

## LSZH Fire Resistant Cables

0.6/1kV 2-Core ~ 5-Core

Mica Tape, XLPE Insulated, Unarmoured & Armoured, LSZH Sheathed Cable

Description: CU/MT/XLPE/LSZH-AT-UV or CU/MT/XLPE/LSZH/SWA/LSZH-AT-UV

Model Code: MXL-AT-UV or MXLSL-AT-UV



|                         |                                                                                                                                                                                                                                                                                                          |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Application :           | This cable is designed for areas where the integrity of the electrical circuit is critical in maintaining power supply. Applications include emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, sewage treatment plants, and high-rise buildings. |
| Voltage rating :        | 0.6/1kV                                                                                                                                                                                                                                                                                                  |
| Construction :          | Plain annealed copper (IEC 60228 Class 2), mica tape fire barrier, XLPE compound insulated, unarmoured or galvanized steel wires armoured, anti-termite and UV resistant LSZH compound sheathed cable                                                                                                    |
| Insulation colour :     | 2-Core: Brown, Blue;<br>3-Core: Brown, Black, Grey;<br>Brown, Blue, Green/Yellow;<br>4-Core: Brown, Black, Grey, Blue;<br>Brown, Black, Grey, Green/Yellow;<br>5-Core: Brown, Black, Grey, Blue, Green/Yellow;<br>(Other colour upon request)                                                            |
| Sheath colour :         | Orange (Other colour upon request)                                                                                                                                                                                                                                                                       |
| Specification :         | IEC 60502-1, SS 299, BS 6387, IEC 60331, IEC 60332-1-2, IEC 60332-3, IEC 60754, IEC 61034-2                                                                                                                                                                                                              |
| Operating temperature : | 90°C                                                                                                                                                                                                                                                                                                     |

### 2-CORE [2C]

(Brown, Blue) (1-phase and neutral)

| Conductor          | Insulation | Unarmoured Cable |                       |                | Armoured Cable |                       |                |
|--------------------|------------|------------------|-----------------------|----------------|----------------|-----------------------|----------------|
|                    |            | Part No.         | Approx. Overall Diam. | Approx. Weight | Part No.       | Approx. Overall Diam. | Approx. Weight |
| (mm <sup>2</sup> ) | Thickness  |                  | (mm)                  | (kg/km)        |                | (mm)                  | (kg/km)        |
| 1.5                | 0.7        | 07024065         | 12.2                  | 150            | 07024054       | 16.4                  | 450            |
| 2.5                | 0.7        | 08024065         | 12.6                  | 193            | 08024054       | 17.3                  | 511            |
| 4                  | 0.7        | 09024065         | 13.8                  | 250            | 09024054       | 18.4                  | 595            |
| 6                  | 0.7        | 10024065         | 15.0                  | 326            | 10024054       | 19.5                  | 809            |
| 10                 | 0.7        | 11024065         | 17.5                  | 411            | 11024054       | 22.1                  | 940            |
| 16                 | 0.7        | 12024065         | 19.5                  | 550            | 12024054       | 24.3                  | 1100           |
| 25 (cs)            | 0.9        | 13024065         | 22.5                  | 792            | 13024054       | 28.0                  | 1634           |
| 35 (cs)            | 0.9        | 14024065         | 26.0                  | 1043           | 14024054       | 31.5                  | 2000           |
| 50 (cs)            | 1.0        | 15024065         | 29.0                  | 1337           | 15024054       | 34.0                  | 2450           |
| 70 (cs)            | 1.1        | 16024065         | 32.3                  | 1828           | 16024054       | 39.0                  | 3200           |
| 95 (cs)            | 1.1        | 17024065         | 36.0                  | 2419           | 17024054       | 43.5                  | 4149           |

#### Current rating and voltage drop

For Unarmoured Cable, please refer to Table 12 & 13 (Page 56)  
For Armoured Cable, please refer to Table 14 & 15 (Page 57)

(cs) : Circular Compact Stranded Conductor

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### 3-CORE [3C]

(Brown, Black, Grey) (3-phase, three wire)

| Conductor          | Insulation | Unarmoured Cable |                       |                | Armoured Cable |                       |                |
|--------------------|------------|------------------|-----------------------|----------------|----------------|-----------------------|----------------|
| Nominal Area       | Thickness  | Part No.         | Approx. Overall Diam. | Approx. Weight | Part No.       | Approx. Overall Diam. | Approx. Weight |
| (mm <sup>2</sup> ) | (mm)       |                  | (mm)                  | (kg/km)        |                | (mm)                  | (kg/km)        |
| 1.5                | 0.7        | 07034623         | 12.3                  | 170            | 07034049       | 17.1                  | 420            |
| 2.5                | 0.7        | 08034623         | 13.8                  | 200            | 08034049       | 18.0                  | 500            |
| 4                  | 0.7        | 09034623         | 15.2                  | 300            | 09034049       | 18.9                  | 600            |
| 6                  | 0.7        | 10034623         | 16.8                  | 380            | 10034049       | 20.1                  | 883            |
| 10                 | 0.7        | 11034623         | 18.6                  | 550            | 11034049       | 23.1                  | 1086           |
| 16                 | 0.7        | 12034623         | 21.0                  | 760            | 12034049       | 25.2                  | 1370           |
| 25 (cs)            | 0.9        | 13034623         | 24.0                  | 1068           | 13034049       | 29.2                  | 1900           |
| 35 (cs)            | 0.9        | 14034623         | 27.4                  | 1420           | 14034049       | 33.2                  | 2458           |
| 50 (cs)            | 1.0        | 15034623         | 30.5                  | 1838           | 15034049       | 36.8                  | 3006           |
| 70 (cs)            | 1.1        | 16034623         | 34.5                  | 2536           | 16034049       | 42.0                  | 4206           |
| 95 (cs)            | 1.1        | 17034623         | 39.0                  | 3401           | 17034049       | 46.1                  | 5400           |
| 120 (cs)           | 1.2        | 18034623         | 42.5                  | 4203           | 18034049       | 49.4                  | 6450           |
| 150 (cs)           | 1.4        | 19034623         | 46.5                  | 5100           | 19034049       | 55.0                  | 8200           |
| 185 (cs)           | 1.6        | 20034623         | 52.0                  | 6357           | 20034049       | 60.0                  | 9800           |
| 240 (cs)           | 1.7        | 21034623         | 58.6                  | 8226           | 21034049       | 68.0                  | 12300          |
| 300 (cs)           | 1.8        | 22034623         | 64.5                  | 10212          | 22034049       | 74.2                  | 14800          |
| 400 (cs)           | 2.0        | 23034623         | 73.0                  | 13000          | 23034049       | 83.0                  | 17600          |

