

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

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

XLPE Insulated Polyolefin Inner Sheath

Polyolefin Outer Sheathed Fire Resistant and Flame Retardant

with Low Smoke and Zero Halogen Shielded Control Cable

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

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CUSTOMER

BANGKOK INER ENERGY

Rev.	Date	Description
0	18/11/2021	Issued specification

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.

DESIGNATION : FS/FDLH-0.6/1KV-CCE-S

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1. Scope

This specification covers 1000V copper conductor mica fire-barrier cross-linked polyethylene (XLPE) insulated polyolefin inner sheathed polyolefin outer sheathed fire resistant and 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 cable shall be fire resistant 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

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. 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

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 in the outer layer.

A suitable binder tape shall be applied helically over the cabled core.

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6. Core Identification

The cores shall be identified by colors or by number 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)

7. 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.

8. Metallic Shield

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

The thickness of the copper tape shall be approximate 0.1 mm.

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

9. Outer Sheath

The outer sheath shall be 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 orange.

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10. 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 "FS/FDLH"
4. Rated circuit voltage "0.6/1KV"
5. Type of insulation "XLPE"
6. Type of cable "SHIELD 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

11. Test and Properties

The cable shall be 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 60331, 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: For longer life of cable should be avoid exposure to direct solar radiation it necessary, cover is required.

12. 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-CCE-S"
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

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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 IEC 60331 and 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.

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Table 1

No. of cores	Size (mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness approx. (mm)	Dia. of inner sheath approx. (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	10.5	1.8	15.0	12.1	150	300
2	2.5	7/Non-compacted	2.01	0.7	1.2	11.5	1.8	16.0	7.41	180	300
2	4	7/Non-compacted	2.55	0.7	1.2	13.0	1.8	17.0	4.61	230	300
2	6	7/Non-compacted	3.12	0.7	1.2	14.0	1.8	18.0	3.08	290	300
3	1.5	7/Non-compacted	1.59	0.7	1.2	11.0	1.8	16.0	12.1	180	300
3	2.5	7/Non-compacted	2.01	0.7	1.2	12.0	1.8	16.5	7.41	230	300
3	4	7/Non-compacted	2.55	0.7	1.2	13.0	1.8	18.0	4.61	300	300
3	6	7/Non-compacted	3.12	0.7	1.2	14.5	1.8	19.0	3.08	360	300
4	1.5	7/Non-compacted	1.59	0.7	1.2	12.0	1.8	17.0	12.1	220	300
4	2.5	7/Non-compacted	2.01	0.7	1.2	13.0	1.8	17.5	7.41	280	300
4	4	7/Non-compacted	2.55	0.7	1.2	15.0	1.8	19.0	4.61	360	300
4	6	7/Non-compacted	3.12	0.7	1.2	16.0	1.8	20.0	3.08	460	300
5	1.5	7/Non-compacted	1.59	0.7	1.2	13.5	1.8	18.0	12.1	260	300
5	2.5	7/Non-compacted	2.01	0.7	1.2	14.5	1.8	19.0	7.41	330	300
5	4	7/Non-compacted	2.55	0.7	1.2	16.0	1.8	20.0	4.61	440	300
5	6	7/Non-compacted	3.12	0.7	1.2	17.5	1.8	22.0	3.08	560	300
6	1.5	7/Non-compacted	1.59	0.7	1.2	15.0	1.8	19.0	12.1	300	300
6	2.5	7/Non-compacted	2.01	0.7	1.2	16.0	1.8	20.0	7.41	390	300
6	4	7/Non-compacted	2.55	0.7	1.2	18.0	1.8	22.0	4.61	520	300
6	6	7/Non-compacted	3.12	0.7	1.2	19.0	1.8	24.0	3.08	650	300
7	1.5	7/Non-compacted	1.59	0.7	1.2	15.0	1.8	19.0	12.1	320	300
7	2.5	7/Non-compacted	2.01	0.7	1.2	16.0	1.8	20.0	7.41	420	300
7	4	7/Non-compacted	2.55	0.7	1.2	18.0	1.8	22.0	4.61	560	300
7	6	7/Non-compacted	3.12	0.7	1.2	19.0	1.8	24.0	3.08	720	300
8	1.5	7/Non-compacted	1.59	0.7	1.2	16.0	1.8	20.0	12.1	380	300
8	2.5	7/Non-compacted	2.01	0.7	1.2	17.0	1.8	21.0	7.41	480	300
8	4	7/Non-compacted	2.55	0.7	1.2	19.0	1.8	24.0	4.61	640	300
8	6	7/Non-compacted	3.12	0.7	1.2	21.0	1.8	25.0	3.08	830	300

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Table 1 (continued)

