

SPECIFICATION

For

FS/FDLH-0.6/1KV-CE-SWA

0.6/1(1.2)kV Copper Conductor Mica fire-barrier XLPE Insulated
Polyolefin Inner Sheathed Steel Wire Armored Polyolefin Outer Sheathed
Fire Resistant and Flame Retardant
with Low Smoke and Zero Halogen Power Cable
(0.6/1(1.2)kV, Cu/Mica/XLPE/FR-LSOH/SWA/FR-LSOH)

BY 

(Wachara Sangsomritphon)

MANAGER, Cable Design Section

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CUSTOMER

Rev.	Date	Description
0	4/12/2019	Issued specification
1	11/5/2020	Correct the value in Table 1
2	16/02/2021	Cancel code "0010"
3	26/08/2021	Update the test standard version
4	12/10/2021	Add black color sheath
5	7/11/2022	Add 5-cores
6	13/2/2024	Update Table 1
7	1/4/2024	Update standard reference
8	3/5/2024	Update specification
9	19/11/2024	Update Table 1
10	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 mica fire-barrier cross-linked polyethylene (XLPE) insulated polyolefin inner sheathed steel wire armored polyolefin outer sheathed fire resistant and 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

Fire resistant tested 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.

- 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.

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. Fire Barrier Tape

The mica tape shall be longitudinally applied over the conductor

A suitable separator tape shall be applied helically over the fire barrier tape (for size $\geq 120 \text{ mm}^2$)

4. 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.

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.

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

6. Core Identification

The cores shall be identified by color, as follows :

2-cores : blue, brown

3-cores : brown, black, grey

4-cores : blue, brown, black, grey

7. Inner Sheath

The inner sheath shall be low smoke and zero halogen flame retardant polyolefin compound applied over the binder tape.

The average thickness given in Table 1.

The color of the inner sheath shall be black.

8. Steel Wire Armor

The armor shall be galvanized round steel wire applied with a minimum gap between adjacent wires over the inner sheathed.

A separator tape may be applied helically over the armored core.

9. Outer Sheath

The outer 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 outer 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 outer sheath shall be black or orange.

10. 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 "FS/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 of cores and size of conductor
9. 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 meet the requirements in Test and Inspection and Table 1, when tested in accordance with IEC 60502-1 : 2021, IEC 60228 : 2004, BS 6387 Category CWZ., 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.

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.

1. Designation "FS/FDLH-0.6/1KV-CE-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

- Fire resistant tested according to BS 6387 Category CWZ.
- 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

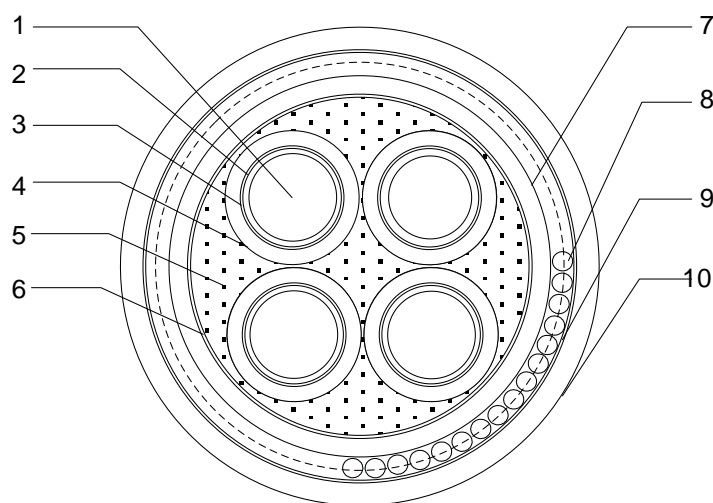
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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	Fire Barrier	Mica tape
3	Separator Tape	PS tape or suitable tape (for size $\geq 120 \text{ mm}^2$)
4	Insulation	Cross-linked polyethylene (XLPE) compound
5	Filler	Non-hygroscopic
6	Binder Tape	PS tape or suitable tape
7	Inner Sheath	Low smoke and zero halogen flame retardant polyolefin compound
8	Armour	Galvanized steel wire
9	Separator Tape	PS tape or suitable tape
10	Outer Sheath	Low smoke and zero halogen flame retardant polyolefin (ST8) compound

Application: For installation into open tray, conduit, underground duct trench or direct burial in ground which provide flame retardant, low smoke and maintain circuit integrity in case of 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)	Inner sheath thickness nominal (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	11.0	0.80	1.8	16.5	12.1	402	500
2	2.5	7/Non-compacted	2.01	0.7	1.2	11.5	1.25	1.8	18.5	7.41	580	500
2	4	7/Non-compacted	2.55	0.7	1.2	13.0	1.25	1.8	19.5	4.61	650	500
2	6	7/Non-compacted	3.12	0.7	1.2	14.0	1.25	1.8	21.0	3.08	740	500
2	10	7/Compacted	3.70	0.7	1.2	15.0	1.25	1.8	22.0	1.83	872	500
2	16	7/Compacted	4.70	0.7	1.2	17.5	1.60	1.8	25.0	1.15	1205	500
2	25	7/Compacted	5.90	0.9	1.2	21.0	1.60	1.8	28.0	0.727	1552	500
2	35	7/Compacted	6.90	0.9	1.2	23.0	1.60	1.9	30.5	0.524	1865	500
2	50	19/Compacted	8.20	1.0	1.2	26.0	1.60	2.0	34.0	0.387	2295	500
2	70	19/Compacted	9.80	1.1	1.2	29.5	2.00	2.1	39.0	0.268	3176	500
2	95	19/Compacted	11.60	1.1	1.2	33.5	2.00	2.3	43.0	0.193	3962	500
2	120	37/Compacted	13.10	1.2	1.3	37.0	2.50	2.4	48.0	0.153	5190	500
2	150	37/Compacted	14.50	1.4	1.3	41.0	2.50	2.6	52.0	0.124	6058	500
2	185	37/Compacted	16.10	1.6	1.4	45.5	2.50	2.7	57.0	0.0991	7176	500
2	240	61/Compacted	18.60	1.7	1.5	51.5	2.50	2.9	63.5	0.0754	8864	500
2	300	61/Compacted	20.80	1.8	1.6	57.0	2.50	3.1	69.0	0.0601	10584	300
2	400	61/Compacted	23.40	2.0	1.7	63.0	3.15	3.4	77.5	0.0470	13797	300

