

**SPECIFICATION****For****FS/FDLH-0.6/1KV-CE-SWA**

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

Polyolefin Inner Sheathed Steel Wire Armored

Polyolefin Outer 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/SWA/FR-LSOH)

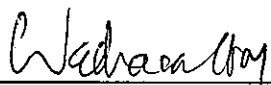
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CUSTOMER

Rev.	Date	Description
0	24/07/2020	Issued specification
1	2/02/2021	Add length mark

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 inner sheathed steel wire armored polyolefin outer 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 IEC 60331 and 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.

Low smoke test requirements per IEC 61034 and acid gas determinations test requirements per IEC 60754-1 and IEC 60754-2.

## 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. Inner Sheath**

The inner sheath shall be low smoke and zero halogen flame retardant polyolefin compound applied over the binder tape.

The approximate thickness given in Table 1.

The color of the inner sheath shall be black.

## **8. 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.

## **9. Outer Sheath**

The outer sheath shall be sunlight resistant, low smoke and zero halogen and flame retardant polyolefin (ST8) 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 1 by more than 20% plus 0.2 mm.

The color of the outer sheath shall be orange.

## 10. 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 code "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 outer sheath at every 1 meter

## 11. Test and Properties

The cable shall be 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 60331, BS 6387 Category CWZ, IEC 60332-1, IEC 60332-3-24 ; Category C, IEC 61034, IEC 60754-1 and IEC 60754-2.

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


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

## 12. 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-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

- Fire resistant tested according to IEC 60331 and BS 6387 Category CWZ.
- Flame retardant tested according to IEC 60332-1 and 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.

### Definition concerning the tests

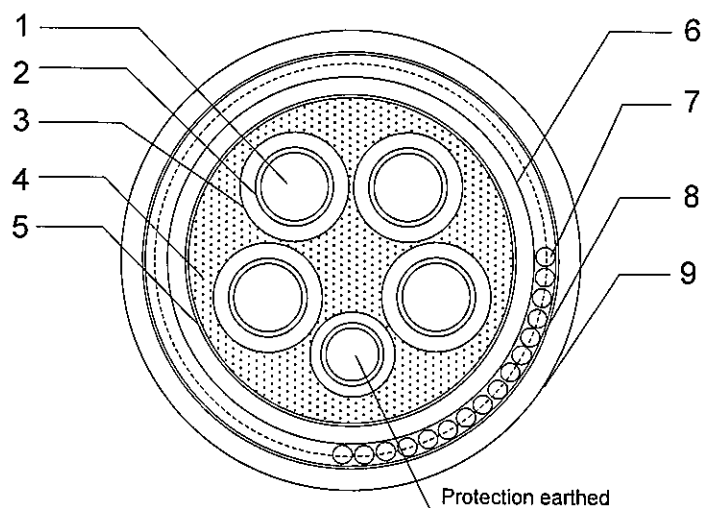
**Routine tests:** Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

