

# INTERNATIONAL STANDARD



High-voltage switchgear and controlgear –  
Part 203: AC gas-insulated metal-enclosed switchgear for rated voltages above  
52 kV

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

#### Part 203: **AC** gas-insulated metal-enclosed switchgear for rated voltages above 52 kV

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**This commented version (CMV) of the official standard IEC 62271-203:2022 edition 3.0 allows the user to identify the changes made to the previous IEC 62271-203:2011 edition 2.0. Furthermore, comments from IEC SC 17C experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.**

**A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.**

**This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.**

IEC 62271-203 has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear. It is an International Standard.

This third edition cancels and replaces the second edition published in 2011. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: **2**

- a) the document has been aligned with IEC 62271-1:2017;
- b) beside SF<sub>6</sub> also alternative gases have been implemented where needed;
- c) the terms and definitions have been updated and terms not used have been removed;
- d) Subclause 6.16 “Gas and vacuum tightness” has been updated;
- e) Subclause 6.16.3 “Closed pressure systems”: Two classes of gas has been introduced:
  - 1) GWP ≤ 1 000
  - 2) GWP > 1 000
 and the tightness requirements for type tests for gasses with GWP > 1 000 has been reduced from 0,5 % to 0,1 % per year per gas compartment;
- f) Subclause 6.108 “Interfaces”: Typical maximum pressures in service for interfaces connected to GIS have been defined;
- g) Subclauses 7.2 through 7.8 have been restructured;
- h) Subclause 7.107 “Corrosion test on earthing connections” has been updated;
- i) Subclause 7.108 “Corrosion tests on sealing systems of enclosures and auxiliary equipment” has been updated;
- j) Annex F ‘Service Continuity’ has been modified and aligned with the recommendations of CIGRE WG B3.51.

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

Draft	Report on voting
17C/835/FDIS	17C/844/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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## HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

### Part 203: AC gas-insulated metal-enclosed switchgear for rated voltages above 52 kV 3

#### 1—General

##### 1 Scope

This part of IEC 62271 specifies requirements for gas-insulated metal-enclosed switchgear in which the insulation is obtained, at least partly, by an insulating gas or gas mixture 4 other than air at atmospheric pressure, for alternating current of rated voltages above 52 kV, for indoor and outdoor installation, and for service frequencies up to and including 60 Hz.

For the purpose of this document, the terms “GIS” and “switchgear” are used for “gas-insulated metal-enclosed switchgear”.

The gas-insulated metal-enclosed switchgear covered by this document consists of individual components intended to be directly connected together and able to operate only in this manner.

This document completes and amends, if necessary applicable, the various relevant standards applying to the individual components constituting GIS.

##### 2 Normative references 5

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 60044-1:1996, Instrument transformers – Part 1: Current transformers~~

~~IEC 60044-2:1997, Instrument transformers – Part 2: Inductive voltage transformers~~

IEC 60068-2-11, ~~Basic environmental testing procedures~~ Environmental testing – Part 2-11: Tests – Test Ka: Salt mist

IEC 60068-2-17, Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing

IEC 60085:2007, Electrical insulation – Thermal evaluation and designation

IEC 60099-4:2014, Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems

IEC 60137:20082017, ~~Insulating~~ Insulated bushings for alternating voltages above 1 000 V

IEC 60141-1, Tests on oil-filled and gas-pressure cables and their accessories – Part 1: Oil-filled, paper or polypropylene paper laminate insulated, metal-sheathed cables and accessories for alternating voltages up to and including ~~400~~ 500 kV

IEC 60270, High-voltage test techniques – Partial discharge measurements

IEC 60376, *Specification of technical grade sulphur hexafluoride (SF<sub>6</sub>) and complementary gases to be used in its mixtures for use in electrical equipment*

~~IEC 60480, *Guidelines for the checking and treatment of sulfur hexafluoride (SF<sub>6</sub>) taken from electrical equipment and specification for its re-use*~~ Specifications for the re-use of sulphur hexafluoride (SF<sub>6</sub>) and its mixtures in electrical equipment

IEC 60840, *Power cables with extruded insulation and their accessories for rated voltages above 30 kV (U<sub>m</sub> = 36 kV) up to 150 kV (U<sub>m</sub> = 170 kV) – Test methods and requirements*

~~IEC/TR 61639:1996, *Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages of 72,5 kV and above*~~

IEC 61869-1, *Instrument transformers – Part 1: General requirements*

IEC 61869-2, *Instrument transformers – Part 2: Additional requirements for current transformers*

IEC 61869-3, *Instrument transformers – Part 3: Additional requirements for inductive voltage transformers*

