

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)

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| 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 |
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CUSTOMER

| 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 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 : 2004 and Amend.1 : 2009.

The maximum conductor temperature shall be 90°C

The cable shall be fire resistant tested according to IEC 60331 and 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 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. 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.

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 approximate 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 suitable 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 : 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.

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

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 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

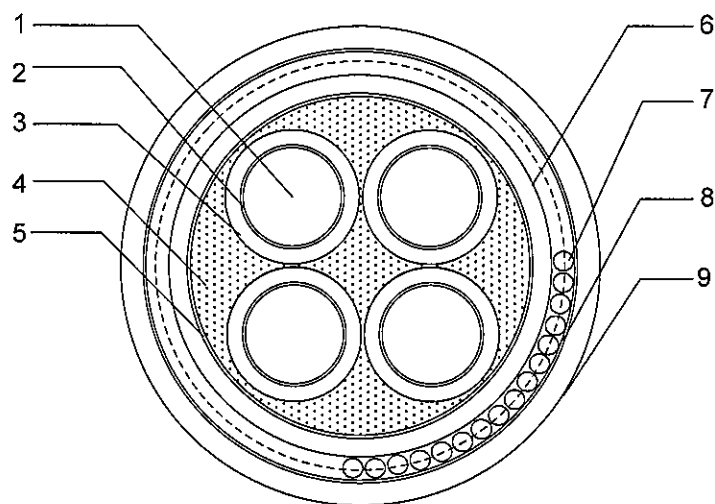
Routine tests: Tests made by the manufacturer on each manufactured length of cable to check that each length meets the specified requirements.

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.

Cable structure

Cross-sectional (Not scale)



| No. | Structure | Material |
|-----|--------------|---|
| 1 | Conductor | Non-compacted & Compacted concentric stranded annealed copper |
| 2 | Fire Barrier | Mica tape |
| 3 | Insulation | Cross-Linked Polyethylene (XLPE) |
| 4 | Filler | PP Calcium Yarn (Non-hygrosopic) |
| 5 | Binder Tape | PS tape or Suitable tape |
| 6 | Inner Sheath | Low smoke and Zero halogen Flame retardant Polyolefin |
| 7 | Armour | Galvanized steel wire |
| 8 | Binder Tape | PS tape or Suitable tape |
| 9 | Outer Sheath | Low smoke and Zero halogen Flame retardant Polyolefin (ST8) |

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 approx. (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 | 1.25 | 1.8 | 18.0 | 12.1 | 500 | 500 |
| 2 | 2.5 | 7/Non-compacted | 2.01 | 0.7 | 1.2 | 12.0 | 1.25 | 1.8 | 18.5 | 7.41 | 600 | 500 |
| 2 | 4 | 7/Non-compacted | 2.55 | 0.7 | 1.2 | 13.0 | 1.25 | 1.8 | 20.0 | 4.61 | 700 | 500 |
| 2 | 6 | 7/Non-compacted | 3.12 | 0.7 | 1.2 | 14.5 | 1.25 | 1.8 | 21.0 | 3.08 | 750 | 500 |
| 2 | 10 | 7/Compacted | 3.80 | 0.7 | 1.2 | 15.5 | 1.25 | 1.8 | 22.0 | 1.83 | 900 | 500 |
| 2 | 16 | 7/Compacted | 4.80 | 0.7 | 1.2 | 17.5 | 1.60 | 1.8 | 25.0 | 1.15 | 1200 | 500 |
| 2 | 25 | 7/Compacted | 6.00 | 0.9 | 1.2 | 21.0 | 1.60 | 1.8 | 28.5 | 0.727 | 1600 | 500 |
| 2 | 35 | 7/Compacted | 7.10 | 0.9 | 1.2 | 23.0 | 2.00 | 1.9 | 31.5 | 0.524 | 2100 | 500 |
| 2 | 50 | 19/Compacted | 8.30 | 1.0 | 1.2 | 26.0 | 2.00 | 2.0 | 35.0 | 0.387 | 2500 | 500 |
| 2 | 70 | 19/Compacted | 9.90 | 1.1 | 1.2 | 29.5 | 2.00 | 2.2 | 39.0 | 0.268 | 3200 | 500 |
| 2 | 95 | 19/Compacted | 11.70 | 1.1 | 1.2 | 33.0 | 2.00 | 2.3 | 42.5 | 0.193 | 3900 | 500 |
| 2 | 120 | 37/Compacted | 13.20 | 1.2 | 1.3 | 37.0 | 2.50 | 2.5 | 48.0 | 0.153 | 5000 | 500 |
| 2 | 150 | 37/Compacted | 14.60 | 1.4 | 1.3 | 40.5 | 2.50 | 2.6 | 51.5 | 0.124 | 6000 | 500 |
| 2 | 185 | 37/Compacted | 16.30 | 1.6 | 1.4 | 45.5 | 2.50 | 2.7 | 57.0 | 0.0991 | 7000 | 500 |
| 2 | 240 | 61/Compacted | 18.70 | 1.7 | 1.5 | 51.0 | 2.50 | 2.9 | 63.0 | 0.0754 | 8500 | 500 |
| 2 | 300 | 61/Compacted | 20.90 | 1.8 | 1.6 | 56.0 | 2.50 | 3.1 | 68.5 | 0.0601 | 10500 | 300 |
| 2 | 400 | 61/Compacted | 23.50 | 2.0 | 1.8 | 62.5 | 3.15 | 3.4 | 77.0 | 0.0470 | 13500 | 300 |

