

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

0.6/1(1.2)kV Copper Conductor XLPE Insulated

Polyolefin Sheathed Flame Retardant

with Low Smoke and Zero Halogen Shield Control Cable

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

BY



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Rev.	Date	Description
0	21/10/2019	Issued specification
1	11/5/2020	Change cable code
2	6/9/2021	Cancel code "0010"
3	22/2/2024	Update specification
4	29/3/2024	Change marking on cable
5	10/6/2025	Update specification

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CUSTOMER

Customer Document	Rev.
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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 shielded control 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 60332-3-24; Category C.
- Low smoke test requirements per IEC 61034.
- Halogen gases 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. 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

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.

6. Metallic Shield

The metallic shield shall be an annealed uncoated copper tape and applied helically with a lap over the binder tape.

The thickness of the tape shall be approximate 0.1 mm.

A suitable separator tape shall be applied helically over the metallic shield.

7. Sheath

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

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 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 "SHIELD CONTROL 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

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 : 2021, IEC 60228 : 2004, 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.


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 "FDLH-0.6/1KV-CCE-S"
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 60332-3-24; 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

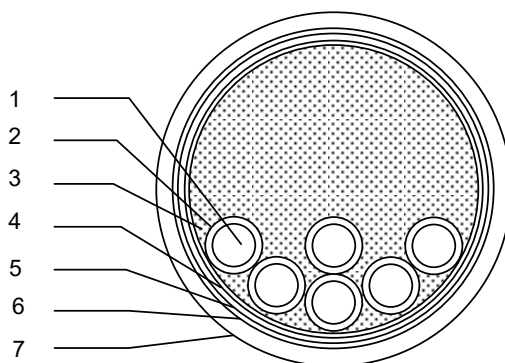
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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	Stranded annealed copper
2	Insulation	Cross-linked polyethylene (XLPE) compound
3	Filler	Non-hygroscopic
4	Binder tape	PS tape or suitable tape
5	Metallic shield	Copper tape
6	Separator tape	PS tape or suitable tape
7	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 cores	Size (mm ²)	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	150	300
2	2.5	7/Non-compacted	2.01	0.7	1.8	12.0	7.41	182	300
2	4	7/Non-compacted	2.55	0.7	1.8	13.0	4.61	229	300
2	6	7/Non-compacted	3.12	0.7	1.8	14.5	3.08	289	300
3	1.5	7/Non-compacted	1.59	0.7	1.8	11.5	12.1	177	300
3	2.5	7/Non-compacted	2.01	0.7	1.8	13.0	7.41	217	300
3	4	7/Non-compacted	2.55	0.7	1.8	14.0	4.61	280	300
3	6	7/Non-compacted	3.12	0.7	1.8	15.0	3.08	361	300
4	1.5	7/Non-compacted	1.59	0.7	1.8	12.5	12.1	207	300
4	2.5	7/Non-compacted	2.01	0.7	1.8	14.0	7.41	259	300
4	4	7/Non-compacted	2.55	0.7	1.8	15.0	4.61	340	300
4	6	7/Non-compacted	3.12	0.7	1.8	16.5	3.08	445	300
5	1.5	7/Non-compacted	1.59	0.7	1.8	13.5	12.1	242	300
5	2.5	7/Non-compacted	2.01	0.7	1.8	15.0	7.41	306	300
5	4	7/Non-compacted	2.55	0.7	1.8	16.0	4.61	407	300
5	6	7/Non-compacted	3.12	0.7	1.8	18.0	3.08	531	300
6	1.5	7/Non-compacted	1.59	0.7	1.8	14.5	12.1	280	300
6	2.5	7/Non-compacted	2.01	0.7	1.8	16.0	7.41	355	300
6	4	7/Non-compacted	2.55	0.7	1.8	17.5	4.61	470	300
6	6	7/Non-compacted	3.12	0.7	1.8	19.5	3.08	623	300
7	1.5	7/Non-compacted	1.59	0.7	1.8	14.5	12.1	297	300
7	2.5	7/Non-compacted	2.01	0.7	1.8	16.0	7.41	381	300
7	4	7/Non-compacted	2.55	0.7	1.8	17.5	4.61	509	300
7	6	7/Non-compacted	3.12	0.7	1.8	19.5	3.08	681	300

Table 1 (continued)

