

TECHNICAL REPORT

Low-voltage switchgear and controlgear assemblies –
Part 0: Guidance to specifying assemblies
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[IEC TR 61439-0:2013](https://standards.iteh.ai/catalog/standards/sist/e0fa2911-42e4-4867-9709-a3af1b745c0b/iec-tr-61439-0-2013)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –**Part 0: Guidance to specifying assemblies**

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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.

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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

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- 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.

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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)*

- IEC 61439-7:2013, *Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electrical vehicles charging stations*¹

A reference to “general rules” means a reference to IEC 61439-1:2011.

A reference to “ASSEMBLY standard” means the relevant part of the IEC 61439 series (e.g. Part 2, 3, etc.).

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).

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¹ To be published.

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 (ASSEMBLIES), there are system and application details that are specified by the user to enable the manufacturer to produce an ASSEMBLY that meets the needs and expectations of the user.

This Part of IEC 61439, which is a technical report identifies, from the user's perspective, those functions and characteristics that should be 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 option and to define characteristics so as to meet specific application needs, using a functional approach; and
- an assistance in the specification of ASSEMBLIES.

References within this technical report 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 IEC 61439 part.

2 Normative references

[IEC TR 61439-0:2013](https://standards.iteh.ai/catalog/standards/sist/e0fa2911-42e4-4867-9709-a3af1b745c0b/iec-tr-61439-0-2013)

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The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CISPR 11, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

IEC 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-6, *Low-voltage electrical installations – Part 6: Verification*

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

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

IEC 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the relevant ASSEMBLY standard apply (e.g. IEC 61439-2).

4 Application of ASSEMBLIES within the IEC 61439 series

4.1 General

ASSEMBLIES manufactured in accordance with the relevant ASSEMBLY standard of the IEC 61439 series of standards are suitable for installation in the majority of operating environments. Many of the characteristics of ASSEMBLIES are fully defined within the standard and do not require further consideration by the user. In some instances there may be a default condition specified within the standard and a range of other identified alternative options, from which the user may choose to suit the application. For other characteristics, the user may be required to choose from a list of options within the standard.

Where special and exceptionally onerous conditions exist, the user should identify these in their specification. Examples of these onerous conditions include: high UV radiation applications, conditions of high particulates/pollutants, more stringent short circuit conditions, special fault protection, special protection due to risk of fire, explosions, burns, etc.

In some instances, the user may wish to seek the advice of experts in order to identify their requirements correctly, e.g. with regard to system harmonics.

The annexes from Annex C onward provide specification templates that the user should complete when defining the interface characteristics and application requirements for an ASSEMBLY in accordance with the relevant ASSEMBLY standard. An explanation of each interface characteristic is given in the subsequent clauses.

4.2 ASSEMBLY design and verification

An ASSEMBLY is intended to be used within an electrical installation of defined characteristics. The ASSEMBLY may be designed and verified with a specific set of application criteria, to suit a particular use, or more usually, it may be designed and verified to meet typical application criteria that make it usable in a range of common applications.

The configuration for a particular user application of an ASSEMBLY usually requires four main steps:

- a) definition or selection of service conditions and interface characteristics. The user should specify these characteristics;
- b) design of the ASSEMBLY by the manufacturer to meet the arrangements, characteristics, and functions particular to the application. The design will generally be based on previously developed standard ASSEMBLY arrangements, characteristics, and functions;
- c) for ASSEMBLIES or parts of ASSEMBLIES where the design is not previously proven, design verification carried out by the manufacturer;
- d) routine verification, carried out on each ASSEMBLY by the manufacturer.

For further information on the design and routine verification carried out by the manufacturer, see Clause 14.

4.3 Service conditions and interface characteristics

The characteristics of the ASSEMBLY should be compatible with the ratings of the circuits to which it is connected and the installation conditions.

Where no user specification is provided, information given in the manufacturer's documentation may take the place of an agreement between the manufacturer and the user.

It is assumed that the user will provide an electrical single line diagram, or equivalent, to define the incoming and outgoing circuit arrangements, loads, external conductors, and selected interface characteristics that are required for the application of a specific ASSEMBLY.