### 3-CORE [3G]

(Brown, Blue, Green/Yellow) (1-phase and earth)

| Conductor          | Insulation | Unarmoured Cable |                       |                | Armoured Cable |                       |                |
|--------------------|------------|------------------|-----------------------|----------------|----------------|-----------------------|----------------|
| Nominal Area       | Thickness  | Part No.         | Approx. Overall Diam. | Approx. Weight | Part No.       | Approx. Overall Diam. | Approx. Weight |
| (mm <sup>2</sup> ) | (mm)       |                  | (mm)                  | (kg/km)        |                | (mm)                  | (kg/km)        |
| 1.5                | 0.7        | 07034164         | 12.3                  | 170            | 07034019       | 17.1                  | 420            |
| 2.5                | 0.7        | 08034164         | 13.8                  | 200            | 08034019       | 18.0                  | 500            |
| 4                  | 0.7        | 09034164         | 15.2                  | 300            | 09034019       | 18.9                  | 600            |
| 6                  | 0.7        | 10034164         | 16.8                  | 380            | 10034019       | 20.1                  | 883            |
| 10                 | 0.7        | 11034164         | 18.6                  | 550            | 11034019       | 23.1                  | 1086           |
| 16                 | 0.7        | 12034164         | 21.0                  | 760            | 12034019       | 25.2                  | 1370           |
| 25 (cs)            | 0.9        | 13034164         | 24.0                  | 1068           | 13034019       | 29.2                  | 1900           |
| 35 (cs)            | 0.9        | 14034164         | 27.4                  | 1420           | 14034019       | 33.2                  | 2458           |
| 50 (cs)            | 1.0        | 15034164         | 30.5                  | 1838           | 15034019       | 36.8                  | 3006           |
| 70 (cs)            | 1.1        | 16034164         | 34.5                  | 2536           | 16034019       | 42.0                  | 4206           |
| 95 (cs)            | 1.1        | 17034164         | 39.0                  | 3401           | 17034019       | 46.1                  | 5400           |
| 120 (cs)           | 1.2        | 18034164         | 42.5                  | 4203           | 18034019       | 49.4                  | 6450           |
| 150 (cs)           | 1.4        | 19034164         | 46.5                  | 5100           | 19034019       | 55.0                  | 8200           |
| 185 (cs)           | 1.6        | 20034164         | 52.0                  | 6357           | 20034019       | 60.0                  | 9800           |
| 240 (cs)           | 1.7        | 21034164         | 58.6                  | 8226           | 21034019       | 68.0                  | 12300          |
| 300 (cs)           | 1.8        | 22034164         | 64.5                  | 10212          | 22034019       | 74.2                  | 14800          |
| 400 (cs)           | 2.0        | 23034164         | 73.0                  | 13000          | 23034019       | 83.0                  | 17600          |

#### Current rating and voltage drop

For Unarmoured Cable, please refer to Table 12 & 13 (Page 56)

For Armoured Cable, please refer to Table 14 & 15 (Page 57)