No. of cores	Size (mm ²)	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)
8	1.5	7/Non-compacted	1.59	0.7	1.8	15.5	12.1	341	300
8	2.5	7/Non-compacted	2.01	0.7	1.8	17.0	7.41	438	300
8	4	7/Non-compacted	2.55	0.7	1.8	19.0	4.61	588	300
8	6	7/Non-compacted	3.12	0.7	1.8	21.0	3.08	789	300
9	1.5	7/Non-compacted	1.59	0.7	1.8	16.5	12.1	370	300
9	2.5	7/Non-compacted	2.01	0.7	1.8	18.5	7.41	491	300
9	4	7/Non-compacted	2.55	0.7	1.8	20.0	4.61	658	300
9	6	7/Non-compacted	3.12	0.7	1.8	22.5	3.08	884	300
10	1.5	7/Non-compacted	1.59	0.7	1.8	17.5	12.1	408	300
10	2.5	7/Non-compacted	2.01	0.7	1.8	19.5	7.41	539	300
10	4	7/Non-compacted	2.55	0.7	1.8	21.5	4.61	729	300
10	6	7/Non-compacted	3.12	0.7	1.8	24.0	3.08	977	300
11	1.5	7/Non-compacted	1.59	0.7	1.8	17.5	12.1	422	300
11	2.5	7/Non-compacted	2.01	0.7	1.8	19.5	7.41	564	300
11	4	7/Non-compacted	2.55	0.7	1.8	21.5	4.61	761	300
11	6	7/Non-compacted	3.12	0.7	1.8	24.0	3.08	1031	300
12	1.5	7/Non-compacted	1.59	0.7	1.8	18.0	12.1	461	300
12	2.5	7/Non-compacted	2.01	0.7	1.8	20.0	7.41	610	300
12	4	7/Non-compacted	2.55	0.7	1.8	22.5	4.61	825	300
12	6	7/Non-compacted	3.12	0.7	1.8	25.0	3.08	1116	300
13	1.5	7/Non-compacted	1.59	0.7	1.8	19.0	12.1	497	300
13	2.5	7/Non-compacted	2.01	0.7	1.8	21.0	7.41	647	300
13	4	7/Non-compacted	2.55	0.7	1.8	23.5	4.61	885	300
13	6	7/Non-compacted	3.12	0.7	1.8	26.0	3.08	1197	300

Table 1 (continued)

No. of cores	Size (mm ²)	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)
14	1.5	7/Non-compacted	1.59	0.7	1.8	19.0	12.1	500	300
14	2.5	7/Non-compacted	2.01	0.7	1.8	21.0	7.41	671	300
14	4	7/Non-compacted	2.55	0.7	1.8	23.5	4.61	915	300
14	6	7/Non-compacted	3.12	0.7	1.8	26.0	3.08	1238	300
15	1.5	7/Non-compacted	1.59	0.7	1.8	19.5	12.1	534	300
15	2.5	7/Non-compacted	2.01	0.7	1.8	22.0	7.41	720	300
15	4	7/Non-compacted	2.55	0.7	1.8	24.0	4.61	985	300
15	6	7/Non-compacted	3.12	0.7	1.8	27.0	3.08	1333	300
16	1.5	7/Non-compacted	1.59	0.7	1.8	20.0	12.1	557	300
16	2.5	7/Non-compacted	2.01	0.7	1.8	22.0	7.41	750	300
16	4	7/Non-compacted	2.55	0.7	1.8	24.5	4.61	1029	300
16	6	7/Non-compacted	3.12	0.7	1.8	27.5	3.08	1395	300
17	1.5	7/Non-compacted	1.59	0.7	1.8	21.0	12.1	604	300
17	2.5	7/Non-compacted	2.01	0.7	1.8	23.5	7.41	809	300
17	4	7/Non-compacted	2.55	0.7	1.8	26.0	4.61	1118	300
17	6	7/Non-compacted	3.12	0.7	1.8	29.0	3.08	1519	300
18	1.5	7/Non-compacted	1.59	0.7	1.8	21.0	12.1	615	300
18	2.5	7/Non-compacted	2.01	0.7	1.8	23.5	7.41	819	300
18	4	7/Non-compacted	2.55	0.7	1.8	26.0	4.61	1132	300
18	6	7/Non-compacted	3.12	0.7	1.8	29.0	3.08	1543	300
19	1.5	7/Non-compacted	1.59	0.7	1.8	21.0	12.1	632	300
19	2.5	7/Non-compacted	2.01	0.7	1.8	23.5	7.41	844	300
19	4	7/Non-compacted	2.55	0.7	1.8	26.0	4.61	1171	300
19	6	7/Non-compacted	3.12	0.7	1.8	29.0	3.08	1599	300