4.4 Design

Once the user has specified any arrangements, characteristics, or functions particular to the application, the manufacturer is responsible for the design of the ASSEMBLY and ensuring it complies with the relevant ASSEMBLY standard in the IEC 61439 series. From the information provided by the user, the manufacturer will derive additional ASSEMBLY characteristics in order to provide an ASSEMBLY that fulfils the user's stated application requirements.

5 Electrical system

5.1 General

The electrical system determines the characteristics (capabilities) an ASSEMBLY should possess in order to perform its required duty safely. The characteristics of the ASSEMBLY should at all times be at least equal to the needs of the application and, where essential, they may exceed those offered in the standard options detailed in the IEC 61439 series.

The user should provide an electrical single line diagram and/or any other information necessary to define their requirements for the ASSEMBLY, as detailed in 5.2 to 5.6 below.

5.2 Earthing system

The means of earthing a low-voltage network, when, how and where, differs from application to application. For a particular network, the earthing system used may be dictated by local regulation, the supply authority, legacy requirements, or the benefits of one system relative to others.

The standard configurations of earthing system are TT, TN-C, TN-C-S, IT, TN-S. Specific systems require and/or permit different solutions. For example, during the isolation of a supply for maintenance:

- in TN-C systems, the PEN conductor is not permitted to be isolated or switched, but,
- in TN-S systems and TN-C-S systems the neutral conductors may or may not be isolated or switched (see IEC 60364-5-53:2001, 536.1.2).

The design of the auxiliary circuits should take into account the supply earthing system to ensure that an earth-fault does not cause unintentional operation.

It is therefore essential that users specify the earthing system.

5.3 Nominal voltage

The nominal voltage of the electrical system determines a number of the ASSEMBLY characteristics.

The user should specify the nominal voltage of the system.

When provided with the nominal voltage, the manufacturer will determine the appropriate values for other rated voltages including:

- the rated operational voltage U_e (of a circuit of an ASSEMBLY)

This is the voltage at which all the devices in a circuit, or a group of circuits, are capable of performing a specified function, for example switching a particular load a given number of times. In all cases, the rated operational voltage of a main circuit of an ASSEMBLY will be at least equal to the rated voltage of the ASSEMBLY.

- the rated insulation voltage U_i

Like U_e , the rated insulation voltage also applies to a circuit or group of circuits of the ASSEMBLY. It is the long-term voltage withstand capability of the insulation and is never less than the rated operational voltage. Generally an insulation voltage equal to the operational voltage is sufficient, but where particularly arduous conditions apply, a higher insulation voltage may be appropriate.

5.4 Transient overvoltages

All networks experience occasional transient overvoltages caused by switching, lightning, etc. Generally, within a low-voltage network, the magnitude of the overvoltages is reduced as the distance from the source of supply is increased. It is therefore possible to have ASSEMBLIES suitable for different levels of overvoltage as determined by their location in the electrical network.

Various levels of overvoltage category are defined using a series of roman numbers.

The overvoltage category options are:

- Category I: Specially protected level (internal to equipment, not normally applicable to an ASSEMBLY)
- Category II: Load level (appliance, equipment, not normally applicable to an ASSEMBLY)
- Category III: Distribution circuit level (typical industrial applications)

