

**Subject:** Global Infrastructure and Networks - GSCH011 Joints for Underground High Voltage Cables.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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THE HEAD OF NETWORK COMPONENTS  
**Maurizio Mazzotti**

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## 1. DOCUMENT AIMS AND APPLICATION AREA

The aim of this document is to provide technical requirements for the supply of joints for high voltage underground cables to be used on transmission lines of the Enel Group Companies listed below:

Country	Distribution Company
Argentina	Edesur
Brasil	Enel Distribuição Rio Enel Distribuição Ceará Enel Distribuição Goiás Enel Distribuição São Paulo
Chile	Enel Distribución Chile
Colombia	Codensa
España	e-distribución redes digitales
Italia	e-distribuzione
Perú	Enel Distribución Perú
Romania	Enel Distributie Banat Enel Distributie Dobrogea Enel Distributie Muntenia

**Table 1 - Distribution Companies**

### 1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

This document applies to both Enel Global Infrastructure and Networks Srl Company and to Infrastructure and Networks Business Line perimeter when each Company does not have to issue further documents.

## 2. DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
1	17/12/2021	Issuing of "Global Infrastructure and Networks - GSCH011 Joints for Underground High Voltage Cables" technical specification

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### 3. UNITS IN CHARGE OF THE DOCUMENT

Responsible for drawing up the document:

- Global Infrastructure and Networks: Engineering and Construction / Components and Devices Design / Network Components.

Responsible for authorizing the document:

- Global Infrastructure and Networks: Head of Network Components unit.
- Global Infrastructure and Networks: Head of Quality unit.

### 4. REFERENCES

- Code of Ethics of Enel Group;
- Enel Human Right Policy;
- The Enel Group Zero Tolerance of Corruption (ZTC) Plan;
- Organization and management model as per Legislative Decree No. 231/2001;
- RACI Handbook Infrastructure and Networks no. 06;
- Enel Global Compliance Program (EGCP);
- Integrated Policy of Quality, Health and Safety, Environment and anti-Bribery;
- Policy n. 332 Global Infrastructure and Networks Design and construction HV lines guidelines ;
- ISO 9001:2015 - Quality Management System - Requirements;
- ISO 14001:2015 - Environmental Management System - Requirements and user guide;
- ISO 45001:2018 - Occupational Health and Safety Management System - Requirements and user guide;
- ISO 50001:2018 - Energy management systems - Requirements with guidance for use;
- ISO 37001:2016 - 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 60229. "Electric cables. Tests on extruded oversheaths with a special protective function.

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- IEC 60811-202: “Electric and optical fibre cables - Test methods for non-metallic materials - Part 202: General tests - Measurement of thickness of non-metallic sheath”.
- IEC 60811-203: “Electric and optical fibre cables - Test methods for non-metallic materials - Part 203: General tests - Measurement of overall dimensions”.
- IEC 60811-501 “Electric and optical fibre cables - Test methods for non-metallic materials - Part 501: Mechanical tests - Tests for determining the mechanical properties of insulating and sheathing compounds”.
- IEC 60811-502: “Electric and optical fibre cables - Test methods for non-metallic materials - Part 502: Mechanical tests – Shrinkage tests for insulations”.
- IEC 60811-503: “Electric and optical fibre cables - Test methods for non-metallic materials - Part 503: Mechanical tests – Shrinkage tests for sheaths”.
- 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”

## 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
<b>Distributed Temperature Sensing (DTS)</b>	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.

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Acronym and Key words	Description
<b>Technical Conformity Assessment (TCA)</b>	A “conformity assessment” <sup>*</sup> with respect to “specified requirements” <sup>†</sup> 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 Enel Group distribution companies. This also includes the verification of conformity with respect to local applicable regulation and laws and possession of relevant requested certifications
<b>XLPE-Cable</b>	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 joints used with high voltage cables included in Global Standard GSCH010, with rated voltage above 36 kV and in detail for  $U_{max}$  equals to 52 kV, 72,5 kV, 145 kV, 170 kV and 245 kV.

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

### 7.1 LIST OF COMPONENTS

This standard includes joints for single-core cables with aluminum or copper conductor, XLPE insulation and metallic screen. Regarding the screen treatment, joints depicted in this standard are classified on the following types:

- **Type I:** Straight through joint.
- **Type II:** Straight through joint with additional earthing.
- **Type III:** Screen interruption joint.

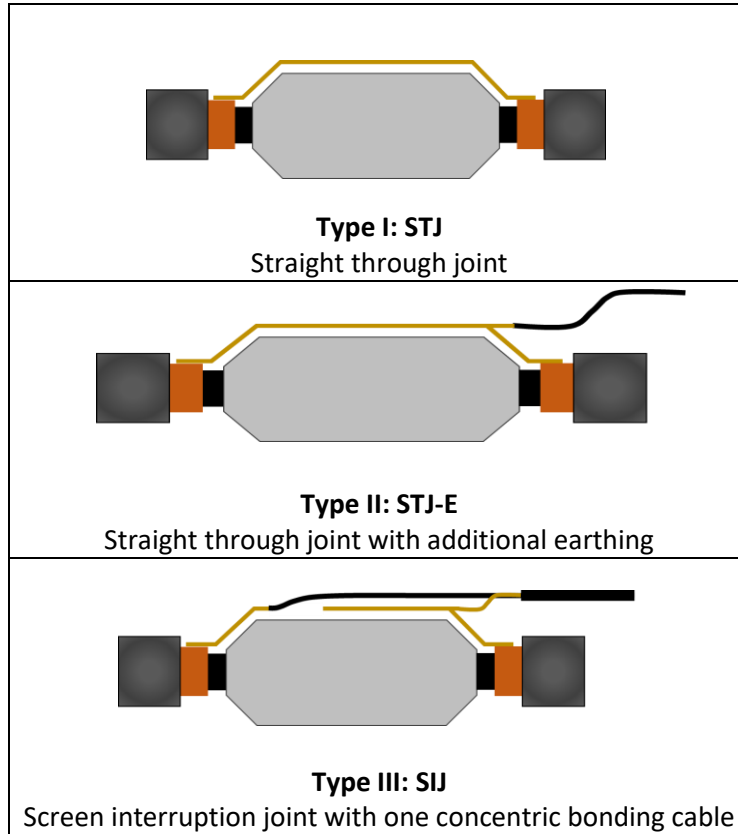
\* Definition 2.1 of ISO/IEC 17000

† Definition 3.1 of ISO/IEC 17000

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**Table 2 – Schemes for connections to earth**

The list of joints with the main requirements, which is an integral part of the present document, is reported in the GS Type Code Lists on Annex B.1 to Annex B.3, and their relationship with country codes is reported on the Common List on Annex C. In **Table 3** the list of joints of all types are shown.

GSCH011 Type Code			Um [kV]	Conductor section [mm <sup>2</sup> ]	Screen Type	Nominal I <sub>cc</sub> (0,5 s) [kA]
Joint Type I STJ	Joint Type II STJ-E	Joint Type III SIJ				
GSCH011/001	GSCH011/101	GSCH011/201	245	2500	Tube	41
GSCH011/051	GSCH011/151	GSCH011/251	245	2500	Wires	41
GSCH011/002	-	GSCH011/202	245	2000	Tube	41
GSCH011/031	-	GSCH011/231	245	2000	Wires	41
GSCH011/003	-	GSCH011/203	245	1600	Tube	41
GSCH011/043	-	GSCH011/243	245	1600	Wires	41
GSCH011/030	-	GSCH011/230	245	1200	Wires	41
GSCH011/004	-	GSCH011/204	245	1000	Tube	41
GSCH011/005	-	GSCH011/205	245	800	Tube	41

