

SPECIFICATION
For
FD-0.6/1KV-CV-SWA

0.6/1(1.2)kV

XLPE Insulated PVC Inner Sheathed Steel Wire Armored

PVC Outer Sheathed Flame Retardant

with Protection Earthed Power Cable

(0.6/1(1.2)kV, Cu/XLPE/PVC/SWA/FR-PVC)

BY Wachara
(Wachara Sangsomritphon)

MANAGER, Cable Design Section

APP. Winai
(Winai Ariyasakulsap)

MANAGER, Development Department

APP. _____
()

CUSTOMER

Rev.	Date	Description
0	20/09/2019	Issued specification
1	26/01/2021	Cancel cable code "0010"
2	16/02/2021	Add size 3+PE x 120/120 mm ²
3	13/7/2021	Add size 4+PE x 185/70 mm ²

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 1000V copper conductor cross-linked polyethylene (XLPE) insulated polyvinyl chloride (PVC) inner sheathed steel wire armored polyvinyl chloride (PVC) outer sheathed flame retardant with protection earthed power cable.

The cable shall be in accordance with IEC 60502-1 : 2004 and Amend.1 : 2009.

The finished cables shall meet the vertical tray flame test requirements per IEC 60332-1 and IEC 60332-3-24; Category C.

2. Conductor

For size $\leq 6 \text{ mm}^2$:

The conductor shall be non-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.

For size $\geq 10 \text{ mm}^2$:

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. Insulation

The insulation shall be cross-linked polyethylene (XLPE) compound meet the requirements of IEC 60502-1 : 2004.

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.

4. Cabling

The individual insulated 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 cable.

5. Core Identification

The cores shall be identified by color, as follows :

2-cores + PE : blue, brown + green/yellow

3-cores + PE : brown, black, grey + green/yellow

4-cores + PE : blue, brown, black, grey + green/yellow

6. Inner Sheath

The inner sheath shall be polyvinyl chloride (PVC) compound applied over the binder tape.
The approximate thickness given in Table 1.
The color of the inner sheath shall be black.

7. Steel Wire Armor


The armor shall be galvanized round steel wire applied with a minimum gap between adjacent wires over the inner sheathed.
A suitable tape may be applied helically over the armored core.

8. Outer Sheath

The outer sheath shall be sunlight resistant and flame retardant polyvinyl chloride (PVC/ST2) compound meet the requirements of IEC 60502-1 : 2004.
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 2 by more than 20% plus 0.2 mm.
The color of the outer sheath shall be black.

9. 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. Flame retardant "FD"
4. Rated circuit voltage "0.6/1KV"
5. Type of insulation "XLPE"
6. Type of cable "POWER CABLE"
7. Number of cores and size of conductor
8. The continuous reel length marking (in figure) shall be made on the outer sheath at every 1 meter.

10. Test and Properties

The cable shall meet the requirements in Test and Inspection and Table 1 , when tested in accordance with IEC 60502-1 : 2004 and Amend.1 : 2009, IEC 60228 : 2004, IEC 60332-1 and IEC 60332-3-24 ; Category C.


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

11. 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 "FD-0.6/1KV-CV-SWA"
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..... 3.5

Sample Tests

- Construction..... specified in Table 1
- 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 and IEC 60332-3-24; Category C.

Definition concerning the tests

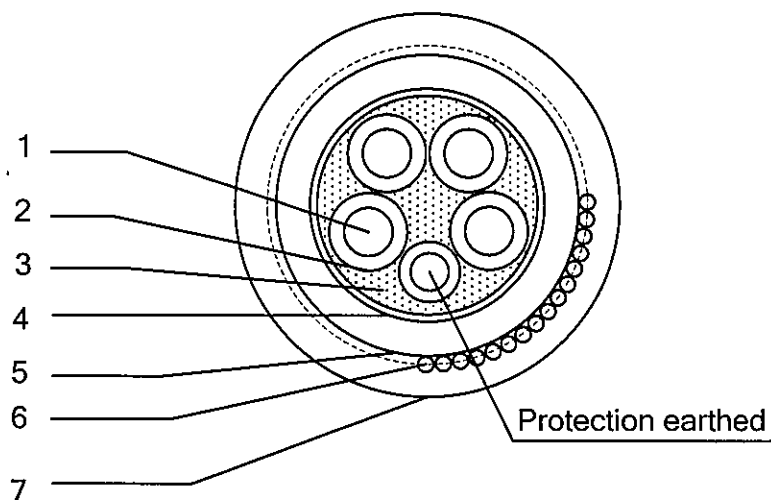
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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	Non-Compacted & Compacted concentric stranded annealed copper
2	Insulation	Cross-Linked Polyethylene (XLPE)
3	Filler	PP Calcium Yarn (Non-hygroscopic)
4	Binder tape	Spun bond tape or suitable tape
5	Inner sheath	Polyvinyl Chloride (PVC)
6	Armor	Galvanized Steel wire
7	Outer Sheath	Flame retardant polyvinyl chloride (ST2)

Application: Use for installation in open tray, conduit, underground duct trench or direct burial in ground, at wet or dry location. Maximum conductor temperature of 90°C for normal operation and 250°C for short circuit conditions.

