

SPECIFICATION

For

FS/FDLH-0.6/1KV-CE

0.6/1(1.2)kV Copper Conductor Mica fire-barrier

XLPE Insulated Polyolefin Sheathed

Fire Resistant and Flame Retardant with Low Smoke and Zero Halogen

with Protection Earthed Power Cable

(0.6/1(1.2)kV, Cu/Mica/XLPE/FR-LSOH)

BY



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CUSTOMER

Rev.	Date	Description
0	22/10/2020	Issued specification
1	28/4/2021	Cancel cable code "0010"
2	14/12/2021	Update the test standard version
3	5/4/2023	Add size 3+PE x 120/ 95 mm ²
4	26/3/2024	Update specification
5	6/5/2024	Update specification
6	27/1/2025	Update specification

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 mica fire-barrier cross-linked polyethylene (XLPE) insulated polyolefin sheathed fire resistant and flame retardant with low smoke and zero halogen with protection earthed power cable.

The cable shall be based on IEC 60502-1 : 2021.

The maximum conductor temperature shall be 90°C.

Fire resistant tested according to BS 6387 Category CWZ.

Remark : Resistance to fire with water (W) and with mechanical shock (Z) ; Not all sizes or types of cable with overall diameters greater than 20 mm. can be presently accommodated with in the standard and guidance on testing these cables should be sought from the manufacturer.

- Flame retardant test requirements per IEC 60332-1.
- Flame propagation test requirements per IEC 60332-3-22; Category A, IEC 60332-3-23; Category B and IEC 60332-3-24; Category C.
- Low smoke test requirements per IEC 61034.
- Halogen gases determinations test requirements per IEC 60754-1 and IEC 60754-2.
- Extremely low toxicity gases test requirements per IEC 60684-2 and Defence Standard 02-713.

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. Fire Barrier Tape

The mica tape shall be longitudinally applied over the conductor

4. Insulation

The insulation shall be cross-linked polyethylene (XLPE) compound meet the requirements of IEC 60502-1 : 2021.

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. 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 cabled core.

6. 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

7. Sheath

The sheath shall be sunlight resistant and low smoke and zero halogen flame retardant polyolefin (ST8) compound meet the requirements of IEC 60502-1 : 2021.

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 or orange.

8. 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. Cable property cable "FS/FDLH"

4. Rated circuit voltage "0.6/1KV"

5. Type of conductor "CU"

6. Type of insulation and sheath "XLPE/LSOH"

7. Type of cable "POWER CABLE"

8. Number of cores and size of conductor

9. The continuous reel length marking (in figure) shall be made on the sheath at every 1 meter

9. Test and Properties

The cable shall meet the requirements in Test and Inspection and Table 1, when tested in accordance with IEC 60502-1 : 2021, IEC 60228 : 2004, BS 6387 Category CWZ., IEC 60332-1, IEC 60332-3-22; Category A, IEC 60332-3-23; Category B, IEC 60332-3-24; Category C, IEC 61034, IEC 60754-1, IEC 60754-2, IEC 60684-2 and Defence Standard 02-713.

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


Except black color sheath; For longer life of cable should be avoid exposure to direct solar radiation it necessary, cover is required.

10. 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 "FS/FDLH-0.6/1KV-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

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

- Fire resistant tested according to BS 6387 Category CWZ.
- Flame retardant tested according to IEC 60332-1.
- Flame propagation test according to IEC 60332-3-22; Category A or IEC 60332-3-23; Category B or IEC 60332-3-24; Category C.
- Smoke emission tested according to IEC 61034.
- Halogen gases tested according to IEC 60754-1 and IEC 60754-2.
- Extremely low toxicity gases test according to IEC 60684-2 and Defence Standard 02-713.

Definition concerning the tests

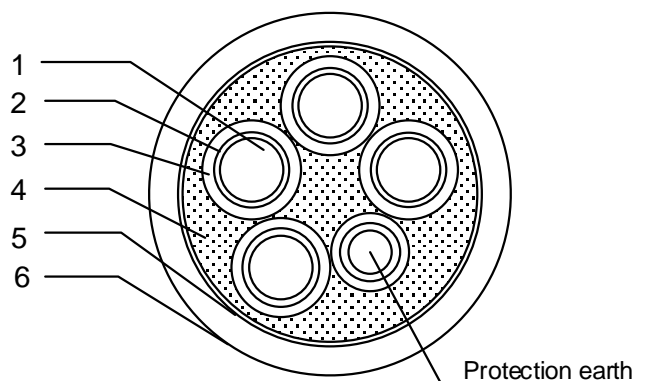
Routine Tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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	Fire barrier	Mica tape
3	Insulation	Cross-Linked Polyethylene (XLPE) compound
4	Filler	Non-hygroscopic
5	Binder tape	PS tape or suitable tape
6	Sheath	Low smoke and zero halogen flame retardant polyolefin (ST8) compound

