OUTDOOR TERMINATIONS FOR HIGH VOLTAGE CABLES

Edition	Main changes description
1	Issuing of “Infrastructure and Networks - GSCH012 Outdoor Terminations for High Voltage Cables” technical specification
2	Changing the company logo

Cuprins

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1.DOCUMENT AIMS AND APPLICATION AREA

The aim of this document is to provide technical requirements for the supply of outdoor terminations for high voltage cables to be used on transmission lines of the Rețele electrice România:

2.RELATED DOCUMENTS TO BE IMPLEMENTED

This document applies to Rețele electrice România.

3.UNITS IN CHARGE OF THE DOCUMENT

Responsible for the preparation of the document:

- Inginerie și standardizare / Omologare și standardizare

Responsible for the authorization of the document:

- Network Operations Directorate

4.REFERENCES

- Code of Ethics;
- Human Right Policy;
- Zero Tolerance of Corruption (ZTC) Plan;
- Integrated Policy of Quality, Health and Safety, Environment and anti-Bribery;
- Infrastructure and Networks Design and construction HV lines guidelines ;
- ISO 9001- Quality Management System - Requirements;
- ISO 14001- Environmental Management System - Requirements and user guide;
- ISO 45001- Occupational Health and Safety Management System - Requirements and user guide;
- ISO 50001- Energy management systems - Requirements with guidance for use;
- ISO 37001- Anti-bribery Management System - Requirements with guidance for use;
- HD 632 “Power cables with extruded insulation and their accessories for rated voltages above 36 kV (Um = 42 kV) up to 150 kV (Um = 170 kV)”
- IEC 60840 “Power cables with extruded insulation and their accessories for rated voltages above 30kV (Um=36kV) up to 150kV (Um=170kV) test method and requirements”
- IEC 62067 “Power cables with extruded insulation and their accessories for rated voltages above 150 kV (Um=170 kV) up to 500 kV (Um=550 kV) - Test methods and requirements”
- IEC 60228 “Conductor for insulated cable”
- IEC 60695-11-10: “Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods”
- IEC 60857: “Electrical insulating materials used under severe ambient conditions - Test methods for evaluating resistance to tracking and erosion”
- IEC 60885-3: “Electrical test methods for electric cables - Part 3: Test methods for partial discharge measurements on lengths of extruded power cables”
- IEC 60230 “Impulse tests on cables and their accessories”.
- IEC 61238-1-3: “Compression and mechanical connectors for power cables - Part 1-3: Test methods and requirements for compression and mechanical connectors for power cables for rated voltages above 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) tested on non-insulated conductors”
- IEC 61462: “Composite hollow insulators – Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1 000 V - Definitions, test methods, acceptance criteria and design recommendations”
- IEC 62217: “Polymeric HV insulators for indoor and outdoor use - General definitions, test methods and acceptance criteria”
- IEC TS 60815-1: “Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 1: Definitions, information and general principles”
- IEC TS 60815-3: “Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 3: Polymer insulators for a.c. systems”

5.ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Engineering & Construction
Macro Process: Devices and Components Development
Process: Standard Catalog Management

6.DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
Distributed Temperature Sensing (DTS)	A DTS system is composed by optoelectronic devices which measure temperatures by means of optical fibers functioning as linear sensors. Thus, temperature is measured as a continuous profile, not at points.
Technical Conformity Assessment (TCA)	A "conformity assessment"[1] with respect to "specified requirements"[2] consists in functional, dimensional, constructional and test characteristics required for a product (or a series of products) and quoted in technical specifications and quality requirements issued by Rețele electrice România. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications
XLPE-Cable	Cable with insulation of cross-linked polyethylene

7.DESCRIPTION

This standard specifies the electrical and mechanical characteristics and test requirements that must be accomplished by the outdoor terminations used with voltage cables included in standard GSCH010, with rated voltage above 36 kV and in detail for U_m[3] equals to 145 kV.
This standard replaces all the standards used up to now by Rețele electrice România, as long as local regulation allows it.

