MV POLE MOUNTED SWITCH-DISCONNECTORS

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1. SCOPE

The scope of this document is to provide the technical requirements for the supply of SF_6 insulated MV pole mounted switch-disconnectors to be used in overhead bare conductors lines (SDL) and cable lines (SDC) of the Enel Group Distribution companies whose Countries are listed below:

- Argentina
- Brazil
- Chile
- Colombia
- Iberia
- Italy
- Peru
- Romania

2. APPLICATION FIELD

The MV pole mounted switch-disconnectors are outdoor installation switch-disconnectors capable of operating normally, carrying their rated normal current, making and breaking their rated current, in systems with isolated neutral, resonant neutral, solidly or impedance earthed neutral.

The switch-disconnector for bare conductors (including covered conductors) shall have a motorised (or manual) command, whereas the switch-disconnector for cable lines shall have a motorised (or manual) command for opening and closing the line and a manual command for the earthing switches.

3. LIST OF COMPONENTS

The following components are covered by this global standard:

<table>
<tr><th>Type code</th><th>Description</th><th>Typology</th><th>Command type</th><th>Rated normal current [A]</th><th>Rated short-circuit breaking current [kA]</th><th>Rated voltage [kV]</th><th>Creepage distance [mm]</th></tr>
<tr><td>GSCM003/1</td><td>SDL-M24</td><td rowspan="2">Bare conductors</td><td>Manual</td><td rowspan="6">630</td><td rowspan="6">16</td><td rowspan="6">24</td><td rowspan="2">744</td></tr>
<tr><td>GSCM003/2</td><td>SDL-E24</td><td>Electrical</td></tr>
<tr><td>GSCM003/3</td><td>SDL-M24P</td><td rowspan="2">Bare conductors extreme pollution</td><td>Manual</td><td rowspan="2">835</td></tr>
<tr><td>GSCM003/4</td><td>SDL-E24P</td><td>Electrical</td></tr>
<tr><td>GSCM003/5</td><td>SDC-M24</td><td rowspan="2">Cable lines</td><td>Manual</td><td rowspan="2"></td></tr>
<tr><td>GSCM003/6</td><td>SDC-E24</td><td>Electrical</td></tr>
</table>

Table 1: List of components (24 kV)

Type code	Description	Typology	Command type	Rated normal current [A]	Rated short-circuit breaking current [kA]	Rated voltage [kV]	Creepage distance [mm]
GSCM003/7	SDL-M36	Bare conductors	Manual	630	16	36	1116
GSCM003/8	SDL-E36		Electrical				
GSCM003/9	SDL-M36P	Bare conductors extreme pollution	Manual				1250
GSCM003/10	SDL-E36P		Electrical				
GSCM003/11	SDC-M36	Cable lines	Manual				
GSCM003/12	SDC-E36		Electrical				

Table 2: List of components (36 kV)

For local components codification see Annex B.

4. REFERENCE LAWS AND STANDARDS

4.1 Laws

4.1.1 Brazil

NR-10 - segurança em instalações e serviços em eletricidade.

4.1.2 Chile

NSEG 5. E.n.71 - Reglamento de Instalaciones Eléctricas de Corrientes Fuertes.

4.1.3 Colombia

RETIE - Reglamento Técnico de Instalaciones Eléctricas.

Ley 400 de 1997 - Reglamento Colombiano de Normas sismo-resistentes.

4.1.4 Iberia

R.D. 614/2001, de 8 de junio, sobre disposiciones mínimas para la protección de la salud y seguridad de los trabajadores frente al riesgo eléctrico.

R.D. 337/2014, de 9 de mayo, por el que se aprueban el Reglamento sobre condiciones técnicas y garantías de seguridad en instalaciones eléctricas de alta tensión y sus Instrucciones Técnicas Complementarias ITC-RAT 01 a 23.

R.D. 223/2008, de 15 de febrero, por el que se aprueban el Reglamento sobre condiciones técnicas y garantías de seguridad en líneas eléctricas de alta tensión y sus instrucciones técnicas complementarias ITC-LAT 01 a 09.

4.1.5 Italy

D.P.R. n. 341 of the 13th of February 1981.

D.Lgs n. 81 of the 9th of April 2008 and subsequent modifications.

D.P.R. n. 43 of the 27th of January 2012.

4.1.6 Peru

Código Nacional de Electricidad Suministro.

4.1.7 All European Countries

Regulation (EU) of the European Parliament and of the Council 517/2014 of the 16th of April 2014.

Regulation (EC) of the Commission 1494/2007 of the 17th of December 2007.

4.2 Standards

4.2.1 Common international standards

The below listed reference documents shall be intended in the in-force edition at the contract date (amendments included). Unless otherwise specified, these documents are valid until the new editions replace them.

Standards	Edition
IEC 62271-1	2007-10
IEC 62271-102	2001-12
IEC 62271-200	2011-10
IEC 60447	2004-01
IEC 60529	1989-11
EN 50181	2010-07
IEC 62271-103	2011-06
ISO 1461	2009-05
ISO 2081	2008-12

4.2.2 Common technical specifications

DY1050 - Requirements for the 24 V_{cc} motorisation

GSTR001 - Peripheral Unit

PVR006 - Barcode

GSCT003 - Self-protected voltage transformer

GSCT004 - Outdoor voltage transformer

GSCS006 - Bracket

4.2.3 Particular technical specifications

Unless otherwise specified, these technical specifications are valid until the new editions replace them.

4.2.3.1 Chile

ETGI-1020 - Especificaciones técnicas generales - Requisitos de diseño sísmico para equipo eléctrico.

DMAD-0184 - Poste de hormigón armado 13,5 m.

4.2.3.2 Colombia

NSR - 10 Norma Sismo Resistente Colombiana.

4.2.3.3 Peru

E-SE-010 - Acción sísmica en equipos eléctricos y mecánicos.

5. SERVICE CONDITIONS

Limits of the ambient temperature:

Maximum temperature not higher than 50 °C with average value, referred to a 24 h period, not higher than:	35 °C
Minimum ambient air temperature for outdoor installation:	- 25 °C *

Table 3: Limits of the ambient temperature

Relative humidity (IEC 60271-2-1)	98%
Contamination level (IEC 60815)	Very High (IV)

Table 4: Requirements for corrosive atmospheres

* For Romania the minimum ambient air temperature is - 40 °C.

For Colombia the maximum reference altitude is 2.700 m.

For all the other characteristics the reference is the IEC 62271-200, whereas the earthing switches shall comply with the IEC 62271-102.

6. COMMON CHARACTERISTICS

6.1 Characteristics of the switch-disconnector

The switch-disconnector has to be manufactured in compliance with the reference national laws and with the standards pointed out in section 4.2.

The enclosures must be filled with SF_6 exclusively in the factory and they have to form a sealed pressure system (IEC 62271-200) [1].

The switch-disconnector must be sealed. The elements used in the factory for filling and recovering the SF_6 at the end of life shall be identified with a self-adhesive plate and protected from accidental shocks. On the plate it shall be written: "*Remove the cap at the end of the switch-disconnector's operating life only for the possible recovery of gas*" [2]. This plate shall have a yellow RAL 1021 background and the words in black RAL 9005.

During the design and manufacturing of the switch-disconnector, strains during operation and transportation must be taken into account; to do this there must be a safety valve against overpressure. The valve shall be equipped with a metallic disc for the protection against accidental strains, placed at a proper distance from the valve itself and equipped with lateral grids which allow the gas vent and prevent the fall of material to the ground.

The valve shan't be put in the operation sides of the switch-disconnector (e.g., motorisation side, cable side, lever side) and shall be protected against water infiltration.

[1] For Italy the filling shall be made in order that the maximum operating relative pressure at 45 °C does not exceed 0,5 [kg/cm^2].
[2] The plate shall be written in the language of the Country in which the component has to be delivered.

The switch-disconnector shall be equipped with “safe position devices” for the indication of the real position of the main moving contacts of the switches, as required by IEC 62271-200 and IEC 62271-102.

The panels for the accessing the mechanical parts of the switch-disconnector and of the earthing switches shall ensure the degree of protection IP54. These panels shall be removed for maintenance operations without removing parts of the commands; it is allowed only removing the extensions of the operating shafts of the switch-disconnector and of the earthing switches that allow the use of the earthing stick.

The switch-disconnector shall be provided with appropriate lifting eyebolts in its upper part and four M12 threaded holes in its lower part. The weight must not exceed 200 kg.

After installation, the switch-disconnector shall be oblique towards the pole of 3 degrees to avoid the stagnation of humidity.

The switch-disconnector shall comply with point 5.102 of IEC 62271-102 regarding the requirements of the isolating distance.

In the case that the switch-disconnector has an additional internal insulating shell, in alternative to the connection described in point 5.102 of IEC 62271-102, to verify the effectiveness of the protection against the pollution caused by the products of decomposition and the behaviour of its insulating material, it’s necessary to perform the test of point 6.104.2 of IEC 62271-200.

In the absence of a safe connection to earth, to verify the effectiveness of the protection against pollution in service of the insulating materials, the test of paragraph 14.1.21 of this Global Standard shall be performed.

6.2 Rated characteristics

The main characteristics are listed in table 5 below.

Rated voltage		[kV]	24	36
Rated insulation level	- impulse withstand voltage to earth and between phases	[kV]	125	170
	- impulse between the open contacts of the switch-disconnectors	[kV]	145	195
	- power frequency voltage to earth and between phases	[kV]	50	70
	- power frequency voltage between the open contacts of the switch-disconnectors	[kV]	60	80
Rated frequency		[Hz]	50 (or 60)	
Rated normal current		[A]	630	
Rated short-time withstand current		[kA]	16	
Crest value of the rated short-time withstand current		[kA_c]	40 (or 41,6)	
Rated short-circuit duration		[s]	1	
External degree of protection			IP54	
Internal arc test current		[kA]	16	
Internal arc test current duration		[s]	0,5	
Mechanical endurance class			M2	
Electrical endurance class			E3	
Rated breaking current	- of a mainly active load	[A]	630	
	- of a no-load transformer	[A]	6,3	
	- of a no-load line	[A]	10	13
	- of a no-load cable	[A]	31,5	40
	- in case of earth fault	[A]	50	
	- with cable-charging in case of earth fault	[A]	16	25

Table 5: Characteristics of the switch-disconnector

6.3 SF_6

The characteristics of the first filling gas shall meet the requirements of IEC 60376. The humidity content of the first filling gas shall be less than 15 ppm in weight and, during operation, the absence of condensation at the minimum operating expected temperatures must be guaranteed. The manufacturer shall ensure that at the end of the expected life of the equipment (30 years) the gas pressure remains higher than (or equal) the minimum operating pressure p_m (minimum necessary pressure to ensure the performances prescribed for the device). In any case, the loss shall not exceed the 0,1% value in weight per year (IEC 62271-1).

