
Visokonapetostne stikalne in krmilne naprave - 205. del: Sestav omrežnih stikalnih naprav, mobilne in montažne postaje za naznačene napetosti nad 52 kV

High-voltage switchgear and controlgear - Part 205: Compact switchgear assemblies, mobile and prefabricated substations for rated voltage above 52 kv

Hochspannungs-Schaltgeräte und -Schaltanlagen - Teil 205: Kompakte Schaltgerätekombinationen für Bemessungsspannungen über 52 kV

Appareillage à haute tension - Partie 205: Ensembles d'appareillage compacts, postes mobiles et préfabriqués pour une tension nominale supérieure à 52 kv

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High-voltage switchgear and controlgear – Part 205: AC compact switchgear assemblies, mobile and prefabricated substations for rated voltage above 52 kV

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 62271-205 has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear. It is an International Standard.

This second edition cancels and replaces the first edition published in 2008. This edition constitutes a technical revision.

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

- a) Scope has been enlarged to include prefabricated substations and mobile substations
- b) New terms "mobile substation" and "prefabricated substation" have been defined
- c) References to actual IEC publications have been updated

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- d) Clauses and subclauses have been re-organized to distinguish between compact switchgear assemblies, mobile substations and prefabricated substations where needed

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

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 International Standard 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/publications.

This document is to be read in conjunction with IEC 62271-1 to which it refers and which is applicable, unless otherwise specified. A list of all parts of the IEC 62271 series can be found, under the general title *High-voltage switchgear and controlgear*, on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This standard uses the terms compact switchgear assemblies, prefabricated substations and mobile substations. Even if these terms suggest a clear distinction, the real applications show a wide overlap and also a mixture of these terms. This is, among other things, due to the fact, that compact switchgear assemblies, prefabricated substations and mobile substations are generally highly customized and thus almost each application can be considered individual.

A prefabricated substation is basically designed for installation without further relocation. It is pre-built off-site e.g., in a factory, and then transported to its final installation site.

A mobile substation is designed for temporary installations and relocations. It is pre-built off-site, e.g., in a factory, and then transported to its location for use.

Compact switchgear assemblies consist of at least one mechanical switching device directly connected to, or sharing components, with one or more other devices (e.g., instrument transformers, bushings etc.). In general, they are designed for fixed installation and in most cases transported to site as a whole.

A combination of above-described terms is possible. For instance, a compact switchgear assembly may also form a part of a mobile substation.

Within mobile or prefabricated substations with rated voltages above 52 kV, switching devices rated up to 52 kV (e.g., medium-voltage switching devices at 36 kV) as well as high-voltage switching devices (e.g., 145 kV) may be used. For a better understanding in reading this document the term “medium-voltage” will be used where necessary.

Mobile substations and prefabricated substations usually, but not exclusively, consist of the following modules:

- High-voltage module;
- Power transformer module;
- Medium-voltage module;
- Protection and control module;

Mobile substations require additional suitable vehicles for transportation.

The CIGRE Technical Brochure 907 [1] “Mobile substations incorporating HV GIS” provides guidance for mobile substation applications, which extend from those intended for rapid deployment in an emergency through relocatable designs to prefabricated or ‘build off-site’ solutions. Three cases for mobile/prefabricated substation are defined:

- Substation for short term (emergency) use – typically 1 week ÷ 6 months;
- Substation for intermediate term use – typically 6 months ÷ 3 years;
- Substation for long term use – typically more than 3 years.

More explanatory information could be found in CIGRE Technical Brochure 907 [1].

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR-

Part 205: AC compact switchgear assemblies, mobile and prefabricated substations for rated voltage above 52 kV

1 Scope

1.1 General

This part of IEC 62271 series applies to service conditions, rated characteristics, general structural requirements and test methods of compact switchgear assemblies, mobile substations and prefabricated substations, for indoor and/or outdoor installations in systems having rated voltages above 52 kV and service frequencies up to and including 60 Hz.

1.2 Compact switchgear assemblies

In general, compact switchgear assemblies consist of at least one mechanical switching device directly connected to or sharing components with one or more other devices such that there is an interaction between the functions of the individual devices.