Table 1

No. of cores and size (core x mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness approx. (mm)	Dia. of inner sheath approx. (mm)	Armor wire dia. nominal (mm)	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)
2+PE x 1.5/1.5	7/Non-compacted	1.59	0.7	1.2	10.5	0.80	1.8	16.0	12.1	410	500
2+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.2	11.5	1.25	1.8	18.0	7.41	600	500
2+PE x 4/4	7/Non-compacted	2.55	0.7	1.2	12.5	1.25	1.8	19.5	4.61	700	500
2+PE x 6/6	7/Non-compacted	3.12	0.7	1.2	14.0	1.25	1.8	20.5	3.08	800	500
2+PE x 10/10	7/Compacted	3.80	0.7	1.2	15.0	1.25	1.8	21.5	1.83	950	500
2+PE x 16/16	7/Compacted	4.80	0.7	1.2	17.0	1.60	1.8	24.5	1.15	1400	500
2+PE x 25/16	7/Compacted	6.00	0.9	1.2	20.0	1.60	1.8	27.0	0.727	1600	500
2+PE x 25/25	7/Compacted	6.00	0.9	1.2	21.0	1.60	1.8	28.0	0.727	1800	500
2+PE x 35/16	7/Compacted	7.10	0.9	1.2	22.0	2.00	1.8	30.0	0.524	2100	500
2+PE x 35/25	7/Compacted	7.10	0.9	1.2	22.5	2.00	1.8	31.0	0.524	2100	500
2+PE x 50/25	19/Compacted	8.30	1.0	1.2	25.0	2.00	1.9	33.5	0.387	2700	500
2+PE x 70/35	19/Compacted	9.90	1.1	1.2	28.5	2.00	2.0	37.5	0.268	3400	500
2+PE x 95/50	19/Compacted	11.70	1.1	1.2	32.0	2.00	2.1	41.0	0.193	4200	500
2+PE x 120/70	37/Compacted	13.20	1.2	1.2	36.0	2.00	2.3	45.5	0.153	5000	500
2+PE x 150/70	37/Compacted	14.60	1.4	1.3	39.0	2.50	2.3	49.0	0.124	6500	500
2+PE x 150/95	37/Compacted	14.60	1.4	1.3	40.0	2.50	2.4	50.5	0.124	6500	500
2+PE x 185/95	37/Compacted	16.30	1.6	1.3	44.0	2.50	2.5	55.0	0.0991	7500	500
2+PE x 240/120	61/Compacted	18.70	1.7	1.4	49.5	2.50	2.7	61.0	0.0754	9500	300
2+PE x 300/150	61/Compacted	20.90	1.8	1.5	54.5	2.50	2.9	66.5	0.0601	11500	300
2+PE x 400/240	61/Compacted	23.50	2.0	1.7	62.0	2.50	3.2	75.0	0.0470	15000	300

Table 1(continued)

No. of cores and size (core x mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness approx. (mm)	Dia. of inner sheath approx. (mm)	Armor wire dia. nominal (mm)	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+PE x 1.5/1.5	7/Non-compacted	1.59	0.7	1.2	11.0	1.25	1.8	18.0	12.1	550	500
3+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.2	12.5	1.25	1.8	19.0	7.41	650	500
3+PE x 4/4	7/Non-compacted	2.55	0.7	1.2	13.5	1.25	1.8	20.5	4.61	750	500
3+PE x 6/6	7/Non-compacted	3.12	0.7	1.2	15.0	1.25	1.8	22.0	3.08	900	500
3+PE x 10/10	7/Compacted	3.80	0.7	1.2	16.5	1.25	1.8	23.0	1.83	1100	500
3+PE x 16/10	7/Compacted	4.80	0.7	1.2	18.0	1.60	1.8	25.0	1.15	1500	500
3+PE x 16/16	7/Compacted	4.80	0.7	1.2	19.0	1.60	1.8	26.0	1.15	1600	500
3+PE x 25/10	7/Compacted	6.00	0.9	1.2	21.0	1.60	1.8	28.0	0.727	1900	500
3+PE x 25/16	7/Compacted	6.00	0.9	1.2	22.0	2.00	1.8	30.5	0.727	2200	500
3+PE x 35/16	7/Compacted	7.10	0.9	1.2	24.0	2.00	1.9	32.5	0.524	2600	500
3+PE x 35/25	7/Compacted	7.10	0.9	1.2	24.0	2.00	1.9	32.0	0.524	2600	500
3+PE x 35/35	7/Compacted	7.10	0.9	1.2	25.0	2.00	1.9	34.0	0.524	2900	500
3+PE x 50/25	19/Compacted	8.30	1.0	1.2	27.5	2.00	2.0	36.5	0.387	3300	500
3+PE x 70/35	19/Compacted	9.90	1.1	1.2	31.5	2.00	2.1	40.5	0.268	4200	500
3+PE x 95/50	19/Compacted	11.70	1.1	1.2	36.0	2.00	2.3	45.5	0.193	5500	500
3+PE x 120/70	37/Compacted	13.20	1.2	1.3	40.0	2.50	2.4	51.0	0.153	7000	500
3+PE x 120/120	37/Compacted	13.20	1.2	1.4	42.5	2.50	2.5	53.5	0.153	7500	500
3+PE x 150/70	37/Compacted	14.60	1.4	1.3	43.0	2.50	2.5	54.0	0.124	8000	500
3+PE x 150/95	37/Compacted	14.60	1.4	1.4	45.0	2.50	2.6	56.0	0.124	8500	500

