



# INTERNATIONAL STANDARD



---

**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**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 29.130.10

ISBN 978-2-8322-6551-2

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions .....	7
4 Normal and special service conditions .....	8
4.1 General.....	8
4.2 Normal service conditions .....	9
4.3 Special service conditions.....	9
5 Ratings.....	9
5.1 General.....	9
5.2 Rated voltage of the equipment of the cable connection ( $U_{RM}$ ).....	9
5.3 Rated insulation level ( $U_d$ , $U_p$ , $U_s$ ) .....	9
5.4 Rated frequency ( $f_r$ ).....	9
<del>Rated short-time and peak withstand currents and rated duration of short circuit.....</del>	<del>9</del>
5.5 Rated <del>normal</del> continuous current ( $I_r$ ) <del>and temperature rise</del> .....	9
5.6 Rated short-time withstand current ( $I_k$ ) .....	10
5.7 Rated peak withstand current ( $I_p$ ) .....	10
5.8 Rated duration of short circuit ( $t_k$ ).....	10
6 Design and construction <del>requirements</del> .....	10
6.1 Gas and vacuum tightness .....	10
6.101 Limits of supply.....	10
6.101.1 General .....	10
6.101.2 Over-voltage protection and earthing.....	11
6.102 <del>Rated</del> Filling pressure of insulating gas in the cable connection enclosure.....	11
6.103 Pressure withstand requirements .....	12
6.104 Mechanical forces on cable terminations.....	12
6.105 Switchgear connection interface and cable termination connection interface.....	13
7 Type Tests .....	13
7.1 General.....	13
7.2 <del>Dielectric</del> Electrical type tests of cable terminations.....	14
7.2.1 General .....	14
7.2.2 <del>Dielectric</del> Electrical type test of cable terminations in a single-phase enclosure.....	14
7.2.3 <del>Dielectric</del> Electrical type test of cable termination in a three-phase enclosure.....	14
7.2.4 Additional electrical type tests on the insulator to be installed by switchgear manufacturer (plug in cable termination) .....	14
7.3 Pressure test on the insulator of a cable termination .....	15
7.4 Leak rate type test on the insulator of a cable termination.....	15
8 Routine tests .....	16
8.1 General.....	16
8.2 Pressure test .....	16
8.3 Visual inspection.....	16
9 Standard dimensions .....	16
9.1 General.....	16

9.2	Fluid-filled cable terminations .....	16
9.3	Dry-type cable terminations .....	16
9.4	Three-phase cable <del>termination</del> connection enclosure .....	17
10	Information to be given with enquiries, tenders and orders .....	17
11	Rules for transport, storage, erection, <del>operation</del> service and maintenance.....	17
11.1	General.....	17
11.2	Tests after cable system installation .....	17
12	Safety practices and constraints during installation of cable connection to switchgear .....	18
13	Influence of the product on the environment .....	18
Annex A (informative) Mechanical forces applied on the flange of the cable connection enclosure .....		2
A.1	General.....	2
A.2	Recommendation when connecting cable systems to switchgear .....	2
Bibliography.....		4
Figure 1 – Operating pressure of the SF <sub>6</sub> gas insulation in the cable connection enclosure.....		12
Figure 2 – Fluid-filled cable connection assembly – Typical arrangement.....		19
Figure 3 – Fluid-filled cable connection – Assembly dimensions .....		20
Figure 4 – Dry-type cable connection assembly – Typical arrangement.....		21
Figure 5 – Dry-type cable connection assembly – Assembly dimensions.....		22
Table 1 – Test voltages for additional electrical type tests according to 7.2.4.....		15
Table A.1 – Moment and forces applied on the flange of the cable connection enclosure attached to the cable termination during normal operation .....		3

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### 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**

#### 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.

**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

International Standard IEC 62271-209 has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear.

This second edition cancels and replaces the first edition published in 2007. This edition constitutes a technical revision.

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

- a) New numbering in accordance with ISO/IEC directives, Part 2 (2016) and to IEC 62271-1:2017;
- b) Clause 3: addition of a definition for plug-in cable termination, filling pressure and minimum function pressure for insulation;
- c) Clause 7: An additional dielectric type test for plug-in cable termination was added; also a pressure type test as well as a leak rate test on the insulator of a cable termination was implemented;
- d) Clause 12: New clause about safety practices;
- e) Clause 13: New clause about influence of the product on the environment;
- f) New informative Annex A: Mechanical forces applied on the flange of the cable connection enclosure.