(cs) : Circular Compact Stranded Conductor

## LSZH Fire Resistant Cables

0.6/1kV 2-Core ~ 5-Core

Mica Tape, XLPE Insulated, Unarmoured & Armoured, LSZH Sheathed Cable

Description: CU/MT/XLPE/LSZH-AT-UV or CU/MT/XLPE/LSZH/SWA/LSZH-AT-UV

Model Code: MXL-AT-UV or MXLSL-AT-UV

| 4-CORE [4C]                                      |            |                  |                       |                |                |                       |                |
|--------------------------------------------------|------------|------------------|-----------------------|----------------|----------------|-----------------------|----------------|
| (Brown, Black, Grey, Blue) (3-phase and neutral) |            |                  |                       |                |                |                       |                |
| Conductor                                        | Insulation | Unarmoured Cable |                       |                | Armoured Cable |                       |                |
| Nominal Area                                     | Thickness  | Part No.         | Approx. Overall Diam. | Approx. Weight | Part No.       | Approx. Overall Diam. | Approx. Weight |
| (mm <sup>2</sup> )                               | (mm)       |                  | (mm)                  | (kg/km)        |                | (mm)                  | (kg/km)        |
| 1.5                                              | 0.7        | 07044008         | 14.3                  | 190            | 07044165       | 18.0                  | 475            |
| 2.5                                              | 0.7        | 08044008         | 15.2                  | 248            | 08044165       | 18.9                  | 570            |
| 4                                                | 0.7        | 09044008         | 16.5                  | 335            | 09044165       | 20.1                  | 690            |
| 6                                                | 0.7        | 10044008         | 18.0                  | 440            | 10044165       | 22.5                  | 940            |
| 10                                               | 0.7        | 11044008         | 20.6                  | 670            | 11044165       | 24.5                  | 1267           |
| 16                                               | 0.7        | 12044008         | 23.0                  | 933            | 12044165       | 28.1                  | 1776           |
| 25 (cs)                                          | 0.9        | 13044008         | 26.7                  | 1364           | 13044165       | 31.6                  | 2400           |
| 35 (cs)                                          | 0.9        | 14044008         | 30.4                  | 1822           | 14044165       | 36.1                  | 2973           |
| 50 (cs)                                          | 1.0        | 15044008         | 34.1                  | 2386           | 15044165       | 40.6                  | 4027           |
| 70 (cs)                                          | 1.1        | 16044008         | 38.5                  | 3324           | 16044165       | 46.0                  | 5300           |
| 95 (cs)                                          | 1.1        | 17044008         | 43.0                  | 4435           | 17044165       | 51.3                  | 6910           |
| 120 (cs)                                         | 1.2        | 18044008         | 46.5                  | 5492           | 18044165       | 55.3                  | 8500           |
| 150 (cs)                                         | 1.4        | 19044008         | 51.5                  | 6691           | 19044165       | 60.2                  | 9683           |
| 185 (cs)                                         | 1.6        | 20044008         | 57.5                  | 8341           | 20044165       | 66.4                  | 11764          |
| 240 (cs)                                         | 1.7        | 21044008         | 65.0                  | 10798          | 21044165       | 74.0                  | 14610          |
| 300 (cs)                                         | 1.8        | 22044008         | 71.9                  | 13411          | 22044165       | 82.0                  | 17598          |
| 400 (cs)                                         | 2.0        | 23044008         | 81.0                  | 17000          | 23044165       | 92.0                  | 25500          |

| 4-CORE [4G]                                            |            |                  |                       |                |                |                       |                |
|--------------------------------------------------------|------------|------------------|-----------------------|----------------|----------------|-----------------------|----------------|
| (Brown, Black, Grey, Green/Yellow) (3-phase and earth) |            |                  |                       |                |                |                       |                |
| Conductor                                              | Insulation | Unarmoured Cable |                       |                | Armoured Cable |                       |                |
| Nominal Area                                           | Thickness  | Part No.         | Approx. Overall Diam. | Approx. Weight | Part No.       | Approx. Overall Diam. | Approx. Weight |
| (mm <sup>2</sup> )                                     | (mm)       |                  | (mm)                  | (kg/km)        |                | (mm)                  | (kg/km)        |
| 1.5                                                    | 0.7        | 07044029         | 14.3                  | 190            | 07044020       | 18.0                  | 475            |
| 2.5                                                    | 0.7        | 08044029         | 15.2                  | 248            | 08044020       | 18.9                  | 570            |
| 4                                                      | 0.7        | 09044029         | 16.5                  | 335            | 09044020       | 20.1                  | 690            |
| 6                                                      | 0.7        | 10044029         | 18.0                  | 440            | 10044020       | 22.5                  | 940            |
| 10                                                     | 0.7        | 11044029         | 20.6                  | 670            | 11044020       | 24.5                  | 1267           |
| 16                                                     | 0.7        | 12044029         | 23.0                  | 933            | 12044020       | 28.1                  | 1776           |
| 25 (cs)                                                | 0.9        | 13044029         | 26.7                  | 1364           | 13044020       | 31.6                  | 2400           |
| 35 (cs)                                                | 0.9        | 14044029         | 30.4                  | 1822           | 14044020       | 36.1                  | 2973           |
| 50 (cs)                                                | 1.0        | 15044029         | 34.1                  | 2386           | 15044020       | 40.6                  | 4027           |
| 70 (cs)                                                | 1.1        | 16044029         | 38.5                  | 3324           | 16044020       | 46.0                  | 5300           |
| 95 (cs)                                                | 1.1        | 17044029         | 43.0                  | 4435           | 17044020       | 51.3                  | 6910           |
| 120 (cs)                                               | 1.2        | 18044029         | 46.5                  | 5492           | 18044020       | 55.3                  | 8500           |
| 150 (cs)                                               | 1.4        | 19044029         | 51.5                  | 6691           | 19044020       | 60.2                  | 9683           |
| 185 (cs)                                               | 1.6        | 20044029         | 57.5                  | 8341           | 20044020       | 66.4                  | 11764          |
| 240 (cs)                                               | 1.7        | 21044029         | 65.0                  | 10798          | 21044020       | 74.0                  | 14610          |
| 300 (cs)                                               | 1.8        | 22044029         | 71.9                  | 13411          | 22044020       | 82.0                  | 17598          |
| 400 (cs)                                               | 2.0        | 23044029         | 81.0                  | 17000          | 23044020       | 92.0                  | 25500          |

### Current rating and voltage drop

For Unarmoured Cable, please refer to Table 12 & 13 (Page 56)

For Armoured Cable, please refer to Table 14 & 15 (Page 57)

(cs) : Circular Compact Stranded Conductor

## LSZH Fire Resistant Cables

0.6/1kV 2-Core ~ 5-Core

Mica Tape, XLPE Insulated, Unarmoured & Armoured, LSZH Sheathed Cable

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Model Code: MXL-AT-UV or MXLSL-AT-UV