7.1.LIST OF COMPONENTS

This standard includes terminations for single-core cables with aluminum or copper conductor, XLPE insulation and metallic screen.

The list of terminals with the main requirements, which is an integral part of the present document, is reported in the Type Code List on Annex B, and their relationship with country codes is reported on the Common List on Annex C. In Table 1 the list of terminals is shown.

GSCH012 Type Code	Um [kV]	Conductor section [mm2]	Screen type	Pollution level
GSCH012/001	245	2500	Tube	e: Very High
GSCH012/051	245	2500	Wires	e: Very High
GSCH012/002	245	2000	Tube	e: Very High
GSCH012/031	245	2000	Wires	e: Very High
GSCH012/003	245	1600	Tube	e: Very High
GSCH012/043	245	1600	Wires	e: Very High
GSCH012/030	245	1200	Wires	e: Very High
GSCH012/004	245	1000	Tube	e: Very High
GSCH012/005	245	800	Tube	e: Very High
GSCH012/006	170	1600	Tube	e: Very High
GSCH012/016	170	1600	Wires	e: Very High
GSCH012/007	170	1000	Tube	e: Very High
GSCH012/017	170	1000	Wires	e: Very High
GSCH012/008	170	630	Tube	e: Very High
GSCH012/018	170	630	Wires	e: Very High
GSCH012/041	145	2500	Wires	e: Very High
GSCH012/046	145	2000	Tube	e: Very High

[1] Definition 2.1 of ISO/IEC 17000
[2] Definition 3.1 of ISO/IEC 17000
[3] U_m: maximum r.m.s. power-frequency voltage between any two conductors for which cables and accessories are designed. It is the highest voltage that can be sustained under normal operating conditions at any time and at any point in a system. It excludes temporary voltage variations due to fault conditions and the sudden disconnection of large loads

GSCH012/034	145	2000	Wires	e: Very High
GSCH012/047	145	1600	Tube	e: Very High
GSCH012/033	145	1600	Wires	e: Very High
GSCH012/009	145	1200	Tube	e: Very High
GSCH012/019	145	1200	Wires	e: Very High
GSCH012/048	145	1000	Tube	e: Very High
GSCH012/037	145	1000	Wires	e: Very High
GSCH012/010	145	800	Tube	e: Very High
GSCH012/036	145	800	Wires	e: Very High
GSCH012/011	145	630	Tube	e: Very High
GSCH012/021	145	630	Wires	e: Very High
GSCH012/045	145	500	Wires	e: Very High
GSCH012/035	145	400	Wires	e: Very High
GSCH012/029	72,5	2000	Wires	e: Very High
GSCH012/027	72,5	1200	Wires	e: Very High
GSCH012/012	72,5	1000	Tube	e: Very High
GSCH012/023	72,5	1000	Wires	e: Very High
GSCH012/024	72,5	800	Wires	e: Very High
GSCH012/013	72,5	630	Tube	e: Very High
GSCH012/028	72,5	630	Wires	e: Very High
GSCH012/042	72,5	500	Wires	e: Very High
GSCH012/014	52	800	Tube	d: High
GSCH012/049	52	800	Wires	d: High
GSCH012/015	52	400	Tube	d: High
GSCH012/025	52	400	Wires	d: High

Table 1 – List of GSCH012 Type Codes for outdoor terminals

7.2.DESIGN AND MANUFACTURE

Outdoor terminal shall assure the integrity of cable system both electrical and mechanically, so they shall meet the requirement specified for cables on which they are installed. They must be designed to be used with cables included in Standard *GSCH010: Underground High Voltage Cables.*

The design requirements common to all of them are:

- Provide electrical stress control for the cable insulation shield terminus
- Provide external insulation between the cable conductor and ground
- Provide a metallic connection to the cable screen, electrically insulated from earth potential to match the insulating integrity of the cable over sheath.
- Withstand nominal and short-circuit currents not smaller than those withstood by the cable.
- Protection against the ingress of water or any other element from the external environment.
- Protection against direct exposure to solar radiation, precipitation, and polluted environment.
- Made of corrosion resistant materials.
- Ability to withstand cable thermomechanical loads and/or external forces.
- Suitable for use with an inclination up to 30º to vertical.
- Maintenance-free product.

