

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

0.6/1(1.2)kV

XLPE Insulated PVC Sheathed

Flame Retardant Power Cable

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

BY Wachara
(Wachara Sangsomritphon)

MANAGER, Cable Design Section

APP. Winai
(Winai Ariyasakulsap)

MANAGER, Development Department

Rev.	Date	Description
0	20/09/2019	Issued specification
1	15/04/2020	Cancel size 1-core size 2.5 to 240 mm ² 2-cores to 4-core size 2.5 to 70 mm ²
2	10/11/2020	Add electrical data
3	21/12/2020	Change marking on cable
4	11/05/2021	Update Table 1

APP. _____
()
CUSTOMER

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) sheathed flame retardant power cable.

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

(Same as TIS 2143-2546)

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 (For multi-cores only)

The individual insulated 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.

5. Core Identification

The cores shall be identified by color, as follows :

Single-core : white

2-cores : blue, brown

3-cores : brown, black, grey

4-cores : blue, brown, black, grey

5-cores : blue, brown, black, grey, green/yellow

(White color is natural color of XLPE insulation)

6. Sheath

The 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 sheath shall not be 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 sheath shall be black.

7. 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 conductor "CU"
6. Type of insulation and sheath "XLPE/PVC"
7. Type of cable "POWER CABLE"
8. Number of cores and size of conductor
9. TIS logo and standard number (For 1-core to 4-cores)
10. The continuous reel length marking (in figure) shall be made on the sheath at every 1 meter (Except, size 1 x 1.5 mm²)

8. 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 (Same as TIS 2143-2546), IEC 60228 : 2004, IEC 60332-1 and IEC 60332-3-24 ; Category C.


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

9. 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"
2. Number of cores and size of cable
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

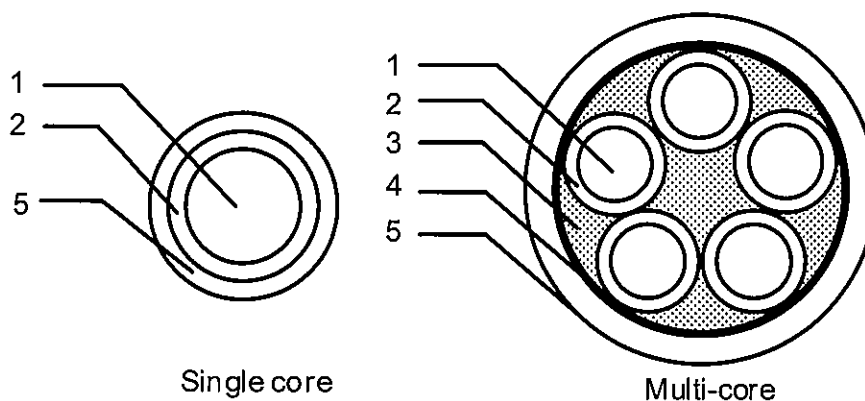
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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	Spunbond tape or suitable tape
5	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 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	1.5	7/Non-compacted	1.59	0.7	1.4	6.5	12.1	50	500
1	300	61/Compacted	20.90	1.8	1.8	29.0	0.0601	3100	500
1	400	61/Compacted	23.50	2.0	1.9	32.5	0.0470	3900	500
1	500	61/Compacted	26.70	2.2	2.0	36.5	0.0366	5000	500
1	630	61/Compacted	30.30	2.4	2.2	41.0	0.0283	6500	500
1	800	61/Compacted	34.10	2.6	2.3	45.0	0.0221	8000	500
1	1000	127/Compacted	39.50	2.8	2.4	51.0	0.0176	10500	300

Table 2

No. of core	Size (mm ²)	A.C. resistance R (Ohm/km)	Inductance L (mH/km)	Reactance XL (Ohm/km)	Impedance Z (Ohm/km)	Current rating in free air at 40°C maximum (A)
1	1.5	15.4287	0.6630	0.2083	15.4301	31
1	300	0.0779	0.4413	0.1387	0.1591	814
1	400	0.0616	0.4393	0.1380	0.1511	950
1	500	0.0488	0.4365	0.1371	0.1455	1,111
1	630	0.0387	0.4341	0.1364	0.1418	1,293
1	800	0.0314	0.4309	0.1354	0.1390	1,486
1	1000	0.0263	0.4265	0.1340	0.1366	1,701

