# High Voltage Power Cable

# Contents

## Company Overview

Ningbo Qrunning Cable Co., Ltd. is a nationally recognized high-tech enterprise specializing in the production of wires and cables. Established in 1990, the company boasts total assets of 1.5 billion yuan and employs over 800 people, including more than 120 senior and intermediate technical professionals. It houses a provincial enterprise engineering technology R&D center, completing over twenty scientific research projects annually, and holds numerous patents.

The company has established sales and service networks in 30 provinces, municipalities, and autonomous regions across China, including Beijing, Guangdong, Shanghai, Tianjin, Yunnan, Inner Mongolia, Guangxi, and Sichuan. Its products, covering low, medium, high, and ultra-high voltage levels, are widely used in the State Grid, Southern Power Grid, rail transit, steel, petrochemical, shipbuilding, machinery manufacturing, and other fields, earning widespread customer recognition and high praise.

Ningbo Qrunning Cable Co., Ltd.'s high voltage cable plant spans 504 acres and features world-class cable manufacturing and testing equipment, including Finland's MAILLEFER 500kV vertical three-layer co-extrusion cross-linking production line, UK's BWE aluminum sheath production line, frequency conversion distributed motor 91-disk frame stranding machine, double-layer co-extrusion sheath production line, Germany's HAIVOT voltage withstand and partial discharge series resonance test system, and a high-quality fully shielded partial discharge test hall. These advanced production technologies provide a solid foundation for the research and manufacturing of high-quality high and ultra-high voltage cables.

The company produces ultra-high and high voltage cables across a range of voltage levels, including 500kV, 220kV, 110kV, and 66kV, adhering to international, national, industry standards, or customer-specific technical quality requirements.

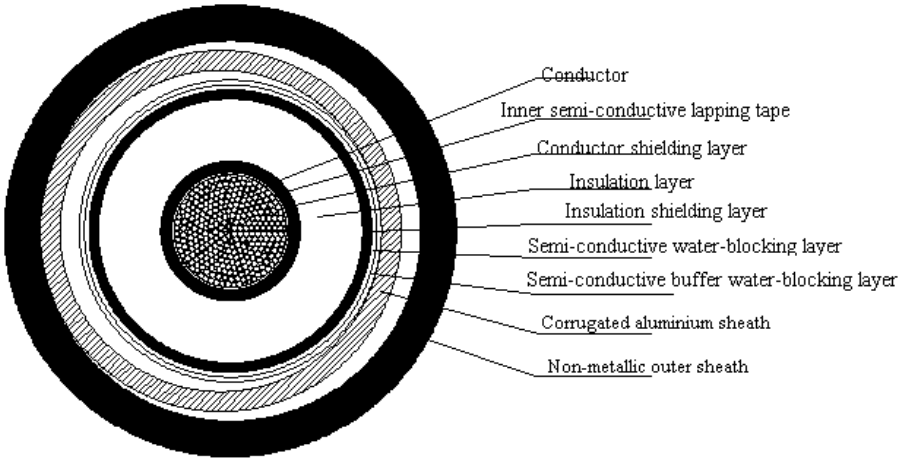
The company's ISO9001-2008 quality management system, GB/T24001-2004 environmental management system, and GB/T28001-2001 occupational health and safety system have been certified and operational for years. A dedicated system management department oversees the effective daily operation of these systems, ensuring reliable and continuously improving product quality.

Ningbo Qrunning Cable Co., Ltd. regards product quality reliability as the primary concern for ultra-high and high voltage cables. It emphasizes strict quality control to meet the diverse needs of different customers, ensuring that the final delivered product fully meets customer requirements through meticulous material selection, structural design, process implementation, process control, and performance testing.

All employees adhere to the philosophy of "Quality First, Supreme Quality," striving for progress and continuous development, committed to serving customers wholeheartedly and contributing to the nation's construction and development.

## Cable Product Introduction

➢ Product Structure Diagram

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|---|
| ★**Conductor**: The conductor meets the specifications of GB/T3956, with a copper purity of over 99.9%, enhancing the cable's transmission capacity. |
| ★ **Inner and Outer Shields:** Made from imported ultra-smooth non-peelable cross-linked polyethylene cable material, extruded in three layers with the insulation material to ensure smooth surfaces and uniform electric field distribution. |
| ★ **Insulation:** Uses imported ultra-clean XLPE material, co-extruded with the inner and outer shields for tight bonding. The most advanced secondary heating production process effectively eliminates internal stress in the insulation. |
| ★ **Buffer Layer and Longitudinal Water Blocking Structure**: Made of semi-conductive elastic material or longitudinally water-blocking semi-conductive swelling tape, meeting water-blocking requirements while ensuring the gap between the layer and the corrugated aluminum sheath. |

| |
|---|
| ★ **Metal Shield:** Uses a corrugated aluminum sheath to meet short-circuit capacity and shielding needs, providing radial water-blocking performance for high water level environments. |
| ★ **Asphalt Coating:** Special cable asphalt coating provides effective corrosion protection for the aluminum sheath, extending the cable's lifespan. |
| ★ **Outer Sheath:** Made from high-quality domestic PVC and PE materials, meeting electrical and mechanical performance requirements. Developed in collaboration with renowned domestic material manufacturers, various high-quality special outer sheath materials are available, such as flame-retardant and termite-resistant types. |

➢ Product Standards

66kV cross-linked polyethylene insulated power cable products are manufactured according to GB/T 11017-2002 and IEC60840 standards.

110kV cross-linked polyethylene insulated power cable products are manufactured according to GB/T 11017-2002 and IEC60840 standards.

220kV cross-linked polyethylene insulated power cable products are manufactured according to GB/Z 18890-2002 and IEC62067 standards.