For terminals with U_m equal or lower than 72,5 kV it is not allowed the use of fluid fillings as isolation.

Terminals with U_m equal or greater than 145 kV must be of the self-supported type. For terminals with lower U_m it is also allowed the use of flexible terminals.

7.2.1.Connector

The connection to the cable conductor should be of the compressed or bolted with shear-off screws type.

The external connector or aerial lug is used for connecting the external conductor to the current-carrying parts of the cable termination.

The connector must be designed to be used with cooper or aluminum conductors and to meet the following requirements when in service:

- transports nominal current without overheating from the conductor
- maintain the resistance of the connection stable
- short circuit currents will not affect the performance of the connector
- ensure an acceptable mechanical performance for the connections to the cable conductors
- avoid galvanic corrosion in case of different material between cable conductor and aerial conductor.

The cross section of cables for whom are intended the joints involved by this standard are those included in Table 2. For every cross section, the minimum diameter range of conductors that must be compatible with the connector is indicated. Nevertheless, other diameters than those indicated could be specified on Local Sections or specific orders.

	Compatible Conductor Diameter Range [mm]	
Cross section [mm²]	**Minimum**	**Maximum**
400	22,6	24,6
500	25,3	27,6
630	28,7	32,5
800	33,6	36,0
1000	37,9	40,0
1200	41,7	45,1
1600	47,7	50,4
2000	52,5	56,7
2500	60,2	63,5

Table 2 - Conductor Cross Sections

7.2.2.Main insulation body

For self-supported terminals the main insulation body should be prefabricated, usually formed by a single premoulded elastomeric sleeve, and tested in factory.
In case of self-supported terminals, it is allowed the use of a filling compound as long as the terminal will not be subjected to internal gas pressure in service.
For flexible joints (with a highest voltage for equipment equal to 52 or 72,5 kV) the main insulation body could use cold shrink technology, provided that they have the prior acceptance of Rețele electrice România.
The rated voltages of reference to be withstood by the terminals are those included in Table 3.

Network Nominal voltage U [kV]	Highest voltage for equipment U_m [kV]	Value of U_0 for determination of test voltages [kV]	Lightning impulse voltage test [kV]
45	52	26	250
60 to 69	72,5	36	325
110 to 138	145	76	650
150	170	87	750
220	245	127	1.050

Table 3 - Test voltages

The diameter over insulation of cables for whom are intended the joints involved by this standard are those included in Table 4. Nevertheless, other diameters over insulation could be specified on specific orders.

	Compatible cable diameter over insulation [mm]									
Um [kV]	**52**		**72,5**		**145**		**170**		**245**	
Cross section [mm²]	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
400	39,6	41,6	-	-	57,6	61,5	-	-	-	-
500	-	-	46,3	48,6	60,3	64,2	-	-	-	-
630	-	-	49,7	53,5	64,0	67,5	67,7	71,5	-	-
800	50,6	53	54,6	57	68,6	71	-	-	78,6	83
1000	-	-	58,9	61	72,9	75	74,9	77	82,9	85
1200	-	-	62,7	66,1	76,7	80,1	-	-	86,7	90,1
1600	-	-	-	-	82,7	86,4	82,7	86,4	92,7	95,4
2000	-	-	73,5	77,7	87,5	91,7	-	-	97,5	101,7
2500	-	-	-	-	95,2	98,5	-	-	105,2	108,5

Table 4 - Compatible cable diameter over insulation

7.2.3.Metal screening, connection to cable screen

Terminals must provide a sectionalizing connection between ground and the cable screen. This connection must be insulated from earth potential to match the insulation integrity of the cable over sheath and shall ensure the circulation of currents in the cable screen, as well as short circuit currents without causing overheating nor any harmful deformation of cable or terminal insulation.
The minimum values of the currents that must be withstood by those connections during 0,5 s are those indicated in Table 6.

