BRITISH STANDARD

BS EN
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

ICS 29.130.10

National foreword

This British Standard is the UK implementation of EN 62271-209:2007. It is identical to IEC 62271-209:2007. It supersedes BS 6904:1987 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee PEL/17, Switchgear, controlgear, and HV-LV co-ordination, to Subcommittee PEL/17/1, High-voltage switchgear and controlgear.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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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 62271-209:2007)

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 sèche
ou remplie d'un fluide
(CEI 62271-209:2007)

Hochspannungs-Schaltgeräte
und -Schaltanlagen -
Teil 209: Kabelanschlüsse für gasisolierte
metallgekapselte Schaltanlagen
für Bemessungsspannungen über 52 kV -
Kabel mit fluidgefüllter
und extrudierter Isolierung -
Fluidgefüllte und feststoffisolierte
Kabelendverschlüsse
(IEC 62271-209:2007)

This European Standard was approved by CENELEC on 2007-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 62271-209:2007 E

Foreword

The text of document 17C/405/FDIS, future edition 1 of IEC 62271-209, prepared by SC 17C, High-voltage switchgear and controlgear assemblies, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62271-209 on 2007-10-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2008-07-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-10-01

Annexes ZA and ZB have been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 62271-209:2007 was approved by CENELEC as a European Standard without any modification.

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CONTENTS

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 standard 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 standard 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, the relevant IEC standards. For the purpose of this standard 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.

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 60038:1983, *IEC standard voltages* [1]
Amendment 1 (1994)
Amendment 2 (1997)

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 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*

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1 There exists a consolidated version (2002) including Amendment 1 and 2.

IEC 62067:2001, *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 62271-203:2003, 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*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
cable-termination
equipment fitted to the end of a cable to ensure electrical connection with other parts of the system and to maintain the insulation up to the point of connection. Two types are described in this standard.

3.1.1
fluid-filled cable-termination
cable-termination which comprises of a separating insulating barrier between the cable insulation and the gas insulation of switchgear. The cable-termination includes an insulating fluid as part of the cable connection assembly.

3.1.2
dry-type cable-termination
cable-termination which comprises an elastomeric electrical stress control component in intimate contact with a separating insulating barrier (insulator) between the cable insulation and the gas insulation of the switchgear. The cable-termination does not require any insulating fluid.

3.2
main-circuit end terminal
part of the main circuit of a gas-insulated metal enclosed switchgear forming part of the connection interface

3.3
cable connection enclosure
part of the gas-insulated metal-enclosed switchgear which houses the cable-termination and the main-circuit end terminal

3.4
cable connection assembly
combination of a cable-termination, a cable connection enclosure and a main-circuit end terminal, which mechanically and electrically connects the cable to the gas-insulated metal enclosed switchgear

3.5
design pressure
pressure used to determine the thickness of the enclosure and the components of the cable termination subjected to that pressure (according to IEC 62271-203:2003)

3.6
fluid/insulating fluid
the term "fluid" means a liquid or a gas for insulation purposes

3.7
cable system
a cable with installed accessories

4 Limits of supply

4.1 General

The limits of supply of gas-insulated metal-enclosed switchgear and the cable-termination shall be in accordance with Figure 2 for fluid-filled cable terminations and Figure 4 for dry-type cable-terminations.

4.2 Over-voltage protection

If a metallic earth connection between parts 6 or 11 and part 13 of Figure 2 for fluid-filled cable terminations and Figure 4 for dry-type cable-terminations is not feasible, non-linear resistors (part 15) may be connected across the insulated junction to limit the voltage under transient conditions. The number and characteristics of the non-linear resistors shall be determined and supplied by the cable termination manufacturer, taking into consideration the requirements of the user and the switchgear manufacturer. For further details refer to report of CIGRE WG 23-10: ELECTRA 151, 1993.

5 Rating

5.1 General

When dimensioning the cable connection assembly, the following rated values shall apply:

a) the rated voltage;

b) the number of phases in one enclosure;

c) the rated insulation level;

d) the rated normal current and temperature rise;

e) the rated short-time and peak withstand currents;

f) the rated duration of the short circuit.

5.2 Rated voltage

The rated voltage for the equipment (U_r) of the cable connection is equal to the lowest of the values for the cable and the gas-insulated metal-enclosed switchgear and shall be selected from the following standard values:

72,5 kV – 100 kV – 123 kV – 145 kV – 170 kV – 245 kV – 300 kV – 362 kV – 420 kV – 550 kV

For cables, the rated voltage U_r corresponds to the highest voltage for equipment U_m.

5.3 Rated insulation level

The rated insulation level for the cable connection assembly shall be selected from the values given in IEC 60038 (IEC standard voltages) as well as IEC 62271-203:2003.