➢ Cable Model

| Model | Product Name | Applicable Range and Environment |
|---|---|---|
| YJLW02<br>YJLW03 | Copper-core cross-linked polyethylene insulated corrugated aluminum sheath PVC sheathed power cable<br>Copper-core cross-linked polyethylene insulated corrugated aluminum sheath PE sheathed power cable | Indoor,tunnel,pipeline,cable trench, or direct burial, capable of withstanding certain mechanical forces and tension. |
| YJLLW02<br>YJLLW03 | Aluminum-core cross-linked polyethylene insulated corrugated aluminum sheath PVC sheathed power cable<br>Aluminum-core cross-linked polyethylene insulated corrugated aluminum sheath PE sheathed power cable | Indoor, tunnel, pipeline, cable trench, or direct burial, capable of withstanding certain mechanical forces and tension. |
| YJLW02-Z<br>YJLW03-Z | Copper-core cross-linked polyethylene insulated corrugated aluminum sheath PVC sheathed longitudinal water-blocking power cable<br>Copper-core cross-linked polyethylene insulated corrugated aluminum sheath PE sheathed longitudinal water-blocking power cable | Indoor, tunnel, pipeline, cable trench, or direct burial, suitable for humid environments and high groundwater levels, capable of withstanding certain mechanical forces and tension. |
| YJLLW02-Z<br>YJLLW03-Z | Aluminum-core cross-linked polyethylene insulated corrugated aluminum sheath PVC sheathed longitudinal water-blocking power cable<br>Aluminum-core cross-linked polyethylene insulated corrugated aluminum sheath PE sheathed longitudinal water-blocking power cable | Indoor, tunnel, pipeline, cable trench, or direct burial, suitable for humid environments and high groundwater levels, capable of withstanding certain mechanical forces and tension. |
| YJA02<br>YJA03 | Copper-core cross-linked polyethylene insulated aluminum-plastic composite layer PVC sheathed power cable<br>Copper-core cross-linked polyethylene insulated aluminum-plastic composite layer PE sheathed power cable | Indoor, tunnel, pipeline, or cable trench. |

**Note**: Based on user requirements and installation conditions, low-smoke low-halogen, low-smoke halogen-free, flame-retardant, rodent-resistant, termite-resistant, and other types of outer sheaths can be produced. To better monitor the cable and ensure its normal operation, we can also produce cables with built-in temperature-sensing optical fibers.

- **Usage Characteristics**

- Rated Voltage U0/U: 48/66kV, 64/110kV, 127/220kV.
- Maximum continuous operating temperature of the conductor: 90°C.
- Maximum temperature during short circuit (maximum duration no more than 5 seconds): 250°C.
- Minimum ambient temperature during cable laying: not less than 0°C.
- Minimum bending radius: not less than 20 times the cable diameter.

# Overview of Production Equipment and process

## LH450/13 Sliding Copper Continuous Annealing Unit

1. Uses 630 reel take-up with highly stable dual-reel automatic switching for long-length continuous stable production.
2. The entire system adopts a new generation PLC control mode, ensuring good quality, uniform size, mechanical properties, and conductivity of copper wire in different production states.
3. Equipped with process parameter storage and recall function, making it convenient to reproduce verified copper wire quality, beneficial for quality control.

## 90-Disk AC Variable Frequency Control Frame Stranding Machine

1. Allows for arbitrary stranding pitch according to quality requirements.
2. The segmented conductor stock stranding pre-twist forming adopts ground shaft drive, rigidly ensuring precise pre-twist pitch.
3. Power shared by the bus ensures synchronous operation of all components, solving traditional problems of stranding pitch variation or over-twisting due to equipment start-stop and power supply anomalies.
4. Conducts semi-conductive and protective tape wrapping simultaneously during stranding, avoiding issues of stranding looseness and tape layer damage.

## Φ3150 Disk Stranding Cable Forming Machine

1. It is capable of manufacturing split conductors with a cross-sectional range of 800 - 3000 $mm^2$ and a continuous manufacturing length of 1100 - 3500 meters.
2. Uses a programmable controller and Profibus field bus to coordinate startup, operation, and synchronization.
3. Five-group centralized phase detection ensures uniform and stable continuous quality of segmented conductors.

## Maillefer VCV Cross-linking Line

1. Capable of manufacturing cross-linked cables with voltage levels of 110~500kV and cross-sectional

areas ranging from 240 to 3000mm².

2. The cross-linking type uses a vertical U-shaped cross-linking tube, equipped with front and rear conductor induction heaters. The cross-linking zone is 36 meters long, and the cooling zone is 131 meters long. The process is determined by the NCC cross-linking software.
3. The feeding method is gravity insulation feeding, with the feeding environment transitioning progressively from "ten-thousand level" to "thousand level" to "hundred level" clean room standards, utilizing the Motan drying treatment system for shielded feeding.
4. Online X-ray measurement detection employs the SIKORA EX-RAY 8000 eccentricity measuring instrument.

## Flow-Through Degassing Oven Room

1. The company holds a patent for the flow-through air distribution design, ensuring uniform temperature distribution within the oven room, making the removal of by-products from the cable insulation reliable.
2. The monitoring and measurement of temperature within the oven room are conducted through a human-machine interface, allowing real-time temperature control and monitoring inside the oven.
3. The degassing parameters of the oven room are automatically stored using specialized software, which collects real-time operational data, forms trend charts, and creates electronic records for easy query and computer storage.

## British BWE Aluminum Extruder

150-Type Dual-Layer Co-Extrusion Plastic Sheath Extrusion Line

1. Capable of single-layer or dual-layer cable sheathing, such as PE/PVC or plastic sheath/semi-conductive extrusion layer co-extrusion.
2. Allows for aluminum sheath anti-corrosion asphalt coating and graphite conductive layer coating.