U_m [kV]	I (0,5s) [kA]
52	11
72,5	41
145	41
170	41
245	63

Table 5 - Short circuit currents

The connections to cable screens must be suitable for cables with aluminum tube screen or cables with wires screen. In case of cables with wires screen, there should be possible the use of aluminum and copper wires without any modification in the joint.
For self-supported terminals the metal base plate must be isolated from earth by mean of supporting insulator.

7.2.4.Termination housing

The outer envelope of the terminal is formed by a polymeric insulation with hydrophobic properties.
That insulation housing, both sheath and sheds, must protect the terminal from external agents providing sealing and preventing the formation of a continuous film of water and shall provide the necessary creepage distance so that the required insulation of the surface is reached. They must present resistance to tracking and erosion class 1A 4,5 as indicated on IEC 60587.
The shape of the sheds must follow the IEC TS 60815-3 recommendations.
The color should be preferably gray.
Terminals will be designed to be used on placement with SPS [4]high (d) and very high (e).
The creepage distance for terminals must be equal or greater than those indicated on Table 6.

Um [kV]	SPS	Creepage distance [mm]
52	d	1.300
72,5	e	2.245
145	e	4.495
170	e	5.270
245	e	7.595

Table 6 - Minimum creepage distances

Greater creepage distances could be specified on specific orders in case of special necessities.
For self-supported terminal with composite insulators, the maximum mechanical load (MML) is indicated on Table 7.

Um [kV]	MML [N]
52	800
72,5	1000
145	1.575
170	2.000
245	2.500

Table 7 - Maximum mechanical load

7.2.5.Head armature and corona shield

The terminal must be protected against possible discharges, for example by means of a head armature made of aluminum or stainless steel.
Manufacturer must consider the radio interference level due to partial discharges in air when designing the termination. Whether it is necessary to reduce them, a corona shield and/or grading rings must be included on the supply of the terminal.

[4] SPS: Site pollution severity as defined on IEC TS 60815-1

7.2.6.Overall dimensions

Usually, once the terminal has been installed, the overall dimension shall not surpass the dimensions indicated on the Table 8.

Highest voltage for equipment Um [kV]	Total Length [mm]
52	1.100
72,5	1.300
145	2.000
170	2.200
245	3.000

Table 8 - Maximum overall dimensions

Those dimensions are not compulsory, but to be used as a reference about maximum dimensions of any type of joint described herein.

7.2.7.Fiber optic treatment (optional)

If required, the terminal will include a fiber optics splice box to allow the use of distributed temperature sensing (DTS) systems.
The splice box must ensure reliable operation and resistance against direct exposure to solar radiation, precipitation, and polluted environment.
The splice box shall manage at least two steel pipes included on the cable wires screen with a minimum of 2 fiber optics each. So, the minimum capacity of that box shall be 4 splices.

7.2.8.Partial discharge measurement (optional)

If required, the terminal will include a system to allow the internal measurement of partial discharge for monitoring purposes.

7.3.TERMINAL DESIGNATION

Designation of the joint is formed by the following terms:
- "GSCH012"
- the code "OT" indicating Outdoor terminal.
- voltage level U_m and "kV",
- section of the conductor (expressed in mm^2),
- "+" and a character representing the type of cable screen (H: for wires screen, T: for welded aluminum tube).
- FO (optional) in case there is integrated a fiber optics splice box.

Designation example for joint GSCH012/001 is:

GSCH012 – OT - 245 kV - 2.500 mm^2 + T

7.4.CONDITIONS OF SUPPLY

There shall be provided a complete set of assembly instructions together with drawings of the terminal. The instructions should include lists of all the components of the terminal including consumable materials, the specified assembly tools and the health and safety precautions.
For every step of the assembly instructions there must be available a video where it is shown that assemble step. Those videos could be storage on-line on the website of the supplier and referenced by a QR Code. All documentation must be provided in English and in the language of the country destiny of the supply. Terminals shall be securely packaged to prevent any damage during loading, transport, storage and installation.
The packaged shall be suitable for sea transportation.
On the packing of the terminals there must be marked the following information:
a) Type Code and reference of this standard.
b) Rated voltages U_0 (U_m).
c) Manufacturer or brand.
d) Order number or purchase order.
e) Year and month of manufacture.
f) Weights, tare and net.

