

SPECIFICATION**For****FDLH-0.6/1KV-CE**

0.6/1(1.2)kV Copper Conductor XLPE Insulated Polyolefin Sheathed

Flame Retardant with Low Smoke and Zero Halogen Power Cable

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

BY Wachara

(Wachara Sangsomritphon)

MANAGER, Cable Design Section

APP. Winai Ariyasakulsap

(Winai Ariyasakulsap)

MANAGER, Development Department

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CUSTOMER

Rev.	Date	Description
0	25/06/2020	Issued specification
1	28/09/2020	Add 5 cores
2	17/2/2021	Cancel cable code "0010"
3	25/2/2021	Add size 1 x 1.5-10 mm ²
4	22/3/2021	Correct the value in Table 1
5	2/04/2021	Change length mark
6	5/05/2021	Update the test standard version

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 sheathed flame retardant with low smoke and zero halogen power 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 and IEC 60332-3-22; Category A.

Low smoke test requirements per IEC 61034 and acid gas 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. 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 (For multi-cores only)

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 color, as follows :

- Single-core : white
 - 2-cores : blue, brown
 - 3-cores : brown, black, grey
 - 4-cores : blue, brown, black, grey
 - 5-cores : blue, brown, black, grey, green/yellow
- (White color is natural color of XLPE insulation)

6. Sheath

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

7. 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 "POWER 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

Remark : Length mark on single-core is for size $\geq 25 \text{ mm}^2$

8. 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 60332-3-22; Category A, 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.

9. 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"
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, 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

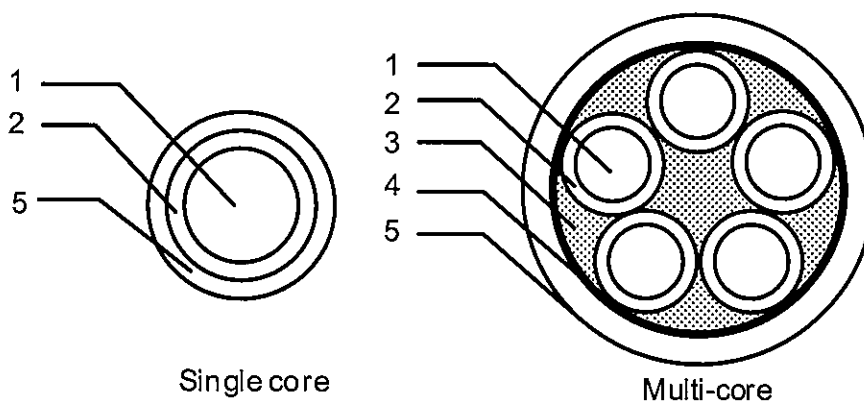
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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.

Cable structure

Cross-sectional (Not scale)



No.	Structure	Material
1	Conductor	Non-Compacted & Compacted concentric stranded annealed copper
2	Insulation	Cross-Linked Polyethylene (XLPE)
3	Filler	PP Calcium Yarn (Non-hygroscopic)
4	Binder Tape	P.S tape or suitable tape
5	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 core	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)
1	1.5	7/Non-compacted	1.59	0.7	1.4	6.5	12.1	55	500
1	2.5	7/Non-compacted	2.01	0.7	1.4	7.0	7.41	65	500
1	4	7/Non-compacted	2.55	0.7	1.4	7.5	4.61	85	500
1	6	7/Non-compacted	3.12	0.7	1.4	8.0	3.08	110	500
1	10	7/Compacted	3.80	0.7	1.4	9.5	1.83	150	500
1	16	7/Compacted	4.80	0.7	1.4	9.5	1.15	210	500
1	25	7/Compacted	6.00	0.9	1.4	11.5	0.727	310	500
1	35	7/Compacted	7.10	0.9	1.4	12.5	0.524	400	500
1	50	19/Compacted	8.30	1.0	1.4	14.0	0.387	500	500
1	70	19/Compacted	9.90	1.1	1.4	15.5	0.268	750	500
1	95	19/Compacted	11.70	1.1	1.5	18.0	0.193	1000	500
1	120	37/Compacted	13.20	1.2	1.5	19.5	0.153	1200	500
1	150	37/Compacted	14.60	1.4	1.6	21.5	0.124	1500	500
1	185	37/Compacted	16.30	1.6	1.7	24.0	0.0991	1900	500
1	240	61/Compacted	18.70	1.7	1.8	27.0	0.0754	2500	500
1	300	61/Compacted	20.90	1.8	1.9	29.5	0.0601	3100	500
1	400	61/Compacted	23.50	2.0	2.0	33.0	0.0470	3900	500
1	500	61/Compacted	26.70	2.2	2.1	36.5	0.0366	5000	500
1	630	61/Compacted	30.30	2.4	2.2	41.0	0.0283	6500	500
1	800	61/Compacted	34.10	2.6	2.4	45.5	0.0221	8000	500
1	1000	127/Compacted	39.50	2.8	2.6	51.5	0.0176	10500	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)
2	1.5	7/Non-compacted	1.59	0.7	1.8	11.0	12.1	130	500
2	2.5	7/Non-compacted	2.01	0.7	1.8	12.0	7.41	160	500
2	4	7/Non-compacted	2.55	0.7	1.8	13.0	4.61	200	500
2	6	7/Non-compacted	3.12	0.7	1.8	14.0	3.08	260	500
2	10	7/Compacted	3.80	0.7	1.8	15.0	1.83	350	500
2	16	7/Compacted	4.80	0.7	1.8	18.0	1.15	490	500
2	25	7/Compacted	6.00	0.9	1.8	21.0	0.727	700	500
2	35	7/Compacted	7.10	0.9	1.8	23.5	0.524	900	500
2	50	19/Compacted	8.30	1.0	1.8	26.5	0.387	1200	500
2	70	19/Compacted	9.90	1.1	1.9	30.0	0.268	1700	500
2	95	19/Compacted	11.70	1.1	2.0	33.5	0.193	2200	500
2	120	37/Compacted	13.20	1.2	2.1	37.0	0.153	2700	500
2	150	37/Compacted	14.60	1.4	2.2	41.0	0.124	3400	500
2	185	37/Compacted	16.30	1.6	2.4	46.0	0.0991	4200	500
2	240	61/Compacted	18.70	1.7	2.6	51.5	0.0754	5500	500
2	300	61/Compacted	20.90	1.8	2.7	56.5	0.0601	7000	500
2	400	61/Compacted	23.50	2.0	3.0	64.0	0.0470	8500	500