# German HIGHVOLT Company HV AC Series Resonance, PD Detection, Fault Location, and Capacitance and Loss Factor Measurement System

1. · Rated voltage: 700kV (series), 350kV (parallel), rated current: 30/60A (series/parallel), rated power: 21000 kVA.
2. · The detection and fault location instrument can detect apparent charges of 0.1~1000 pC, with a PD resolution of 10ns and a positioning error of 1 ± 0.1%.
3. · Capable of detecting cable lengths up to 5km.
4. · Loss factor (tan delta) measurement range: 1x10-5~1, with a measurement error of no more than ±0.05%.
5. · Capacitance measurement range: 0.1 x CN … 1000 x CN, with a measurement error of no more than ±0.01%.

## Shielded Test Hall

1. Space dimensions: 30 meters long, 20 meters wide, 15 meters high.
2. Background noise level in the hall: 0.5 pC.

# Main Technical Parameters of the Cable

## ➢ 66kV Power Cable

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Main structural parameters

| Nominal cross-section | Conductor outer diameter | Conductor shield thickness | Insulation thickness | Insulation shield thickness | Corrugated Aluminum Sheath Thickness | Outer Sheath Thickness | Approximate Cable Outer Diameter | Approximate Cable Weight(kg/km) | |
|---|---|---|---|---|---|---|---|---|---|
| $mm^2$ | mm | mm | mm | mm | mm | mm | mm | PVC sheath | PE sheath |
| 240 | 18.4 | 1.5 | 14.0 | 1.0 | 2.0 | 4.0 | 81.7 | 7211 | 6716 |
| 300 | 20.6 | 1.5 | 14.0 | 1.0 | 2.0 | 4.0 | 83.9 | 7953 | 7445 |
| 400 | 23.2 | 1.5 | 14.0 | 1.0 | 2.0 | 4.0 | 86.5 | 8937 | 8412 |
| 500 | 26.5 | 1.5 | 14.0 | 1.0 | 2.0 | 4.0 | 90.8 | 10277 | 9726 |
| 630 | 30.1 | 1.5 | 14.0 | 1.0 | 2.0 | 4.5 | 95.4 | 12123 | 11490 |
| 800 | 34.1 | 1.5 | 14.0 | 1.0 | 2.0 | 4.5 | 99.6 | 14113 | 13450 |
| 1000 | 38.0 | 1.5 | 14.0 | 1.0 | 2.3 | 4.5 | 104.7 | 16823 | 16125 |
| 1200 | 41.7 | 1.5 | 14.0 | 1.0 | 2.3 | 5.0 | 109.4 | 19054 | 18220 |
| 1400 | 46.6 | 1.5 | 14.0 | 1.0 | 2.3 | 5.0 | 114.3 | 21348 | 20488 |
| 1600 | 48.5 | 1.5 | 14.0 | 1.0 | 2.3 | 5.0 | 116.6 | 23399 | 22520 |
| 1800 | 51.5 | 1.5 | 14.0 | 1.0 | 2.3 | 5.0 | 119.6 | 25426 | 24526 |
| 2000 | 53.8 | 1.5 | 14.0 | 1.0 | 2.3 | 5.0 | 121.9 | 27641 | 26721 |
| 2500 | 60.8 | 1.5 | 14.0 | 1.0 | 2.3 | 5.0 | 128.9 | 32561 | 31586 |

YJA02、YJA03 Main structural parameters

| Nominal cross-section | Conductor outer diameter | Conductor shield thickness | Insulation thickness | Insulation shield thickness | Corrugated Aluminum Sheath Thickness | Outer Sheath Thickness | Approximate Cable Outer Diameter | Approximate Cable Weight(kg/km) | |
|---|---|---|---|---|---|---|---|---|---|
| $mm^2$ | mm | mm | mm | mm | mm | mm | mm | PVC sheath | PE sheath |
| 240 | 18.4 | 1.5 | 14.0 | 1.0 | 0.25 | 4.0 | 64.8 | 6376 | 6014 |
| 300 | 20.6 | 1.5 | 14.0 | 1.0 | 0.25 | 4.0 | 66.5 | 7229 | 6792 |
| 400 | 23.2 | 1.5 | 14.0 | 1.0 | 0.25 | 4.0 | 69.0 | 8131 | 7679 |
| 500 | 26.5 | 1.5 | 14.0 | 1.0 | 0.25 | 4.0 | 72.3 | 9371 | 8900 |
| 630 | 30.1 | 1.5 | 14.0 | 1.0 | 0.25 | 4.5 | 76.9 | 10255 | 9696 |
| 800 | 34.1 | 1.5 | 14.0 | 1.0 | 0.25 | 4.5 | 81.1 | 13315 | 12728 |
| 1000 | 38.0 | 1.5 | 14.0 | 1.0 | 0.25 | 4.5 | 85.0 | 15596 | 14980 |
| 1200 | 41.7 | 1.5 | 14.0 | 1.0 | 0.25 | 5.0 | 89.7 | 17691 | 16965 |
| 1400 | 46.6 | 1.5 | 14.0 | 1.0 | 0.25 | 5.0 | 94.6 | 21719 | 20956 |
| 1600 | 48.5 | 1.5 | 14.0 | 1.0 | 0.25 | 5.0 | 96.5 | 21872 | 21095 |
| 1800 | 51.5 | 1.5 | 14.0 | 1.0 | 0.25 | 5.0 | 98.7 | 25447 | 24654 |
| 2000 | 53.8 | 1.5 | 14.0 | 1.0 | 0.25 | 5.0 | 101.0 | 25633 | 24822 |
| 2500 | 60.8 | 1.5 | 14.0 | 1.0 | 0.25 | 5.0 | 108.0 | 30408 | 29545 |

