IEC 62271-203

Edition 2.0 2011-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Appareillage à haute tension –
Partie 203: Appareillage sous enveloppe métallique à isolation gazeuse de tensions assignées supérieures à 52 kV

IEC 62271-203:2011

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HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV

FOREWORD

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

This second edition of IEC 62271-203 cancels and replaces the first edition of IEC 62271-203, published in 2003, and constitutes a technical revision.

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

- adopting the structure and the content to IEC 62271-1,
- harmonisation with IEEE C37.122,
- addition of the new Annex F and the new Annex G.

The text of this standard is based on the following documents:

FDIS	Report on voting
17C/512/FDIS	17C/524/RVD

Full information on the voting for the approval of this standard 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 H lists all of the 'in-some-country' clauses on differing practices of a less permanent nature relating to the subject of this standard.

This International Standard should be read in conjunction with IEC 62271-1:2007, to which it refers and which is applicable unless otherwise specified. In order to simplify the indication of corresponding requirements, the same numbering of clauses and subclauses is used as in IEC 62271-1. Amendments to these clauses and subclauses are given under the same numbering, whilst additional subclauses, are numbered from 101.

A list of all the parts of 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 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.

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV

1 General

1.1 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 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 standard, the terms “GIS” and “switchgear” are used for “gas-insulated metal-enclosed switchgear”.

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

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

1.2 Normative references

The following referenced documents are indispensable for the application 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 – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60137:2008, *Insulating 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-insulated, metal-sheathed cables and accessories for alternating voltages up to and including 400 kV*

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

IEC 60376, *Specification of technical grade sulfur hexafluoride (SF_6) for use in electrical equipment*

IEC 60480, *Guidelines for the checking and treatment of sulfur hexafluoride (SF_6) taken from electrical equipment and specification for its re-use*

IEC 60840, *Power cables with extruded insulation and their accessories for rated voltages above 30 kV (U_m = 36 kV) up to 150 kV (U_m = 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 62067, *Power cables with extruded insulation and their accessories for rated voltages above 150 kV (U_m = 170 kV) up to 500 kV (U_m = 550 kV) – Test methods and requirements*

IEC 62271-1:2007, *High-voltage switchgear and controlgear – Part 1: Common specifications*

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

IEC 62271-102:2001, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*

IEC 62271-209:2007, *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/TR 62271-303, *High-voltage switchgear and controlgear – Part 303: Use and handling of sulphur hexafluoride (SF_6)*

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

2 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.

2.1 Normal service conditions

Subclause 2.1 of IEC 62271-1 is applicable, taking into account Table 1 of this standard.

2.2 Special service conditions

Subclause 2.2 of IEC 62271-1 is applicable, taking into account Table 1 of this standard.

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

Table 1 – Reference table of service conditions relevant to GIS

Item	Normal		Special	
	Indoor	Outdoor	Indoor	Outdoor
Ambient air temperature: Minimum (°C) Maximum (°C)	 –5 or –25 +40	 –25 or –40 +40	 –25 +50	 –50 +50
Solar radiation (W/m^2)	Not applicable	1 000	Not applicable	>1 000
Altitude (m)	1 000	1 000	>1 000	>1 000
Site pollution severity [a]	Not applicable	c	c, d or e	d or e
Ice coating (mm)	Not applicable	1, 10 or 20	Not applicable	>20
Wind (m/s)	Not applicable	34	Not applicable	>34
Humidity (%)	95	100	98	100
Condensation or precipitation	Occasional	Yes	Yes	Yes
Vibration class	Not applicable	Not applicable	IEC 62271-207 IEC/TR 62271-300	IEC 62271-207 IEC/TR 62271-300
NOTE The user's specification may use any combination of normal or special service conditions above.				
[a] Site pollution severity c, d or e according to IEC/TS 60815-1:2008, 8.3.				