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

FDIS	Report on voting
17C/696/FDIS	17C/701/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard is to be read in conjunction with IEC 62271-1:2017, to which it refers and which is applicable unless otherwise specified in this standard. 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 references whilst additional subclauses are numbered from 101.

A list of all parts in the IEC 62271 series, published under the general title *High-voltage switchgear and controlgear*, can be found 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 "<http://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.

**IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.**

## 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

#### 1 Scope

This part of IEC 62271 covers the connection assembly of fluid-filled and extruded cables to gas-insulated metal enclosed switchgear (GIS), in single- or three-phase arrangements where the cable terminations are fluid-filled or dry-type and there is a separating insulating barrier between the cable insulation and the gas insulation of the switchgear.

The purpose of this document is to establish electrical and mechanical interchangeability between cable terminations and the gas-insulated metal-enclosed switchgear and to determine the limits of supply. It complements and amends, if ~~necessary~~ applicable, the relevant IEC standards. For the purpose of this document the term "switchgear" is used for "gas-insulated metal enclosed switchgear".

It does not cover directly immersed cable terminations, as described in CIGRE brochure 89 [4]<sup>1</sup>.

#### 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 60038:~~1983~~, *IEC standard voltages*<sup>2</sup>  
~~Amendment 1 (1994)~~  
~~Amendment 2 (1997)~~

IEC 60068-2-17:1994, *Basic environmental testing procedures – Part 2-17:Tests – Test Q: Sealing*

IEC 60141 (all parts), *Tests on oil-filled and gas-pressure cables and their accessories*

~~IEC 60141-1:1993, 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 60141-2:1963, Tests on oil-filled and gas-pressure cables and their accessories – Part 2: Internal gas-pressure cables and accessories for alternating voltages up to 275 kV~~

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*

<sup>1</sup> Numbers in square brackets refer to the Bibliography.

<sup>2</sup> ~~There exists a consolidated version (2002) including Amendment 1 and 2.~~

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

~~IEC 60694:1996, Common specifications for high-voltage switchgear and controlgear standards~~

IEC 60840:2004, *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 62067:2004, *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*

~~Amendment 1 (2006)~~

IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1: Common specifications for alternating current switchgear and controlgear*

IEC 62271-203:2003 2011, *High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV*

~~Report of CIGRE WG 23-10, ELECTRA 151, December 1993, Earthing of GIS – An Application Guide~~

~~CIGRE brochure 89: Accessories for HV Extruded Cables, CIGRE WG 21.06, 1995, Chapter 2.1.5 Directly Immersed Metal Enclosed GIS Termination~~

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**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**

**Appareillage à haute tension –  
Partie 209: Raccordement de câbles pour appareillage sous enveloppe  
métallique à isolation gazeuse de tension assignée supérieure à 52 kV – Câbles  
remplis d'un fluide ou à isolation extrudée – Extrémité de câble de type sec ou  
remplie d'un fluide**



## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions .....	7
4 Normal and special service conditions .....	8
4.1 General.....	8
4.2 Normal service conditions .....	8
4.3 Special service conditions.....	8
5 Ratings.....	8
5.1 General.....	8
5.2 Rated voltage of the equipment of the cable connection ( $U_{RM}$ ).....	9
5.3 Rated insulation level ( $U_d$ , $U_p$ , $U_s$ ).....	9
5.4 Rated frequency ( $f_r$ ).....	9
5.5 Rated continuous current ( $I_r$ ) .....	9
5.6 Rated short-time withstand current ( $I_k$ ) .....	9
5.7 Rated peak withstand current ( $I_p$ ) .....	9
5.8 Rated duration of short circuit ( $t_k$ ).....	9
6 Design and construction .....	10
6.1 Gas and vacuum tightness .....	10
6.101 Limits of supply.....	10
6.101.1 General .....	10
6.101.2 Over-voltage protection and earthing .....	10
6.102 Filling pressure of insulating gas in the cable connection enclosure .....	11
6.103 Pressure withstand requirements .....	11
6.104 Mechanical forces on cable terminations.....	11
6.105 Switchgear connection interface and cable termination connection interface.....	12
7 Type tests .....	12
7.1 General.....	12
7.2 Electrical type tests of cable terminations .....	12
7.2.1 General .....	12
7.2.2 Electrical type test of cable terminations in a single-phase enclosure .....	12
7.2.3 Electrical type test of cable termination in a three-phase enclosure .....	12
7.2.4 Additional electrical type tests on the insulator to be installed by switchgear manufacturer (plug in cable termination) .....	13
7.3 Pressure test on the insulator of a cable termination .....	13
7.4 Leak rate type test on the insulator of a cable termination.....	14
8 Routine tests .....	14
8.1 General.....	14
8.2 Pressure test .....	14
8.3 Visual inspection.....	14
9 Standard dimensions .....	14
9.1 General.....	14
9.2 Fluid-filled cable terminations .....	14
9.3 Dry-type cable terminations .....	15
9.4 Three-phase cable connection enclosure .....	15