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GSCH011 Type Code			Um [kV]	Conductor section [mm <sup>2</sup> ]	Screen Type	Nominal I <sub>cc</sub> (0,5 s) [kA]
Joint Type I STJ	Joint Type II STJ-E	Joint Type III SIJ				
GSCH011/006	-	GSCH011/206	170	1600	Tube	31,5
GSCH011/016	-	GSCH011/216	170	1600	Wires	20
GSCH011/007	-	GSCH011/207	170	1000	Tube	31,5
GSCH011/017	-	GSCH011/217	170	1000	Wires	20
GSCH011/008	-	GSCH011/208	170	630	Tube	31,5
GSCH011/018	-	GSCH011/218	170	630	Wires	20
GSCH011/041	-	GSCH011/241	145	2500	Wires	31,5
GSCH011/046	-	GSCH011/246	145	2000	Tube	31,5
GSCH011/034	-	GSCH011/234	145	2000	Wires	31,5
GSCH011/047	-	GSCH011/247	145	1600	Tube	31,5
GSCH011/033	-	GSCH011/233	145	1600	Wires	31,5
GSCH011/009	GSCH011/109	GSCH011/209	145	1200	Tube	31,5
GSCH011/019	-	GSCH011/219	145	1200	Wires	41
GSCH011/048	-	GSCH011/248	145	1000	Tube	31,5
GSCH011/037	-	GSCH011/237	145	1000	Wires	31,5
GSCH011/010	GSCH011/110	GSCH011/210	145	800	Tube	31,5
GSCH011/036	-	GSCH011/236	145	800	Wires	31,5
GSCH011/011	-	GSCH011/211	145	630	Tube	31,5
GSCH011/026	-	GSCH011/226	145	630	Wires	31,5
GSCH011/045	-	GSCH011/245	145	500	Wires	31,5
GSCH011/035	-	GSCH011/235	145	400	Wires	31,5
GSCH011/029	-	GSCH011/229	72,5	2000	Wires	41
GSCH011/027	-	GSCH011/227	72,5	1200	Wires	41
GSCH011/012	-	GSCH011/212	72,5	1000	Tube	20
GSCH011/023	-	GSCH011/223	72,5	1000	Wires	20
GSCH011/024	-	GSCH011/224	72,5	800	Wires	41
GSCH011/013	-	GSCH011/213	72,5	630	Tube	20
GSCH011/028	-	GSCH011/228	72,5	630	Wires	41
GSCH011/042	-	GSCH011/242	72,5	500	Wires	41
GSCH011/014	-	GSCH011/214	52	800	Tube	11
GSCH011/049	-	GSCH011/249	52	800	Wires	11
GSCH011/015	-	GSCH011/215	52	400	Tube	11
GSCH011/025	-	GSCH011/225	52	400	Wires	11

**Table 3 – List of GSCH011 Type Codes for joints**

**7.2 DESIGN AND MANUFACTURE**

Joints 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 ENEL's Global Standard GSCH010: Underground High Voltage Cables.

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The design requirements common to all of them are:

- A high current connection between conductors, not smaller than that of the cable.
- Insulation at least to the same performance standard as the cable.
- A high current connection to permit the flow of short circuit current between the two cable sheaths or screen wires, not smaller than that of the cable.
- A metallic joint shell or screen wire connection electrically insulated from earth potential to match the insulating integrity of the cable oversheath.
- Protection against the ingress of water.
- Protection against corrosion.
- Ability to withstand cable thermomechanical loads and/or external forces.

It is not allowed the use of fluid fillings as isolation.

### 7.2.1.Connector

Connector is used for connecting two consecutive lengths of conductor together. There should be mechanical connectors with shear-off screws designed to be used with copper 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

The cross section of cables for whom are intended the joints involved by this standard are those included in **Table 4**. 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.



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

**Table 4 Conductor Cross Sections**

In addition, a semi conductive tape shall be added around the connector.

It is not allowed the use of welded connector of any kind.

**7.2.2. Main insulation body**

Main insulation body of the joint should be prefabricated and tested in factory. It could be formed by a single premoulded elastomeric sleeve (one-piece type) or by a large diameter premoulded sleeve which is stretched to fit on top of one or two smaller diameter elastomeric adaptor moldings (two-piece and three-piece type respectively).

For joints with a highest voltage for equipment  $U_m^\ddagger$  equal to 52 or 72,5 kV the main insulation body could use cold shrink technology, provided that they have the prior acceptance of Enel.

The main function of insulation body of the accessory is to withstand the cable electrical stresses at the conductor and insulation screens, as well as maintain thermal-mechanical properties of the cable even in case of short circuit.

The rated voltages of reference to be withstood by the joints are those included in **Table 5**.

<sup>‡</sup>  $U_m$ : 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

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Network Nominal voltage $U^{\S}$ [kV]	Highest voltage for equipment $U_m$ [kV]	Value of $U_0^{**}$ for determination of test voltages [kV]	Lightning impulse voltage test $U_p^{\dagger\dagger}$ [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 5 Test voltages**

The diameter over insulation of cables for whom are intended the joints involved by this standard are those included in **Table 6**. Nevertheless, other diameters over insulation could be specified on Local Sections or specific orders.

$U_m$ [kV]	Compatible cable diameter over insulation [mm.]									
	52		72,5		145		170		245	
Cross section [mm <sup>2</sup> ]	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 6 Compatible cable diameter over insulation**

<sup>§</sup>  $U$ : rated r.m.s. power-frequency voltage between any two conductors for which cables and accessories are designed.

<sup>\*\*</sup>  $U_0$ : Rated r.m.s. power-frequency voltage between each conductor and screen or sheath for which cables and accessories are designed.

<sup>††</sup>  $U_p$ : peak value of the lightning impulse withstand voltage (and switching, where applicable) between each conductor and screen or sheath for which cables and accessories are designed.

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**7.2.3. Metal screening, connection to cable screen**

For straight through joints (Type I and Type II) there should be an electric connection between the screens of the two sections of the cable.

This connection must be insulated from earth potential to match the insulation integrity of the cable oversheath 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 joint insulation.

The values of the short circuit currents that must be withstood by the screen are those indicated in **Table 7**.

<b>U<sub>m</sub> [kV]</b>	<b>I<sub>cc</sub> (0,5s) [kA]</b>
<b>52</b>	11
<b>72,5</b>	20 – 41
<b>145</b>	31,5 – 41
<b>170</b>	20 - 31,5
<b>245</b>	41

**Table 7 Short circuit currents**

Unlike Type I joints, for Type II joints these connection between cables' screen shall be accessible to be earthed.

For screen interruption joints (Type III) there must be a gap in the electric connection that withstand dielectric transients and bonding leads to permit the adjacent cable screens to be connected in the configuration necessary for a specially bonded cable system using an adequate link box. That screen take out will use one concentric bonding cable to be connected to the link box.

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.

**7.2.4. Outer protection**

Outer protection of the joint is required to provide protection against the ingress of water and corrosion and to maintain mechanical and insulation properties of the cable oversheath.

There must include a metallic radial moisture barrier and a heavy-duty heat shrinkable layer for protection or other elements with superior performance.

If required, the outer protection must be protected against damaged due to wildlife, as termite or rodents.

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### 7.2.5. Overall dimensions

Usually, once the joint is been installed on the cable, the overall dimension shall not surpass the dimensions indicated on the **Table 8**

Highest voltage for equipment $U_m$ [kV]	Overall diameter [mm]	Total Length [mm]
<b>52</b>	250	1.350
<b>72,5</b>	300	1.700
<b>145</b>	400	2.400
<b>170</b>	500	2.500
<b>245</b>	560	2.800

**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.

### 7.2.6. Fiber optic treatment (optional)

If required, the joint will include a fiber optics splice box to allow the use of distributed temperature sensing (DTS) systems.

If the splice box is external to the joint, not inside the outer protection, there must ensures reliable operation even when buried or flooded.

The splice box shall manage at least two steel pipes on every side of the joint with a minimum of 2 fiber optics each. So, the minimum capacity of that box shall be 4 splices.

## 7.3 JOINT DESIGNATION

Designation of the joint is formed by the following terms:

- "ENEL GSCH011.
- voltage level  $U_m$  and "kV",
- a code indicating the Type of Joint (STJ, STJ-E or SIJ) as shown in **Table 2**.
- "1X" and section of the conductor (expressed in mm<sup>2</sup>),
- "+" and a character representing the type of cable screen (H: for wires screen, T: for welded aluminum tube),
- Nominal short circuit current (expressed in kA) from **Table 7**,
- FO (optional) in case there is integrated a fiber optics splice box.

Designation example for joint GSCH011/001 is:

*ENEL GSCH011 - 245 kV - STJ - 1x2500 + T41*

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## 7.4 CONDITIONS OF SUPPLY

There shall be provided a complete set of assembly instructions together with drawings of the joints.

The instructions should include lists of all the components of the joint 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 the language of the country destiny of the supply.