5.4 Rated normal current and temperature rise

The connection interface of the main circuit shown in Figures 2 and 3 for fluid-filled cable-terminations and Figures 4 and 5 for dry-type cable-terminations is applicable at rated normal currents up to 3 150 A. The normal current-carrying contact surfaces of the connection interface shall be silver- or copper-coated or solid copper.

For full interchangeability of the cable-termination, the connection interface shall be designed so that at a current equal to the cable rated current corresponding to a maximum temperature of 90 °C, no heat transfer from the GIS main circuit end terminal to the cable-termination will occur.

NOTE As the maximum conductor temperature for cables is limited by the maximum operating temperature for the insulation, there are certain cable dielectrics which cannot withstand the maximum temperature specified for gas-insulated metal-enclosed switchgear if there is heat transfer across the connection interface to the cable terminations.

For cases when the design value of 90 °C at rated normal current of the cable system cannot be achieved, the manufacturer of the switchgear should provide the necessary data on temperature rise of the main-circuit end terminal and of the insulating gas (SF_6) as a function of current.

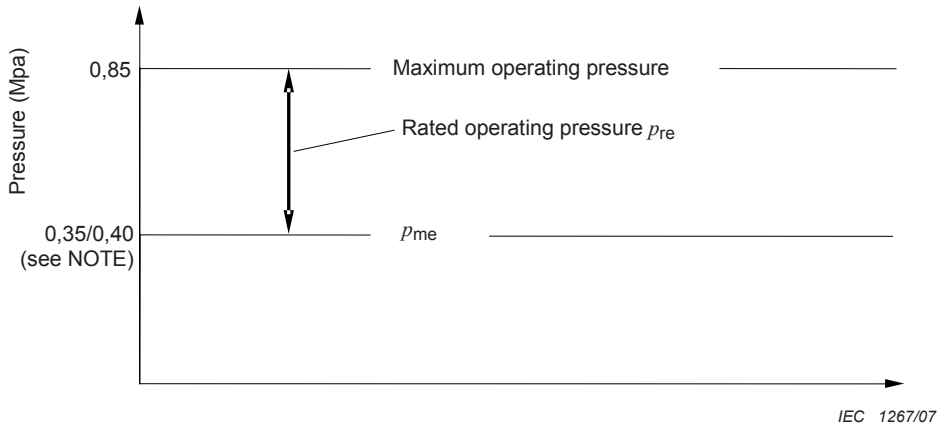
5.5 Rated short-time and peak withstand currents and rated duration of short circuit

Short-time and peak withstand currents as well as the duration of short circuit shall refer to the levels provided by the cable system, not exceeding the values given in IEC 60694.

5.6 Rated filling pressure of insulating gas in the cable connection enclosure

If SF_6 is used as the insulating gas, the minimum functional pressure for insulation p_{me} used to determine the design of the cable-termination insulation shall not exceed p_{me}= 0,35 MPa (absolute) at 20 °C for maximum rated voltages up to 300 kV. For maximum rated voltages exceeding 300 kV the minimum functional pressure for insulation p_{me} used to determine the design of the cable-termination insulation shall not exceed p_{me} 0,4 MPa (absolute) at 20 °C.

The rated filling pressure p_{re} of gas for insulating is assigned by the switchgear manufacturer but shall in no case be lower than p_{me}. If a gas other than SF_6 is used, the minimum functional pressure shall be chosen to give the same dielectric strength while being lower than the maximum recommended operating pressure as per 6.1.



p_{re} rated filling pressure of gas for insulating (not lower than p_{me})

p_{me} minimal functional pressure for insulation

NOTE 0,35 MPa for voltages up to 300 kV

0,40 MPa for voltages exceeding 300 kV

Figure 1 – Operating pressure of the gas insulation in the cable connection enclosure

6 Design and construction requirements

6.1 Pressure withstand requirements

The design pressure (absolute) for the outside of the cable termination is 0,85 MPa at 20 °C. The cable-termination shall be capable of withstanding the vacuum conditions when the cable connection enclosure is evacuated as part of the gas filling process.

6.2 Mechanical forces on cable-terminations

The manufacturer of the cable-termination in a three-phase connection shall take into account the total dynamic forces generated during short-circuit conditions. These forces consist of those generated within the cable-termination and those coming from the main circuit of the switchgear. The maximum additional force applied from the switchgear to the connection interface (Figure 2 or 4) transversely and then being transferred from the main circuit end terminal shall not exceed 5 kN. For single-phase connections, taking into account lack of symmetry, it is considered that this additional force is small. However, a total mechanical force of 2 kN applied to the connection interface transversely, should be assumed. It is the responsibility of the manufacturer of the switchgear to ensure that the specified forces are not exceeded.

