

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



(Wachara Sangsomritphon)

MANAGER, Cable Design Section

APP.



(Winai Ariyasakulsap)

MANAGER, Development Department

APP.

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CUSTOMER

Rev.	Date	Description
0	21/10/2019	Issued specification
1	11/5/2020	Change cable code
2	6/9/2021	Cancel code "0010"

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 : 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 60332-3-24; 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.

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 be not fall below the value in Table 1 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. 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 : 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 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 insulation "XLPE"
6. Type of cable "SHIELD CONTROL CABLE"
7. Number cores and size of conductor
8. 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 : 2004 and Amend. 1 : 2009, 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 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

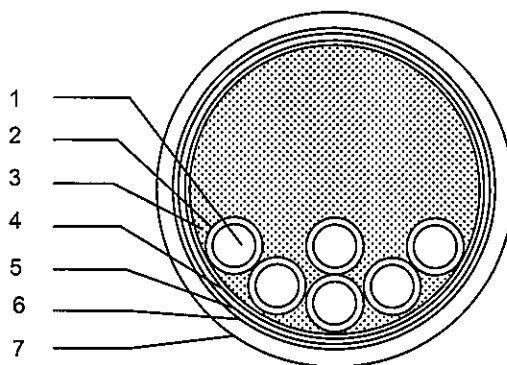
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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 concentric stranded annealed copper
2	Insulation	Cross-linked polyethylene (XLPE)
3	Filler	PP calcium yarn (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)