### 5-CORE [5G]

(Brown, Black, Grey, Blue, Green/Yellow) (3-phase, neutral and earth)

| Conductor          | Insulation | Unarmoured Cable |                       |                | Armoured Cable  |                       |                |
|--------------------|------------|------------------|-----------------------|----------------|-----------------|-----------------------|----------------|
| Nominal Area       | Thickness  | Part No.         | Approx. Overall Diam. | Approx. Weight | Part No.        | Approx. Overall Diam. | Approx. Weight |
| (mm <sup>2</sup> ) | (mm)       |                  | (mm)                  | (kg/km)        |                 | (mm)                  | (kg/km)        |
| 1.5                | 0.7        | <b>07054810</b>  | 15.2                  | 273            | <b>07054163</b> | 19.2                  | 588            |
| 2.5                | 0.7        | <b>08054810</b>  | 16.4                  | 330            | <b>08054163</b> | 20.6                  | 674            |
| 4                  | 0.7        | <b>09054810</b>  | 17.8                  | 434            | <b>09054163</b> | 22.9                  | 928            |
| 6                  | 0.7        | <b>10054810</b>  | 19.5                  | 547            | <b>10054163</b> | 24.6                  | 1083           |
| 10                 | 0.7        | <b>11054810</b>  | 22.0                  | 780            | <b>11054163</b> | 27.3                  | 1679           |
| 16                 | 0.7        | <b>12054810</b>  | 24.8                  | 1105           | <b>12054163</b> | 30.6                  | 2096           |
| 25 (cs)            | 0.9        | <b>13054810</b>  | 29.0                  | 1625           | <b>13054163</b> | 34.8                  | 2765           |
| 35 (cs)            | 0.9        | <b>14054810</b>  | 33.8                  | 2270           | <b>14054163</b> | 40.0                  | 3415           |
| 50 (cs)            | 1.0        | <b>15054810</b>  | 38.0                  | 2876           | <b>15054163</b> | 45.0                  | 4239           |
| 70 (cs)            | 1.1        | <b>16054810</b>  | 43.0                  | 3967           | <b>16054163</b> | 50.4                  | 5920           |
| 95 (cs)            | 1.1        | <b>17054810</b>  | 48.5                  | 5355           | <b>17054163</b> | 57.2                  | 8053           |
| 120 (cs)           | 1.2        | <b>18054810</b>  | 52.6                  | 6750           | <b>18054163</b> | 61.4                  | 9582           |
| 150 (cs)           | 1.4        | <b>19054810</b>  | 57.8                  | 8220           | <b>19054163</b> | 67.2                  | 11363          |
| 185 (cs)           | 1.6        | <b>20054810</b>  | 64.5                  | 10250          | <b>20054163</b> | 73.5                  | 13725          |

#### Current rating and voltage drop

For Unarmoured Cable, please refer to Table 12 & 13 (Page 56)

For Armoured Cable, please refer to Table 14 & 15 (Page 57)

(cs) : Circular Compact Stranded Conductor

## TESTS

### Flame Propagation Tests (IEC 60332, BS EN 60332)

#### Tests on Electric Cables under Fire Conditions

Part 1 : Tests on a single vertical insulated wire or cable  
Part 3 : Tests on bunched wires and cables under fire condition

Flame retardant cables prevent flame propagation during a fire emergency. Our cable's protective material includes additives such as aluminium hydroxide or magnesium hydroxide. When the protective materials comes into contact with fire, the by-product from the endothermic reaction is gaseous water which will help envelop the flame, and thereby exclude oxygen from the fire.



In this reaction, the decomposition products are non-toxic and the mineral phases MgO and Al<sub>2</sub>O<sub>3</sub> are alkaline, reducing the likelihood of acidic, corrosive gases exiting the plastic. This ensures higher levels of safety.

This test is also conducted on both a single cable as well as bunched vertical cables. This is because flame propagation along a vertical bunch of cables depends on other factors such as the volume of combustible material exposed and cables' geometrical configuration, which differ across single and bunched cables.

The IEC 60332-3 specifies methods for assessing flame retardance of bunched cables comprising of varying densities of combustible material.

| IEC 60332-3             | Total volume of non-metallic material in the bunched cables on a vertical ladder | Duration exposed to flame |
|-------------------------|----------------------------------------------------------------------------------|---------------------------|
|                         | (litres)                                                                         | (mins)                    |
| IEC 60332-3-22 (Cat. A) | 7                                                                                | 40                        |
| IEC 60332-3-23 (Cat. B) | 3.5                                                                              | 40                        |
| IEC 60332-3-24 (Cat. C) | 1.5                                                                              | 20                        |

Passing criteria: After the burning has ceased, the charred portion should not exceed a height of 2.5 meters.

### Acid Gas Emission Tests (IEC 60754, BS EN 60754)

#### Test on Gases Evolved During Combustion of Materials from Cables

When fire comes into contact with polyvinyl chloride (PVC) or chlorine-containing material, hydrogen chloride gas (HCl) is released. The HCl gas could cause irritation to the eyes, mouth, throat, nose, and lungs. At Keystone Cable, all our fire resistant and flame retardant cables use Low Smoke Zero Halogen (LSZH) compounds to prevent the formation of HCl gases from the burning of cables.

The standards determine the degree of acidity of gases evolved during the combustion of cable materials by measuring pH and conductivity.

Passing Criteria: The weighted pH value is not less than 4.3 when related to 1 litre of water, and the weighted value of conductivity is not more than 10µS/mm when related to 1 litre of water.