For both single-phase and three-phase connections, additional forces and movements from the switchgear can be experienced due to temperature variations and vibrations in service. These forces can act on both switchgear and cable-termination and depend largely on the switchgear layout, termination installation, cable design and the methods of mechanical support. The design of any support structure shall take into account these forces and movements. It is particularly important that the support for the switchgear shall not be affixed to the insulator collar and/or clamping flange, parts 9 and 11 of Figure 2 or 4.

7 Standard dimensions

7.1 Fluid-filled cable-terminations

Standard dimensions for fluid-filled cable connection enclosures, main circuit end terminals and cable-terminations applied to single-phase enclosures are shown in Figure 3. With the given four standard sizes, the voltage range (U_r) from 72,5 kV to 550 kV is covered.

7.2 Dry-type cable-terminations

Standard dimensions for dry-type cable-connection enclosures, main-circuit end terminals and cable-terminations applied to single-phase enclosures are shown in Figure 5. The given four standard sizes cover the voltage range (U_r) from 72,5 kV to 550 kV. Figure 4 shows the two types of dry-type cable-termination. Type A incorporates an elastomeric electrical stress control component inside the insulating barrier. For type B, the elastomeric electrical stress control component is located externally.

NOTE 1 In case the dry-type termination dimensions for 245 kV to 300 kV are in excess of those specified in Figure 5, the termination may be fitted into the housing for fluid filled terminations of this voltage class. In this case it is the cable termination manufacturer's responsibility to meet the dimensions of the cable termination enclosure for 245 kV to 300 kV as per Figure 3. It falls further within the responsibility of the cable termination manufacturer to clearly notify all involved party about his intent to rely on the stipulations of this note.

NOTE 2 For a full interchangeability of both fluid-filled and dry-type cable-terminations, a suitable connection interface extension, if required, should be supplied by the cable-termination manufacturer.

7.3 Three-phase cable-termination enclosure

The minimum dimensions of the 3-phase cable-termination enclosure are defined by the minimum phase to phase distance arising out of d_{10} and the minimum phase to ground distance arising out of d5/2.

8 Tests

8.1 General

The testing of the cable-termination and the gas-insulated metal-enclosed switchgear is to be performed for cable-terminations in accordance with IEC 60141-1:1993 for oil-filled cables, IEC 60141-2:1963 for gas-filled cables, IEC 60840:2004 or IEC 62067:2001 (and its amendment 1:2006) for cables with extruded insulation, IEC 62271-203:2003 for switchgear. In addition, this standard gives recommended arrangements for dielectric tests and for the tests after cable installation.

In case the insulator for cable termination is pre-installed during GIS manufacturing, this insulator is subject to the GIS routine tests specified in IEC 62271-203:2003.

As such the insulator shall be designed to withstand these routine tests. The GIS manufacturer shall follow the handling and/or assembling instructions for test preparation provided by the cable termination manufacturer.

8.2 Dielectric type tests of cable-terminations

8.2.1 General

The dielectric type tests of the cable-termination fitted with a representative cable shall be performed in an enclosure as per 8.2.2, filled with insulating gas at the pressure not exceeding p_{me}+0,02 MPa as specified in 5.6. If a shield is an integral part of the cable-termination design, it shall be mounted in its service position during the test.

An additional test shield may be used to screen the exposed connection interface, if required by the cable-termination manufacturer, provided it does not overlap the connection interface by more than the distance l_2 in Figure 3 for fluid-filled cable-terminations and Figure 5 for dry-type cable-terminations.

8.2.2 Dielectric type test of cable-terminations in a single phase enclosure

The cable-termination is surrounded by a metal cylinder connected to earth, the maximum internal diameter is equal to d_5 for the four standard sizes of cable connection enclosures (d_5 in Figure 3 for fluid-filled cable-terminations and Figure 5 for dry-type cable-terminations). The minimum length of the metal cylinder shall be in accordance with the dimension l_5 given in Figures 3 and 5.

8.2.3 Dielectric type test of cable-termination in a three phase enclosure

The single phase test arrangement using the single phase cable termination enclosure from the GIS covers the test requirements of the cable-termination in a three phase enclosure as it imposes the most severe dielectric stress to the test object. It is therefore the referenced type test arrangement.

8.3 Tests after cable system installation

If required by the user of the switchgear, the manufacturer shall make special provisions for the testing of the cable system, such as disconnecting facilities, earthing facilities and/or increasing gas pressure within the given design limits of the cable connection enclosure. This applies also if parts of the switchgear directly connected to the cable connection assembly cannot withstand the test voltage specified in IEC 60141 and IEC 60840 or IEC 62067 for the cable test at rated gas density. It also applies if in the judgment of the switchgear manufacturer, it is not acceptable to apply the test voltage to the affected switchgear components.