Joints 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 joints there must be marked the following information:

- a) GS Type Code and reference of this standard.
- b) Type of joint
- c) Rated voltages  $U_0$  ( $U_m$ ).
- d) Manufacturer or brand.
- e) Order number or purchase order.
- f) Year and month of manufacture.
- g) 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

#### 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 Enel Standard GSCG002.
- Routine tests in paragraph 7.5.2
- Sample tests in paragraph 7.5.3

If a joint fails any of the sample tests, two further joints of the same type shall be subjected to the same tests. If both additional joints 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.

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**ii) Routine tests**

Routine tests shall be performed at 100% of the main insulation of delivered joints 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 joints.

**iii) 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” joints following the formula:

$$n = P^{1/3}$$

where “P” stands for the total number of joints included in the batch.

**iv) Type tests**

Type tests shall be performed before supplying a type of joint 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 joints 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.
- 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 first partial discharge test.

The minimum length of free cable between accessories shall be 5 m.

**v) Prequalification tests**

Prequalification tests shall be performed before supplying a type of joint 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

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Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

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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.

**vi) Development tests**

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

**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

**7.5.3. Sample Test List**

**i) Joint examination**

Requirements: Conformity to constructive characteristics, installation instructions and drawings declared on TCA.

Test method: inspection by visual examination

**ii) Partial discharge test**

To be done just for joints where the main insulation cannot be routine tested. In that cases shall be performed on one joint of each type per every 50 joints provided.

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

Test method: IEC 60840 clause 9.2

**iii) Voltage routine test**

To be done just for joints where the main insulation cannot be routine tested. In that cases shall be performed on one joint of each type per every 50 joints provided.

Requirements: No breakdown of the insulation shall occur.

Test method: IEC 60840 clause 9.3

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Test voltage:  $2.5 U_0$

Duration: 30 min

#### 7.5.4. Type Tests List

Prior to electrical type test of joints, 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 joints with  $U_0=127$  kV

IEC 60840 clause 12.4.6 for joints 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 joints with  $U_0=127$  kV

IEC 60840 clause 12.4.7 for joints with  $U_0<127$  kV

Impulse lightning voltage value:

250 kV for joints with  $U_{max} = 52$  kV.

325 kV for joints with  $U_{max} = 72.5$  kV.

650 kV for joints with  $U_{max} = 145$  kV.

750 kV for joints with  $U_{max} = 170$  kV.

1.050 kV for joints with  $U_{max} = 245$  kV.

Power frequency voltage value:

65 kV for joints with  $U_{max} = 52$  kV.

90 kV for joints with  $U_{max} = 72.5$  kV.

190 kV for joints with  $U_{max} = 145$  kV.

218 kV for joints with  $U_{max} = 170$  kV.

254 kV for joints with  $U_{max} = 245$  kV.



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**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<sub>0</sub>

Test method: IEC 60840 clause 12.4.4

**vi) Water immersion**

Range of approval for this test according to IEC 60840 H.2

The following sequence shall be carried out:

a) Thermal cycles for conditioning

Test method: IEC 60840 sub-clause H.3.1

b) DC voltage withstand test between screen and earth

Test method: IEC 60840 sub-clause H.3.2.2

c) DC voltage withstand test between screen and screen

For joints with a screen interruption (Type III)

Test method: IEC 60840 sub-clause H.3.2.3

d) Lightning impulse voltage withstand test between screen and earth

Test method: IEC 60840 sub-clause H.3.2.4

Lighting impulse level metal screen to earth:

30 kV for terminals with U<sub>max</sub> = 52 kV.

30 kV for terminals with U<sub>max</sub> = 72.5 kV.

37,5 kV for terminals with U<sub>max</sub> = 145 kV.

37,5 kV for terminals with U<sub>max</sub> = 170 kV.

47,5 kV for terminals with U<sub>max</sub> = 245 kV.

e) Lightning impulse voltage withstand test between screen and screen

For joints with a screen interruption (Type III)

Test method: IEC 60840 sub-clause H.3.2.5

Lighting impulse level between parts:

60 kV for terminals with U<sub>max</sub> = 52 kV.

60 kV for terminals with U<sub>max</sub> = 72.5 kV.

75 kV for terminals with U<sub>max</sub> = 145 kV.

75 kV for terminals with U<sub>max</sub> = 170 kV.

95 kV for terminals with U<sub>max</sub> = 245 kV.

f) Examination

Requirements: No evidence of water ingress or internal corrosion behind the defined water-protection barriers, as stated on IEC 60840 sub-clause H.5

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**vii) Examination of joints after completion of the above test**

Requirements: No signs of deterioration

Test method: IEC 60840 clause 12.4.8

**7.5.5. Prequalification Test list**

**i) Heating cycle voltage test**

Requirements: No breakdown shall occur.

Test voltage:  $1,7 U_0$

Cycles:  $\geq 180$

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:

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

**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

**7.5.6. Development tests list**

**i) Corrosion at the accessories**

Requirements: IEC TR 61901 clause 4.2.3

Test method: IEC TR 61901 clause 4.2.3

**ii) 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

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Test method: IEC TR 61901 clause 4.2.2

## 7.6 LOCAL SECTIONS

### 7.6.1. LOCAL SECTION B – BRASIL. Enel Distribuição Rio, Ceará, Goiás and São Paulo

Joints for Brasil will include a fiber optics splice box to allow the use of distributed temperature sensing (DTS) systems.

The outer protection of all joints must be protected against damaged due to termites.

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Staff Function: -

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## 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's Type A documentation:

Item	Description	Unit	Required values	Ofered values
<b>1</b>	<b>GENERAL INFORMATION</b>			
1.1	Supplier Name	-		
1.2	Suplier CUI			
1.3	Factory	-		
1.4	Location of factory	-		
<b>2</b>	<b>MAIN FEATURES</b>			
2.1	ENEL Distribution Company and Country of supply	-		
2.2	Country Code	-		
2.3	GS Type Code	-		
2.4	Enel designation	-		
2.5	Highest voltage for equipment $U_m$	[kV]		
2.6	Power frequency withstand voltage	[kV]		
2.7	Lighting impulse voltage	[kV]		
2.8	Type of joint (I, II or III)	-		
2.9	Supplier product designation	-		
<b>3</b>	<b>CONNECTOR</b>			
3.1	Reference	-		
3.2	Material	-		
3.3	Assembly technique	-		
3.4	Nominal cross-section of conductor	[mm <sup>2</sup> ]		
3.5	Minimum diameter of conductor	[mm]		
3.6	Maximum diameter of conductor	[mm]		
3.7	Minimum cross-section of connector	[mm <sup>2</sup> ]		
<b>4</b>	<b>MAIN INSULATION BODY</b>			
4.1	Reference	-		
4.2	Material	-		
4.3	Number of pieces	-		
4.4	Nominal thickness	[mm]		

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Item	Description	Unit	Required values	Ofered values
4.5	Minimum diameter of cable core	[mm]		
4.6	Maximum diameter of cable core	[mm]		
4.7	Maximum withstand electrical stress	[kV/mm]		
4.8	Length of main body	[mm]		
4.9	Field control method	-		
<b>5</b>	<b>METAL SCREENING</b>			
5.1	Type	-		
5.2	Material	-		
5.3	Total section	[mm <sup>2</sup> ]		
5.4	Maximum DC resistance at 20°C (Type I joints)	[Ω/ m]		
5.5	Screen connection	-		
<b>6</b>	<b>BONDING LEADS (Type II and Type III joints)</b>			
6.1	Earth cable type	-		
6.2	Maximum cross-section of cable	[mm <sup>2</sup> ]		
6.3	Minimum diameter of cable	[mm]		
6.4	Maximum diameter of cable	[mm]		
6.5	Type of connection	-		
<b>7</b>	<b>OUTER PROTECTION</b>			
7.1	Type	-		
7.2	Material	-		
7.3	Nominal thickness	[mm]		
7.4	Color	-		
7.5	Fire resistance grade	-		
<b>8</b>	<b>FIBER OPTIC SPLICE BOX</b>			
8.1	Integrated in joint	[Yes/No]		
8.2	Maximum number of steel pipes	-		
8.2	Maximum number of fiber optic on every steel pipe	-		
8.3	Maximum number of splices	-		
<b>9</b>	<b>AMPACITY FEATURES</b>			
9.1	Rated withstand current in steady state condition	[A]		
9.2	Maximum temperature of conductor in 9.1	[°C]		
9.3	Rated short circuit withstand current in the conductor (0,5 s)	[kA]		
9.4	Maximum temperature of conductor in 9.3	[°C]		
9.5	Rated short circuit withstand current in the screen (0,5 s)	[kA]		
9.6	Maximum temperature of screen in 9.5	[°C]		