IEC 62067, *Power cables with extruded insulation and their accessories for rated voltages above 150 kV (U<sub>m</sub> = 170 kV) up to 500 kV (U<sub>m</sub> = 550 kV) – Test methods and requirements*

IEC 62271-1:~~2007~~2017, *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 sulphur hexafluoride (SF<sub>6</sub>) and its mixtures*

IEC 62271-100:~~2008~~2021, *High-voltage switchgear and controlgear – Part 100: Alternating current circuit-breakers*

IEC 62271-102:~~2004~~2018, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*

IEC 62271-209:~~2007~~2019, *High-voltage switchgear and controlgear – Part 209: Cable connections for gas-insulated metal-enclosed switchgear for rated voltages above 52 kV – Fluid-filled and extruded insulation cables – Fluid-filled and dry-type cable-terminations*

IEC 62271-211:2014, *High-voltage switchgear and controlgear – Part 211: Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages above 52 kV*

~~IEC/TR 62271-303, *High-voltage switchgear and controlgear – Part 303: Use and handling of sulphur hexafluoride (SF<sub>6</sub>)*~~

~~ISO 3231, *Paints and varnishes – Determination of resistance to humid atmospheres containing sulfur dioxide*~~

ISO 22479, *Corrosion of metals and alloys – Sulfur dioxide test in a humid atmosphere (fixed gas method)*

### 3 Terms and definitions **6**

For the purposes of this document, the terms and definitions given in IEC 62271-1:2017 and the following, apply.

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

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

#### 3.101

##### **metal-enclosed switchgear and controlgear**

switchgear and controlgear assemblies with an external metal enclosure intended to be earthed, and complete except for external connections

[SOURCE: IEC 60050-441:1984, 441-12-04, modified – The note was deleted.]

#### 3.102

##### **gas-insulated metal-enclosed switchgear**

metal-enclosed switchgear in which the insulation is obtained, at least partly, by an insulating gas or gas mixture other than air at atmospheric pressure

Note 1 to entry: This term generally applies to high-voltage switchgear and controlgear.

Note 2 to entry: Three-phase enclosed gas-insulated switchgear applies to switchgear with the three phases enclosed in a common enclosure.

Note 3 to entry: Single-phase enclosed gas-insulated switchgear applies to switchgear with each phase enclosed in a single independent enclosure.

[SOURCE: IEC 60050-441:1984, 441-12-05, modified – "or gas mixture" has been added in the definition, and Note 2 and 3 to entry have been added.]

#### 3.103

##### **gas-insulated switchgear enclosure**

part of gas-insulated metal-enclosed switchgear retaining the insulating gas under the prescribed conditions necessary to maintain safely the highest insulation level, protecting the equipment against external influences and providing a high degree of protection to personnel

Note 1 to entry: The enclosure can be single-phase or three-phase.

#### 3.104

##### **isolating link **7****

part of the conductor which can easily be opened or removed in order to isolate two parts of the GIS from each other

Note 1 to entry: The open gap is designed to withstand the test voltages across isolating distance according Table 2 and Table 3.

Note 2 to entry: The purpose of an isolating link is to ensure electrical isolation between sections of a GIS e.g. during maintenance and repair work.

#### 3.105

##### **removable link **8****

part of the conductor which can easily be opened or removed in order to **isolate** separate two parts of the GIS from each other

Note 1 to entry: The open gap is designed to withstand the phase-to-earth test voltages according to Table 2 and Table 3.

Note 2 to entry: The purpose of a removable link is to ensure electrical separation between sections of a GIS, where the equipment is separated from the rest of the GIS, e.g. in front of voltage transformers, surge arresters, cable connections and transformer connections during high voltage testing of GIS or testing of the components.

**3.106  
compartment**

part of gas-insulated metal-enclosed switchgear, ~~totally enclosed except for openings necessary for interconnection and control~~ which is gastight and enclosed

Note 1 to entry: A compartment ~~may~~ can be designated by the main component contained therein, e.g. circuit-breaker compartment, busbar compartment.

**3.107  
component**

essential part of the main or earthing circuits of gas-insulated metal-enclosed switchgear which serves a specific function (for example circuit-breaker, disconnecter, switch, fuse, instrument transformer, bushing, busbar, etc.)

**3.108  
support insulator**

internal insulator supporting one or more conductors

**3.109  
partition**

gas tight support insulator of gas-insulated metal-enclosed switchgear separating ~~one compartment from other compartments~~ two adjacent compartments

**3.110  
bushing**

a device that enables one or several conductors to pass through ~~a partition such as a wall or a tank~~, an enclosure and insulate the conductors from it

~~NOTE—The means of attachment (flange or fixing device) to the partition form part of the bushing.~~

[SOURCE: IEC 60050-471:2007, 471-02-01, modified – “an enclosure” inserted after “pass through” and “a partition such as a wall or a tank” deleted. Notes 1 and 2 were deleted.]

