



BSI Standards Publication

Low-voltage switchgear and controlgear assemblies

Part 0: Guidance to specifying assemblies

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

National foreword

This Published Document is the UK implementation of IEC TR 61439-0:2022. It supersedes PD IEC/TR 61439-0:2013, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/121/2, Low voltage switchgear and controlgear assemblies.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

© The British Standards Institution 2022
Published by BSI Standards Limited 2022

ISBN 978 0 539 11919 0

ICS 29.130.20

Compliance with a Published Document cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 September 2022.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

This is a preview of "PD IEC TR 61439-0:20...". Click here to purchase the full version from the ANSI store.



Edition 3.0 2022-07

TECHNICAL REPORT

RAPPORT TECHNIQUE

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

**Ensembles d'appareillage à basse tension –
Partie 0: Recommandations pour la spécification d'ensembles**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.130.20

ISBN 978-2-8322-4027-4

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	10
2 Normative references	10
3 Terms and definitions	11
4 Application of assemblies within the IEC 61439 series.....	11
4.1 General.....	11
4.2 Assembly design and verification	11
4.3 Service conditions and interface characteristics	13
4.4 Application design.....	13
5 Electrical system	13
5.1 General.....	13
5.2 Earthing system	13
5.3 Nominal voltage	14
5.4 Transient overvoltages.....	14
5.5 Unusual voltage transients, temporary overvoltages	16
5.6 Rated frequency f_n (Hz).....	16
5.7 Additional on-site testing requirements: wiring, operational performance and function.....	17
6 Short-circuit withstand capability	17
6.1 General.....	17
6.2 Prospective short-circuit current at supply terminals I_{cp} (kA)	18
6.3 Prospective short-circuit current in the neutral	19
6.4 Prospective short-circuit current in the protective circuit	19
6.5 Short-circuit protective device (SCPD)	19
6.6 Coordination of short-circuit protective devices including external short-circuit protective device details	20
6.7 Data associated with loads likely to contribute to the short-circuit current	21
6.8 Multiple supplies	21
7 Protection of persons against electric shock	21
7.1 General.....	21
7.2 Basic protection (protection against direct contact)	21
7.2.1 General	21
7.2.2 Basic insulation provided by insulating material	22
7.2.3 Basic insulation by barriers or enclosures	22
7.3 Fault protection (protection against indirect contact)	22
7.3.1 General	22
7.3.2 Requirements for the protective conductor to facilitate automatic disconnection of the supply	23
7.3.3 Electrical separation	24
7.3.4 Class II protection (double or reinforced insulation)	24
8 Installation environment.....	24
8.1 General.....	24
8.2 Location type	24
8.3 Protection against access to hazardous parts, ingress of solid foreign bodies and ingress of water (IP code)	25

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

8.4	External mechanical impact (IK code)	28
8.5	Resistance to radiation	29
8.5.1	General	29
8.5.2	Solar irradiance	29
8.5.3	Ultraviolet (UV) radiation	29
8.6	Resistance to corrosion	29
8.7	Ambient air temperature.....	30
8.8	Maximum relative humidity.....	30
8.9	Pollution degree.....	31
8.10	Altitude	32
8.11	Electromagnetic compatibility (EMC).....	32
8.12	Special service conditions.....	33
8.12.1	General	33
8.12.2	Climatic conditions	34
8.12.3	Protection against ingress of solid foreign bodies and ingress of water (IP code)	34
8.12.4	Shock, vibration, seismic occurrence and external mechanical impact (IK code)	34
8.12.5	Fire and explosion hazards.....	34
8.12.6	Exceptional overvoltages	34
8.12.7	Polluted atmospheres	35
8.12.8	EMC environment	35
9	Installation method	35
9.1	General.....	35
9.2	Assembly type	35
9.3	Portability	36
9.4	Maximum overall dimensions and weight	36
9.5	External conductor type(s)	36
9.6	Direction(s) of external conductors.....	37
9.7	External conductor material	37
9.8	External line conductor, cross sections, and terminations	37
9.9	External PE, N, PEN, PEM, PEL conductors' cross sections, and terminations	37
9.10	Special terminal identification requirements	38
10	Storage and handling.....	38
10.1	General.....	38
10.2	Maximum dimensions and weight of transport units.....	38
10.3	Methods of transport (e.g. forklift, crane)	38
10.4	Environmental conditions different from the service conditions.....	39
10.5	Packing details	39
11	Operating arrangements	39
11.1	General.....	39
11.2	Access to manually operated devices	39
12	Maintenance and upgrade capabilities	40
12.1	General.....	40
12.2	Requirements related to accessibility for inspection and similar operations.....	40
12.3	Requirements related to accessibility for maintenance in service by authorized persons	41
12.4	Requirements related to extension under voltage.....	41