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Item	Description	Unit	Required values	Ofered values
<b>10</b>	<b>ADDITIONAL FEATURES</b>			
10.1	Nominal overall diameter	[mm]		
10.2	Total length	[mm]		
10.3	Total weight	[kg]		
10.4	Maximum storage time	[months]		
10.5	Estimated time of installation (without cable preparation)	[h]		
10.6	Expected service life after installation	[years]		
<b>11</b>	<b>TCA INFORMATION</b>			
11.1	TCA Available	[Yes/No]	Informative	
11.2	TCA Code	-	Informative	
<b>12</b>	<b>OBSERVATION</b>			
12.1	Any exception to what is required on GSCH011	-		
12.2	Additional comments	-		

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**Application Areas**

Perimeter: *Global*  
 Staff Function: -  
 Service Function: -  
 Business Line: *Infrastructure & Networks*

**ANNEX B.1 – GLOBAL TYPE CODES FOR STRAIGHT TROUGH JOINTS**

GSCH011 Type Codes for Type I Joints: STJ		Um [kV]	Conductor Section [mm <sup>2</sup> ]	Screen Type	Nominal I <sub>cc</sub> (0,5 s) [kA]	For use on cable GSCH010	
Code	Designation					Type Code	Designation
GSCH011/001	245kV-STJ-1x2500+T41	245	2500	Tube	41	GSCH010/001	245kV2500Al+T363
GSCH011/002	245kV-STJ-1x2000+T41	245	2000	Tube	41	GSCH010/002	245kV2000Al+T363
GSCH011/003	245kV-STJ-1x1600+T41	245	1600	Tube	41	GSCH010/003	245kV1600Al+T363
GSCH011/004	245kV-STJ-1x1000+T41	245	1000	Tube	41	GSCH010/004	245kV1000Al+T363
GSCH011/005	245kV-STJ-1x800+T41	245	800	Tube	41	GSCH010/005	245kV800Al+T363
GSCH011/006	170kV-STJ-1x1600+T31,5	170	1600	Tube	31,5	GSCH010/006	170kV1600Al+T242
GSCH011/007	170kV-STJ-1x1000+T31,5	170	1000	Tube	31,5	GSCH010/007	170kV1000Al+T242
GSCH011/008	170kV-STJ-1x630+T31,5	170	630	Tube	31,5	GSCH010/008	170kV630Al+T242
GSCH011/009	145kV-STJ-1x1200+T31,5	145	1200	Tube	31,5	GSCH010/009	145kV1200Al+T242
GSCH011/010	145kV-STJ-1x800+T31,5	145	800	Tube	31,5	GSCH010/010	145kV800Al+T242
GSCH011/011	145kV-STJ-1x630+T31,5	145	630	Tube	31,5	GSCH010/011	145kV630Al+T242
GSCH011/012	72,5kV-STJ-1x1000+T20	72,5	1000	Tube	20	GSCH010/012	72,5kV1000Al+T144
GSCH011/013	72,5kV-STJ-1x630+T20	72,5	630	Tube	20	GSCH010/013	72,5kV630Al+T144
GSCH011/014	52kV-STJ-1x800+T11	52	800	Tube	9,3	GSCH010/014	52kV800Al+T76
GSCH011/015	52kV-STJ-1x400+T11	52	400	Tube	9,3	GSCH010/015	52kV400Al+T76
GSCH011/016	170kV-STJ-1x1600+H20	170	1600	Wires	20	GSCH010/016	170kV1600Al+H95
GSCH011/017	170kV-STJ-1x1000+H20	170	1000	Wires	20	GSCH010/017	170kV1000Al+H95
GSCH011/018	170kV-STJ-1x630+H20	170	630	Wires	20	GSCH010/018	170kV630Al+H95
GSCH011/019	145kV-STJ-1x1200+H41	145	1200	Wires	41	GSCH010/019	145kV1200Al+H240
GSCH011/019*	145kV-STJ-1x1200+H41	145	1200	Wires	41	GSCH010/020	145kV1200Al+H120
GSCH011/026*	145kV-STJ-1x630+H31,5	145	630	Wires	31,5	GSCH010/021	145kV630Al+H120
GSCH011/029*	72,5kV-STJ-1x2000+H41	72,5	2000	Wires	41	GSCH010/022	72,5kV2000Al+H240
GSCH011/023	72,5kV-STJ-1x1000+H20	72,5	1000	Wires	20	GSCH010/023	72,5kV1000Al+H95
GSCH011/024	72,5kV-STJ-1x800+H41	72,5	800	Wires	41	GSCH010/024	72,5kV800Al+H240
GSCH011/025	52kV-STJ-1x400+H11	52	400	Wires	9,3	GSCH010/025	52kV400Al+H50
GSCH011/026	145kV-STJ-1x630+H31,5	145	630	Wires	31,5	GSCH010/026	145kV630Cu+H160
GSCH011/027	72,5kV-STJ-1x1200+H41	72,5	1200	Wires	41	GSCH010/027	72,5kV1200Cu+H240
GSCH011/028	72,5kV-STJ-1x630+H41	72,5	630	Wires	41	GSCH010/028	72,5kV630Cu+H240
GSCH011/029	72,5kV-STJ-1x2000+H41	72,5	2000	Wires	41	GSCH010/029	72,5kV2000Cu+H240
GSCH011/030	245kV-STJ-1x1200+H41	245	1200	Wires	41	GSCH010/030	245kV1200Cu+H240
GSCH011/031	245kV-STJ-1x2000+H41	245	2000	Wires	41	GSCH010/031	245kV2000Cu+H240
GSCH011/019*	145kV-STJ-1x1200+H41	145	1200	Wires	41	GSCH010/032	145kV1200Cu+H120
GSCH011/033	145kV-STJ-1x1600+H31,5	145	1600	Wires	31,5	GSCH010/033	145kV1600Cu+H120
GSCH011/034	145kV-STJ-1x2000+H31,5	145	2000	Wires	31,5	GSCH010/034	145kV2000Cu+H120
GSCH011/035	145kV-STJ-1x400+H31,5	145	400	Wires	31,5	GSCH010/035	145kV400Al+H120
GSCH011/036	145kV-STJ-1x800+H31,5	145	800	Wires	31,5	GSCH010/036	145kV800Al+H120
GSCH011/037	145kV-STJ-1x1000+H31,5	145	1000	Wires	31,5	GSCH010/037	145kV1000Al+H120
GSCH011/033*	145kV-STJ-1x1600+H31,5	145	1600	Wires	31,5	GSCH010/038	145kV1600Al+H120
GSCH011/034*	145kV-STJ-1x2000+H31,5	145	2000	Wires	31,5	GSCH010/039	145kV2000Al+H120
GSCH011/035*	145kV-STJ-1x400+H31,5	145	400	Wires	31,5	GSCH010/040	145kV400Cu+H120
GSCH011/041	145kV-STJ-1x2500+H31,5	145	2500	Wires	31,5	GSCH010/041	145kV2500Cu+H120
GSCH011/042	72,5kV-STJ-1x500+H41	72,5	500	Wires	41	GSCH010/042	72,5kV500Cu+H240
GSCH011/043	245kV-STJ-1x1600+H41	245	1600	Wires	41	GSCH010/043	245kV1600Cu+H240
GSCH011/041*	145kV-STJ-1x2500+H31,5	145	2500	Wires	31,5	GSCH010/044	145kV2500Al+H120

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**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