7.5.TESTS

These tests shall be accomplished according to the requirements of this standard and those of Technical Conformity Assessment (TCA) procedures.

7.5.1.Test classification

7.5.1.1.Acceptance tests

Acceptance tests shall be carried out in the supplier's facilities and include:

- Visual examination. Checking the absence of defects, the appropriate packaging and the conformity with technical specification, list of components, instructions and documentation included in Technical Conformity Assessment Dossier stated in ILRE097
- Routine tests in paragraph 7.5.2
- Sample tests in paragraph 7.5.3

If a terminal fails any of the sample tests, two further terminals of the same type shall be subjected to the same tests. If both additional terminals pass the tests, the other units shall be regarded as having complied. If either fails, this type of accessory shall be regarded as having failed to comply.

7.5.1.2.Routine tests

Routine tests shall be performed at 100% of the main insulation of delivered terminals to demonstrate product integrity. There could be tested on accessories installed on cable, by using a host accessory into which a component of an accessory is substituted for test or by using a simulated accessory rig in which the electrical stress environment of a main insulation component is reproduced.
Routine tests do not apply to cold shrink terminals.

7.5.1.3.Sample tests

Sample tests are carried out over samples taken from each batch (manufacturing series) in order to verify that the finished product meet the design specifications.
For every batch will be tested "n" terminals following the formula: $n = P^{1/3}$ where "P" stands for the total number of terminals included in the batch.

7.5.1.4.Type tests

Type tests shall be performed before supplying a type of terminal covered by this standard in order to demonstrate satisfactory performance characteristics to meet the intended application.
When type tests have been successfully performed on one or more terminals covered herein with one cable of specific cross-section, and of the same rated voltage and construction characteristics, the type of approval could be accepted as valid for other accessories as long as all the following conditions are met:

- The rated voltage does not exceed that of the tested accessory.
- The cable with another conductor cross-section is within the range of type approval of the tested cable.
- Accessories have the same or similar construction as that of the tested accessory.
- The calculated nominal electrical stresses within the main insulation parts of the accessory and at the cable and accessory interfaces do not exceed those of the tested accessory.

Accessories shall undergo type tests after having passed all the acceptance tests gathered in routine and sample tests lists.
One sample of each accessory type shall be tested, assembled on the cable in the manner specified by the manufacturer's instructions, with the grade and quantity of materials supplied, including lubricants, if any.
The accessories shall be installed before the firs partial discharge test.
The minimum length of free cable between accessories shall be 5 m.

7.5.1.5.Prequalification tests

Prequalification tests shall be performed before supplying a type of terminal covered by this standard in order to demonstrate satisfactory long term performance of the complete cable system.
The prequalification test shall be performed on cable systems where the calculated nominal electrical stresses at the conductor screen will be higher than 8,0 kV/mm and/or at the insulation screen higher than 4,0 kV/mm.
The prequalification test shall be performed except if cable systems with the same construction and accessories of the same family have been prequalified for a higher rated voltage.
Prequalification test must be performed on a cable system, using a cable of a large conductor cross-section in order to cover thermos-mechanical aspects. General conditions for these tests and their extension are those indicated in IEC 62067 clause 13 for cable systems with $U_0 \geq 127$ kV and IEC 60840 clause 13 for cable systems with $U_0 \leq 127$ kV.

7.5.1.6.Development tests
These are tests made during the development of a cable system design and shall be performed before supplying a type of terminal covered by this standard in order to demonstrate satisfactory performance of the complete cable system.

