EHV XLPE Cable & Accessories

TAIHAN
ELECTRIC WIRE CO., LTD.

Connecting the World, Lighting up the Future

Building on our core competencies through more than 50 years in the cable business, TAIHAN is gearing up for a new future. With technologies ahead of the world, we will achieve our vision of global leading company.

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Contents

Having led the establishment of the nation's power network for the half-century, TAIHAN has led the development of extra high voltage cables since the 1970s and been recognized for the world class technology in XLPE underground cable. We have continued to increase its technology to 230kV and 345kV XLPE cables through advancement of technology and facilities. In step with the ever increasing power consumption and the expansion of extra high voltage cable demand, we reinforced the production capacity by equipping the 125 meters high VCV Tower, to produce high quality extra high voltage XLPE cable up to 500kV grade. Furthermore, we produce and supply quality accessories and joints materials for extra high voltage cables. From raw materials, production process, testing of products, to network design & installation, we have strictly controlled the quality of products and elevated ourselves to an extra high voltage cable specialist trusted by the world's major markets including Asia, Middle East, US, and Australia.

History of EHV XLPE Cable& Accessories

1983	Constructed the VCV extra high voltage power cable plant in Anyang
1984	Developed and produced 154kV XLPE cable
1985	Exported 132kV XLPE cable for the first time in Korea (Malaysia)
1993	Acquired ISO 9001 certificate on power cable for the first time in Korea
1996	Constructed new VCV tower and extra high voltage power cable plant in Anyang Acquired ISO 9001 certificate on power cable accessories
2000	Acquired ISO 9001 certificate on extra high voltage underground power cable
2001	Acquired ISO 14001 certificate for environmental management system
2002	Developed and commercialized the 345kV XLPE cable and accessories
2003	Supplied 345kV XLPE cable to KEPCO for the first time in Korea
2004	Developed 400kV XLPE cable and accessories (KEMA certificate) Developed Pre-molded joint for 400kV XLPE cable
2006	Installed new VCV line for extra high voltage power cable
2007	Constructed extra high voltage power accessory plant in Dangjin

XLPE(Cross-Linked Polyethylene) insulated cables have been widely used for electric power distribution of voltage up to 30kV grade since they were develpoed in 1960 to replace the paper insulated cables and other thermoplastic insulated cables. XLPE cables have many excellent characteristics, especially for use in higher operating temperature. Generally PE insulated cables can be used in maximum operating temperature of 70°C and paper insulated cables in 85°C, but XLPE cables, which have more compact crystallity than PE by cross-linking process, can be used up to 90°C in normal condition. The major merits of XLPE cables can be illustrated as follows;

- excellent electrical properties
- higher operating temperature, higher current capacity
- excellent physical and mechanical properties
- anti-chemical properties
- ease of jointing, installation and maintenance

Introduction of XLPE Cable

XLPE cables, however, had been scarcely used for extra high voltage exceeding 30kV grade because of its weakness for water treeing phenomena which occurs in the insulation in long-term operating situation. Water treeing is a phenomena of gradual insulation destroying due to water concentration onto some weak points in the insulation.

The water can be invaded through the polymeric materials in gaseous states and /or contained in insulation materials together with small voids and impurities during extrusion, steam-curing and cooling process. These waters can be concentrated onto weak points due to high electric intensity and repeating switching operation, and eventually formed a treeshaped tunnel from inside to outer surface of insulation.

But nowadays, with the aid of technical development in cable manufacturing field, water treeing phenomena cannot be an obstacle any more to extent the voltage grade higher. Water invasion from the outside of cable can be prevented by adopting water-proof seamless metal sheath and water contents in insulation during manufacturing process can be practically minimized by adopting dry curing cross-linking process instead of steam-curing method.

Many researches and develpoments are accomplished in many develpoed countries including ourselves and it shows excellent operating experiences. 66kV and 77kV grade XLPE cables have already been used since early 1970s and now XLPE cables up to and including 230kV grade are popularly being adopted for power transmission lines. 345kV grade and 500kV grade cables are also developed and under operations.

Cables Specification of XLPE Cable

Scope

This specification applies to materials and constructions of cross-linked thermosetting polyethylene (XLPE) cables for extra high voltage transmission of rated voltage from 66kV grade upto and including 345kV grade. This specification deals manufacturer's standard models of the cable, however any other models as for buyer's standard are also available.

Conductor

The conductor shall be formed from plain copper or aluminum complying with Korean Standard KS C 3101, British Standard 6360/6791, IEC Publication 228 or ICEA S-66-524. The conductor shall be stranded circular, compacted circular, or segmental compacted circular. Segmental compacted circular conductors shall be applied to cables of conductor nominal cross-sectional areas of 800mm^2 and above.

Conductor Shielding

Conductor shielding of an extruded semi-conducting thermosetting compound shall be applied over the conductor. One or two layer of semi- conducting tape(s) may be applied with a proper lapping between the conductor and the extruded semi-conducting layer.

Insulation

The insulation shall be of dry-cured XLPE compound with a thickness to meet dimensional, electrical and physical requirements specified. The compound shall be high quality, heat-,moisture-, ozone- and corona-resitant. This insulation shall be suitable for operation in wet or dry locations at conductor temperature not exceeding 90°C for normal condition, 130°C for emergency overload conditions and 250°C for short circuit conditions.

Insulation Shielding

The insulation shielding shall be applied direct upon the insulation and shall consist of either a semiconducting tape or a layer of extruded semi-conducting compound, or combination of these materials. The extruded semiconducting compound shall be a ther-mosetting or thermosetting compound and firmly and totally bonded to the insulation.

Matallic Layer

The metallic layer can be applied over the insulation shielding to reinforce the capability of carrying fault current specified, if required. The metallic layer will be one of the next page's forms; (**Fig.1**)

Inner Plastic Bedding

If required, extruded layer of a thermoplastic compound, PVC or PE canbe applied.

Metal Tape Moisture Barrier

When the moisture barrier required, a layer of aluminum tape laminated at both or outer side with copolymer shall be applied longitudinally over the cable core with an overlap so as to lap parts of the tape on each other.

Outer Jacket

The outer jacket shall consist of thermoplastic compound(PVC, PE or similar materials) extruded continuously over the metallic layer or moisture barrier. A bituminous compound primer shall be applied under the outer jacket to protect the sheath against local corrosion when corrugated aluminum sheath or lead alloy sheath is adopted.

Copper Wire Shield (CWS)

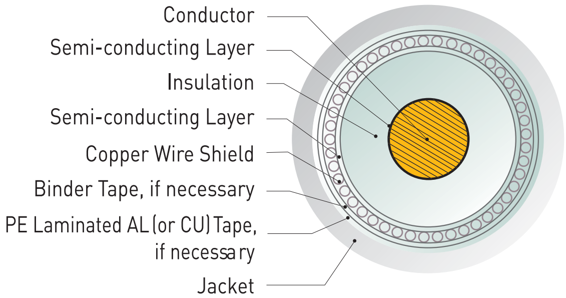
When a layer of copper wire shield is required, it shall be applied directly over the insulation shielding with a length of lay of approximately 10 times the diameter over the screen conductors and with gaps not less than 0.1mm, if not specified. One or more layers of suitable separator tape may be applied helically over a layer of CWS.

Corrugated Aluminum

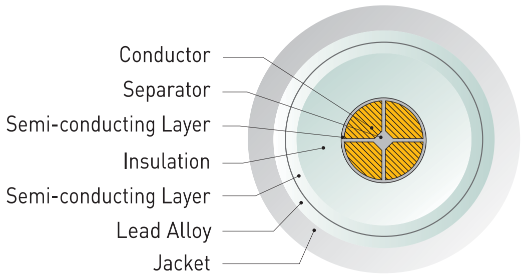
When the corrugated aluminum sheath is required, it shall be applied by extrusion and then passing through a corrugating head. The corrugating head contains rotating dies to form the valleys between the ribs like sine wave and produce to correct diameter of sheath to fit over the insulation. The sheath shall be free from pinholes flaws and other imperfections.
When the aluminum sheath is applied directly over the extruded semi-conducting layer or inner plastic bedding, suitable non-metallic tape(s) can be applied under the aluminum sheath to prevent heat transfer onto the plastic material during the manufacturing.

Fig.1

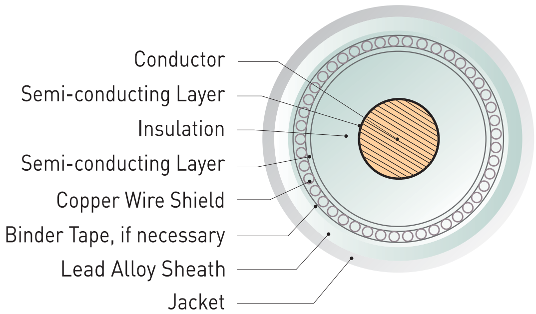
Copper Wire Shield Type



Metallic Sheath Type



Copper Wire Shield & Lead Alloy Sheath Type



Lead Alloy

When the lead alloy sheath is required, it shall be applied by a continuous screw extrusion in high quality, smooth surface and free from pinholes and any other imperfections including one associated with oxide inclusions. When the lead sheath is applied directly over the extruded semi-conducting layer or inner plastic bedding, suitable non-magnetic tape(s) can be applied under the lead sheath to prevent heat transfer onto the plastic material during the manufacturing. The composition of lead alloy of composition of Cu 0.04%, Te 0.04% and the remainder for lead will be applied.

Insulation Thickness

The insulation thickness of XLPE cable must be based on its ability to withstand lightening impulse voltage as well as operating voltage throughout its expected life. For the design of XLPE cable, the nominal thickness of insulation is determined by AC withstand voltage (V_{AC}) or impulse withstand voltage(V_{imp}), that can be determined by following formula. Larger value of T_{AC} and T_{imp} should be determined as minimum thickness of insulation.