GSCH011 Type Codes for Type I Joints: STJ		Um [kV]	Conductor Section [mm <sup>2</sup> ]	Screen Type	Nominal I <sub>cc</sub> (0,5 s) [kA]	For use on cable GSCH010	
Code	Designation					Type Code	Designation
GSCH011/045	145kV-STJ-1x500+H31,5	145	500	Wires	31,5	GSCH010/045	145kV500AI+H120
GSCH011/046	145kV-STJ-1x2000+T31,5	145	2000	Tube	31,5	GSCH010/046	145kV2000Cu+T242
GSCH011/047	145kV-STJ-1x1600+T31,5	145	1600	Tube	31,5	GSCH010/047	145kV1600AI+T242
GSCH011/048	145kV-STJ-1x1000+T31,5	145	1000	Tube	31,5	GSCH010/048	145kV1000AI+T242
GSCH011/049	52kV-STJ-1x800+H11	52	800	Wires	9,3	GSCH010/049	52kV800AI+H50
GSCH011/001*	245kV-STJ-1x2500+T41	245	2500	Tube	41	GSCH010/050	245kV2500Cu+T363
GSCH011/051	245kV-STJ-1x2500+H41	245	2500	Wires	41	GSCH010/051	245kV2500Cu+H240

\* Codes that appears on the table more than one time because they are used for more than one cable

## ANNEX B.2 – GLOBAL TYPE CODES FOR STRAIGHT TROUGH JOINTS WITH EARTHING

GSCH011 Type Codes for Type II Joints: STJ-E		Um [kV]	Conductor Section [mm <sup>2</sup> ]	Screen Type	Nominal I <sub>cc</sub> (0,5 s) [kA]	For use on cable GSCH010	
Code	Designation					Type Code	Designation
GSCH011/101	245kV-STJ-E-1x2500+T41	245	2500	Tube	41	GSCH010/001	245kV2500AI+T363
GSCH011/109	145kV-STJ-E-1x1200+T31,5	145	1200	Tube	31,5	GSCH010/009	145kV1200AI+T242
GSCH011/110	145kV-STJ-E-1x800+T31,5	145	800	Tube	31,5	GSCH010/010	145kV800AI+T242
GSCH011/151	245kV-STJ-E-1x2500+H41	245	2500	Wires	41	GSCH010/051	245kV2500Cu+H240

## ANNEX B.3 – GLOBAL TYPE CODES FOR SCREEN INTERRUPTION JOINTS

GSCH011 Type Codes for Type III Joints: SIJ		Um [kV]	Conductor Section [mm <sup>2</sup> ]	Screen Type	Nominal I <sub>cc</sub> (0,5 s) [kA]	For use on cable GSCH010	
Code	Designation					Type Code	Designation
GSCH011/201	245kV-SIJ-1x2500+T41	245	2500	Tube	41	GSCH010/001	245kV2500AI+T363
GSCH011/202	245kV-SIJ-1x2000+T41	245	2000	Tube	41	GSCH010/002	245kV2000AI+T363
GSCH011/203	245kV-SIJ-1x1600+T41	245	1600	Tube	41	GSCH010/003	245kV1600AI+T363
GSCH011/204	245kV-SIJ-1x1000+T41	245	1000	Tube	41	GSCH010/004	245kV1000AI+T363
GSCH011/205	245kV-SIJ-1x800+T41	245	800	Tube	41	GSCH010/005	245kV800AI+T363
GSCH011/206	170kV-SIJ-1x1600+T31,5	170	1600	Tube	31,5	GSCH010/006	170kV1600AI+T242
GSCH011/207	170kV-SIJ-1x1000+T31,5	170	1000	Tube	31,5	GSCH010/007	170kV1000AI+T242
GSCH011/208	170kV-SIJ-1x630+T31,5	170	630	Tube	31,5	GSCH010/008	170kV630AI+T242
GSCH011/209	145kV-SIJ-1x1200+T31,5	145	1200	Tube	31,5	GSCH010/009	145kV1200AI+T242
GSCH011/210	145kV-SIJ-1x800+T31,5	145	800	Tube	31,5	GSCH010/010	145kV800AI+T242
GSCH011/211	145kV-SIJ-1x630+T31,5	145	630	Tube	31,5	GSCH010/011	145kV630AI+T242
GSCH011/212	72,5kV-SIJ-1x1000+T20	72,5	1000	Tube	20	GSCH010/012	72,5kV1000AI+T144
GSCH011/213	72,5kV-SIJ-1x630+T20	72,5	630	Tube	20	GSCH010/013	72,5kV630AI+T144
GSCH011/214	52kV-SIJ-1x800+T11	52	800	Tube	9,3	GSCH010/014	52kV800AI+T76
GSCH011/215	52kV-SIJ-1x400+T11	52	400	Tube	9,3	GSCH010/015	52kV400AI+T76
GSCH011/216	170kV-SIJ-1x1600+H20	170	1600	Wires	20	GSCH010/016	170kV1600AI+H95





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**Application Areas**Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

GSCH011 Type Codes for Type III Joints: SIJ		Um [kV]	Conductor Section [mm <sup>2</sup> ]	Screen Type	Nominal I <sub>cc</sub> (0,5 s) [kA]	For use on cable GSCH010	
Code	Designation					Type Code	Designation
GSCH011/217	170kV-SIJ-1x1000+H20	170	1000	Wires	20	GSCH010/017	170kV1000Al+H95
GSCH011/218	170kV-SIJ-1x630+H20	170	630	Wires	20	GSCH010/018	170kV630Al+H95
GSCH011/219	145kV-SIJ-1x1200+H41	145	1200	Wires	41	GSCH010/019	145kV1200Al+H240
<i>GSCH011/219*</i>	145kV-SIJ-1x1200+H41	145	1200	Wires	41	GSCH010/020	145kV1200Al+H120
<i>GSCH011/226*</i>	145kV-SIJ-1x630+H31,5	145	630	Wires	31,5	GSCH010/021	145kV630Al+H120
<i>GSCH011/229*</i>	72,5kV-SIJ-1x2000+H41	72,5	2000	Wires	41	GSCH010/022	72,5kV2000Al+H240
GSCH011/223	72,5kV-SIJ-1x1000+H20	72,5	1000	Wires	20	GSCH010/023	72,5kV1000Al+H95
GSCH011/224	72,5kV-SIJ-1x800+H41	72,5	800	Wires	41	GSCH010/024	72,5kV800Al+H240
GSCH011/225	52kV-SIJ-1x400+H11	52	400	Wires	9,3	GSCH010/025	52kV400Al+H50
GSCH011/226	145kV-SIJ-1x630+H31,5	145	630	Wires	31,5	GSCH010/026	145kV630Cu+H160
GSCH011/227	72,5kV-SIJ-1x1200+H41	72,5	1200	Wires	41	GSCH010/027	72,5kV1200Cu+H240
GSCH011/228	72,5kV-SIJ-1x630+H41	72,5	630	Wires	41	GSCH010/028	72,5kV630Cu+H240
GSCH011/229	72,5kV-SIJ-1x2000+H41	72,5	2000	Wires	41	GSCH010/029	72,5kV2000Cu+H240
GSCH011/230	245kV-SIJ-1x1200+H41	245	1200	Wires	41	GSCH010/030	245kV1200Cu+H240
GSCH011/231	245kV-SIJ-1x2000+H41	245	2000	Wires	41	GSCH010/031	245kV2000Cu+H240
<i>GSCH011/219*</i>	145kV-SIJ-1x1200+H41	145	1200	Wires	41	GSCH010/032	145kV1200Cu+H120
GSCH011/233	145kV-SIJ-1x1600+H31,5	145	1600	Wires	31,5	GSCH010/033	145kV1600Cu+H120
GSCH011/234	145kV-SIJ-1x2000+H31,5	145	2000	Wires	31,5	GSCH010/034	145kV2000Cu+H120
GSCH011/235	145kV-SIJ-1x400+H31,5	145	400	Wires	31,5	GSCH010/035	145kV400Al+H120
GSCH011/236	145kV-SIJ-1x800+H31,5	145	800	Wires	31,5	GSCH010/036	145kV800Al+H120
GSCH011/237	145kV-SIJ-1x1000+H31,5	145	1000	Wires	31,5	GSCH010/037	145kV1000Al+H120
<i>GSCH011/233*</i>	145kV-SIJ-1x1600+H31,5	145	1600	Wires	31,5	GSCH010/038	145kV1600Al+H120
<i>GSCH011/234*</i>	145kV-SIJ-1x2000+H31,5	145	2000	Wires	31,5	GSCH010/039	145kV2000Al+H120
<i>GSCH011/235*</i>	145kV-SIJ-1x400+H31,5	145	400	Wires	31,5	GSCH010/040	145kV400Cu+H120
GSCH011/241	145kV-SIJ-1x2500+H31,5	145	2500	Wires	31,5	GSCH010/041	145kV2500Cu+H120
GSCH011/242	72,5kV-SIJ-1x500+H41	72,5	500	Wires	41	GSCH010/042	72,5kV500Cu+H240
GSCH011/243	245kV-SIJ-1x1600+H41	245	1600	Wires	41	GSCH010/043	245kV1600Cu+H240
<i>GSCH011/241*</i>	145kV-SIJ-1x2500+H31,5	145	2500	Wires	31,5	GSCH010/044	145kV2500Al+H120
GSCH011/245	145kV-SIJ-1x500+H31,5	145	500	Wires	31,5	GSCH010/045	145kV500Al+H120
GSCH011/246	145kV-SIJ-1x2000+T31,5	145	2000	Tube	31,5	GSCH010/046	145kV2000Cu+T242
GSCH011/247	145kV-SIJ-1x1600+T31,5	145	1600	Tube	31,5	GSCH010/047	145kV1600Al+T242
GSCH011/248	145kV-SIJ-1x1000+T31,5	145	1000	Tube	31,5	GSCH010/048	145kV1000Al+T242
GSCH011/249	52kV-SIJ-1x800+H11	52	800	Wires	9,3	GSCH010/049	52kV800Al+H50
<i>GSCH011/201*</i>	245kV-SIJ-1x2500+T41	245	2500	Tube	41	GSCH010/050	245kV2500Cu+T363
GSCH011/251	245kV-SIJ-1x2500+H41	245	2500	Wires	41	GSCH010/051	245kV2500Cu+H240

