

Medium Voltage Power Cables XLPE-insulated

6/10 kV, 12/20 kV, 18/30 kV

Since about 1970 the cross-linked polyethylene (XLPE)-insulated power cables has been used in Germany. The XLPE-insulation possesses very good electrical, mechanical and thermal characteristics in medium voltage networks. This type of insulation is excellent chemical resistant and also resistant to cold. Due to various advantages, the XLPE-insulated type has vastly displaced the traditional classical paper-insulated types in many sectors.

In order to prevent the penetration of moisture and also to extend the duration of life, the XLPE-insulated medium voltage cables are designed with longitudinally water-proof screen including an additional swell tape and a PE outer sheath.

The manufacture of this sheath is based on high density polyethylene (HDPE), in which an additive organic peroxide is mixed. Due to the heating and pressure the molecule chains are joined each other, assuring the transition from thermoplastic to elastic condition.

In comparison to PVC and paper-insulated cables, the advantages of XLPE-insulated medium voltage power cables are possessing a low dielectric factor, such as it is 100 times smaller than of PVC-insulated cables.

Moreover, a better dielectric constant value has an effect on the low mutual capacitance, the short-circuit to ground and the charging current of XLPE-insulated cables.

The good properties of XLPE-insulated cables remain constant at a long temperature range.

Characteristics of XLPE

- permissible operating temperature
 - For permanent (normal) operation + 90°C
 - In short circuit +250°C
 - In overload operation and damage by sea up to +130°C
- Specific heat resistance 3,5 K · m/W
- Dielectric constant 2,4
- Specific resistance (20°C) min. 10^{16} Ohm · cm
- Loss factor (tan δ) (20°C) max. $0,5 \cdot 10^{-3}$
- Density 0,92 g/cm³
- Breaking strength min. 200%
- Tensile strength min. 12,5 N/mm²

Conductor

- Copper or aluminium, round, multiwire stranded and compact, according to VDE 0295 and HD 383.

Inner semi-conducting layer

- Semi-conducting compound, cross-linked, minimum wall-thickness 0,3 mm.

Insulation

- Cross-linked polyethylene (XLPE), compound type 2X11 according to DIN VDE 0207 part 22 and HD 620.1.
- Insulation nominal wall-thickness
 - for 6/10 kV = 3,4 mm
 - 12/20 kV = 5,5 mm
 - 18/30 kV = 8,0 mm

Outer semi-conducting layer

- Outer semi-conducting layer is extruded together with the inner semi-conducting layer and the insulation in one working process and are spliced with each other.
- Semi-conducting compound, cross-linked, wall-thickness 0,3 to 0,6 mm.

Concentricity of conductor

- The difference between the maximum and minimum value of 0,5 mm should not be exceeded.

Semi-conducting type

- Over the outer semi-conducting layer, a semi-conducting tape must be used.

Screen

- Screening of copper wires must have a minimum diameter of 0,5 mm and over that a copper tape applied helically with a minimum thickness of 0,1 mm.
- Copper cross-section according to DIN VDE 0273 and 0276 to the corresponded table 2.

Separator

- Over the screen as well as under outer jacket, a separating layer must be used (e.g. taping).

Outer jacket

- PE compound DMP2 according to HD 620.1 and 2YM3 to DIN VDE 0276 part 3, black or
- PVC compound DMV6 according to HD 620.1 and YM5 to DIN VDE 0207 part 5, red
- Wall-thickness = 2,5 mm, for 1 x 500 mm²/30 kV = 2,6 mm

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