High voltage cable terminations for GIS

Revision	Date	List of changes
01	15/01/2014	Issuing of “GSCH013 High voltage cable termination for GIS” material specification
02	05/02/2025	Changing the company logo

CONTENTS

1. DOCUMENT AIMS AND APPLICATION AREA 3
2. RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL 3
3. UNITS IN CHARGE OF THE DOCUMENT 3
4. REFERENCES 3
5. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY 4
7. DESCRIPTION 5
7.1 LIST OF COMPONENTS 5
7.2 DESIGN AND MANUFACTURE 6
7.2.1. General Ratings 7
7.2.2. Dimensions 7
7.2.3. Capacitive voltage tap 8
7.2.4. Fiber optic treatment (optional) 8
7.3 TERMINAL DESIGNATION 8
7.4 CONDITIONS OF SUPPLY 9
7.5 TESTS 9
7.5.1. Test classification 10
i) Acceptance tests 10
7.5.2. Routine Tests List 11
i) Partial discharge test 11
Type Tests List 12
i) Partial discharge test at ambient temperature 12
vii) Pressure test 14
7.5.3. Prequalification Test list 14
i) Heating cycle voltage test 14
8. ANNEX 16
ANNEX A – TECHNICAL CHECK LIST 16
ANNEX B –GENERAL TYPE CODES FOR GIS TERMINALS 19
ANNEX C – COMMON LIST 20
ANNEX D – CABLE JOINTS 21

1. DOCUMENT AIMS AND APPLICATION AREA

The aim of this document is to provide technical requirements for the supply of high voltage terminations for GIS, to be used on transmission lines of RETELE ELECTRICE:

This document shall be implemented and applied to the extent possible within the RETELE ELECTRICE and in compliance with any applicable laws, regulations and governance rules, including any stock exchange and unbundling-relevant provisions, which in any case prevail over the provisions contained in this document.

2. RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

This document does not require the implementation of further documents.

3. UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- RETELE ELECTRICE Grids: Engineering and Standardization / Homologation and Standardization.

Responsible for authorizing the document:

- Retele Electrice: Head of Network Operations
- Retele Electrice: Head of HSEQ unit.

4. REFERENCES

- Code of Ethics ;
- Human Right Policy;
- Zero Tolerance of Corruption (ZTC) Plan;
- Integrated Policy of Quality, Health and Safety, Environment, anti-Bribery and Information security;
- 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 37001 - Anti-bribery Management System - Requirements with guidance for use;
- ISO 27001- Information Security Management System – Requirements;
- OI Design and Construction HV lines Guidelines
- GSCH010:” Underground High Voltage Cables”.
- GSCH006:“ Shielded single or double busbar equipment with sulphur hexafluoride insulation (SF6) of 72.5-145-170-245 kV”;
- IEC 60840:2020 “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 62067:2022

"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 of insulated cable"
- IEC 60230 "Impulse tests on cables and their accessories"
- IEC 62271-203 High-voltage switchgear and controlgear – Part 203: AC gas-insulated metal-enclosed switchgear for rated voltages above 52 kV
- IEC 62271-209 High-voltage switchgear and controlgear – Part 209: Cable connections for gas-insulated metal-enclosed switchgear for rated voltages above 52 kV – Fluid-filled and extruded insulation cables – Fluid-filled and dry-type cable-terminations

5. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Engineering & Homologation

Macro Process: Devices and Components Development

Process: Standard Catalog Management

6. DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
Gas Insulated Substation (GIS)	A compact, multi-component switchgear assembly, enclosed in grounded metallic housings in which the primary insulation medium is gas, typically SF6 or SF6 free gas and which normally includes buses, switches, circuit breakers, and other associated equipment.
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 RETELE ELECTRICE. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications.

[1] Definition 2.1 of ISO/IEC 17000

[2] Definition 3.1 of ISO/IEC 17000

7. DESCRIPTION

This standard specifies the electrical and mechanical characteristics and test requirements that must be accomplished by the GIS terminations used with voltage cables included in standard GSCH010, with rated voltage above 52 kV and in detail for Um equals to 72,5 kV, 145 kV, 170 kV and 245 kV.

This standard replaces all the local standards used up to now, as long as local regulation allows it.