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z、YJA02、YJA03 Main electrical parameters

| Nominal cross-section mm² | Conductor resistance （Ω/km） | | Capacitance （μF/km） |
|---|---|---|---|
| | Direct current resistance （20℃） | Alternating current resistance （90℃） | |
| 240 | 0.0754 | 0.0971 | 0.155 |
| 300 | 0.0601 | 0.0779 | 0.165 |
| 400 | 0.0470 | 0.0615 | 0.178 |
| 500 | 0.0366 | 0.0488 | 0.193 |
| 630 | 0.0283 | 0.0388 | 0.210 |
| 800 | 0.0221 | 0.0289 | 0.230 |
| 1000 | 0.0176 | 0.0234 | 0.248 |
| 1200 | 0.0151 | 0.0204 | 0.266 |
| 1400 | 0.0129 | 0.0178 | 0.288 |
| 1600 | 0.0113 | 0.0159 | 0.297 |
| 1800 | 0.0101 | 0.0146 | 0.311 |
| 2000 | 0.0090 | 0.0133 | 0.322 |
| 2500 | 0.0073 | 0.0115 | 0.354 |

Positive and negative sequence impedance, zero sequence impedance

| Nominal cross-section mm² | Positive-negative sequence impedance （Ω/km） | | Zero sequence impedance （Ω/km） | |
|---|---|---|---|---|
| | 实部 | 虚部 | 实部 | 虚部 |
| 240 | 0.0971 | 0.1571 | 0.2450 | 0.6477 |
| 300 | 0.0779 | 0.1527 | 0.2258 | 0.6383 |
| 400 | 0.0615 | 0.1481 | 0.2094 | 0.6280 |
| 500 | 0.0488 | 0.1438 | 0.1967 | 0.6145 |
| 630 | 0.0388 | 0.1397 | 0.1867 | 0.6011 |
| 800 | 0.0289 | 0.1350 | 0.1768 | 0.5883 |
| 1000 | 0.0234 | 0.1319 | 0.1713 | 0.5758 |
| 1200 | 0.0204 | 0.1293 | 0.1683 | 0.5649 |
| 1400 | 0.0178 | 0.1256 | 0.1657 | 0.5530 |
| 1600 | 0.0159 | 0.1245 | 0.1638 | 0.5481 |
| 1800 | 0.0146 | 0.1226 | 0.1625 | 0.5414 |
| 2000 | 0.0133 | 0.1212 | 0.1612 | 0.5364 |
| 2500 | 0.0115 | 0.1175 | 0.1594 | 0.5222 |

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Short Circuit Current Unit：kA

| Nominal cross-section | Conductor | Metal Sheath | Conductor | Metal Sheath | Conductor | Metal Sheath |
|---|---|---|---|---|---|---|
| ($mm^2$) | 1.0（S） | | 2.0（S） | | 3.0（S） | |
| 240 | 34.8 | 40.4 | 24.7 | 28.9 | 20.3 | 23.7 |
| 300 | 43.4 | 41.7 | 30.9 | 29.8 | 25.3 | 24.5 |
| 400 | 57.8 | 43.4 | 41.1 | 31.0 | 33.6 | 25.5 |
| 500 | 72.5 | 46.0 | 51.8 | 33.8 | 42.0 | 27.0 |
| 630 | 90.9 | 48.1 | 64.5 | 34.3 | 52.8 | 28.2 |
| 800 | 115.3 | 50.6 | 81.8 | 36.1 | 66.9 | 29.7 |
| 1000 | 144.0 | 60.9 | 102.1 | 43.4 | 83.5 | 35.7 |
| 1200 | 172.7 | 63.4 | 122.4 | 45.2 | 100.2 | 37.1 |
| 1400 | 201.4 | 66.9 | 142.8 | 47.7 | 116.8 | 39.2 |
| 1600 | 230.1 | 68.2 | 163.1 | 48.6 | 133.4 | 39.9 |
| 1800 | 258.8 | 70.2 | 183.4 | 50.1 | 150.0 | 41.1 |
| 2000 | 287.5 | 71.7 | 203.7 | 51.1 | 166.5 | 42.0 |
| 2500 | 359.2 | 76.4 | 254.4 | 54.5 | 208.0 | 44.7 |

YJA02、YJA03 Short Circuit Current Unit：kA

| Nominal cross-section | Conductor | Metal Sheath | Conductor | Metal Sheath | Conductor | Metal Sheath |
|---|---|---|---|---|---|---|
| ($mm^2$) | 1.0（S） | | 2.0（S） | | 3.0（S） | |
| 240 | 34.8 | 13.7 | 24.7 | 9.8 | 20.3 | 8.0 |
| 300 | 43.4 | 13.7 | 30.9 | 9.8 | 25.3 | 8.0 |
| 400 | 57.8 | 13.7 | 41.1 | 9.8 | 33.6 | 8.0 |
| 500 | 72.5 | 13.7 | 51.8 | 9.8 | 42.0 | 8.0 |
| 630 | 90.9 | 13.7 | 64.5 | 9.8 | 52.8 | 8.0 |
| 800 | 115.3 | 13.7 | 81.8 | 9.8 | 66.9 | 8.0 |
| 1000 | 144.0 | 13.7 | 102.1 | 9.8 | 83.5 | 8.0 |
| 1200 | 172.7 | 13.7 | 122.4 | 9.8 | 100.2 | 8.0 |
| 1400 | 201.4 | 13.7 | 142.8 | 9.8 | 116.8 | 8.0 |
| 1600 | 230.1 | 13.7 | 163.1 | 9.8 | 133.4 | 8.0 |
| 1800 | 258.8 | 13.7 | 183.4 | 9.8 | 150.0 | 8.0 |
| 2000 | 287.5 | 13.7 | 203.7 | 9.8 | 166.5 | 8.0 |
| 2500 | 359.2 | 13.7 | 254.4 | 9.8 | 208.0 | 8.0 |

Note: The cross-sectional area of the copper wire shielding layer is calculated based on 95 $mm^2$, but copper wire shielding with different cross-sections can be provided according to the user's requirements.