6.4 Voltage transformer

The switch-disconnectors with motorised command shall consider an outdoor phase-to-phase voltage transformer (not to be supplied with the switch-disconnector), for giving the power supply to the Peripheral Unit, in accordance with the Global Standard GSCT003 or GSCT004.

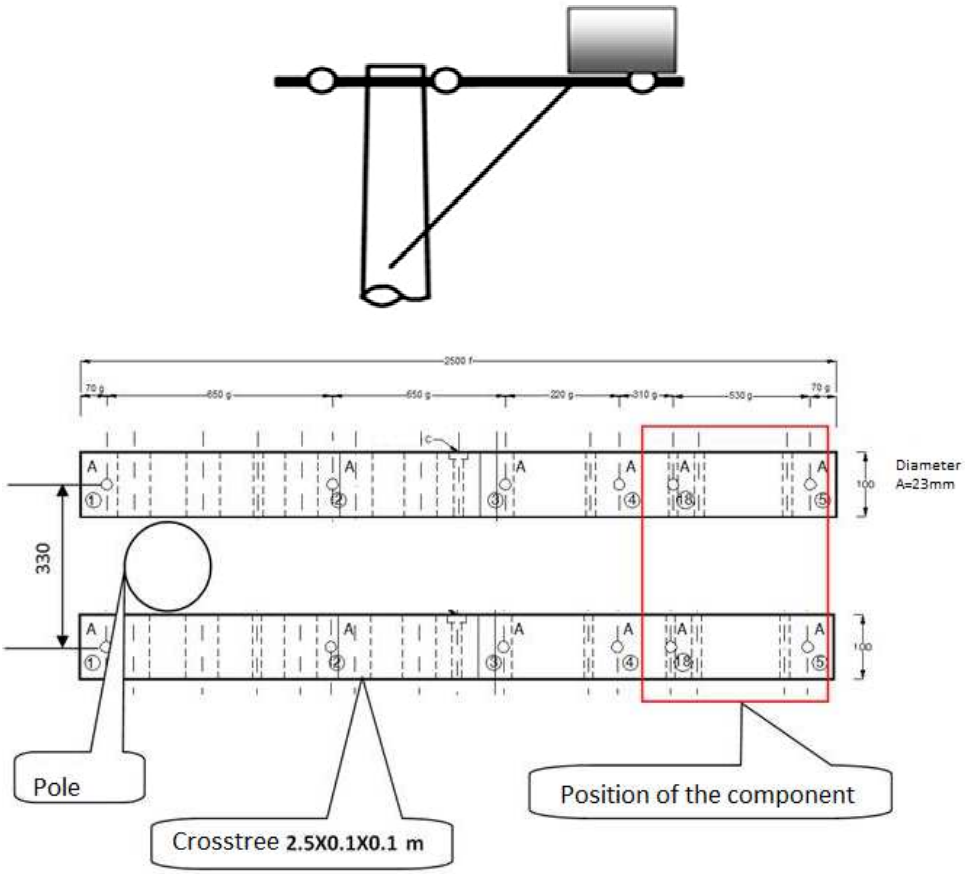
The voltage transformer shall be put on another support on the pole on the opposite side of the switch-disconnector.

6.5 Bracket

The switch-disconnector shall be provided with the standardised bracket GSCS006 to be connected to the pole.

6.5.1 Colombia

The switch-disconnector shall be designed also to be installed on a horizontal surface, as shown in the figure below:



6.5.2 Chile

The switch-disconnector shall be provided with a support which has to comply with the technical specification DMAD-0184.

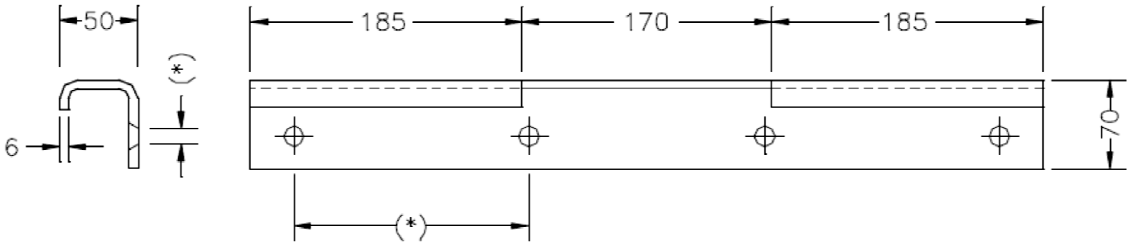
6.5.3 Iberia

The bracket shall be fixed with specific screws for any type of pole.

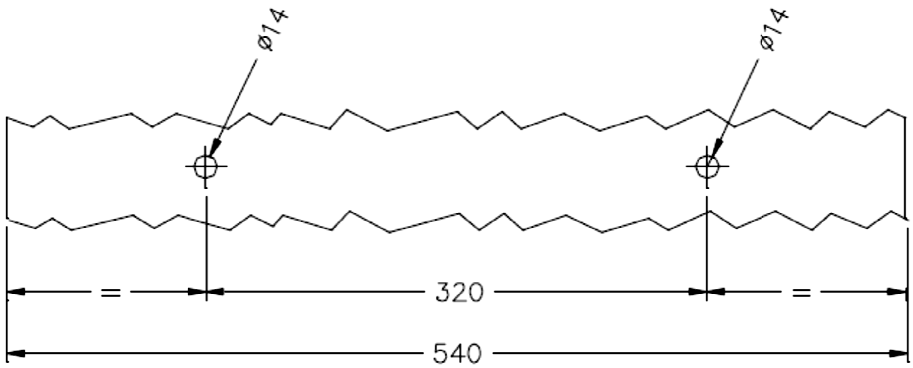
6.5.4 Italy and Peru

The bracket shall be fixed with the dedicated stainless steel band DS3230/2 and braces DS3240/2 and with the coupling supports in stainless steel between the bracket and the switch-disconnector (part.1 and 2).

Part.1



Part.2



* The number and size of the holes for fixing the equipment and the centre to centre distance shall be stated by the Manufacturer in order to ensure the stability of the structure with a weight which is the double of the normal weight of the equipment.

6.6 Operating directions and switch-disconnector's commands

The operation direction shall be compliant with the IEC 60447 and with everything written in this global standard. For each operating place, it shall be written the function of the device, the movement direction and the "open" or "closed" signal positions, which must be visible from the ground [3].

It must be allowed to measure the opening and closing speeds of the switch-disconnector and of the earthing switches on the front (e.g., by making accessible the operating shaft of the equipment removing the protective shell only).

6.7 Devices and signal position

The switch-disconnector (and the earthing switches) shall be equipped with "safe position devices" for the indication of the real position of the main moving contacts of the switches, as required by IEC 62271-200 and IEC 62271-102.

The indicators of the positions shall be luminescent and protected from the action of weather by adopting a transparent protection and shall be of an adequate dimension to be clearly visible from the ground; it is allowed for that a lenticular transparent protection.

[3] Even in the case of installation on a horizontal surface (par. 6.5.1).

Near the indicators, nameplates shall be applied. These nameplates, for "switch-disconnector" and "earthing switches", shall be on white background with black RAL 9005 characters to facilitate their identification.

Moreover, the following indications shall be provided:

- switch-disconnector's signal position, through the following symbology [4]:
  - black letter "I" on 3000 RAL F2 red background corresponding to the close position of the switch-disconnector;
  - black letter "O" on 6017 RAL F2 green background corresponding to the open position of the switch-disconnector;
- earthing switch's signal position. The used device shall be mechanically interlocked with the main circuit moving contacts and the correspondent position shall be displayed through the following symbology:
  - black letter "I" on 1021 RAL F2 yellow background corresponding to the close position of the earthing switch;
    black letter "O" on 7030 RAL F2 grey background corresponding to the open position of the earthing switch;

The signal positions shall be visible even with the protection shell removed.

6.8 Earth connections

Every metallic parts of the enclosures and/or metallic partitions and the local command shall be connected to the provided M12 earthing point. [5]

The operating shafts of the switch-disconnectors and of the earthing switches and the other metallic objects must be connected to the earth with copper conductors whose section must not be less than 16 mm^2.

In case of switch-disconnectors for cable lines, from the switch-disconnector earthing point a copper bar shall be derived and it shall develop above and along the entire length of the switch-disconnector and, in correspondence of the bushings, it shall be provided with three M12 bolts per side on which the earthing connections of the MV cable shields shall be fixed.

6.9 Protective coating

The enclosure of the switch-disconnector and the command cover, which has to be in stainless steel AISI 316, doesn't need a protective coating.

The welded parts in stainless steel shall be treated with surface passivation using nitric acid or equivalent.

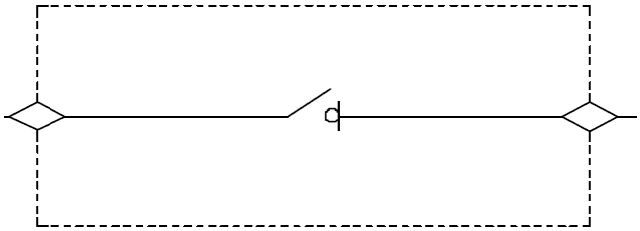
The parts in ferrous material of the operating commands, treated with an iridescent conversion coating or equivalent [6] (Fe/Zn12/C in compliance with ISO 2081), shall be protected by an electrolytic coating of 12 µm of zinc. The assembling nuts and bolts and the small accessories, unless otherwise specified, shall be protected with electrolytic zinc, except the external ones which must be in stainless steel.

