

## Technical Specification for Cold Shrink

### Cable Accessories Rated 18/30kV

#### ➤ Overview

This specification specifies the product classification, technical requirements, test methods, inspection rules, marking, package, transportation and shelf life for the 18/30kV cold shrink cable accessories.

#### ➤ Designation

Definition

##### 1. Termination

Device fitted to the end of a cable to ensure the electrical connection with parts of the system and maintain the insulation up to the point of connection.

##### 2. Indoor termination

Termination intended for using where it is exposed to neither solar radiation nor weathering

##### 3. Outdoor termination

Termination intended for using where it is exposed to either solar radiation or weathering or both

##### 4. Straight joint

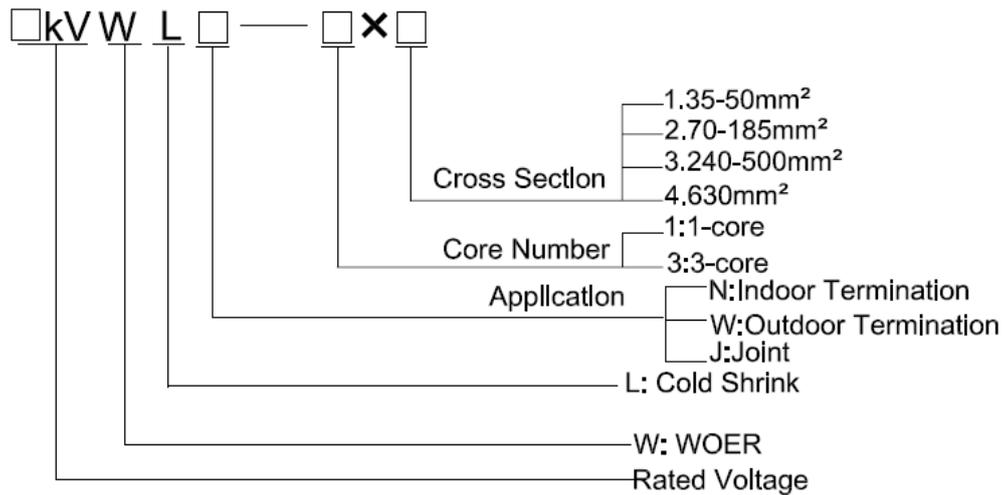
Accessory for connecting two cables to form a continuous circuit.

#### ➤ Standard executed

NO.	Standard	Normative reference
1	<b>IEC 60502-4:2010</b>	Power cables with extruded insulation and their accessories for rated voltages from 1kV (Um=1.2kV) up to 30 kV (Um =36kV) – Part 4: Test requirements on accessories for cables with rated voltages from 6kV (Um=7.2kV) up to 30 kV (Um =36kV)
2	<b>GB 311.1 (neq IEC71-1)</b>	Insulation co-ordination for high voltage transmission and distribution equipment
3	<b>GB/T 12706.4:2020</b>	Extruded insulation power cables and accessories with rated voltages from 1kV (Um=1.2kV) up to 35kV (Um=40.5kV) part 4: Test requirement on cable accessories with rated voltages from 6kV (Um=7.2kV) up to 35kV (Um=40.5kV)
4	<b>GB 14315</b>	Compression type terminal lugs and ferrules with copper or aluminum for power cables conductors
5	<b>GB/T 18889 (IEC 61442,MOD)</b>	Electric cables-test methods for accessories for cables with rated voltage from 6kV(Um=7.2kV) up to 35kV(Um=40.5kV)
6	<b>JB/T 10740.1</b>	Cold shrinkable accessories for extruded insulation power cables with rated voltages from 6kV(Um=7.2kV) up to 35kV (Um=40.5kV) Part 1:Termination
7	<b>JB/T 10740.2</b>	Cold shrinkable accessories for extruded insulation power cables with rated voltages from 6kV(Um=7.2kV) up to 35kV (Um=40.5kV) Part 2:Straight joints

#### ➤ Product designation

The product code is made as below rule:



➤ **Rated Voltage**

Rated voltage  $U_0/U$  ( $U_m$ ) for cable accessories is 18/30(36) kV

$U_0$ : Rated power frequency voltage between conductor and earth or metallic screen for which the cable is designed.

$U$ : Rated power frequency voltage between conductors for which the cable is designed.

$U_m$ : Maximum value of the “highest system voltage” for which the equipment may be used.

➤ **Suitable cable**

power cable with extruded insulation

➤ **Creepage ratio**

larger than 3.1cm/kV(outdoor termination)

➤ **Standard executed for the matched fittings**

*GB/T 14315*

➤ **Maximum conductor temperature**

Table 1. Maximum conductor temperature for different types of insulating compound

Insulating compound	Maximum conductor temperature ( °C )	
	Normal Operation	Short Circuit(Continuous time less than 5s)
XLPE	90	250
EPR and HEPR	90	250

➤ **Main properties of the silicone rubber used**

Table 2

NO.	Properties	Unit	Typical value after cured(insulation)	Typical value after cured(conductive)
1	Hardness	Shore A	40±5	40±5
2	Tensile Strength	MPa	≥7.0	≥5.0
3	Elongation at Break	%	≥600	≥500
4	Tear Strength	kN/m (N/mm)	≥35	≥25
5	Tension set: keeping 300% for 168hours at 90°C	%	≤5	≤5
6	Volume Resistivity	Ω.cm	≥1.0×10 <sup>15</sup>	≤1000
7	Dielectric Constant	-	2.8-3.5	-
8	Dissipation Factor	-	≤0.004	-
9	Tracking Resistance	-	≥1A3.5	-
10	Dielectric Strength	kV/mm	≥23	-

➤ **Applied conditions**

- a) Ambient temperature: no higher than +60°C and no lower than -40°C
- b) Elevation isn't exceeded 3000m
- c) Temperature of long term operation, over-load and short-circuit for the cable accessories shall meet the requirements of relevant cable.
- d) The long term operating in the zone of intensity shake, strong wind, ice and snow or extreme pollution.