3 Terms and definitions

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

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

[IEC 60050-441:1984, 441-12-04]

3.102
gas-insulated metal-enclosed switchgear
metal-enclosed switchgear in which the insulation is obtained, at least partly, by an insulating gas other than air at atmospheric pressure

[IEC 60050-441:1984, 441-12-05]

NOTE 1 This term generally applies to high-voltage switchgear and controlgear.

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

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

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 The enclosure can be single-phase or three-phase.

3.104
removable link
part of the conductor which can easily be removed in order to isolate two parts of the GIS from each other

3.105
compartment
part of gas-insulated metal-enclosed switchgear, totally enclosed except for openings necessary for interconnection and control

NOTE A compartment may be designated by the main component contained therein, e.g. circuit-breaker compartment, busbar compartment.

3.106
component
essential part of the main or earthing circuits of gas-insulated metal-enclosed switchgear which serves a specific function (for example circuit-breaker, disconnector, switch, fuse, instrument transformer, bushing, busbar, etc.)

3.107
support insulator
internal insulator supporting one or more conductors

3.108
partition
support insulator of gas-insulated metal-enclosed switchgear separating one compartment from other compartments

3.109
bushing
device that enables one or several conductors to pass through a partition such as a wall or a tank, and insulate the conductors from it

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

[IEC 60050-471:2007, 471-02-01, modified]

3.110
main circuit
all the conductive parts of gas-insulated metal-enclosed switchgear included in a circuit which is intended to transmit electrical energy

[IEC 60050-441:1984, 441-13-02, modified]

3.111
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 The auxiliary circuits of gas-insulated metal-enclosed switchgear include the control and auxiliary circuits of the switching devices.

3.112
design temperature of enclosures
maximum temperature that the enclosures can reach under specified maximum service conditions

3.113
design pressure of enclosures
relative pressure used to determine the design of the enclosure

NOTE 1 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 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.

3.114
design pressure of partitions
relative pressure across the partition

NOTE 1 It is at least equal to the maximum relative pressure across the partition during maintenance activities.

NOTE 2 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
operating pressure of pressure relief device
relative pressure chosen for the opening operation of pressure relief devices

3.116
routine test pressure of enclosures and partitions
relative pressure to which all enclosures and partitions are subjected after manufacturing

3.117
type test pressure of enclosures and partitions
relative pressure to which all enclosures and partitions are subjected for type test

3.118
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.

3.119
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

4 Ratings

Clause 4 of IEC 62271-1 is applicable with the following modifications:

e) rated short-time withstand current (I_k) (for main and earthing circuits);

f) rated peak withstand current (I_p) (for main and earthing circuits);

and with the following addition:

l) rated values of the components forming part of gas-insulated metal-enclosed switchgear, including their operating devices and auxiliary equipment.

4.1 Rated voltage (U_r)

Subclause 4.1 of IEC 62271-1 is applicable with the following addition:

NOTE Components forming part of the GIS may have individual values of rated voltage for equipment in accordance with the relevant standards.

4.2 Rated insulation level

Subclause 4.2 of IEC 62271-1 is applicable with the following addition:

Tables 1 and 2 in Subclause 4.2 of IEC 62271-1 are replaced by Tables 2 and 3 below.

For rated voltages above 800 kV, see Annex G.

The GIS comprises components having a definite insulation level. Although internal faults can largely be avoided by the choice of a suitable insulation level, measures to limit external overvoltages (e.g. surge arresters,) should be considered.

NOTE 1 According to CIGRE studies the natural ratio between the withstand voltages under standard tests, for SF_6 gas insulation is $U_d / U_p = 0{,}45$ and $U_s / U_p = 0{,}75$. The values U_d shown in Table 3 are calculated with these factors.

NOTE 2 Regarding the external parts of bushings (if any), refer to IEC 60137.

NOTE 3 The waveforms are standardized lightning impulse and switching impulse shapes, pending the results of studies on the ability of this equipment to withstand other types of impulses.

NOTE 4 The choice between alternative insulation levels for a particular rated voltage for equipment should be based on insulation coordination studies, taking into account also the self-generated transient overvoltages due to switching.