\* Codes that appears on the table more than one time because they are used for more than one cable.

**Subject:** Global Infrastructure and Networks - GSCH011 Joints for Underground High Voltage Cables.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

**ANNEX C – COMMON LIST**

COMMON LIST					17/12/2021
GS Type Code	Designation	Distribution Company and Country	Country Code	TAM Description	
GSCH011/109	145 kV - STJ-E - 1x1200 +T31,5	EDESUR Argentina	TBD	-	
GSCH011/110	145 kV - STJ-E - 1x800 +T31,5	EDESUR Argentina	TBD	-	
GSCH011/151	245 kV - STJ-E - 1x2500 +H41	EDESUR Argentina	TBD	-	
GSCH011/101	245 kV - STJ-E - 1x2500 +T41	EDESUR Argentina	TBD	-	
GSCH011/209	145 kV - SIJ - 1x1200 +T31,5	EDESUR Argentina	TBD	-	
GSCH011/210	145 kV - SIJ - 1x800 +T31,5	EDESUR Argentina	TBD	-	
GSCH011/251	245 kV - SIJ - 1x2500 +H41	EDESUR Argentina	TBD	-	
GSCH011/201	245 kV - SIJ - 1x2500 +T41	EDESUR Argentina	TBD	-	
GSCH011/018	170 kV - STJ - 1x630 +H20	edistribuzione Italia	TBD	-	
GSCH011/017	170 kV - STJ - 1x1000 +H20	edistribuzione Italia	TBD	-	
GSCH011/016	170 kV - STJ - 1x1600 +H20	edistribuzione Italia	TBD	-	
GSCH011/008	170 kV - STJ - 1x630 +T31,5	edistribuzione Italia	TBD	-	
GSCH011/007	170 kV - STJ - 1x1000 +T31,5	edistribuzione Italia	TBD	-	
GSCH011/006	170 kV - STJ - 1x1600 +T31,5	edistribuzione Italia	TBD	-	
GSCH011/003	245 kV - STJ - 1x1600 +T41	edistribuzione Italia	TBD	-	
GSCH011/218	170 kV - SIJ - 1x630 +H20	edistribuzione Italia	TBD	-	
GSCH011/217	170 kV - SIJ - 1x1000 +H20	edistribuzione Italia	TBD	-	
GSCH011/216	170 kV - SIJ - 1x1600 +H20	edistribuzione Italia	TBD	-	
GSCH011/208	170 kV - SIJ - 1x630 +T31,5	edistribuzione Italia	TBD	-	
GSCH011/207	170 kV - SIJ - 1x1000 +T31,5	edistribuzione Italia	TBD	-	
GSCH011/206	170 kV - SIJ - 1x1600 +T31,5	edistribuzione Italia	TBD	-	
GSCH011/203	245 kV - SIJ - 1x1600 +T41	edistribuzione Italia	TBD	-	
GSCH011/047	145 kV - STJ - 1x1600 +T31,5	Enel Romania	270028	Manson cablu subteran IT GSCH011 - Um 145 kV - STJ - 1x1600 +T31,5	
GSCH011/048	145 kV - STJ - 1x1000 +T31,5	Enel Romania	270029	Manson cablu subteran IT GSCH011 145 kV-STJ-1x1000+T31,5	
GSCH011/011	145 kV - STJ - 1x630 +T31,5	Enel Romania	270030	Manson cablu subteran IT GSCH011 145 kV-STJ-1x630+T31,5	
GSCH011/033	145 kV - STJ - 1x1600 +H31,5	Enel Romania	270031	Manson cablu subteran IT GSCH011 145 kV-STJ-1x1600+H31,5	
GSCH011/037	145 kV - STJ - 1x1000 +H31,5	Enel Romania	270032	Manson cablu subteran IT GSCH011 145 kV-STJ-1x1000+H31,5	
GSCH011/026	145 kV - STJ - 1x630 +H31,5	Enel Romania	270033	Manson cablu subteran IT GSCH011 145 kV-STJ-1x630+H31,5	
GSCH011/247	145 kV - SIJ - 1x1600 +T31,5	Enel Romania	270034	Manson cablu subteran IT GSCH011 145 kV-SIJ-1x1600+T31,5	
GSCH011/248	145 kV - SIJ - 1x1000 +T31,5	Enel Romania	270035	Manson cablu subteran IT GSCH011 145 kV - SIJ-1x1000+T31,5	
GSCH011/211	145 kV - SIJ - 1x630 +T31,5	Enel Romania	270036	Manson cablu subteran IT GSCH011 145 kV - SIJ-1x630+T31,5	
GSCH011/233	145 kV - SIJ - 1x1600 +H31,5	Enel Romania	270037	Manson cablu subteran IT GSCH011 145 kV-SIJ-1x1600+H31,5	
GSCH011/237	145 kV - SIJ - 1x1000 +H31,5	Enel Romania	270038	Manson cablu subteran IT GSCH011 145 kV-SIJ-1x1000+H31,5	

**Subject:** Global Infrastructure and Networks - GSCH011 Joints for Underground High Voltage Cables.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