7.1 LIST OF COMPONENTS

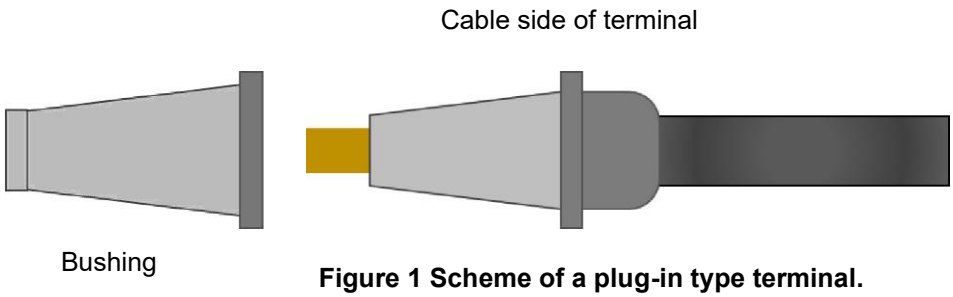


Figure 1 Scheme of a plug-in type terminal.

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

The list of terminals with the main	U_m [kV]	Conductor section [mm2]	Screen type
GSCH013/001	245	2500	Tube
GSCH013/051	245	2500	Wires
GSCH013/002	245	2000	Tube
GSCH013/031	245	2000	Wires
GSCH013/003	245	1600	Tube
GSCH013/043	245	1600	Wires

GSCH013 Type Code	U_m [kV]	Conductor section [mm2]	Screen type
GSCH013/030	245	1200	Wires
GSCH013/004	245	1000	Tube
GSCH013/005	245	800	Tube
GSCH013/006	170	1600	Tube
GSCH013/016	170	1600	Wires
GSCH013/007	170	1000	Tube
GSCH013/017	170	1000	Wires
GSCH013/008	170	630	Tube
GSCH013/018	170	630	Wires
GSCH013/041	145	2500	Wires
GSCH013/046	145	2000	Tube

GSCH013/034	145	2000	Wires
GSCH013/047	145	1600	Tube
GSCH013/033	145	1600	Wires
GSCH013/009	145	1200	Tube
GSCH013/019	145	1200	Wires
GSCH013/048	145	1000	Tube
GSCH013/037	145	1000	Wires
GSCH013/010	145	800	Tube
GSCH013/036	145	800	Wires
GSCH013/011	145	630	Tube
GSCH013/021	145	630	Wires
GSCH013/045	145	500	Wires
GSCH013/035	145	400	Wires
GSCH013/029	72,5	2000	Wires
GSCH013/027	72,5	1200	Wires
GSCH013/012	72,5	1000	Tube
GSCH013/023	72,5	1000	Wires
GSCH013/024	72,5	800	Wires
GSCH013/013	72,5	630	Tube
GSCH013/028	72,5	630	Wires
GSCH013/042	72,5	500	Wires

Table 2 – List of GSCH013 Type Codes for GIS terminals

7.2 DESIGN AND MANUFACTURE

Design of terminations shall assure the integrity of the connection assembly between cable and GIS, both electrical and mechanically, being in compliance with IEC 62271-209.

Terminations must be designed to connect cables included in standard GSCH010:" Underground High Voltage Cables" into switchgears included in standard GSCH006:"Shielded single or double busbar equipment with sulphur hexafluoride insulation (SF6) of 72,5–145–170-245 kV".

The GIS termination must allow the use of cooper or aluminum conductors indistinctly.

They will be of the dry type, not requiring any fluid to provide insulation or pressure. So, a termination will comprise an elastomeric electrical stress control component in contact with a separating insulating barrier between the cable insulation and the gas insulation of the GIS.

Additionally, it must be possible to engage/disengage the cable/stress cone assembly into the insulator assembly previously installed into the GIS enclosure (plug-in type terminations). So, the terminal is formed by two sides, the side to be assembled to the GIS, also called bushing or female side, and the side to be assembled to the cable, also called male side. The bushing will be usually pre-assembled and tested at the GIS factory instead of on site.

For system cables with U_m lower or equal to 170 kV, arrangements with terminations for three phases in one enclosure are allowed. In other cases, cable terminations in a single-phase enclosure are used.

7.2.1. General Ratings

General ratings for GIS equipment are those indicated on GSCH006:"Shielded single or double busbar equipment with sulphur hexafluoride insulation (SF6) of 72,5–145–170-245 kV".

For cable systems, the rated voltages are included in **Table 3**.