Design and Construction of XLPE Cable

Construction

$T_{AC} = V_{AC}/E_L(AC)$, $T_{imp} = V_{imp}/E_L(imp)$

Where,

1) Value of E_L

$E_L(AC)$: minimum breakdown stress obtained from weibull distribution plot for AC. (kV/mm)

$E_L(imp)$: minimum breakdown stress obtained from weibull distribution for impulse. (kV/mm)

2) Value of V_{AC}

$$\text{*AC withstand voltage} = \frac{E_0}{\sqrt{3}} \times \frac{1.5}{1.1} \times K_1 \times K_2 \times K_3$$

Where,

E_0 : nominal voltage(kV)
K_1 : safety factor
K_2 : deterioration coefficient of XLPE cable under electrical stresses
K_3 : temperature coefficient corresponding to the ratio of break down stresses of the cable at room temperature to those at maximum permissible temperature (90°C)

3) Value of V_{imp}

$$\text{Imp withstand voltage} = B_{IL} \times K'_1 \times K'_2 \times k'_3$$

Where,

B_{IL} : basic impulse level(kV)
K'_1 : safety factor
K'_2 : deterioration coefficient of XLPE cable under electrical stresses
K'_3 : temperature coefficient corresponding to the ratio of breakdown stresses of the cable at room temperature to those at maximum permissible temperature (90°C)

66kV Single Core Cable

Aluminum Sheath Type

Construction Copper Conductor / XLPE Insulation / Aluminum Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor Shield	Thick of Insulation	Approx. Thick of Insulation Shield	Thick of Sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape							
(mm^2)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
200	C.C	1.0	11.0	1.5	1.5	3.5	64.0	5.2
250	C.C	1.0	11.0	1.5	1.6	3.5	67.0	5.9
325	C.C	1.0	11.0	1.5	1.6	3.5	70.0	7.0
400	C.C	1.0	11.0	1.5	1.7	3.5	74.0	8.1
500	C.C	1.0	11.0	1.5	1.7	3.5	76.0	9.1
600	C.C	1.0	11.0	1.5	1.8	3.5	80.0	10.4
800	SEG	2.0	11.0	1.5	1.9	3.5	87.0	13.2
1000	SEG	2.0	11.0	1.5	2.0	3.5	92.0	15.6
1200	SEG	2.0	11.0	1.5	2.1	3.5	98.0	18.0
1400	SEG	2.0	11.0	1.5	2.1	3.5	101.0	20.3
1600	SEG	2.0	11.0	1.5	2.2	3.5	105.0	22.5
1800	SEG	2.0	11.0	1.5	2.3	3.5	108.0	24.5
2000	SEG	2.0	11.0	1.5	2.3	3.5	111.0	26.9

* C.C:Circular Compacted, SEG:Segmental Compacted

Copper Wire Shield Type

Construction Copper Conductor / XLPE Insulation / Copper Wire Shield / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor Shield	Thick of Insulation	Approx. Thick of Insulation Shield	No. of Wire	Dia. of Wire	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape								
(mm^2)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)	(kg/m)
200	C.C	1.0	11.0	1.5	40	1.2	3.5	56.0	4.5
250	C.C	1.0	11.0	1.5	40	1.2	3.5	58.0	5.1
325	C.C	1.0	11.0	1.5	40	1.2	3.5	60.0	5.9
400	C.C	1.0	11.0	1.5	40	1.2	4.0	64.0	6.9
500	C.C	1.0	11.0	1.5	40	1.2	4.0	67.0	8.0
600	C.C	1.0	11.0	1.5	40	1.2	4.0	69.0	9.1
800	SEG	2.0	11.0	1.5	40	1.2	4.5	77.0	11.7
1000	SEG	2.0	11.0	1.5	40	1.2	4.5	81.0	13.7
1200	SEG	2.0	11.0	1.5	40	1.2	4.5	85.0	15.7
1400	SEG	2.0	11.0	1.5	40	1.2	4.5	89.0	17.9
1600	SEG	2.0	11.0	1.5	40	1.2	4.5	92.0	19.8
1800	SEG	2.0	11.0	1.5	40	1.2	4.5	95.0	21.8
2000	SEG	2.0	11.0	1.5	40	1.2	4.5	98.0	23.8

* C.C:Circular Compacted, SEG:Segmental Compacted

77kV Single Core Cable

Aluminum Sheath Type

Construction Copper Conductor / XLPE Insulation / Aluminum Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor Shield	Thick of Insulation	Approx. Thick of Insulation Shield	Thick of Sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape							
(mm^2)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
200	C.C	1.0	13.0	1.5	1.6	3.5	69.0	5.2
250	C.C	1.0	13.0	1.5	1.6	3.5	72.0	6.6
325	C.C	1.0	13.0	1.5	1.7	3.5	75.0	7.5
400	C.C	1.0	13.0	1.5	1.8	3.5	78.0	8.5
500	C.C	1.0	13.0	1.5	1.8	3.5	81.0	9.6
600	C.C	1.0	13.0	1.5	1.9	3.5	84.0	10.9
800	SEG	2.0	13.0	1.5	2.0	3.5	92.0	14.0
1000	SEG	2.0	13.0	1.5	2.1	3.5	97.0	16.4
1200	SEG	2.0	13.0	1.5	2.2	3.5	102.0	18.7
1400	SEG	2.0	13.0	1.5	2.2	3.5	106.0	21.0
1600	SEG	2.0	13.0	1.5	2.3	3.5	110.0	23.3
1800	SEG	2.0	13.0	1.5	2.3	3.5	112.0	25.2
2000	SEG	2.0	13.0	1.5	2.4	3.5	116.0	27.7

* C.C:Circular Compacted, SEG:Segmental Compacted

Copper Wire Shield Type

Construction Copper Conductor / XLPE Insulation / Copper Wire Shield / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor Shield	Thick of Insulation	Approx. Thick of Insulation Shield	No. of Wire	Dia. of Wire	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape								
(mm^2)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)	(kg/m)
200	C.C	1.0	13.0	1.5	40	1.2	3.5	60.0	4.8
250	C.C	1.0	13.0	1.5	40	1.2	3.5	62.0	5.3
325	C.C	1.0	13.0	1.5	40	1.2	3.5	64.0	6.2
400	C.C	1.0	13.0	1.5	40	1.2	4.0	67.0	7.2
500	C.C	1.0	13.0	1.5	40	1.2	4.0	70.0	8.3
600	C.C	1.0	13.0	1.5	40	1.2	4.0	73.0	9.4
800	SEG	2.0	13.0	1.5	40	1.2	4.5	81.0	12.1
1000	SEG	2.0	13.0	1.5	40	1.2	4.5	86.0	14.2
1200	SEG	2.0	13.0	1.5	40	1.2	4.5	90.0	16.3
1400	SEG	2.0	13.0	1.5	40	1.2	4.5	94.0	18.4
1600	SEG	2.0	13.0	1.5	40	1.2	4.5	97.0	20.4
1800	SEG	2.0	13.0	1.5	40	1.2	4.5	100.0	22.4
2000	SEG	2.0	13.0	1.5	40	1.2	4.5	103.0	24.4

* C.C:Circular Compacted, SEG:Segmental Compacted

110kV Single Core Cable

Aluminum Sheath Type

Construction Copper Conductor / XLPE Insulation / Aluminum Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape							
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
400	C.C	1.5	15.0	1.2	1.8	4.0	83	9.3
500	C.C	1.5	15.0	1.2	1.9	4.0	86	10.8
630	C.C	1.5	15.0	1.2	2.0	4.0	92	12.7
800	SEG	2.0	15.0	1.2	2.1	4.0	97	15.4
1000	SEG	2.0	15.0	1.2	2.2	4.0	102	17.9
1200	SEG	2.0	15.0	1.2	2.3	4.0	108	20.2
2000	SEG	2.0	15.0	1.2	2.5	4.0	122	29.6

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity(40kA/1sec)

Copper Wire Shield & Lead Sheath Type

Construction Copper Conductor / XLPE Insulation / Copper Wire Shield / Lead Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	No.of wire (ea) / Dia.of wire	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape								
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
400	C.C	1.5	15.0	1.2	Φ2.0x67ea	2.5	4.0	81	15.5
500	C.C	1.5	15.0	1.2	Φ2.0x70ea	2.6	4.0	84	17.4
630	C.C	1.5	15.0	1.2	Φ1.9x67ea	2.7	4.0	88	19.3
800	SEG	2.0	15.0	1.2	Φ1.8x70ea	2.9	4.0	94	22.8
1000	SEG	2.0	15.0	1.2	Φ1.8x65ea	3.0	4.0	98	25.6
1200	SEG	2.0	15.0	1.2	Φ1.7x67ea	3.1	4.0	102	28.1
2000	SEG	2.0	15.0	1.2	Φ1.4x70ea	3.5	4.0	115	39.1

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity(40kA/1sec)

132kV Single Core Cable

Aluminum Sheath Type

Construction Copper Conductor / XLPE Insulation / Aluminum Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape							
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
400	C.C	1.5	16	1.2	1.9	4.0	88	9.8
500	C.C	1.5	16	1.2	2.0	4.0	92	11.2
630	C.C	1.5	16	1.2	2.1	4.0	96	13.1
800	SEG	2.0	16	1.2	2.2	4.0	102	15.7
1000	SEG	2.0	16	1.2	2.3	4.0	109	18.4
1200	SEG	2.0	16	1.2	2.3	4.0	113	20.4
2000	SEG	2.0	16	1.2	2.6	4.0	126	29.9

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity(40kA/1sec)

Copper Wire Shield & Lead Sheath Type

Construction Copper Conductor / XLPE Insulation / Copper Wire Shield / Lead Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	No.of wire (ea) / Dia.of wire	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape								
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
400	C.C	1.5	16	1.2	Φ2.0x67ea	2.5	4.0	82	15.5
500	C.C	1.5	16	1.2	Φ1.9x70ea	2.6	4.0	85	17.2
630	C.C	1.5	16	1.2	Φ1.9x67ea	2.7	4.0	89	19.4
800	SEG	2.0	16	1.2	Φ1.8x67ea	2.9	4.0	95	22.6
1000	SEG	2.0	16	1.2	Φ1.7x70ea	3.0	4.0	99	25.4
1200	SEG	2.0	16	1.2	Φ1.7x65ea	3.1	4.0	103	27.9
2000	SEG	2.0	16	1.2	Φ1.4x65ea	3.5	4.0	116	38.8

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity(40kA/1sec)

154kV Single Core Cable

Aluminum Sheath Type

Construction Copper Conductor / XLPE Insulation / Aluminum Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape							
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
600	C.C	1.5	17	1.3	2.9	4.5	103	15.0
1200	SEG	2.0	17	1.3	2.5	4.5	115	21.8
2000	SEG	2.0	17	1.3	2.6	4.5	127	31.2
2500	SEG	2.0	17	1.3	2.8	4.5	135	36.2

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity(50kA/1.7sec)

Copper Wire Shield & Lead Sheath Type

Construction Copper Conductor / XLPE Insulation / Copper Wire Shield / Lead Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	No.of wire (ea) / Dia.of wire	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape								
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
600	C.C	1.5	17	1.3	Φ2.6x70ea	2.9	4.5	95	22.7
1200	SEG	2.0	17	1.3	Φ2.5x65ea	3.3	4.5	109	31.7
2000	SEG	2.0	17	1.3	Φ2.3x68ea	3.6	4.5	122	42.7
2500	SEG	2.0	17	1.3	Φ2.2x66ea	3.8	4.5	129	48.5

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity(50kA/1.7sec)

230kV Single Core Cable

Aluminum Sheath Type

Construction Copper Conductor / XLPE Insulation / Aluminum Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area (mm²)	Shape	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
600	C.C	1.5	23	1.3	2.4	5.0	117	16.8
1200	SEG	2.0	23	1.3	2.6	5.0	132	24.2
2000	SEG	2.0	23	1.3	2.9	5.0	146	34.1
2500	SEG	2.0	23	1.3	3.0	5.0	153	39.1

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity (63kA/1sec)

Copper Wire Shield & Lead Sheath Type

Construction Copper Conductor / XLPE Insulation / Copper Wire Shield / Lead Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	No.of wire (ea) / Dia.of wire	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area (mm²)	Shape	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
600	C.C	1.5	23	1.3	Φ2.3x66ea	3.2	5.0	108	25.7
1200	SEG	2.0	23	1.3	Φ2.2x68ea	3.6	5.0	121	35.0
2000	SEG	2.0	23	1.3	Φ2.0x65ea	4.0	5.0	134	46.7
2500	SEG	2.0	23	1.3	Φ1.9x65ea	4.1	5.0	141	52.4

