

SPECIFICATION

For

FDLH-0.6/1KV-CE-SWA

0.6/1(1.2)kV Copper Conductor XLPE Insulated

Polyolefin Inner Sheathed Steel Wire Armored

Polyolefin Outer Sheathed Flame Retardant

with Low Smoke and Zero Halogen with Protection Earthed Power Cable

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

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CUSTOMER

Rev.	Date	Description
0	11/11/2022	Issued specification
1	22/4/2024	Update specification
2	25/12/2024	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 inner sheathed steel wire armored polyolefin outer sheathed flame retardant with low smoke and zero halogen with protection earthed 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.

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, as follows :

2-cores + PE : blue, brown + green/yellow

3-cores + PE : brown, black, grey + green/yellow

4-cores + PE : blue, brown, black, grey + green/yellow

6. 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.

7. 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.

8. Outer Sheath

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

9. 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 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

10. 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 and IEC 60754-2.


Remark: Sunlight resistant test meet the requirement of TIS 293-2541.

11. 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-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

- 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.

Definition concerning the tests

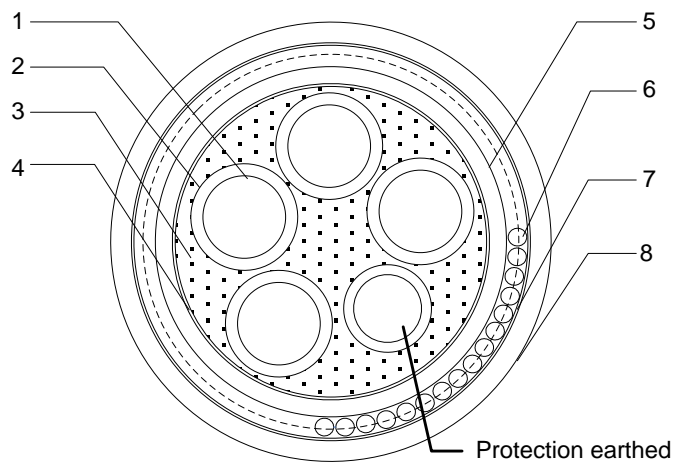
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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	Inner sheath	Low smoke and Zero halogen flame retardant polyolefin compound
6	Aarmor	Galvanized steel wire
7	Separator tape	PS tape or suitable tape
8	Outer 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 and size (core x 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)
2+PE x 1.5/1.5	7/Non-compacted	1.59	0.7	1.2	10.0	0.80	1.8	16.0	12.1	393	500
2+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.2	11.0	1.25	1.8	18.0	7.41	563	500
2+PE x 4/4	7/Non-compacted	2.55	0.7	1.2	12.0	1.25	1.8	19.0	4.61	657	500
2+PE x 6/6	7/Non-compacted	3.12	0.7	1.2	13.5	1.25	1.8	20.0	3.08	769	500
2+PE x 10/10	7/Compacted	3.70	0.7	1.2	14.5	1.25	1.8	21.5	1.83	929	500
2+PE x 16/16	7/Compacted	4.70	0.7	1.2	17.0	1.60	1.8	24.0	1.15	1325	500
2+PE x 25/16	7/Compacted	5.90	0.9	1.2	19.5	1.60	1.8	27.0	0.727	1615	500
2+PE x 35/16	7/Compacted	6.90	0.9	1.2	21.0	1.60	1.8	28.5	0.524	1893	500
2+PE x 50/25	19/Compacted	8.20	1.0	1.2	24.5	1.60	1.9	32.0	0.387	2404	500
2+PE x 70/35	19/Compacted	9.80	1.1	1.2	28.0	2.00	2.1	37.0	0.268	3344	500
2+PE x 95/50	19/Compacted	11.60	1.1	1.2	31.5	2.00	2.2	41.0	0.193	4192	500
2+PE x 120/70	37/Compacted	13.10	1.2	1.2	35.5	2.00	2.4	45.0	0.153	5129	500
2+PE x 150/95	37/Compacted	14.50	1.4	1.3	39.5	2.50	2.5	50.5	0.124	6674	500
2+PE x 185/95	37/Compacted	16.10	1.6	1.4	43.5	2.50	2.7	55.0	0.0991	7750	500
2+PE x 240/120	61/Compacted	18.60	1.7	1.5	49.5	2.50	2.9	61.0	0.0754	9651	300
2+PE x 300/150	61/Compacted	20.80	1.8	1.6	54.5	2.50	3.1	67.0	0.0601	11568	300
2+PE x 400/240	61/Compacted	23.40	2.0	1.7	62.0	3.15	3.4	76.0	0.0470	15594	200

Table 1 (continued)