COMMON LIST					17/12/2021
GS Type Code	Designation	Distribution Company and Country	Country Code	TAM Description	
GSCH011/226	145 kV - SIJ - 1x630 +H31,5	Enel Romania	270039	Manson cablu subteran IT GSCH011 145 kV-SIJ-1x630+H31,5	
GSCH011/009	145 kV - STJ - 1x1200 +T31,5	edistribución España	270176	145 kV - STJ - 1x1200 +T31,5	
GSCH011/011	145 kV - STJ - 1x630 +T31,5	edistribución España	270165	145 kV - STJ - 1x630 +T31,5	
GSCH011/012	72,5 kV - STJ - 1x1000 +T20	edistribución España	270182	72,5 kV - STJ - 1x1000 +T20	
GSCH011/013	72,5 kV - STJ - 1x630 +T20	edistribución España	270166	72,5 kV - STJ - 1x630 +T20	
GSCH011/014	52 kV - STJ - 1x800 +T11	edistribución España	270163	52 kV - STJ - 1x800 +T9,3	
GSCH011/015	52 kV - STJ - 1x400 +T11	edistribución España	270164	52 kV - STJ - 1x400 +T9,3	
GSCH011/019	145 kV - STJ - 1x1200 +H41	edistribución España	270160	145 kV - STJ - 1x1200 +H41	
GSCH011/026	145 kV - STJ - 1x630 +H31,5	edistribución España	270159	145 kV - STJ - 1x630 +H31,5	
GSCH011/023	72,5 kV - STJ - 1x1000 +H20	edistribución España	270158	72,5 kV - STJ - 1x1000 +H20	
GSCH011/025	52 kV - STJ - 1x400 +H11	edistribución España	270157	52 kV - STJ - 1x400 +H9,3	
GSCH011/049	52 kV - STJ - 1x800 +H11	edistribución España	270139	52 kV - STJ - 1x800 +H9,3	
GSCH011/209	145 kV - SIJ - 1x1200 +T31,5	edistribución España	270181	EMP SECC 145 kV - SIJ - 1x1200 +T31,5	
GSCH011/211	145 kV - SIJ - 1x630 +T31,5	edistribución España	270162	EMP SECC 145 kV - SIJ - 1x630 +T31,5	
GSCH011/212	72,5 kV - SIJ - 1x1000 +T20	edistribución España	270108	EMP SECC 72,5 kV - SIJ - 1x1000 +T20	
GSCH011/213	72,5 kV - SIJ - 1x630 +T20	edistribución España	270132	EMP SECCI 72,5 kV - SIJ - 1x630 +T20	
GSCH011/214	52 kV - SIJ - 1x800 +T11	edistribución España	270109	EMP SECC 52 kV - SIJ - 1x800 +T9,3	
GSCH011/215	52 kV - SIJ - 1x400 +T11	edistribución España	270105	EMP SECC 52 kV - SIJ - 1x400 +T9,3	
GSCH011/219	145 kV - SIJ - 1x1200 +H41	edistribución España	270107	EMP SECC 145 kV - SIJ - 1x1200 +H41	
GSCH011/226	145 kV - SIJ - 1x630 +H31,5	edistribución España	270106	EMP SECC 145 kV - SIJ - 1x630 +H31,5	
GSCH011/223	72,5 kV - SIJ - 1x1000 +H20	edistribución España	270167	EMP SECC 72,5 kV - SIJ - 1x1000 +H20	
GSCH011/225	52 kV - SIJ - 1x400 +H11	edistribución España	270104	EMP SECC 52 kV - SIJ - 1x400 +H9,3	
GSCH011/249	52 kV - SIJ - 1x800 +H11	edistribución España	270103	EMP SECC 52 kV - SIJ - 1x800 +H9,3	
GSCH011/009	145 kV - STJ - 1x1200 +T31,5 /FO	Enel Brazil	270244	EMENDA CABO ISOLADO - 145 kV - STJ - 1x1200 +T31,5 /FO (FIBRA ÓPTICA),GSCH011/009	
GSCH011/010	145 kV - STJ - 1x800 +T31,5 /FO	Enel Brazil	270245	EMENDA CABO ISOLADO - 145 kV - STJ - 1x800 +T31,5 /FO (FIBRA ÓPTICA),GSCH011/010	
GSCH011/011	145 kV - STJ - 1x630 +T31,5 /FO	Enel Brazil	270246	EMENDA CABO ISOLADO - 145 kV - STJ - 1x630 +T31,5 /FO (FIBRA ÓPTICA),GSCH011/011	
GSCH011/012	72,5 kV - STJ - 1x1000 +T20 /FO	Enel Brazil	270247	EMENDA CABO ISOLADO - 72,5 kV - STJ - 1x1000 +T20 /FO (FIBRA ÓPTICA),GSCH011/012	
GSCH011/013	72,5 kV - STJ - 1x630 +T20 /FO	Enel Brazil	270248	EMENDA CABO ISOLADO - 72,5 kV - STJ - 1x630 +T20 /FO (FIBRA ÓPTICA),GSCH011/013	
GSCH011/019	145 kV - STJ - 1x1200 +H41 /FO	Enel Brazil	270249	EMENDA CABO ISOLADO - 145 kV - STJ - 1x1200 +H41 /FO (FIBRA ÓPTICA),GSCH011/019	
GSCH011/026	145 kV - STJ - 1x630 +H31,5 /FO	Enel Brazil	270250	EMENDA CABO ISOLADO - 145 kV - STJ - 1x630 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/026	
GSCH011/023	72,5 kV - STJ - 1x1000 +H20 /FO	Enel Brazil	270251	EMENDA CABO ISOLADO - 72,5 kV - STJ - 1x1000 +H20 /FO (FIBRA ÓPTICA),GSCH011/023	
GSCH011/033	145 kV - STJ - 1x1600 +H31,5 /FO	Enel Brazil	270252	EMENDA CABO ISOLADO - 145 kV - STJ - 1x1600 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/033	
GSCH011/034	145 kV - STJ - 1x2000 +H31,5 /FO	Enel Brazil	270253	EMENDA CABO ISO 145kV,STJ,2000mm <sup>2</sup> GSCH011	
GSCH011/035	145 kV - STJ - 1x400 +H31,5 /FO	Enel Brazil	270254	EMENDA CABO ISO 145kV,STJ,400mm <sup>2</sup> GSCH011	
GSCH011/036	145 kV - STJ - 1x800 +H31,5 /FO	Enel Brazil	270255	EMENDA CABO ISO 145kV,STJ,800mm <sup>2</sup> GSCH011	
GSCH011/037	145 kV - STJ - 1x1000 +H31,5 /FO	Enel Brazil	270256	EMENDA CABO ISO 145kV,STJ,1000mm <sup>2</sup> GSCH011	

**Subject:** Global Infrastructure and Networks - GSCH011 Joints for Underground High Voltage Cables.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

COMMON LIST					17/12/2021
GS Type Code	Designation	Distribution Company and Country	Country Code	TAM Description	
GSCH011/041	145 kV - STJ - 1x2500 +H31,5 /FO	Enel Brazil	270257	EMENDA CABO ISO 145kV,STJ,2500mm <sup>2</sup> GSCH011	
GSCH011/045	145 kV - STJ - 1x500 +H31,5 /FO	Enel Brazil	270258	EMENDA CABO ISO 145kV,STJ,500mm <sup>2</sup> GSCH011	
GSCH011/209	145 kV - SIJ - 1x1200 +T31,5 /FO	Enel Brazil	270259	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x1200 +T31,5 /FO (FIBRA ÓPTICA),GSCH011/209	
GSCH011/210	145 kV - SIJ - 1x800 +T31,5 /FO	Enel Brazil	270269	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x800 +T31,5 /FO (FIBRA ÓPTICA),GSCH011/210	
GSCH011/211	145 kV - SIJ - 1x630 +T31,5 /FO	Enel Brazil	270268	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x630 +T31,5 /FO (FIBRA ÓPTICA),GSCH011/211	
GSCH011/212	72,5 kV - SIJ - 1x1000 +T20 /FO	Enel Brazil	270267	EMENDA CABO ISOLADO - 72,5 kV - SIJ - 1x1000 +T20 /FO (FIBRA ÓPTICA),GSCH011/212	
GSCH011/213	72,5 kV - SIJ - 1x630 +T20 /FO	Enel Brazil	270266	EMENDA CABO ISOLADO - 72,5 kV - SIJ - 1x630 +T20 /FO (FIBRA ÓPTICA),GSCH011/213	
GSCH011/219	145 kV - SIJ - 1x1200 +H41 /FO	Enel Brazil	270265	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x1200 +H41 /FO (FIBRA ÓPTICA),GSCH011/219	
GSCH011/226	145 kV - SIJ - 1x630 +H31,5 /FO	Enel Brazil	270264	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x630 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/226	
GSCH011/223	72,5 kV - SIJ - 1x1000 +H20 /FO	Enel Brazil	270263	EMENDA CABO ISOLADO - 72,5 kV - SIJ - 1x1000 +H20 /FO (FIBRA ÓPTICA),GSCH011/223	
GSCH011/233	145 kV - SIJ - 1x1600 +H31,5 /FO	Enel Brazil	270262	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x1600 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/233	
GSCH011/234	145 kV - SIJ - 1x2000 +H31,5 /FO	Enel Brazil	270261	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x2000 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/234	
GSCH011/235	145 kV - SIJ - 1x400 +H31,5 /FO	Enel Brazil	270260	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x400 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/235	
GSCH011/236	145 kV - SIJ - 1x800 +H31,5 /FO	Enel Brazil	270243	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x800 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/236	
GSCH011/237	145 kV - SIJ - 1x1000 +H31,5 /FO	Enel Brazil	270242	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x1000 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/237	
GSCH011/241	145 kV - SIJ - 1x2500 +H31,5 /FO	Enel Brazil	270241	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x2500 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/241	
GSCH011/245	145 kV - SIJ - 1x500 +H31,5 /FO	Enel Brazil	270240	EMENDA CABO ISOLADO - 145 kV - SIJ - 1x500 +H31,5 /FO (FIBRA ÓPTICA),GSCH011/245	
GSCH011/001	245 kV - STJ - 1x2500 +T41	Enel Chile	270219	GSCH011 - 245 kV - STJ - 1x2500 +T41	
GSCH011/002	245 kV - STJ - 1x2000 +T41	Enel Chile	TBD	-	
GSCH011/003	245 kV - STJ - 1x1600 +T41	Enel Chile	270218	GSCH011 - 245 kV - STJ - 1x1600 +T41	
GSCH011/004	245 kV - STJ - 1x1000 +T41	Enel Chile	270217	GSCH011 - 245 kV - STJ - 1x1000 +T41	
GSCH011/009	145 kV - STJ - 1x1200 +T31,5	Enel Chile	270216	GSCH011 - 145 kV - STJ - 1x1200 +T31,5	
GSCH011/011	145 kV - STJ - 1x630 +T31,5	Enel Chile	270215	GSCH011 - 145 kV - STJ - 1x630 +T31,5	
GSCH011/019	145 kV - STJ - 1x1200 +H41	Enel Chile	270214	GSCH011 - 145 kV - STJ - 1x1200 +H41	
GSCH011/026	145 kV - STJ - 1x630 +H31,5	Enel Chile	270213	GSCH011 - 145 kV - STJ - 1x630 +H31,5	
GSCH011/034	145 kV - STJ - 1x2000 +H31,5	Enel Chile	270211	GSCH011 - 145 kV - STJ - 1x2000 +H31,5	
GSCH011/033	145 kV - STJ - 1x1600 +H31,5	Enel Chile	270212	GSCH011 - 145 kV - STJ - 1x1600 +H31,5	
GSCH011/035	145 kV - STJ - 1x400 +H31,5	Enel Chile	270210	GSCH011 - 145 kV - STJ - 1x400 +H31,5	
GSCH011/046	145 kV - STJ - 1x2000 +T31,5	Enel Chile	270209	GSCH011 - 145 kV - STJ - 1x2000 +T31,5	
GSCH011/047	145 kV - STJ - 1x1600 +T31,5	Enel Chile	270208	GSCH011 - 145 kV - STJ - 1x1600 +T31,5	
GSCH011/201	245 kV - SIJ - 1x2500 +T41	Enel Chile	270207	GSCH011 - 245 kV - SIJ - 1x2500 +T41	
GSCH011/202	245 kV - SIJ - 1x2000 +T41	Enel Chile	270206	GSCH011 - 245 kV - SIJ - 1x2000 +T41	
GSCH011/203	245 kV - SIJ - 1x1600 +T41	Enel Chile	270205	GSCH011 - 245 kV - SIJ - 1x1600 +T41	

