



TECHNICAL REPORT

Low-voltage switchgear and controlgear assemblies – Part 0: Guidance to specifying assemblies

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

XB

ICS 29.130.20

ISBN 978-2-83220-787-1

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	10
4 Application of ASSEMBLIES within the IEC 61439 series	10
4.1 General.....	10
4.2 ASSEMBLY design and verification.....	10
4.3 Service conditions and interface characteristics	10
4.4 Design.....	11
5 Electrical system	11
5.1 General.....	11
5.2 Earthing system	11
5.3 Nominal voltage	11
5.4 Transient overvoltages	12
5.5 Unusual voltage transients, temporary overvoltages.....	13
5.6 Rated frequency f_n (Hz)	13
5.7 Additional on-site testing requirements: wiring, operational performance and function	14
6 Short-circuit withstand capability	14
6.1 General.....	14
6.2 Prospective short-circuit current at supply terminals I_{cp} (kA).....	14
6.3 Prospective short-circuit current in the neutral.....	15
6.4 Prospective short-circuit current in the protective circuit.....	15
6.5 Short-circuit protective device (SCPD).....	15
6.6 Co-ordination of short-circuit protective devices including external short-circuit protective device details.....	16
6.7 Data associated with loads likely to contribute to the short-circuit current.....	16
7 Protection of persons against electric shock	17
7.1 General.....	17
7.2 Basic protection (protection against direct contact).....	17
7.2.1 General	17
7.2.2 Basic insulation provided by insulating material	17
7.2.3 Barriers or enclosures	17
7.3 Fault protection (protection against indirect contact).....	18
7.3.1 General	18
7.3.2 Requirements for the protective conductor to facilitate automatic disconnection of the supply	18
7.3.3 Electrical separation	19
7.3.4 Protection by total insulation.....	19
8 Installation environment.....	20
8.1 General.....	20
8.2 Location type.....	20
8.3 Protection against ingress of solid foreign bodies and ingress of water.....	20
8.4 External mechanical impact.....	21
8.5 Resistance to UV radiation	21
8.6 Resistance to corrosion	21

8.7	Ambient air temperature	21
8.8	Maximum relative humidity	21
8.9	Pollution degree	22
8.10	Altitude.....	22
8.11	EMC environment.....	22
8.12	Special service conditions	23
8.12.1	General	23
8.12.2	Climatic conditions	24
8.12.3	Protection against ingress of solid foreign bodies and ingress of water	24
8.12.4	Shock, vibration, seismic occurrence and external mechanical impact (IK)	24
8.12.5	Fire and explosion hazards.....	24
8.12.6	Exceptional overvoltages	25
8.12.7	EMC environment	25
9	Installation method	25
9.1	General	25
9.2	Assembly type	25
9.3	Portability	26
9.4	Maximum overall dimensions and weight	26
9.5	External conductor type(s).....	26
9.6	Direction(s) of external conductors	26
9.7	External conductor material	26
9.8	External phase conductor, cross-sections, and terminations	27
9.9	External PE, N, PEN conductors cross-sections, and terminations	27
9.10	Special terminal identification requirements.....	27
10	Storage and handling	28
10.1	General	28
10.2	Maximum dimensions and weight of transport units	28
10.3	Methods of transport (e.g. forklift, crane)	28
10.4	Environmental conditions different from the service conditions	28
10.5	Packing details	28
11	Operating arrangements	28
11.1	General	28
11.2	Access to manually operated devices	29
11.3	Isolation of load installation equipment items.....	29
12	Maintenance and upgrade capabilities	30
12.1	General	30
12.2	Requirements related to accessibility for inspection and similar operations	30
12.3	Requirements related to accessibility for maintenance in service by authorized persons.....	30
12.4	Requirements related to extension under voltage	31
12.5	Protection against direct contact with hazardous live internal parts during maintenance or upgrade	31
12.6	Method of functional units connection.....	31
12.7	Operating and maintenance gangways within an ASSEMBLY	32
12.8	Internal separation	32
13	Current carrying capability.....	32
13.1	General	32

