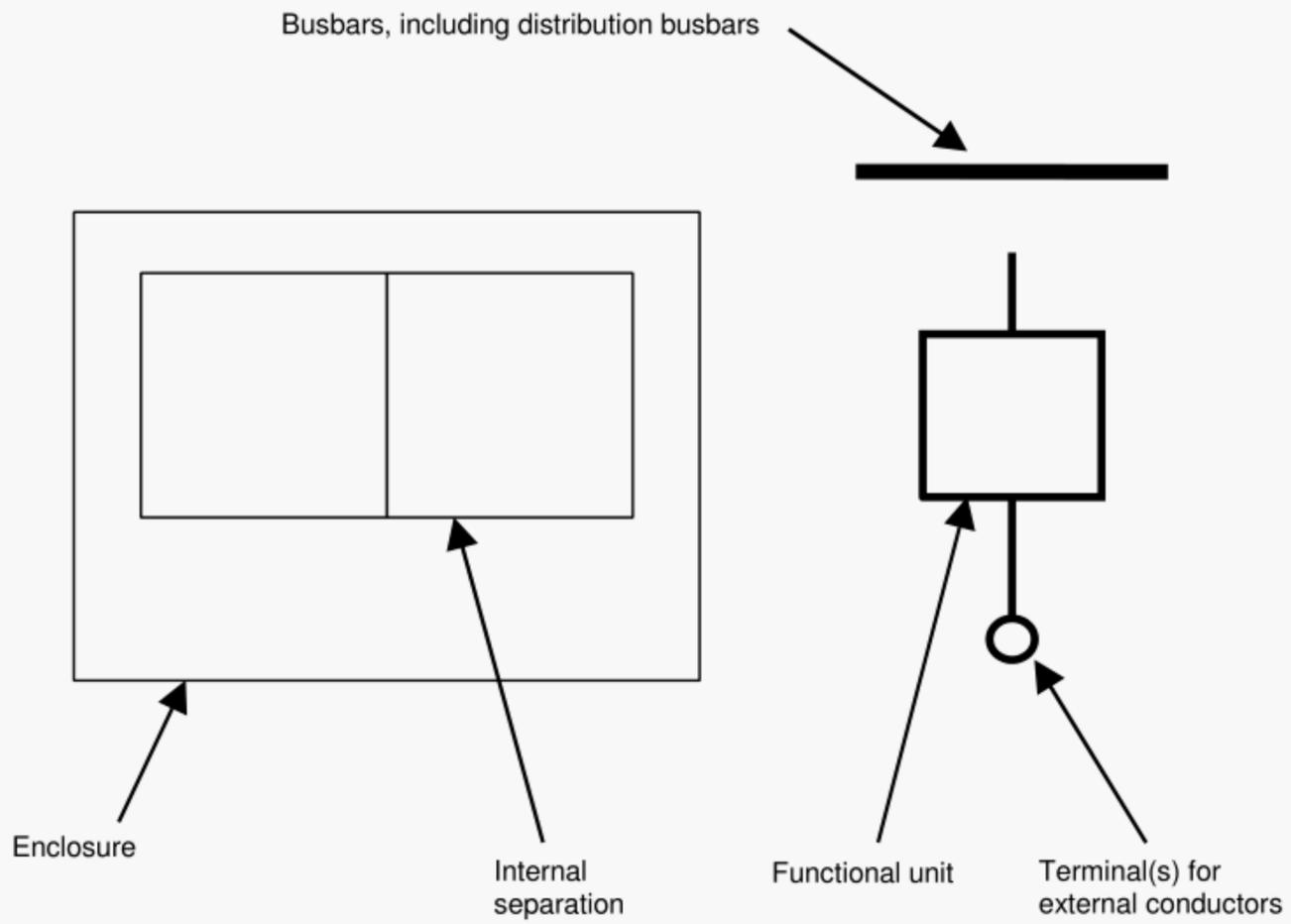
Annexes of Part 1 are applicable except as follows.

Annex C of Part 1 is not applicable.

Additional annexes:

Annex AA
(informative)

Forms of internal separation (see 8.101)