All the external metallic parts which are not in stainless steel shall be protected with a galvanization process according to ISO 1461.

[4] For Brazil the letters indicating the signal position of switch-disconnector and earthing switches shall be "D" for the open position and "L" for the close one.
[5] For Italy and Romania an additional copper wire of 50 mm^2 shall be provided to connect the earthing point of the switch-disconnector to the earthing point of the local command.
[6] The equivalent conversion coatings shan't show the red rust before 336 hours (as well as the hexavalent chromium).

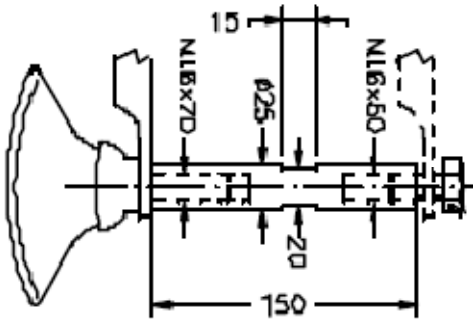
7. SWITCH-DISCONNECTOR FOR BARE CONDUCTOR LINES

This component has just the switch-disconnector for opening and closing the line. The functional electric scheme is the one of the figure below.



The three-pole manual or motorised operating device of the switch-disconnector has to be deadcenter overcoming both in opening and closing operation, rotating type.

Only for Italy and Romania, in the case of screened cable line connected with usual terminals, the earthing for work must be realised on the attacks (which are on demand) to be put on the insulators, as shown in the figure below.



In the case of covered conductor, the earthing for work must be realised directly on the anchor lines.

However, in any case, all dispositions against electrocution must be adopted meticulously, because the positions of the main contacts of the switch-disconnector is independent from the insertion of the portable earthings.

7.1 Manual command

It must be created in order to allow both the opening and the closing by traction (pulling the earthing stick downwards).

The manual operation of the switch-disconnector shall be available in every moment, independently from the motorised command.

The operations shall be made from the ground, with the standardised earthing stick, applying a downward strength which does not exceed 200 N. For this purpose the switch-disconnector shall be

operated with the earthing stick directly on a local command with a lever put at 4 ÷ 4,5 m from the base of the pole.[7]

The manual command shall be realised in order to allow the application of a lock with an arc of 8 mm thickness in the open and close position on the local command.

The manual operation or the lock must prevent the motorised command. The command shall be outdoor type, realised to prevent condensation.

The degree of protection of the operating devices shall be IP54.

7.2 Motorised command

The motorised command of the switch-disconnector shall allow the possibility to put the local command operated with the earthing stick, to install the VT on the opposite side of the pole, to substitute the electronic board and the electric motor in an easy way and without removing the switch-disconnector. It shall be compliant to what it's stated in the technical specification DY1050, with the modifications listed below:

- the connection cable between switch-disconnector and Peripheral Unit, to be supplied with the switch-disconnector, shall be 10x1,5 mm^2 outdoor type, 10 m long[8]. Both the extremities of this cable shall have pre-isolated terminals for the terminal box used and identification marks according to the connection table 10.
  This cable shall be prepared joining two conductors in parallel for each polarity of the power circuit, mechanically joint by a heat shrinking for a minimum length of 20 cm. Every necessary hole for cable passage shall have appropriate cable gland in order to restore the degree of protection of the shell (IEC 60529);
- The connection cable between the voltage transformer and the Peripheral Unit shall be a 2x2,5 mm^2 outdoor type with a maximum external diameter of 16 mm. One of the two conductors shall have the earthing symbol at one extremity. The cable length shall be 10 m[9].

7.3 Insulators

The insulators, compliant with the standard IEC 60137, shall be made of organic material resistant at the electrical environment ageing (silicone without EPDM)[10]; they must have a creepage distance as shown in the table below between live parts to the earth and a bending moment at the base of the attack of minimum 250 Nm and must resist at an adequate tightening torque for the conductors.

Rated voltage [kV]	Minimum creepage distance [mm]
24	744 (835*)
36	1116 (1250*)

* Values of the creepage distance for extreme pollution.

[7] On the switch-disconnectors to be provided in LATAM, the lever to operate the line shall be put on the enclosure on the command cover (in front of the switch-disconnector), jointly liable with the motorisation, and designed in order that they ensure the safety distance of 750 mm from live parts.

[8] For switch-disconnectors to be delivered in Spain, the connection cable between switch-disconnector and peripheral unit shall be 10x2,5 mm^2 and 20 m long.

[9] For switch-disconnectors to be delivered in Spain, the connection cable between voltage transformer and peripheral unit shall be 20 m long.

[10] For Peru the test of resistance to tracking and erosion shall be performed at the test voltage of 5 kV to 6 kV according to IEC 60587, Table 1.

7.4 End fitting

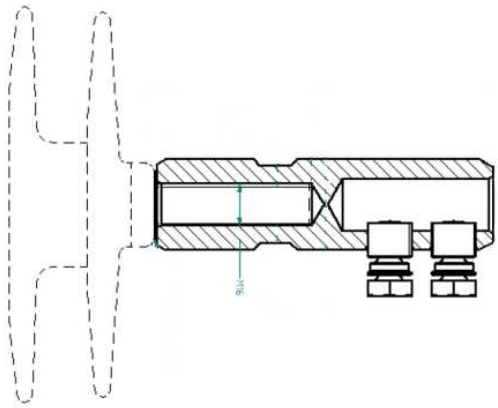
7.4.1 Italy and Romania

The internal conductor of the insulator shall be in copper and have a diameter of 16 mm; its far end shall be threaded M16x60.

The connection between the bare conductor line and the insulator shall be made with an eyelet terminal compatible with the M16 of the far end of the internal conductor of the insulator.

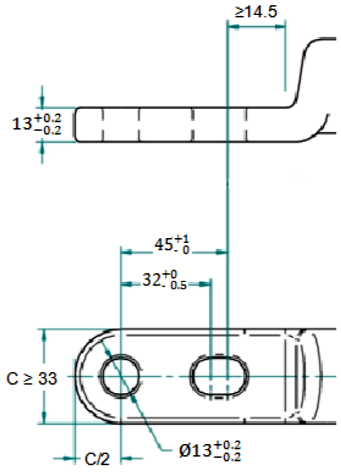
7.4.2 Brazil

The far end of the internal conductor, that has to be threaded M16x2x60, shall be of bi-metallic material compatible with the terminal of the figure below.



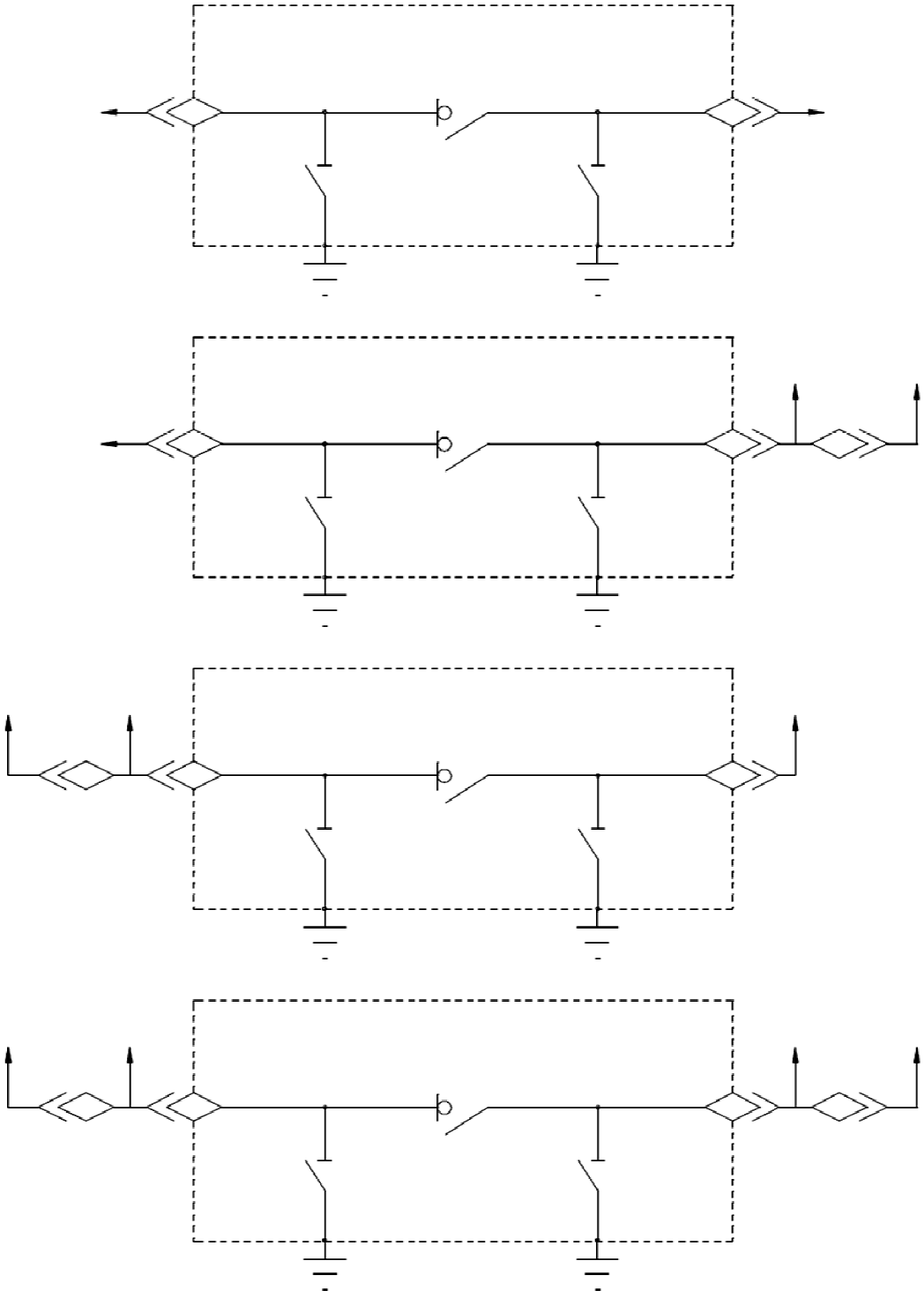
7.4.3 Argentina, Chile, Colombia, Iberia and Peru

The far end of the internal conductor shall be compatible with the eyelet terminal of the figure below, put in vertical position.