The devices, defined by IEC standards, which can be a part of a compact switchgear assembly are exemplary listed below and is not be limited to:

NOTE To simplify the reading of this document, the term "switching device" is used instead of the term "mechanical switching device".

Switching devices:

- Circuit-breakers
- Disconnectors/Earthing switches
- Switch-disconnectors
- Disconnecting circuit-breakers

Devices:

- Instrument transformers
- Surge arresters
- Bushings
- Insulators
- Cable connections
- Transformer connections

The interaction between devices might be due to proximity, sharing of components or a combination of both. The assemblies can contain devices of air insulated switchgear (AIS) only or a combination of part of AIS and part of gas-insulated metal-enclosed switchgear (GIS), so called mixed technology switchgear (MTS) and can be delivered entirely prefabricated or partially assembled.

Each switching device forming a part of a compact switchgear assembly shall comply with the relevant individual standard. If a part of the compact switchgear assembly is formed by gas-insulated metal-enclosed switchgear devices, the requirements of IEC 62271-203:2022 apply.

The parts of this document relevant for compact switchgear assemblies do not apply to switchgear assemblies (for fixed or mobile purpose) consisting solely of GIS which are covered by IEC 62271-203.

It is not possible to define all potential arrangements of compact switchgear assemblies. Four examples are shown for information in Annex A.

1.3 Prefabricated substation and mobile substation

In general, a prefabricated substation is a high-voltage assembly, comprising of different functional type-tested modules, assembled off-site in a factory and then transported to its final location for installation. The majority of the assembly and testing operations which are normally carried out at site are completed before delivery in order to shorten site works. A prefabricated substation is based on functional modules and consists at least of a power transformer module and/or a high-voltage switchgear and controlgear module. Further functional modules, which may be part of a prefabricated substation, are listed below but shall not be seen as conclusive:

- Protection and control module
- Medium-voltage module
- Lightning protection
- Power cable

Compact switchgear assemblies can be an integral part of the high-voltage switchgear and controlgear module and can be therefore part of a prefabricated substation.

A mobile substation is a prefabricated substation designed and intended to be transported during lifetime by use of an adequate vehicle. Requirements for the vehicle can be linked to local regulations and are not in the scope of this document.

In general, it is not feasible to specify every possible configuration of prefabricated and mobile substations. Annex B provides more information on mobile substations and Annex C on prefabricated substations.

NOTE For the use of this document high voltage (IEC 60050-601:1985 [2], 601-01-27) is the rated voltage above 1 000 V. However, medium voltage (IEC 60050-601:1985 [2], 601-01-28) is commonly used for distribution systems with voltages above 1 000 V and generally applied up to and including 52 kV. For a better understanding in reading this document the term “medium voltage” will be used where necessary.

2 Normative references

The following publications 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 publication (including any amendments) applies.

IEC 60068-2-17 Environmental testing - Part 2-17: Tests - Test Q: Sealing

IEC 61936-1 Power installations exceeding 1 kV AC and 1,5 kV DC - Part 1: AC

IEC 62271-1 High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear

IEC 62271-4 High-voltage switchgear and controlgear – Part 4: Handling procedures for gases for insulating and/or switching

IEC 62271-203 High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV

3 Terms and definitions

3.1 General terms

For the purposes of this document, the terms and definitions given in IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021, the publications mentioned in clause 2 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1.1

agreement between user and manufacturer

documented understanding between the user and/or customer and the manufacturer defining responsibilities, technical requirements, and conditions applicable to the product or system.

3.2 Assemblies of switchgear and controlgear

3.2.1

compact switchgear assembly

assembly of high-voltage devices consisting of at least one switching device directly connected to, or sharing components with, one or more other devices such that there is an interaction between the functions of the individual devices

Note 1 to entry: Assembly of high-voltage devices can be made of “air insulated/air insulated” or “air insulated/gas insulated” devices. Annex A provides examples of compact switchgear assemblies.

Note 2 to entry: A compact switchgear assembly may be mounted on one or more structures, but it is only intended for installation and operation as a single, complete unit.

