

SPECIFICATION**For****12/20KV-CV-CWS**

12/20(24)kV XLPE Insulated

PVC Inner Sheathed Copper Wire Screened

PVC Outer Sheathed Power Cable

(12/20(24)kV, Cu/XLPE/CTS/PVC/CWS/PVC)

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CUSTOMER

Rev.	Date	Description
0	21/09/2020	Issued specification
1	26/01/2021	- Cancel cable code "0010" - Change marking on cable

Customer Document	Rev.

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 polyvinyl chloride (PVC) inner sheathed copper wire screened polyvinyl chloride (PVC) outer sheathed power cable.

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

The finished cables shall meet the flame test requirements per IEC 60332-1.

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 the value in Table 1 by more than 10% plus 0.1 mm.

The thickness of insulation shall not be included that of conductor shield.

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 (For multi-core only)

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.

7. Cabling (For multi-core only)

The individual shielded cores shall be cabled together with suitable 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. Inner Sheath (For multi-core only)

The inner sheath shall be polyvinyl chloride (PVC) compound applied over the binder tape.

The approximated thickness given in Table 1.

The color of the inner sheath shall be black.

10. Copper Wire Screen

The copper wire screen shall consist of plain annealed round copper wires applied helically over the insulation shield for single-core or inner sheathed for multi-core.

The contact tape shall be an annealed uncoated copper tape and shall be applied helically with a gap over the copper wire screen.

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

A suitable separator tape shall be applied helically over the contacted tape.

11. Outer Sheath

The outer sheath shall be sunlight resistant polyvinyl chloride (PVC/ST2) compound meet the requirements of IEC 60502-2 : 2014.


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

The minimum thickness shall not fall below the value in Table 1 by more than 20% plus 0.2 mm.

The color of the outer sheath shall be black.

12. Marking on Cable

The marking items shall be marked 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/PVC"
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

13. 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 (Same as TIS 2143-2546), IEC 60228 : 2004 and IEC 60332-1.

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

14. 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 as follows.

1. Designation "12/20KV-CV-CWS"
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

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 sheathNo 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

Type Tests

- Flame retardant tested according to IEC 60332-1.

Definition concerning the tests

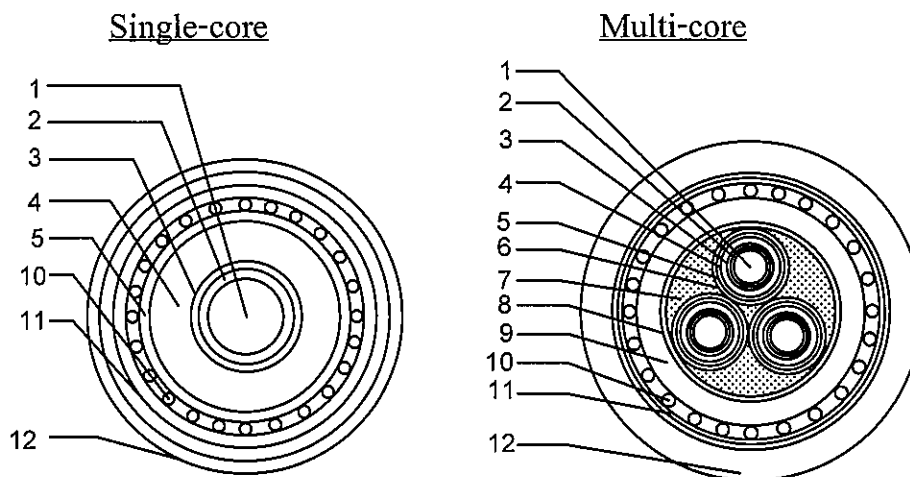
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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	Compacted concentric stranded annealed copper
2	Nylon tape	Semi-conducting nylon tape (For size $\geq 185 \text{ mm}^2$ only)
3	Conductor shield	Semi-conducting XLPE compound
4	Insulation	Cross-linked polyethylene (XLPE)
5	Insulation shield	Semi-conducting XLPE compound
6	Metallic shield	Copper tape (For multi-cores only)
7	Filler	PP calcium yarn (Non-hygroscopic)
8	Binder tape	Spun bond tape or suitable tape
9	Inner sheath	Polyvinyl chloride (PVC)
10	Metallic shield	Copper wire screen with copper contact tape
11	Binder tape	Spun bond tape or suitable tape
12	Outer sheath	Polyvinyl chloride (PVC/ST2)

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 (wire/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Copper wire area (mm ²)	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	35/10	7/Compacted	7.10	5.5	10	1.8	27.5	0.524	900	500
1	50/10	19/Compacted	8.30	5.5	10	1.8	28.5	0.387	1100	500
1	70/10	19/Compacted	9.90	5.5	10	1.9	30.5	0.268	1300	500
1	95/16	19/Compacted	11.70	5.5	16	2.0	33.0	0.193	1700	500
1	120/16	37/Compacted	13.20	5.5	16	2.0	34.5	0.153	1900	500
1	150/25	37/Compacted	14.60	5.5	25	2.1	36.5	0.124	2300	500
1	185/25	37/Compacted	16.30	5.5	25	2.2	38.5	0.0991	2700	500
1	240/35	61/Compacted	18.70	5.5	35	2.2	41.0	0.0754	3400	500
1	300/35	61/Compacted	20.90	5.5	35	2.3	43.5	0.0601	4100	500
1	400/35	61/Compacted	23.50	5.5	35	2.4	46.0	0.0470	4900	500
1	500/50	61/Compacted	26.70	5.5	50	2.5	50.5	0.0366	6000	500
1	630/50	61/Compacted	30.30	5.5	50	2.7	54.0	0.0283	7500	500
1	800/50	61/Compacted	34.10	5.5	50	2.8	58.0	0.0221	9500	300

Table 1 (continued)

No. of cores	Size (mm ²)	Conductor (wire/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness nominal (mm)	Dia. of inner sheath approx. (mm)	Copper wire area (mm ²)	Outer 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	35/10	7/Compacted	7.10	5.5	1.5	50.5	10	2.8	59.5	0.524	3400	500
3	50/10	19/Compacted	8.30	5.5	1.6	53.5	10	2.9	62.5	0.387	3900	500
3	70/10	19/Compacted	9.90	5.5	1.6	57.0	10	3.0	66.5	0.268	4800	500
3	95/16	19/Compacted	11.70	5.5	1.7	61.0	16	3.2	71.0	0.193	6000	300
3	120/16	37/Compacted	13.20	5.5	1.8	64.5	16	3.3	74.5	0.153	7000	300
3	150/25	37/Compacted	14.60	5.5	1.8	67.5	25	3.4	78.0	0.124	8000	300
3	185/25	37/Compacted	16.30	5.5	1.9	72.0	25	3.6	83.0	0.0991	9500	300
3	240/35	61/Compacted	18.70	5.5	2.0	77.5	35	3.8	89.0	0.0754	11500	200
3	300/35	61/Compacted	20.90	5.5	2.1	82.5	35	3.9	94.0	0.0601	13500	100
3	400/35	61/Compacted	23.50	5.5	2.2	88.5	35	4.1	100.5	0.0470	16500	100