### Smoke Emission Tests (IEC 61034, BS EN 61034)

#### Measurement of Smoke Density of Electric Cables Burning under Defined Conditions

The "3-meter cube test" measures the amount of smoke generated by cables in the event of a fire. The cables are placed in a 3m<sup>3</sup> enclosure. A beam of light is transmitted from one window of the chamber to the opposite window. The cables are subjected to fire in the chamber, and the light transmission is recorded.

Passing Criteria: A minimum light transmission value of 60%.

## Fire Resistant Tests (SS 299, BS 6387, IEC 60331)

### Specification for Performance Requirements for Cables Required to Maintain Circuit Integrity under Fire Conditions

During fire evacuations, it is important for critical electrical installations including fire alarms, smoke detectors, sprinklers, emergency lightings, and exit lights to function optimally. At Keystone Cable, we conduct these stringent tests by simulating the environment for our fire resistant cables to ensure that they pass the safety requirements and will perform during such emergencies. The protocol letter assigned to the cable reflects the level of testing the cable has gone through and passed.

**SS 299:2021, BS 6387:2013 are recognised as the stringent fire resistant test standards for power cables.**

#### Resistance to Fire Alone (SS 299:2021, BS 6387:2013)

|            |                                                   |
|------------|---------------------------------------------------|
| Protocol C | Cables are subjected to fire at 950°C for 3 hours |
|------------|---------------------------------------------------|

#### Resistance to Fire with Water (SS 299:2021, BS 6387:2013)

|            |                                                                                                              |
|------------|--------------------------------------------------------------------------------------------------------------|
| Protocol W | Cables are subjected to fire at 650°C for 15 minutes, then at 650°C with water spray for another 15 minutes. |
|------------|--------------------------------------------------------------------------------------------------------------|

#### Resistance to Fire with Mechanical Shock (SS 299:2021, BS 6387:2013)

|            |                                                                                               |
|------------|-----------------------------------------------------------------------------------------------|
| Protocol Z | Cables are subjected to fire at 950°C for 15 minutes with mechanical shock applied every 30s. |
|------------|-----------------------------------------------------------------------------------------------|

**IEC 60331-21 is commonly used as a basic fire resistant test standard.**

#### Resistance to Fire Alone (IEC 60331-21 for common test)

|  |                                                      |
|--|------------------------------------------------------|
|  | Cables are subjected to fire at 750°C for 90 minutes |
|--|------------------------------------------------------|

SS 299:2021 does not specify the essential construction standard and test requirement for small power, instrument, and control cables of less than 0.6/1kV. Based on market's requirement, SS 299-1:1998 will be used for these cables to test circuit integrity accordingly.

#### Resistance to Fire Alone (SS 299 Part 1:1998)

|            |                                                   |
|------------|---------------------------------------------------|
| Category A | Cables are subjected to fire at 650°C for 3 hours |
| Category B | Cables are subjected to fire at 750°C for 3 hours |
| Category C | Cables are subjected to fire at 950°C for 3 hours |

#### Resistance to Fire with Water (SS 299 Part 1:1998)

|            |                                                                                                              |
|------------|--------------------------------------------------------------------------------------------------------------|
| Category W | Cables are subjected to fire at 650°C for 15 minutes, then at 650°C with water spray for another 15 minutes. |
|------------|--------------------------------------------------------------------------------------------------------------|

#### Resistance to Fire with Mechanical Shock (SS 299 Part 1:1998)

|            |                                                                                               |
|------------|-----------------------------------------------------------------------------------------------|
| Category X | Cables are subjected to fire at 650°C for 15 minutes with mechanical shock applied every 30s. |
| Category Y | Cables are subjected to fire at 750°C for 15 minutes with mechanical shock applied every 30s. |
| Category Z | Cables are subjected to fire at 950°C for 15 minutes with mechanical shock applied every 30s. |

Passing criteria: No short circuit during the respective testing period.

# Current Rating and Voltage Drop

XLPE (or LSZH) Insulated Cables  
Multi-Core, Unarmoured



tel (65) 6367 0107 fax (65) 6365 2963  
www.keystone-cable.com

Multi-Core Cables with XLPE (or LSZH) Insulation, PVC (or LSZH) Outersheath 300/500V or 0.6/1kV