No. of cores	Size (mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness approx. (mm)	Dia. of inner sheath approx. (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)
9	1.5	7/Non-compacted	1.59	0.7	1.2	17.0	1.8	22.0	12.1	420	300
9	2.5	7/Non-compacted	2.01	0.7	1.2	19.0	1.8	23.0	7.41	530	300
9	4	7/Non-compacted	2.55	0.7	1.2	21.0	1.8	25.0	4.61	730	300
9	6	7/Non-compacted	3.12	0.7	1.2	23.0	1.8	27.0	3.08	930	300
10	1.5	7/Non-compacted	1.59	0.7	1.2	18.5	1.8	23.0	12.1	480	300
10	2.5	7/Non-compacted	2.01	0.7	1.2	20.0	1.8	24.5	7.41	600	300
10	4	7/Non-compacted	2.55	0.7	1.2	22.0	1.8	27.0	4.61	820	300
10	6	7/Non-compacted	3.12	0.7	1.2	24.0	1.9	29.0	3.08	1050	300
11	1.5	7/Non-compacted	1.59	0.7	1.2	18.5	1.8	23.0	12.1	490	300
11	2.5	7/Non-compacted	2.01	0.7	1.2	20.0	1.8	24.5	7.41	630	300
11	4	7/Non-compacted	2.55	0.7	1.2	22.0	1.8	27.0	4.61	850	300
11	6	7/Non-compacted	3.12	0.7	1.2	24.0	1.9	29.0	3.08	1100	300
12	1.5	7/Non-compacted	1.59	0.7	1.2	19.0	1.8	24.0	12.1	530	300
12	2.5	7/Non-compacted	2.01	0.7	1.2	21.0	1.8	25.0	7.41	690	300
12	4	7/Non-compacted	2.55	0.7	1.2	23.0	1.8	28.0	4.61	930	300
12	6	7/Non-compacted	3.12	0.7	1.2	25.0	1.9	30.0	3.08	1200	300
13	1.5	7/Non-compacted	1.59	0.7	1.2	20.0	1.8	25.0	12.1	570	300
13	2.5	7/Non-compacted	2.01	0.7	1.2	22.0	1.8	26.0	7.41	740	300
13	4	7/Non-compacted	2.55	0.7	1.2	25.0	1.9	29.0	4.61	1000	300
13	6	7/Non-compacted	3.12	0.7	1.2	27.0	1.9	31.0	3.08	1300	300
14	1.5	7/Non-compacted	1.59	0.7	1.2	20.0	1.8	25.0	12.1	580	300
14	2.5	7/Non-compacted	2.01	0.7	1.2	22.0	1.8	26.0	7.41	750	300
14	4	7/Non-compacted	2.55	0.7	1.2	25.0	1.9	29.0	4.61	1030	300
14	6	7/Non-compacted	3.12	0.7	1.2	27.0	1.9	31.0	3.08	1340	300
15	1.5	7/Non-compacted	1.59	0.7	1.2	21.0	1.8	25.0	12.1	620	300
15	2.5	7/Non-compacted	2.01	0.7	1.2	23.0	1.8	27.0	7.41	810	300
15	4	7/Non-compacted	2.55	0.7	1.2	25.5	1.9	30.0	4.61	1100	300
15	6	7/Non-compacted	3.12	0.7	1.2	28.0	2.0	33.0	3.08	1450	300

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Table 1 (continued)

No. of cores	Size (mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness approx. (mm)	Dia. of inner sheath approx. (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)
16	1.5	7/Non-compacted	1.59	0.7	1.2	21.0	1.8	26.0	12.1	650	300
16	2.5	7/Non-compacted	2.01	0.7	1.2	23.0	1.8	28.0	7.41	840	300
16	4	7/Non-compacted	2.55	0.7	1.2	26.0	1.9	31.0	4.61	1150	300
16	6	7/Non-compacted	3.12	0.7	1.2	28.0	2.0	33.0	3.08	1530	300
17	1.5	7/Non-compacted	1.59	0.7	1.2	23.0	1.8	27.0	12.1	720	300
17	2.5	7/Non-compacted	2.01	0.7	1.2	24.5	1.9	29.0	7.41	920	300
17	4	7/Non-compacted	2.55	0.7	1.2	27.5	2.0	32.0	4.61	1250	300
17	6	7/Non-compacted	3.12	0.7	1.2	30.0	2.1	35.0	3.08	1650	300
18	1.5	7/Non-compacted	1.59	0.7	1.2	23.0	1.8	27.0	12.1	720	300
18	2.5	7/Non-compacted	2.01	0.7	1.2	24.5	1.9	29.0	7.41	930	300
18	4	7/Non-compacted	2.55	0.7	1.2	27.5	2.0	32.0	4.61	1300	300
18	6	7/Non-compacted	3.12	0.7	1.2	30.0	2.1	35.0	3.08	1700	300
19	1.5	7/Non-compacted	1.59	0.7	1.2	23.0	1.8	27.0	12.1	740	300
19	2.5	7/Non-compacted	2.01	0.7	1.2	24.5	1.9	29.0	7.41	960	300
19	4	7/Non-compacted	2.55	0.7	1.2	27.5	2.0	32.0	4.61	1330	300
19	6	7/Non-compacted	3.12	0.7	1.2	30.0	2.1	35.0	3.08	1750	300
20	1.5	7/Non-compacted	1.59	0.7	1.2	23.0	1.8	27.5	12.1	780	300
20	2.5	7/Non-compacted	2.01	0.7	1.2	25.0	1.9	30.0	7.41	1000	300
20	4	7/Non-compacted	2.55	0.7	1.2	28.0	2.0	33.0	4.61	1400	300
20	6	7/Non-compacted	3.12	0.7	1.2	31.0	2.1	36.0	3.08	1800	300
21	1.5	7/Non-compacted	1.59	0.7	1.2	24.0	1.8	28.0	12.1	820	300
21	2.5	7/Non-compacted	2.01	0.7	1.2	26.0	1.9	30.5	7.41	1050	300
21	4	7/Non-compacted	2.55	0.7	1.2	29.0	2.0	34.0	4.61	1500	300
21	6	7/Non-compacted	3.12	0.7	1.2	32.0	2.1	37.0	3.08	1900	300
22	1.5	7/Non-compacted	1.59	0.7	1.2	25.0	1.9	30.0	12.1	860	300
22	2.5	7/Non-compacted	2.01	0.7	1.2	27.0	2.0	32.0	7.41	1100	300
22	4	7/Non-compacted	2.55	0.7	1.2	31.0	2.1	36.0	4.61	1600	300
22	6	7/Non-compacted	3.12	0.7	1.2	33.0	2.2	39.0	3.08	2000	300