Remark :

Laying type : Spacing

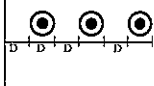


Table 1 (Continued)

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)
2	1.5	7/Non-compacted	1.59	0.7	1.8	11.5	12.1	130	500
2	95	19/Compacted	11.70	1.1	2.0	34.0	0.193	2200	500
2	120	37/Compacted	13.20	1.2	2.1	37.5	0.153	2800	500
2	150	37/Compacted	14.60	1.4	2.2	41.5	0.124	3400	500
2	185	37/Compacted	16.30	1.6	2.3	46.0	0.0991	4200	500
2	240	61/Compacted	18.70	1.7	2.5	52.0	0.0754	5500	500
2	300	61/Compacted	20.90	1.8	2.7	57.0	0.0601	7000	500
2	400	61/Compacted	23.50	2.0	2.9	63.5	0.0470	8500	500

Table 2 (continued)

No. of core	Size (mm ²)	A.C. resistance R (Ohm/km)	Inductance L (mH/km)	Reactance XL (Ohm/km)	Impedance Z (Ohm/km)	Current rating in free air at 40°C maximum (A)
2	1.5	15.4287	0.3427	0.1077	15.4291	27
2	95	0.2468	0.2331	0.0732	0.2575	329
2	120	0.1960	0.2315	0.0727	0.2091	381
2	150	0.1593	0.2302	0.0723	0.1749	436
2	185	0.1278	0.2338	0.0734	0.1474	503
2	240	0.0981	0.2295	0.0721	0.1217	593
2	300	0.0791	0.2260	0.0710	0.1063	676
2	400	0.0630	0.2259	0.0710	0.0949	777

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	1.5	7/Non-compacted	1.59	0.7	1.8	12.0	12.1	150	500
3	95	19/Compacted	11.70	1.1	2.0	36.0	0.193	3100	500
3	120	37/Compacted	13.20	1.2	2.1	40.0	0.153	3900	500
3	150	37/Compacted	14.60	1.4	2.3	44.5	0.124	4800	500
3	185	37/Compacted	16.30	1.6	2.4	49.5	0.0991	6000	500
3	240	61/Compacted	18.70	1.7	2.6	55.5	0.0754	8000	500
3	300	61/Compacted	20.90	1.8	2.8	61.0	0.0601	9500	300
3	400	61/Compacted	23.50	2.0	3.1	69.0	0.0470	12500	300

Table 2 (continued)

No. of core	Size (mm ²)	A.C. resistance R (Ohm/km)	Inductance L (mH/km)	Reactance XL (Ohm/km)	Impedance Z (Ohm/km)	Current rating in free air at 40°C maximum (A)
3	1.5	15.4287	0.3427	0.1077	15.4291	22
3	95	0.2471	0.2331	0.0732	0.2577	272
3	120	0.1964	0.2315	0.0727	0.2094	320
3	150	0.1597	0.2302	0.0723	0.1753	366
3	185	0.1282	0.2338	0.0734	0.1478	422
3	240	0.0987	0.2295	0.0721	0.1222	498
3	300	0.0798	0.2260	0.0710	0.1068	567
3	400	0.0639	0.2259	0.0710	0.0955	652

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)
4	1.5	7/Non-compacted	1.59	0.7	1.8	12.5	12.1	180	500
4	95	19/Compacted	11.70	1.1	2.1	40.0	0.193	4000	500
4	120	37/Compacted	13.20	1.2	2.3	44.5	0.153	5000	500
4	150	37/Compacted	14.60	1.4	2.4	49.0	0.124	6500	500
4	185	37/Compacted	16.30	1.6	2.6	55.0	0.0991	8000	500
4	240	61/Compacted	18.70	1.7	2.8	62.0	0.0754	10000	300
4	300	61/Compacted	20.90	1.8	3.0	68.5	0.0601	12500	300
4	400	61/Compacted	23.50	2.0	3.3	76.5	0.0470	16000	200