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity (63kA/1sec)

345kV Single Core Cable

Aluminum Sheath Type

Construction Copper Conductor / XLPE Insulation / Aluminum Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape							
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
600	C.C	1.5	27	1.3	3.0	6.0	132	19.3
1200	SEG	2.0	27	1.3	2.8	6.0	143	27.4
2000	SEG	2.0	27	1.3	3.0	6.0	157	37.5
2500	SEG	2.0	27	1.3	3.2	6.0	165	43.0

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity (63kA/1.7sec)

Copper Wire Shield & Lead Sheath Type

Construction Copper Conductor / XLPE Insulation / Copper Wire Shield / Lead Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	No.of wire (ea) / Dia.of wire	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape								
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
600	C.C	1.5	27	1.3	Φ2.9x84ea	3.1	6.0	119	31.2
1200	SEG	2.0	27	1.3	Φ2.9x81ea	3.4	6.0	132	41.1
2000	SEG	2.0	27	1.3	Φ2.9x78ea	3.7	6.0	145	53.0
2500	SEG	2.0	27	1.3	Φ2.9x75ea	3.9	6.0	153	60.2

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity (63kA/1.7sec)

380/400kV Single Core Cable

Aluminum Sheath Type

Construction Copper Conductor / XLPE Insulation / Aluminum Sheath / PVC (or PE) Outer Sheath

Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape							
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
600	C.C	1.5	29	1.5	2.6	6.0	132	19.9
1200	SEG	2.0	29	1.5	2.9	6.0	146	27.6
2000	SEG	2.0	27	1.5	3.0	6.0	157	37.5
2500	SEG	2.0	27	1.5	3.2	6.0	165	43.8

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity (63kA/1sec)

Copper Wire Shield & Lead Sheath Type

Construction Copper Conductor / XLPE Insulation / Copper Wire Shield / Lead Sheath / PVC (or PE) Outer Sheath

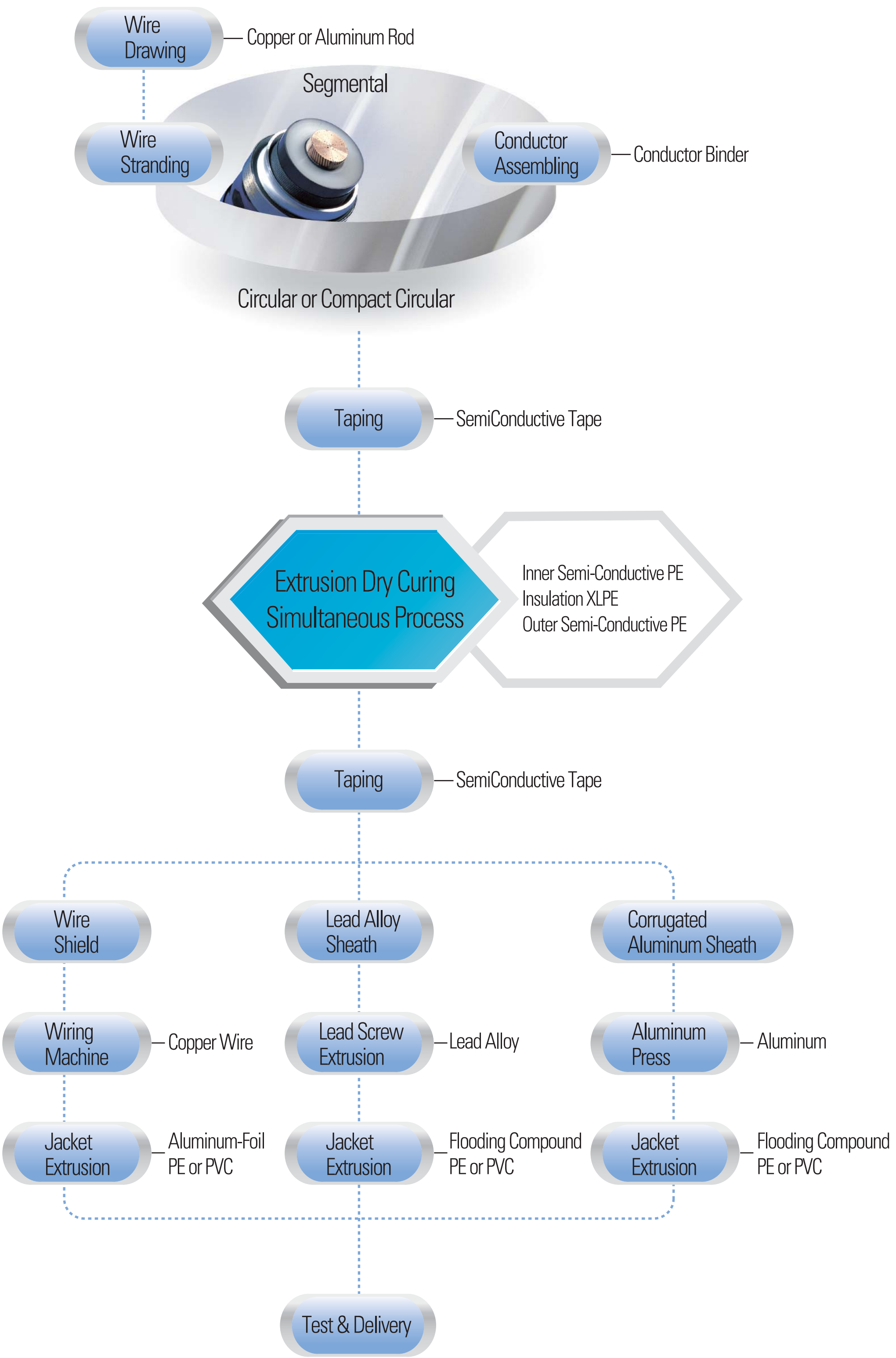
Conductor		Approx. Thick of Conductor shield	Thick of Insulation	Approx. Thick of Insulation shield	No.of wire (ea) / Dia.of wire	Thick of Metallic sheath	Thick of Jacket	Overall Dia.	Approx. Weight
Nominal Area	Shape								
(mm²)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg/m)
600	C.C	1.5	29	1.5	Φ2.5x82ea	3.1	6.0	122	31.4
1200	SEG	2.0	29	1.5	Φ2.5x77ea	3.5	6.0	135	41.3
2000	SEG	2.0	27	1.5	Φ2.5x74ea	3.7	6.0	145	51.6
2500	SEG	2.0	27	1.5	Φ2.5x71ea	3.9	6.0	153	58.8

* C.C:Circular Compacted, SEG:Segmental Compacted

* Fault Current Capacity (63kA/1sec)

Manufacturing Process

Flow Chart of Manufacturing Process

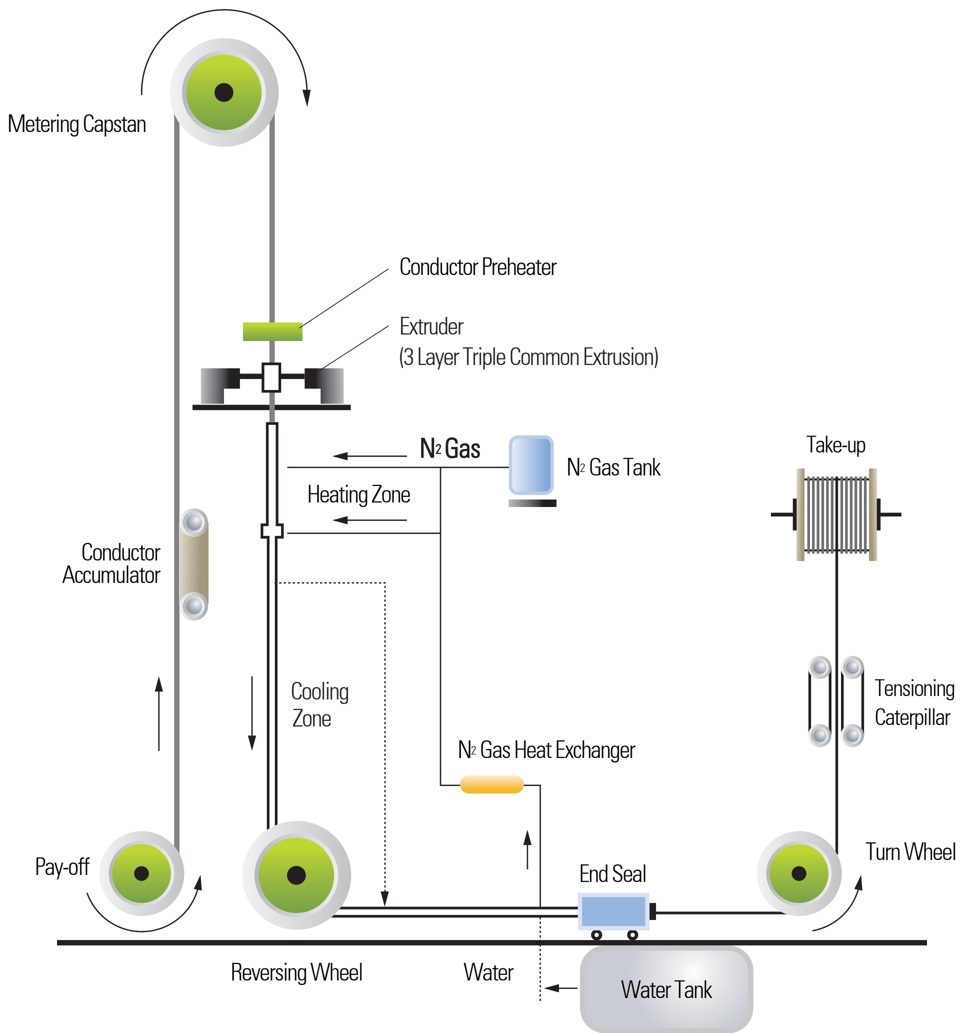


VCV Line

Vertical Type Continuous Vulcanizing Equipment

In case of extra high voltage cable, the insulation thickness is so thick that centers of the conductor and the insulation was not coincided each other when catenary type vulcanizing system was adopted. Due to the considerable eccentricity of the insulated core, the insulation thickness should be thicker than the electrically required value.

Our facility of vulcanizing process is installed in vertical in the tower of height of approximately 125m. The insulation is extruded on the highest place of the tower and passed through the vertical tube for vulcanizing and cooling purposes. Since the pass line of the insulated core is vertical, strengthen core is exposed to uniform gravity force through its cross-section that no eccentricity can be occurred. By adopting this method, the insulation thickness can be reduced remarkably and nowadays, and the extruded thermosetting insulated cables are enough competitive to conventional cables.



CDCC System

Completely Dry Curing and Cooling Vulcanizing Method

We adopt CDCC system for vulcanizing XLPE insulation that is a continuous vulcanizing and dry curing system using nitrogen gas. This CDCC system has been recently developed to produce extra high voltage XLPE cables and it shows excellent function to reduce faults and imperfections in the insulation.