Table 1 (continued)

No. of cores	Size (mm ²)	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)
20	1.5	7/Non-compacted	1.59	0.7	1.8	21.5	12.1	666	300
20	2.5	7/Non-compacted	2.01	0.7	1.8	24.0	7.41	889	300
20	4	7/Non-compacted	2.55	0.7	1.8	26.5	4.61	1232	300
20	6	7/Non-compacted	3.12	0.7	1.9	30.0	3.08	1702	300
21	1.5	7/Non-compacted	1.59	0.7	1.8	22.0	12.1	696	300
21	2.5	7/Non-compacted	2.01	0.7	1.8	24.5	7.41	933	300
21	4	7/Non-compacted	2.55	0.7	1.8	27.0	4.61	1295	300
21	6	7/Non-compacted	3.12	0.7	1.9	30.5	3.08	1786	300
22	1.5	7/Non-compacted	1.59	0.7	1.8	23.0	12.1	733	300
22	2.5	7/Non-compacted	2.01	0.7	1.8	25.5	7.41	985	300
22	4	7/Non-compacted	2.55	0.7	1.8	28.5	4.61	1366	300
22	6	7/Non-compacted	3.12	0.7	1.9	32.0	3.08	1882	300
23	1.5	7/Non-compacted	1.59	0.7	1.8	23.0	12.1	755	300
23	2.5	7/Non-compacted	2.01	0.7	1.8	25.5	7.41	1016	300
23	4	7/Non-compacted	2.55	0.7	1.8	28.5	4.61	1412	300
23	6	7/Non-compacted	3.12	0.7	1.9	32.0	3.08	1948	300
24	1.5	7/Non-compacted	1.59	0.7	1.8	24.0	12.1	786	300
24	2.5	7/Non-compacted	2.01	0.7	1.8	27.0	7.41	1057	300
24	4	7/Non-compacted	2.55	0.7	1.9	30.0	4.61	1491	300
24	6	7/Non-compacted	3.12	0.7	2.0	34.0	3.08	2053	300
25	1.5	7/Non-compacted	1.59	0.7	1.8	24.0	12.1	811	300
25	2.5	7/Non-compacted	2.01	0.7	1.8	27.0	7.41	1093	300
25	4	7/Non-compacted	2.55	0.7	1.9	30.0	4.61	1537	300
25	6	7/Non-compacted	3.12	0.7	2.0	34.0	3.08	2119	300

Table 1 (continued)

No. of cores	Size (mm ²)	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)
26	1.5	7/Non-compacted	1.59	0.7	1.8	24.0	12.1	830	300
26	2.5	7/Non-compacted	2.01	0.7	1.8	27.0	7.41	1120	300
26	4	7/Non-compacted	2.55	0.7	1.9	30.0	4.61	1576	300
26	6	7/Non-compacted	3.12	0.7	2.0	34.0	3.08	2178	300
27	1.5	7/Non-compacted	1.59	0.7	1.8	24.5	12.1	859	300
27	2.5	7/Non-compacted	2.01	0.7	1.8	27.5	7.41	1157	300
27	4	7/Non-compacted	2.55	0.7	1.9	31.0	4.61	1631	300
27	6	7/Non-compacted	3.12	0.7	2.0	35.0	3.08	2254	300
28	1.5	7/Non-compacted	1.59	0.7	1.8	25.5	12.1	909	300
28	2.5	7/Non-compacted	2.01	0.7	1.8	28.5	7.41	1224	300
28	4	7/Non-compacted	2.55	0.7	1.9	32.0	4.61	1721	300
28	6	7/Non-compacted	3.12	0.7	2.1	36.5	3.08	2394	300
29	1.5	7/Non-compacted	1.59	0.7	1.8	25.5	12.1	908	300
29	2.5	7/Non-compacted	2.01	0.7	1.8	28.5	7.41	1227	300
29	4	7/Non-compacted	2.55	0.7	1.9	32.0	4.61	1731	300
29	6	7/Non-compacted	3.12	0.7	2.1	36.5	3.08	2412	300
30	1.5	7/Non-compacted	1.59	0.7	1.8	25.5	12.1	930	300
30	2.5	7/Non-compacted	2.01	0.7	1.8	28.5	7.41	1258	300
30	4	7/Non-compacted	2.55	0.7	1.9	32.0	4.61	1778	300
30	6	7/Non-compacted	3.12	0.7	2.1	36.5	3.08	2480	300