

# SPECIFICATION

## For

### FS/FDLH-0.6/1KV-CE

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

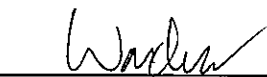
XLPE Insulated Polyolefin Sheathed

Fire Resistant and Flame Retardant

with Low Smoke and Zero Halogen Power Cable

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

BY



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CUSTOMER

Rev.	Date	Description
0	25/06/2020	Issued specification
1	16/02/2021	Cancel code "0010"
2	25/02/2021	Add size 1 x 1.5-10 mm <sup>2</sup>
3	31/03/2021	Change length mark
4	5/05/2021	Update the test standard version
5	11/6/2021	Update length mark on cable
6	7/11/2022	Add 5-cores

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 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 (For multi-cores only)

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 :

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)

## 7. Sheath

The 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 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 orange or black.

## 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

Remark : Length mark on single-core is for size  $\geq 16 \text{ mm}^2$

## 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 "  "
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

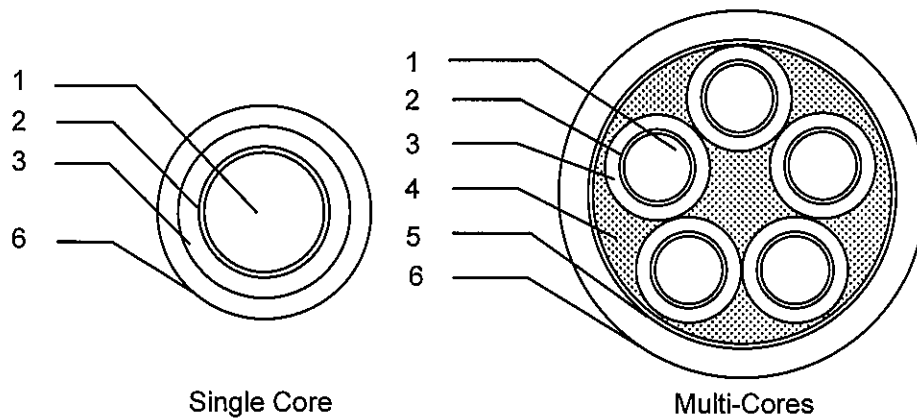
**Routine Tests:** Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

**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	P.S 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 core	Size (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)
1	1.5	7/Non-compacted	1.59	0.7	1.4	7.5	12.1	65	500
1	2.5	7/Non-compacted	2.01	0.7	1.4	8.0	7.41	75	500
1	4	7/Non-compacted	2.55	0.7	1.4	8.5	4.61	95	500
1	6	7/Non-compacted	3.12	0.7	1.4	9.0	3.08	120	500
1	10	7/Compacted	3.80	0.7	1.4	9.5	1.83	160	500
1	16	7/Compacted	4.80	0.7	1.4	10.5	1.15	220	500
1	25	7/Compacted	6.00	0.9	1.4	12.0	0.727	330	500
1	35	7/Compacted	7.10	0.9	1.4	13.5	0.524	410	500
1	50	19/Compacted	8.30	1.0	1.4	14.5	0.387	550	500
1	70	19/Compacted	9.90	1.1	1.5	17.0	0.268	750	500
1	95	19/Compacted	11.70	1.1	1.5	18.5	0.193	1000	500
1	120	37/Compacted	13.20	1.2	1.6	20.5	0.153	1300	500
1	150	37/Compacted	14.60	1.4	1.6	22.5	0.124	1600	500
1	185	37/Compacted	16.30	1.6	1.7	25.0	0.0991	1900	500
1	240	61/Compacted	18.70	1.7	1.8	27.5	0.0754	2500	500
1	300	61/Compacted	20.90	1.8	1.9	30.5	0.0601	3100	500
1	400	61/Compacted	23.50	2.0	2.0	33.5	0.0470	3900	500
1	500	61/Compacted	26.70	2.2	2.1	37.5	0.0366	5000	500
1	630	61/Compacted	30.30	2.4	2.3	42.0	0.0283	6500	500
1	800	61/Compacted	34.10	2.6	2.4	46.5	0.0221	8000	500
1	1000	127/Compacted	39.50	2.8	2.6	52.5	0.0176	10500	300

**Table 1 (continued)**

No. of cores	Size  (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	1.5	7/Non-compacted	1.59	0.7	1.8	12.5	12.1	160	500
2	2.5	7/Non-compacted	2.01	0.7	1.8	13.5	7.41	190	500
2	4	7/Non-compacted	2.55	0.7	1.8	15.0	4.61	240	500
2	6	7/Non-compacted	3.12	0.7	1.8	16.0	3.08	290	500
2	10	7/Compacted	3.80	0.7	1.8	17.5	1.83	390	500
2	16	7/Compacted	4.80	0.7	1.8	19.5	1.15	650	500
2	25	7/Compacted	6.00	0.9	1.8	23.0	0.727	750	500
2	35	7/Compacted	7.10	0.9	1.8	25.0	0.524	950	500
2	50	19/Compacted	8.30	1.0	1.8	28.0	0.387	1300	500
2	70	19/Compacted	9.90	1.1	1.8	31.5	0.268	1700	500
2	95	19/Compacted	11.70	1.1	1.8	35.5	0.193	2300	500
2	120	37/Compacted	13.20	1.2	2.2	39.0	0.153	2800	500
2	150	37/Compacted	14.60	1.4	2.3	43.0	0.124	3400	500
2	185	37/Compacted	16.30	1.6	2.4	48.0	0.0991	4200	500
2	240	61/Compacted	18.70	1.7	2.6	53.5	0.0754	5500	500
2	300	61/Compacted	20.90	1.8	2.8	59.0	0.0601	7000	500
2	400	61/Compacted	23.50	2.0	3.0	65.5	0.0470	8500	500