**Table 12 : Current-Carrying Capacities (Amp)**  
**[CU/XLPE/PVC, CU/XLPE/LSZH or CU/MT/XLPE/LSZH Cables]**

Conductor Operating Temperature : 90°C

Ambient Temperature : 30°C

IEC 60502-1

| Conductor Cross-sectional Area | Reference Method 4<br>(enclosed in an conduit insulated wall etc) | Reference Method 3<br>(enclosed in conduit on a wall or ceiling, or in trunking) |                                          | Reference Method 1<br>(clipped direct) |                                          | Reference Method 11<br>(on a perforated cable tray), or<br>Reference Method 13<br>(in free air) |                                          |
|--------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------|----------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------|
|                                | one 3-core or 4-core cable, 3-phase a.c.                          | one 2-core cable, 1-phase a.c. or d.c.                                           | one 3-core or 4-core cable, 3-phase a.c. | one 2-core cable, 1-phase a.c. or d.c. | one 3-core or 4-core cable, 3-phase a.c. | one 2-core cable, 1-phase a.c. or d.c.                                                          | one 3-core or 4-core cable, 3-phase a.c. |
| 1                              | 2                                                                 | 3                                                                                | 4                                        | 5                                      | 6                                        | 7                                                                                               | 8                                        |
| mm <sup>2</sup>                | A                                                                 | A                                                                                | A                                        | A                                      | A                                        | A                                                                                               | A                                        |
| 1.5                            | 16.5                                                              | 22                                                                               | 19.5                                     | 24                                     | 22                                       | 26                                                                                              | 23                                       |
| 2.5                            | 22                                                                | 30                                                                               | 26                                       | 33                                     | 30                                       | 36                                                                                              | 32                                       |
| 4                              | 30                                                                | 40                                                                               | 35                                       | 45                                     | 40                                       | 49                                                                                              | 42                                       |
| 6                              | 38                                                                | 51                                                                               | 44                                       | 58                                     | 52                                       | 63                                                                                              | 54                                       |
| 10                             | 51                                                                | 69                                                                               | 60                                       | 80                                     | 71                                       | 86                                                                                              | 75                                       |
| 16                             | 68                                                                | 91                                                                               | 80                                       | 107                                    | 96                                       | 115                                                                                             | 100                                      |
| 25                             | 89                                                                | 119                                                                              | 105                                      | 138                                    | 119                                      | 149                                                                                             | 127                                      |
| 35                             | 109                                                               | 146                                                                              | 128                                      | 171                                    | 147                                      | 185                                                                                             | 158                                      |
| 50                             | 130                                                               | 175                                                                              | 154                                      | 209                                    | 179                                      | 225                                                                                             | 192                                      |
| 70                             | 164                                                               | 221                                                                              | 194                                      | 269                                    | 229                                      | 289                                                                                             | 246                                      |
| 95                             | 197                                                               | 265                                                                              | 233                                      | 328                                    | 278                                      | 352                                                                                             | 298                                      |
| 120                            | 227                                                               | 305                                                                              | 268                                      | 382                                    | 322                                      | 410                                                                                             | 346                                      |
| 150                            | 259                                                               | 334                                                                              | 300                                      | 441                                    | 371                                      | 473                                                                                             | 399                                      |
| 185                            | 295                                                               | 384                                                                              | 340                                      | 506                                    | 424                                      | 542                                                                                             | 456                                      |
| 240                            | 346                                                               | 459                                                                              | 398                                      | 599                                    | 500                                      | 641                                                                                             | 538                                      |
| 300                            | 396                                                               | 532                                                                              | 455                                      | 693                                    | 576                                      | 741                                                                                             | 621                                      |
| 400                            | 472                                                               | 625                                                                              | 536                                      | 803                                    | 667                                      | 865                                                                                             | 741                                      |

Note : For rating factors of ambient temperature other than 30°C, please refer to Table 23 (Page 62)

**Table 13 : Voltage Drop (Per Amp Per Meter)**  
**[CU/XLPE/PVC, CU/XLPE/LSZH or CU/MT/XLPE/LSZH Cables]**

Conductor Operating Temperature : 90°C

IEC 60502-1

| Conductor Cross-sectional Area | 2-core cable, d.c. | 2-core cable, 1-phase a.c. |       |       | 3-core or 4-core cables, 3-phase a.c. |       |       |
|--------------------------------|--------------------|----------------------------|-------|-------|---------------------------------------|-------|-------|
| 1                              | 2                  | 3                          |       |       | 4                                     |       |       |
| mm <sup>2</sup>                | mV/A/m             | mV/A/m                     |       |       | mV/A/m                                |       |       |
| 1.5                            | 31                 | 31                         |       |       | 27                                    |       |       |
| 2.5                            | 19                 | 19                         |       |       | 16                                    |       |       |
| 4                              | 12                 | 12                         |       |       | 10                                    |       |       |
| 6                              | 7.9                | 7.9                        |       |       | 6.8                                   |       |       |
| 10                             | 4.7                | 4.7                        |       |       | 4.0                                   |       |       |
| 16                             | 2.9                | 2.9                        |       |       | 2.5                                   |       |       |
|                                |                    | r                          | x     | z     | r                                     | x     | z     |
| 25                             | 1.85               | 1.85                       | 0.160 | 1.90  | 1.60                                  | 0.140 | 1.65  |
| 35                             | 1.35               | 1.35                       | 0.155 | 1.35  | 1.15                                  | 0.135 | 1.15  |
| 50                             | 0.98               | 0.99                       | 0.155 | 1.00  | 0.86                                  | 0.135 | 0.87  |
| 70                             | 0.67               | 0.67                       | 0.150 | 0.69  | 0.59                                  | 0.130 | 0.60  |
| 95                             | 0.49               | 0.50                       | 0.150 | 0.52  | 0.43                                  | 0.130 | 0.45  |
| 120                            | 0.39               | 0.40                       | 0.145 | 0.42  | 0.34                                  | 0.130 | 0.37  |
| 150                            | 0.31               | 0.32                       | 0.145 | 0.35  | 0.28                                  | 0.125 | 0.30  |
| 185                            | 0.25               | 0.26                       | 0.145 | 0.29  | 0.22                                  | 0.125 | 0.26  |
| 240                            | 0.195              | 0.200                      | 0.140 | 0.24  | 0.175                                 | 0.125 | 0.21  |
| 300                            | 0.155              | 0.160                      | 0.140 | 0.21  | 0.140                                 | 0.120 | 0.185 |
| 400                            | 0.120              | 0.130                      | 0.140 | 0.190 | 0.115                                 | 0.120 | 0.165 |

Note : r = resistive component; x = reactive component; z = impedance value

# Current Rating and Voltage Drop

XLPE (or LSZH) Insulated Cables  
Multi-Core, Armoured



tel (65) 6367 0107 fax (65) 6365 2963  
www.keystone-cable.com

Multi-Core Cables with XLPE (or LSZH) Insulation, Armoured, PVC or LSZH Outersheath 0.6/1kV