**3.111  
main circuit**

all the conductive parts of gas-insulated metal-enclosed switchgear included in a circuit which is intended to transmit electrical energy

[SOURCE: IEC 60050-441:1984, 441-13-02, modified – “gas-insulated metal-enclosed switchgear” inserted after “parts of” and “an assembly” deleted]

**3.112  
auxiliary circuit**

all the conductive parts of gas-insulated metal-enclosed switchgear included in a circuit ~~(other than the main circuit)~~ intended to control, measure, signal and regulate

Note 1 to entry: The auxiliary circuits of gas-insulated metal-enclosed switchgear include the control and auxiliary circuits of the switching devices.

**3.113  
enclosure design temperature ~~of enclosures~~**

maximum temperature that the enclosures can reach under specified maximum service conditions

### 3.114

#### **enclosure design pressure** ~~of enclosures~~

relative pressure used to determine the design of the enclosure

Note 1 to entry: It is at least equal to the maximum pressure in the enclosure at the highest temperature that the gas used for insulation can reach under specified maximum service conditions.

Note 2 to entry: The transient pressure occurring during and after a breaking operation (e.g. circuit-breaker) is not ~~to be~~ considered in the determination of the design pressure.

### 3.115

#### **partition design pressure** ~~of partitions~~

relative pressure across the partition used to determine the design of the partition

Note 1 to entry: It is at least equal to the maximum ~~relative~~ differential pressure across the partition during maintenance activities.

Note 2 to entry: The transient pressure occurring during and after a breaking operation (e.g. circuit-breaker) is not ~~to be~~ considered in the determination of the design pressure.

### 3.116

#### **operating pressure**

<pressure relief device> relative pressure chosen for the opening operation of pressure relief devices

### 3.117

#### **routine test pressure**

<enclosures and partitions> relative pressure to which all enclosures and partitions are subjected after manufacturing

### 3.118

#### **type test pressure**

<enclosures and partitions> relative pressure to which enclosures and partitions are subjected for type test

### 3.119

#### **fragmentation**

damage to enclosure due to pressure rise with projection of solid material

~~NOTE The term "no fragmentation of the enclosure" is interpreted as follows:~~

~~— no explosion of the compartment;~~

~~— no solid parts flying off from the compartment.~~

~~Exceptions are:~~

~~— parts of the pressure relief device, if their ejection is directed;~~

~~— glowing particles and molten material resulting from burn-through of the enclosure.~~ **9**

### 3.120

#### **disruptive discharge**

phenomena associated with the failure of insulation under electric stress, in which the discharge completely bridges the insulation under test, reducing the voltage between the electrodes to zero or almost zero

### 3.120

#### **service period**

~~time until a maintenance, including opening of the gas compartments, is required~~

### 3.121

#### **transport unit**

part of gas-insulated metal-enclosed switchgear suitable for shipment without being dismantled

### 3.122

#### **functional unit 10**

part of metal-enclosed switchgear and controlgear comprising all the components of the main circuits and auxiliary circuits that contribute to the fulfilment of a single function

Note 1 to entry: Functional units can be distinguished according to the function for which they are intended, for example complete single-phase or three-phase bay or functional parts of a bay like complete circuit-breaker, disconnector, earthing switch, voltage transformer, current transformer, operating mechanism, enclosure, etc.

[SOURCE: IEC 60050-441:1984, 441-13-04, modified – In the definition, “metal-enclosed” inserted after “part of” and “an assembly of” deleted. In the note the examples have been exchanged with examples relevant for GIS.]

## **4 Normal and special service conditions**

~~Clause 2 of IEC 62271-1 is applicable with the following additions:~~

~~At any altitude the dielectric characteristics of the internal insulation are identical with those measured at sea-level. For this internal insulation, therefore, no specific requirements concerning the altitude are applicable.~~

~~Some items of a GIS such as pressure relief devices and pressure and density monitoring devices may be affected by altitude. The manufacturer shall take appropriate measures if necessary. 11~~

### **4.1 Normal service conditions**

Subclause 4.1 of IEC 62271-1:2017 is applicable, taking into account the recommended values presented in Table 1 of this document.

### **4.2 Special service conditions**

Subclause 4.2 of IEC 62271-1:2017 is applicable, taking into account the recommended values presented in Table 1 of this document.

In the cases where higher than (>) is used in Table 1, the values shall be specified by the user as described in IEC 62271-1:2017.