No. of cores	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)
3+PE x 1.5/1.5	7/Non-compacted	1.59	0.7	1.2	11.0	1.25	1.8	17.5	12.1	552	500
3+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.2	12.0	1.25	1.8	19.0	7.41	629	500
3+PE x 4/4	7/Non-compacted	2.55	0.7	1.2	13.5	1.25	1.8	20.0	4.61	736	500
3+PE x 6/6	7/Non-compacted	3.12	0.7	1.2	15.0	1.25	1.8	21.5	3.08	883	500
3+PE x 10/10	7/Compacted	3.70	0.7	1.2	16.0	1.60	1.8	23.5	1.83	1208	500
3+PE x 16/16	7/Compacted	4.70	0.7	1.2	18.5	1.60	1.8	26.0	1.15	1555	500
3+PE x 25/16	7/Compacted	5.90	0.9	1.2	21.5	1.60	1.8	29.0	0.727	1958	500
3+PE x 35/16	7/Compacted	6.90	0.9	1.2	23.5	1.60	1.9	31.0	0.524	2355	500
3+PE x 50/25	19/Compacted	8.20	1.0	1.2	27.0	2.00	2.1	36.5	0.387	3269	500
3+PE x 70/35	19/Compacted	9.80	1.1	1.2	31.0	2.00	2.2	40.5	0.268	4192	500
3+PE x 95/50	19/Compacted	11.60	1.1	1.2	35.5	2.00	2.4	45.0	0.193	5327	500
3+PE x 120/70	37/Compacted	13.10	1.2	1.3	40.0	2.50	2.6	51.0	0.153	7016	500
3+PE x 150/95	37/Compacted	14.50	1.4	1.4	44.5	2.50	2.7	56.0	0.124	8473	500
3+PE x 185/95	37/Compacted	16.10	1.6	1.5	49.0	2.50	2.9	61.0	0.0991	9946	300
3+PE x 240/120	61/Compacted	18.60	1.7	1.6	55.0	2.50	3.1	67.5	0.0754	12434	300
3+PE x 300/150	61/Compacted	20.80	1.8	1.7	61.0	2.50	3.3	73.5	0.0601	15029	200
3+PE x 400/240	61/Compacted	23.40	2.0	1.9	70.0	3.15	3.6	84.5	0.0470	20138	200

Table 1 (continued)

No. of cores	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+PE x 1.5/1.5	7/Non-compacted	1.59	0.7	1.2	12.0	1.25	1.8	18.5	12.1	607	500
4+PE x 2.5/2.5	7/Non-compacted	2.01	0.7	1.2	13.0	1.25	1.8	20.0	7.41	702	500
4+PE x 4/4	7/Non-compacted	2.55	0.7	1.2	14.5	1.25	1.8	21.0	4.61	834	500
4+PE x 6/6	7/Non-compacted	3.12	0.7	1.2	16.0	1.60	1.8	23.5	3.08	1129	500
4+PE x 10/10	7/Compacted	3.70	0.7	1.2	17.5	1.60	1.8	25.0	1.83	1379	500
4+PE x 16/16	7/Compacted	4.70	0.7	1.2	20.0	1.60	1.8	27.5	1.15	1790	500
4+PE x 25/16	7/Compacted	5.90	0.9	1.2	24.5	1.60	1.9	32.5	0.727	2375	500
4+PE x 35/16	7/Compacted	6.90	0.9	1.2	27.0	2.00	2.1	36.0	0.524	3130	500
4+PE x 50/25	19/Compacted	8.20	1.0	1.2	31.0	2.00	2.2	40.5	0.387	3956	500
4+PE x 70/35	19/Compacted	9.80	1.1	1.2	36.0	2.00	2.4	45.5	0.268	5135	500
4+PE x 95/50	19/Compacted	11.60	1.1	1.3	41.0	2.50	2.6	52.0	0.193	7137	500
4+PE x 120/70	37/Compacted	13.10	1.2	1.4	46.0	2.50	2.8	57.5	0.153	8732	500
4+PE x 150/95	37/Compacted	14.50	1.4	1.5	51.5	2.50	2.9	63.0	0.124	10541	300
4+PE x 185/95	37/Compacted	16.10	1.6	1.6	56.5	2.50	3.1	69.0	0.0991	12413	300
4+PE x 240/120	61/Compacted	18.60	1.7	1.8	64.0	3.15	3.4	78.0	0.0754	16592	200
4+PE x 300/150	61/Compacted	20.80	1.8	1.9	70.5	3.15	3.7	85.5	0.0601	19891	200
4+PE x 400/240	61/Compacted	23.40	2.0	2.1	81.0	3.15	4.0	96.5	0.0470	25226	100

Table 1 (continued)

FOR PROTECTION EARTHED CONDUCTOR

No. of core	Size (mm ²)	Conductor (wires/type)	Conductor diameter approx. (mm)	Insulation thickness nominal (mm)	Conductor resistance at 20°C maximum (Ohm/km)
1	1.5	7/Non-compacted	1.59	0.7	12.1
1	2.5	7/Non-compacted	2.01	0.7	7.41
1	4	7/Non-compacted	2.55	0.7	4.61
1	6	7/Non-compacted	3.12	0.7	3.08
1	10	7/Compacted	3.70	0.7	1.83
1	16	7/Compacted	4.70	0.7	1.15
1	25	7/Compacted	5.90	0.9	0.727
1	35	7/Compacted	6.90	0.9	0.524
1	50	19/Compacted	8.20	1.0	0.387
1	70	19/Compacted	9.80	1.1	0.268
1	95	19/Compacted	11.60	1.1	0.193
1	120	37/Compacted	13.10	1.2	0.153
1	150	37/Compacted	14.50	1.4	0.124
1	240	61/Compacted	18.60	1.7	0.0754