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

12.5	Protection against direct contact with hazardous live internal parts during maintenance or upgrade	41
12.6	Method of functional unit connection	42
12.7	Operating and maintenance gangways within an assembly	42
12.8	Internal separation (only relevant for assemblies in accordance with IEC 61439-2)	42
12.8.1	Fundamentals of separation.....	42
12.8.2	Considerations when determining a form of separation	43
12.8.3	Selecting the most appropriate form of separation	44
13	Current carrying capability.....	46
13.1	General.....	46
13.2	Rated current of the assembly I_{nA} (A) (maximum current allowable).....	46
13.3	Loading of outgoing circuits within an assembly.....	47
13.4	Ratio of cross section of the neutral conductor to line conductors	48
13.4.1	General	48
13.4.2	Line conductors up to and including 16 mm ²	48
13.4.3	Line conductors above 16 mm ²	48
14	Assembly design and routine verification processes	49
14.1	Design verification	49
14.1.1	Object.....	49
14.1.2	Methods	49
14.1.3	Records.....	50
14.2	Routine verification	50
14.2.1	General	50
14.2.2	Records.....	50
	Annex A (informative) Cross section of copper cables suitable for connection to terminals for external cables	51
	Annex B (informative) Forms of internal separation (see 12.8)	52
	Annex C (informative) Specification template for assemblies	58
	Annex D (informative) Optional information.....	62
D.1	General.....	62
D.2	Electrical conditions.....	63
D.2.1	Internal arc-fault considerations.....	63
D.2.2	Insulated busbars	64
	Annex E (informative) List of notes concerning certain countries.....	65
	Bibliography.....	66
	Figure 1 – Required rated impulse withstand voltage	16
	Figure 2 – Examples of separation included in IEC 61439-2.....	45
	Figure B.1 – Symbols used in Figure B.2, Figure B.3 and Figure B.4	53
	Figure B.2 – Form 1 and Form 2	55
	Figure B.3 – Form 3.....	56
	Figure B.4 – Form 4	57
	Table 1 – IP codes, first numeral	26
	Table 2 – IP codes, second numeral	27

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

Table 3 – IP codes, additional letter (optional)	28
Table 4 – Assemblies and application ratings.....	48
Table A.1 – Cross section of copper cables suitable for connection to terminals for external cables	51
Table B.1 – Forms of internal separation.....	52
Table C.1 – Example of items typically subject to agreement between the assembly manufacturer and the user	58
Table D.1 – Examples of optional items subject to agreement between the assembly manufacturer and the specifier.....	62

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.

IEC TR 61439-0 has been prepared by subcommittee 121B: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage. It is a Technical Report.

This third edition cancels and replaces the second edition published in 2013. It constitutes a technical revision.

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

- a) alignment with IEC 61439-1:2020;
- b) addition of new content in Clause 13 regarding current ratings;
- c) addition of a new subclause 12.8.1 detailing the fundamentals of the forms of internal separation;
- d) alignment of Annex B with Annex AA of 61439-2:2020;
- e) removal of the annexes detailing items subject to agreement between specifier and manufacturer for all product parts as not all of them can always be up to date

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

The text of this Technical Report is based on the following documents:

Draft	Report on voting
121B/126/DTR	121B/152/RVDTR

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

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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

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.

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

INTRODUCTION

Low-voltage assemblies form an integral part of most electrical distribution networks. In their application they have two prime functions:

- to safely control and distribute electrical energy; and
- to safely isolate sections of faulted networks.

Whilst these two functions place very different demands on the assembly, an assembly has to be capable of performing both these functions throughout its expected service life. Controlling and distributing electrical energy is the assembly's routine ongoing duty. The second function, fault management, is a very rare occurrence within a well-managed and maintained system. Some assemblies will never be called upon to manage a fault, but if a fault does occur, it can place immense thermal and mechanical stresses on the assembly in an instant. Any ageing or deterioration of the assembly should be limited such that its safety function is not impaired.

Due to the nature of the application, if there are weaknesses in the design or application of an assembly, it is possible they will not be identified until years after the assembly was installed. In order to avoid latent issues, and to ensure that assemblies are suitable for their application, they will be designed and verified to meet the exacting requirements defined in the IEC 61439 series of standards. However, as the IEC 61439 series covers a wide range of applications, and some applications can be partially outside the scope of the standard, it is equally important that assemblies are correctly specified. Where options are given in the IEC 61439 series, the most suitable for the application will be selected; where the requirements are outside the scope of the standards, detailed requirements will be agreed between the specifier and manufacturer.