7.5.2.Routine Tests List
7.5.2.1.Partial discharge test
Requirements: No detectable discharge exceeding sensitivity of 5 pC or better at 1.5 U_0
Test method: IEC 60840 clause 9.2

7.5.2.2.Voltage routine test
Requirements: No breakdown of the insulation shall occur.
Test method: IEC 60840 clause 9.3
Test voltage: 2.5 U_0
Duration: 30 min

7.5.3.Sample Test List
7.5.3.1.Terminal examination
Requirements: Conformity to constructive characteristics, installation instructions and drawings declared on TCA.
Test method: inspection by visual examination

7.5.3.2.Partial discharge test
To be done just for terminals where the main insulation cannot be routine tested. In that cases shall be performed on one terminal per every 50 terminals provided.
Requirements: No detectable discharge exceeding sensitivity of 5 pC or better at 1.5 U_0
Test method: IEC 60840 clause 9.2

7.5.3.3.Voltage routine test
To be done just for terminals where the main insulation cannot be routine tested. In that cases shall be performed on one terminal per every 50 terminals provided.
Requirements: No breakdown of the insulation shall occur.
Test method: IEC 60840 clause 9.3
Test voltage: 2.5 U_0
Duration: 30 min

7.5.4.Type Tests List
Prior to electrical type test of terminals, the insulation thickness of the cable used shall be measured and the test voltage values adjusted, if necessary, as stated in IEC 60840 paragraph 12.4.1

7.5.4.1.Partial discharge test at ambient temperature
Requirements: No detectable discharge exceeding sensitivity of 5 pC or better at 1.5 U0
Test method: IEC 60840 clause 12.4.4

7.5.4.2.Heating cycle voltage test
Requirements: A U-bend in the cable is not required
Test method:
IEC 62067 clause 12.4.6 for terminals with U_0=127 kV
IEC 60840 clause 12.4.6 for terminals with U_0<127 kV

7.5.4.3.Partial discharge test at ambient and high temperature
This test shall be carried out after the final cycle of test in 7.5.4.2 or, alternatively, after the test in 7.5.4.4
Requirements: No detectable discharge exceeding sensitivity of 5 pC or better at 1.5 U_0
Test method: IEC 60840 clause 12.4.4

7.5.4.4.Lightning impulse voltage test followed by a power frequency voltage test
Requirements: No breakdown of the insulation or flashover shall occur
Test method:

- IEC 62067 clause 12.4.7 for terminals with U_0=127 kV
- IEC 60840 clause 12.4.7 for terminals with U_0<127 kV

Impulse lighting voltage value:

- 250 kV for terminals with U_{max} = 52 kV.
- 325 kV for terminals with U_{max} = 72.5 kV.
- 650 kV for terminals with U_{max} = 145 kV.
- 750 kV for terminals with U_{max} = 170 kV.
- 1.050 kV for terminals with U_{max} = 245 kV.

Power frequency voltage value:

- 65 kV for terminals with U_{max} = 52 kV.
- 90 kV for terminals with U_{max} = 72.5 kV.
- 190 kV for terminals with U_{max} = 145 kV.
- 218 kV for terminals with U_{max} = 170 kV.
- 254 kV for terminals with U_{max} = 245 kV.

7.5.4.5.Partial discharge test at ambient and high temperature
If not previously carried out after the final cycle of heating cycle voltage test in point 7.5.4.3
Requirements: No detectable discharge exceeding sensitivity of 5 pC or better at 1.5 U_0
Test method: IEC 60840 clause 12.4.4

7.5.4.6.Test of termination with sheath sectionalizing
Range of approval for this test according to IEC 60840 H.2.4

a) DC voltage withstand test between screen and earth
Test method: IEC 60840 sub-clause H.4.1
b) Lightning impulse voltage withstand test between screen and earth
Test method: IEC 60840 sub-clause H.4.2

Lighting impulse level metal screen to earth:

- 30 kV for terminals with U_{max} = 52 kV.
- 30 kV for terminals with U_{max} = 72.5 kV.
- 37,5 kV for terminals with U_{max} = 145 kV.
- 37,5 kV for terminals with U_{max} = 170 kV.
- 47,5 kV for terminals with U_{max} = 245 kV.