In this system, extruded thermosetting compounds are cured in the curing tube by thermal radiation through inert nitrogen gas, therefore there is no opportunity that the compounds can absorb any moisture during vulcanizing process. The insulated core may be cooled by water in the lower part of the tube, but to obtain better quality in the absence of moisture, generally cooled by convection and radiation in a nitrogen gas atmosphere.

This system is being wholly controlled by computer so that manufacturing conditions and temperatures are controlled perfectly. These mean that the quality of the insulation is uniform throughout the cross-section and the length. All of the process of this system is perfectly protected from outer atmosphere to prevent the insulation compounds and the insulated core from any contact with moistures, dust, contaminated air, etc.



Advantage of CDCC

Water Content

Compared with the case of steam curing cable in which a large amount of water due to the saturated steam remains in the insulation, for CDCC cable, only 100 to 200ppm moisture is detected in insulation. The water content during curing process is shown inTable 1.

Table 1. Example of Comparison of Water Content in XLPE Cable

Sample	Dry	Steam
Wt(%)	0.018	0.29

Microvoids

The exteremly small amount of residual water in dry cured insulation minimize micorovoids. The example of comparison of voids in insulation during curing process is shown in Table 2.

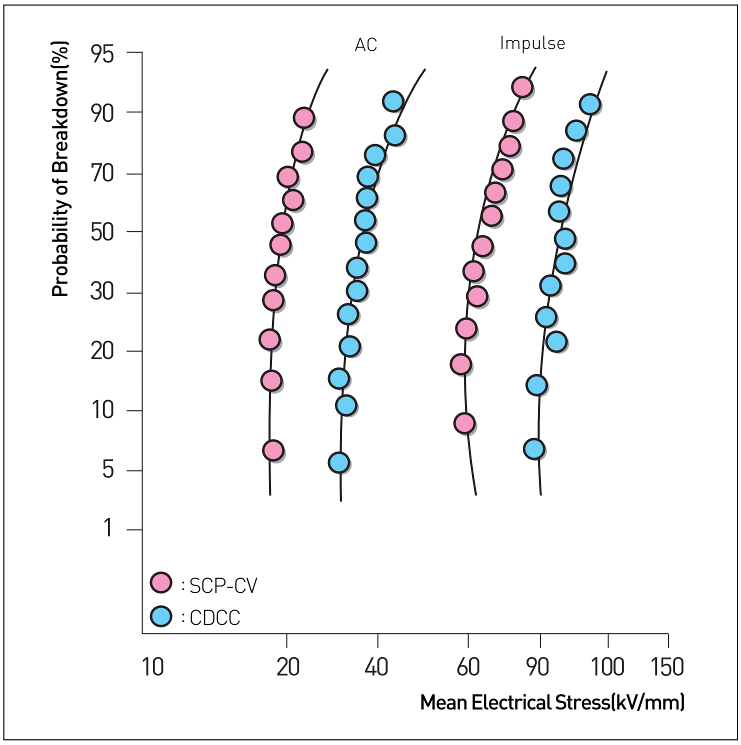
Table 2. Example of Voids in XLPE Cable

Curing Method	Dry			
	1~3㎛	4~5㎛	5~10㎛	10㎛ Over
Dry Cure	120	3	0	0
Steam Cure	>2,000	~300	77	4

Electrical Strength

Both AC and impulse breakdown strength of insulation by CDCC system have been remarkably improved compared with that by steam curing process. **Fig.2** shows the properties.

Fig.2 AC and Impulse Voltage Breakdown Characteristic

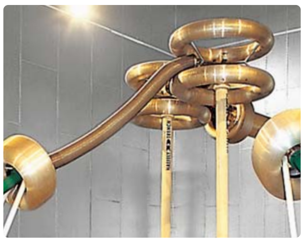


Quality Assurance & Test Requirements

Extra high voltage cables are the most important cable because they are generally adopted to massive power transmission system. Therefore the quality of the cable shall be not only tested for finished cable products but also controlled during the whole manufacturing processes. All the materials and manufacturing processes are stringently controlled, tested and reported according to quality standards.
Drum test and type test are performed on completed cables. Drum test is done for every length of cables by measuring conductor resistance, capacitance, power factor, partial discharge, etc.
Electrical quality assurance for D/M length test program is done for sampled cable, generally one out of ten lengths by measuring impulse breakdown, long-time AC withstand voltage, power factor, partial discharge, etc. Testing procedure is one of the important process and every necessary test equipments and devices are installed, such as 3600kV impulse generator, 600kV AC testing transformer, schering bridge, 1200kV dielectric breakdown tester and shield room.

Test Item		Requirements
Routine Test	Conductor Resistance	Not exceed the specified value
	AC Voltage Withstand	$2.5U_0$ for 30 min
	Insulation Resistance	Not less than specified value (ρ2.5 x 10^{15} Ω·cm at 20℃)
	Capacitance	Not exceed the specified value by more than 8%
	Power Factor	Not more than 0.1% at U_0
	Partial Discharge	Step 1:$1.75U_0$ for 10 sec Step 2:Not more than 10pC at $1.5U_0$
Type Test (Sequence Test)	Bending Test	The diameter of the test cylinder : 25(d+D)+5% D : measured external diameter of the cable in ㎜ d : measured diameter of the conductor in ㎜
	Partial Discharge Test	The sensitivity being 5pC or less The magnitude of the discharge at $1.5U_0$ shall not exceed 5pC.
	Tan & Measurement	Not exceed the value 10x 10^{-4}
	Heating Cycle Voltage Test	The cycle of heating and cooling shall be carried out 20 times.
	Impulse Withstand Test	BIL/+10 times
	Power Frequency Voltage Test	At $2.5U_0$ for 15 min

Note U_0 is the rated power-frequency voltage between conductor and earth or metallic screen.


*Partialdischarge Test Equipment


*High Voltage Test Transformer


*Control Room


*Test terminal

System Design and Engineering Work

Cable System Design

Most of the EHV cable projects include not only the manufacturing and supply of cables and accessories but also cable system design, civil works, cable laying, erection works, site testing and commissioning. A cable system should be designed to meet the user's requirements in various respects in technology, economy, and stability. The design flow of cable system is shown in **Chart 1**.

Determining Cable Size

The selection of conductor size depends on various system and installation conditions. The system conditions consist of required current ratings, rated system voltages, system frequency, short-circuit current and its duration, and so on. For the maximum current ratings, there are continuous current and emergency current. For the rated system voltages, there are nominal voltage, highest voltage, and basic impulse insulation voltage. The installation conditions consist of cable laying arrangements, laying methods, laying depth, soil thermal resistivity, ambient temperatures, other heat sources, and so on. For the cable laying arrangements, there are flat formation, trefoil formation and distances between phases and circuits. For the laying methods, there are direct-burial laying, in-duct laying, in-air laying and others.

Determining Sheath Bonding Methed

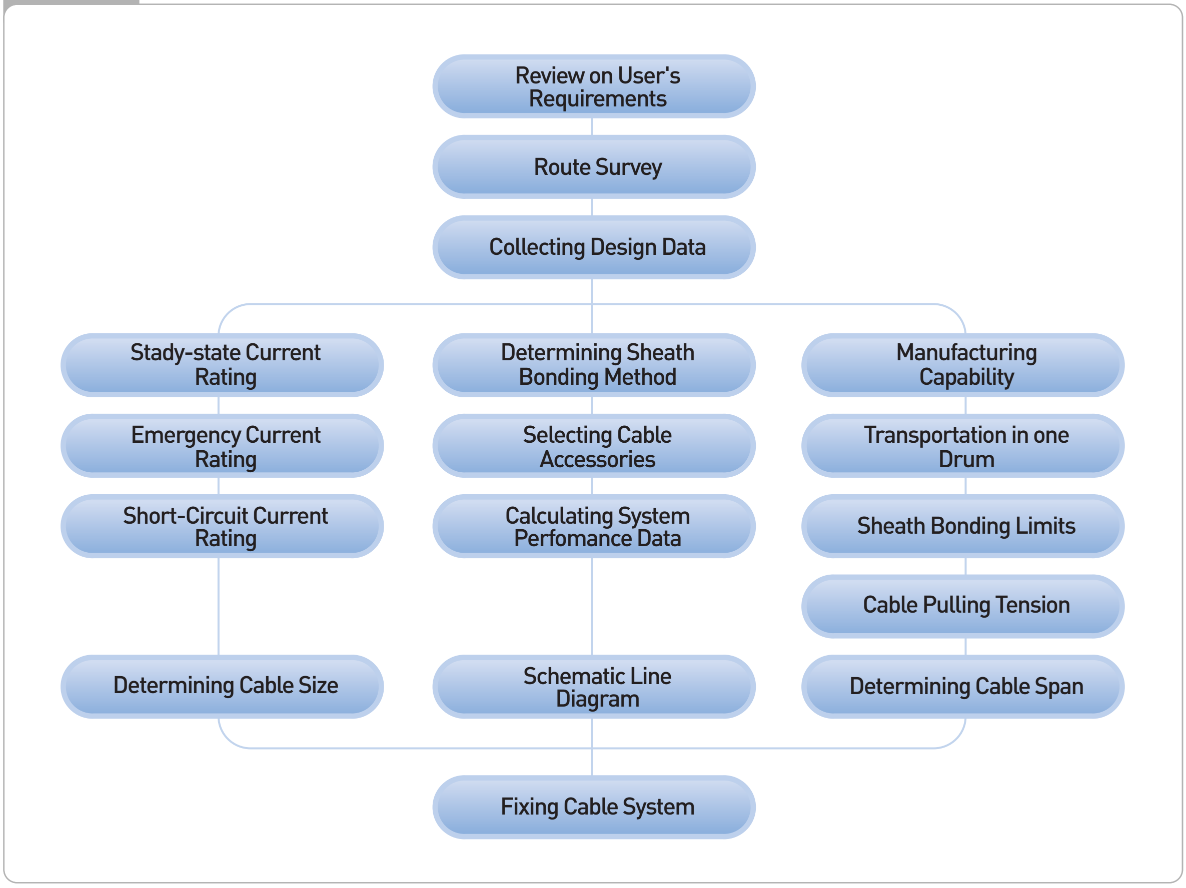
Cable sheaths are grounded by various methods. A solid bonding method presents the simplest solution. But the grounded sheaths produce large cable losses and, in turn, it largely reduces the power capacity of cable system. Special bonding methods are applied to reduce the cable losses. A single-point bonding method is applied in case of short route and less then two joints (see Figure 1), and a cross bonding method is applied in case of long route and many joints (see Figure 2). But these methods produce standing sheath-induced voltages, while the cable system shall be designed not to exceed the required maximum sheath voltage.

Determining Cable Span

Since cable products are produced at a certain length, cable jointing is required at a long cable route. Cable drum lengths and number of joints are determined generally on the various terms, cable manufacturing, transportation of drum, cable laying, cable system design and so on. In general, the followings are the most important terms to determine the maximum cable drum length.