If required by the user, the switchgear manufacturer shall provide the location for a suitable test bushing and provide the user with all necessary information for mounting such a bushing to the cable connection enclosure.

For cases where electrical clearances are inadequate, the term bushing shall include a suitable insulated connection and test terminal. The requirement for the test bushing shall be specified by the user in the enquiry.

NOTE It should be noted that increasing the gas pressure is not a reliable method of improving the electrical strength at the surface of an insulator when tested with DC voltage. The AC test voltages of extruded cables after installation according to IEC 60840 and IEC 62067 are normally not critical for GIS insulators if the level is below the site test voltages of GIS according to IEC 62271-203 Subclause 10.2.101.1.4.

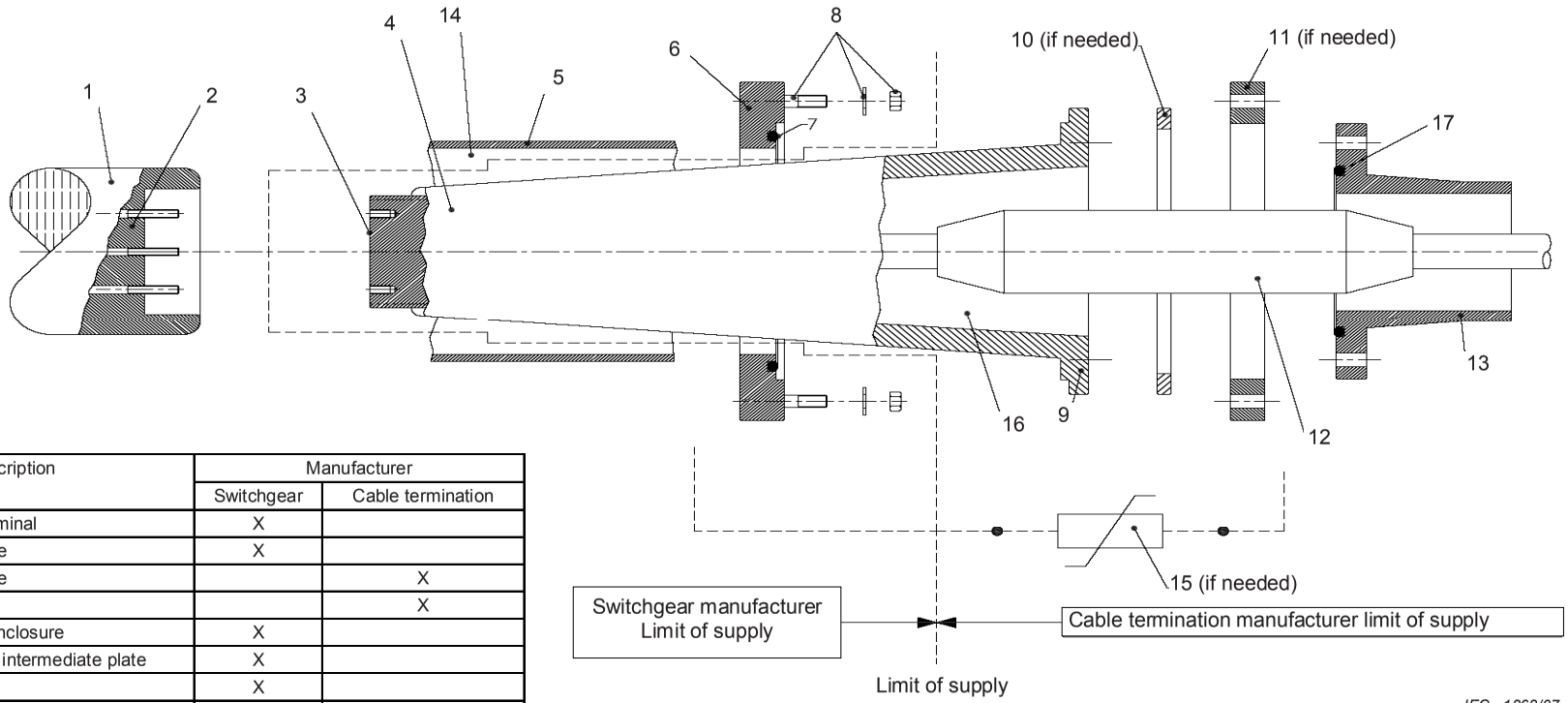
9 Information to be given with enquiries, tenders and orders

Refer to IEC 60840:2004 or IEC 62067:2001 (and its amendment 1:2006), IEC 60141-1:1993 and IEC 62271-203:2003. In addition, the user and the manufacturers shall consider the installation requirements of the equipment. Manufacturers shall state the specific requirements for civil, electrical and installation clearances applicable to the switchgear, cable-termination and cable. Information shall be provided in particular and if required in relation to switchgear/cable termination installation sequence as well as positioning and temporary fixing of the relevant components.