Table 1 (continued)

No. of cores	Size (mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness nominal (mm)	Dia. of inner sheath approx. (mm)	Aarmor 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)
3	1.5	7/Non-compacted	1.59	0.7	1.2	11.5	1.25	1.8	18.0	12.1	558	500
3	2.5	7/Non-compacted	2.01	0.7	1.2	12.5	1.25	1.8	19.0	7.41	629	500
3	4	7/Non-compacted	2.55	0.7	1.2	13.5	1.25	1.8	20.5	4.61	724	500
3	6	7/Non-compacted	3.12	0.7	1.2	15.0	1.25	1.8	21.5	3.08	838	500
3	10	7/Compacted	3.70	0.7	1.2	16.0	1.60	1.8	23.5	1.83	1131	500
3	16	7/Compacted	4.70	0.7	1.2	18.5	1.60	1.8	26.0	1.15	1404	500
3	25	7/Compacted	5.90	0.9	1.2	22.0	1.60	1.9	30.0	0.727	1876	500
3	35	7/Compacted	6.90	0.9	1.2	24.5	1.60	1.9	32.0	0.524	2257	500
3	50	19/Compacted	8.20	1.0	1.2	27.5	2.00	2.1	37.0	0.387	3061	500
3	70	19/Compacted	9.80	1.1	1.2	32.0	2.00	2.2	41.0	0.268	3915	500
3	95	19/Compacted	11.60	1.1	1.2	35.5	2.00	2.4	45.5	0.193	4933	500
3	120	37/Compacted	13.10	1.2	1.3	40.0	2.50	2.5	51.0	0.153	6445	500
3	150	37/Compacted	14.50	1.4	1.4	44.0	2.50	2.7	55.5	0.124	7640	500
3	185	37/Compacted	16.10	1.6	1.5	49.5	2.50	2.8	61.0	0.0991	9159	300
3	240	61/Compacted	18.60	1.7	1.6	55.5	2.50	3.1	68.0	0.0754	11411	300
3	300	61/Compacted	20.80	1.8	1.7	61.0	2.50	3.3	74.0	0.0601	13727	300
3	400	61/Compacted	23.40	2.0	1.8	68.0	3.15	3.5	82.5	0.0470	17682	200

Table 1 (continued)

No. of cores	Size (mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Inner sheath thickness nominal (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)
4	1.5	7/Non-compacted	1.59	0.7	1.2	12.5	1.25	1.8	19.5	12.1	617	500
4	2.5	7/Non-compacted	2.01	0.7	1.2	13.5	1.25	1.8	20.0	7.41	708	500
4	4	7/Non-compacted	2.55	0.7	1.2	15.0	1.25	1.8	21.5	4.61	823	500
4	6	7/Non-compacted	3.12	0.7	1.2	16.5	1.60	1.8	24.0	3.08	1090	500
4	10	7/Compacted	3.70	0.7	1.2	17.5	1.60	1.8	25.0	1.83	1310	500
4	16	7/Compacted	4.70	0.7	1.2	20.5	1.60	1.8	28.0	1.15	1659	500
4	25	7/Compacted	5.90	0.9	1.2	24.5	1.60	1.9	32.0	0.727	2227	500
4	35	7/Compacted	6.90	0.9	1.2	27.0	2.00	2.0	36.0	0.524	2983	500
4	50	19/Compacted	8.20	1.0	1.2	30.5	2.00	2.2	40.0	0.387	3700	500
4	70	19/Compacted	9.80	1.1	1.2	35.0	2.00	2.3	44.5	0.268	4782	500
4	95	19/Compacted	11.60	1.1	1.3	40.0	2.50	2.5	51.0	0.193	6537	500
4	120	37/Compacted	13.10	1.2	1.4	44.5	2.50	2.7	56.0	0.153	7969	500
4	150	37/Compacted	14.50	1.4	1.5	49.5	2.50	2.9	61.5	0.124	9504	300
4	185	37/Compacted	16.10	1.6	1.6	55.0	2.50	3.0	67.0	0.0991	11394	300
4	240	61/Compacted	18.60	1.7	1.7	62.0	2.50	3.3	74.5	0.0754	14312	300
4	300	61/Compacted	20.80	1.8	1.8	68.0	3.15	3.5	82.5	0.0601	18127	200
4	400	61/Compacted	23.40	2.0	2.0	76.0	3.15	3.8	91.5	0.0470	22323	200