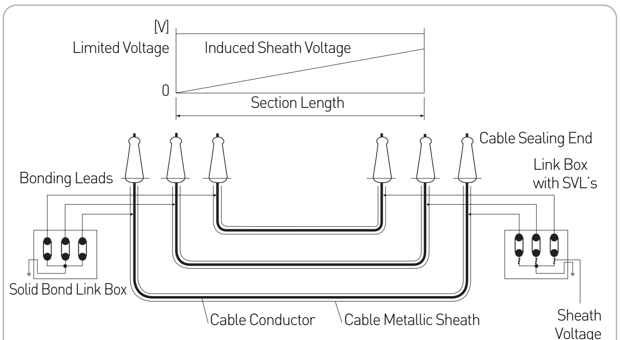
- Maximum manufacturing length of cables
- Related regulations on transportation of cable drums to site
- Maximum pulling tension and sidewall pressure during cable installation
- Cable sheath bonding and maximum sheath-induced voltage

Chart1



1. Single Point Bonding System

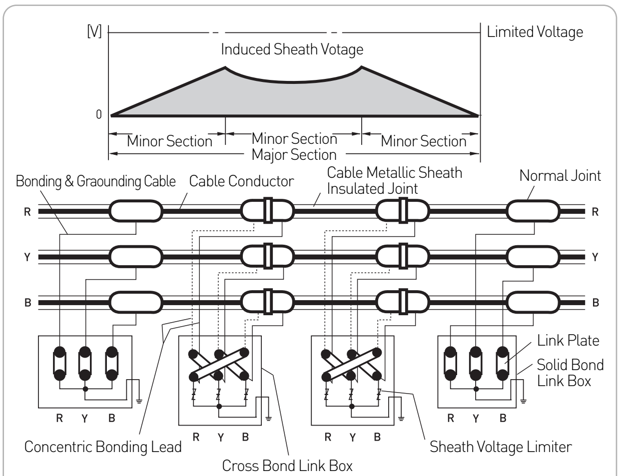
This system is adopted for short length of the single core cable, generally without any joint, or circuit extension portion in addition to cross-bonding system. In this case, induced voltage on the metal layer cannot be diminished, therefore the system can be used, provided the induced voltage is less than dangerous level approximately 65V.



Single Point Bonding System

2. Cross-Bonding System

This system is generally adopted for single core cable circuit having two or more joints. In the system, metallic layer of a cable is electrically separated(insulated) and connected to other cable's metallic layer at ends of every three section of the circuit, and then it will be connected to the another cable's layer. In the first section of the circuit, induced voltage is increased in proportion to cable length, but in the next section, it is decreased first time and increased again because induced voltages from two otherphase is mixed together in this section. In same reason, induced voltage at the end of this three section circuit becomes almost zero level remaining small amount of residual voltage due to unbalance of the joint section, etc.



Cross-Bonding System

Installation

Taihan has many achievements and excellent techniques related to turnkey-base projects. The turnkey-base projects include the installation and engineering services as well as the supply of cable system. The quality of the cable system at the site depends mainly on cable laying work, and jointing and terminating works. Taihan has most qualified engineers and workers who are skillful and experienced in carrying out the installation works. Also Taihan has much experience on various cable laying methods. The followings are generally applied as a cable laying method.

Direct in the Ground

This method is shown in **Fig.3**, and is employed in following cases;

1) Where road is narrow so the construction of conduit under the road not permitted.
2) Where the number of cables is few and no future increase is expected.
3) Where the road digging is easy.

Underground Duct or Tunnel

This method is shown in **Fig.4,5,** and is employed in following cases;

1) The case of main underground transmission line where the number of cables are many or expected to be in-creased in near future.
2) The case of hard pavement or where hard pavement will be constructed in future.
3) Where digging is difficult due to heavy traffic.

Special Laying

In case cables are installed in special places where there are bridges or railways, special laying methods are employed as follows;

1) When a cable crosses a river or canal, cables are attached to the bridge. If there is no suitable bridge in the neighborhood, an exclusive bridge should be built or a method of submarine laying should be adopted. As long as the strength and space of the bridge permits, it is best to attach the cables to the bridge. Whether it is better to build an exclusive bridge or to lay submarine cable depends on the cost and difficulty of construction.
2) In case of crossing a railway, there are two methods; one is digging through the railway bed, and the other is piercing from the side of the railway by using an excavator, when the cable crosses many tracks like a surface from railroad or suburban railway, digging the railway bed is usually adopted. Except for the above case, piercing by using an excavator is adopted.

Fig. 3 Direct Burial

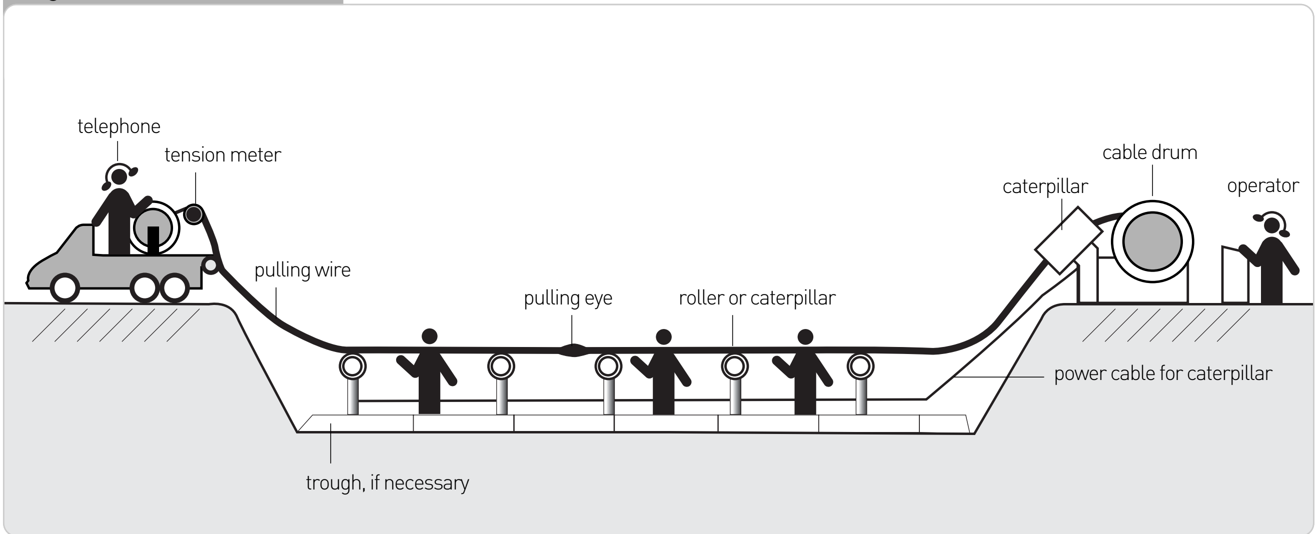


Fig. 4 Cable Laying at Duct

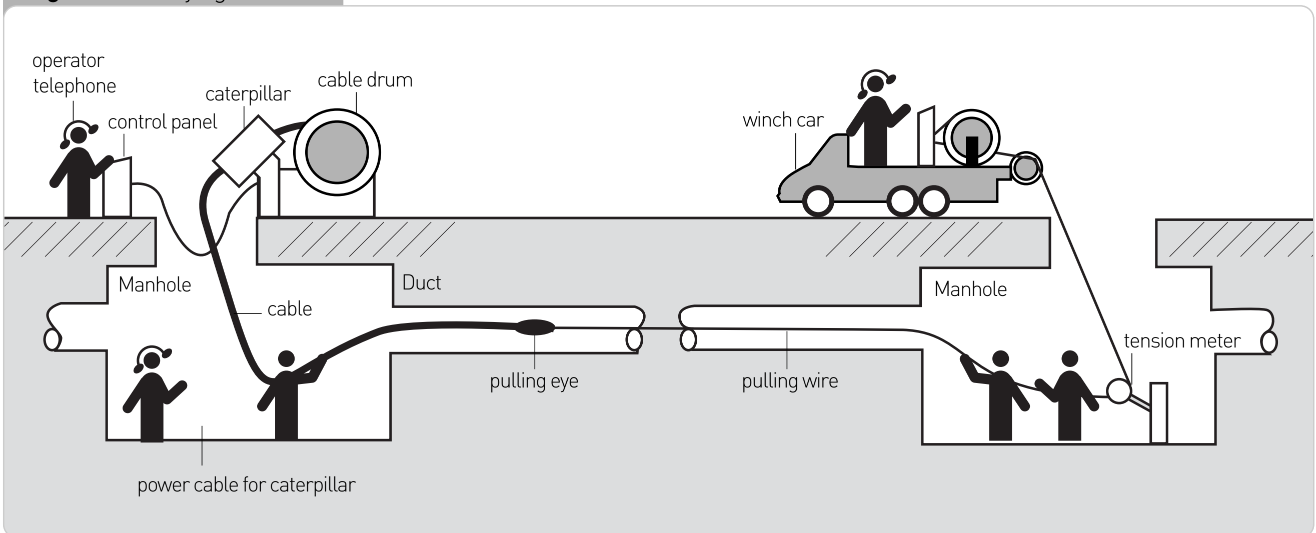
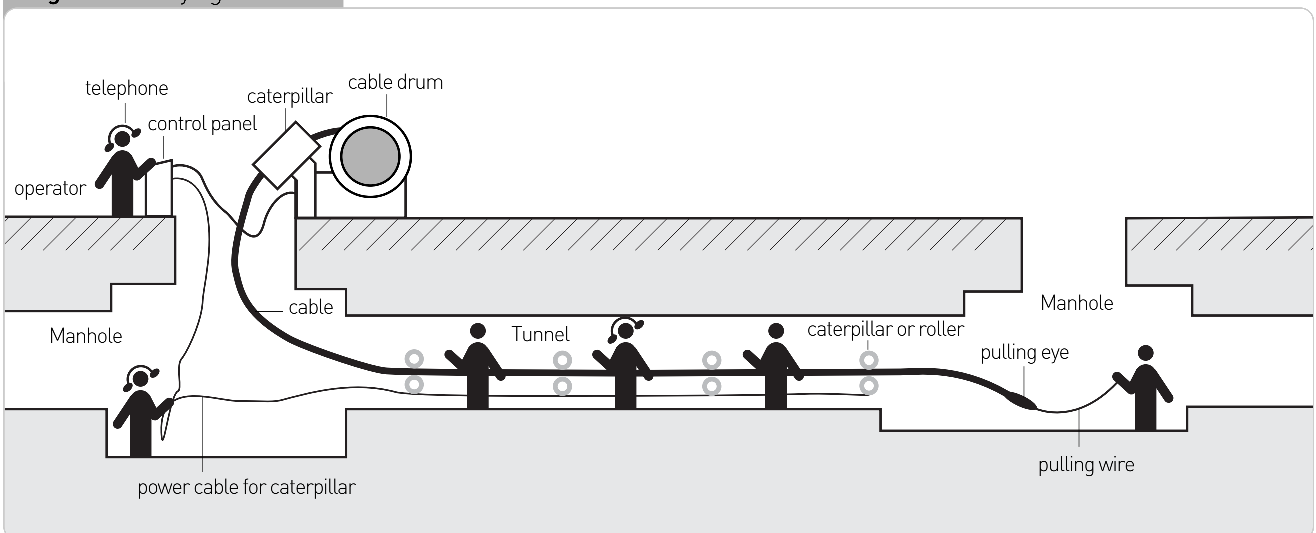


