

**SPECIFICATION****For****FDLH-0.6/1KV-CCE-SWA**

0.6/1(1.2)kV Copper Conductor XLPE Insulated

Polyolefin Inner Sheathed Steel Wire Armored

Polyolefin Outer Sheathed Flame Retardant

with Low Smoke and Zero Halogen Control Cable

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

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CUSTOMER

Rev.	Date	Description
0	11/11/2022	Issued specification
1	28/11/2022	Add size 6 x 1.5 mm <sup>2</sup>
2	6/4/2023	Add size 4 x 2.5 mm <sup>2</sup>

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 cross-linked polyethylene (XLPE) insulated polyolefin inner sheathed steel wire armored polyolefin outer sheathed flame retardant with low smoke and zero halogen control cable.

The cable shall be based on IEC 60502-1 : 2004 and Amend.1 : 2009.

The maximum conductor temperature shall be 90°C.

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

Low smoke test requirements per IEC 61034 and acid gas 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**

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.

## **3. 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 2 by more than 10% plus 0.1 mm.

## **4. 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.

## **5. Core Identification**

The cores shall be identified by colors or by numbers printed on the insulation, as follows :

2-cores : blue, brown

3-cores : brown, black, grey

4-cores : blue, brown, black, grey

For 5-cores to 30-cores :

The cores shall be identified by the arabic numerals printed longitudinally and continuously on the surface of white insulation.

(White color is natural color of XLPE insulation)

## **6. 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.

## **7. 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.

## **8. Outer Sheath**

The outer sheath shall be sunlight resistant, low smoke and zero halogen 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 black.

## **9. 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 "FDLH"

4. Rated circuit voltage "0.6/1KV"

5. Type of insulation "XLPE"

6. Type of cable "CONTROL 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

## 10. 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, 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.

## 11. 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 "FDLH-0.6/1KV-CCE-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

- Flame retardant tested according to IEC 60332-1 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

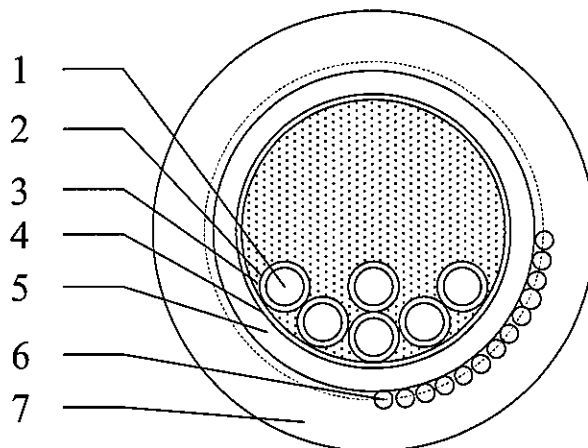
**Routine tests:** Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

**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	Stranded annealed copper
2	Insulation	Cross-Linked Polyethylene (XLPE)
3	Filler	Non-hygroscopic
4	Binder tape	PS tape or suitable tape
5	Inner sheath	Low smoke and Zero halogen Flame retardant Polyolefin
6	Aarmor	Galvanized steel wire
7	Outer sheath	Low smoke and zero halogen flame retardant polyolefin (ST8)

**Application:** For installed into tray, conduit, underground duct trench or direct burial in ground which provide flame retardant, low smoke and non-toxic emission under fire. Maximum conductor temperature of 90°C for normal operation and 250°C for short circuit conditions.

**Table 1**

No. of cores	Size (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	1.5	7/Non-compacted	1.59	0.7	1.2	9.5	0.80	1.8	15.5	12.1	360	500
3	1.5	7/Non-compacted	1.59	0.7	1.2	10.0	0.80	1.8	16.0	12.1	400	500
4	1.5	7/Non-compacted	1.59	0.7	1.2	11.0	0.80	1.8	16.5	12.1	440	500
4	2.5	7/Non-compacted	2.01	0.7	1.2	12.0	1.25	1.8	19.0	7.41	650	500
4	4	7/Non-compacted	2.55	0.7	1.2	13.5	1.25	1.8	20.0	4.61	750	500
4	6	7/Non-compacted	3.12	0.7	1.2	15.0	1.25	1.8	21.5	3.08	900	500
5	1.5	7/Non-compacted	1.59	0.7	1.2	12.0	1.25	1.8	18.5	12.1	600	500
6	1.5	7/Non-compacted	1.59	0.7	1.2	13.0	1.25	1.8	19.5	12.1	650	500
8	1.5	7/Non-compacted	1.59	0.7	1.2	14.0	1.25	1.8	20.5	12.1	750	500
9	1.5	7/Non-compacted	1.59	0.7	1.2	15.0	1.25	1.8	21.5	12.1	800	500
10	1.5	7/Non-compacted	1.59	0.7	1.2	16.0	1.60	1.8	23.5	12.1	1000	500
12	1.5	7/Non-compacted	1.59	0.7	1.2	16.5	1.60	1.8	24.0	12.1	1100	500
15	1.5	7/Non-compacted	1.59	0.7	1.2	18.0	1.60	1.8	25.5	12.1	1200	500
19	1.5	7/Non-compacted	1.59	0.7	1.2	19.0	1.60	1.8	26.5	12.1	1300	500
20	1.5	7/Non-compacted	1.59	0.7	1.2	19.5	1.60	1.8	27.0	12.1	1400	500
22	1.5	7/Non-compacted	1.59	0.7	1.2	21.5	1.60	1.8	28.5	12.1	1500	500
22	2.5	7/Non-compacted	2.01	0.7	1.2	24.0	2.00	1.9	34.5	7.41	2000	500

**Table 1 (continued)**

No. of cores	Size (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)
25	1.5	7/Non-compacted	1.59	0.7	1.2	22.5	2.00	1.9	31.0	12.1	1800	500
26	1.5	7/Non-compacted	1.59	0.7	1.2	22.5	2.00	1.9	31.0	12.1	1800	500
26	2.5	7/Non-compacted	2.01	0.7	1.2	25.5	2.00	2.0	34.0	7.41	2200	500
30	1.5	7/Non-compacted	1.59	0.7	1.2	23.5	2.00	1.9	32.0	12.1	2000	500