

SPECIFICATION

For

12/20KV-CE

12/20(24)kV

XLPE Insulated PE Sheathed

Power Cable

(12/20(24)kV, Cu/XLPE/CTS/PE)

BY



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CUSTOMER

| Rev. | Date | Description |
|------|------------|---|
| 0 | 21/08/2020 | Issued specification |
| 1 | 23/07/2021 | - Delete cable code "0010" - Change marking on cable |
| 2 | 9/8/2024 | Update specification |
| 3 | 11/02/2025 | Update Table 1 |
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| Customer Document | Rev. |
|-------------------|------|
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Remark:

This document is based on the Customer Document for the structure and properties of electric wire and cable only. If there are different points, will be shown in deviation table.

1. Scope

This specification covers 22000V copper conductor cross-linked polyethylene (XLPE) insulated polyethylene (PE) sheathed power cable.

The cable shall be in accordance with IEC 60502-2 : 2014. (Comply with TIS 2143-2546)

2. Conductor

The conductor shall be compacted concentric stranded uncoated annealed copper conductor in accordance with IEC 60228 : 2004, Class 2.

The direction of lay shall be left-hand (S) lay in the outermost layer.

3. Conductor Shield

The conductor shield shall be a semi-conducting nylon tape and shall be applied helically with a wrap over the conductor and a layer of extruded semi-conducting compound.

Size $\leq 150 \text{ mm}^2$: Applied extruded semi-conducting compound

Size $\geq 185 \text{ mm}^2$: Applied semi-conducting nylon tape and extruded semi-conducting compound

The thickness of the conductor shield shall be approximate 0.5 mm.

4. Insulation

The insulation shall be cross-linked polyethylene (XLPE) compound meet the requirements of IEC 60502-2 : 2014.

The average thickness of the insulation shall be not less than that given in Table 1.

The minimum thickness shall not fall below 90% of the nominal value in Table 1 by more than 0.1 mm.

5. Insulation Shield

The insulation shield shall be a layer of extruded semi-conducting compound and shall be free stripping.

The thickness of the insulation shield shall be approximate 0.5 mm.

6. Metallic Shield

The metallic shield shall be an uncoated annealed copper tape and shall be applied helically with a lap over the insulation shield.

The thickness of the copper tape shall be approximate 0.1 mm.

A suitable separator tape shall be applied helically over the shielded core for single-core only.

7. Cabling (For multi-cores only)

The individual shielded cores shall be cabled together with non-hygroscopic filler to give the completed cable a substantially circular cross section.

The direction of lay shall be left-hand (S) lay.

A suitable binder tape shall be applied helically over the cabled core.

8. Core Identification

The cores shall be identified by colors of identification tape, placed longitudinally under the metallic shield, as follow :

Single-core : Not inserted color of identification tape
3-cores : white, red, blue

9. Sheath

The sheath shall be sunlight resistant polyethylene (PE/ST7) compound meet the requirements of IEC 60502-2 : 2014.


The average thickness of the sheath shall be not less than that given in Table 1.

The minimum thickness shall not fall below 80% of the nominal value in Table 1 by more than 0.2 mm.

The color of the sheath shall be black.

10. Marking on Cable

The marking items shall be marked by printed at intervals not exceeding 1 meter with suitable means throughout the length of cable.

1. Manufacturer's name and/or trade mark "  YAZAKI.....TYE"
2. Year of manufacture
3. Rated circuit voltage "12/20(24)KV"
4. Type of conductor "CU"
5. Type of insulation and sheath "XLPE/PE"
6. Type of cable "POWER CABLE"
7. Number of cores and size of conductor
8. TIS logo and standard number (For single-core only)
9. The continuous reel length marking (in figure) shall be made on the sheath at every 1 meter

11. Test and Properties

The cable shall meet the requirements in Test and Inspection and Table 1, when tested in accordance with IEC 60502-2 : 2014 (Comply with TIS 2143-2546) and IEC 60228 : 2004.


Remark: Sunlight resistant test meet the requirement of TIS 293-2541.

12. Packing

The cable shall be placed on non-returnable wooden reels.

The reels shall be covered with suitable covering to provide the cable with physical protection during transportation and during ordinary storage and handling operations.

Each reel shall be clearly marked on drum or label as follows.

1. Designation "12/20KV-CE "
2. Number of cores and size of conductor
3. Cable length
4. Net and gross weight
5. Manufacturer's name and/or trade mark "  **YAZAKI** "
6. Rolling direction of reel
7. TIS logo and standard number (For single-core only)

Test and Inspection

Routine Tests

- Maximum conductor resistance, Ohm/km..... specified in Table 1
 - AC test voltage for 5 minutes, kV..... 42
 - Maximum partial discharge level*..... 10 pC or better, at 20.76 kV
 - Electrical test on over sheath No breakdown
- *The partial discharge level shall be no detectable discharge exceeding the declared sensitivity

Sample Tests

- Construction..... specified in Table 1
- AC test voltage for 4 hours, kV..... 48
- Hot set test at $200\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ for XLPE
 - Maximum elongation under load (%) 175
 - Maximum permanent elongation after cooling (%)..... 15

Definition concerning the tests

Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

Sample tests: Tests made by the manufacturer on samples of completed cable or components taken from a completed cable, at a specified frequency, so as to verify that the finished product meets the specified requirements.

