IEC 61439-2

Edition 1.0 2009-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Withdrawn

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

IEC 61439-2:2009

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.
If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.
Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

Withdrawn

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub
The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, withdrawn and replaced publications.
- IEC Just Published: www.iec.ch/online_news/justpub
Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.
- Electropedia: www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.
- Customer Service Centre: www.iec.ch/webstore/custserv
If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:
Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm
Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,…). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.
- Just Published CEI: www.iec.ch/online_news/justpub
Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.
- Electropedia: www.electropedia.org
Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.
- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:
Email: csc@iec.ch
Tél.: +41 22 919 02 11
Fax: +41 22 919 03 00

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

IEC 61439-2

Edition 1.0 2009-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

withdrawn

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 S

ICS 29.130.30

ISBN 978-2-88910-516-8

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

CONTENTS

FOREWORD 3
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
3.1 General terms 5
3.2 Constructional units of PSC-ASSEMBLIES 6
4 Symbols and abbreviations 7
5 Interface characteristics 7
6 Information 7
6.1 PSC-ASSEMBLY designation marking 7
7 Service conditions 8
8 Constructional requirements 8
9 Performance requirements 11
10 Design verification 11
11 Routine verifications 11
Annexes 15
Annex AA (informative) Forms of internal separations (see 8.101) 16
Annex BB (informative) Items subject to agreement between the ASSEMBLY manufacturer and the user 19
Bibliography 22

Figure AA.1 – Symbols used in Figures AA.2 and AA.3 16
Figure AA.2 – Forms 1 and 2 17
Figure AA.3 – Forms 3 and 4 18

Table 101 – Values of assumed loading 12
Table 102 – Test voltages across the open contacts of equipment suitable for isolation 12
Table 103 – Electrical conditions for the different positions of withdrawable parts 13
Table 104 – Forms of internal separation 14

Withdrawn

AVA Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 2: Power switchgear and controlgear assemblies

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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.

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

CDV	Report on voting
17D/358/CDV	17D/363/RVC

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.

Withdrawn

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

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.

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 maintenance result 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.

Withdrawn

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 2: Power switchgear and controlgear assemblies

Withdrawn

1 Scope

This clause of Part 1 is applicable except as follows.

Addition:

This standard defines the specific requirements of power switchgear and controlgear assemblies (PSC-ASSEMBLIES), the rated voltage of which does not exceed 1000 V a.c. or 1500 V d.c.

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

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 is applicable except as follows.

Addition:

IEC 60947-3:1999, *Low-voltage switchgear and controlgear – Part 3: Switchgear, disconnectors, switch-disconnectors and fuse-combination units*

IEC 61140:2001, *Protection against electric shock – Common aspects for installation and equipment – Basic safety publication*

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

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

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

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.

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

[IEV 441-17-35: 1984. 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

Withdrawn

AVA Documents Document Sharing Hub

Full document details: IEC 61439-2 2009

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.

5.3.3 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 in Table 101.

5.5 Other characteristics

Replacement of item l):

l) the type of construction - fixed, removable or withdrawable parts (see 8.5.2.101 to 8.5.2.103);

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;

Withdrawn

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

6.2.1 Information relating to the ASSEMBLY

Replacement of the title:

6.2.1 Information relating to the PSC-ASSEMBLY

Addition:

l) form of internal separation (see 8.101);

m) types of electrical connections of functional units (see 8.5.101).

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 a ASSEMBLY enclosure

Replacement of the title:

8.2 Degree of protection provided by a PSC-ASSEMBLY enclosure

Subclause 8.2.1 of Part 1 is not applicable.

Additional subclause:

8.2.101 Degree of protection of 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, the original degree of protection is not maintained, 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:

Where functional units are mounted on 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.

Withdrawn

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

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

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

This subclause of Part 1 is not applicable.

8.4.5.2 Requirements related to accessibility in service by authorized persons

Additional subclause:

8.4.5.2.101 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

Additional subclauses:.

8.5.2.101 General

The removable and withdrawable parts shall be so constructed that their electrical equipment can be safely 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). Minimum 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.

NOTE It may be necessary to ensure that these operations are not performed under load.

8.5.2.102 Removable parts

Removable parts shall have a connected position (see 3.2.3 of Part 1) and a removed position (see 3.2.4 of Part 1).

8.5.2.103 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.

Withdrawn

AVA Documents Document Sharing Hub

Full document details: IEC 61439-2 2009

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 8.4.5.2.5 of Part 1, and warning labels shall be provided.

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

8.5.2.104 Interlocking and padlocking of withdrawable parts

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

In order to prevent unauthorized operation, withdrawable parts may be provided with means for a padlock or lock 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 3.101.1);
– D for disconnectable connections (see 3.101.2);
– W for withdrawable connections (see 3.101.3).

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.

PSC-ASSEMBLIES can be divided 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;
– protection against the passage of solid foreign bodies. The degree of protection shall be at least IP 2X.

NOTE 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

Withdrawn
AVA Documents Document Sharing Hub
Full document details: IEC 61439-2 2009

See 8.4.5.2 of Part 1 and above with regard to accessibility for maintenance on isolated functional units.

9 Performance requirements

This clause of Part 1 is applicable.

10 Design verification

This clause of Part 1 is applicable except as follows.

10.3 Degree of protection of ASSEMBLIES

Addition:

The degree of protection associated with withdrawable parts as specified in accordance with 8.2.101 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 verifications

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.

Withdrawn

Documents
Document Sharing Hub

Full document details: IEC 61439-2 2009

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

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	1000 m	2000 m	Sea level	200 m	500 m	1000 m	2000 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

Withdrawn

Documents
Document Sharing Hub
Full document details: IEC 61439-2 2009

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

Circuit	Method of connection	Position			
		Connected position (see 3.2.104)	Test situation/position (see 3.1.101/3.2.105)	Isolated position (see 3.2.106)	Removed position (see 3.2.108)
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 [a]	or [a]	
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 8.4.4 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

Withdrawn

Full document details: IEC 61439-2 2009

AVA Documents Document Sharing Hub