10	Information to be given with enquiries, tenders and orders .....	15
11	Rules for transport, storage, erection, service and maintenance .....	15
11.1	General.....	15
11.2	Tests after cable system installation .....	16
12	Safety practices and constraints during installation of cable connection to switchgear .....	16
13	Influence of the product on the environment .....	16
Annex A (informative) Mechanical forces applied on the flange of the cable connection enclosure.....		21
A.1	General.....	21
A.2	Recommendation when connecting cable systems to switchgear .....	21
Bibliography.....		23
Figure 1 – Operating pressure of the SF <sub>6</sub> gas insulation in the cable connection enclosure.....		11
Figure 2 – Fluid-filled cable connection assembly – Typical arrangement.....		17
Figure 3 – Fluid-filled cable connection – Assembly dimensions .....		18
Figure 4 – Dry-type cable connection assembly – Typical arrangement.....		19
Figure 5 – Dry-type cable connection assembly – Assembly dimensions.....		20
Table 1 – Test voltages for additional electrical type tests according to 7.2.4.....		13
Table A.1 – Moment and forces applied on the flange of the cable connection enclosure attached to the cable termination during normal operation .....		22

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### 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**

#### 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.

International Standard IEC 62271-209 has been prepared by subcommittee 17C: Assemblies, of IEC technical committee 17: High-voltage switchgear and controlgear.

This second edition cancels and replaces the first edition published in 2007. This edition constitutes a technical revision.

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

- a) New numbering in accordance with ISO/IEC directives, Part 2 (2016) and to IEC 62271-1:2017;
- b) Clause 3: addition of a definition for plug-in cable termination, filling pressure and minimum function pressure for insulation;

- c) Clause 7: An additional dielectric type test for plug-in cable termination was added; also a pressure type test as well as a leak rate test on the insulator of a cable termination was implemented;
- d) Clause 12: New clause about safety practices;
- e) Clause 13: New clause about influence of the product on the environment;
- f) New informative Annex A: Mechanical forces applied on the flange of the cable connection enclosure.

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

FDIS	Report on voting
17C/696/FDIS	17C/701/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard is to be read in conjunction with IEC 62271-1:2017, to which it refers and which is applicable unless otherwise specified in this standard. 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 references whilst additional subclauses are numbered from 101.

A list of all parts in the IEC 62271 series, published under the general title *High-voltage switchgear and controlgear*, can be found 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 "<http://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.

## 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

#### 1 Scope

This part of IEC 62271 covers the connection assembly of fluid-filled and extruded cables to gas-insulated metal enclosed switchgear (GIS), in single- or three-phase arrangements where the cable terminations are fluid-filled or dry-type and there is a separating insulating barrier between the cable insulation and the gas insulation of the switchgear.

The purpose of this document is to establish electrical and mechanical interchangeability between cable terminations and the gas-insulated metal-enclosed switchgear and to determine the limits of supply. It complements and amends, if applicable, the relevant IEC standards. For the purpose of this document the term "switchgear" is used for "gas-insulated metal enclosed switchgear".

It does not cover directly immersed cable terminations, as described in CIGRE brochure 89 [4]<sup>1</sup>.

#### 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 60038, *IEC standard voltages*

IEC 60068-2-17:1994, *Basic environmental testing procedures – Part 2-17:Tests – Test Q: Sealing*

IEC 60141 (all parts), *Tests on oil-filled and gas-pressure cables and their accessories*

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 sulphur hexafluoride (SF<sub>6</sub>) 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<sub>m</sub> = 36 kV) up to 150 kV (U<sub>m</sub> = 170 kV) – Test methods and requirements*

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*

---

<sup>1</sup> Numbers in square brackets refer to the Bibliography.

IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1:Common specifications for alternating current switchgear and controlgear*

IEC 62271-203:2011, *High-voltage switchgear and controlgear – Part 203:Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV*

## SOMMAIRE

AVANT-PROPOS .....	26
1 Domaine d'application .....	28
2 Références normatives .....	28
3 Termes et définitions .....	29
4 Conditions normales et spéciales de service.....	30
4.1 Généralités .....	30
4.2 Conditions normales de service .....	30
4.3 Conditions spéciales de service .....	30
5 Caractéristiques assignées.....	30
5.1 Généralités .....	30
5.2 Tension assignée de l'équipement du raccordement de câble ( $U_{rm}$ ) .....	31
5.3 Niveau d'isolement assigné ( $U_d$ , $U_p$ , $U_s$ ).....	31
5.4 Fréquence assignée ( $f_r$ ) .....	31
5.5 Courant permanent assigné ( $I_r$ ) .....	31
5.6 Courant de courte durée admissible assigné ( $I_k$ ) .....	31
5.7 Valeur de crête du courant admissible assignée ( $I_p$ ) .....	31
5.8 Durée de court-circuit assignée ( $t_k$ ) .....	31
6 Conception et construction .....	32
6.1 Étanchéité au gaz et au vide .....	32
6.101 Limites de fourniture .....	32
6.101.1 Généralités .....	32
6.101.2 Protection contre la surtension et mise à la terre .....	32
6.102 Pression de remplissage du gaz isolant dans l'enveloppe du raccordement de câble.....	33
6.103 Exigences pour la tenue à la pression.....	33
6.104 Efforts mécaniques sur les extrémités de câble.....	33
6.105 Interface de raccordement de l'appareillage et de l'extrémité de câble.....	34
7 Essais de type .....	34
7.1 Généralités .....	34
7.2 Essais électriques de type des extrémités de câble.....	34
7.2.1 Généralités .....	34
7.2.2 Essai électrique de type des extrémités de câble dans une enveloppe unipolaire .....	34
7.2.3 Essai électrique de type des extrémités de câble dans une enveloppe tripolaire .....	35
7.2.4 Essais électriques complémentaires sur l'isolateur en vue d'une installation par le fabricant de l'appareillage (extrémité de câble embrochable) .....	35
7.3 Essai de pression pour l'isolateur d'une extrémité de câble .....	36
7.4 Essai de type de taux de fuite pour l'isolateur d'une extrémité de câble .....	37
8 Essais individuels de série .....	37
8.1 Généralités .....	37
8.2 Essai de pression .....	37
8.3 Inspection visuelle .....	37
9 Dimensions normalisées .....	37
9.1 Généralités .....	37

9.2	Extrémités de câble remplies d'un fluide .....	37
9.3	Extrémités de câble de type sec .....	38
9.4	Enveloppe du raccordement de câble tripolaire .....	38
10	Renseignements à donner dans les appels d'offres, les soumissions et les commandes .....	38
11	Règles pour le transport, le stockage, l'installation, le service et la maintenance .....	38
11.1	Généralités .....	38
11.2	Essais après pose du système de câble .....	39
12	Pratiques en matière de sécurité et contraintes à l'installation de raccordement de câble à l'appareillage .....	39
13	Influence du produit sur l'environnement .....	39
	Annexe A (informative) Forces mécaniques appliquées sur la bride de l'enveloppe du raccordement de câble .....	44
A.1	Généralités .....	44
A.2	Recommandation lors du raccordement du système de câble à l'appareillage .....	44
	Bibliographie .....	47
	 Figure 1 – Pression de service du gaz isolant SF <sub>6</sub> dans l'enveloppe du raccordement de câble .....	 33
	Figure 2 – Assemblage de raccordement de câble rempli d'un fluide – Exemple de disposition .....	40
	Figure 3 – Assemblage de raccordement de câble rempli d'un fluide – Dimensions de l'appareil .....	41
	Figure 4 – Assemblage de raccordement de câble sec – Exemples de dispositions .....	42
	Figure 5 – Assemblage de raccordement de câble sec – Dimensions de l'appareillage .....	43
	 Tableau 1 – Tensions d'essai des essais de type électriques complémentaires conformément à 7.2.4 .....	 36
	Tableau A.1 – Forces et moments appliqués sur la bride de l'enveloppe du raccordement de câble fixée à l'extrémité de câble en fonctionnement normal .....	46



## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

### APPAREILLAGE À HAUTE TENSION –

#### **Partie 209: Raccordement de câbles pour appareillage sous enveloppe métallique à isolation gazeuse de tension assignée supérieure à 52 kV – Câbles remplis d'un fluide ou à isolation extrudée – Extrémité de câble de type sec ou remplie d'un fluide**

#### AVANT-PROPOS

- 1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 62271-209 a été établie par le sous-comité 17C: Ensembles, du comité d'études 17 de l'IEC: Appareillage haute tension.

Cette deuxième édition annule et remplace la première édition parue en 2007. Cette édition constitue une révision technique.