**Subject:** Global Infrastructure and Networks - GSCH011 Joints for Underground High Voltage Cables.

**Application Areas**

Perimeter: *Global*

Staff Function: -

Service Function: -

Business Line: *Infrastructure & Networks*

COMMON LIST					17/12/2021
GS Type Code	Designation	Distribution Company and Country	Country Code	TAM Description	
GSCH011/204	245 kV - SIJ - 1x1000 +T41	Enel Chile	270204	GSCH011 - 245 kV - SIJ - 1x1000 +T41	
GSCH011/209	145 kV - SIJ - 1x1200 +T31,5	Enel Chile	270203	GSCH011 - 145 kV - SIJ - 1x1200 +T31,5	
GSCH011/211	145 kV - SIJ - 1x630 +T31,5	Enel Chile	270202	GSCH011 - 145 kV - SIJ - 1x630 +T31,5	
GSCH011/219	145 kV - SIJ - 1x1200 +H41	Enel Chile	270201	GSCH011 - 145 kV - SIJ - 1x1200 +H41	
GSCH011/226	145 kV - SIJ - 1x630 +H31,5	Enel Chile	270200	GSCH011 - 145 kV - SIJ - 1x630 +H31,5	
GSCH011/234	145 kV - SIJ - 1x2000 +H31,5	Enel Chile	270199	GSCH011 - 145 kV - SIJ - 1x2000 +H31,5	
GSCH011/233	145 kV - SIJ - 1x1600 +H31,5	Enel Chile	270198	GSCH011 - 145 kV - SIJ - 1x1600 +H31,5	
GSCH011/235	145 kV - SIJ - 1x400 +H31,5	Enel Chile	270197	GSCH011 - 145 kV - SIJ - 1x400 +H31,5	
GSCH011/246	145 kV - SIJ - 1x2000 +T31,5	Enel Chile	270196	GSCH011 - 145 kV - SIJ - 1x2000 +T31,5	
GSCH011/247	145 kV - SIJ - 1x1600 +T31,5	Enel Chile	270195	GSCH011 - 145 kV - SIJ - 1x1600 +T31,5	
GSCH011/002	245 kV - STJ - 1x2000 +T41	Enel Perú	270239	Empalme STJ 245kV cable Al 2000mm2	
GSCH011/005	245 kV - STJ - 1x800 +T41	Enel Perú	270238	Empalme STJ 245kV cable Al 800mm2	
GSCH011/024	72,5 kV - STJ - 1x800 +H41	Enel Perú	270237	Empalme STJ 72,5kV cable Al 800mm2	
GSCH011/027	72,5 kV - STJ - 1x1200 +H41	Enel Perú	270236	Empalme STJ 72,5kV cable Cu 1200mm2	
GSCH011/028	72,5 kV - STJ - 1x630 +H41	Enel Perú	270235	Empalme STJ 72,5kV cable Cu 630mm2	
GSCH011/029	72,5 kV - STJ - 1x2000 +H41	Enel Perú	270234	Empalme STJ 72,5kV cable Cu 2000mm2	
GSCH011/030	245 kV - STJ - 1x1200 +H41	Enel Perú	270233	Empalme STJ 245kV cable Cu 1200mm2	
GSCH011/031	245 kV - STJ - 1x2000 +H41	Enel Perú	270232	Empalme STJ 245kV cable Cu 2000mm2	
GSCH011/042	72,5 kV - STJ - 1x500 +H41	Enel Perú	270231	Empalme STJ 72,5kV cable Cu 500mm2	
GSCH011/043	245 kV - STJ - 1x1600 +H41	Enel Perú	270230	Empalme STJ 245kV cable Cu 1600mm2	
GSCH011/202	245 kV - SIJ - 1x2000 +T41	Enel Perú	270229	Empalme SIJ 245kV cable Al 2000mm2	
GSCH011/205	245 kV - SIJ - 1x800 +T41	Enel Perú	270228	Empalme SIJ 245kV cable Al 800mm2	
GSCH011/224	72,5 kV - SIJ - 1x800 +H41	Enel Perú	270227	Empalme SIJ 72,5kV cable Al 800mm2	
GSCH011/227	72,5 kV - SIJ - 1x1200 +H41	Enel Perú	270226	Empalme SIJ 72,5kV cable Cu 1200mm2	
GSCH011/228	72,5 kV - SIJ - 1x630 +H41	Enel Perú	270225	Empalme SIJ 72,5kV cable Cu 630mm2	
GSCH011/229	72,5 kV - SIJ - 1x2000 +H41	Enel Perú	270224	Empalme SIJ 72,5kV cable Cu 2000mm2	
GSCH011/230	245 kV - SIJ - 1x1200 +H41	Enel Perú	270223	Empalme SIJ 245kV cable Cu 1200mm2	
GSCH011/231	245 kV - SIJ - 1x2000 +H41	Enel Perú	270222	Empalme SIJ 245kV cable Cu 2000mm2	
GSCH011/242	72,5 kV - SIJ - 1x500 +H41	Enel Perú	270221	Empalme SIJ 72,5kV cable Cu 500mm2	
GSCH011/243	245 kV - SIJ - 1x1600 +H41	Enel Perú	270220	Empalme SIJ 245kV cable Cu 1600mm2	
GSCH011/019	145 kV - STJ - 1x1200 +H41	Codensa Colombia	TBD	-	
GSCH011/219	145 kV - SIJ - 1x1200 +H41	Codensa Colombia	TBD	-	