Highest voltage for equipment Um [kV]	Value of U0 for determination of test voltages [kV]	Lightning impulse voltage test [kV]
72,5	36	325
145	76	650
170	87	750
245	127	1.050

Table 3 Test voltages

The minimum values of the rated short time withstand currents that must be withstood by terminations during 1 s. are 40 kA. Although, for termination with Um greater than 145 kV, values of 50 kA or 63 kA could be

specified for short time withstand currents on specific orders for special cases.

U_m [kV]	I (1s) [kA]
72,5	40
145	
170	
245	

Table 4 Short time withstand currents

Termination could be used indistinctly on systems with a rated frequency of 50 Hz or 60 Hz.

7.2.2. Dimensions

General dimensions of termination are those indicated on Fig. 5 "Dry-type cable connection assembly-Assembly dimensions" from IEC 62271-209:2022.

Moreover, to guarantee compatibility between terminations and cables from GSCH010, there would be the following additional requirements:

- For every cross section of the cable, the minimum diameter range of conductors that must be compatible with the termination are those indicated in **Table 5**.
- For every rated voltage and cross section of the cable, the minimum diameter over insulation range of cables that must be compatible with the termination are those included in **Table 5**.

	Conductor diameter [mm]		Cable diameter over insulation [mm.]							
U_m [kV]	**All**		**72,5**		**145**		**170**		**245**	
Cross section [mm²]	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
400	22,6	24,6	-	-	57,6	61,5	-	-	-	-
500	25,3	27,6	46,3	48,6	60,3	64,2	-	-	-	-
630	28,7	32,5	49,7	53,5	64,0	67,5	67,7	71,5	-	-
800	33,6	36,0	54,6	57	68,6	71	-	-	78,6	83
1000	37,9	40,0	58,9	61	72,9	75	74,9	77	82,9	85
1200	41,7	45,1	62,7	66,1	76,7	80,1	-	-	86,7	90,1
1600	47,7	50,4	-	-	82,7	86,4	82,7	86,4	92,7	95,4
2000	52,5	56,7	73,5	77,7	87,5	91,7	-	-	97,5	101,7
2500	60,2	63,5	-	-	95,2	98,5	-	-	105,2	108,5

Table 5 Compatible conductor diameter and cable diameter over insulation.

Nevertheless, other diameters than those indicated herein could be specified on specific orders for special cases.

7.2.3. Capacitive voltage tap

The bushing will include a capacitive voltage cap to allow voltage measurements.

7.2.4. 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.

7.3 TERMINAL DESIGNATION

Designation of the terminal is formed by the following terms:

- "RETELE ELECTRICE GSCH013"
- the code "GT" indicating GIS terminal.
- voltage level U_m and "kV",
- section of the conductor (expressed in mm²),
- "+" 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 GSCH013/001 is:

RETELE ELECTRICE GSCH013 – GT - 245 kV - 2.500 mm² + 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 has to be provided in English and in Romanian. 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) GS Type Code and reference of this standard.
b) Rated voltages U_0 (Um).
c) Manufacturer or brand.
d) Order number or purchase order.
e) Year and month of manufacture.
f) Weights, tare and net.

In case of need, it is possible to supply only the bushing or only the cable side of the terminal. That would be indicated in the specific order.

Equally, it is possible to supply accessories for the terminals, like mechanical protection covers or special tools, in specific orders.

7.5 TESTS

These tests shall be accomplished according to the requirements of this standard and those of TCA procedures.

7.5.1. Test classification

i) 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 standard ILRE097.
- Routine tests in paragraph 7.5.2

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 terminal shall be regarded as having failed to comply.

ii) Routine tests

Routine tests shall be performed at 100% of the main insulation of delivered terminals to demonstrate product integrity, according to IEC62271-209 paragraph 8.1.

iii) 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.

Electrical type test shall be performed using the single-phase cable connection enclosure from the switchgear. The terminal 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. 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 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.
- Terminals have the same or similar construction as that of the tested terminal.
- The calculated nominal electrical stresses within the main insulation parts of the terminal and at the cable and terminal interfaces do not exceed those of the tested terminal.
- The same type of gas or gas mixture and pressure is used in the cable connection enclosure of a gas immersed termination.
- The termination has the same separating insulating barrier, stress cone assembly and cable as are used in the type test.

Terminals shall undergo type tests after having passed all the acceptance tests gathered in routine tests lists.

iv) Prequalification tests

Prequalification tests should 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 thermo-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.