Type tests: Tests made before supplying, on a general commercial basis, a type of cable covered by this standard, in order to demonstrate satisfactory performance characteristics to meet the intended application.

Cable structure

Cross-sectional (Not scale)

| No. | Structure | Material |
|-----|-------------------|--|
| 1 | Conductor | Stranded annealed copper |
| 2 | Nylon tape | Semi-conducting nylon tape (For size $\geq 185 \text{ mm}^2$ only) |
| 3 | Conductor shield | Semi-conducting compound |
| 4 | Insulation | Cross-linked polyethylene (XLPE) compound |
| 5 | Insulation shield | Semi-conducting compound |
| 6 | Metallic shield | Copper tape |
| 7 | Filler | Non-hygroscopic |
| 8 | Binder tape | Spun bond tape or suitable tape |
| 9 | Sheath | Polyethylene (PE/ST7) compound |

Application: Use for installation exposed, or in raceway, wet or dry location, or direct burial in ground.

Maximum conductor temperature of 90°C for normal operation and 250°C for short circuit conditions

Table 1

| No. of core | Size (mm ²) | Conductor (wires/type) | Conductor diameter approx. (mm) | Insulation thickness nominal (mm) | Sheath thickness nominal (mm) | Overall diameter approx. (mm) | Conductor resistance at 20°C maximum (Ohm/km) | Weight of cable approx. (kg/km) | Standard packing length (m) |
|-------------|----------------------------|---------------------------|------------------------------------|--------------------------------------|----------------------------------|----------------------------------|--|------------------------------------|--------------------------------|
| 1 | 35 | 7/Compacted | 6.90 | 5.5 | 1.8 | 26.0 | 0.524 | 788 | 500 |
| 1 | 50 | 19/Compacted | 8.20 | 5.5 | 1.8 | 27.0 | 0.387 | 936 | 500 |
| 1 | 70 | 19/Compacted | 9.80 | 5.5 | 1.8 | 29.0 | 0.268 | 1168 | 500 |
| 1 | 95 | 19/Compacted | 11.60 | 5.5 | 1.9 | 31.0 | 0.193 | 1463 | 500 |
| 1 | 120 | 37/Compacted | 13.10 | 5.5 | 2.0 | 32.5 | 0.153 | 1750 | 500 |
| 1 | 150 | 37/Compacted | 14.50 | 5.5 | 2.0 | 34.0 | 0.124 | 2040 | 500 |
| 1 | 185 | 37/Compacted | 16.10 | 5.5 | 2.1 | 36.0 | 0.0991 | 2400 | 500 |
| 1 | 240 | 61/Compacted | 18.60 | 5.5 | 2.1 | 38.5 | 0.0754 | 2995 | 500 |
| 1 | 300 | 61/Compacted | 20.80 | 5.5 | 2.2 | 41.0 | 0.0601 | 3624 | 500 |
| 1 | 400 | 61/Compacted | 23.40 | 5.5 | 2.3 | 44.0 | 0.0470 | 4493 | 500 |
| 1 | 500 | 61/Compacted | 26.60 | 5.5 | 2.4 | 47.5 | 0.0366 | 5623 | 500 |
| 1 | 630 | 61/Compacted | 30.20 | 5.5 | 2.5 | 51.5 | 0.0283 | 7031 | 500 |
| 1 | 800 | 61/Compacted | 34.00 | 5.5 | 2.6 | 55.5 | 0.0221 | 8648 | 500 |
| 1 | 1000 | 127/Compacted | 39.40 | 5.5 | 2.8 | 61.0 | 0.0176 | 11132 | 300 |

Table 1 (continued)

| No. of cores | Size (mm ²) | Conductor (wires/type) | Conductor diameter approx. (mm) | Insulation thickness nominal (mm) | Sheath thickness nominal (mm) | Overall diameter approx. (mm) | Conductor resistance at 20°C maximum (Ohm/km) | Weight of cable approx. (kg/km) | Standard packing length (m) |
|-----------------|--------------------------------|-------------------------------|--|--|--|--|---|--|--|
| 3 | 35 | 7/Compacted | 6.90 | 5.5 | 2.7 | 52.5 | 0.524 | 2678 | 500 |
| 3 | 50 | 19/Compacted | 8.20 | 5.5 | 2.8 | 56.0 | 0.387 | 3177 | 500 |
| 3 | 70 | 19/Compacted | 9.80 | 5.5 | 2.9 | 59.5 | 0.268 | 3950 | 500 |
| 3 | 95 | 19/Compacted | 11.60 | 5.5 | 3.0 | 64.0 | 0.193 | 4911 | 500 |
| 3 | 120 | 37/Compacted | 13.10 | 5.5 | 3.1 | 67.5 | 0.153 | 5829 | 500 |
| 3 | 150 | 37/Compacted | 14.50 | 5.5 | 3.2 | 70.5 | 0.124 | 6790 | 300 |
| 3 | 185 | 37/Compacted | 16.10 | 5.5 | 3.3 | 75.0 | 0.0991 | 8044 | 300 |
| 3 | 240 | 61/Compacted | 18.60 | 5.5 | 3.5 | 80.5 | 0.0754 | 9999 | 300 |
| 3 | 300 | 61/Compacted | 20.80 | 5.5 | 3.7 | 86.0 | 0.0601 | 12021 | 300 |
| 3 | 400 | 61/Compacted | 23.40 | 5.5 | 3.9 | 92.0 | 0.0470 | 14720 | 200 |