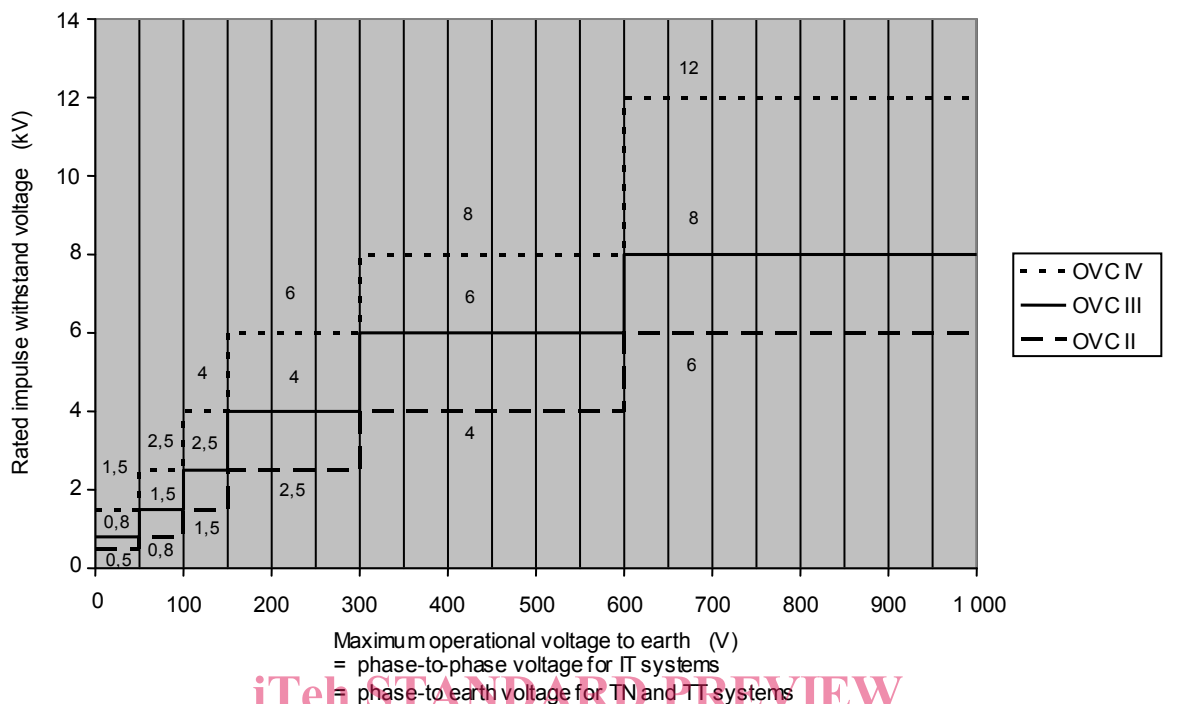
Examples: Equipment which is part of the fixed electrical installation and other equipment where a high degree of availability is expected, e.g. distribution boards, motor control centres.

- Category IV: Origin of installation level (service entrance)

Examples: Equipment to be used at or in the proximity of the origin of the electrical installation upstream of the main distribution board, e.g. electricity meter, primary overcurrent protective device.

The manufacturer will determine the likely overvoltage category from the electrical system, single line diagram. Where exceptional overvoltage conditions apply, the user should specify the required overvoltage category option for their application.

From the overvoltage category, the nominal voltage and the type of electrical supply system the manufacturer will determine the appropriate values for the rated impulse withstand voltage (U_{imp}). This relationship is illustrated for information in Figure 1.



IEC 2361/10

Figure 1 – Required rated impulse withstand voltage

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The rated impulse withstand voltage U_{imp} is a measure of the ASSEMBLY's tolerance to transient overvoltages. In normal networks, it will be equal to or higher than the transient overvoltages occurring in the system(s) to which the circuit is designed to be connected.

5.5 Unusual voltage transients, temporary overvoltages

The ASSEMBLY will be capable of withstanding:

- transient overvoltage – short duration overvoltage of a few milliseconds or less, oscillatory or non-oscillatory, usually highly damped, and
- temporary overvoltage – overvoltage at power frequency of relatively long duration (several seconds).

The rated impulse withstand voltage (U_{imp}) defines the transient overvoltage to be withstood, ranging from 0,33 kV to 12 kV.

The rated insulation voltage (U_i) defines the level of temporary overvoltage to be withstood.

If unusual voltage transients or temporary overvoltages are anticipated, the user should specify the conditions to be met. Where such unusual conditions apply, it is important that they are identified in order that the appropriate ASSEMBLY can be provided (guidance is provided e.g. in IEC 61643-12 for transient overvoltages).

5.6 Rated frequency f_n (Hz)

ASSEMBLIES are designed to operate at a particular (rated) frequency or over a range of frequencies or with direct current. Connecting a circuit of an ASSEMBLY to a supply with a frequency outside its intended range can result in devices not operating correctly, altered