7.5.2. Routine Tests List

i) 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

ii) 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

iii) Pressure test

Requirements: The insulator shall not show any signs of overstress or leakage.

Test method: IEC 62271-209 clause 8.2

Test pressure: 2 times design pressure

Duration: 1 min

iv) Visual inspection

Requirements: No detectable signs of significant defects.

Test method: IEC 62271-209 clause 8.3

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

i) Partial discharge test at ambient temperature

Requirements: No detectable discharge exceeding sensitivity of 5 pC or better at 1.5 U_0

Test method: IEC 60840 clause 12.4.4

ii) 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

iii) Partial discharge test at ambient and high temperature

This test shall be carried out after the final cycle of test in **ii)** or, alternatively, after the test in **iv)**
Requirements: No detectable discharge exceeding sensitivity of 5 pC or better at 1.5 U_0
Test method: IEC 60840 clause 12.4.4

iv) 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:

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:

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.

v) Partial discharge test at ambient and high temperature

If not previously carried out after the final cycle of heating cycle voltage test in point **iii)** Requirements: No detectable discharge exceeding sensitivity of 5 pC or better at 1.5 U_0 Test method: IEC 60840 clause 12.4.4

vi) Additional electrical type tests on the insulator to be installed by switchgear manufactures (plug in cable termination)

Requirements and test method: IEC 62271-209 clause 7.2.4.

Rated voltage for equipment U_m [kV]	Power frequency voltage tests U_d [kV]		Lightning impulse voltage test [kV] Phase to earth
	Phase to earth withstand voltage test (1 min.)	Test voltage for PD measurement (> 1 min)	
72,5	140	87	260
145	275	174	520
170	325	204	600
245	460	294	840

vii) Pressure test

Requirements: The insulator shall not show any signs of overstress or leakage.

Test method: IEC 62271-209 clause 7.3

Test pressure: 3 times design pressure

Duration: 1 min

viii) Leak rate on the insulator

Requirements and test method: IEC 62271-209 clause 7.4

7.5.3. Prequalification Test list

i) 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

ii) Lightning impulse voltage test

Requirements: withstand 10 positive and 10 negative voltage impulses without failure
Test voltage:

325 kVfor cables systems withU_{max} =72.5 kV.

650 kVfor cables systems withU_{max} =145 kV.

750 kVfor cables systems withU_{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

iii) Examination of the cable system after completion of the tests above

Requirements: No signs of deterioration

Test method: IEC 60840 clause 13.2.6

8. ANNEX

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 U_m	[kV]		
2.6	U_0 for determination of test voltages	[kV]		
2.7	Power frequency withstand voltage (15 min)	[kV]		
2.8	Lighting impulse voltage test	[kV]		
2.9	Rated withstand current in steady state condition	[A]		
2.10	Maximum short circuit withstand current (0,5 s)	[kA]		
2.11	Plug-in dry type termination	[Yes/No]		
2.12	Supplier product designation	-		
3	**BUSHING**			
3.1	Supplier Reference	-		
3.2	Insulation Material	-		
3.3	Field control method	-		
3.4	Production method			
3.5	Dimensions according to Fig. 5 from IEC62217-209:2022	[Yes/No]		
3.6	d1	[mm]		
3.7	d3	[mm]		
3.8	d4	[mm]		
3.9	d9	[mm]		
3.10	d10	[mm]		

Item	Description	Unit	Required values	Offered values
3.11	l4	[mm]		
3.12	l10	[mm]		
3.13	s3	[mm]		
3.14	s4	[mm]		
4	**CABLE SIDE**			
4.1	Supplier Reference	-		
4.2	Insulation Material	-		
4.3	Field control method	-		
4.4	Production method	-		
4.5	Contact system. Assembly technique	-		
4.6	Material of admissible conductor	Al/Cu		
4.7	Nominal cross-section of admissible conductor	[mm^2]		
4.8	Minimum diameter of conductor	[mm]		
4.9	Maximum diameter of conductor	[mm]		
4.10	Minimum diameter of cable core (over insulation)	[mm]		
4.11	Maximum diameter of cable core (over insulation)	[mm]		
4.12	Maximum withstand electrical stress	[kV/mm]		
4.13	Cable Screen type	[mm]		
4.14	Maximum cross-section of cable screen	[mm^2]		
4.15	Length outside GIS side	[mm]		
5	**ADDITIONAL FEATURES**			
5.1	Maximum overall cable diameter	[mm]		
5.2	Maximum inclination installed	[º]		
5.3	Weight of GIS side	[kg]		
5.4	Weight of cable side	[kg]		
5.5	Maximum storage time	[months]		
5.6	Estimated time of installation (GIS side)	[h]		
5.7	Estimated time of installation (cable side)	[h]		
5.8	Expected service life after installation	[years]		
5.9	Integrated FO box in terminal	[Yes/No]		
5.10	Capacity voltage cap included	[Yes/No]		
6	**TCA INFORMATION**			
6.1	TCA Available	[Yes/No]	Informative	
6.2	TCA Code	-	Informative	
7	**OBSERVATION**			