Table 1(continued)

No. of cores and size (core x mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness approx. (mm)	Dia. of inner sheath approx. (mm)	Armor wire dia. nominal (mm)	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+PE x 185/95	37/Compacted	16.30	1.6	1.4	49.0	2.50	2.7	60.5	0.0991	10000	300
3+PE x 240/120	61/Compacted	18.70	1.7	1.5	55.5	2.50	2.9	67.0	0.0754	12500	300
3+PE x 300/150	61/Compacted	20.90	1.8	1.6	61.0	2.50	3.1	73.5	0.0601	15000	300
3+PE x 400/240	61/Compacted	23.50	2.0	1.7	70.0	3.15	3.2	83.5	0.0470	20000	200

Table 1 (continued)

No. of cores and size (core x mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness approx. (mm)	Dia. of inner sheath approx. (mm)	Armor wire dia. nominal (mm)	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)
4+PE x 1.5/1.5	7/Non-compacted	1.59	0.7	1.2	12.0	1.25	1.8	19.0	12.1	650	500
4+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.2	13.5	1.25	1.8	20.0	7.41	700	500
4+PE x 4/4	7/Non-compacted	2.55	0.7	1.2	15.0	1.25	1.8	21.5	4.61	850	500
4+PE x 6/6	7/Non-compacted	3.12	0.7	1.2	16.5	1.60	1.8	24.0	3.08	1200	500
4+PE x 10/10	7/Compacted	3.80	0.7	1.2	18.0	1.60	1.8	25.5	1.83	1400	500
4+PE x 16/16	7/Compacted	4.80	0.7	1.2	20.5	1.60	1.8	28.0	1.15	1800	500
4+PE x 25/16	7/Compacted	6.00	0.9	1.2	25.0	2.00	1.9	33.5	0.727	2600	500
4+PE x 35/16	7/Compacted	7.10	0.9	1.2	27.5	2.00	1.9	36.0	0.524	3200	500
4+PE x 35/25	7/Compacted	7.10	0.9	1.2	27.0	2.00	1.9	36.0	0.524	3200	500
4+PE x 50/25	19/Compacted	8.30	1.0	1.2	31.5	2.00	2.1	40.5	0.387	4000	500
4+PE x 70/35	19/Compacted	9.90	1.1	1.2	36.0	2.00	2.3	45.5	0.268	5000	500
4+PE x 95/50	19/Compacted	11.70	1.1	1.3	41.5	2.50	2.4	52.0	0.193	7000	500
4+PE x 120/70	37/Compacted	13.20	1.2	1.4	46.5	2.50	2.6	57.5	0.153	8500	500
4+PE x 150/70	37/Compacted	14.60	1.4	1.4	50.0	2.50	2.7	61.0	0.124	10000	300
4+PE x 150/95	37/Compacted	14.60	1.4	1.5	52.0	2.50	2.8	63.5	0.124	10500	300
4+PE x 185/70	37/Compacted	16.30	1.6	1.5	56.0	2.50	2.9	67.5	0.0991	12000	300
4+PE x 185/95	37/Compacted	16.30	1.6	1.5	57.0	2.50	2.9	68.5	0.0991	12500	300
4+PE x 240/120	61/Compacted	18.70	1.7	1.7	64.0	2.50	3.1	76.5	0.0754	15500	200
4+PE x 300/150	61/Compacted	20.90	1.8	1.8	71.0	3.15	3.4	85.0	0.0601	20000	200
4+PE x 400/240	61/Compacted	23.50	2.0	2.0	81.0	3.15	3.8	96.0	0.0470	25000	100

Table 1 (continued)

FOR PROTECTION EARTHED CONDUCTOR

No. of core	Size (mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Conductor resistance at 20 °C maximum (Ohm/km)
1	1.5	7/Non-compacted	1.59	0.7	12.1
1	2.5	7/Non-compacted	2.01	0.7	7.41
1	4	7/Non-compacted	2.55	0.7	4.61
1	6	7/Non-compacted	3.12	0.7	3.08
1	10	7/Compacted	3.80	0.7	1.83
1	16	7/Compacted	4.80	0.7	1.15
1	25	7/Compacted	6.00	0.9	0.727
1	35	7/Compacted	7.10	0.9	0.524
1	50	19/Compacted	8.30	1.0	0.387
1	70	19/Compacted	9.90	1.1	0.268
1	95	19/Compacted	11.70	1.1	0.193
1	120	37/Compacted	13.20	1.2	0.153
1	150	37/Compacted	14.60	1.4	0.124
1	240	61/Compacted	18.70	1.7	0.0754