**Table 14 : Current-Carrying Capacities (Amp)**  
[CU/XLPE/PVC/SWA/PVC, CU/XLPE/LSZH/SWA/LSZH, CU/MT/XLPE/LSZH/SWA/LSZH Cables]

Conductor Operating Temperature : 90°C

Ambient Temperature : 30°C

Ground Temperature : 15°C

Depth of Laying : 0.5m

Soil Thermal Resistivity : 1.2 k•m/W

BS 6724

IEC 60502-1

| Conductor Cross-sectional Area | Reference Method 1<br>(clipped direct) |                                          | Reference Method 11<br>(on a perforated horizontal cable tray)<br>or<br>Reference Method 13<br>(in free air) |                                          | In single-way ducts                    |                                          | Laid direct in ground                  |                                          |
|--------------------------------|----------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------|------------------------------------------|----------------------------------------|------------------------------------------|
|                                | one 2-core cable, 1-phase a.c. or d.c. | one 3-core or 4-core cable, 3-phase a.c. | one 2-core cable, 1-phase a.c. or d.c.                                                                       | one 3-core or 4-core cable, 3-phase a.c. | one 2-core cable, 1-phase a.c. or d.c. | one 3-core or 4-core cable, 3-phase a.c. | one 2-core cable, 1-phase a.c. or d.c. | one 3-core or 4-core cable, 3-phase a.c. |
| 1                              | 2                                      | 3                                        | 4                                                                                                            | 5                                        | 6                                      | 7                                        | 8                                      | 9                                        |
| mm <sup>2</sup>                | A                                      | A                                        | A                                                                                                            | A                                        | A                                      | A                                        | A                                      | A                                        |
| 1.5                            | 27                                     | 23                                       | 29                                                                                                           | 25                                       | -                                      | 23                                       | -                                      | 28                                       |
| 2.5                            | 36                                     | 31                                       | 39                                                                                                           | 33                                       | -                                      | 30                                       | -                                      | 36                                       |
| 4                              | 49                                     | 42                                       | 52                                                                                                           | 44                                       | -                                      | 40                                       | -                                      | 48                                       |
| 6                              | 62                                     | 53                                       | 66                                                                                                           | 56                                       | -                                      | 50                                       | -                                      | 60                                       |
| 10                             | 85                                     | 73                                       | 90                                                                                                           | 78                                       | -                                      | 65                                       | -                                      | 80                                       |
| 16                             | 110                                    | 94                                       | 115                                                                                                          | 99                                       | 115                                    | 94                                       | 140                                    | 115                                      |
| 25                             | 146                                    | 124                                      | 152                                                                                                          | 131                                      | 145                                    | 125                                      | 180                                    | 150                                      |
| 35                             | 180                                    | 154                                      | 188                                                                                                          | 162                                      | 175                                    | 150                                      | 215                                    | 180                                      |
| 50                             | 219                                    | 187                                      | 228                                                                                                          | 197                                      | 210                                    | 175                                      | 255                                    | 215                                      |
| 70                             | 279                                    | 238                                      | 291                                                                                                          | 251                                      | 260                                    | 215                                      | 315                                    | 265                                      |
| 95                             | 338                                    | 289                                      | 354                                                                                                          | 304                                      | 310                                    | 260                                      | 380                                    | 315                                      |
| 120                            | 392                                    | 335                                      | 410                                                                                                          | 353                                      | 355                                    | 300                                      | 430                                    | 360                                      |
| 150                            | 451                                    | 386                                      | 472                                                                                                          | 406                                      | 400                                    | 335                                      | 480                                    | 405                                      |
| 185                            | 515                                    | 441                                      | 539                                                                                                          | 463                                      | 455                                    | 380                                      | 540                                    | 460                                      |
| 240                            | 607                                    | 520                                      | 636                                                                                                          | 546                                      | 520                                    | 440                                      | 630                                    | 530                                      |
| 300                            | 698                                    | 599                                      | 732                                                                                                          | 628                                      | 590                                    | 495                                      | 700                                    | 590                                      |
| 400                            | 787                                    | 673                                      | 847                                                                                                          | 728                                      | 660                                    | 560                                      | 790                                    | 670                                      |

Note : For rating factors of ambient temperature other than 30°C, please refer to Table 23 (Page 62)  
For rating factors of ground temperature other than 15°C, please refer to Table 24 (Page 62)

**Table 15 : Voltage Drop (Per Amp Per Meter)**  
[CU/XLPE/PVC/SWA/PVC, CU/XLPE/LSZH/SWA/LSZH, CU/MT/XLPE/LSZH/SWA/LSZH Cables]