8. SWITCH-DISCONNECTOR FOR CABLE LINES

This component has the switch-disconnector for opening and closing the line and two earthing switches. The functional electric scheme is the one of the figure below.



The three-pole manual operating device of the switch-disconnector has to be deadcenter overcoming both in opening and closing operation, interlocked with the two earthing switches before and after the switch-disconnector itself. The opening or closing of the switch-disconnector must be allowed only if both the earthing switches are in open position.

The lever of the switch-disconnector to open or close the line shall be red RAL 3026 (e.g., polyurethane paint) and shall have a nameplate with the characters “IMS” referring to the switch-disconnector in black RAL 9005 on white RAL 9010 background.

The enclosure of the switch-disconnector shall be designed to have a stainless steel AISI 316 cover on the upper side and lateral side of the bushings with a dimension of 300 mm from the border of the enclosure.

8.1 Manual command

The manual command of the switch-disconnector shall be realised in accordance with what it’s stated in paragraph 7.1, with the following modifications:

- the operations shall be made from the ground, with the standardised earthing stick, applying a strength which does not exceed 200 N. For this purpose the switch-disconnector shall be put at 6 m from the ground.
- the manual command shall be realised in order to allow the application of a lock in the open and close positions; this lock shall resist at a strength of 800 N applied at the lever in vertical direction, without causing permanent deformations.

8.2 Motorised command

See paragraph 7.2.

8.3 Bushings

To connect the MV cable terminals, the switch-disconnector shall be equipped with outdoor cone bushings in accordance with EN 50181. Bushings shall have 630 A rated normal current (type C interface). To connect the MV cable to the bushings, symmetrical T-separable connectors shall be used.

In order to avoid that the cable weight interferes with the bushing resistance, a support shall be provided on the bottom of the switch-disconnector (the support may be removable for transportation). The height between the axis of the bushing and the support shall be at least 420 mm.

The support shall have a tension clamp for each cable according to the Global Standard GSC001 to transmit the mechanical tension in the cable to the supporting structure.

8.4 Earthing switches

The earthing switches shall comply with the IEC 62271-102 and shall have the characteristics listed in table 6.

Rated short-time withstand current	[kA]	16
Crest value of the rated short-time withstand current	[kA_c]	40 (or 41,6)
Short-circuit making capacity	[kA]	40 (or 41,6)
Rated short-circuit duration	[s]	1
Mechanical endurance class		M0
Electrical endurance class		E2

Table 6: Characteristics of the earthing switches

The two earthing switches, which are independent between them, must be moved only with the switch-disconnector in open position.

The levers of both the earthing switches shall be yellow RAL 1026 (e.g., polyurethane paint) and shall have a nameplate with the characters "ST_1" and "ST_2" in black RAL 9005 on white RAL 9010 background.

The levers may be taken away in order to remove the front panels. Their assembling must be allowed only in an obliged position, to avoid that they can be exchanged between them and with that one of the switch-disconnector. The levers shall be removed for transportation.

It shall be provided a hole to allow the application of a lock with an arc of 8 mm thickness in the open and close positions; this lock shall resist at a strength of 800 N applied at the lever in vertical direction, without causing permanent deformations.

9. MANOMETER

To measure the SF_6 pressure, on the type codes to be supplied in Spain a manometer shall be provided.

The manometer shall not be extractable and, in supply normal conditions, the pressure indication shall be between 25% and 75% of the area marked as safe. The area marked as safe shall be green RAL 6017 whereas the other area shall be red RAL 3000. It must be visible from the bottom of the pole.

10. NAMEPLATES

Each switch-disconnector shall have a nameplate in the language of the Country in which it has to be delivered carved or relief printed on a long-lasting material, weather resistant and secured on the protective shell [11]. This nameplate shall have four eyelets for fixing it at the base of the pole with a stainless steel band or it shall be provided with a support to put on the pole.

10.1 Rating plate

The rating plate shall contain information on the code that the Manufacturer assigns to each series of the same type. It shall contain the mandatory information required by IEC 62271-200 (table 101), such as: Manufacturer's name, year and month of manufacture, manufacturer's type designation, serial number, weight [kg] and pressure [Pa] of SF_6, electric scheme [12].

In the proximity of the rating plate it must be put a barcode with the characteristics described in Nota Operativa Presidio Vendor Rating PVR006.

An informative nameplate with the sentence "Contains fluorinated greenhouse gases covered by the Kyoto Protocol", in accordance with Regulation (EU) of the European Parliament and of the Council 517/2014 of the 16th of April 2014, has to be provided.

11. MAINTENANCE

The switch-disconnectors shall have a manual in accordance with the point 10.4 of IEC 62271-1, which shall include the maintenance mode to be observed (e.g., grease on some parts of the command), considering the device type and the period of time in which they have to be carried out. The switch-disconnector, for the first 36 months from its delivery date, must be maintenance free. The subsequent maintenance must have a frequency that is not less than 36 months. These statements must be written in the instruction manual.

12. EQUIPMENT

Each switch-disconnector must be equipped with:

[11] For Italy and Spain two nameplates shall be provided: one on the switch-disconnector and the other one at the base of the pole.
[12] For Colombia on the rating plate there shall be also the Customer's Name.

- installation, operation and maintenance manual in the language of the Country in which the switch-disconnector has to be delivered;
- manual with procedures to be adopted for storage, after factory test and transportation;
- a packing for transportation and storage (which does not take part in the homologation process) according to the documents of every Country.

The insulators and the bushings shall be opportunely protected to safeguard them from impacts that may damage them. These protections shall be realised so not to have a difficult assembling and in order they can be removed only after installation.

Outside of the box containing the switch-disconnector, it shall be clearly written:

- name of the Distribution Company;
- name of the supplier;
- description of the product;
- code assigned by the supplier;
- type code and serial number of the Distribution Company;
- gross weight.

13. EXCEPTION TO THIS SPECIFICATION

Any exception to this technical specification, concerning the adoption of techniques and/or special construction different than what is specified in this document, may be taken into account during the homologation process. However, in this case, the Distribution Company reserves the right to prescribe the execution of additional tests other than those ones described in this document, in relation to the specific proposals.

14. TESTING

On the switch-disconnector the tests described in the following paragraphs shall be performed.

The making capability of the earthing switch and the pressure leak test, referred to point 6.101 of IEC 62271-200, shall be carried out on a switch-disconnector fully prepared to be put in service.

The tests to be performed on the switch-disconnectors are divided in:

- Type tests
- Routine tests.

14.1 Type tests

During tests maintenance is not allowed.

14.1.1 Visual inspection

The switch-disconnector shall be subject to a visual inspection in order to verify the absence of defects and that the construction features and the dimensions are those ones prescribed in the technical specifications. In detail, it must be verified that the characteristics are correctly shown on the rating plate, as indicated by IEC 62271-200.

14.1.2 Dielectric tests

The tests shall be performed in accordance with IEC 62271-200 § 6.2 and shall be:

- lightning impulse test
- power frequency test
- test on auxiliary and control circuits.

14.1.3 Partial discharge test

The test shall be performed in accordance with IEC 62271-200 § 6.2.9.

The partial discharges control shall be carried out on each bushing or organic material element as indicated in IEC 60270 with the following details:

- partial discharge inception and extinction voltages shall be recorded;
- partial discharge extinction voltage shall not be less than $1{,}1\frac{U_n}{\sqrt{3}}$, where U_n represents the switch-disconnector's rated voltage;
- instrument circuit sensitivity shall be able to log a 2 pC discharge intensity;
- instrument circuit background noise shall not be more than 5 pC;
- partial discharges intensity shall not be more than 100 pC at 1,05 U_n.

If it's not possible to remove the bushings or the organic material elements from the switch-disconnector, they shall be picked up by the production.

14.1.4 Measurement of the main circuit resistance

The test shall be performed in accordance with IEC 62271-200 § 6.4.

14.1.5 Temperature-rise test

The test shall be performed in accordance with IEC 62271-200 § 6.5.

14.1.6 Short-time withstand current and peak withstand current tests

The test shall be performed in accordance with IEC 62271-200 § 6.6.

The three-phase test shall be performed with the test current which passes through the switch-disconnector for 1 second. The power supply circuit shall have the conductors rigidly stuck to the bushings or to the terminal-carrier bracket provided on the switch-disconnectors. The connection to the tested object shall be made with rigid conductors, whose length is 120 cm. The output connections shall be connected together with flexible conductors.

The test shall be performed both on the line blades and on the earthing blades.

14.1.7 Control of the degree of protection (IP)

The control shall be made in accordance with IEC 62271-200 § 6.7, in every part of the switch-disconnector defined in this global standard.

14.1.8 Tightness tests

The tests shall be performed in accordance with IEC 62271-200 § 6.8 regarding the "Sealed pressure systems".

For the tightness tests before and after the mechanical operation test, the switch-disconnector shall be put in a tight enclose during 24 hours.

The measured leaks shall not be more than the annual percentage in weight obtained from the following equation:

$$100\frac{P_r - P_m}{30P_r}$$

where P_r represents the value of the relative leaks and P_m that one of the measured leaks.

Alternatively, to measure the leakage rate, it's possible to use the methods described in § 6.8.2 of IEC 62271-1. The leakage rate shall guarantee a 30 years useful life.