13.2	Rated current I_{nA} (A) (maximum current allowable).....	32
13.3	Rated current of circuits I_{nC} (A).....	33
13.4	Rated diversity factor (RDF)	33
13.5	Ratio of cross-section of the neutral conductor to phase conductors.....	33
13.5.1	General	33
13.5.2	Phase conductors up to and including 16 mm ²	33
13.5.3	Phase conductors above 16 mm ²	33
14	ASSEMBLY design and routine verification processes	34
14.1	Design verification.....	34
14.1.1	Object.....	34
14.1.2	Methods	34
14.1.3	Records.....	34
14.2	Routine verification.....	34
14.2.1	General	34
14.2.2	Records.....	35
	Annex A (informative) Cross-section of copper conductors suitable for connection to terminals for external conductors	36
	Annex B (informative) Forms of internal separation (see 12.8).....	37
	Annex C (informative) Specification guidance for IEC 61439-2.....	41
	Annex D (informative) Specification guidance for IEC 61439-3.....	47
	Annex E (informative) Specification guidance for IEC 61439-4.....	51
	Annex F (informative) Specification guidance for future IEC 61439-5.....	55
	Annex G (informative) Specification guidance for IEC 61439-6	56
	Annex H (informative) Specification guidance for IEC 61439-7.....	60
	Annex I (informative) List of notes concerning certain countries	61
	Bibliography.....	62
	Figure 1 – Required rated impulse withstand voltage	13
	Figure B.1 – Symbols used in Figures B.2 and B.3.....	38
	Figure B.2 – Forms 1 and 2	39
	Figure B.3 – Forms 3 and 4	40
	Table A.1 – Cross-section of copper conductors suitable for connection to terminals for external conductors	36
	Table B.1 – Forms of internal separation.....	37
	Table C.1 – Items subject to agreement between the ASSEMBLY manufacturer and the user.....	41
	Table C.2 – Examples of optional items subject to agreement between the ASSEMBLY manufacturer and the user	45
	Table D.1 – Items subject to agreement between the ASSEMBLY manufacturer and the user	47
	Table E.1 – Items subject to agreement between the ASSEMBLY manufacturer and the user	51
	Table G.1 – Items subject to agreement between the ASSEMBLY manufacturer and the user	56

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 0: Guidance to specifying 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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC 61439-0, which is a technical report, 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 2010. It constitutes a technical revision.

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

- alignment with IEC 61439-1:2011;
- alignment of Annex B with Annex AA of IEC 61439-2:2011;
- alignment of Table C.1 with Table BB.1 of IEC 61439-2:2011;

- addition of a new Annex D regarding IEC 61439-3;
- addition of a new Annex E regarding IEC 61439-4;
- addition of a new Annex G regarding IEC 61439-6;
- general editorial review.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
17D/458/DTR	17D/467A/RVC

Full information on the voting for the approval of this technical report 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.

The reader's attention is drawn to the fact that Annex I lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this Technical Report.

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 web site

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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

For the purposes of this technical report, the user is the party who specifies or selects the ASSEMBLY characteristics. The user may be the same party as the one who will use and operate the ASSEMBLY, or someone acting on their behalf. The aim of this technical report is to provide the user with guidance on the specification that should be provided in order to achieve the desired design of an assembly. Throughout this technical report, the term ASSEMBLY is used for a low-voltage switchgear and controlgear assembly. The term “manufacturer” refers to the ASSEMBLY manufacturer unless specifically noted otherwise.

The purpose of the IEC 61439 series of standards is to harmonize as far as practicable all the general rules and requirements that apply to ASSEMBLIES. The series further seeks, in order to obtain uniformity of requirements for ASSEMBLIES, consistency in the verification of ASSEMBLIES and to avoid the need for verification to other standards.

All those requirements for the various ASSEMBLIES that can be considered as general, together with specific subjects of wide interest and application, e.g. temperature rise, dielectric properties, have therefore been gathered in IEC 61439-1 as general rules. For each type of ASSEMBLY only two main standards are necessary to determine all requirements and the corresponding methods of verification:

- 1) the standard giving the general rules and designated “Part 1”, and
- 2) the specific ASSEMBLY standard, hereinafter referred to as the relevant ASSEMBLY standard.

The IEC 61439 series of standards encompasses ASSEMBLIES for a wide variety of uses, some of which have specific needs as dictated by their particular application. In order to define clearly these specific needs, relevant ASSEMBLY standards focussed on a particular type of application have been (or are being) developed. These are identified as IEC 61439-2 to IEC 61439-7, inclusive (see list below). Each relevant ASSEMBLY standard with reference to IEC 61439-1, the general rules, as appropriate, specifies the characteristics and performance required by an ASSEMBLY within its defined scope of application. Each relevant ASSEMBLY standard includes, as an annex, a template for “items subject to agreement between the ASSEMBLY manufacturer and the user” to facilitate the specifying of an ASSEMBLY. These are reproduced and explained in this technical report.

General characteristics of all types of assemblies are considered in this Technical Report. Details of which are applicable to each type of assembly can be determined by reference to the Specification Template in Annex ‘C’ onwards.

Within this technical report, reference to IEC 61439 means the series of ASSEMBLY standards, including:

- IEC 61439-1:2011, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*
- IEC 61439-2:2011, *Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies*
- IEC 61439-3:2012, *Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)*
- IEC 61439-4:2012, *Low-voltage switchgear and controlgear assemblies – Part 4: Particular requirements for assemblies for construction sites (ACS)*
- IEC 61439-5:2010, *Low-voltage switchgear and controlgear assemblies – Part 5: Assemblies for power distribution in public networks*
- IEC 61439-6:2012, *Low-voltage switchgear and controlgear assemblies – Part 6: Busbar trunking systems (busways)*