Conductor Operating Temperature : 90°C

BS 6724

IEC 60502-1

| Conductor Cross-sectional Area | 2-core cable, d.c. | 2-core cables, 1-phase a.c. |       |       | 3-core or 4-core cables, 3-phase a.c. |       |       | 2-core cables, 1-phase a.c. | 3-core or 4-core cables, 3-phase a.c. |
|--------------------------------|--------------------|-----------------------------|-------|-------|---------------------------------------|-------|-------|-----------------------------|---------------------------------------|
|                                |                    |                             |       |       |                                       |       |       | In ducts or in ground       | In ducts or in ground                 |
| 1                              | 2                  | 3                           |       |       | 4                                     |       |       | 5                           | 6                                     |
| mm <sup>2</sup>                | mV/A/m             | mV/A/m                      |       |       | mV/A/m                                |       |       | mV/A/m                      | mV/A/m                                |
| 1.5                            | 31.0               | 31.0                        |       |       | 27.0                                  |       |       | 31.0                        | 25.0                                  |
| 2.5                            | 19.0               | 19.0                        |       |       | 16.0                                  |       |       | 19.0                        | 15.0                                  |
| 4                              | 12.0               | 12.0                        |       |       | 10.0                                  |       |       | 12.0                        | 9.7                                   |
| 6                              | 7.9                | 7.9                         |       |       | 6.8                                   |       |       | 7.9                         | 6.5                                   |
| 10                             | 4.7                | 4.7                         |       |       | 4.0                                   |       |       | 4.7                         | 3.9                                   |
| 16                             | 2.9                | 2.9                         |       |       | 2.5                                   |       |       | 2.9                         | 2.6                                   |
|                                |                    | r                           | x     | z     | r                                     | x     | z     |                             |                                       |
| 25                             | 1.850              | 1.850                       | 0.160 | 1.900 | 1.600                                 | 0.140 | 1.650 | 1.900                       | 1.600                                 |
| 35                             | 1.350              | 1.350                       | 0.155 | 1.350 | 1.150                                 | 0.135 | 1.150 | 1.350                       | 1.200                                 |
| 50                             | 0.980              | 0.990                       | 0.155 | 1.000 | 0.860                                 | 0.135 | 0.870 | 1.000                       | 0.870                                 |
| 70                             | 0.670              | 0.670                       | 0.150 | 0.690 | 0.590                                 | 0.130 | 0.600 | 0.690                       | 0.610                                 |
| 95                             | 0.490              | 0.500                       | 0.150 | 0.520 | 0.430                                 | 0.130 | 0.450 | 0.520                       | 0.450                                 |
| 120                            | 0.390              | 0.400                       | 0.145 | 0.420 | 0.340                                 | 0.130 | 0.370 | 0.420                       | 0.360                                 |
| 150                            | 0.310              | 0.320                       | 0.145 | 0.350 | 0.280                                 | 0.125 | 0.300 | 0.350                       | 0.300                                 |
| 185                            | 0.250              | 0.260                       | 0.145 | 0.290 | 0.220                                 | 0.125 | 0.260 | 0.290                       | 0.250                                 |
| 240                            | 0.195              | 0.200                       | 0.140 | 0.240 | 0.175                                 | 0.125 | 0.210 | 0.240                       | 0.210                                 |
| 300                            | 0.155              | 0.160                       | 0.140 | 0.210 | 0.140                                 | 0.120 | 0.185 | 0.210                       | 0.190                                 |
| 400                            | 0.120              | 0.130                       | 0.140 | 0.190 | 0.115                                 | 0.120 | 0.165 | 0.190                       | 0.180                                 |

Note : r = resistive component; x = reactive component; z = impedance value

**Table 23 : Correction Factor for Ambient Air Temperature Other Than 30°C to be Applied to the Current-Carrying Capacities for Cables in Free Air**

| Ambient Temperature<br>(°C) | Insulation    |                |                  |                  |                  |
|-----------------------------|---------------|----------------|------------------|------------------|------------------|
|                             | PVC<br>(70°C) | XLPE<br>(90°C) | HT-PVC<br>(90°C) | Rubber<br>(85°C) | Rubber<br>(60°C) |
| 10                          | 1.22          | 1.15           | -                | -                | -                |
| 15                          | 1.17          | 1.12           | -                | -                | -                |
| 20                          | 1.12          | 1.08           | -                | -                | -                |
| 25                          | 1.06          | 1.04           | 1.03             | 1.02             | -                |
| 30                          | 1.00          | 1.00           | 1.00             | 1.00             | 1.00             |
| 35                          | 0.94          | 0.96           | 0.97             | 0.95             | 0.91             |
| 40                          | 0.87          | 0.91           | 0.94             | 0.90             | 0.82             |
| 45                          | 0.79          | 0.87           | 0.91             | 0.85             | 0.71             |
| 50                          | 0.71          | 0.82           | 0.87             | 0.80             | 0.58             |
| 55                          | 0.61          | 0.76           | 0.84             | 0.74             | 0.41             |
| 60                          | 0.50          | 0.71           | 0.80             | 0.67             | -                |
| 65                          | 0.35          | 0.65           | 0.76             | 0.60             | -                |
| 70                          | -             | 0.58           | 0.71             | 0.52             | -                |
| 75                          | -             | 0.50           | 0.61             | 0.43             | -                |
| 80                          | -             | 0.41           | 0.50             | 0.30             | -                |
| 85                          | -             | 0.29           | 0.35             | -                | -                |

**Table 24 : Correction Factor for Ambient Ground Temperature Other Than 15°C to be Applied to the Current-Carrying Capacities for Cables in Ducts or in Ground**

| Ground Temperature<br>(°C) | Insulation    |                |
|----------------------------|---------------|----------------|
|                            | PVC<br>(70°C) | XLPE<br>(90°C) |
| 10                         | 1.04          | 1.03           |
| 15                         | 1.00          | 1.00           |
| 20                         | 0.95          | 0.97           |
| 25                         | 0.90          | 0.93           |
| 30                         | 0.85          | 0.89           |
| 35                         | 0.80          | 0.86           |
| 40                         | 0.74          | 0.82           |
| 45                         | 0.67          | 0.77           |
| 50                         | 0.60          | 0.73           |
| 55                         | -             | 0.68           |
| 60                         | -             | 0.63           |
| 65                         | -             | 0.58           |