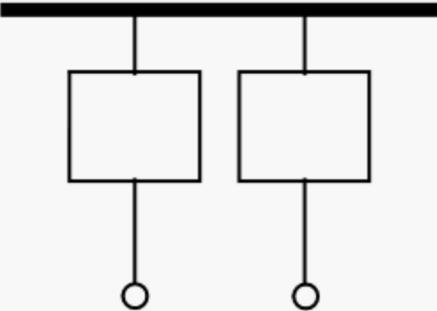


IEC 1711/11

Figure AA.1 – Symbols used in Figures AA.2 and AA.3

Form 1

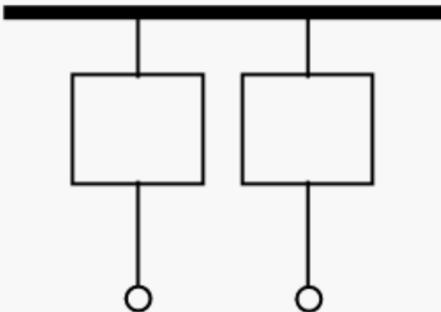
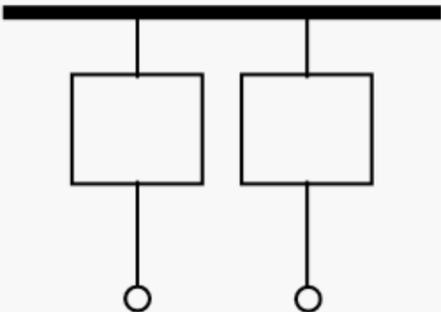
No internal separation



IEC 1712/11

Form 2

Separation of busbars from all functional units



Form 2a:
Terminals not separated from busbars

IEC 1713/11

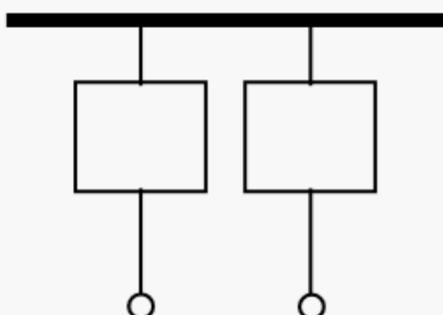
Form 2b:
Terminals separated from busbars

IEC 1714/11

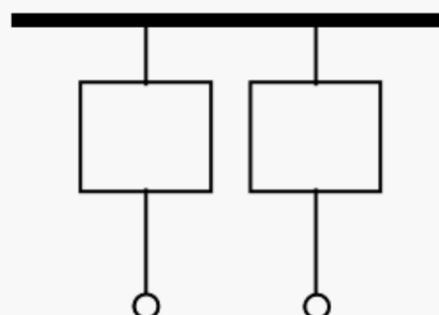
Figure AA.2 – Forms 1 and 2

Form 3

Separation of busbars from all functional units
 +
 Separation of all functional units from one another
 +
 Separation of terminals for external conductors and external conductors from the functional units, but not from the terminals of other functional units



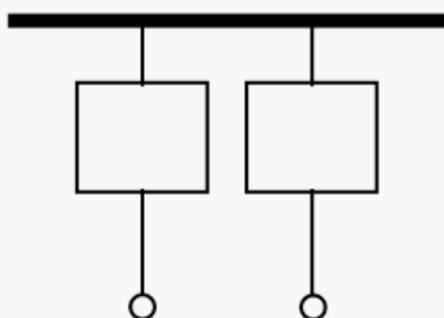
Form 3a:
 Terminals not separated from busbars
 IEC 1715/11



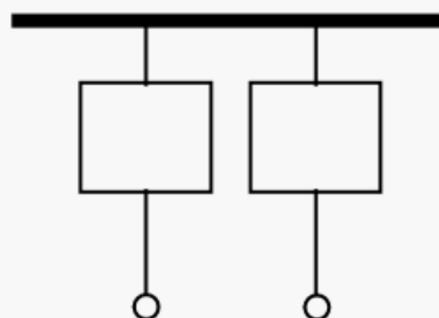
Form 3b:
 Terminals and external conductors separated from busbars
 IEC 1716/11

Form 4

Separation of busbars from all functional units
 +
 Separation of all functional units from one another
 +
 Separation of terminals for external conductors associated with a functional unit from the terminals of any other functional unit and the busbars
 +
 Separation of the external conductors from the busbars
 +
 Separation of the external conductors associated with a functional unit from other functional units and their terminals
 +
 External conductors need not be separated from each other



Form 4a:
 Terminals in same compartment
 as associated functional unit
 IEC 1717/11



Form 4b:
 Terminals not in same compartment
 as associated functional unit
 IEC 1718/11

Figure AA.3 – Forms 3 and 4

Annex BB (informative)

Items subject to agreement between the ASSEMBLY manufacturer and the user

The following information is subject to an agreement between the ASSEMBLY manufacturer and the user. In some cases, information declared by the ASSEMBLY manufacturer may take the place of an agreement.