Note 3 to entry: Interaction is the transfer of stresses (e.g., electrical, mechanical and thermal) between the individual devices.

3.2.2

prefabricated substation

prefabricated high-voltage assembly comprising at least a power transformer and/or a high-voltage switchgear and controlgear, and usually one or several of the following devices: medium-voltage switchgear and controlgear, high-voltage interconnection, medium-voltage interconnection, auxiliary and control equipment and circuits

Note 1 to entry: A prefabricated substation includes all main and earthing circuits to be connected through appropriate interfaces to external high-voltage and medium-voltage cables and to external earthing system and (protective) bonding conductor (if any).

Note 2 to entry: A prefabricated substation may be partially or completely protected by an enclosure.

Note 3 to entry: A prefabricated substation is normally not designed for relocation to alternative sites during its lifetime.

Note 4 to entry: Annex C provides some more information of prefabricated substations.

[SOURCE: IEC 62271-202:2022 [3], 3.2.101, modified - change from “low-voltage” to “medium-voltage”; “and type-tested” deleted; “an enclosure containing” deleted; Note 2, Note 3 and Note 4 to entry added]

3.2.3

mobile substation

pre-fabricated electrical substation which is designed to be relocated to alternative sites during lifetime and connectable to the grid itself or via a substation.

Note 1 to entry: Mobile substations are normally mounted as an integral part of a vehicle for road or train transportation. Alternatively, they can also be mounted on e.g., a platform or rack which is at site unloaded and placed on ground until relocation.

Note 2 to entry: According to the intended usage of the mobile substation (e.g., short term emergency use or intermediate use during renovation/reconstruction of an existing substation) the design and requirements e.g., on type-tests and site acceptance tests may differ.

Note 3 to entry: A mobile substation can consist of different transportation units

Note 4 to entry: Annex B provides more information and examples of mobile substations.

3.2.4

high-voltage module

functional unit with a rated voltage above 52 kV, may consisting of, but not limited for, switching devices, instrument transformers including their associated auxiliary and control devices, establishing the connection to the existing grid by either overhead line or cable connection

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Note 1 to entry: The functional unit may be prefabricated.

Note 2 to entry: The functional unit may be based on compact switchgear assemblies or e.g., GIS (covered by IEC 62271-203).

3.2.5

transformer module

functional unit for a power transformer and additional windings if applicable and/or a shunt reactor, as well as associated auxiliary, protection and control devices.

3.2.6

medium-voltage module

functional unit with a rated voltage up to and including 52 kV, may consisting of, but not limited to, switching devices, instrument transformers, medium-voltage / low-voltage power transformer, reactive power compensation device including their associated auxiliary and control devices

Note 1 to entry: The functional unit may be prefabricated.

3.2.7

protection & control module

functional unit which may integrate automation system, scheduling automation system, communication system, protection relay and safety automatic device, AC and DC power supply system, time synchronization device, auxiliary facilities intelligent control and other equipment

Note 1 to entry: The functional unit may be a combination of protection & control system and local power supply system.

3.2.8

vehicle

transportation system designed to relocate mobile substation or parts of it (e.g., trailer)

4 Normal and special service conditions

Clause 4 of IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 is applicable with the following additions:

Unless otherwise specified in this document, a prefabricated or mobile substation is intended to be used in accordance with its rated characteristics and at locations compliant with the normal service conditions defined for outdoor switchgear and controlgear in IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021.

Inside an enclosed installation (e.g., inside a container or indoor installation) of a prefabricated or mobile substation, it is assumed that the normal indoor service conditions defined for indoor switchgear and controlgear in IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 prevail.

The air temperature inside an enclosed installation of a prefabricated or mobile substation might differ from the ambient air temperature. If the air temperature inside the enclosed installation is higher than the limits defined for the devices in their respective product standards, de-rating can be necessary

Generally, as compact switchgear assemblies, prefabricated substations and mobile substations can contain devices that are not covered by IEC 62271-1 (e.g., voltage transformers), the normal and special service conditions of these devices shall at least meet Clause 4 of IEC 62271-1:2017 and IEC 62271-1:2017/AMD1:2021 without the need for derating.