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Ampacity（reference value）Unit：A

| Nominal cross-section $mm^2$ | Laying in duct. | | Bury in underground | | In air | |
|---|---|---|---|---|---|---|
| | Parallel laying | Trifoil formation | Parallel laying | Trifoil formation | Parallel laying | Trifoil formation |
| 240 | 511 | 494 | 576 | 545 | 716 | 717 |
| 300 | 575 | 556 | 649 | 613 | 816 | 818 |
| 400 | 653 | 632 | 737 | 697 | 942 | 945 |
| 500 | 739 | 716 | 836 | 790 | 1085 | 1090 |
| 630 | 834 | 809 | 943 | 893 | 1249 | 1258 |
| 800 | 930 | 906 | 1053 | 1000 | 1425 | 1440 |
| 1000 | 1065 | 1046 | 1065 | 1155 | 1669 | 1699 |
| 1200 | 1137 | 1122 | 1290 | 1239 | 1815 | 1857 |
| 1400 | 1210 | 1203 | 1374 | 1328 | 1975 | 2033 |
| 1600 | 1270 | 1269 | 1443 | 1402 | 2094 | 2167 |
| 1800 | 1318 | 1325 | 1498 | 1465 | 2203 | 2294 |
| 2000 | 1366 | 1381 | 1556 | 1527 | 2308 | 2415 |
| 2500 | 1434 | 1474 | 1634 | 1631 | 2499 | 2655 |

The calculation data above is based on the following laying assumptions:

1. A single circuit is used, with a cable spacing of 250mm.
2. The normal operating temperature of the conductor is 90° C, and the ambient temperature is 20° C.
3. The cable laying depth is 1000mm, and the soil thermal resistivity is 1.2 K.m/W.

## ➢ 110kV Electric Cable

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Main structural parameters

| Nominal cross-section | Conductor outer diameter | Conductor shield thickness | Insulation thickness | Insulation shield thickness | Corrugated Aluminum Sheath Thickness | Outer Sheath Thickness | Approximate Cable Outer Diameter | Approximate Cable Weight(kg/km) | |
|---|---|---|---|---|---|---|---|---|---|
| $mm^2$ | mm | mm | mm | mm | mm | mm | mm | PVC Sheath | PE Sheath |
| 240 | 18.4 | 1.5 | 19.0 | 1.0 | 2.0 | 4.0 | 92.7 | 8496 | 7933 |
| 300 | 20.6 | 1.5 | 18.5 | 1.0 | 2.0 | 4.0 | 93.9 | 9138 | 8568 |
| 400 | 23.2 | 1.5 | 17.5 | 1.0 | 2.0 | 4.0 | 94.5 | 9882 | 9308 |
| 500 | 26.5 | 1.5 | 17.0 | 1.0 | 2.0 | 4.0 | 96.8 | 11080 | 10491 |
| 630 | 30.1 | 1.5 | 16.5 | 1.0 | 2.0 | 4.5 | 101.0 | 12862 | 12177 |
| 800 | 34.1 | 1.5 | 16.0 | 1.0 | 2.0 | 4.5 | 104.2 | 14730 | 14024 |
| 1000 | 38.0 | 1.5 | 16.0 | 1.0 | 2.3 | 4.5 | 109.1 | 17469 | 16728 |
| 1200 | 41.7 | 1.5 | 16.0 | 1.0 | 2.3 | 5.0 | 113.8 | 19721 | 18852 |
| 1400 | 46.6 | 1.5 | 16.0 | 1.0 | 2.3 | 5.0 | 118.7 | 22057 | 21149 |
| 1600 | 48.5 | 1.5 | 16.0 | 1.0 | 2.3 | 5.0 | 120.6 | 24101 | 23178 |
| 1800 | 51.5 | 1.5 | 16.0 | 1.0 | 2.3 | 5.0 | 123.6 | 26148 | 25202 |
| 2000 | 53.8 | 1.5 | 16.0 | 1.0 | 2.3 | 5.0 | 125.9 | 28374 | 27410 |
| 2500 | 60.8 | 1.5 | 16.0 | 1.0 | 2.3 | 5.0 | 132.9 | 33333 | 32313 |

YJA02、YJA03 Main structural parameters

| Nominal cross-section | Conductor outer diameter | Conductor shield thickness | Insulation thickness | Insulation shield thickness | Corrugated Aluminum Sheath Thickness | Outer Sheath Thickness | Approximate Cable Outer Diameter | Approximate Cable Weight(kg/km) | |
|---|---|---|---|---|---|---|---|---|---|
| $mm^2$ | mm | mm | mm | mm | mm | mm | mm | PVC Sheath | PE Sheath |
| 240 | 18.4 | 1.5 | 19.0 | 1.0 | 0.25 | 4.0 | 74.8 | 7447 | 7025 |
| 300 | 20.6 | 1.5 | 18.5 | 1.0 | 0.25 | 4.0 | 75.5 | 8214 | 7724 |
| 400 | 23.2 | 1.5 | 17.5 | 1.0 | 0.25 | 4.0 | 76.0 | 8913 | 8419 |
| 500 | 26.5 | 1.5 | 17.0 | 1.0 | 0.25 | 4.0 | 78.3 | 10064 | 9557 |
| 630 | 30.1 | 1.5 | 16.5 | 1.0 | 0.25 | 4.5 | 81.9 | 10873 | 10281 |
| 800 | 34.1 | 1.5 | 16.0 | 1.0 | 0.25 | 4.5 | 85.1 | 13807 | 13194 |
| 1000 | 38.0 | 1.5 | 16.0 | 1.0 | 0.25 | 4.5 | 89.0 | 16131 | 15490 |
| 1200 | 41.7 | 1.5 | 16.0 | 1.0 | 0.25 | 5.0 | 93.7 | 18260 | 17504 |
| 1400 | 46.6 | 1.5 | 16.0 | 1.0 | 0.25 | 5.0 | 98.6 | 22316 | 21523 |
| 1600 | 48.5 | 1.5 | 16.0 | 1.0 | 0.25 | 5.0 | 100.5 | 22480 | 21673 |
| 1800 | 51.5 | 1.5 | 16.0 | 1.0 | 0.25 | 5.0 | 102.7 | 26071 | 25248 |
| 2000 | 53.8 | 1.5 | 16.0 | 1.0 | 0.25 | 5.0 | 105.0 | 26271 | 25430 |
| 2500 | 60.8 | 1.5 | 16.0 | 1.0 | 0.25 | 5.0 | 112.0 | 31086 | 30193 |