**Table 1 (continued)**

No. of cores	Size  (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	1.5	7/Non-compacted	1.59	0.7	1.8	13.5	12.1	190	500
3	2.5	7/Non-compacted	2.01	0.7	1.8	14.5	7.41	230	500
3	4	7/Non-compacted	2.55	0.7	1.8	15.5	4.61	290	500
3	6	7/Non-compacted	3.12	0.7	1.8	17.0	3.08	370	500
3	10	7/Compacted	3.80	0.7	1.8	18.5	1.83	490	500
3	16	7/Compacted	4.80	0.7	1.8	20.5	1.15	700	500
3	25	7/Compacted	6.00	0.9	1.8	24.5	0.727	1000	500
3	35	7/Compacted	7.10	0.9	1.8	27.0	0.524	1300	500
3	50	19/Compacted	8.30	1.0	1.8	30.0	0.387	1700	500
3	70	19/Compacted	9.90	1.1	1.8	34.0	0.268	2400	500
3	95	19/Compacted	11.70	1.1	2.1	38.0	0.193	3100	500
3	120	37/Compacted	13.20	1.2	2.3	42.0	0.153	4000	500
3	150	37/Compacted	14.60	1.4	2.4	46.0	0.124	4900	500
3	185	37/Compacted	16.30	1.6	2.6	51.5	0.0991	6000	500
3	240	61/Compacted	18.70	1.7	2.8	57.5	0.0754	8000	500
3	300	61/Compacted	20.90	1.8	2.9	63.0	0.0601	9500	300
3	400	61/Compacted	23.50	2.0	3.2	70.5	0.0470	12500	300

**Table 1 (continued)**

No. of cores	Size  (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	1.5	7/Non-compacted	1.59	0.7	1.8	14.5	12.1	230	500
4	2.5	7/Non-compacted	2.01	0.7	1.8	15.5	7.41	280	500
4	4	7/Non-compacted	2.55	0.7	1.8	17.5	4.61	360	500
4	6	7/Non-compacted	3.12	0.7	1.8	18.5	3.08	450	500
4	10	7/Compacted	3.80	0.7	1.8	20.0	1.83	600	500
4	16	7/Compacted	4.80	0.7	1.8	22.5	1.15	750	500
4	25	7/Compacted	6.00	0.9	1.8	27.0	0.727	1300	500
4	35	7/Compacted	7.10	0.9	1.8	29.5	0.524	1700	500
4	50	19/Compacted	8.30	1.0	1.8	33.0	0.387	2200	500
4	70	19/Compacted	9.90	1.1	2.1	37.5	0.268	3100	500
4	95	19/Compacted	11.70	1.1	2.3	42.0	0.193	4100	500
4	120	37/Compacted	13.20	1.2	2.4	46.5	0.153	5000	500
4	150	37/Compacted	14.60	1.4	2.6	51.5	0.124	6500	500
4	185	37/Compacted	16.30	1.6	2.8	57.5	0.0991	8000	500
4	240	61/Compacted	18.70	1.7	3.0	64.5	0.0754	10500	300
4	300	61/Compacted	20.90	1.8	3.2	70.5	0.0601	13000	300
4	400	61/Compacted	23.50	2.0	3.4	78.5	0.0470	16000	200

**Table 1 (continued)**

No. of cores	Size  (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)
5	1.5	7/Non-compacted	1.59	0.7	1.8	15.5	12.1	270	500
5	2.5	7/Non-compacted	2.01	0.7	1.8	16.5	7.41	330	500
5	4	7/Non-compacted	2.55	0.7	1.8	18.0	4.61	410	500
5	6	7/Non-compacted	3.12	0.7	1.8	19.5	3.08	550	500
5	10	7/Compacted	3.80	0.7	1.8	21.0	1.83	750	500
5	16	7/Compacted	4.80	0.7	1.8	24.0	1.15	1000	500
5	25	7/Compacted	6.00	0.9	1.8	28.5	0.727	1500	500
5	35	7/Compacted	7.10	0.9	1.9	32.0	0.524	2000	500
5	50	19/Compacted	8.30	1.0	2.1	36.0	0.387	2700	500
5	70	19/Compacted	9.90	1.1	2.2	41.0	0.268	3800	500
5	95	19/Compacted	11.70	1.1	2.4	46.5	0.193	5000	500
5	120	37/Compacted	13.20	1.2	2.6	52.0	0.153	6500	500
5	150	37/Compacted	14.60	1.4	2.8	57.0	0.124	8000	500
5	185	37/Compacted	16.30	1.6	3.0	64.0	0.0991	10000	300
5	240	61/Compacted	18.70	1.7	3.2	71.5	0.0754	13000	300
5	300	61/Compacted	20.90	1.8	3.4	78.5	0.0601	16000	200
5	400	61/Compacted	23.50	2.0	3.7	87.5	0.0470	20500	200