14.1.9 Tests to verify the tightness with the repeated temperature variations

The switch-disconnector shall be subject to 20 thermal cycles in accordance with the following figure:

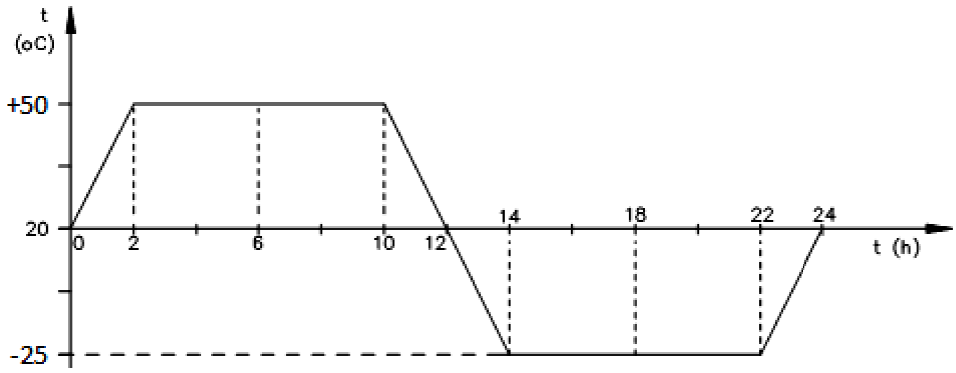


Figure 1: Thermal cycles to verify the tightness with the repeated temperature variations

After 6 hours and 18 hours from the beginning of each of the 20 cycles, 2 C-O operations must be performed on the switch-disconnector (IMS + ST). Verifications for the leaks determination shall be carried out with the following way:

- one measurement at ambient temperature at the beginning and at the end of the test, in accordance with paragraph 14.1.8.

At the end of the 20 cycles, leakages must not be more than the annual percentage in weight obtained from the equation pointed out in paragraph 14.1.8.

14.1.10 Additional test on auxiliary and control circuits

The test shall be performed in accordance with IEC 62271-200 § 6.10.

14.1.11 Making and breaking tests

The test shall be performed in accordance with IEC 62271-200 § 6.101 and with the specific standards:

- switch-disconnectors: IEC 62271-103 § 6.101
- earthing switches: IEC 62271-102 § 6.101

The tests include:

- verification of the rated normal breaking current on a mainly active load;
- verification of the rated normal breaking current on a no-load transformer;
- verification of the rated normal breaking current on no-load lines;
- verification of the rated normal breaking current on no-load cables;
- verification of the rated short-circuit making current.

The tests shall be carried out on one switch-disconnector.

Regarding the tests with no-load transformer:

- the power supply circuit is the same of the one used in the test with mainly active loads;
- the load circuit shall be composed by a transformer with the secondary winding closed on a proper reactance;
- the power factor shall be less than 0.1; the circuit natural frequency shall have a value between 100 Hz and 200 Hz; the damping ratio shall have a value between 0.15 and 0.25.

The test cycle shall provide the execution of 100 opening operations as follow:

- 50 operations with a current between 20% and 40% of the no-load transformer rated breaking capability;

- 50 operations with a current between 80% and 100% of the no-load transformer rated making capability.

The maximum permissible over-voltage is 3.5 p.u. towards the earth and 4.5 p.u. between phases[13].

To verify the making capability, the test cycle includes making operations with a 3 minutes interval.

14.1.12 Mechanical endurance test

The test shall be performed in accordance with IEC 62271-200 § 6.102.

The switch-disconnector's mechanical operation test shall be performed in accordance with IEC 62271-103 § 6.102, whereas the earthing switches' one in accordance with IEC 62271.102 § 6.102.

At the beginning of the tests, the recording of the opening and closing contacts movement shall be performed on all the samples submitted by the manufacturer: the average speeds of the contacts, from the moment of their separation to that one in which they have made the 25% of their travel and from the moment in which they arrive at the 75% of their travel[14] to that of their connection, shall not differ more than ±5% on five specimens.

After the execution of 5000 operations, the recording of the contacts movement shall be repeated on the tested specimen: the already defined average speeds of the contacts, at the moment of separation and connection, observed at the end of the tests, shall not differ more than 5% than those ones observed at the beginning of the tests.

If the tested object has got earthing blades, the following tests shall be performed too:

- execution of 1000 complete opening and closing operations on the earthing blades;
- verification of the interlock between the line blades and the earthing blades
  - through the execution of 50 complete opening and closing operations on alternated earthing blades and line blades;
  - if the interlock doesn't forbid the earthing switch operation with switch-disconnector in closed position. In case of switch-disconnectors with manual command, there shall be a 40 Nm moment on the earthing blades command shaft with the line blades closed and, subsequently, on the line blades command shaft with the earthing blades closed; in case of switch-disconnectors with electric or pneumatic command, it must be verified that, with the earthing blades closed, operating those commands, it's impossible to close the line blades operating on them.

At the end of the tests, the switch-disconnector must work perfectly.

14.1.13 Pressure withstand test for gas-filled compartments

The test shall be performed in accordance with IEC 62271-200 § 6.103.

14.1.14 Tests for organic material insulating elements

The insulator shall pass all the tests of the standard IEC 62217. The only exception is the electrical environmental ageing test, as stated in paragraph 9.3.3 of IEC 62217, which shall have a duration of 5000 hours.

The 5000 hours electrical environmental ageing tests may be done on insulators put in the switch-disconnector or on single insulators. In the case that single insulators have been tested, the whole switch-disconnector must pass the test of paragraph 9.3.3 of IEC 62217 with a duration of 500 hours.

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[13] Values p.u. referred to $\frac{U\sqrt{2}}{\sqrt{3}}$, where U is the real phase-to-phase testing voltage

[14] The travel is measured as a straight line distance between the closed and open position of the arcing contact

14.1.15 Verification of the protection against rust

At the end of the previous paragraph test, the switch-disconnector must be able to function perfectly; moreover no trace of rust shall be on the joints, washers, screws, and/or similar pieces. However, some traces of rust are allowed on large pieces when it is clear that any possible development of the area affected by rust cannot lead to a decrease in strength or effectiveness of the switch-disconnector.

14.1.16 Internal arc test

The test shall be performed in accordance with IEC 62271-200 § 6.106 considering a minimum approach distance of 3 m.

14.1.17 Verification of switch-disconnector and earthing switches' safe devices

The switch-disconnector and the earthing switch shall be tested in accordance with points A.6.105.1.3 and A.6.105.2 of IEC 62271-102. These tests are positive if they comply with point A.6.105.3 of the same standard.

14.1.18 Mechanical strength test

On a complete switch-disconnector, the following tests shall be performed:

- lifting test: the switch-disconnector shall be lifted through the two eyebolts with an additional 250 kg mass, uniformly distributed on the bottom and kept lifted during five minutes;
- strain test: the test consists in securing the switch-disconnector to the floor through four bolts and applying 1000 N on each of the two eyebolts, as indicated in the following Fig. 1, during 5 minutes. The test must be repeated applying the same 1000 N in accordance with the following Fig. 2.

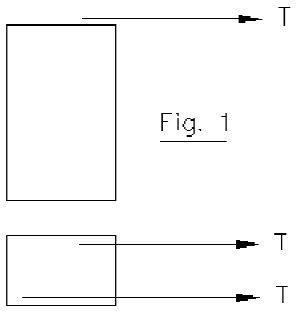


Fig. 1

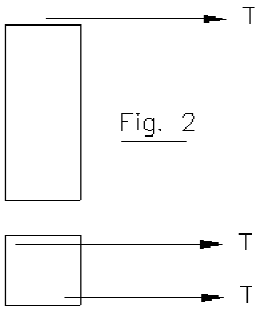


Fig. 2

After having completed the tests, permanent strains greater than 3 mm, measured at the base of the roof's vertical, shall not be present. All the electric and mechanical systems shall work perfectly applying a 200 Nm maximum moment.

14.1.19 Test of the kinematic chain in an abnormal working condition

In addition to the test in A.6.105.1.3 of IEC 62271-102 to verify the safe position, the switch-disconnectors which have one or more phases in a different position from those one indicated in the signal device, for their constructive features, in case one or more elements of the kinematic chain break, shall be subject to a test in order to verify, during the homologation process, the reliability of the kinematic chain itself in an abnormal working condition during the type tests repetition.

The test shall be performed, on one switch-disconnector and before closing the shell, by realising an obstruction at the end of the main contacts travel, before they reach both the open position (or earthing position in case of three positions switch-disconnectors) and the close position.

Testing modalities shall be indicated by the manufacturer, submitting them to the Distribution Companies approval that will endorse the documentation in order to ensure the repeatability.

With the command or equivalent system and in order to stress all the elements of the chain, the test shall be realized by applying on the same obstruction and through the moving contacts, a force F and a possible moment M of 1.5 times the value defined by the manufacturer during the design, as indicated by the above-mentioned standard.

The test can be considered positive if no breaks occur.

14.1.20 Tests for the verification in humid atmosphere

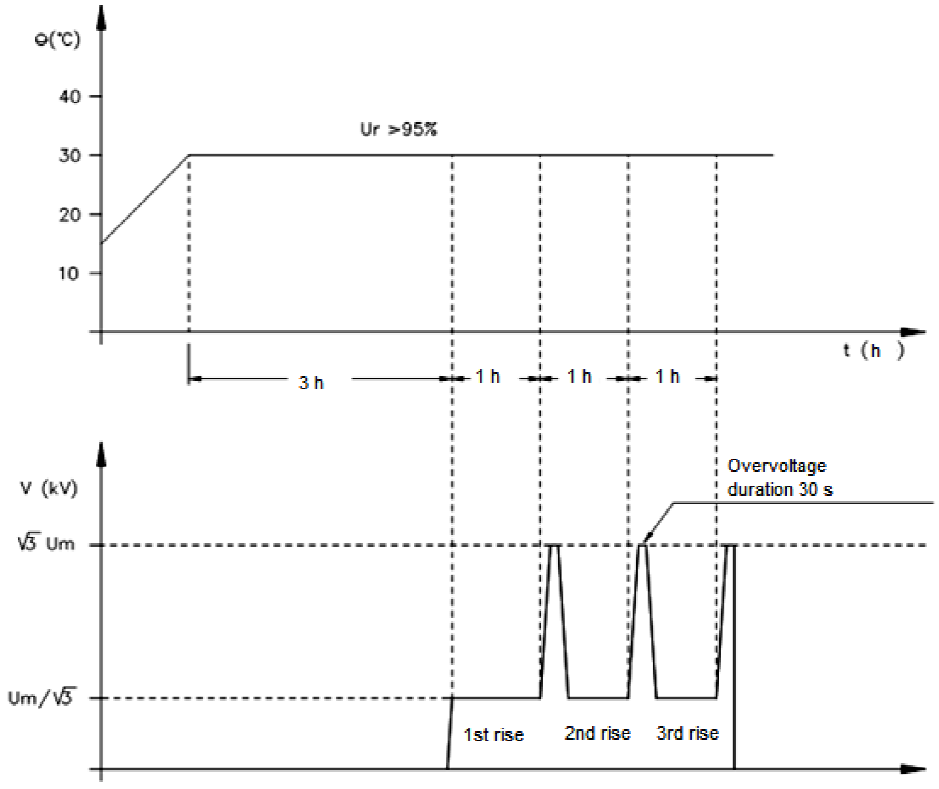
1a) Dielectric dry test

The switch-disconnectors shall be held during 24 hours without voltage in the test room at a 20 ± 2 °C temperature and with relative humidity less than 80%, in order to obtain their complete drying. They shall then be subject to dry power frequency test during 1 minute.