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z、YJA02、YJA03 Main electrical parameters

| Nominal cross-section mm² | Conductor resistance （Ω/km） | | Capacitance（μF/km） |
|---|---|---|---|
| | Direct current resistance （20℃） | Alternating current resistance （90℃） | |
| 240 | 0.0754 | 0.0971 | 0.126 |
| 300 | 0.0601 | 0.0778 | 0.136 |
| 400 | 0.0470 | 0.0615 | 0.152 |
| 500 | 0.0366 | 0.0487 | 0.169 |
| 630 | 0.0283 | 0.0387 | 0.188 |
| 800 | 0.0221 | 0.0289 | 0.210 |
| 1000 | 0.0176 | 0.0234 | 0.224 |
| 1200 | 0.0151 | 0.0203 | 0.239 |
| 1400 | 0.0129 | 0.0177 | 0.259 |
| 1600 | 0.0113 | 0.0159 | 0.267 |
| 1800 | 0.0101 | 0.0145 | 0.279 |
| 2000 | 0.0090 | 0.0133 | 0.289 |
| 2500 | 0.0073 | 0.0115 | 0.317 |

Positive and negative sequence impedance, zero sequence impedance

| Nominal cross-section mm² | Positive and negative sequence impedance （Ω/km） | | Zero sequence impedance（Ω/km） | |
|---|---|---|---|---|
| | Solid | Imaginary part | Solid | Imaginary part |
| 240 | 0.0971 | 0.1650 | 0.2450 | 0.6318 |
| 300 | 0.0778 | 0.1598 | 0.2257 | 0.6242 |
| 400 | 0.0615 | 0.1537 | 0.2094 | 0.6169 |
| 500 | 0.0487 | 0.1478 | 0.1966 | 0.6065 |
| 630 | 0.0387 | 0.1433 | 0.1866 | 0.5940 |
| 800 | 0.0289 | 0.1378 | 0.1768 | 0.5826 |
| 1000 | 0.0234 | 0.1345 | 0.1713 | 0.5706 |
| 1200 | 0.0203 | 0.1318 | 0.1682 | 0.5600 |
| 1400 | 0.0177 | 0.1280 | 0.1656 | 0.5482 |
| 1600 | 0.0159 | 0.1266 | 0.1638 | 0.5439 |
| 1800 | 0.0145 | 0.1247 | 0.1624 | 0.5373 |
| 2000 | 0.0133 | 0.1232 | 0.1612 | 0.5324 |
| 2500 | 0.0115 | 0.1194 | 0.1594 | 0.5183 |

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Short Circuit Current Unit：kA

| Nominal cross-section | Conductor | Metal Sheath | Conductor | Metal Sheath | Conductor | Metal Sheath |
|---|---|---|---|---|---|---|
| ($mm^2$) | 1.0（S） | | 2.0（S） | | 3.0（S） | |
| 240 | 34.8 | 46.9 | 24.7 | 33.5 | 20.3 | 27.5 |
| 300 | 43.4 | 47.5 | 30.9 | 33.9 | 25.3 | 27.9 |
| 400 | 57.8 | 48.0 | 41.1 | 34.3 | 33.6 | 28.2 |
| 500 | 72.5 | 49.5 | 51.8 | 35.3 | 42.0 | 29.0 |
| 630 | 90.9 | 51.4 | 64.5 | 36.7 | 52.8 | 30.2 |
| 800 | 115.3 | 53.3 | 81.8 | 38.0 | 66.9 | 31.3 |
| 1000 | 144.0 | 63.9 | 102.1 | 45.5 | 83.5 | 37.4 |
| 1200 | 172.7 | 66.3 | 122.4 | 47.3 | 100.2 | 38.9 |
| 1400 | 201.4 | 69.6 | 142.8 | 49.6 | 116.8 | 40.7 |
| 1600 | 230.1 | 70.9 | 163.1 | 50.5 | 133.4 | 41.5 |
| 1800 | 258.8 | 72.9 | 183.4 | 52.0 | 150.0 | 42.7 |
| 2000 | 287.5 | 74.4 | 203.7 | 53.0 | 166.5 | 43.6 |
| 2500 | 359.2 | 79.0 | 254.4 | 56.4 | 208.0 | 46.3 |

YJA02、YJA03 Short Circuit Current Unit：kA

| Nominal cross-section | Conductor | Metal Sheath | Conductor | Metal Sheath | Conductor | Metal Sheath |
|---|---|---|---|---|---|---|
| ($mm^2$) | 1.0（S） | | 2.0（S） | | 3.0（S） | |
| 240 | 34.8 | 13.7 | 24.7 | 9.8 | 20.3 | 8.0 |
| 300 | 43.4 | 13.7 | 30.9 | 9.8 | 25.3 | 8.0 |
| 400 | 57.8 | 13.7 | 41.1 | 9.8 | 33.6 | 8.0 |
| 500 | 72.5 | 13.7 | 51.8 | 9.8 | 42.0 | 8.0 |
| 630 | 90.9 | 13.7 | 64.5 | 9.8 | 52.8 | 8.0 |
| 800 | 115.3 | 13.7 | 81.8 | 9.8 | 66.9 | 8.0 |
| 1000 | 144.0 | 13.7 | 102.1 | 9.8 | 83.5 | 8.0 |
| 1200 | 172.7 | 13.7 | 122.4 | 9.8 | 100.2 | 8.0 |
| 1400 | 201.4 | 13.7 | 142.8 | 9.8 | 116.8 | 8.0 |
| 1600 | 230.1 | 13.7 | 163.1 | 9.8 | 133.4 | 8.0 |
| 1800 | 258.8 | 13.7 | 183.4 | 9.8 | 150.0 | 8.0 |
| 2000 | 287.5 | 13.7 | 203.7 | 9.8 | 166.5 | 8.0 |
| 2500 | 359.2 | 13.7 | 254.4 | 9.8 | 208.0 | 8.0 |