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)
3	1.5	7/Non-compacted	1.59	0.7	1.8	11.5	12.1	150	500
3	2.5	7/Non-compacted	2.01	0.7	1.8	12.5	7.41	190	500
3	4	7/Non-compacted	2.55	0.7	1.8	13.5	4.61	250	500
3	6	7/Non-compacted	3.12	0.7	1.8	15.0	3.08	330	500
3	10	7/Compacted	3.80	0.7	1.8	16.0	1.83	450	500
3	16	7/Compacted	4.80	0.7	1.8	19.0	1.15	650	500
3	25	7/Compacted	6.00	0.9	1.8	22.5	0.727	950	500
3	35	7/Compacted	7.10	0.9	1.8	25.0	0.524	1300	500
3	50	19/Compacted	8.30	1.0	1.8	28.0	0.387	1600	500
3	70	19/Compacted	9.90	1.1	1.9	32.0	0.268	2300	500
3	95	19/Compacted	11.70	1.1	2.1	36.0	0.193	3100	500
3	120	37/Compacted	13.20	1.2	2.2	40.0	0.153	3900	500
3	150	37/Compacted	14.60	1.4	2.3	44.0	0.124	4800	500
3	185	37/Compacted	16.30	1.6	2.5	49.5	0.0991	6000	500
3	240	61/Compacted	18.70	1.7	2.7	55.5	0.0754	8000	500
3	300	61/Compacted	20.90	1.8	2.9	61.0	0.0601	9500	300
3	400	61/Compacted	23.50	2.0	3.1	68.5	0.0470	12000	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)
4	1.5	7/Non-compacted	1.59	0.7	1.8	12.0	12.1	180	500
4	2.5	7/Non-compacted	2.01	0.7	1.8	13.5	7.41	240	500
4	4	7/Non-compacted	2.55	0.7	1.8	15.0	4.61	310	500
4	6	7/Non-compacted	3.12	0.7	1.8	16.5	3.08	410	500
4	10	7/Compacted	3.80	0.7	1.8	18.0	1.83	550	500
4	16	7/Compacted	4.80	0.7	1.8	20.5	1.15	800	500
4	25	7/Compacted	6.00	0.9	1.8	24.5	0.727	1200	500
4	35	7/Compacted	7.10	0.9	1.8	27.0	0.524	1600	500
4	50	19/Compacted	8.30	1.0	1.9	31.0	0.387	2200	500
4	70	19/Compacted	9.90	1.1	2.0	35.0	0.268	3000	500
4	95	19/Compacted	11.70	1.1	2.2	40.0	0.193	4000	500
4	120	37/Compacted	13.20	1.2	2.3	44.0	0.153	5000	500
4	150	37/Compacted	14.60	1.4	2.5	49.0	0.124	6500	500
4	185	37/Compacted	16.30	1.6	2.7	55.0	0.0991	8000	500
4	240	61/Compacted	18.70	1.7	2.9	61.5	0.0754	10000	300
4	300	61/Compacted	20.90	1.8	3.1	68.0	0.0601	12500	300
4	400	61/Compacted	23.50	2.0	3.4	76.5	0.0470	16000	200

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)
5	1.5	7/Non-compacted	1.59	0.7	1.8	13.5	12.1	220	500
5	2.5	7/Non-compacted	2.01	0.7	1.8	14.5	7.41	280	500
5	4	7/Non-compacted	2.55	0.7	1.8	16.0	4.61	370	500
5	6	7/Non-compacted	3.12	0.7	1.8	17.5	3.08	490	500
5	10	7/Compacted	3.80	0.7	1.8	19.0	1.83	650	500
5	16	7/Compacted	4.80	0.7	1.8	21.5	1.15	1000	500
5	25	7/Compacted	6.00	0.9	1.8	26.5	0.727	1500	500
5	35	7/Compacted	7.10	0.9	1.9	29.5	0.524	2000	500
5	50	19/Compacted	8.30	1.0	2.0	33.5	0.387	2600	500
5	70	19/Compacted	9.90	1.1	2.2	39.0	0.268	3700	500
5	95	19/Compacted	11.70	1.1	2.3	44.0	0.193	5000	500
5	120	37/Compacted	13.20	1.2	2.5	49.0	0.153	6500	500
5	150	37/Compacted	14.60	1.4	2.7	54.5	0.124	8000	500
5	185	37/Compacted	16.30	1.6	2.9	61.0	0.0991	10000	300
5	240	61/Compacted	18.70	1.7	3.1	69.0	0.0754	12500	300
5	300	61/Compacted	20.90	1.8	3.4	76.0	0.0601	16000	200
5	400	61/Compacted	23.50	2.0	3.6	85.0	0.0470	20000	200