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No. of cores	Size (mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness approx. (mm)	Dia. of inner sheath approx. (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)
23	1.5	7/Non-compacted	1.59	0.7	1.2	25.0	1.9	30.0	12.1	890	300
23	2.5	7/Non-compacted	2.01	0.7	1.2	27.0	2.0	32.0	7.41	1200	300
23	4	7/Non-compacted	2.55	0.7	1.2	31.0	2.1	36.0	4.61	1600	300
23	6	7/Non-compacted	3.12	0.7	1.2	33.0	2.2	39.0	3.08	2100	300
24	1.5	7/Non-compacted	1.59	0.7	1.2	26.0	1.9	31.0	12.1	930	300
24	2.5	7/Non-compacted	2.01	0.7	1.2	29.0	2.0	34.0	7.41	1200	300
24	4	7/Non-compacted	2.55	0.7	1.2	32.0	2.1	37.0	4.61	1700	300
24	6	7/Non-compacted	3.12	0.7	1.3	35.0	2.2	41.0	3.08	2200	300
25	1.5	7/Non-compacted	1.59	0.7	1.2	26.0	1.9	31.0	12.1	960	300
25	2.5	7/Non-compacted	2.01	0.7	1.2	29.0	2.0	34.0	7.41	1200	300
25	4	7/Non-compacted	2.55	0.7	1.2	32.0	2.1	37.0	4.61	1700	300
25	6	7/Non-compacted	3.12	0.7	1.3	35.0	2.2	41.0	3.08	2300	300
26	1.5	7/Non-compacted	1.59	0.7	1.2	26.0	1.9	31.0	12.1	1000	300
26	2.5	7/Non-compacted	2.01	0.7	1.2	29.0	2.0	34.0	7.41	1300	300
26	4	7/Non-compacted	2.55	0.7	1.2	32.0	2.1	37.0	4.61	1800	300
26	6	7/Non-compacted	3.12	0.7	1.3	35.0	2.2	41.0	3.08	2400	300
27	1.5	7/Non-compacted	1.59	0.7	1.2	27.0	2.0	32.0	12.1	1000	300
27	2.5	7/Non-compacted	2.01	0.7	1.2	29.5	2.0	34.0	7.41	1350	300
27	4	7/Non-compacted	2.55	0.7	1.2	33.0	2.2	38.0	4.61	1900	300
28	1.5	7/Non-compacted	1.59	0.7	1.2	28.0	2.0	33.0	12.1	1100	300
28	2.5	7/Non-compacted	2.01	0.7	1.2	31.0	2.1	36.0	7.41	1400	300
28	4	7/Non-compacted	2.55	0.7	1.2	34.0	2.2	40.0	4.61	2000	300
29	1.5	7/Non-compacted	1.59	0.7	1.2	28.0	2.0	33.0	12.1	1100	300
29	2.5	7/Non-compacted	2.01	0.7	1.2	31.0	2.1	36.0	7.41	1400	300
29	4	7/Non-compacted	2.55	0.7	1.2	34.0	2.2	40.0	4.61	2000	300
30	1.5	7/Non-compacted	1.59	0.7	1.2	28.0	2.0	33.0	12.1	1100	300
30	2.5	7/Non-compacted	2.01	0.7	1.2	31.0	2.1	36.0	7.41	1500	300
30	4	7/Non-compacted	2.55	0.7	1.2	34.0	2.2	40.0	4.61	2100	300

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Fire Resistant and Flame Retardant with Low smoke and Zero Halogen Shielded Control Cable

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