

4.10 DC CABLES

The DC cable has the following characteristics compared with the AC cable.

1. The system used is different. The DC cable is used in the rectified DC transmission system, and the AC cable is often used in the power frequency (domestic 50 Hz) power system.
 2. Compared with the AC cable, the power loss during the transmission of the DC cable is small. The power loss of the DC cable is mainly the DC resistance loss of the conductor, and the insulation loss is small (the size depends on the current fluctuation after rectification); while the AC resistance of the low-voltage AC cable is slightly larger than the DC resistance, the high-voltage cable is obvious, mainly because of the proximity effect and the skin effect, the loss of insulation resistance accounts for a large proportion, mainly the impedance generated by the capacitor and the inductor.
 3. High transmission efficiency and low line loss.
 4. It is convenient to adjust the current and change the power transmission direction.
 5. Although the price of the converter equipment is higher than that of the transformer, the cost of using the cable line is much lower than that of the AC cable. The DC cable is positive and negative poles, and the structure is simple; the AC cable is three-phase four-wire or five-wire system, the insulation safety requirements are high, the structure is complex, and the cable cost is more than three times that of the DC cable.
 6. DC cable is safe to use:
 - 1) The inherent characteristics of DC transmission, it is difficult to generate induced current and leakage current, and it will not interfere with the electric field generated by other cables.
 - 2) The single-core laying cable does not affect the cable transmission performance due to the hysteresis loss of the steel structure bridge.
 - 3) It has higher interception capability and over-cut protection than DC cables of the same structure.
 - 4) A straight, alternating electric field of the same voltage is applied to the insulation, and the DC electric field is much safer than the AC electric field.
 7. The installation and maintenance of the DC cable is simple and the cost is low.
- Requirements for the same cable insulation for the same AC and DC voltage and current

When an AC and DC electric field of the same voltage is applied to the insulation, the electric field of the DC cable is much smaller than the AC electric field. Due to the large difference in the structure of the two electric fields, the maximum electric field when the AC cable is energized is concentrated near the conductor, and the maximum electric field when the DC cable is energized is mainly concentrated within the insulating surface layer, which is more secure (2.4 times).

Third, the mutual conversion relationship between AC and DC voltage

There are many different understandings on the mutual conversion of AC and DC voltages. However, our company is uniformly calculated according to GB12528.1, that is, the same AC cable, the rated voltage of the DC cable is 1.5 times the phase voltage of the AC cable. But our company's 1500V DC cable is designed according to the voltage of DC3000V, which has safe electrical insulation performance.