10 Rules for transport, storage, erection, operation and maintenance

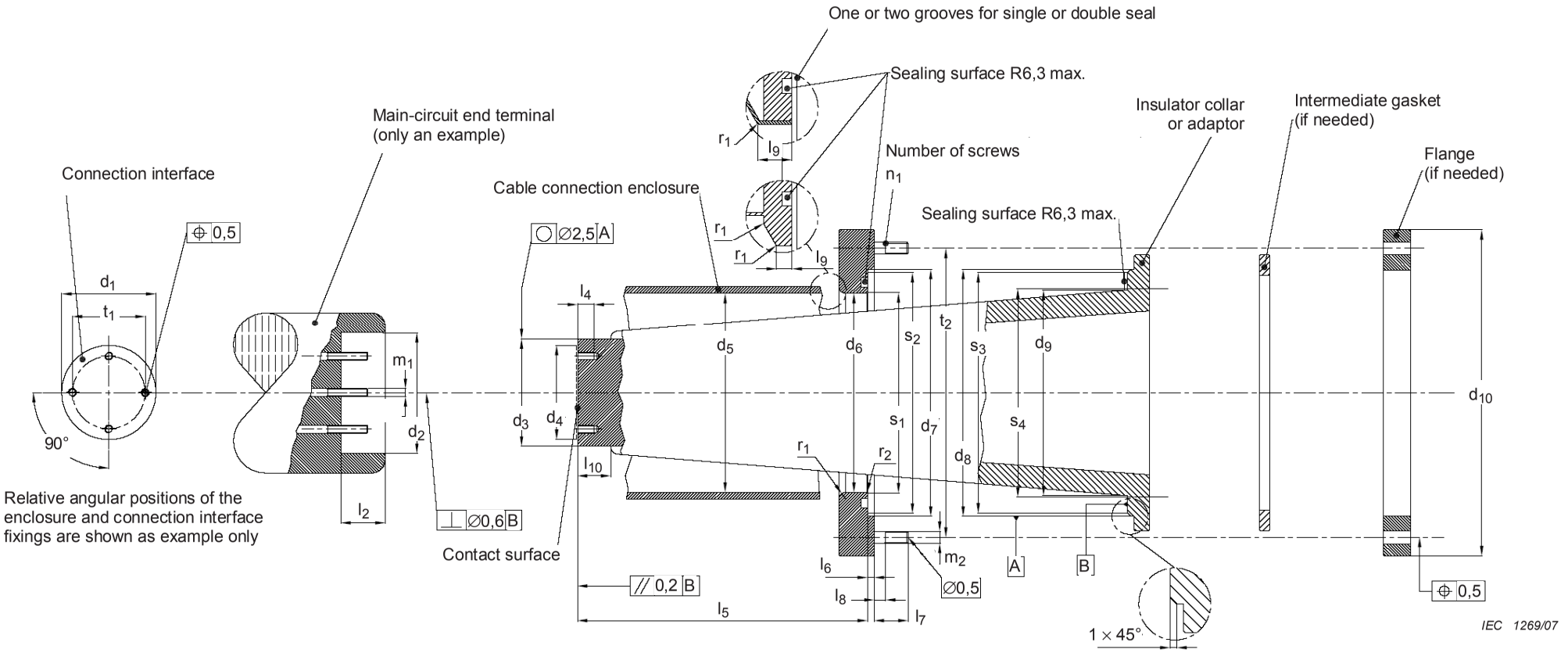
Refer to IEC 60694:1996, Clause 10.

The cable-termination manufacturer should ensure that during manufacture, handling, storage and installation of the cable-termination, provisions should be made to ensure that the requirements given in 5.2 of IEC 60694:1996 can be satisfied after final assembly of the connection. The cable-termination manufacturer should supply the necessary information to enable these requirements to be satisfied, if the cable-termination is to be installed by others.