Application: For installation into open tray, conduit, underground duct trench or direct burial in ground which provide flame retardant, low smoke and maintain circuit integrity in case of fire. 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	1.8	13.0	12.1	173	500
2+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.8	14.0	7.41	219	500
2+PE x 4/4	7/Non-compacted	2.55	0.7	1.8	15.0	4.61	279	500
2+PE x 6/6	7/Non-compacted	3.12	0.7	1.8	16.5	3.08	357	500
2+PE x 10/10	7/Compacted	3.70	0.7	1.8	17.5	1.83	481	500
2+PE x 16/16	7/Compacted	4.70	0.7	1.8	20.0	1.15	658	500
2+PE x 25/16	7/Compacted	5.90	0.9	1.8	22.5	0.727	871	500
2+PE x 35/16	7/Compacted	6.90	0.9	1.8	24.5	0.524	1075	500
2+PE x 50/25	19/Compacted	8.20	1.0	1.8	27.5	0.387	1454	500
2+PE x 70/35	19/Compacted	9.80	1.1	1.9	31.5	0.268	1996	500
2+PE x 95/50	19/Compacted	11.60	1.1	2.0	35.5	0.193	2666	500
2+PE x 120/70	37/Compacted	13.10	1.2	2.2	39.5	0.153	3454	500
2+PE x 150/95	37/Compacted	14.50	1.4	2.3	44.0	0.124	4337	500
2+PE x 185/95	37/Compacted	16.10	1.6	2.4	48.0	0.0991	5139	500
2+PE x 240/120	61/Compacted	18.60	1.7	2.6	54.0	0.0754	6666	500
2+PE x 300/150	61/Compacted	20.80	1.8	2.8	59.5	0.0601	8249	500
2+PE x 400/240	61/Compacted	23.40	2.0	3.0	67.0	0.0470	10976	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	1.8	14.0	12.1	210	500
3+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.8	15.0	7.41	266	500
3+PE x 4/4	7/Non-compacted	2.55	0.7	1.8	16.5	4.61	345	500
3+PE x 6/6	7/Non-compacted	3.12	0.7	1.8	18.0	3.08	446	500
3+PE x 10/10	7/Compacted	3.70	0.7	1.8	19.0	1.83	610	500
3+PE x 16/16	7/Compacted	4.70	0.7	1.8	22.0	1.15	842	500
3+PE x 25/16	7/Compacted	5.90	0.9	1.8	25.0	0.727	1142	500
3+PE x 35/16	7/Compacted	6.90	0.9	1.8	27.0	0.524	1436	500
3+PE x 50/25	19/Compacted	8.20	1.0	1.9	31.0	0.387	1952	500
3+PE x 70/35	19/Compacted	9.80	1.1	2.0	35.0	0.268	2698	500
3+PE x 95/50	19/Compacted	11.60	1.1	2.2	40.0	0.193	3635	500
3+PE x 120/70	37/Compacted	13.10	1.2	2.3	44.5	0.153	4664	500
3+PE x 150/95	37/Compacted	14.50	1.4	2.5	49.5	0.124	5848	500
3+PE x 185/95	37/Compacted	16.10	1.6	2.6	54.0	0.0991	7011	500
3+PE x 240/120	61/Compacted	18.60	1.7	2.8	60.5	0.0754	9104	300
3+PE x 300/150	61/Compacted	20.80	1.8	3.0	66.5	0.0601	11295	300
3+PE x 400/240	61/Compacted	23.40	2.0	3.3	75.5	0.0470	14867	200

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	1.8	15.0	12.1	245	500
4+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.8	16.0	7.41	318	500
4+PE x 4/4	7/Non-compacted	2.55	0.7	1.8	18.0	4.61	411	500
4+PE x 6/6	7/Non-compacted	3.12	0.7	1.8	19.5	3.08	536	500
4+PE x 10/10	7/Compacted	3.70	0.7	1.8	21.0	1.83	741	500
4+PE x 16/10	7/Compacted	4.70	0.7	1.8	24.0	1.15	971	500
4+PE x 16/16	7/Compacted	4.70	0.7	1.8	24.0	1.15	1028	500
4+PE x 25/16	7/Compacted	5.90	0.9	1.8	28.0	0.727	1436	500
4+PE x 35/16	7/Compacted	6.90	0.9	1.9	30.5	0.524	1857	500
4+PE x 50/25	19/Compacted	8.20	1.0	2.0	35.5	0.387	2479	500
4+PE x 70/35	19/Compacted	9.80	1.1	2.2	40.5	0.268	3447	500
4+PE x 95/50	19/Compacted	11.60	1.1	2.4	46.0	0.193	4725	500
4+PE x 120/70	37/Compacted	13.10	1.2	2.5	51.0	0.153	6007	500
4+PE x 150/95	37/Compacted	14.50	1.4	2.7	57.0	0.124	7520	500
4+PE x 185/95	37/Compacted	16.10	1.6	2.9	62.0	0.0991	9066	300
4+PE x 240/120	61/Compacted	18.60	1.7	3.1	70.0	0.0754	11801	300
4+PE x 300/150	61/Compacted	20.80	1.8	3.4	77.0	0.0601	14603	300
4+PE x 400/240	61/Compacted	23.40	2.0	3.7	87.5	0.0470	19148	200

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	3.70	0.7	1.83
1	16	7/Compacted	4.70	0.7	1.15
1	25	7/Compacted	5.90	0.9	0.727
1	35	7/Compacted	6.90	0.9	0.524
1	50	19/Compacted	8.20	1.0	0.387
1	70	19/Compacted	9.80	1.1	0.268
1	95	19/Compacted	11.60	1.1	0.193
1	120	37/Compacted	13.10	1.2	0.153
1	150	37/Compacted	14.50	1.4	0.124
1	240	61/Compacted	18.60	1.7	0.0754