Table 2 (continued)

No. of core	Size (mm ²)	A.C. resistance R (Ohm/km)	Inductance L (mH/km)	Reactance XL (Ohm/km)	Impedance Z (Ohm/km)	Current rating in free air at 40°C maximum (A)
4	1.5	15.4287	0.3427	0.1077	15.4291	22
4	95	0.2471	0.2331	0.0732	0.2577	272
4	120	0.1964	0.2315	0.0727	0.2094	320
4	150	0.1597	0.2302	0.0723	0.1753	366
4	185	0.1282	0.2338	0.0734	0.1478	422
4	240	0.0987	0.2295	0.0721	0.1222	498
4	300	0.0798	0.2260	0.0710	0.1068	567
4	400	0.0639	0.2259	0.0710	0.0955	652

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)
5	1.5	7/Non-compacted	1.59	0.7	1.8	13.5	12.1	210	500
5	2.5	7/Non-compacted	2.01	0.7	1.8	15.0	7.41	270	500
5	4	7/Non-compacted	2.55	0.7	1.8	16.5	4.61	360	500
5	6	7/Non-compacted	3.12	0.7	1.8	18.0	3.08	480	500
5	10	7/Compacted	3.80	0.7	1.8	19.5	1.83	650	500
5	16	7/Compacted	4.80	0.7	1.8	22.0	1.15	1000	500
5	25	7/Compacted	6.00	0.9	1.8	26.5	0.727	1500	500
5	35	7/Compacted	7.10	0.9	1.8	29.5	0.524	2000	500
5	50	19/Compacted	8.30	1.0	2.0	34.0	0.387	2600	500
5	70	19/Compacted	9.90	1.1	2.1	39.0	0.268	3700	500
5	95	19/Compacted	11.70	1.1	2.3	44.5	0.193	5000	500
5	120	37/Compacted	13.20	1.2	2.4	49.5	0.153	6500	500
5	150	37/Compacted	14.60	1.4	2.6	54.5	0.124	8000	500
5	185	37/Compacted	16.30	1.6	2.8	61.5	0.0991	10000	500
5	240	61/Compacted	18.70	1.7	3.0	69.0	0.0754	12500	300
5	300	61/Compacted	20.90	1.8	3.2	76.0	0.0601	16000	300
5	400	61/Compacted	23.50	2.0	3.6	85.0	0.0470	20000	200

Table 2 (continued)

No. of core	Size	A.C. resistance	Inductance	Reactance	Impedance	Current rating in free air at 40°C maximum (A)
	(mm ²)	R (Ohm/km)	L (mH/km)	XL (Ohm/km)	Z (Ohm/km)	
5	1.5	15.4287	0.3427	0.1077	15.4291	22
5	2.5	9.4485	0.3328	0.1046	9.4491	29
5	4	5.8782	0.3127	0.0982	5.8791	39
5	6	3.9274	0.2971	0.0933	3.9285	50
5	10	2.3335	0.2794	0.0878	2.3352	67
5	16	1.4665	0.2692	0.0846	1.4689	89
5	25	0.9272	0.2674	0.0840	0.9310	119
5	35	0.6685	0.2593	0.0815	0.6734	146
5	50	0.4939	0.2554	0.0802	0.5004	178
5	70	0.3424	0.2437	0.0766	0.3509	225
5	95	0.2471	0.2331	0.0732	0.2577	272
5	120	0.1964	0.2315	0.0727	0.2094	320
5	150	0.1597	0.2302	0.0723	0.1753	366
5	185	0.1282	0.2338	0.0734	0.1478	422
5	240	0.0987	0.2295	0.0721	0.1222	498
5	300	0.0798	0.2260	0.0710	0.1068	567
5	400	0.0639	0.2259	0.0710	0.0955	652