No.	Description	Manufacturer	
		Switchgear	Cable termination
1	Main circuit end terminal	X	
2	Connection interface	X	
3	Connection interface		X
4	Insulator		X
5	Cable connection enclosure	X	
6	Enclosure flange or intermediate plate	X	
7	Seal	X	
8	Screws, washers, nuts	X	
9	Insulator collar or adaptor		X
10	Intermediate gasket		X (if needed)
11	Flange		X (if needed)
12	Electrical stress control component		X
13	Cable gland		X
14	Gas	X	
15	Non-linear resistors		X (if needed)
16	Insulating fluid		X
17	Seal		X

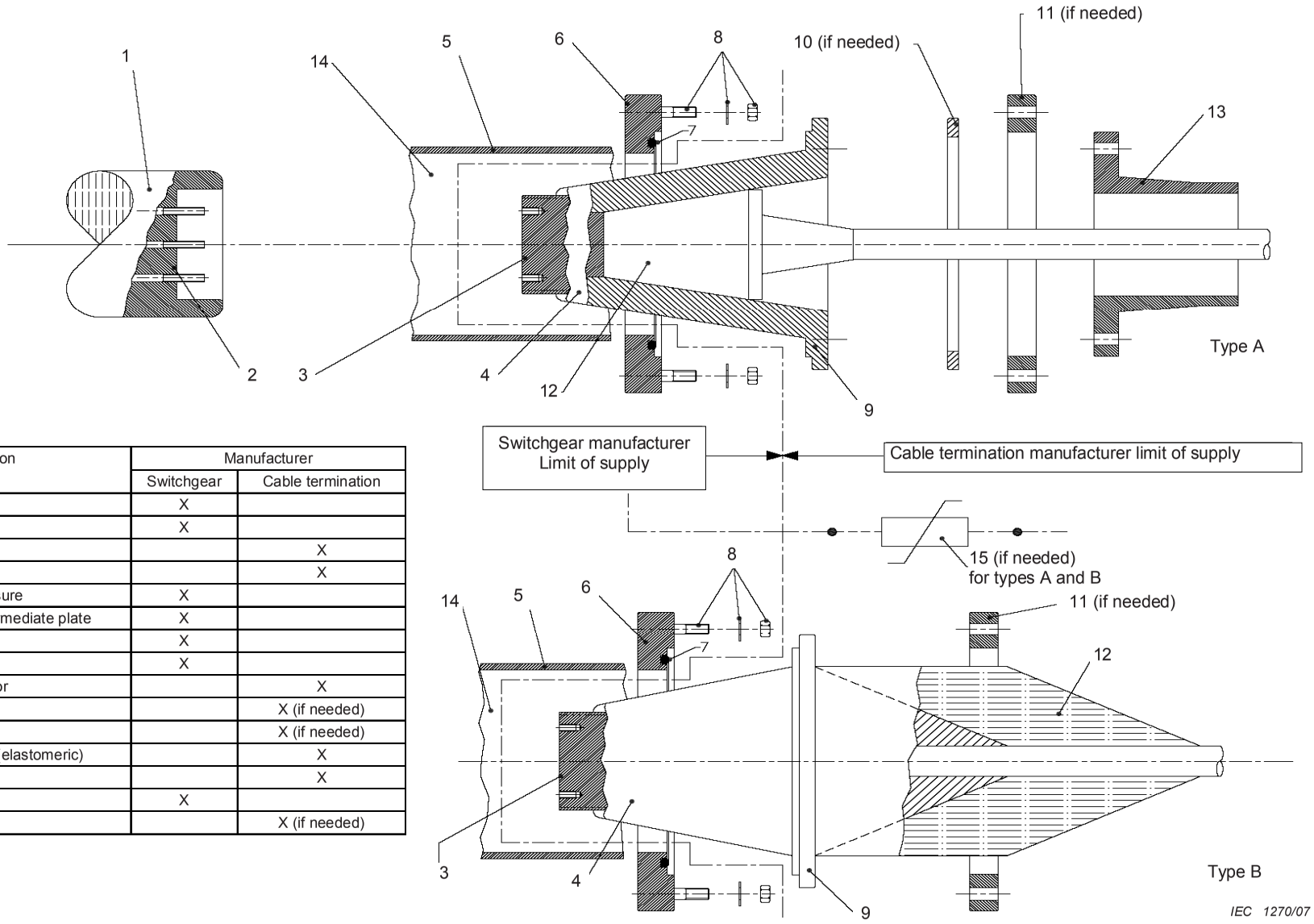
Figure 2 – Fluid-filled cable connection assembly – Typical arrangement



