

# 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)

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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

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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 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 : 2004 and Amend. 1: 2009.

The maximum conductor temperature shall be 90°C.

The cable shall be 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.

The finished cables shall meet the flame test requirements per IEC 60332-1 and IEC 60332-3-24; Category C. and IEC 60332-3-22; Category A.

Low smoke test requirements per IEC 61034 and 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 : 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.

## **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 : 2004.


The average thickness of the 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 sheath shall be black or orange.

## **8. 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. Cable property cable "FS/FDLH"

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

## 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 : 2004 and Amend. 1 : 2009, IEC 60228 : 2004, BS 6387 Category CWZ., IEC 60332-1, IEC 60332-3-24; Category C., IEC 60332-3-22; Category A, 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, IEC 60332-3-24; Category C and IEC 60332-3-22; Category A.
- 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

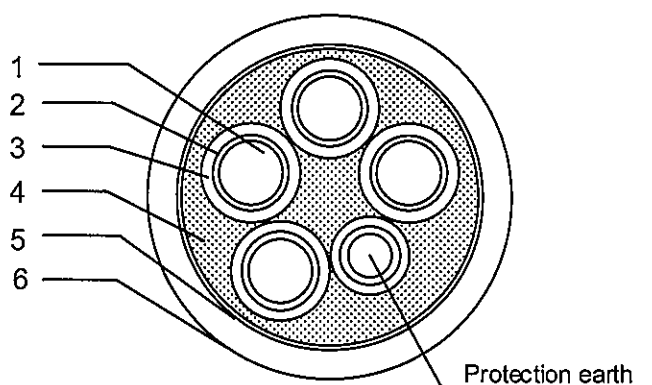
**Routine Tests:** Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

**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	Non-compacted & compacted concentric stranded annealed copper
2	Fire barrier	Mica tape
3	Insulation	Cross-Linked Polyethylene (XLPE)
4	Filler	Non-hygroscopic
5	Binder tape	PS tape or suitable tape
6	Sheath	Low smoke and zero halogen flame retardant polyolefin (ST8)

**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 <sup>2</sup> )	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	13.5	12.1	220	500
2+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.8	14.5	7.41	250	500
2+PE x 4/4	7/Non-compacted	2.55	0.7	1.8	15.5	4.61	300	500
2+PE x 6/6	7/Non-compacted	3.12	0.7	1.8	17.0	3.08	360	500
2+PE x 10/10	7/Compacted	3.80	0.7	1.8	18.0	1.83	480	500
2+PE x 16/16	7/Compacted	4.80	0.7	1.8	20.0	1.15	650	500
2+PE x 25/16	7/Compacted	6.00	0.9	1.8	22.5	0.727	900	500
2+PE x 35/16	7/Compacted	7.10	0.9	1.8	24.5	0.524	1100	500
2+PE x 50/25	19/Compacted	8.30	1.0	1.8	27.5	0.387	1500	500
2+PE x 70/35	19/Compacted	9.90	1.1	1.9	31.5	0.268	2000	500
2+PE x 95/50	19/Compacted	11.70	1.1	2.1	35.5	0.193	2700	500
2+PE x 120/70	37/Compacted	13.20	1.2	2.2	39.5	0.153	3500	500
2+PE x 150/95	37/Compacted	14.60	1.4	2.3	43.5	0.124	4300	500
2+PE x 185/95	37/Compacted	16.30	1.6	2.5	48.0	0.0991	5000	500
2+PE x 240/120	61/Compacted	18.70	1.7	2.6	53.5	0.0754	6500	500
2+PE x 300/150	61/Compacted	20.90	1.8	2.8	58.5	0.0601	8000	500
2+PE x 400/240	61/Compacted	23.50	2.0	3.1	66.5	0.0470	11000	300

**Table 1 (continued)**

No. of cores and size  (core x mm <sup>2</sup> )	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	14.5	12.1	250	500
3+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.8	15.5	7.41	300	500
3+PE x 4/4	7/Non-compacted	2.55	0.7	1.8	17.5	4.61	370	500
3+PE x 6/6	7/Non-compacted	3.12	0.7	1.8	18.5	3.08	450	500
3+PE x 10/10	7/Compacted	3.80	0.7	1.8	19.5	1.83	600	500
3+PE x 16/16	7/Compacted	4.80	0.7	1.8	22.0	1.15	850	500
3+PE x 25/16	7/Compacted	6.00	0.9	1.8	25.0	0.727	1200	500
3+PE x 35/16	7/Compacted	7.10	0.9	1.8	27.0	0.524	1500	500
3+PE x 50/25	19/Compacted	8.30	1.0	1.9	31.0	0.387	2000	500
3+PE x 50/35	19/Compacted	8.30	1.0	1.9	31.5	0.387	2100	500
3+PE x 70/35	19/Compacted	9.90	1.1	2.0	35.0	0.268	2700	500
3+PE x 95/50	19/Compacted	11.70	1.1	2.2	39.5	0.193	3700	500
3+PE x 120/70	37/Compacted	13.20	1.2	2.3	44.0	0.153	4700	500
3+PE x 150/95	37/Compacted	14.60	1.4	2.5	49.0	0.124	6000	500
3+PE x 185/95	37/Compacted	16.30	1.6	2.6	53.5	0.0991	7000	500
3+PE x 240/120	61/Compacted	18.70	1.7	2.8	60.0	0.0754	9000	300
3+PE x 300/150	61/Compacted	20.90	1.8	3.0	66.0	0.0601	11500	300
3+PE x 400/240	61/Compacted	23.50	2.0	3.3	75.0	0.0470	15000	200



**Table 1 (continued)**

No. of cores and size  (core x mm <sup>2</sup> )	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	15.5	12.1	300	500
4+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.8	16.5	7.41	350	500
4+PE x 4/4	7/Non-compacted	2.55	0.7	1.8	18.0	4.61	440	500
4+PE x 6/6	7/Non-compacted	3.12	0.7	1.8	19.5	3.08	550	500
4+PE x 10/10	7/Compacted	3.80	0.7	1.8	21.0	1.83	750	500
4+PE x 16/16	7/Compacted	4.80	0.7	1.8	24.0	1.15	1000	500
4+PE x 25/16	7/Compacted	6.00	0.9	1.8	28.5	0.727	1500	500
4+PE x 35/16	7/Compacted	7.10	0.9	1.9	31.0	0.524	1900	500
4+PE x 50/25	19/Compacted	8.30	1.0	2.1	35.5	0.387	2500	500
4+PE x 70/35	19/Compacted	9.90	1.1	2.2	40.5	0.268	3500	500
4+PE x 95/50	19/Compacted	11.70	1.1	2.4	45.5	0.193	4700	500
4+PE x 120/70	37/Compacted	13.20	1.2	2.6	51.0	0.153	6000	500
4+PE x 150/95	37/Compacted	14.60	1.4	2.7	56.0	0.124	7500	500
4+PE x 185/95	37/Compacted	16.30	1.6	2.9	62.0	0.0991	9000	300
4+PE x 240/120	61/Compacted	18.70	1.7	3.1	69.0	0.0754	12000	300
4+PE x 300/150	61/Compacted	20.90	1.8	3.4	76.0	0.0601	14500	300
4+PE x 400/240	61/Compacted	23.50	2.0	3.7	86.5	0.0470	19000	200

**Table 1 (continued)**

**FOR PROTECTION EARTHED CONDUCTOR**

No. of core	Size (mm <sup>2</sup> )	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