Item	Description	Unit	Required values	Offered values
7.1	Any exception to what is required on GSCH013	-		
7.2	Additional comments	-		

ANNEX B –GENERAL TYPE CODES FOR GIS TERMINALS

GS Type Code	Designation	Um [kV]	Conductor Section [mm^2]	Screen Type
GSCH013/001	GT-245 kV 2500 mm2 -T	245	2500	T
GSCH013/002	GT-245 kV 2000 mm2 -T	245	2000	T
GSCH013/003	GT-245 kV 1600 mm2 -T	245	1600	T
GSCH013/004	GT-245 kV 1000 mm2 -T	245	1000	T
GSCH013/005	GT-245 kV 800 mm2 -T	245	800	T
GSCH013/006	GT-170 kV 1600 mm2 -T	170	1600	T
GSCH013/007	GT-170 kV 1000 mm2 -T	170	1000	T
GSCH013/008	GT-170 kV 630 mm2 -T	170	630	T
GSCH013/009	GT-145 kV 1200 mm2 -T	145	1200	T
GSCH013/010	GT-145 kV 800 mm2 -T	145	800	T
GSCH013/011	GT-145 kV 630 mm2 -T	145	630	T
GSCH013/012	GT-72,5 kV 1000 mm2 -T	72,5	1000	T
GSCH013/013	GT-72,5 kV 630 mm2 -T	72,5	630	T
GSCH013/016	GT-170 kV 1600 mm2 -H	170	1600	H
GSCH013/017	GT-170 kV 1000 mm2 -H	170	1000	H
GSCH013/018	GT-170 kV 630 mm2 -H	170	630	H
GSCH013/019	GT-145 kV 1200 mm2 -H	145	1200	H
GSCH013/021	GT-145 kV 630 mm2 -H	145	630	H
GSCH013/023	GT-72,5 kV 1000 mm2 -H	72,5	1000	H
GSCH013/024	GT-72,5 kV 800 mm2 -H	72,5	800	H
GSCH013/027	GT-72,5 kV 1200 mm2 -H	72,5	1200	H
GSCH013/028	GT-72,5 kV 630 mm2 -H	72,5	630	H
GSCH013/029	GT-72,5 kV 2000 mm2 -H	72,5	2000	H
GSCH013/030	GT-245 kV 1200 mm2 -H	245	1200	H
GSCH013/031	GT-245 kV 2000 mm2 -H	245	2000	H
GSCH013/033	GT-145 kV 1600 mm2 -H	145	1600	H
GSCH013/034	GT-145 kV 2000 mm2 -H	145	2000	H
GSCH013/035	GT-145 kV 400 mm2 -H	145	400	H
GSCH013/036	GT-145 kV 800 mm2 -H	145	800	H
GSCH013/037	GT-145 kV 1000 mm2 -H	145	1000	H
GSCH013/041	GT-145 kV 2500 mm2 -H	145	2500	H
GSCH013/042	GT-72,5 kV 500 mm2 -H	72,5	500	H
GSCH013/043	GT-245 kV 1600 mm2 -H	245	1600	H
GSCH013/045	GT-145 kV 500 mm2 -H	145	500	H
GSCH013/046	GT-145 kV 2000 mm2 -T	145	2000	T
GSCH013/047	GT-145 kV 1600 mm2 -T	145	1600	T
GSCH013/048	GT-145 kV 1000 mm2 -T	145	1000	T
GSCH013/051	GT-245 kV 2500 mm2 -H	245	2500	H