7.5.4.7.Examination of terminals after completion of the above test
Requirements: No signs of deterioration
Test method: IEC 60840 clause 12.4.8

7.5.4.8.Cantilever load test
Requirements and Test method: IEC 61462 clause 8.5

7.5.4.9.Constant tracking voltage test
For insulating polymeric materials exposed to outdoor
Requirements: 1A 4.5
Test method: IEC 60587 clause 5

7.5.4.10.Hardness test
Requirements and Test method: IEC 62217 clause 9.3.1

7.5.4.11.Accelerated weathering test (1.000 h UV)
Requirements and Test method: IEC 62217 clause 9.3.2

7.5.4.12.Tracking and erosion test (1.000 h salt fog test)
Requirements and Test method: IEC 62217 clause 9.3.3

7.5.4.13.Flammability test
Requirements: V1 as indicated on IEC 60695-11-10
Test method: IEC 62217 clause 9.3.4

7.5.5.Prequalification Test list
7.5.5.1.Heating cycle voltage test
Requirements: No breakdown shall occur.
Test voltage: 1,7 U_0
Cycles: ≥ 180
Test method:
IEC 62067 clause 13.2.4 for cable systems with U_0=127 kV
IEC 60840 clause 13.2.4 for cables systems with U_0<127 kV

7.5.5.2.Lightning impulse voltage test
Requirements: withstand 10 positive and 10 negative voltage impulses without failure Test voltage:

- 250 kV for cables systems with U_{max} = 52 kV.
- 325 kV for cables systems with U_{max} = 72.5 kV.
- 650 kV for cables systems with U_{max} = 145 kV.
- 750 kV for cables systems with U_{max} = 170 kV.
- 1.050 kV for cables systems with U_{max} = 245 kV.

Test method:

- IEC 62067 clause 13.2.5 for cables systems with U_0=127 kV
- IEC 60840 clause 13.2.5 for cables systems with U_0<127 kV

7.5.5.3.Examination of the cable system after completion of the tests above
Requirements: No signs of deterioration
Test method: IEC 60840 clause 13.2.6

7.5.6.Development tests list
7.5.6.1.Corrosion at the accessories
Requirements: IEC TR 61901 clause 4.2.3
Test method: IEC TR 61901 clause 4.2.3

7.5.6.2.Short circuit test
The short circuit test shall be performed on cable systems including cable, connection to accessories, the accessories, the grounding connection, and the grounding cables.
Requirements: IEC TR 61901 clause 4.2.2
Test method: IEC TR 61901 clause 4.2.2

8.ANNEX

8.1.ANNEX A – TECHNICAL CHECK LIST

The following chart indicates the minimum technical information that suppliers shall provide in technical offer during tenders and as part of the TCA Type A documentation:

Item	Description	Unit	Required values	Offered values
1	**GENERAL INFORMATION**			
1.1	Supplier Name	-		
1.2	Supplier CUI			
1.3	Factory	-		
1.4	Location of factory	-		
2	**MAIN FEATURES**			
2.1	Distribution Company and Country of supply	-		
2.2	Country Code	-		
2.3	Type Code	-		
2.4	Designation	-		
2.5	Highest voltage for equipment Um	[kV]		
2.6	U0 for determination of test voltages	[kV]		
2.7	Power frequency withstand voltage (15 min)	[kV]		
2.8	Lighting impulse voltage test	[kV]		
2.9	Type of terminal	-		
2.10	Supplier product designation	-		
3	**CONNECTOR**			
3.1	Reference			
3.2	Material	-		
3.3	Assembly technique	-		
3.4	Nominal cross-section of admissible conductor	[mm^2]		
3.5	Minimum diameter of conductor	[mm]		
3.6	Maximum diameter of conductor	[mm]		
4	**EXTERNAL CONNECTING BOLT**			
4.1	Type			
4.2	Material			
4.3	Shape	-		
4.4	Length	[mm]		
4.5	Diameter (dimensions) of cross section	[mm]		
5	**MAIN INSULATION BODY**			
5.1	Reference	-		
5.2	Material	-		
5.3	Number of pieces	-		
5.4	Nominal thickness	[mm]		
5.5	Minimum diameter of cable core	[mm]		
5.6	Maximum diameter of cable core	[mm]		
5.7	Maximum withstand electrical stress	[kV/mm]		
5.8	Length of main body	[mm]		
5.9	Filling material	-		
5.10	Volume of filling material	[dm^3]		
6	**HOUSING**			
6.1	Reference			
6.2	Type			

