

# SPECIFICATION

## For

### FDLH-0.6/1KV-CE

0.6/1(1.2)kV Copper Conductor XLPE Insulated Polyolefin Sheathed  
Flame Retardant with Low Smoke and Zero Halogen Power Cable  
(0.6/1(1.2)kV, Cu/XLPE/FR-LSOH)

BY



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CUSTOMER

Rev.	Date	Description
0	25/06/2020	Issued specification
1	28/09/2020	Add 5 cores
2	17/2/2021	Cancel cable code "0010"
3	25/2/2021	Add size 1 x 1.5-10 mm <sup>2</sup>
4	22/3/2021	Correct the value in Table 1
5	2/04/2021	Change length mark
6	5/05/2021	Update the test standard version
7	13/2/2024	Update Table 1
8	25/3/2024	Update marking
9	25/4/2024	Update marking on cable
10	3/5/2024	Update specification
11	19/11/2024	Update Table 1
12	19/12/2024	Update conductor diameter

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 sheathed flame retardant with low smoke and zero halogen power cable. The cable shall be based on IEC 60502-1 : 2021.

The maximum conductor temperature shall be 90°C.

- 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. (Conductor size  $\leq 400 \text{ mm}^2$ ).

## 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. 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.

## 4. 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.

## 5. 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

(White color is natural color of XLPE insulation)

## 6. Sheath

The sheath shall be sunlight resistant, low smoke and zero halogen flame retardant polyolefin (ST8) compound meet the requirements of the 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.

## 7. 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 code "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 cores and size of conductor

9. 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  $\geq 16 \text{ mm}^2$

## 8. 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, 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.

## 9. 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-CE"
2. Number of core and size of cable
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.
- 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

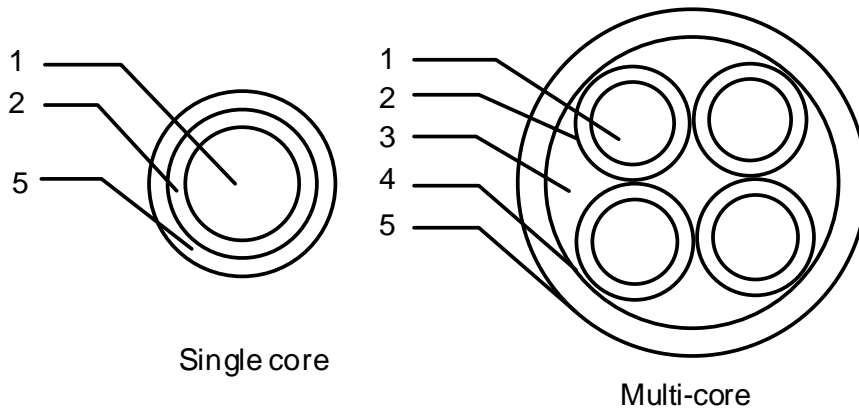
**Routine tests:** Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

**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	Insulation	Cross-linked polyethylene (XLPE) compound
3	Filler	Non-hygroscopic
4	Binder Tape	PS tape or suitable tape
5	Sheath	Low smoke and Zero halogen flame retardant polyolefin (ST8) compound