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	11.5	12.1	150	300
2	2.5	7/Non-compacted	2.01	0.7	1.8	12.5	7.41	180	300
2	4	7/Non-compacted	2.55	0.7	1.8	13.5	4.61	220	300
2	6	7/Non-compacted	3.12	0.7	1.8	14.5	3.08	280	300
2	10	7/Compacted	3.80	0.7	1.8	15.5	1.83	370	300
3	1.5	7/Non-compacted	1.59	0.7	1.8	12.0	12.1	180	300
3	2.5	7/Non-compacted	2.01	0.7	1.8	13.0	7.41	210	300
3	4	7/Non-compacted	2.55	0.7	1.8	14.0	4.61	270	300
3	6	7/Non-compacted	3.12	0.7	1.8	15.5	3.08	350	300
3	10	7/Compacted	3.80	0.7	1.8	16.5	1.83	480	300
4	1.5	7/Non-compacted	1.59	0.7	1.8	13.0	12.1	200	300
4	2.5	7/Non-compacted	2.01	0.7	1.8	14.0	7.41	260	300
4	4	7/Non-compacted	2.55	0.7	1.8	15.5	4.61	330	300
4	6	7/Non-compacted	3.12	0.7	1.8	17.0	3.08	430	300
4	10	7/Compacted	3.80	0.7	1.8	18.0	1.83	600	300
5	1.5	7/Non-compacted	1.59	0.7	1.8	14.0	12.1	250	300
5	2.5	7/Non-compacted	2.01	0.7	1.8	15.0	7.41	300	300
5	4	7/Non-compacted	2.55	0.7	1.8	16.5	4.61	400	300
5	6	7/Non-compacted	3.12	0.7	1.8	18.0	3.08	500	300
5	10	7/Compacted	3.80	0.7	1.8	19.5	1.83	700	300
6	1.5	7/Non-compacted	1.59	0.7	1.8	14.5	12.1	270	300
6	2.5	7/Non-compacted	2.01	0.7	1.8	16.5	7.41	340	300
6	4	7/Non-compacted	2.55	0.7	1.8	18.0	4.61	450	300
6	6	7/Non-compacted	3.12	0.7	1.8	19.5	3.08	600	300
6	10	7/Compacted	3.80	0.7	1.8	21.0	1.83	850	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)
7	1.5	7/Non-compacted	1.59	0.7	1.8	14.5	12.1	300	300
7	2.5	7/Non-compacted	2.01	0.7	1.8	16.5	7.41	370	300
7	4	7/Non-compacted	2.55	0.7	1.8	18.0	4.61	490	300
7	6	7/Non-compacted	3.12	0.7	1.8	19.5	3.08	650	300
7	10	7/Compacted	3.80	0.7	1.8	21.0	1.83	950	300
8	1.5	7/Non-compacted	1.59	0.7	1.8	15.5	12.1	320	300
8	2.5	7/Non-compacted	2.01	0.7	1.8	17.5	7.41	420	300
8	4	7/Non-compacted	2.55	0.7	1.8	19.0	4.61	550	300
8	6	7/Non-compacted	3.12	0.7	1.8	21.0	3.08	750	300
8	10	7/Compacted	3.80	0.7	1.8	22.5	1.83	1100	300
9	1.5	7/Non-compacted	1.59	0.7	1.8	17.0	12.1	370	300
9	2.5	7/Non-compacted	2.01	0.7	1.8	18.5	7.41	470	300
9	4	7/Non-compacted	2.55	0.7	1.8	20.5	4.61	650	300
9	6	7/Non-compacted	3.12	0.7	1.8	22.5	3.08	850	300
9	10	7/Compacted	3.80	0.7	1.8	24.5	1.83	1200	300
10	1.5	7/Non-compacted	1.59	0.7	1.8	18.0	12.1	390	300
10	2.5	7/Non-compacted	2.01	0.7	1.8	20.0	7.41	500	300
10	4	7/Non-compacted	2.55	0.7	1.8	22.0	4.61	700	300
10	6	7/Non-compacted	3.12	0.7	1.8	24.0	3.08	950	300
10	10	7/Compacted	3.80	0.7	1.8	26.0	1.83	1300	300
11	1.5	7/Non-compacted	1.59	0.7	1.8	18.0	12.1	400	300
11	2.5	7/Non-compacted	2.01	0.7	1.8	20.0	7.41	550	300
11	4	7/Non-compacted	2.55	0.7	1.8	22.0	4.61	750	300
11	6	7/Non-compacted	3.12	0.7	1.8	24.0	3.08	1000	300
11	10	7/Compacted	3.80	0.7	1.8	26.0	1.83	1400	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)
12	1.5	7/Non-compacted	1.59	0.7	1.8	18.5	12.1	470	300
12	2.5	7/Non-compacted	2.01	0.7	1.8	20.5	7.41	600	300
12	4	7/Non-compacted	2.55	0.7	1.8	22.5	4.61	800	300
12	6	7/Non-compacted	3.12	0.7	1.8	25.0	3.08	1100	300
12	10	7/Compacted	3.80	0.7	1.8	27.0	1.83	1500	300
13	1.5	7/Non-compacted	1.59	0.7	1.8	19.0	12.1	470	300
13	2.5	7/Non-compacted	2.01	0.7	1.8	21.5	7.41	600	300
13	4	7/Non-compacted	2.55	0.7	1.8	23.5	4.61	850	300
13	6	7/Non-compacted	3.12	0.7	1.8	26.5	3.08	1200	300
13	10	7/Compacted	3.80	0.7	1.8	28.5	1.83	1700	300
14	1.5	7/Non-compacted	1.59	0.7	1.8	19.0	12.1	470	300
14	2.5	7/Non-compacted	2.01	0.7	1.8	21.5	7.41	650	300
14	4	7/Non-compacted	2.55	0.7	1.8	23.5	4.61	900	300
14	6	7/Non-compacted	3.12	0.7	1.8	26.5	3.08	1200	300
14	10	7/Compacted	3.80	0.7	1.8	28.5	1.83	1700	300
15	1.5	7/Non-compacted	1.59	0.7	1.8	20.0	12.1	500	300
15	2.5	7/Non-compacted	2.01	0.7	1.8	22.0	7.41	700	300
15	4	7/Non-compacted	2.55	0.7	1.8	24.5	4.61	950	300
15	6	7/Non-compacted	3.12	0.7	1.8	27.0	3.08	1300	300
15	10	7/Compacted	3.80	0.7	1.9	29.5	1.83	1900	300
16	1.5	7/Non-compacted	1.59	0.7	1.8	20.0	12.1	500	300
16	2.5	7/Non-compacted	2.01	0.7	1.8	22.5	7.41	700	300
16	4	7/Non-compacted	2.55	0.7	1.8	25.0	4.61	1000	300