Cette édition inclut les modifications majeures suivantes par rapport à l'édition précédente:

- a) Nouvelle numérotation conformément aux directives ISO/IEC, Partie 2 (2016) et à l'IEC 62271-1:2017;

- b) Article 3: ajout des définitions d'extrémité de câble embrochable, de pression de remplissage et de pression minimale de fonctionnement;
- c) Article 7: Un essai diélectrique de type complémentaire pour les extrémités de câbles embrochables a été ajouté; un essai de pression de type ainsi qu'un essai de taux de fuite type pour l'isolateur des extrémités de câble ont également été appliqués;
- d) Article 12: Nouvel article relatif aux pratiques en matière de sécurité;
- e) Article 13: Nouvel article relatif à l'influence du produit sur l'environnement;
- f) Nouvelle Annexe A informative: Forces mécaniques appliquées sur la bride de l'enveloppe du raccordement de câble.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
17C/696/FDIS	17C/701/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de la présente Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

La présente Norme doit être lue conjointement à l'IEC 62271-1:2017, à laquelle elle fait référence et qui est applicable, sauf indication contraire dans la présente Norme. Pour faciliter le repérage des exigences correspondantes, cette norme utilise une numérotation identique des articles et des paragraphes à celle de l'IEC 62271-1. Les modifications de ces articles et de ces paragraphes ont des références identiques; les paragraphes supplémentaires qui n'ont pas d'équivalent dans l'IEC 62271-1, sont numérotés à partir de 101.

Une liste de toutes les parties de la série IEC 62271, publiées sous le titre général *Appareillage à haute tension*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous «<http://webstore.iec.ch>» dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

## APPAREILLAGE À HAUTE TENSION –

### **Partie 209: Raccordement de câbles pour appareillage sous enveloppe métallique à isolation gazeuse de tension assignée supérieure à 52 kV – Câbles remplis d'un fluide ou à isolation extrudée – Extrémité de câble de type sec ou remplie d'un fluide**

#### **1 Domaine d'application**

La présente partie de l'IEC 62271 est applicable à l'assemblage de raccordement de câbles remplis d'un fluide ou à isolation extrudée au poste sous enveloppe métallique (PSEM), dans une disposition unipolaire ou tripolaire. Les extrémités de câble sont remplies d'un fluide ou de type sec et une séparation isolante se trouve entre le fluide d'isolation du câble et l'isolation gazeuse de l'appareillage.

Le but du présent document est d'établir une interchangeabilité électrique et mécanique entre les extrémités de câble et l'appareillage sous enveloppe métallique à isolation gazeuse et de déterminer les limites de fourniture. Elle complète et modifie, le cas échéant, les normes particulières de l'IEC. Dans le cadre du présent document, le terme «appareillage» est utilisé pour «appareillage sous enveloppe métallique à isolation gazeuse».

Il ne s'applique pas aux extrémités de câble du type directement immergées telles que décrites dans la brochure 89 du CIGRÉ [14]<sup>1</sup>.

#### **2 Références normatives**

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60038, *Tensions normales de la CEI*

IEC 60068-2-17:1994, *Essais fondamentaux climatiques et de robustesse mécanique – Partie 2-17:Essais – Essai Q:Étanchéité*

IEC 60141 (toutes les parties), *Essais de câbles à huile fluide, à pression de gaz et de leurs dispositifs accessoires*

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* (disponible en anglais seulement)

IEC 60480, *Lignes directrices relatives au contrôle et au traitement de l'hexafluorure de soufre (SF<sub>6</sub>) prélevé sur le matériel électrique et spécification en vue de sa réutilisation*

IEC 60840, *Câbles d'énergie à isolation extrudée et leurs accessoires pour des tensions assignées supérieures à 30 kV (U<sub>m</sub> = 36 kV) et jusqu'à 150 kV (U<sub>m</sub> = 170 kV) – Méthodes et exigences d'essai*

---

<sup>1</sup> Les chiffres entre crochets renvoient à la Bibliographie.

IEC 62067, *Câbles d'énergie à isolation extrudée et leurs accessoires pour des tensions assignées supérieures à 150 kV ( $U_m = 170$  kV) et jusqu'à 500 kV ( $U_m = 550$  kV) – Méthodes et exigences d'essai*

IEC 62271-1:2017, *Appareillage à haute tension – Partie 1: Spécifications communes pour appareillage à courant alternatif*

IEC 62271-203:2011, *Appareillage à haute tension – Partie 203: Appareillage sous enveloppe métallique à isolation gazeuse de tensions assignées supérieures à 52 kV*