

SPECIFICATION

For

FD-0.6/1KV-CV (VM)

0.6/1(1.2)kV

XLPE Insulated PVC Sheathed

Flame Retardant and Vermin Proof

with Protection Earthed Power Cable

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

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CUSTOMER

Rev.	Date	Description
0	21/10/2019	Issued specification
1	3/2/2021	- Cancel code "0010" - Correct the value in Table 1
2	23/8/2021	Change sheath thickness

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.

Scope

This specification covers 1000V copper conductor cross-linked polyethylene (XLPE) insulated polyvinyl chloride (PVC) sheathed flame retardant and vermin proof 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.

1. 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.

2. 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.

3. Cabling

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.

4. 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

5. Sheath

The sheath shall be sunlight resistant, flame retardant and resistant to vermin by special chemical treated polyvinyl chloride (PVC/ST2) compound meet the requirements of IEC 60502-1 : 2004. (vermin means rat, termite).


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.

6. 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 sheath at every 1 meter

7. 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.

8. 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 (VM) "
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

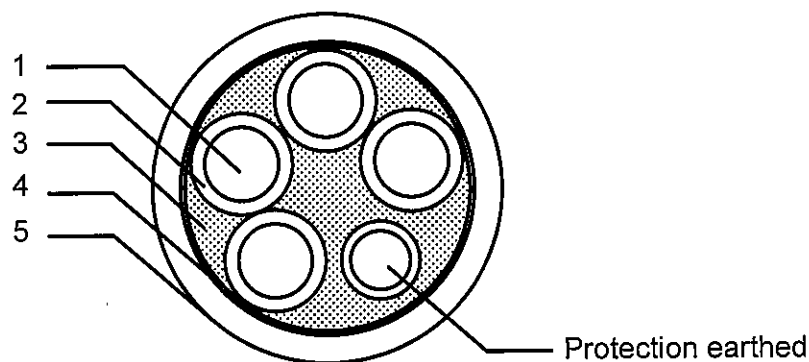
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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	Spun bond tape or suitable tape
5	Sheath	Flame retardant and vermin proof polyvinyl chloride (PVC/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)	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	2.4	13.0	12.1	150	500
2+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	2.3	14.0	7.41	190	500
2+PE x 4/4	7/Non-compacted	2.55	0.7	2.1	14.5	4.61	250	500
2+PE x 6/6	7/Non-compacted	3.12	0.7	1.9	15.5	3.08	320	500
2+PE x 10/10	7/Compacted	3.80	0.7	1.8	16.5	1.83	450	500
2+PE x 16/16	7/Compacted	4.80	0.7	1.8	18.5	1.15	650	500
2+PE x 25/16	7/Compacted	6.00	0.9	1.8	21.0	0.727	850	500
2+PE x 25/25	7/Compacted	6.00	0.9	1.8	22.0	0.727	950	500
2+PE x 35/16	7/Compacted	7.10	0.9	1.8	23.0	0.524	1100	500
2+PE x 35/25	7/Compacted	7.10	0.9	1.8	24.0	0.524	1200	500
2+PE x 50/25	19/Compacted	8.30	1.0	1.8	26.0	0.387	1400	500
2+PE x 70/35	19/Compacted	9.90	1.1	1.8	30.0	0.268	2000	500
2+PE x 95/50	19/Compacted	11.70	1.1	1.9	33.5	0.193	2600	500
2+PE x 120/50	37/Compacted	13.20	1.2	2.1	37.0	0.153	3100	500
2+PE x 120/70	37/Compacted	13.20	1.2	2.1	38.0	0.153	3400	500
2+PE x 150/70	37/Compacted	14.60	1.4	2.2	41.0	0.124	4000	500
2+PE x 150/95	37/Compacted	14.60	1.4	2.2	42.0	0.124	4300	500
2+PE x 185/70	37/Compacted	16.30	1.6	2.3	45.0	0.0991	4800	500
2+PE x 185/95	37/Compacted	16.30	1.6	2.3	46.0	0.0991	5000	500
2+PE x 240/120	61/Compacted	18.70	1.7	2.5	52.0	0.0754	6500	500
2+PE x 300/150	61/Compacted	20.90	1.8	2.6	57.0	0.0601	8000	500
2+PE x 300/185	61/Compacted	20.90	1.8	2.8	58.0	0.0601	8500	500
2+PE x 400/185	61/Compacted	23.50	2.0	2.9	63.0	0.0470	10000	300
2+PE x 400/240	61/Compacted	23.50	2.0	2.9	64.5	0.0470	11000	300

Table 1 (continued)