Note: The cross-sectional area of the copper wire shielding layer is calculated based on 95 $mm^2$, but copper wire shielding with different cross-sections can be provided according to the user's requirements.

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Ampacity（reference value）Unit：A

| Nominal cross-section $mm^2$ | Laying in duct. | | Bury in underground | | In air | |
|---|---|---|---|---|---|---|
| | Parallel laying | Trifoil formation | Parallel laying | Trifoil formation | Parallel laying | Trifoil formation |
| 240 | 505 | 489 | 565 | 535 | 712 | 714 |
| 300 | 569 | 551 | 637 | 604 | 812 | 814 |
| 400 | 647 | 627 | 727 | 688 | 937 | 941 |
| 500 | 733 | 711 | 825 | 782 | 1079 | 1086 |
| 630 | 827 | 804 | 932 | 885 | 1242 | 1252 |
| 800 | 922 | 900 | 1041 | 991 | 1426 | 1443 |
| 1000 | 1056 | 1038 | 1056 | 1145 | 1659 | 1691 |
| 1200 | 1126 | 1114 | 1275 | 1228 | 1803 | 1847 |
| 1400 | 1197 | 1193 | 1358 | 1316 | 1960 | 2021 |
| 1600 | 1255 | 1258 | 1425 | 1389 | 2077 | 2153 |
| 1800 | 1301 | 1313 | 1478 | 1450 | 2184 | 2279 |
| 2000 | 1348 | 1368 | 1534 | 1511 | 2287 | 2399 |
| 2500 | 1413 | 1459 | 1609 | 1613 | 2474 | 2635 |

The calculation data above is based on the following laying assumptions:

1. A single circuit is used, with a cable spacing of 250mm.
2. The normal operating temperature of the conductor is 90°C, and the ambient temperature is 20°C.
3. The cable laying depth is 1000mm, and the soil thermal resistivity is 1.2 K.m/W.

# 220kV Electric Cable

YJLW02、YJLW03、YJLW02-Z、YJLW03-ZMain structural parameters

| Nominal cross-section | Conductor outer diameter | Conductor shield thickness | Insulation thickness | Insulation shield thickness | Corrugated Aluminum Sheath Thickness | Outer Sheath Thickness | Approximate Cable Outer Diameter | Approximate Cable Weight(kg/km) | |
|---|---|---|---|---|---|---|---|---|---|
| $mm^2$ | mm | mm | mm | mm | mm | mm | mm | PVC Sheath | PE Sheath |
| 400 | 23.2 | 1.8 | 27.0 | 1.0 | 2.4 | 5.0 | 124.7 | 14499 | 13542 |
| 500 | 26.5 | 1.8 | 27.0 | 1.0 | 2.4 | 5.0 | 128.0 | 15971 | 14988 |
| 630 | 30.1 | 1.8 | 26.0 | 1.0 | 2.4 | 5.0 | 130.2 | 17410 | 16410 |
| 800 | 34.1 | 1.8 | 25.0 | 1.0 | 2.4 | 5.0 | 132.4 | 19232 | 18215 |
| 1000 | 38.0 | 2.0 | 24.0 | 1.0 | 2.6 | 5.0 | 135.5 | 21789 | 20748 |
| 1200 | 41.7 | 2.0 | 24.0 | 1.0 | 2.6 | 5.0 | 139.2 | 23843 | 22772 |
| 1400 | 46.6 | 2.0 | 24.0 | 1.0 | 2.6 | 5.0 | 144.7 | 26359 | 25245 |
| 1600 | 48.5 | 2.0 | 24.0 | 1.0 | 2.6 | 5.0 | 146.6 | 28459 | 27330 |
| 1800 | 51.5 | 2.0 | 24.0 | 1.0 | 2.8 | 5.0 | 150.4 | 30902 | 29743 |
| 2000 | 53.8 | 2.0 | 24.0 | 1.0 | 2.8 | 5.0 | 152.7 | 33190 | 32013 |
| 2500 | 60.8 | 2.0 | 24.0 | 1.0 | 2.8 | 5.0 | 159.7 | 38530 | 37297 |

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Main Electrical Parameters

| Nominal cross-section $mm^2$ | Conductor resistance （Ω/km） | | capacitance（μF/km） |
|---|---|---|---|
| | Direct current resistance （20℃） | Alternating current resistance （90℃） | |
| 400 | 0.0470 | 0.0614 | 0.117 |
| 500 | 0.0366 | 0.0486 | 0.125 |
| 630 | 0.0283 | 0.0385 | 0.138 |
| 800 | 0.0221 | 0.0288 | 0.153 |
| 1000 | 0.0176 | 0.0233 | 0.169 |
| 1200 | 0.0151 | 0.0202 | 0.180 |
| 1400 | 0.0129 | 0.0176 | 0.193 |
| 1600 | 0.0113 | 0.0157 | 0.199 |
| 1800 | 0.0101 | 0.0143 | 0.207 |
| 2000 | 0.0090 | 0.0131 | 0.213 |
| 2500 | 0.0073 | 0.0113 | 0.232 |