**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 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	6.5	12.1	53	500
1	2.5	7/Non-compacted	2.01	0.7	1.4	7.0	7.41	65	500
1	4	7/Non-compacted	2.55	0.7	1.4	7.5	4.61	84	500
1	6	7/Non-compacted	3.12	0.7	1.4	8.0	3.08	108	500
1	10	7/Compacted	3.70	0.7	1.4	8.5	1.83	147	500
1	16	7/Compacted	4.70	0.7	1.4	9.5	1.15	210	500
1	25	7/Compacted	5.90	0.9	1.4	11.5	0.727	312	500
1	35	7/Compacted	6.90	0.9	1.4	12.5	0.524	408	500
1	50	19/Compacted	8.20	1.0	1.4	14.0	0.387	537	500
1	70	19/Compacted	9.80	1.1	1.4	15.5	0.268	746	500
1	95	19/Compacted	11.60	1.1	1.5	18.0	0.193	1013	500
1	120	37/Compacted	13.10	1.2	1.5	19.5	0.153	1272	500
1	150	37/Compacted	14.50	1.4	1.6	21.5	0.124	1566	500
1	185	37/Compacted	16.10	1.6	1.7	24.0	0.0991	1922	500
1	240	61/Compacted	18.60	1.7	1.8	27.0	0.0754	2509	500
1	300	61/Compacted	20.80	1.8	1.9	29.5	0.0601	3125	500
1	400	61/Compacted	23.40	2.0	2.0	33.0	0.0470	3991	500
1	500	61/Compacted	26.60	2.2	2.1	36.5	0.0366	5092	500
1	630	61/Compacted	30.20	2.4	2.2	41.0	0.0283	6508	500
1	800	61/Compacted	34.00	2.6	2.4	45.5	0.0221	8159	500
1	1000	127/Compacted	39.40	2.8	2.6	51.5	0.0176	10694	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	11.0	12.1	128	500
2	2.5	7/Non-compacted	2.01	0.7	1.8	12.0	7.41	157	500
2	4	7/Non-compacted	2.55	0.7	1.8	13.0	4.61	201	500
2	6	7/Non-compacted	3.12	0.7	1.8	14.0	3.08	257	500
2	10	7/Compacted	3.70	0.7	1.8	15.0	1.83	340	500
2	16	7/Compacted	4.70	0.7	1.8	17.0	1.15	469	500
2	25	7/Compacted	5.90	0.9	1.8	20.5	0.727	706	500
2	35	7/Compacted	6.90	0.9	1.8	22.5	0.524	911	500
2	50	19/Compacted	8.20	1.0	1.8	25.5	0.387	1201	500
2	70	19/Compacted	9.80	1.1	1.9	29.5	0.268	1676	500
2	95	19/Compacted	11.60	1.1	2.0	33.5	0.193	2257	500
2	120	37/Compacted	13.10	1.2	2.1	37.0	0.153	2845	500
2	150	37/Compacted	14.50	1.4	2.2	41.0	0.124	3482	500
2	185	37/Compacted	16.10	1.6	2.4	45.5	0.0991	4351	500
2	240	61/Compacted	18.60	1.7	2.6	51.5	0.0754	5663	500
2	300	61/Compacted	20.80	1.8	2.7	56.5	0.0601	7005	500
2	400	61/Compacted	23.40	2.0	3.0	63.5	0.0470	8921	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	11.5	12.1	152	500
3	2.5	7/Non-compacted	2.01	0.7	1.8	12.5	7.41	190	500
3	4	7/Non-compacted	2.55	0.7	1.8	13.5	4.61	250	500
3	6	7/Non-compacted	3.12	0.7	1.8	15.0	3.08	326	500
3	10	7/Compacted	3.70	0.7	1.8	16.0	1.83	446	500
3	16	7/Compacted	4.70	0.7	1.8	18.0	1.15	625	500
3	25	7/Compacted	5.90	0.9	1.8	22.0	0.727	929	500
3	35	7/Compacted	6.90	0.9	1.8	24.0	0.524	1229	500
3	50	19/Compacted	8.20	1.0	1.8	27.5	0.387	1624	500
3	70	19/Compacted	9.80	1.1	1.9	31.5	0.268	2286	500
3	95	19/Compacted	11.60	1.1	2.1	36.0	0.193	3123	500
3	120	37/Compacted	13.10	1.2	2.2	40.0	0.153	3940	500
3	150	37/Compacted	14.50	1.4	2.3	44.0	0.124	4844	500
3	185	37/Compacted	16.10	1.6	2.5	49.0	0.0991	6040	500
3	240	61/Compacted	18.60	1.7	2.7	55.5	0.0754	7887	500
3	300	61/Compacted	20.80	1.8	2.9	61.0	0.0601	9810	300
3	400	61/Compacted	23.40	2.0	3.1	68.5	0.0470	12443	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	12.0	12.1	181	500
4	2.5	7/Non-compacted	2.01	0.7	1.8	13.5	7.41	229	500
4	4	7/Non-compacted	2.55	0.7	1.8	14.5	4.61	306	500
4	6	7/Non-compacted	3.12	0.7	1.8	16.0	3.08	407	500
4	10	7/Compacted	3.70	0.7	1.8	17.5	1.83	565	500
4	16	7/Compacted	4.70	0.7	1.8	20.0	1.15	796	500
4	25	7/Compacted	5.90	0.9	1.8	24.0	0.727	1203	500
4	35	7/Compacted	6.90	0.9	1.8	26.5	0.524	1584	500
4	50	19/Compacted	8.20	1.0	1.9	30.5	0.387	2118	500
4	70	19/Compacted	9.80	1.1	2.0	35.0	0.268	2976	500
4	95	19/Compacted	11.60	1.1	2.2	39.5	0.193	4063	500
4	120	37/Compacted	13.10	1.2	2.3	44.0	0.153	5147	500
4	150	37/Compacted	14.50	1.4	2.5	49.0	0.124	6352	500
4	185	37/Compacted	16.10	1.6	2.7	54.5	0.0991	7917	500
4	240	61/Compacted	18.60	1.7	2.9	61.5	0.0754	10331	300
4	300	61/Compacted	20.80	1.8	3.1	68.0	0.0601	12878	300
4	400	61/Compacted	23.40	2.0	3.4	76.5	0.0470	16361	200