1b) Tests for the verification in humid atmosphere

The test room temperature shall then be increased to 30 ± 2 °C with relative humidity above 95%. The achievement of these environmental conditions is carried out by placing steam and compressed air alternating the phases. After the switch-disconnector spent 3 hours under the above-mentioned conditions without voltage, it shall be applied the maximum rated voltage U_m divided for √3 during 1 hour. The test voltage is then increased continuously until $U_m\sqrt{3}$ and here kept during 30 seconds.

The voltage application shall be performed cyclically on each phase by connecting to the earth the phases not under test. The trend of the main parameters is shown in the following figure.



14.1.21 Tests to verify the effectiveness of the protection against pollution

Referring to point 5.102 of IEC 62271-102, in the absence of a safe connection to earth, to verify the effectiveness of the protection against pollution in service of the insulating materials, it shall be performed the following test:

1) with the switch-disconnector isolated, it shall be applied a 60 kV power frequency voltage (for 24 kV switch-disconnector) or 80 kV power frequency voltage (for 36 kV switch-disconnector) between inlet and outlet, measuring the leakage current.[15]

2) the switch-disconnector is then subject to the following cycle, that simulates a 10 years electrical service life to be repeated 3 times:

- 20 openings at 100 Arms and cosφ = 0,7
- 8 closings at 4 kArms and cosφ = 0,15
- 15 closings at 3 kArms and cosφ = 0,15
- 10 openings at 100 Arms and cosφ = 0,7
- 30 closings at 200 Arms and cosφ = 0,7
- 37 closings at 2 kArms and cosφ = 0,15
- 15 closings at 1 kArms and cosφ = 0,15
- 15 openings at 100 Arms and cosφ = 0,7

3) the switch-disconnector shall be tested in accordance with the previous point 1.

The test result is positive if there are no discharges on the sectioning and if the leakage current value doesn't exceed 30 mA.

14.2 Additional type tests for switch-disconnectors with electrical command DC 24 V_{cc}

In addition to type and routine tests, described in paragraphs 14.1 and 14.3, also the following tests shall be performed on the switch-disconnector with electrical command.

Tests from 14.2.1 to 14.2.8 must be performed in accordance with what specified in the following paragraphs and without voltage on the main circuits; the mechanical operation test, described in 14.1.12, shall be carried out with the variants and integrations provided in 14.2.4.

In details, after the test described in 14.2.4 (and possible 14.2.4.1), tests from 14.2.5 to 14.2.8 shall be performed on the same specimen and without maintenance.

14.2.1 Verification of the auxiliary circuits connections

It shall be verified the correspondence of the connections to the electric scheme approved by the Distribution Company in accordance with the technical specifications DY1050.

14.2.2 Dielectric tests

Before beginning the tests, motor conductors and surge suppressors must be disconnected and properly isolated (leaving connected the possible coupling device).

14.2.3 Verification of electrical interlocks functioning

The electrical command must be forbidden in the following conditions:

- the earthing switch is not in open position;
- the lever for the manual operation of the switch-disconnector's blades is being inserted (the prohibition must already act before the end of the lever engages on the tang of the operating shaft).

[15] In case of a discharge towards the earth, the switch-disconnector shall be properly isolated towards the earth.

Particular attention shall be put to verify the interlocks functioning in case a supply interruption occurs when the mechanism is close to the deadcenter, so immediately before the switch-disconnector could be operated.

14.2.4 Mechanical operation tests with electrical command

The switch-disconnector shall be subject to 5000 C-O operating cycles, as indicated in 14.1.12, under the following conditions:

Number of cycles	Temperature [°C]	Voltage [V_{cc}]
1250	50	28,8
1250	50	19,2
1250	-25 *	19,2
1250	-25	28,8

* For Romania it shall be considered the temperature of -40 °C.

The 1250 cycles shall be performed with 1 cycle every 30 seconds.

All the operations shall be realized sending command impulses $\leq$ 300 ms.

At the end of the 5000 cycles, other 100 cycles shall be made with manual command and at ambient temperature.

Before and after the mechanical operation tests, the average speed of the contacts shall be measured in accordance with the requirements in 14.1.12.

At the end of the mechanical operation tests, opening and closing operating times shall be recorded, together with the motor and the possible coupling device absorption; the obtained values shall not differ more than ±10% respect those ones obtained during the test in 14.2.5.

14.2.4.1 Mechanical operation tests with motor entrainment

Before the operations with electrical command described in the previous paragraph, if during the electrical operation the motor is completely or partially drag (excluding the first operation), 100 manual operations shall be made on the switch-disconnector, recording the absorption before and after so as to verify that there are no damages.

14.2.5 Characteristics of the electrical command

Opening and closing operating times shall be recorded, together with the absorbed power at minimum, rated and maximum supply voltage.

For the possible coupling device, only the absorbed power shall be recorded at miminum, nominal and maximum values.

For the other electrical components used on the electrical command, the manufacturer shall give specific documentation in accordance with this global standard. The Distribution Companies reserve the right to prescribe additional tests.

14.2.6 Interruption and subsequent electrical operating completion

After having caused a supply interruption during opening and closing operations, it must be verified that there aren't anomalies during the subsequent electrical operating cycles (3 O-C and 3 C-O).

14.2.7 Interruption and subsequent manual operating completion

After having caused a supply interruption during opening and closing operations, it must be verified that there aren't anomalies during the subsequent manual operating cycles (3 O-C and 3 C-O).

14.2.8 Verification of the enclosures' degree of protection

It shall be verified the degree of protection (IEC 60529) on all the components used on the electrical command, whose characteristic has been specified in this global standard.

14.3 Routine tests

14.3.1 Visual inspection

It shall be performed on a random switch-disconnector among those ones that belong to the batch submitted to the commissioning.

The control shall be made comparing the constructive and dimensional features with those ones in the drawings and pictures approved by the Distribution Companies and kept by the manufacturer.

14.3.2 Dielectric test on main circuit

The test shall be performed in accordance with IEC 62271-200 § 7.1.

14.3.3 Tests on auxiliary and control circuits

The test shall be performed in accordance with IEC 62271-200 § 7.2.

14.3.4 Measurement of the resistance of the main circuit

The test shall be performed in accordance with IEC 62271-200 § 7.3.

14.3.5 Mechanical operation tests

The test shall be performed in accordance with IEC 62271-200 § 7.102.

The contact speeds, measured as indicated in 14.1.12, shall not differ more than ±10% from the average values obtained during the type tests for the homologation of the products.

14.3.6 Partial discharge measurement

The manufacturer shall provide appropriate documentation stating the regular partial discharge test during the own production cycles. The Distribution Companies reserve the right to perform additional tests on organic material elements taken during the production process.

14.3.7 Tightness tests

The manufacturer shall self-certify the measure on each switch-disconnector, as indicated in IEC 62271-200 § 7.4.

14.4 Additional routine tests for switch-disconnectors with electrical command DC 24 V_{cc}

Tests from 14.4.1 to 14.4.8 shall be performed in accordance with the following modalities and without voltage on main circuits.

Mechanical operation test, described in 14.3.5, shall be made under the conditions stated in 14.4.4; in detail, tests from 14.4.6 to 14.4.8 shall be performed, after that test, on the same specimens and without maintenance.

14.4.1 Verification of auxiliary circuits connections

As indicated in 14.2.1, the same tests shall be performed on the sampling.

14.4.2 Dielectric tests

The tests shall be performed with the same modalities described in 14.2.2.

14.4.3 Verification of electrical interlocks functioning

The tests shall be performed with the same modalities described in 14.2.3.

14.4.4 Mechanical operation tests on the electrical command

The switch-disconnector shall be subject to 20 electrical C-O cycles at ambient temperature, 10 at maximum voltage and 10 at minimum voltage, one every minute. The main contacts speeds shall not differ more than ±10% from the average values obtained during the homologation tests.

After having completed the 20 cycles with the electrical command, other 2 shall be performed with manual command.

14.4.5 Characteristics of the electrical command

The tests shall be performed on one specimen of the sampling, with the same modalities indicated in 14.2.5.

14.4.6 Interruption and subsequent electrical operating completion

The test shall be made for 2 C-O cycles with the same modalities indicated in 14.2.6.

14.4.7 Interruption and subsequent manual operating completion

The test shall be made for 2 C-O cycles with the same modalities indicated in 14.2.7.

14.4.8 Verification of the enclosures' degree of protection

On one specimen of the sampling, it shall be verified the degree of protection of the shell and enclosures, in accordance with 14.2.8.

14.5 Routine tests plan

All the routine tests indicated in the following table shall be carried out by the supplier on all the samples prepared for the commissioning. For each piece that belongs to the prepared batch, the supplier shall prepare a test report with the results of the tests performed.

The test, under the Distribution Companies surveillance, shall be carried out on a sample chosen randomly among those ones of the batch that has already been successfully tested by the supplier. The tests shall be carried out on samples defined by the sampling plan below.

At the end of the commissioning, within the measurement uncertainty, there shall not be differences between the measured values and those ones in the acceptation ranges of the approved test values.

In case of commissioning attended by the Distribution Companies, the entire batch will be rejected if the results of one of any test is negative.