Fig. 5 Cable Laying at Tunnel

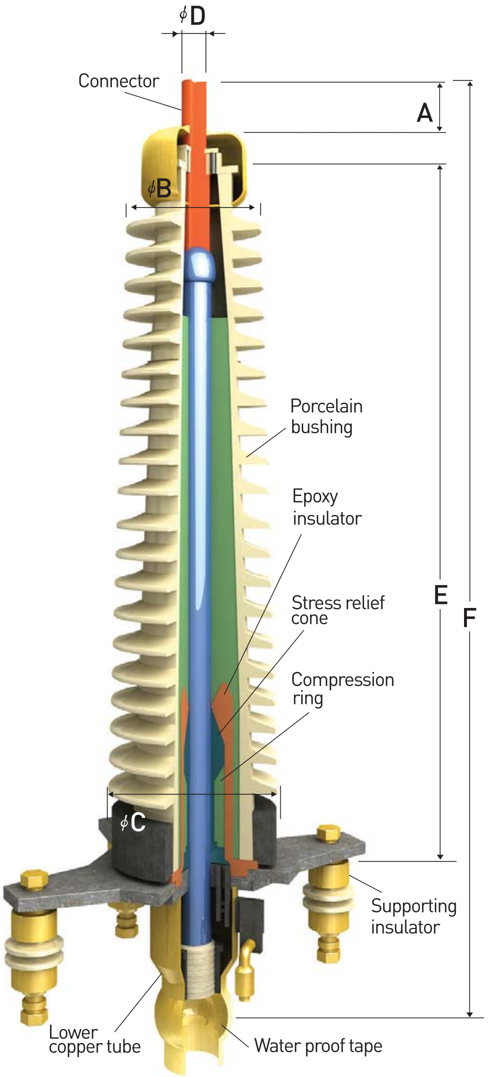


Accessories for XLPE Cable

TAIHAN has developed and manufactured a wide range of terminations and joints for XLPE cable. Our products are manufactured to meet the requirements of international standards, such as KEMA, KERI and the purchaser's specification etc. Our products include terminations, joints, and insulation parts.

Joint Materials Sealing Ends

Outdoor/Anti-fog Sealing End (EB-A)



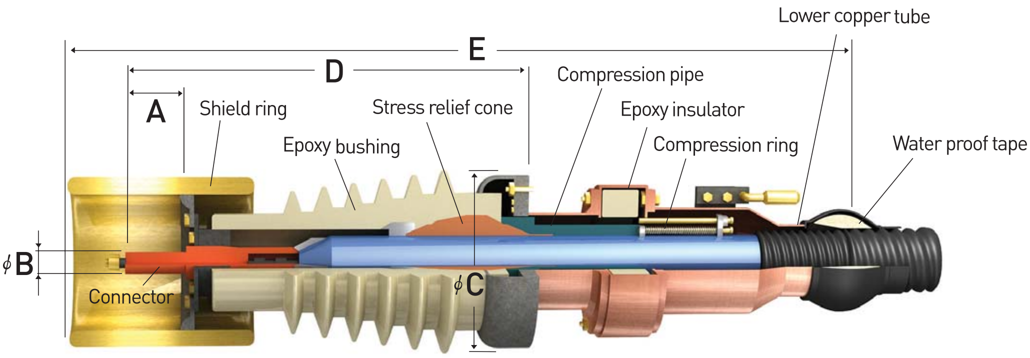
*Outdoor

Rated Voltage (kV)	Conductor Nominal Area(mm²)	Approx. Dimension (mm)					
		A	B	C	D	E	F
72.5	Under 400	80	297	385	28	1370	1820
	600 ~ 1000	85	297	385	45	1370	1830
	1200 ~ 2000	110	297	385	60	1370	1860
123~170	Under 1000	197	336	455	45	2000	2545
	1200 ~ 2000	225	336	455	60	2000	2575
245~300	Under 1000	197	332	556	45	2500	3100
	1200 ~ 2000	225	332	556	60	2500	3100
362~400	Under 1000	85	505	510	45	3550	4775
	1200 ~ 2000	110	505	510	60	3550	4775

*Anti-fog

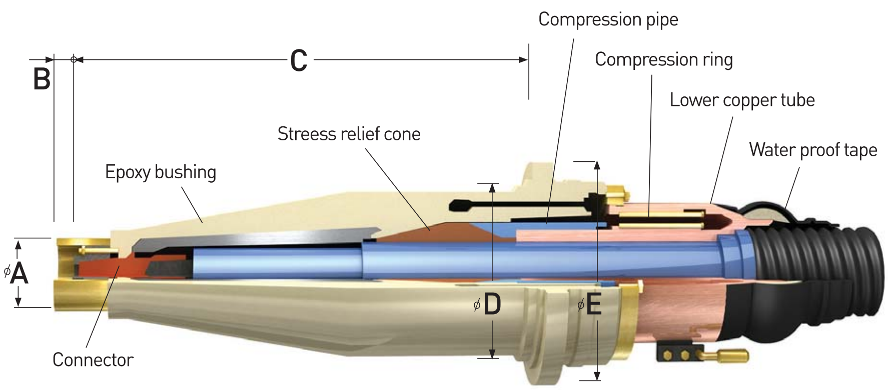
Rated Voltage (kV)	Conductor Nominal Area(mm²)	Approx. Dimension (mm)					
		A	B	C	D	E	F
72.5	Under 400	80	297	385	28	1370	1820
	600 ~ 1000	85	297	385	45	1370	1830
	1200 ~ 2000	110	297	385	60	1370	1860
123~170	Under 1000	197	336	455	45	2000	2545
	1200 ~ 2000	225	336	455	60	2000	2575
245~300	Under 1000	197	362	565	45	2770	3280
	1200 ~ 2000	225	362	565	60	2770	3280
362~400	Under 1000	85	550	530	45	4250	5790
	1200 ~ 2000	110	550	530	60	4250	5790

Oil Immersed Sealing End (EB-O)



Rated Voltage (kV)	Conductor Nominal Area(mm²)	Approx. Dimension (mm)				
		A	B	C	D	E
72.5	Under 400	80	28	255	520	1135
	600 ~ 1000	85	45	255	525	1135
	1200 ~ 2000	110	60	255	550	1135
123~170	Under 1000	85	45	350	735	1755
	1200 ~ 2000	110	60	350	760	1755

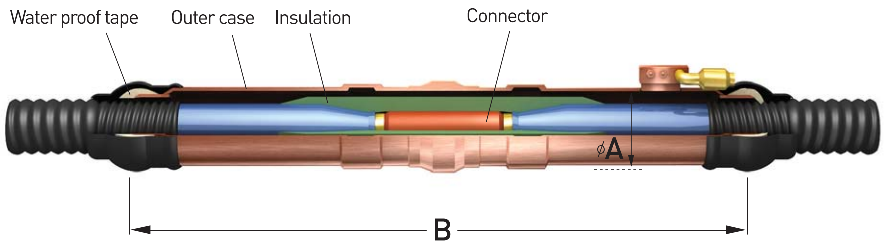
SF_6 Gas Immersed Sealing End (EB-G)



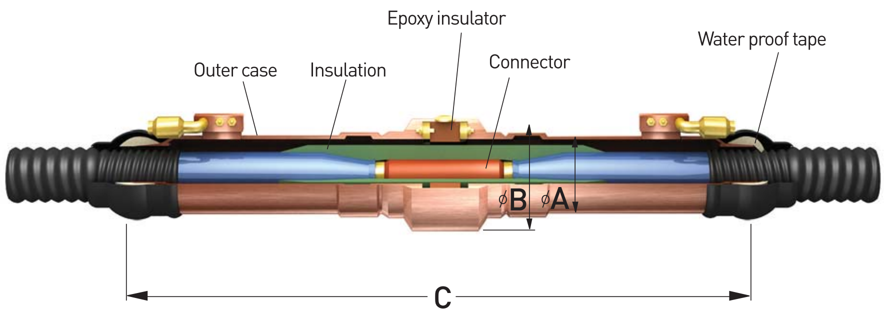
Rated Voltage (kV)	Conductor Nominal Area(mm²)	Approx. Dimension (mm)				
		A	B	C	D	E
72.5	200 ~ 2000	110	15	583	205	270
123 ~ 170	200 ~ 2000	110	15	757	230	320
245 ~ 300	200 ~ 2000	200	49	960	490	582
362 ~ 400	200 ~ 2000	250	49	1400	550	640

Tape Molded Joint (TMJ)

Nomal Joint (TMNJ)



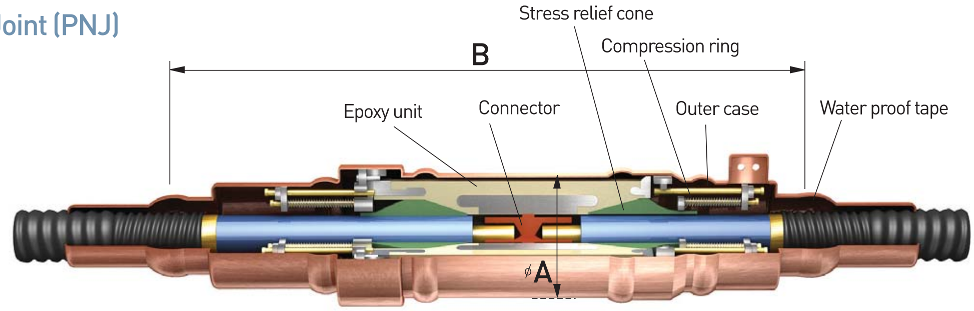
Insulation Joint (TMIJ)



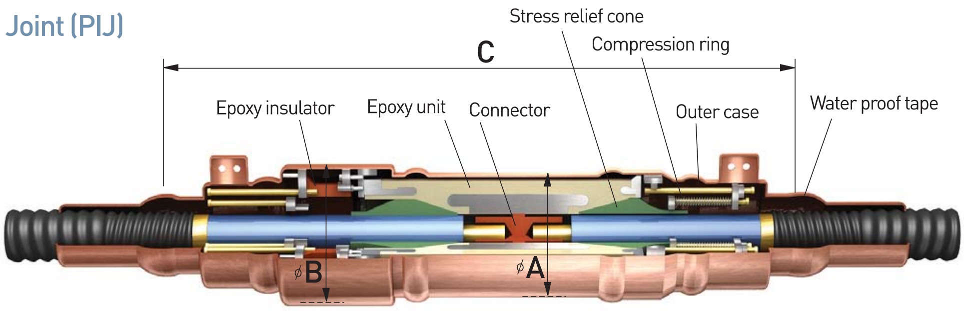
Conductor Nominal Area(mm²)	Approx. Dimension (mm)				
	TMNJ		TMIJ		
	123~170kV		123~170kV		
	A	B	A	B	C
200 ~ 800	140	1400	160	240	1400
1000 ~ 1400	160	1500	180	260	1500
1600 ~ 2000	180	1500	180	260	1500

Prefabricated Joint (PJ)

Normal Joint (PNJ)