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) | 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 | 1.5 | 7/Non-compacted | 1.59 | 0.7 | 1.2 | 12.0 | 1.25 | 1.8 | 18.5 | 12.1 | 600 | 500 |
| 3 | 2.5 | 7/Non-compacted | 2.01 | 0.7 | 1.2 | 12.5 | 1.25 | 1.8 | 19.5 | 7.41 | 650 | 500 |
| 3 | 4 | 7/Non-compacted | 2.55 | 0.7 | 1.2 | 14.0 | 1.25 | 1.8 | 20.5 | 4.61 | 750 | 500 |
| 3 | 6 | 7/Non-compacted | 3.12 | 0.7 | 1.2 | 15.0 | 1.25 | 1.8 | 22.0 | 3.08 | 850 | 500 |
| 3 | 10 | 7/Compacted | 3.80 | 0.7 | 1.2 | 16.5 | 1.60 | 1.8 | 24.0 | 1.83 | 1200 | 500 |
| 3 | 16 | 7/Compacted | 4.80 | 0.7 | 1.2 | 18.5 | 1.60 | 1.8 | 26.0 | 1.15 | 1400 | 500 |
| 3 | 25 | 7/Compacted | 6.00 | 0.9 | 1.2 | 22.5 | 2.00 | 1.9 | 31.0 | 0.727 | 2100 | 500 |
| 3 | 35 | 7/Compacted | 7.10 | 0.9 | 1.2 | 24.5 | 2.00 | 2.0 | 33.5 | 0.524 | 2500 | 500 |
| 3 | 50 | 19/Compacted | 8.30 | 1.0 | 1.2 | 28.0 | 2.00 | 2.1 | 37.0 | 0.387 | 3100 | 500 |
| 3 | 70 | 19/Compacted | 9.90 | 1.1 | 1.2 | 31.5 | 2.00 | 2.2 | 41.0 | 0.268 | 3900 | 500 |
| 3 | 95 | 19/Compacted | 11.70 | 1.1 | 1.2 | 35.5 | 2.00 | 2.4 | 45.5 | 0.193 | 4900 | 500 |
| 3 | 120 | 37/Compacted | 13.20 | 1.2 | 1.3 | 39.5 | 2.50 | 2.5 | 50.5 | 0.153 | 6500 | 500 |
| 3 | 150 | 37/Compacted | 14.60 | 1.4 | 1.4 | 43.5 | 2.50 | 2.7 | 55.0 | 0.124 | 7500 | 500 |
| 3 | 185 | 37/Compacted | 16.30 | 1.6 | 1.5 | 49.0 | 2.50 | 2.9 | 61.0 | 0.0991 | 9000 | 300 |
| 3 | 240 | 61/Compacted | 18.70 | 1.7 | 1.6 | 55.0 | 2.50 | 3.1 | 67.5 | 0.0754 | 11500 | 300 |
| 3 | 300 | 61/Compacted | 20.90 | 1.8 | 1.7 | 60.5 | 2.50 | 3.3 | 73.0 | 0.0601 | 13500 | 300 |
| 3 | 400 | 61/Compacted | 23.50 | 2.0 | 1.8 | 67.5 | 3.15 | 3.5 | 82.0 | 0.0470 | 17500 | 200 |