Rated voltage [kV]	BIL kVp	d_1 max.	d_2 min.	d_3 max.	d_4 min.	d_5 min.	d_6	d_7	d_8	d_9 max. [b]	d_{10} max.	former dimension l_1 was deleted	l_2 max.	former dimension l_3 was deleted	l_4 min.	l_5	l_6 max.	l_7 min.	l_8 max.	l_9 max.	l_{10} min.	m_1	m_2	n_1	r_1 min.	r_2 min.	s_1 min.	s_2 max.	s_3 min.	s_4 max.	t_1	t_2
72,5 to 100	325 to 450	100	112	110	100	300	+3 200 -0	+0,5 246 -0,0	+0,3 245 -0,3	196	300		50		18	+1,0 583 -1,0	5,5	85	30	50	55	M10	M10	8	10	1	205	241	242	206	+0,3 80 -0,3	+0,5 270 -0,5
123 to 170	550 to 750	100	112	110	100	300	+0.5 255 -0	+0,5 299 -0,0	+0,3 298 -0,3	250	350		50		18	+1,0 757 -1,0	5,5	85	30	50	55	M10	M12	12	10	1,5	257	294	295	266	+0,3 80 -0,3	+0,5 320 -0,5
245 to 300	850 to 1050	139	202	200	140	480	+5 480 -0	+0,5 560 -0	+0,3 559 -0,3	440	620		100		21	+2,0 960 -2,0	6	110	30	70	105	M12	M16	16	10 [a]	2,5	490	554	555	491	+0,3 110 -0,3	+0,5 582 -0,5
362 to 550	1175 to 1550	139	252	250	140	540	+5,0 540 -0,0	+0,5 618 -0,0	+0,3 617 -0,3	500	690		100		21	+2,0 1400 -2,0	6	110	30	70	105	M12	M16	20	10 [a]	2,5	550	612	613	551	+0,3 110 -0,3	+0,5 640 -0,5

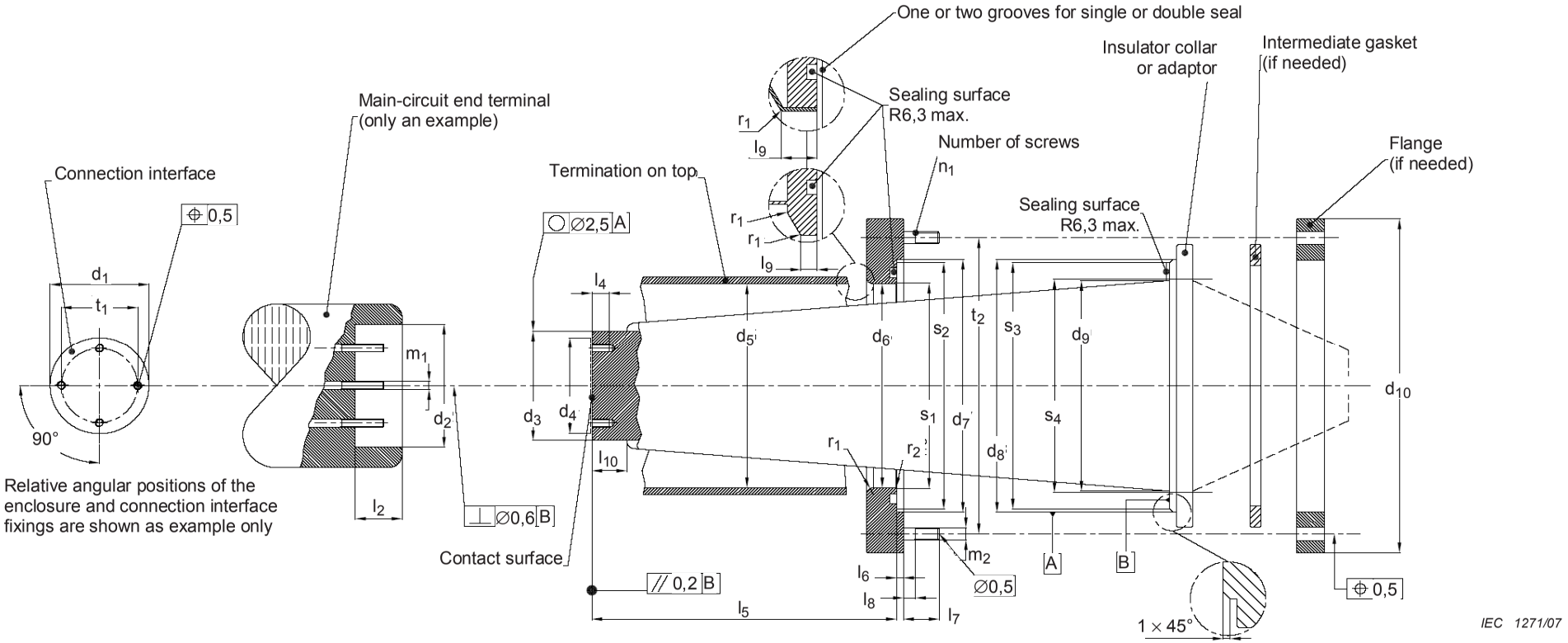
[a] If $d_5 > d_6$. [b] d_9 and corner radius shall not interfere with d_6 and r_2.