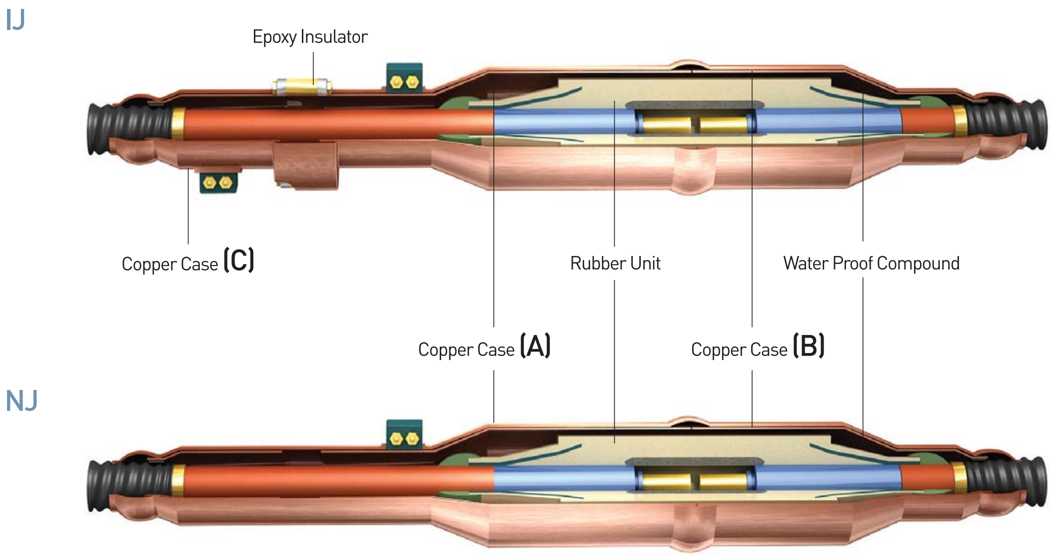


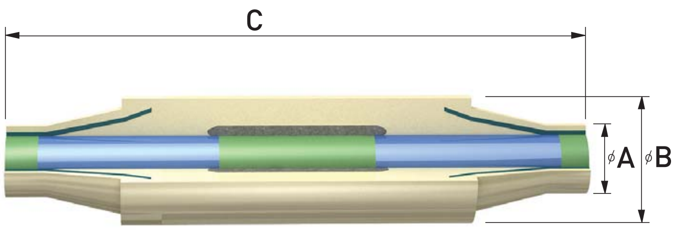
Insulation Joint (PIJ)



Rated Voltage (kV)	Approx. Dimension (mm)				
	PNJ		PIJ		
	A	B	A	B	C
72.5	180	1660	180	204	1660
123 ~ 170	320	1700	320	340	1700
245 ~ 300	320	1800	320	340	1800
362 ~ 400	370	2000	370	370	2000

Pre-Molded Joint (XLPE)





Rated Voltage (kV)	Dimension(mm) - PMIJ/PMNJ		
	A	B	C
60 ~ 88	65	180	900
110 ~ 161	69	181	950
220 ~ 287	80	200	1000
330 ~ 400	90	350	1100

Others

GIS Epoxy Insulation Parts

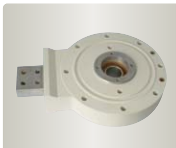
The SF6 gas insulated switchgear, so called GIS, contains the major equipments of the substation, that is the gas circuit breaker, disconnecting switch(isolator), earthing switch, voltage transformer, current transformer, lightning arrester, GIS spacer, condenser cylinder, main bus, feeder bus, etc., in the grounded metallic enclosure, and is filled with SF6 gas which has the most excellent insulation and arc-quenching ability. TAIHAN produces the main epoxy insulation parts of GIS, which are GIS spacer, condenser cylinder, etc.

362kV x 1P Spacer

170kV x 4P Spacer

Earthing Terminal 362kV

CT Terminal 170kV

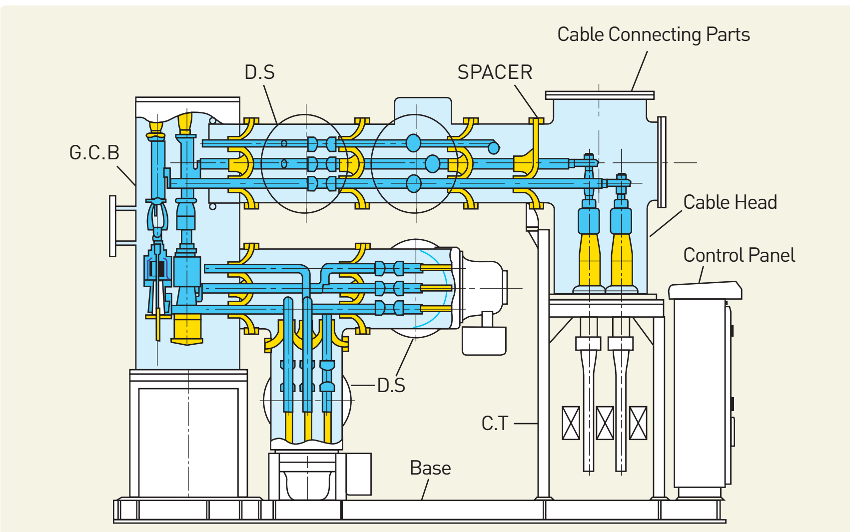


Earthing Terminal 362kV

Insulating Support 362kV

Support Spacer 362kV

Tri-Post Insulator 362kV



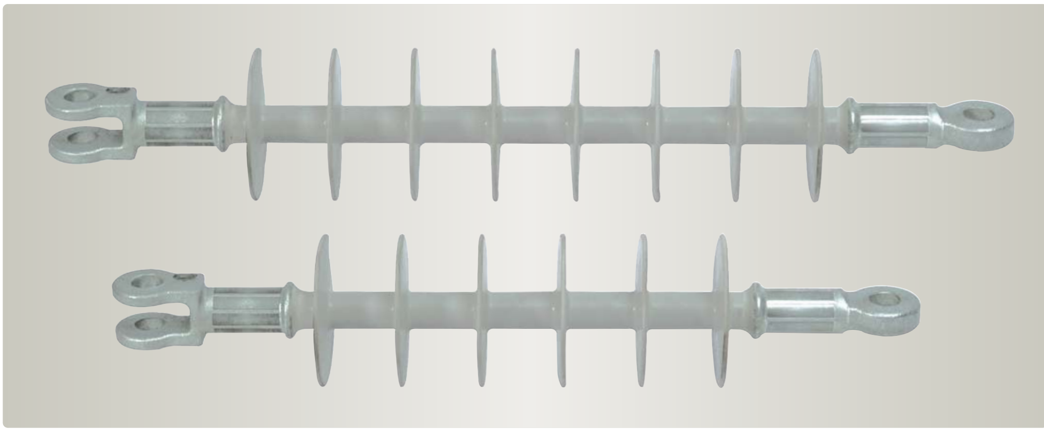
GIS Spacer 72.5kV ~ 362kV

Please tell us your requirements and specifications. We shall be pleased to propose a custom solution or to jointly develop one with you.

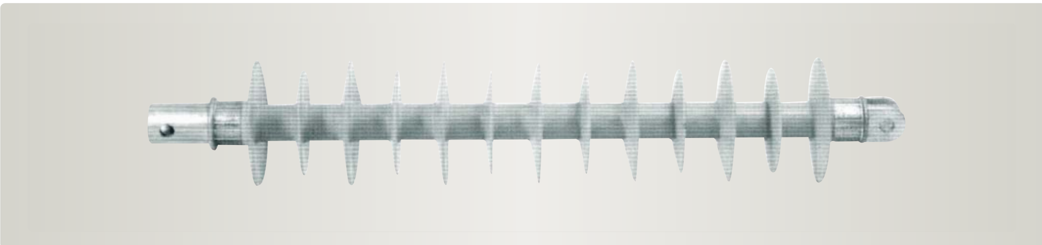
Composite Insulator Parts

These Insulators, superior to conventional ceramic insulators, are made by new design and manufacturing process for reduced weight and improved electrical, mechanical characteristics. Weathersheds are made of high temperature vulcanizing(HTV) silicone rubber and the FRP rod as the highest quality material. Polymer Insulator for railway is suitable for the polluted area with vibration and has a longer creepage distance than Polymer Suspension Insulator for distribution line.

Dead-end / Suspension Composite Insulator



Railway Composite Insulator

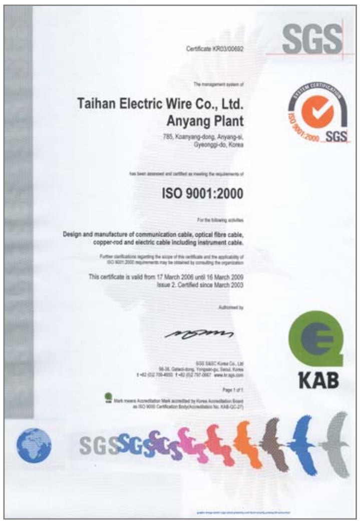


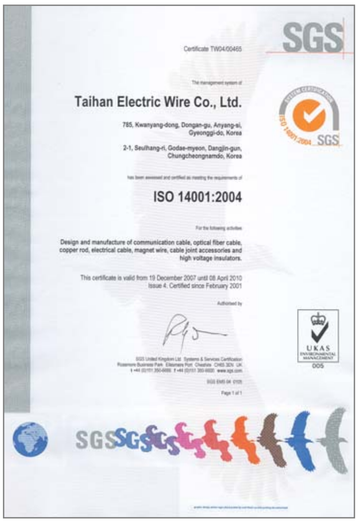
Ratings

Item		Dead-end		Railway
		A Type	B Type	
Low-frequency Dry Frashover Test(kV)		145	130	300
Low-frequency Wet Frashover Test(kV)		130	110	230
Critical Impulse Flashover Test(kV) (1.2×50㎲)	Positive	250	190	480
	Negative	275	230	480
Radio Influence Voltage Test	ms kV	25	20	25
	㎲ at 1000 kHz	10	10	10
Min. Specified Mechanical Load(SML) (kg)		7000	7000	7000
Leakage Distance(mm)		760	580	1480
Arcing Distance(mm)		320	280	750

Certificates

The outstanding quality of TAIHAN communication cables are verified by internationally accredited certification institutes.