A	1 sample for type
B	Sampling plan: reduced, LQA = 0,65 level II (in case of negative result, in the new commissioning the sampling plan shall be ordinary)
D	documentation check

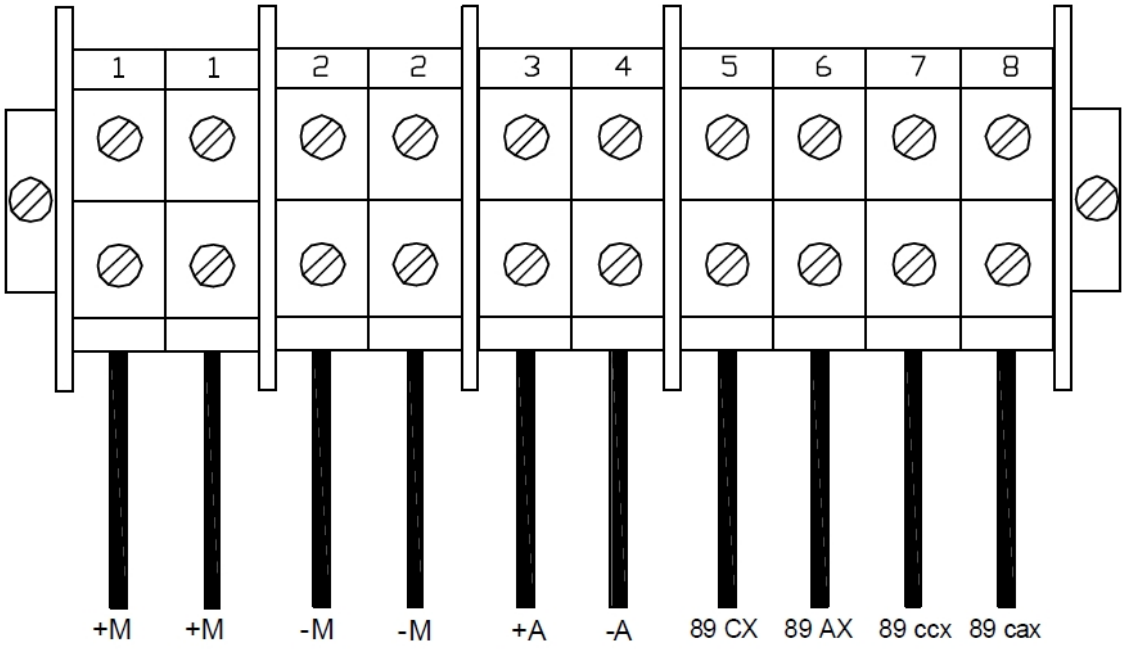
Table 7: Sampling plan

N.	TEST	Reference	Sampling plan
1	Visual inspection (a)	14.3.1	A
2	Dielectric test on main circuit (e)	14.3.2	B
3	Tests on auxiliary and control circuits	14.3.3	B
4	Measurement of the resistance of the main circuit (d)	14.3.4	B
5	Mechanical operation tests (c)	14.3.5	B
6	Partial discharge measurement	14.3.6	D
7	Tightness tests (f)	14.3.7	D
8	Verification of auxiliary circuits connections	14.4.1	B
9	Dielectric tests on auxiliary circuits connections (b)	14.4.2	B
10	Verification of electrical interlocks functioning	14.4.3	B
11	Mechanical operation tests on the electrical command	14.4.4	A
12	Characteristics of the electric command	14.4.5	A
13	Interruption and subsequent electrical operating completion	14.4.6	B
14	Interruption and subsequent manual operating completion	14.4.7	B
15	Verification of the enclosures' degree of protection	14.4.8	A

Table 8: Testing plan

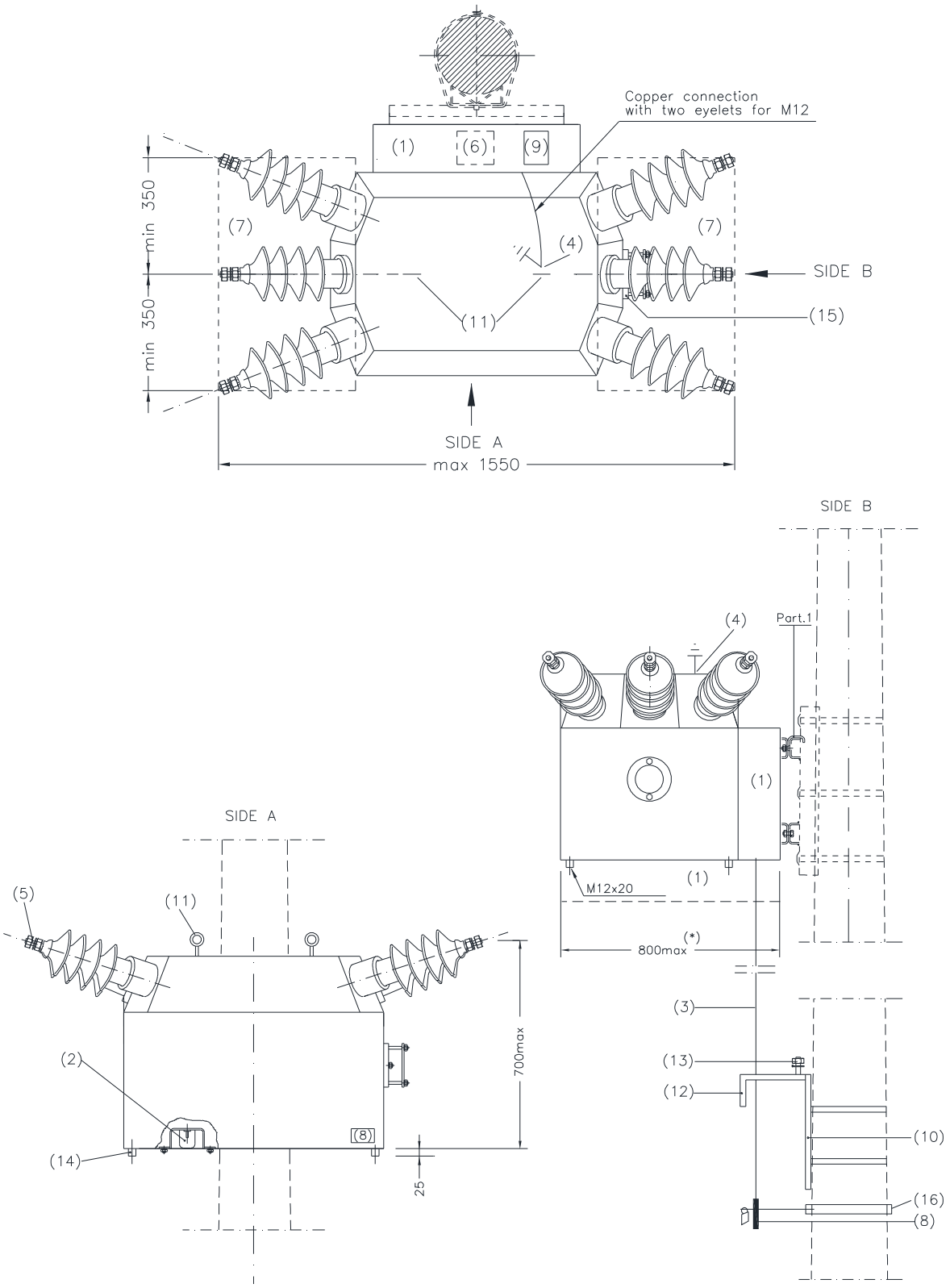
a	Including the verification of the enclosures' degree of protection (IP)
b	2 kV power frequency testing voltage during 60 seconds
c	• On the earthing switches and on the switch-disconnector, 5 closing operations and 5 opening operations verifying the mechanical interlocks functioning (IEC 62271-200 § 7.102). On the earthing switches it shall be measured the main contacts closing speed during the last operation. • On the switch-disconnector mechanical operation tests shall be realised in accordance with IEC 62271-103 § 7.101. In case of electrical command, the maximum voltage shall be V_{max} (28,8 V_{cc}) and the minimum one V_{min} (19,2 V_{cc}). It shall be recorded the opening and closing main contacts speed only during the last operation of every sequence. During all the operations, all the electrical interlocks shall be verified (§ 14.4.3).
d	Test to be performed on the same configuration used during the homologation process.
e	The test shall be performed with the operating devices closed and on the sectioning distance. All the tests shall be performed at a 50 kV power frequency voltage (for 24 kV switch-disconnector) or 70 kV power frequency voltage (for 36 kV switch-disconnector).
f	Test to be certified on single units by the supplier