16	6	7/Non-compacted	3.12	0.7	1.8	27.5	3.08	1400	300
16	10	7/Compacted	3.80	0.7	1.9	30.5	1.83	2000	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)
17	1.5	7/Non-compacted	1.59	0.7	1.8	21.0	12.1	550	300
17	2.5	7/Non-compacted	2.01	0.7	1.8	23.5	7.41	750	300
17	4	7/Non-compacted	2.55	0.7	1.8	26.0	4.61	1100	300
17	6	7/Non-compacted	3.12	0.7	1.8	29.0	3.08	1500	300
17	10	7/Compacted	3.80	0.7	1.9	32.0	1.83	2100	300
18	1.5	7/Non-compacted	1.59	0.7	1.8	21.0	12.1	600	300
18	2.5	7/Non-compacted	2.01	0.7	1.8	23.5	7.41	750	300
18	4	7/Non-compacted	2.55	0.7	1.8	26.0	4.61	1100	300
18	6	7/Non-compacted	3.12	0.7	1.8	29.0	3.08	1500	300
18	10	7/Compacted	3.80	0.7	1.9	32.0	1.83	2200	300
19	1.5	7/Non-compacted	1.59	0.7	1.8	21.0	12.1	600	300
19	2.5	7/Non-compacted	2.01	0.7	1.8	23.5	7.41	800	300
19	4	7/Non-compacted	2.55	0.7	1.8	26.0	4.61	1100	300
19	6	7/Non-compacted	3.12	0.7	1.8	29.0	3.08	1500	300
19	10	7/Compacted	3.80	0.7	1.9	32.0	1.83	2300	300
20	1.5	7/Non-compacted	1.59	0.7	1.8	21.5	12.1	600	300
20	2.5	7/Non-compacted	2.01	0.7	1.8	24.0	7.41	850	300
20	4	7/Non-compacted	2.55	0.7	1.8	27.0	4.61	1200	300
20	6	7/Non-compacted	3.12	0.7	1.9	30.0	3.08	1600	300
20	10	7/Compacted	3.80	0.7	2.0	33.0	1.83	2400	300
21	1.5	7/Non-compacted	1.59	0.7	1.8	22.0	12.1	650	300
21	2.5	7/Non-compacted	2.01	0.7	1.8	25.0	7.41	900	300
21	4	7/Non-compacted	2.55	0.7	1.8	27.5	4.61	1200	300
21	6	7/Non-compacted	3.12	0.7	1.9	31.0	3.08	1700	300
21	10	7/Compacted	3.80	0.7	2.0	34.0	1.83	2500	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)
22	1.5	7/Non-compacted	1.59	0.7	1.8	23.0	12.1	700	300
22	2.5	7/Non-compacted	2.01	0.7	1.8	26.0	7.41	950	300
22	4	7/Non-compacted	2.55	0.7	1.8	29.0	4.61	1300	300
22	6	7/Non-compacted	3.12	0.7	1.9	32.5	3.08	1800	300
22	10	7/Compacted	3.80	0.7	2.1	35.5	1.83	2700	300
23	1.5	7/Non-compacted	1.59	0.7	1.8	23.0	12.1	700	300
23	2.5	7/Non-compacted	2.01	0.7	1.8	26.0	7.41	1000	300
23	4	7/Non-compacted	2.55	0.7	1.8	29.0	4.61	1400	300
23	6	7/Non-compacted	3.12	0.7	1.9	32.5	3.08	1900	300
23	10	7/Compacted	3.80	0.7	2.1	35.5	1.83	2800	300
24	1.5	7/Non-compacted	1.59	0.7	1.8	24.0	12.1	750	300
24	2.5	7/Non-compacted	2.01	0.7	1.8	27.0	7.41	1000	300
24	4	7/Non-compacted	2.55	0.7	1.9	30.5	4.61	1400	300
24	6	7/Non-compacted	3.12	0.7	2.0	34.5	3.08	2000	300
24	10	7/Compacted	3.80	0.7	2.1	37.5	1.83	2900	300
25	1.5	7/Non-compacted	1.59	0.7	1.8	24.0	12.1	750	300
25	2.5	7/Non-compacted	2.01	0.7	1.8	27.0	7.41	1000	300
25	4	7/Non-compacted	2.55	0.7	1.9	30.5	4.61	1500	300
25	6	7/Non-compacted	3.12	0.7	2.0	34.5	3.08	2000	300
25	10	7/Compacted	3.80	0.7	2.1	37.5	1.83	3000	300
26	1.5	7/Non-compacted	1.59	0.7	1.8	24.0	12.1	800	300
26	2.5	7/Non-compacted	2.01	0.7	1.8	27.0	7.41	1100	300
26	4	7/Non-compacted	2.55	0.7	1.9	30.5	4.61	1500	300
26	6	7/Non-compacted	3.12	0.7	2.0	34.5	3.08	2100	300
26	10	7/Compacted	3.80	0.7	2.1	37.5	1.83	3100	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)
27	1.5	7/Non-compacted	1.59	0.7	1.8	25.0	12.1	800	300
27	2.5	7/Non-compacted	2.01	0.7	1.8	28.0	7.41	1100	300
27	4	7/Non-compacted	2.55	0.7	1.9	31.0	4.61	1600	300
27	6	7/Non-compacted	3.12	0.7	2.0	35.0	3.08	2200	300
27	10	7/Compacted	3.80	0.7	2.2	38.5	1.83	3200	300
28	1.5	7/Non-compacted	1.59	0.7	1.8	25.5	12.1	850	300
28	2.5	7/Non-compacted	2.01	0.7	1.8	29.0	7.41	1200	300
28	4	7/Non-compacted	2.55	0.7	1.9	32.5	4.61	1700	300
28	6	7/Non-compacted	3.12	0.7	2.1	36.5	3.08	2300	300
28	10	7/Compacted	3.80	0.7	2.2	40.0	1.83	3400	300
29	1.5	7/Non-compacted	1.59	0.7	1.8	25.5	12.1	850	300
29	2.5	7/Non-compacted	2.01	0.7	1.8	29.0	7.41	1200	300
29	4	7/Non-compacted	2.55	0.7	1.9	32.5	4.61	1700	300
29	6	7/Non-compacted	3.12	0.7	2.1	36.5	3.08	2300	300
29	10	7/Compacted	3.80	0.7	2.2	40.0	1.83	3400	300
30	1.5	7/Non-compacted	1.59	0.7	1.8	25.5	12.1	900	300
30	2.5	7/Non-compacted	2.01	0.7	1.8	29.0	7.41	1200	300
30	4	7/Non-compacted	2.55	0.7	1.9	32.5	4.61	1700	300
30	6	7/Non-compacted	3.12	0.7	2.1	36.5	3.08	2400	300
30	10	7/Compacted	3.80	0.7	2.2	40.0	1.83	3500	300