Figure 3 – Fluid-filled cable connection – Assembly dimensions



No.	Description	Manufacturer	
		Switchgear	Cable termination
1	Main circuit end terminal	X	
2	Connection interface	X	
3	Connection interface		X
4	Insulator		X
5	Cable connection enclosure	X	
6	Enclosure flange or intermediate plate	X	
7	Seal	X	
8	Screws, washers, nuts	X	
9	Insulator collar or adaptor		X
10	Intermediate gasket		X (if needed)
11	Flange		X (if needed)
12	Electrical stress control (elastomeric)		X
13	Cable gland		X
14	Gas	X	
15	Non-linear resistors		X (if needed)

Figure 4 – Dry-type cable connection assembly – Typical arrangement



Rated voltage [kV]	BIL kVp	d_1 max.	d_2 min.	d_3 max.	d_4 min.	d_5 min.	d_6	d_7	d_8	d_9 max. [b]	d_{10} max.	former dimension l_1 was deleted	l_2 max.	former dimension l_3 was deleted	l_4 min.	l_5	l_6 max.	l_7 min.	l_8 max.	l_9 max.	l_{10} min.	m_1	m_2	n_1	r_1 min.	r_2 min.	s_1 min.	s_2 max.	s_3 min.	s_4 max.	t_1	t_2
72,5 to 100	325 to 450	100	112	110	100	300	+3 200 -0	+0,5 246 -0,0	+0,3 245 -0,3	196	300		50		18	+1,0 310 -1,0	5,5	85	30	50	55	M10	M10	8	10	1	205	241	242	206	+0,3 80 -0,3	+0,5 270 -0,5
123 to 170	550 to 750	100	112	110	100	300	+0.5 255 -0	+0,5 299 -0,0	+0,3 298 -0,3	250	350		50		18	+1,0 470 -1,0	5,5	85	30	50	55	M10	M12	12	10	1,5	258	294	295	266	+0,3 80 -0,3	+0,5 320 -0,5
245 to 300	850 to 1050	139	202	200	140	400	+5 385 -0	+0,5 455 -0	+0,3 454 -0,3	375	500		100		21	+2,0 620 -2,0	6	110	30	70	105	M12	M12	16	10	2,5	390	450	451	391	+0,3 110 -0,3	+0,5 475 -0,5
362 to 550	1175 to 1550	139	252	250	140	540	+5,0 540 -0,0	+0,5 618 -0,0	+0,3 617 -0,3 [c]	500	690 [c]		100		21	+2,0 960 -2,0 [c]	6	110	30	70	105	M12	M16	20	10 [a]	2,5	550	612 [c]	613 [c]	551	+0,3 110 -0,3	+0,5 640 -0,5 [c] [4]

[a] If $d_5 > d_6$. [b] d_9 and corner radius shall not interfere with d_6 and r_2. [c] Values as indicated are tentative only. Smaller dimensions are under consideration.

Figure 5 – Dry-type cable connection assembly – Assembly dimensions

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60038 (mod) A1 A2	1983 1994 1997	IEC standard voltages [1)]	HD 472 S1 + corr. February	1989 2002
IEC 60141	Series	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-shealthed 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 60694	1996	Common specifications for high-voltage switchgear and controlgear standards	EN 60694 + corr. May	1996 1999
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 A1	2001 2006	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 62271-203	2003	High-voltage switchgear and controlgear - Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	EN 62271-203	2004
CIGRE WG 23-10 Report, ELECTRA 151	1993	Earthing of GIS - An Application Guide	–	–
CIGRE Brochure 89, WG 21.06	1995	Accessories for HV Extruded Cables - Chapter 2.1.5: Directly Immersed Metal Enclosed GIS Termination	–	–

[1)] The title of HD 472 S1 is: Nominal voltages for low voltage public electricity supply systems.

Annex ZB
(informative)

A-deviations

A-deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CENELEC national member.

This European Standard does not fall under any Directive of the EC.

In the relevant CENELEC countries these A-deviations are valid instead of the provisions of the European Standard until they have been removed.

Clause	Deviation
1	**Italy**
	(DM 1 December 1980 and DM 10 September 1981 published in Gazzetta Ufficiale no. 285 dated 16.10.1981)
	For insulation-enclosed switchgear and controlgear containing gas-filled compartments, the design pressure is limited to a maximum of 0,5 bar (gauge) and the volume is limited to a maximum of 2 m^3. Gas filled compartments having a design pressure exceeding 0,5 bar (gauge) or a volume exceeding 2 m^3 shall be designed according to the Italian pressure vessel code for electrical switchgear.

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