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) | 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 | 13.0 | 1.25 | 1.8 | 19.5 | 12.1 | 650 | 500 |
| 4 | 2.5 | 7/Non-compacted | 2.01 | 0.7 | 1.2 | 14.0 | 1.25 | 1.8 | 20.5 | 7.41 | 750 | 500 |
| 4 | 4 | 7/Non-compacted | 2.55 | 0.7 | 1.2 | 15.5 | 1.25 | 1.8 | 22.0 | 4.61 | 850 | 500 |
| 4 | 6 | 7/Non-compacted | 3.12 | 0.7 | 1.2 | 16.5 | 1.60 | 1.8 | 24.0 | 3.08 | 1100 | 500 |
| 4 | 10 | 7/Compacted | 3.80 | 0.7 | 1.2 | 18.0 | 1.60 | 1.8 | 25.5 | 1.83 | 1300 | 500 |
| 4 | 16 | 7/Compacted | 4.80 | 0.7 | 1.2 | 20.5 | 1.60 | 1.8 | 28.0 | 1.15 | 1700 | 500 |
| 4 | 25 | 7/Compacted | 6.00 | 0.9 | 1.2 | 24.5 | 2.00 | 2.0 | 33.5 | 0.727 | 2500 | 500 |
| 4 | 35 | 7/Compacted | 7.10 | 0.9 | 1.2 | 27.5 | 2.00 | 2.1 | 36.5 | 0.524 | 3000 | 500 |
| 4 | 50 | 19/Compacted | 8.30 | 1.0 | 1.2 | 30.5 | 2.00 | 2.2 | 40.0 | 0.387 | 3700 | 500 |
| 4 | 70 | 19/Compacted | 9.90 | 1.1 | 1.2 | 35.0 | 2.00 | 2.3 | 44.5 | 0.268 | 4800 | 500 |
| 4 | 95 | 19/Compacted | 11.70 | 1.1 | 1.3 | 39.5 | 2.50 | 2.5 | 50.5 | 0.193 | 6500 | 500 |
| 4 | 120 | 37/Compacted | 13.20 | 1.2 | 1.4 | 44.0 | 2.50 | 2.7 | 55.5 | 0.153 | 8000 | 500 |
| 4 | 150 | 37/Compacted | 14.60 | 1.4 | 1.5 | 49.0 | 2.50 | 2.9 | 60.5 | 0.124 | 9500 | 300 |
| 4 | 185 | 37/Compacted | 16.30 | 1.6 | 1.6 | 54.5 | 2.50 | 3.1 | 67.0 | 0.0991 | 11500 | 300 |
| 4 | 240 | 61/Compacted | 18.70 | 1.7 | 1.7 | 61.0 | 2.50 | 3.3 | 74.0 | 0.0754 | 14000 | 300 |
| 4 | 300 | 61/Compacted | 20.90 | 1.8 | 1.8 | 67.0 | 3.15 | 3.5 | 81.5 | 0.0601 | 18000 | 200 |
| 4 | 400 | 61/Compacted | 23.50 | 2.0 | 2.0 | 75.5 | 3.15 | 3.8 | 90.5 | 0.0470 | 22000 | 200 |