Table 9: Additional information



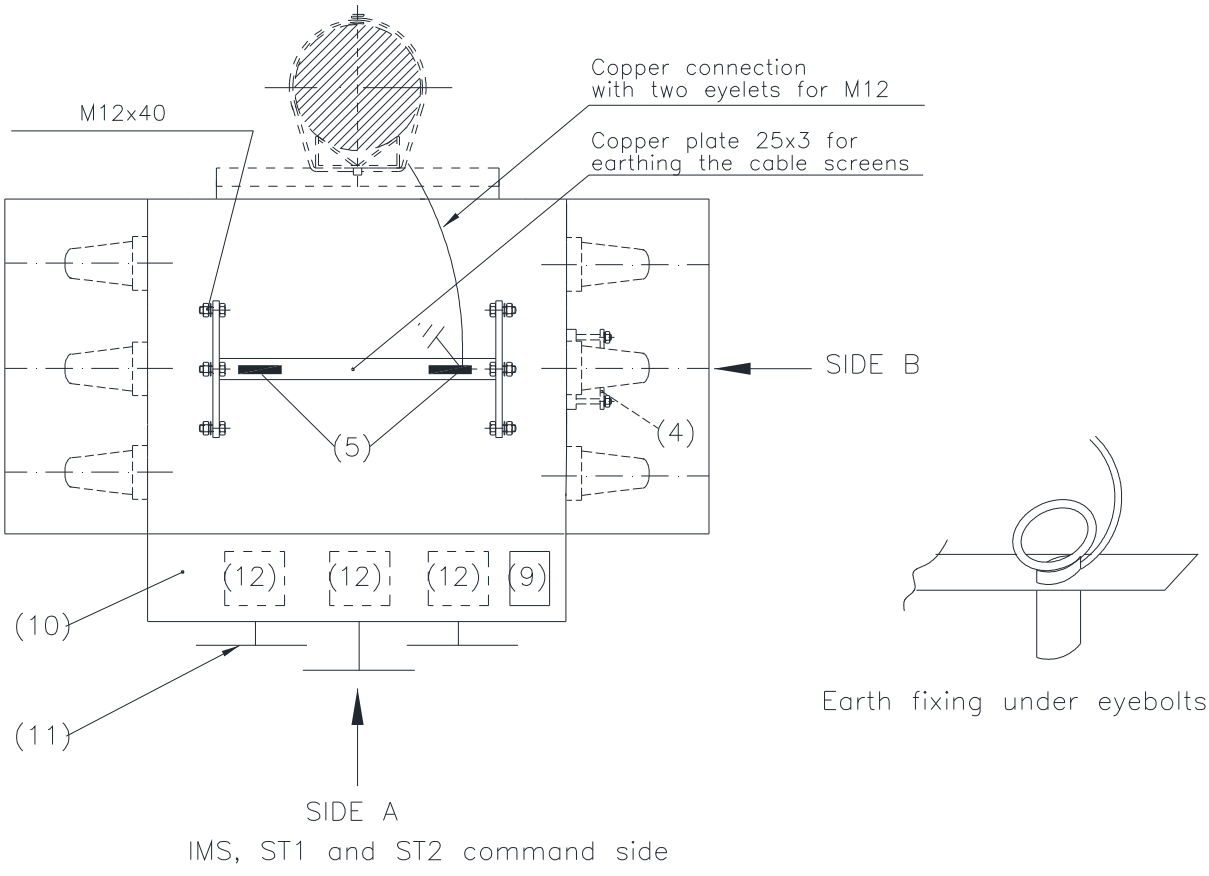
IMS	Function		Peripheral Unit
1	+M	Motor power supply (+24 V_{DC})	1
1	+M	Motor power supply (+24 V_{DC})	1
2	-M	Motor power supply (-24 V_{DC})	2
2	-M	Motor power supply (-24 V_{DC})	2
3	+A	Commands power supply (+24 V_{DC})	3
4	-A	Commands power supply (-24 V_{DC})	4
5	89CX	Closing command	5
6	89AX	Opening command	6
7	89ccx	Signal closing position switch-disconnector	7
8	89cax	Signal opening position switch-disconnector	8

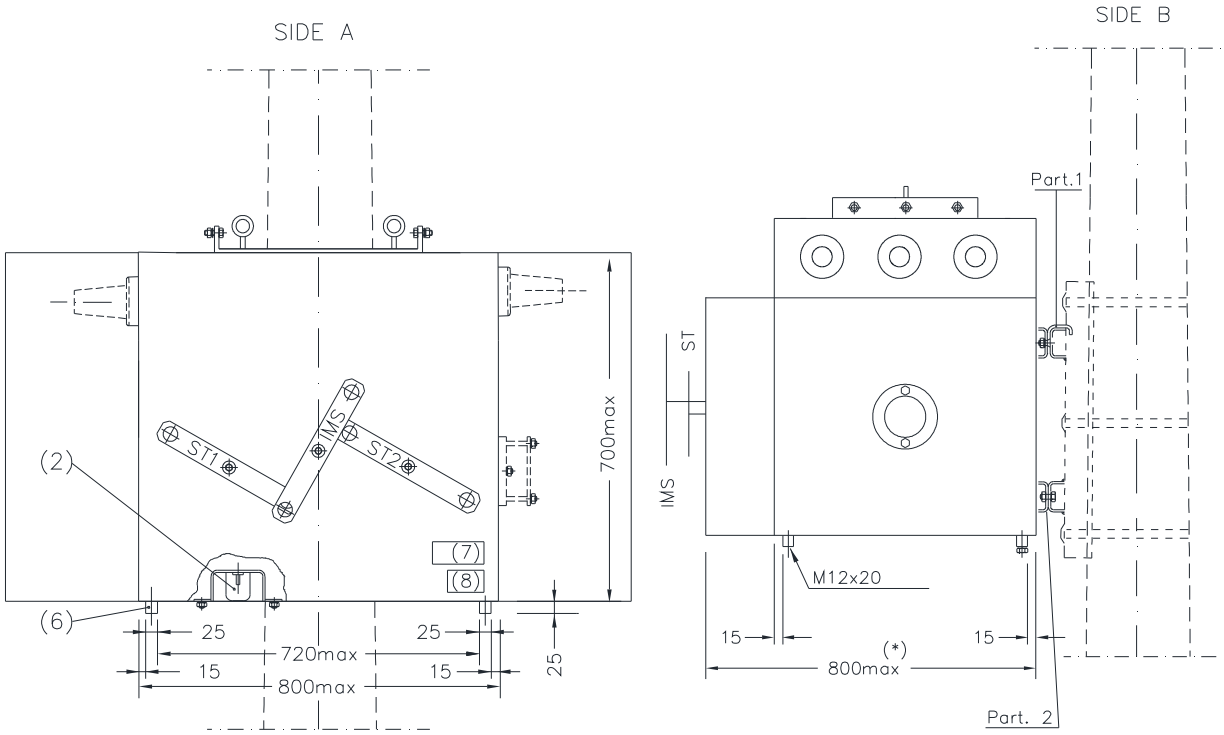
Table 10: Connection between switch-disconnector and Peripheral Unit



(1) Switch–disconnector motor area (it can be different as long as the levers are next to the pole)
(2) Sealed cap for the possible recovery of gas at the end of operating life
(3) n°2 levers for the command put at 4–4.5 m from the ground
in stainless steel ø min 8 mm (L min 3.5 m)
(4) Earthing point of the switch–disconnector M12x40
(5) End fitting of the insulators (please read the requirements)
(6) Device for the position indicator of the switch–disconnector (min height of character 50 mm)
(7) Area of the insulators. If the insulators have different distances from the bracket, the distance between the far end of their axis shan't be less than 250 mm
(8) Ring min ø60mm for the earthing stick
(9) Rating plate
(10) Nameplate with operating directions
(11) Lifting eyebolts
(12) Panel with 3 mm thickness for the track of the levers of switch–disconnector and earthing with mobile device
(13) M12 for the fixing of the earthing point
(14) M12 screws
(15) Overpressure valve (the drawing is just a scheme: for the position of the valve please read the requirements)
(16) Blocking system to be supplied by the Manufacturer of the switch–disconnector
(*) excluding overpressure valve and levers

Figure 2: Switch-disconnector for bare conductor lines





(*) excluding overpressure valve and levers
(2) Sealed cap for the possible recovery of gas at the end of operating life
(4) Overpressure valve (the drawing is just a scheme; for the position of the valve please read the requirements)
(5) Lifting eyebolts
(6) M12 screws
(7) Rating plate
(8) Synoptic scheme
(9) Identification plates for the phases 4–8–12
(10) Panels for the access at the mechanical parts in command shell of IMS, ST1 and ST2
(11) Levers for IMS, ST1 and ST2
(12) Transparent windows for the indication of "Open" and "Closed" position of IMS, ST1 and ST2

Figure 3: Switch-disconnector for cable lines

ANNEX A

The Manufacturer shall specify, in detail, data and information listed below.

General part

- Overall dimensional drawing with:
  - switch-disconnector and earthing switches position of the operating devices;
  - position and distance of the MV insulators and/or bushings;
  - dimension and position of the safety valve against overpressure;
  - position of the earthing point;
- Single-line electrical scheme of the main circuits and functional scheme of the auxiliary circuits.
- Drawing of the rating plate with the indication of the name given by the Manufacturer.
- Maintenance plan, pointing out the characteristics of the resources to be used (people, lifting machines, plant for gas treatment, special tools, etc.).
- SF_6 pressure at 20 °C:
  - p_r: filling pressure to be verified during routine tests;
  - p_m: minimum necessary pressure to ensure the prescribed characteristics;
  - intervention pressure of the safety valve against overpressure.
- Documentation to demonstrate the dielectric strength of the protective shell of the switch-disconnector for the arc dispersion products.
- Characteristics of the resin used for the insulators and/or bushings.
- List of type A and B documentation (public general drawings and reserved drawings).
- Photos of the switch-disconnector.
- Drawing of the installation layout of the switch-disconnector and its connections.
- Test reports.

ANNEX B

Type code	Argentina	Brazil	Chile	Colombia	Iberia	Italy	Peru	Romania
GSCM003/1	0104-0461		6812234		6711741			
GSCM003/2		6764371	6812235	6812270	6711742	162122		162122
GSCM003/3					6711743			
GSCM003/4					6711744		6812131	
GSCM003/5					6711745			
GSCM003/6		4683980 4684031		6812271	6711746	162224	6812132	162224
GSCM003/7	0104-0463				6711747			
GSCM003/8				6812272	6711748			
GSCM003/9								
GSCM003/10		4684021						
GSCM003/11					6711749			
GSCM003/12				6812273	6711750			

ANNEX C

This form is used for evaluating the offer in the tender process and also for the technical data validation during the homologation, certification and approval procedure.

Flag here the use of this form:

☐ Offer in the Tender

☐ Technical Data Validation

This document has to be used for checking the compliance of the switch-disconnector during the tender process.

Deviations are in principle not acceptable.

Possible deviations have to be clearly reported in the following form for specific deviations.

The acceptance of this document for the next tender stage does not mean the acceptance of any deviation to the technical specification if such deviations are not clearly reported in the form for specific deviations.

FORM FOR SPECIFIC DEVIATIONS

Each specific deviation shall be reported and explained here below (to be indicated with a progressive number).

☐ NO DEVIATIONS

(to flag in case of no deviations from the Global Standard)

DEVIATION 1

[To indicate possible Deviation

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DEVIATION 2

[To indicate possible Deviation

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DEVIATION …

[To indicate possible Deviation

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Date [……]

Sign [……]