**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	PP Calcium Yarn (Non-hygrosopic)
5	Binder tape	PS tape or Suitable tape
6	Inner Sheath	Low smoke and Zero halogen Flame retardant Polyolefin
7	Armor	Galvanized steel wire
8	Binder tape	PS tape or Suitable tape
9	Outer 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)	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	12.0	1.25	1.8	18.5	12.1	600	500
2+PE x 2.5/2.5	7/Non-Compacted	2.01	0.7	1.2	12.5	1.25	1.8	19.5	7.41	650	500
2+PE x 4/4	7/Non-Compacted	2.55	0.7	1.2	14.0	1.25	1.8	20.5	4.61	750	500
2+PE x 6/6	7/Non-Compacted	3.12	0.7	1.2	15.0	1.25	1.8	22.0	3.08	850	500
2+PE x 10/10	7/Compacted	3.80	0.7	1.2	16.5	1.60	1.8	24.0	1.83	1200	500
2+PE x 16/16	7/Compacted	4.80	0.7	1.2	18.5	1.60	1.8	26.0	1.15	1400	500
2+PE x 25/16	7/Compacted	6.00	0.9	1.2	21.0	1.60	1.8	28.5	0.727	1700	500
2+PE x 35/16	7/Compacted	7.10	0.9	1.2	23.0	2.00	1.9	31.5	0.524	2200	500
2+PE x 50/25	19/Compacted	8.30	1.0	1.2	26.5	2.00	2.0	35.0	0.387	2800	500
2+PE x 70/35	19/Compacted	9.90	1.1	1.2	30.0	2.00	2.2	39.0	0.268	3500	500
2+PE x 95/50	19/Compacted	11.70	1.1	1.2	33.5	2.00	2.3	43.0	0.193	4400	500
2+PE x 120/70	37/Compacted	13.20	1.2	1.3	37.5	2.50	2.5	48.5	0.153	5500	500
2+PE x 150/95	37/Compacted	14.60	1.4	1.4	41.5	2.50	2.6	52.5	0.124	7000	500
2+PE x 185/95	37/Compacted	16.30	1.6	1.4	45.5	2.50	2.7	57.0	0.0991	8000	500
2+PE x 240/120	61/Compacted	18.70	1.7	1.5	51.0	2.50	2.9	63.0	0.0754	10000	300
2+PE x 300/150	61/Compacted	20.90	1.8	1.6	56.0	2.50	3.1	68.5	0.0601	11500	300
2+PE x 400/240	61/Compacted	23.50	2.0	1.8	64.0	3.15	3.4	78.0	0.0470	16000	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)	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	13.0	1.25	1.8	19.5	12.1	650	500
3+PE x 2.5/2.5	7/Non-Compacted	2.01	0.7	1.2	14.0	1.25	1.8	20.5	7.41	750	500
3+PE x 4/4	7/Non-Compacted	2.55	0.7	1.2	15.5	1.25	1.8	22.0	4.61	850	500
3+PE x 6/6	7/Non-Compacted	3.12	0.7	1.2	16.5	1.60	1.8	24.0	3.08	1100	500
3+PE x 10/10	7/Compacted	3.80	0.7	1.2	18.0	1.60	1.8	25.5	1.83	1300	500
3+PE x 16/16	7/Compacted	4.80	0.7	1.2	20.5	1.60	1.8	28.0	1.15	1700	500
3+PE x 25/16	7/Compacted	6.00	0.9	1.2	23.5	2.00	1.9	32.0	0.727	2300	500
3+PE x 35/16	7/Compacted	7.10	0.9	1.2	25.5	2.00	2.0	34.5	0.524	2800	500
3+PE x 50/25	19/Compacted	8.30	1.0	1.2	29.5	2.00	2.1	38.5	0.387	3400	500
3+PE x 70/35	19/Compacted	9.90	1.1	1.2	33.5	2.00	2.3	43.0	0.268	4400	500
3+PE x 95/50	19/Compacted	11.70	1.1	1.3	37.5	2.50	2.5	48.5	0.193	6000	500
3+PE x 120/70	37/Compacted	13.20	1.2	1.4	42.0	2.50	2.6	53.0	0.153	7000	500
3+PE x 150/95	37/Compacted	14.60	1.4	1.5	47.0	2.50	2.8	58.5	0.124	9000	500
3+PE x 185/95	37/Compacted	16.30	1.6	1.5	51.0	2.50	2.9	63.0	0.0991	10000	300
3+PE x 240/120	61/Compacted	18.70	1.7	1.7	57.5	2.50	3.2	70.0	0.0754	12500	300
3+PE x 300/150	61/Compacted	20.90	1.8	1.8	63.0	3.15	3.4	77.5	0.0601	16000	200
3+PE x 400/240	61/Compacted	23.50	2.0	1.9	72.0	3.15	3.7	86.5	0.0470	20500	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)	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	14.0	1.25	1.8	21.0	12.1	750	500
4+PE x 2.5/2.5	7/Non-Compacted	2.01	0.7	1.2	15.0	1.25	1.8	22.0	7.41	800	500
4+PE x 4/4	7/Non-Compacted	2.55	0.7	1.2	17.0	1.60	1.8	24.0	4.61	1100	500
4+PE x 6/6	7/Non-Compacted	3.12	0.7	1.2	18.0	1.60	1.8	25.5	3.08	1300	500
4+PE x 10/10	7/Compacted	3.80	0.7	1.2	20.0	1.60	1.8	27.0	1.83	1500	500
4+PE x 16/16	7/Compacted	4.80	0.7	1.2	22.5	2.00	1.9	31.0	1.15	2200	500
4+PE x 25/16	7/Compacted	6.00	0.9	1.2	27.0	2.00	2.1	36.0	0.727	2800	500
4+PE x 35/16	7/Compacted	7.10	0.9	1.2	29.5	2.00	2.1	38.5	0.524	3300	500
4+PE x 50/25	19/Compacted	8.30	1.0	1.2	33.5	2.00	2.3	43.0	0.387	4200	500
4+PE x 70/35	19/Compacted	9.90	1.1	1.3	38.5	2.50	2.5	49.5	0.268	6000	500
4+PE x 95/50	19/Compacted	11.70	1.1	1.4	43.5	2.50	2.7	55.0	0.193	7500	500
4+PE x 120/70	37/Compacted	13.20	1.2	1.5	48.5	2.50	2.9	60.5	0.153	9000	300
4+PE x 150/95	37/Compacted	14.60	1.4	1.6	54.0	2.50	3.0	66.0	0.124	11000	300
4+PE x 185/95	37/Compacted	16.30	1.6	1.7	59.5	2.50	3.2	72.0	0.0991	13000	300
4+PE x 240/120	61/Compacted	18.70	1.7	1.8	66.5	3.15	3.5	81.0	0.0754	17000	200
4+PE x 300/150	61/Compacted	20.90	1.8	2.0	73.0	3.15	3.7	88.0	0.0601	20000	200
4+PE x 400/240	61/Compacted	23.50	2.0	2.1	83.0	3.15	4.1	99.0	0.0470	25500	100

**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