6.3	Material			
6.4	Nominal overall diameter	[mm]		
6.5	Creepage distance	[mm]		
6.6	Arcing distance	[mm]		
6.7	Pollution level (IEC 6815-1)	-		
6.8	Number of sheds	-		
6.9	Diameter of shed	[mm]		
6.10	Tracking and erosion class (IEC 60587)			
6.11	Fire resistance grade			
7	**METAL SCREENING**			
7.1	Earth cable type	-		
7.2	Maximum cross-section of cable	[mm^2]		
7.3	Minimum diameter of cable	[mm]		
7.4	Maximum diameter of cable	[mm]		
7.5	Type of connection	-		
8	**BASE PLATE**			
8.1	Material of base plate			
8.2	Dimension of base plate	[mm]		
8.3	Fixing holes distance	[mm]		
8.4	Type of supporting insulator	-		
8.5	Number of supporting insulators	-		
8.6	Supporting insulator length	[mm]		
8.7	Supporting insulator withstand voltage	[kV]		
9	**FIBER OPTIC SPLICE BOX**			
9.1	Integrated in terminal	[Yes/No]		
9.2	Maximum number of steel pipes	-		
9.3	Maximum number of fiber optic on every steel pipe	-		
9.4	Maximum number of splices	-		
10	**AMPACITY FEATURES**			
10.1	Rated withstand current in steady state condition	[A]		
10.2	Maximum short circuit withstand current in the conductor (0,5 s)	[kA]		
10.3	Maximum short circuit withstand current in the screen (0,5 s)	[kA]		
11	**ADDITIONAL FEATURES**			
11.1	MML (Maximum mechanical load)	[N]		
11.2	Maximum overall cable diameter	[mm]		
11.3	Maximum inclination installed	[º]		
11.4	Total length	[mm]		
11.5	Total weight	[kg]		
11.6	Maximum storage time	[months]		
11.7	Estimated time of installation (without cable preparation)	[h]		
11.8	Expected service life after installation	[years]		
12	**TCA INFORMATION**			
12.1	TCA Available	[Yes/No]	Informative	
12.2	TCA Code	-	Informative	
13	**OBSERVATION**			
13.1	Any exception to what is required on GSCH012	-		
13.2	Additional comments	-		

8.2.ANNEX B – TYPE CODES FOR OUTDOOR TERMINALS

Type Code	Designation	U_m(kV)	Section (mm^2)	Screen type	Nominal Icc(kA) 0,5 s	Pollution level	Creepage distance
GSCH012/011	OT-145 kV 630 mm2 -T	145	630	T	41	e: Very High	4495
GSCH012/021	OT-145 kV 630 mm2 -H	145	630	H	41	e: Very High	4495
GSCH012/033	OT-145 kV 1600 mm2 -H	145	1600	H	41	e: Very High	4495
GSCH012/037	OT-145 kV 1000 mm2 -H	145	1000	H	41	e: Very High	4495
GSCH012/047	OT-145 kV 1600 mm2 -T	145	1600	T	41	e: Very High	4495
GSCH012/048	OT-145 kV 1000 mm2 -T	145	1000	T	41	e: Very High	4495

8.3.ANNEX C – COMMON LIST

Designation	Matricola
GSCH012/047 OT-145 kV 1600 mm2 -T	270058
GSCH012/048 OT-145 kV 1000 mm2 -T	270057
GSCH012/011 OT-145 kV 630 mm2 -T	270056
GSCH012/033OT-145 kV 1600 mm2 -H	270055
GSCH012/037 OT-145 kV 1000 mm2 -H	270054
GSCH012/021 OT-145 kV 630 mm2 -H	270053