No. of cores and size (core x 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+PE x 1.5/1.5	7/Non-compacted	1.59	0.7	2.3	13.5	12.1	180	500
3+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	2.1	14.5	7.41	230	500
3+PE x 4/4	7/Non-compacted	2.55	0.7	1.9	15.0	4.61	300	500
3+PE x 6/6	7/Non-compacted	3.12	0.7	1.8	16.5	3.08	400	500
3+PE x 10/10	7/Compacted	3.80	0.7	1.8	18.0	1.83	550	500
3+PE x 16/16	7/Compacted	4.80	0.7	1.8	20.0	1.15	800	500
3+PE x 25/16	7/Compacted	6.00	0.9	1.8	23.5	0.727	1100	500
3+PE x 25/25	7/Compacted	6.00	0.9	1.8	24.0	0.727	1200	500
3+PE x 35/16	7/Compacted	7.10	0.9	1.8	25.5	0.524	1400	500
3+PE x 35/25	7/Compacted	7.10	0.9	1.8	26.0	0.524	1500	500
3+PE x 35/35	7/Compacted	7.10	0.9	1.8	27.0	0.524	1600	500
3+PE x 50/25	19/Compacted	8.30	1.0	1.8	29.0	0.387	1900	500
3+PE x 50/35	19/Compacted	8.30	1.0	1.9	29.0	0.387	2000	500
3+PE x 70/35	19/Compacted	9.90	1.1	1.9	33.0	0.268	2700	500
3+PE x 95/50	19/Compacted	11.70	1.1	2.1	38.0	0.193	3600	500
3+PE x 120/50	37/Compacted	13.20	1.2	2.2	41.0	0.153	4400	500
3+PE x 120/70	37/Compacted	13.20	1.2	2.2	42.5	0.153	4600	500
3+PE x 120/95	37/Compacted	13.20	1.2	2.3	43.0	0.153	4900	500
3+PE x 150/70	37/Compacted	14.60	1.4	2.3	45.0	0.124	5500	500
3+PE x 150/95	37/Compacted	14.60	1.4	2.4	47.0	0.124	6000	500
3+PE x 185/50	37/Compacted	16.30	1.6	2.5	49.0	0.0991	6500	500
3+PE x 185/70	37/Compacted	16.30	1.6	2.5	50.0	0.0991	6500	500
3+PE x 185/95	37/Compacted	16.30	1.6	2.5	51.5	0.0991	7000	500
3+PE x 185/185	61/Compacted	16.30	1.6	2.7	55.0	0.0991	8000	500
3+PE x 240/120	61/Compacted	18.70	1.7	2.7	58.0	0.0754	9000	300
3+PE x 300/150	61/Compacted	20.90	1.8	2.9	64.0	0.0601	11000	300
3+PE x 300/185	61/Compacted	20.90	1.8	3.0	65.0	0.0601	11500	300
3+PE x 400/185	61/Compacted	23.50	2.0	3.2	71.0	0.0470	14000	300
3+PE x 400/240	61/Compacted	23.50	2.0	3.2	73.0	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)	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	2.1	14.0	12.1	210	500
4+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	2.0	15.5	7.41	270	500
4+PE x 4/4	7/Non-compacted	2.55	0.7	1.8	16.5	4.61	360	500
4+PE x 6/6	7/Non-compacted	3.12	0.7	1.8	18.0	3.08	480	500
4+PE x 10/10	7/Compacted	3.80	0.7	1.8	19.5	1.83	650	500
4+PE x 16/10	7/Compacted	4.80	0.7	1.8	22.0	1.15	1000	500
4+PE x 16/16	7/Compacted	4.80	0.7	1.8	22.0	1.15	1000	500
4+PE x 25/16	7/Compacted	6.00	0.9	1.8	26.5	0.727	1400	500
4+PE x 35/16	7/Compacted	7.10	0.9	1.8	29.0	0.524	1800	500
4+PE x 35/25	7/Compacted	7.10	0.9	1.9	29.0	0.524	1900	500
4+PE x 50/25	19/Compacted	8.30	1.0	1.9	33.0	0.387	2400	500
4+PE x 50/35	19/Compacted	8.30	1.0	2.0	33.0	0.387	2500	500
4+PE x 70/35	19/Compacted	9.90	1.1	2.1	38.5	0.268	3400	500
4+PE x 95/50	19/Compacted	11.70	1.1	2.2	43.5	0.193	4600	500
4+PE x 120/50	37/Compacted	13.20	1.2	2.4	47.0	0.153	5500	500
4+PE x 120/70	37/Compacted	13.20	1.2	2.4	48.5	0.153	6000	500
4+PE x 150/70	37/Compacted	14.60	1.4	2.5	52.0	0.124	7000	500
4+PE x 150/95	37/Compacted	14.60	1.4	2.5	54.0	0.124	7500	500
4+PE x 185/70	37/Compacted	16.30	1.6	2.7	58.0	0.0991	8500	500
4+PE x 185/95	37/Compacted	16.30	1.6	2.7	59.5	0.0991	9000	500
4+PE x 240/120	61/Compacted	18.70	1.7	2.9	66.5	0.0754	11500	300
4+PE x 300/150	61/Compacted	20.90	1.8	3.1	73.5	0.0601	14500	300
4+PE x 300/185	61/Compacted	20.90	1.8	3.4	75.0	0.0601	15000	300
4+PE x 400/185	61/Compacted	23.50	2.0	3.4	82.0	0.0470	18000	200
4+PE x 400/240	61/Compacted	23.50	2.0	3.4	84.0	0.0470	19000	200

Table 1 (continued)

FOR PROTECTION EARTHED CONDUCTORS

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	185	37/Compacted	16.30	1.6	0.0991
1	240	61/Compacted	18.70	1.7	0.0754