ANNEX C – COMMON LIST

COMMON LIST 07/12/2022				
GS Type Code	**Designation**	**Distribution Company and Country**	**Country Code**	**TAM Description**
GSCH013/033	GT-145 kV 1600 mm2 -H	RETELE ELECTRICE Romania	270048	Conector GIS conform GSCH013/033, 145kV, sectiune 1600mm2, cu ecran fire cupru
GSCH013/037	GT-145 kV 1000 mm2 -H	RETELE ELECTRICE Romania	270049	Conector GIS conform GSCH013/037, 145kV, sectiune 1000mm2, cu ecran fire cupru
GSCH013/011	GT-145 kV 630 mm2 -T	RETELE ELECTRICE Romania	270050	Conector GIS conform GSCH013/011, 145kV, sectiune 630mm2, cu ecran tub de aluminiu
GSCH013/047	GT-145 kV 1600 mm2 -T	RETELE ELECTRICE Romania	270051	Conector GIS conform GSCH013/047, 145kV, sectiune 1600mm2, cu ecran tub de aluminiu
GSCH013/048	GT-145 kV 1000 mm2 -T	RETELE ELECTRICE Romania	270052	Conector GIS conform GSCH013/048, 145kV, sectiune 1000mm2, cu ecran tub de aluminiu

ANNEX D – CABLE JOINTS

GIS terminal could be used to form different types of joints by mean of a GIS enclosure that provide the connection for all of them. The system uses a pressurized vessel ready to connect two or more cable terminals to a connecting rod on the inside. So, it is possible to form a joint or the branching of one or more cables. As an example, in **Figure 2** it is shown a scheme for a joint formed by a vessel and two terminal and in **Figure 3** a scheme for a T-joint formed by a vessel and 3 terminals.

The enclosure contains a separating insulation barrier, and it is filled with an insulation material, usually pressurized SF6 or any other gas. It will be protected against corrosion and will fulfill the requirements of IP67 class protection according to IEC 60529.

If one connection point remains unused, it must be sealed with an appropriate plug. And, in any case, the enclosure may contain the effects of thermal or electrical failure of any of the elements housed in it.

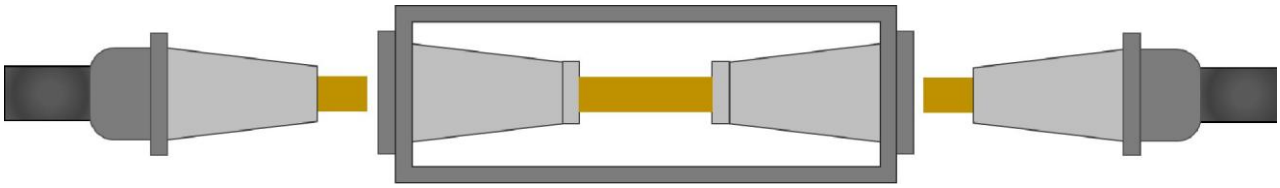


Figure 2 Scheme of a joint.

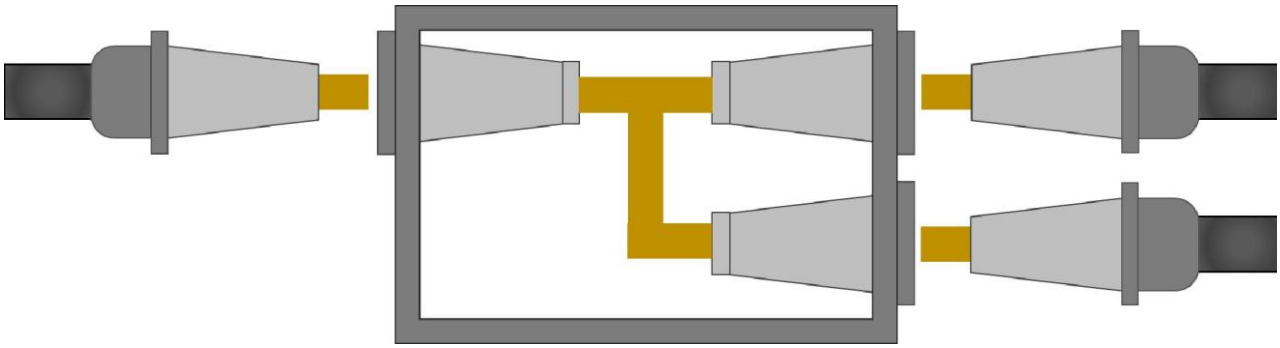


Figure 3 Scheme of a T-joint.

The technical characteristics of these systems will be defined on every order, according to IEC 62271-203 and IEC60840 or IEC62067.