➤ **Tests**

1. Procedure and requirements for the type test: refer annex 1
2. Procedure and requirements for the sample test: refer annex 2
3. Acceptance test (recommendation)
  - a. Test main insulation resistance of the cable: make the standard voluntarily
  - b. Voltage withstand test for the main insulation  
After installation of cable accessories, apply 2U<sub>0</sub> (2.5 U<sub>0</sub>) between the conductor and metal shield for 60min (or 5min).

➤ **Kit packing content**

1. Standard packing includes main part, auxiliary material and consumable material, of which spec and quantity satisfy the installation requirements.

Auxiliary material includes copper braid, constant force spring, phase marking strip, sealing mastics, semi-con tape, self-adhesive insulation tape, water proof tape, armour tape, vinyl tape and etc.

Consumable material includes cleaning tissue, lubricating grease, operating gloves and etc.

2. Cable accessory installation instruction and packing list.

➤ **Symbol, package, transport and storage**

1. Symbol

Permanent marking for each product shall be clearly made with regard to below info,

- a. Name of manufacturing company
- b. Name and pattern
- c. Rated voltage
- d. Conductor cross-section
- e. Manufacture date and number
- f. The period of validity

2. Package, transport and storage

The package, transport and storage of the product shall conduct according to the instruction and data offered by the manufacturing company.

- a. Separate package and sealing for main product with handling of oxidation-proof, rain-proof and moisture-proof.
- b. Complete instruction and illustration on the surface of package box.
- c. Detail packing list is packed with the kit.

**Annex: Type Test**

No	Items <sup>1)</sup>	Standard Requirements		
		Indoor termination	Outdoor termination	Joint
1	AC and DC voltage	AC for 5min at 4.5U <sub>0</sub> and DC for 15min at 4U <sub>0</sub> , no breakdown nor flashover		
	AC voltage (wet)	/	1min at 4U <sub>0</sub> , no breakdown nor flashover	/
2	Partial discharge	10pC max. at 1.73U <sub>0</sub>		
3	Impulse voltage at elevated temperature $\theta_t$ <sup>2)</sup>	10 impulses of each polarity at 170kV, no breakdown nor flashover		
4	Heating cycles	60 cycles <sup>3)</sup> in air at $\theta_t$ <sup>2)</sup> and 2.5U <sub>0</sub>		30 cycles <sup>3)</sup> in air and 30 cycles <sup>3)</sup> under water at $\theta_t$ and 2.5U <sub>0</sub>
5	Immersion test	-----	10 cycles at $\theta_t$ <sup>2)</sup>	-----
6	Partial discharge at $\theta_t$ <sup>2) 4)</sup> and ambient temperature	10pC max. at 1.73U <sub>0</sub>		
7	Thermal short-circuit (screen) <sup>5)</sup>	Two short-circuits at I <sub>SC</sub> of the cable screen, no visible deterioration		
8	Thermal short-circuit (conductor)	Two short-circuits to raise conductor to $\theta_{SC}$ of the cable, no visible deterioration		
9	Dynamic short-circuit test(conductor) <sup>6)</sup>	One short-circuit at I <sub>d</sub> , no visible deterioration		
10	Impulse voltage	10 impulses of each polarity at 170kV, no breakdown nor flashover		
11	AC voltage	15min at 2.5U <sub>0</sub> , no breakdown nor flashover		
12	Humidity	300h at 1.25U <sub>0</sub>	/	/
13	Salt fog Test <sup>7)</sup>	/	1000h at 1.25U <sub>0</sub>	/
14	Examination	No visible deterioration on appearance		

- 1) Unless otherwise specified, tests shall be carried out at ambient temperature.
- 2)  $\theta_t$  is the maximum cable conductor temperature in normal operation from 5 °C to 10 °C.
- 3) 8h total with  $\geq 2$  h steady and  $\geq 3$  h cooling.
- 4) Measurement is made at the end of the heating period.
- 5) This test is only required for terminations that are equipped with a connection to, or adaptor for the metallic screen of the cable.
- 6) Not required for termination of porcelain bushing or porcelain insulated bushing. Test shall be conducted on condition of 3-phase for termination with cover.
- 7) Not required for termination with porcelain insulator. Shrouded termination shall be tested in a three-phase condition.

**Annex 2 (Sampling Test):**

No.	Items		Requirements
1	Termination	AC withstand for 5min	No breakdown and flashover occurs at $4.5U_0$ for 5min
2		Partial discharge test	10pC max. at $1.73U_0$
3		Impulse voltage withstand	No breakdown and flashover occurs at 10 positive and 10 negative impulses at 170kV
4	Joint	AC withstand for 5min	No breakdown and flashover occurs at $4.5U_0$ for 5min
5		Partial discharge test	10pC max. at $1.73U_0$
6		Impulse voltage withstand	No breakdown and flashover occurs at 10 positive and 10 negative impulses at 170kV

Annex 3: Profile for cable accessories rated 18/30kV