Table BB.1 – Items subject to agreement between
the ASSEMBLY manufacturer and the user

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

| Characteristics | Reference clause or subclause | Default arrangement ^b | Options listed in standard | User requirement ^a |
|---|-------------------------------|--|--|-------------------------------|
| 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 insulation | |
| Installation environment | | | | |
| Location type | 3.5, 8.1.4, 8.2 | Manufacturer's standard, according to application | Indoor / outdoor | |
| Protection against ingress of solid foreign bodies and ingress of water | 8.2.2, 8.2.3 | Indoor (enclosed): IP 2X Outdoor (min.): IP 23 | IP 00, 2X, 3X, 4X, 5X, 6X | |
| Protection after removal of withdrawable part | 8.2.101 | Manufacturer's standard | As for connected position / Reduced protection to manufacturer's standard | |
| External mechanical impact (IK) NOTE IEC 61439-1 does not nominate specific IK codes. | 8.2.1, 10.2.6 | None | None | |
| Resistance to UV radiation (applies for outdoor assemblies only unless specified otherwise) | 10.2.4 | Indoor: Not applicable. Outdoor: Temperate climate | None | |
| Resistance to corrosion | 10.2.2 | Normal Indoor/Outdoor arrangements | None | |
| Ambient air temperature – Lower limit | 7.1.1 | Indoor: –5 °C Outdoor: –25 °C | None | |
| Ambient air temperature – Upper limit | 7.1.1 | 40 °C | None | |
| Ambient air temperature – Daily average maximum | 7.1.1, 9.2 | 35 °C | None | |
| Maximum relative humidity | 7.1.2 | Indoor: 50 % at 40 °C Outdoor: 100 % at 25 °C | None | |
| Pollution degree (of the installation environment) | 7.1.3 | Industrial: 3 | 1, 2, 3, 4 | |
| Altitude | 7.1.4 | ≤ 2 000 m | None | |
| EMC environment (A or B) | 9.4, 10.12, Annex J | A/B | A/B | |
| Special service conditions (e.g. vibration, exceptional condensation, heavy pollution, corrosive environment, strong electric or magnetic fields, fungus, small creatures, explosion hazards, heavy vibration and shocks, | 7.2, 8.5.4, 9.3.3 Table 7, | No special service conditions | None | |

| Characteristics | Reference clause or subclause | Default arrangement ^b | Options listed in standard | User requirement ^a |
|---|-------------------------------|---|--|-------------------------------|
| earthquakes) | | | | |
| Installation method | | | | |
| Type | 3.3, 5.6 | Manufacturer's standard | Various e.g. floor standing / wall mounted | |
| Stationary/Movable | 3.5 | Stationary | Stationary / movable | |
| Maximum overall dimensions and weight | 5.6, 6.2.1 | Manufacturer's standard, according to application | None | |
| External conductor type(s) | 8.8 | Manufacturer's standard | Cable / Busbar Trunking System | |
| Direction(s) of external conductors | 8.8 | Manufacturer's standard | None | |
| External conductor material | 8.8 | Copper | Copper / aluminium | |
| External phase conductor, cross sections, and terminations | 8.8 | As defined within the standard | None | |
| External PE, N, PEN conductors 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 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 | | Authorized persons / Ordinary persons | |
| 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 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 | 8.4 | No requirements for protection during | None | |

| Characteristics | Reference clause or subclause | Default arrangement ^b | Options listed in standard | User requirement ^a |
|---|--|---|---|-------------------------------|
| units, main busbars, distribution busbars) | | maintenance or upgrade | | |
| Gangways | 8.4.6.2.101 | Basic protection | None | |
| Method of functional unit's connection NOTE This refers to the capability of removal and re-insertion of functional units. | 8.5.101 | | F fixed connections D disconnectable connections W withdrawable connections | |
| Form of separation | 8.101 | | Form 1, 2, 3, 4 | |
| Capability to test individual operation of the auxiliary circuits relating to specified circuits while the functional unit is isolated | 3.1.102, 3.2.102, 3.2.103, 8.5.101, Table 103 | | None | |
| Current carrying capability | | | | |
| Rated current of the ASSEMBLY I_{nA} (amps) | 3.8.9.1, 5.3, 8.4.3.2.3, 8.5.3, 8.8, 10.10.2, 10.10.3, 10.11.5, Annex E | Manufacturer's standard, according to application | None | |
| Rated current of circuits I_{nC} (amps) | 5.3.2 | Manufacturer's standard, according to application | None | |
| Rated diversity factor | 5.4, 10.10.2.3, Annex E | As defined within the standard | RDF for groups of circuits / RDF for whole ASSEMBLY | |
| Ratio of cross section of the neutral conductor to phase conductors: phase conductors up to and including 16 mm ² | 8.6.1 | 100 % | None | |
| Ratio of cross section of the neutral conductor to phase conductors: phase conductors above 16 mm ² | 8.6.1 | 50 % (min. 16 mm ²) | None | |
| ^a For exceptionally onerous applications, the user may need to specify more stringent requirements to those in the standard. ^b In some cases information declared by the ASSEMBLY manufacturer may take the place of an agreement. | | | | |

Bibliography

The bibliography of Part 1 is applicable.

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