Type Test Certificates

No.	Description of Cable & Accessories	Institute	Date	Specification	Results of Test	BIL (kV)
1	132kV XLPE Cable 1C x 630sqmm (CU) - Premolde Straight Joint - Outdoor Sealing Ends	KEMA	1986. 05	IEC 502	Good	650
2	33kV XLPE Cable 1C x 400sqmm (CU)	Crown Agents	1986.12	IEC 502	Good	170
3	154kV XLPE Cable 1C x 600sqmm(CU)	KERI	1986.05	KEPCO	Good	750
4	154kV XLPE Cable 1C x 1200sqmm(CU)	KERI	1986.08	KEPCO	Good	750
5	154kV XLPE Cable 1C x 2000sqmm(CU)	KERI	1988.08	KEPCO	Good	750
6	33kV XLPE Cable 1C x 630sqmm (AL)	KERI	1995.05	IEC 502	Good	170
7	132kV XLPE Cable 1C x 1000sqmm (CU)	Crown Agents	1995.05	IEC 840	Good	650
8	132kV XLPE Cable 1C x 630sqmm (AL) -Outdoor Sealing End (EB-A)	Crown Agents	1996.05	IEC 840	Good	650
9	154kV XLPE Cable 1C x 600sqmm (CU) - Outdoor Sealing End (EB-A) - Normal Joint (NJ) - Insulated Joint (IJ)	KERI	1997.05	KEPCO	Good	750
10	154kV XLPE Cable 1C x 2000sqmm (CU) - Outdoor Sealing End (EB-A) - Normal Joint (NJ) - Insulated Joint (IJ)	KERI	1997.09	KEPCO	Good	750
11	230kV XLPE Cable 1C x 2000sqmm (CU) - Prefabricated Insulated Joint (PIJ) - SF_6 Gas Sealing End (EB-G) - Outdoor Sealing End (EB-A)	KEMA	1998.06	IEC 840	Good	1050
12	66kV XLPE Cable 1C x 1000sqmm(CU) - Prefabricated Insulated Joint (PIJ) - Prefabricated Normal Joint (PNJ)	KEMA	1999.04	IEC 840	Good	350
13	66kV XLPE Cable 1C x 1000sqmm(CU) - Prefabricated Insulated Joint (PIJ) - Prefabricated Normal Joint (PNJ)	KEMA	1999.04	IEC 840	Good	350
14	154kV XLPE Cable 1C x 2000sqmm (CU) - Outdoor Sealing End (EB-A) - Normal Joint (NJ) - Insulated Joint (IJ)	KERI	1999.09	KEPCO	Good	750
15	132kV XLPE Cable 1C x 630sqmm(CU) - SF_6 Gas Sealing End (EB-G) - Insulated Joint (IJ)	TAIHAN	2000.08	IEC 62067	Good	650

No.	Description of Cable & Accessories	Institute	Date	Specification	Results of Test	BIL (kV)
16	132kV XLPE Cable 1C x 1200sqmm (CU) - Prefabricated Normal Joint (PNJ) - Prefabricated Insulated Joint (PIJ) - SF_6 Gas Sealing End (EB-G) - Outdoor Sealing End (EB-A)	KEMA	2000.08	IEC 60840	Good	650
17	132kV XLPE Cable 1C x 800sqmm(AL) - Normal Joint (NJ) - Outdoor Sealing End - SF_6 Gas Sealing End (EB-G)	TAIHAN	2001.03	IEC 60840	Good	650
18	275kV XLPE Cable 1C x 500sqmm(CU) - Outdoor Sealing End - Oil Immersed Sealing End	TAIHAN	2001.08	IEC 62067	Good	1050
19	345kV XLPE Cable 1C x 2000sqmm (CU) - Outdoor Sealing End (EB-A - Normal Joint (NJ) - Insulated Joint (IJ)	KERI	2001.06	KEPCO	Good	1300
20	400kV XLPE Cable 1C x 2000sqmm (CU) - Outdoor Sealing End (EB-A) - GIS Sealing End (EB-G) - Normal Joint (NJ) - Insulated Joint (IJ)	KEMA	2005.01	IEC 62067	Good	1550
21	138kV XLPE Cable 1C x 1,000kcmil (CU)	Cable Technology Lab	2005.02	AEIC CS7-93	Good	650
22	230kV XLPE Cable 1C x 2000sqmm (CU) - Outdoor Sealing End (EB-A) - GIS Sealing End (EB-G) - Insulated Joint (IJ)	SGS/SPPG	2005.03	IEC 60141-1	Good	1050
23	154kV XLPE Cable 1C x 2500sqmm (CU) - Outdoor Sealing End (EB-A) - GIS Sealing End (EB-G) - Insulated Joint (Pre-mold joint)	KERI	2005.09	KEPCO	Good	750
24	154kV XLPE Cable 1C x 2500sqmm (CU) P/Q TEST - Outdoor Sealing End (EB-A) - GIS Sealing End (EB-G) - Insulated Joint (Pre-mold joint)	KERI	2006.03	KEPCO	Good	750
25	220kV XLPE Cable 1C x 2500sqmm (CU) - Outdoor Sealing End (EB-A) - GIS Sealing End (EB-G) - Insulated Joint (Pre-mold joint)	KEMA	2006.04	IEC 62067	Good	1050
26	69kV CU/XLPE 1C x 2500mcm (CU)	KERI	2006.11.08	IEC 61901 Electra No. 141	Good	325
27	132kV XLPE 630sqmm (CU) - Outdoor Sealing End (EB-A) - Insulated Joint (Pre-mold joint)	KEMA	2006.12.14	IEC 60840	Good	650
28	380kV XLPE 2500sqmm (CU) - Outdoor Sealing End (EB-A) - GIS Sealing End (EB-G) - Insulated Joint (Pre-mold joint)	KEMA	2007.04.06	IEC 62067	Good	1425
29	400kv XLPE Cable 2500sqmm (CU) - Outdoor Sealing End (EB-A)	KEMA	2007.06.07	IEC 62067	Good	1425
30	154kV XLPE Cable 2500sqmm (CU) - GIS Sealing End (EB-G) - Outdoor Sealing End (EB-A)	KERI	2007.06.21	IEC 60840	Good	750
31	66kV XLPE Cable 630sqmm (CU)	SGS KAHRAMAA	2007.07.27	IEC 60840	Good	325
32	132kV XLPE Cable 630sqmm (CU)	DEWA	2007.10.20	IEC 60840	Good	650

* KERI : Korea Electrotechnology Research Institute
* KEPCO : Korea Electricity Power Company(The National Power Utility in Korea)
* POSCO : Pohang Steel Corporation
* SPPG : Singapore Powergrid

System certificates

No.	Description	Institute	Date	Specification
1	Design and manufacture of high voltage insulators and cable joint accessories	SGS-ICS	2001.02	ISO 14001
2	Design and manufacture of electric cable	SGS-ICS	2003.03	ISO 9001

* SGS-ICS : Systems & Services Certification

Global Network

OVERSEAS BRANCH OFFICE

Dubai Representative Office

Flat no. 705, Al Safa Tower, Sheikh Zayed Road, P.O.Box117561, Dubai, U.A.E
TEL : +971-4-331-7233 FAX : +971-4-331-7322
E-mail : taihangulf@yahoo.com

Riyadh Branch Office

Room No.726, Al Akariyah Shopping Center 2, Olaya Road, P.O.Box 300201, Riyadh11372, Saudi Arabia
TEL : +966-1-419-0027 FAX : +966-1-419-0262
E-mail : taihangulf@yahoo.com

Kuwait Branch Office

Al-Adan, Block No. 6, Street No.14, House No.20, State of Kuwait
TEL : +965-544-2456 FAX : +965-541-5344
E-mail : ehlee@taihan.com

Australia Branch Office

Suite 704, Level 7, 90 Mount Street, North Sydeny, NSW 2060, Australia
TEL : +61-2-9460-3600 FAX : +61-2-9954-4354
E-mail : cwlee@taihan.com

Kuala Lumpur Branch Office

Suite 15.03 15th Floor, Kenanga International, JL. Sultan Ismail, 50250 Kuala Lumpur, Malaysia
TEL : +60-3-2161-8017 FAX : +60-3-2161-3628
E-mail : gahng74@taihan.com

Singapore Branch Office

150 Kampong Ampat #07-04 KA Centre Singapore 368324 Republic of Singapore
TEL : +65-6842-5069 FAX : +65-6842-5076
E-mail : shpark@taihan.com

Cambodia Branch Office

Phlove Tomnupkopsrove, Phum Tropaingo Sangkat Korkrokar, Khan Dankor, Phnom Pen, Cambodia
TEL : +855-23-357-114 FAX : +855-23-357-116
E-mail : dspark@taihan.com

Thailand Branch Office

253, Asoke 26th FL, Sukhumvit 21 Road, Klongtoeynua, Wattana, Bangkok 10110, Thailand
TEL : +66-2644-1464(Ext.544)
FAX : +66-2644-4002

OVERSEAS CORPORATES

South Africa

M-TEC
(Malesela Taihan Electric Cable(Pty)Ltd.)
Steel Rd Peacehaven Vereeniging 1930 Gauteng, South Africa
TEL : +27-16-450-8200 FAX :+ 27-16-450-8202
E-mail : junehah@m-tec.co.za
Website : www.m-tec.co.za

D.R.Congo

STANDARD TELECOM
158, Avenue de la Democratie(Ex-Huilerie) Commune de la Gombe, Kinshasa, D. R.Congo
TEL : +01-511-0002 FAX :+ 01-511-1100
E-mail : ohsejoon@taihan.com

Vietnam

TSC (Taihan Sacom Cable Company.,Ltd.)
7th Floor, 71-73 Dien Bien Phu, phuong 15, Binh Thanh District , Vietnam
TEL : +8461-351-4145 FAX : +8461-351-4211
E-mail : kimjh@tscable.com.vn
Website : www.tsc.vn

Hong Kong

TGH (Taihan Global Holdings Ltd.)
No.1808, 18F,Tower 2, Admiralty Center,18 Harcourt Road, Admiralty, Hong Kong

Mongolia

SKYTEL
3rd FL, Skytel Plaza Bldg, Chinggis khaan Avenue-9, Ulaanbaatar-13, Mongolia
TEL : +976-11-318488 FAX : +976-11-318487
E-mail : skytel@mtcone.net
Website : www.skytel.mn

SKYNETWORKS
4th FL, Skytel Plaza Bldg, Chinggiskhan Avenue-9, P.O.B 2033 Ulaanbaatar-211213 Mongolia
TEL : +976-9111-4219 FAX : +976-1131-8841
E-mail : kynet@skynetworks.mn
Website : www.skynetworks.mn

USA

Taihan USA (Taihan Electric USA., Ltd.)
LandMark Building, 99 Tulip Avenue, Suite#106, Floral Park, NY 11001, USA
TEL : +1-516-355-5600 FAX : +1-516-355-5601
E-mail : jhpak33@taihan.com

Canada

Taihan Global Canada Investment., Ltd.
Unit 610-4538 Kingsway, Burnaby, BC, Canada V5H 4T9
TEL : +604-438-7070 FAX : +604-438-7072
E-mail : taihanglobal@gmail.com

OFFICES & PLANTS

HEAD OFFICE
Insong Building, 194-15, Hoehyeon-dong 1-ga, Jung-gu, Seoul, Korea
Overseas Sales Team
TEL +82-2-316-9433~5 FAX +82-2-757-2942

ANYANG PLANT
785, Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
EHV. Power Cable Engineering Team
TEL +82-31-420-9430~2 FAX +82-31-422-9705

R&D CENTER
785, Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
TEL : +82-31-420-9530

DANGJIN PLANT
2-1 Seulhang-ri, Godae-myeon, Dangjin-gun, Chungcheongnam-do, Korea
EHV. Accessory Engineering Team
TEL +82-41-359-9250~5 FAX +82-41-420-9225

TAIHAN
ELECTRIC WIRE CO., LTD.
www.taihan.com

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