Positive and negative sequence impedance, zero sequence impedance

| Nominal cross-section mm² | Positive and negative sequence impedance（Ω/km） | | Zero sequence impedance（Ω/km） | |
|---|---|---|---|---|
| | Solid | Imaginary part | Solid | Imaginary part |
| 400 | 0.0614 | 0.1697 | 0.2093 | 0.5806 |
| 500 | 0.0486 | 0.1641 | 0.1965 | 0.5701 |
| 630 | 0.0385 | 0.1581 | 0.1864 | 0.5609 |
| 800 | 0.0288 | 0.1519 | 0.1767 | 0.5515 |
| 1000 | 0.0233 | 0.1466 | 0.1712 | 0.5419 |
| 1200 | 0.0202 | 0.1431 | 0.1681 | 0.5333 |
| 1400 | 0.0176 | 0.1392 | 0.1655 | 0.5221 |
| 1600 | 0.0157 | 0.1377 | 0.1636 | 0.5181 |
| 1800 | 0.0143 | 0.1359 | 0.1622 | 0.5115 |
| 2000 | 0.0131 | 0.1343 | 0.1610 | 0.5070 |
| 2500 | 0.0113 | 0.1300 | 0.1592 | 0.4943 |

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Short Circuit Current Unit：kA

| Nominal cross-section | Conductor | Metal Sheath | Conductor | Metal Sheath | Conductor | Metal Sheath |
|---|---|---|---|---|---|---|
| (mm²) | 1.0（S） | | 2.0（S） | | 3.0（S） | |
| 400 | 57.8 | 75.2 | 41.1 | 53.6 | 33.6 | 44.0 |
| 500 | 72.5 | 77.6 | 51.8 | 55.3 | 42.0 | 45.4 |
| 630 | 90.9 | 79.3 | 64.5 | 56.5 | 52.8 | 46.4 |
| 800 | 115.3 | 81.1 | 81.8 | 57.8 | 66.9 | 47.5 |
| 1000 | 144.0 | 89.4 | 102.1 | 63.7 | 83.5 | 52.3 |
| 1200 | 172.7 | 92.2 | 122.4 | 65.7 | 100.2 | 53.9 |
| 1400 | 201.4 | 96.3 | 142.8 | 68.6 | 116.8 | 56.3 |
| 1600 | 230.1 | 97.8 | 163.1 | 69.6 | 133.4 | 57.2 |
| 1800 | 258.8 | 108.0 | 183.4 | 76.9 | 150.0 | 63.1 |
| 2000 | 287.5 | 109.9 | 203.7 | 78.3 | 166.5 | 64.2 |
| 2500 | 359.2 | 115.5 | 254.4 | 82.3 | 208.0 | 67.5 |

YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Ampacity（reference value）Unit：A

| Nominal cross-section $mm^2$ | Laying in duct. | | Bury in underground | | In air | |
|---|---|---|---|---|---|---|
| | Parallel laying | Trifoil formation | Parallel laying | Trifoil formation | Parallel laying | Trifoil formation |
| 400 | 631 | 615 | 702 | 669 | 935 | 942 |
| 500 | 711 | 695 | 792 | 757 | 1073 | 1084 |
| 630 | 799 | 785 | 893 | 857 | 1230 | 1248 |
| 800 | 888 | 877 | 996 | 959 | 1400 | 1427 |
| 1000 | 1011 | 1011 | 1011 | 1107 | 1635 | 1681 |
| 1200 | 1073 | 1081 | 1209 | 1186 | 1769 | 1832 |
| 1400 | 1134 | 1155 | 1281 | 1269 | 1914 | 1999 |
| 1600 | 1225 | 1230 | 1385 | 1354 | 1976 | 2047 |
| 1800 | 1220 | 1265 | 1382 | 1392 | 2121 | 2249 |
| 2000 | 1258 | 1315 | 1428 | 1447 | 2217 | 2365 |
| 2500 | 1309 | 1396 | 1489 | 1540 | 2384 | 2589 |

The calculation data above is based on the following laying assumptions:

1. A single circuit is used, with a cable spacing of 250mm.
2. The normal operating temperature of the conductor is 90°C, and the ambient temperature is 20°C.
3. The cable laying depth is 1000mm, and the soil thermal resistivity is 1.2 K.m/W.

High voltage XLPE insulatin electric cable YJLW02、YJLW03、YJLW02-Z、YJLW03-Z Ampacity correction coefficient (reference value)

| Burial depth (m) | 0.5 | 0.7 | 0.9 | 1.0 | 1.2 | 1.5 | 2.0 |
|---|---|---|---|---|---|---|---|
| Revising coefficient | 0.08 | 1.04 | 1.01 | 1.00 | 0.97 | 0.95 | 0.91 |

**Effect of thermal resistivity of soil**

| Thermal resistance（K.m/W） | 0.6 | 0.8 | 1.0 | 1.2 | 1.5 | 2.0 | 3.0 |
|---|---|---|---|---|---|---|---|
| Revising coefficient | 1.21 | 1.12 | 1.06 | 1 | 0.93 | 0.84 | 0.72 |

**Effect of soil temperature**

| Ambient temperature（℃） | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|
| Revising coefficient | 1.07 | 1.04 | 1 | 0.96 | 0.93 | 0.89 | 0.84 |

**Effect of air temperature**

| Air temperature（℃） | 10 | 20 | 25 | 30 | 35 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| Revising coefficient | 0.07 | 1 | 0.96 | 0.93 | 0.89 | 0.84 | 0.76 |

**Effect of Space between cables**

| Space between cables（mm） | 150 | 200 | 250 | 270 | 300 | 350 | 400 |
|---|---|---|---|---|---|---|---|
| Revising coefficient | 0.88 | 0.95 | 1.00 | 1.01 | 1.03 | 1.06 | 1.08 |