This document identifies the significance of each characteristic to be considered when specifying an assembly and provides the specifier with guidance on defining a suitable assembly for their application.

For the purposes of this document, the specifier is the party who specifies or selects the assembly characteristics. The specifier 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 document is to provide the specifier with guidance on the specification that should be provided in order to obtain an assembly with the required performance and at optimised costs.

Throughout this document, the term "assembly" is used for a low-voltage switchgear and controlgear assembly. The term "manufacturer" refers to the assembly manufacturer unless specifically indicated otherwise.

The term "line conductor" is used in many places throughout this document. Previously the terminology was phase conductors.

This document is focussed on the specifier, that is, the person or organization providing the specification for the assembly. It is assumed the specifier is acting on behalf of the user.

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 the requirements for the various assemblies that can be considered as general, together with specific subjects dedicated to performances and application, for example temperature rise, short-circuit, 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 designated "IEC 61439-1", and

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

- 2) the specific product part of the IEC 61439 series, hereinafter referred to as the relevant product part of the IEC 61439 series.

The IEC 61439 series of standards encompasses assemblies for a wide variety of uses, some of which have specific needs as imposed by their particular application. In order to clearly define these specific needs, relevant product parts of the IEC 61439 series focussed on a particular type of application have been (or are being) developed. These are identified as IEC 61439-2, IEC 61439-3, and so on (for a list of all parts of the IEC 61439 series, refer to the IEC web site). Each relevant product part of the IEC 61439 series 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 product part of the IEC 61439 series includes, as an annex, a template for "items subject to agreement between the assembly manufacturer and the specifier" to facilitate the specifying of an assembly.

General characteristics of all types of assemblies are considered in this document. Details which are applicable to each type of assembly can be determined by reference to the specification schedule in the relevant product part of the IEC 61439 series.

Within this document, reference to IEC 61439 means the current edition of the IEC 61439 series of standards, including:

- IEC 61439-1, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*
- IEC 61439-2, *Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies*
- IEC 61439-3, *Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)*
- IEC 61439-4, *Low-voltage switchgear and controlgear assemblies – Part 4: Particular requirements for assemblies for construction sites (ACS)*
- IEC 61439-5, *Low-voltage switchgear and controlgear assemblies – Part 5: Assemblies for power distribution in public networks*
- IEC 61439-6, *Low-voltage switchgear and controlgear assemblies – Part 6: Busbar trunking systems (busways)*
- IEC 61439-7, *Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations*

Refer to the IEC web site for the latest edition of each product part of the IEC 61439 series and additional product part of the IEC 61439 series published for other specific applications.

NOTE Each product part of the IEC 61439 series is related to the appropriate edition of IEC 61439-1, as listed in the product part, and the corresponding edition of IEC TR 61439-0.

A reference to "general rules" means a reference to IEC 61439-1:2020.

A reference to "product standard" means the relevant part or parts of the IEC standard for the components used in the assembly (e.g. IEC 60947-2 for circuit-breakers).

This is a preview of "PD IEC TR 61439-0:20...". [Click here to purchase the full version from the ANSI store.](#)

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 0: Guidance to specifying assemblies

1 Scope

Within the IEC 61439 series of standards for low-voltage switchgear and controlgear assemblies, there are system and application details that are specified by the specifier to enable the manufacturer to produce an assembly that meets the needs and expectations of the specifier.

This part of IEC 61439, which is a technical report, identifies from the specifier's perspective those functions and characteristics that are defined when specifying assemblies. It provides:

- an explanation of the assembly characteristics and options within the IEC 61439 series;
- a guidance on how to select the appropriate options and define characteristics so as to meet specific application needs; and
- an assistance in the specification of assemblies.

References within this document to the interface characteristics of an assembly and the requirements with which they will comply assume that the assembly is designed, manufactured, and verified in accordance with the relevant part of the IEC 61439 series.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61439 (all parts), *Low-voltage switchgear and controlgear assemblies*

IEC 61439-1:2020, *Low-voltage switchgear and controlgear assemblies – Part 1: General rules*

IEC 61439-2:2020, *Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies*

IEC 61439-3, *Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)*

IEC 61439-4, *Low-voltage switchgear and controlgear assemblies – Part 4: Particular requirements for assemblies for construction sites (ACS)*

IEC 61439-5, *Low-voltage switchgear and controlgear assemblies – Part 5: Assemblies for power distribution in public networks*

IEC 61439-6, *Low-voltage switchgear and controlgear assemblies – Part 6: Busbar trunking systems (busways)*

IEC 61439-7, *Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations*