## INSTRUMENT (IS-OS)
## MULTI-PAIR (CU OR ATC/PVC/IS-OS/PVC)


### CONSTRUCTION

| | |
|---|---|
| 1. CONDUCTOR | : Solid/Flexible/Stranded Circular, plain annealed copper or Tinned Copper, Class 1 or Class 2 or Class 5 to BS 6360 |
| 2. INSULATION | : Polyethylene (PE) to BS 6234 |
| 3. PAIRING | : Two insulated core uniformly twisted together |
| 4. INDIVIDUAL SCREEN | : Aluminium/Polyester tape is applied over the laid up pairs with tinned copper drain wire |
| 5. BINDER | : PETP tape |
| 6. COLLECTIVE SCREEN | : Aluminium/Polyester tape is applied over the laid up pairs with tinned copper drain wire |
| 7. OUTER SHEATH | : PVC-FR, TM-1-FR to BS 7655 Color ■ ■ Blue / Black |

### APPLICATION

These cables are generally used for indoor installation and suitable for wet and damp areas. Generally used within industrial process manufacturing plants for communication, data and voice transmission signals and services. Also used for the interconnection of electrical equipment and instruments, typically in petroleum industry.

**STANDARD: BS 5308**
**VOLTAGE GRADE: $U_0/U$: 300/500V**

| No. of pairs & Cross sectional area of conductor | Shape of conductor | No. of strands & Diameter of wire | Nominal thickness of Insulation | Nominal thickness of Sheath | Approx. Overall Diameter | Approx. weight of cable | Max. DC resistance of conductor at 20°C |
|---|---|---|---|---|---|---|---|
| Pair x mm² | — | no./mm | mm | mm | mm | kg/km | Ω/km |
| **INSTRUMENT (IS-OS)** | | | | | | | |
| 2PX0.5 | rm | 16/0.2 | 0.6 | 1.1 | 11.2 | 170 | 39.7 |
| 5PX0.5 | rm | 16/0.2 | 0.6 | 1.2 | 14.3 | 270 | 39.7 |
| 10PX0.5 | rm | 16/0.2 | 0.6 | 1.3 | 18.4 | 520 | 39.7 |
| 15PX0.5 | rm | 16/0.2 | 0.6 | 1.5 | 22.7 | 850 | 39.7 |
| 2PX0.75 | rm | 24/0.2 | 0.6 | 1.1 | 12.2 | 200 | 26.5 |
| 5PX0.75 | rm | 24/0.2 | 0.6 | 1.2 | 15.6 | 355 | 26.5 |
| 10PX0.75 | rm | 24/0.2 | 0.6 | 1.3 | 21.1 | 680 | 26.5 |
| 15PX0.75 | rm | 24/0.2 | 0.6 | 1.5 | 24.8 | 770 | 26.5 |
| 2PX1.5 | rm | 7/0.53 | 0.6 | 1.2 | 13.6 | 285 | 12.8 |
| 5PX1.5 | rm | 7/0.53 | 0.6 | 1.3 | 14.8 | 400 | 12.8 |
| 10PX1.5 | rm | 7/0.53 | 0.6 | 1.5 | 24.1 | 820 | 12.8 |
| 15PX1.5 | rm | 7/0.53 | 0.6 | 1.7 | 28.2 | 1110 | 12.8 |

## INSTRUMENT ARMOURED (OS)
## MULTI-CORE (CU OR ATC/PVC/OS/SWA/PVC)


### CONSTRUCTION

| | |
|---|---|
| 1. CONDUCTOR | : Flexible Stranded Circular, plain annealed copper or Tinned Copper, Class 1 or Class-2 or Class 5 to BS 6360 |
| 2. INSULATION | : PVC, TI1 to BS 7655 |
| 3. BINDER | : Polyester tape |
| 4. COLLECTIVE SCREEN | : Aluminium/Polyester tape is applied over the laid up pairs with tinned copper drain wire |
| 5. INNER COVERING | : PVC, TM-1 to BS 7655 |
| 6. ARMOUR | : Round Galvanized Steel wire |
| 7. OUTER SHEATH | : PVC-FR, TM-1-FR to BS 7655 |

Color ■ ■ Blue / Black

### APPLICATION

These armoured cables are generally used when the risk of mechanical damage is increased. The galvanized steel wire armour provides excellent protection. Generally used within industrial process manufacturing plants for communication, data and voice transmission signals and services. Also used for the interconnection of electrical equipment and instruments, typically in petroleum industry. The armourd versions are generally use for outdoor installation for direct burial or install in the duct and suitable for wet and damp areas.

**STANDARD: BS 5308**
**VOLTAGE GRADE: $U_o/U$: 300/500V**

| No. of pairs & Cross sectional area of conductor | Shape of conductor | No. of strands & Diameter of wire | Nominal thickness of insulation | Nominal thickness of bedding | Nominal diameter of round steel wire armour | Nominal thickness of Sheath | Approx. Overall diameter of cable | Approx. weight of cable | Max. DC resistance of conductor at 20°C |
|---|---|---|---|---|---|---|---|---|---|
| Pair x mm² | – | no./mm | mm | mm | mm | mm | mm | kg/km | Ω/km |
| **INSTRUMENT ARMOURED (OS)** | | | | | | | | | |
| 2CX0.5 | rm | 16/0.2 | 0.6 | 0.6 | 0.9 | 1.8 | 11.1 | 255 | 95.7 |
| 3CX0.5 | rm | 16/0.2 | 0.6 | 0.6 | 0.9 | 1.8 | 11.0 | 280 | 39.7 |
| 4CX0.5 | rm | 16/0.2 | 0.6 | 0.6 | 0.9 | 1.8 | 11.9 | 305 | 39.7 |
| 6CX0.5 | rm | 16/0.2 | 0.6 | 0.9 | 0.9 | 1.4 | 13.2 | 380 | 39.7 |
| 10CX0.5 | rm | 16/0.2 | 0.6 | 1.0 | 0.9 | 1.5 | 16.0 | 510 | 39.7 |
| 20CX0.5 | rm | 16/0.2 | 0.6 | 1.2 | 1.25 | 1.6 | 19.9 | 980 | 39.7 |
| 2CX0.75 | rm | 24/0.2 | 0.6 | 0.6 | 0.9 | 1.8 | 11.6 | 280 | 26.5 |
| 3CX0.75 | rm | 24/0.2 | 0.6 | 0.6 | 0.9 | 1.8 | 11.8 | 305 | 26.5 |
| 4CX0.75 | rm | 24/0.2 | 0.6 | 0.6 | 0.9 | 1.8 | 12.4 | 335 | 26.5 |
| 6CX0.75 | rm | 24/0.2 | 0.6 | 0.9 | 0.9 | 1.4 | 14.0 | 400 | 26.5 |
| 10CX0.75 | rm | 24/0.2 | 0.6 | 1.1 | 0.9 | 1.5 | 17.0 | 565 | 26.5 |
| 20CX0.75 | rm | 24/0.2 | 0.6 | 1.2 | 1.25 | 1.6 | 21.3 | 950 | 26.5 |
| 2CX1.5 | rm | 7/0.53 | 0.6 | 0.6 | 0.9 | 1.4 | 12.6 | 330 | 12.3 |
| 3CX1.5 | rm | 7/0.53 | 0.6 | 0.9 | 0.9 | 1.4 | 12.8 | 380 | 12.3 |
| 4CX1.5 | rm | 7/0.53 | 0.6 | 0.9 | 0.9 | 1.4 | 13.6 | 420 | 12.3 |
| 6CX1.5 | rm | 7/0.53 | 0.6 | 1.1 | 0.9 | 1.4 | 15.5 | 540 | 12.3 |
| 10CX1.5 | rm | 7/0.53 | 0.6 | 1.2 | 1.25 | 1.6 | 19.7 | 750 | 12.3 |
| 20CX1.5 | rm | 7/0.53 | 0.6 | 1.3 | 1.6 | 1.7 | 24.5 | 1280 | 12.3 |

## INSTRUMENT ARMOURED (OS)
## MULTI-PAIR (CU OR ATC/PVC/OS/SWA/PVC)


### CONSTRUCTION

1. CONDUCTOR : Solid/ Flexible/ Stranded Circular, plain annealed copper or Tinned Copper, Class 1 or Class-2 or Class 5 to BS 6360
2. INSULATION : Polyethylene (PE) to BS 6234
3. PAIRING : Two insulated core uniformly twisted together
4. BINDER : PETP tape
5. COLLECTIVE SCREEN : Aluminium/Polyester tape is applied over the laid up pairs with tinned copper drain wire
6. INNER COVERING : Polyvinyl Chloride (PVC)
7. ARMOUR : Round Galvanized Steel wire
8. OUTER SHEATH : PVC-FR, TM-1-FR to BS 7655 Color ■■ Blue / Black

### APPLICATION

These armoured cables are generally used when the risk of mechanical damage is increased. The galvanized steel wire armour provides excellent protection. Generally used within industrial process manufacturing plants for communication, data and voice transmission signals and services. Also used for the interconnection of electrical equipment and instruments, typically in petroleum industry. The armourd versions are generally use for outdoor installation for direct burial or install in the duct and suitable for wet and damp areas.

**STANDARD: BS 5308**
**VOLTAGE GRADE: $U_o/U$: 300/500V**

| No. of pairs & Cross sectional area of conductor | Shape of conductor | No. of strands & Diameter of wire | Nominal thickness of insulation | Nominal thickness of bedding | Nominal diameter of round steel wire armour | Nominal thickness of Sheath | Approx. Overall diameter of cable | Approx. weight of cable | Max. DC resistance of conductor at 20°C |
|---|---|---|---|---|---|---|---|---|---|
| Pair x mm² | – | no./mm | mm | mm | mm | mm | mm | kg/km | Ω/km |
| **INSTRUMENT ARMOURED (OS)** | | | | | | | | | |
| 1PXO.5 | rm | 16/0.2 | 0.6 | 0.8 | 0.9 | 1.3 | 10.6 | 260 | 39.7 |
| 2PXO.5 | rm | 16/0.2 | 0.6 | 0.8 | 0.9 | 1.3 | 11.5 | 305 | 39.7 |
| 5PXO.5 | rm | 16/0.2 | 0.6 | 1.1 | 0.9 | 1.5 | 17.2 | 610 | 39.7 |
| 10PXO.5 | rm | 16/0.2 | 0.6 | 1.2 | 1.25 | 1.6 | 22.2 | 1080 | 39.7 |
| 15PXO.5 | rm | 16/0.2 | 0.6 | 1.3 | 1.6 | 1.7 | 25.8 | 1330 | 39.7 |
| 1PXO.75 | rm | 24/0.2 | 0.6 | 0.8 | 0.9 | 1.3 | 11.1 | 305 | 26.5 |
| 2PXO.75 | rm | 24/0.2 | 0.6 | 0.8 | 0.9 | 1.4 | 12.3 | 380 | 26.5 |
| 5PXO.75 | rm | 24/0.2 | 0.6 | 1.2 | 1.25 | 1.5 | 18.8 | 820 | 26.5 |
| 10PXO.75 | rm | 24/0.2 | 0.6 | 1.3 | 1.6 | 1.7 | 25.0 | 1250 | 26.5 |
| 15PXO.75 | rm | 24/0.2 | 0.6 | 1.3 | 1.6 | 1.8 | 27.9 | 1600 | 26.5 |
| 1PX1.5 | rm | 7/0.53 | 0.6 | 0.8 | 0.9 | 1.4 | 12.1 | 360 | 12.3 |
| 2PX1.5 | rm | 7/0.53 | 0.6 | 0.8 | 0.9 | 1.4 | 13.4 | 480 | 12.3 |
| 5PX1.5 | rm | 7/0.53 | 0.6 | 1.2 | 1.25 | 1.6 | 21.3 | 1040 | 12.3 |
| 10PX1.5 | rm | 7/0.53 | 0.6 | 1.3 | 1.6 | 1.8 | 27.1 | 1610 | 12.3 |
| 15PX1.5 | rm | 7/0.53 | 0.6 | 1.5 | 1.6 | 1.9 | 31.6 | 2060 | 12.3 |

## INSTRUMENT ARMOURED (IS-OS)
## MULTI-PAIR (CU OR ATC/PE/IS-OS/SWA/PVC)


### CONSTRUCTION

| | |
|---|---|
| 1. CONDUCTOR | : Solid/ Flexible/ Stranded Circular, plain annealed copper or Tinned Copper, Class 1 or Class-2 or Class 5 to BS 6360 |
| 2. INSULATION | : Polyethylene (PE) to BS 6234 |
| 3. PAIRING | : Two insulated core uniformly twisted together |
| 4. INDIVIDUAL SCREEN | : Aluminium/Polyester tape is applied over the laid up pairs with tinned copper drain wire |
| 5. BINDER | : PETP tape |
| 6. COLLECTIVE SCREEN | : Aluminium/Polyester tape is applied over the laid up pairs with tinned copper drain wire |
| 7. INNER COVERING | : Polyvinyl Chloride (PVC) |
| 8. ARMOUR | : Round Galvanized Steel wire |
| 9. OUTER SHEATH | : PVC-FR, TM-1-FR to BS 7655 Color ■■ Blue / Black |

### APPLICATION

These armoured cables are generally used when the risk of mechanical damage is increased. The galvanized steel wire armour provides excellent protection. Generally used within industrial process manufacturing plants for communication, data and voice transmission signals and services. Also used for the interconnection of electrical equipment and instruments, typically in petroleum industry. The armoured versions are generally use for outdoor installation for direct burial or install in the duct and suitable for wet and damp areas.

**STANDARD: BS 5308**
**VOLTAGE GRADE: $U_0/U$: 300/500V**

| No. of pairs & Cross sectional area of conductor | Shape of conductor | No. of strands & Diameter of wire | Nominal thickness of insulation | Nominal thickness of bedding | Nominal Diameter of round steel wire armour | Nominal thickness of Sheath | Approx. Overall diameter of cable | Approx. weight of cable | Max. DC resistance of conductor at 20°C |
|---|---|---|---|---|---|---|---|---|---|
| Pair x mm² | – | no./mm | mm | mm | mm | mm | mm | kg/km | Ω/km |
| **INSTRUMENT ARMOURED (OS)** | | | | | | | | | |
| 2PX0.5 | rm | 16/0.2 | 0.6 | 0.6 | 0.8 | 1.8 | 15.0 | 505 | 39.7 |
| 5PX0.5 | rm | 16/0.2 | 0.6 | 1.1 | 0.8 | 1.5 | 19.1 | 830 | 39.7 |
| 10PX0.5 | rm | 16/0.2 | 0.6 | 1.2 | 1.25 | 1.6 | 24.8 | 1420 | 39.7 |
| 15PX0.5 | rm | 16/0.2 | 0.6 | 1.5 | 1.6 | 1.7 | 28.8 | 1570 | 39.7 |
| 2PX0.75 | rm | 24/0.2 | 0.6 | 0.8 | 0.8 | 1.4 | 16.1 | 545 | 26.5 |
| 5PX0.75 | rm | 24/0.2 | 0.6 | 1.2 | 1.25 | 1.5 | 21.2 | 1005 | 26.5 |
| 10PX0.75 | rm | 24/0.2 | 0.6 | 1.5 | 1.6 | 1.7 | 27.5 | 1400 | 26.5 |
| 15PX0.75 | rm | 24/0.2 | 0.6 | 1.8 | 1.6 | 1.8 | 31.0 | 1750 | 26.5 |
| 2PX1.5 | rm | 7/0.53 | 0.6 | 0.8 | 0.8 | 1.4 | 17.6 | 600 | 12.3 |
| 5PX1.5 | rm | 7/0.53 | 0.6 | 1.2 | 1.25 | 1.6 | 23.2 | 1200 | 12.3 |
| 10PX1.5 | rm | 7/0.53 | 0.6 | 1.5 | 1.6 | 1.6 | 30.3 | 1980 | 12.3 |
| 15PX1.5 | rm | 7/0.53 | 0.6 | 1.5 | 1.6 | 1.8 | 34.6 | 2580 | 12.3 |

# FLEXIBLE CONTROL
# MULTI-CORE (CU/PVC/PVC)


## CONSTRUCTION

1. CONDUCTOR : Flexible, plain annealed copper, Class 5 to IEC 60228
2. INSULATION : PVC, PVC/D to IEC 60227-1
3. BINDER : Polyester or Non-woven tape
4. OUTER SHEATH : PVC, ST-9 to IEC 60227-1 Color ■ Black

## APPLICATION

The auxiliary cable is used in supervi sory electrical equipment and station control circuits, in light, ordinary or heavy duty industry where power distribution device is needed to transmit control signals or measure signal operations.

**STANDARD: IEC 60227-7**
**VOLTAGE GRADE: $U_0/U$: 300/500V** **OPERATING TEMPERATURE: -20°C to +70°C**

| | PHYSICAL DATA | | | | | | ELECTRICAL DATA | |
|---|---|---|---|---|---|---|---|---|
| No. of pairs & Cross sectional area of conductor | No. of strands & Diameter of wire | Nominal thickness of insulation | Nominal Thickness of sheath | Approx. Overall diameter Lower Limit | Approx. Overall diameter Upper Limit | Approx. Weight of cable | Max. DC Resistance of Conductor at 20°C | Current Carrying Capacity in Air at 35°C ambient temp. |
| core x mm² | No./mm | mm | mm | mm | mm | kg/km | Ω/km | Amps |
| **FLEXIBLE CONTROL** | | | | | | | | |
| 2X0.5 mm | 16/0.2 | 0.6 | 0.7 | 5.2 | 6.6 | 35 | 36.0 | 7 |
| 3X0.5 mm | 16/0.2 | 0.6 | 0.7 | 5.5 | 7.0 | 46 | 36.0 | 7 |
| 5X0.5 mm | 16/0.2 | 0.6 | 0.8 | 6.8 | 8.6 | 75 | 36.0 | 5 |
| 7X0.5 mm | 16/0.2 | 0.6 | 0.8 | 8.8 | 10.4 | 95 | 36.0 | 4 |
| 12X0.5 mm | 16/0.2 | 0.6 | 1.1 | 10.4 | 12.9 | 168 | 36.0 | 4 |
| 19X0.5 mm | 16/0.2 | 0.6 | 1.2 | 12.8 | 15.3 | 240 | 36.0 | 3 |
| 36X0.5 mm | 16/0.2 | 0.6 | 1.5 | 17.0 | 20.9 | 472 | 36.0 | 2 |
| 48X0.5 mm | 16/0.2 | 0.6 | 1.7 | 19.8 | 24.3 | 630 | 36.0 | 2 |
| 2X0.75 mm | 24/0.2 | 0.6 | 0.8 | 5.7 | 7.2 | 49 | 26.0 | 11 |
| 3X0.75 mm | 24/0.2 | 0.6 | 0.8 | 6.0 | 7.8 | 60 | 26.0 | 11 |
| 5X0.75 mm | 24/0.2 | 0.6 | 0.8 | 7.4 | 9.2 | 88 | 26.0 | 8 |
| 7X0.75 mm | 24/0.2 | 0.6 | 1.0 | 9.6 | 11.3 | 120 | 26.0 | 7 |
| 12X0.75 mm | 24/0.2 | 0.6 | 1.1 | 11.0 | 13.7 | 208 | 26.0 | 5 |
| 19X0.75 mm | 24/0.2 | 0.6 | 1.3 | 13.2 | 16.4 | 310 | 26.0 | 4 |
| 36X0.75 mm | 24/0.2 | 0.6 | 1.6 | 18.2 | 22.4 | 588 | 26.0 | 3 |
| 48X0.75 mm | 24/0.2 | 0.6 | 1.9 | 21.2 | 25.9 | 800 | 26.0 | 3 |
| 2X1.0 mm | 32/0.2 | 0.6 | 0.8 | 5.9 | 7.5 | 54 | 19.5 | 14 |
| 3X1.0 mm | 32/0.2 | 0.6 | 0.8 | 6.3 | 8.0 | 70 | 19.5 | 14 |
| 5X1.0 mm | 32/0.2 | 0.6 | 0.8 | 7.8 | 9.8 | 110 | 19.5 | 11 |
| 7X1.0 mm | 32/0.2 | 0.6 | 1.0 | 9.5 | 11.9 | 144 | 19.5 | 9 |
| 12X1.0 mm | 32/0.2 | 0.6 | 1.2 | 11.8 | 14.8 | 248 | 19.5 | 6 |
| 19X1.0 mm | 32/0.2 | 0.6 | 1.3 | 14.0 | 17.2 | 360 | 19.5 | 6 |
| 36X1.0 mm | 32/0.2 | 0.6 | 1.7 | 18.4 | 23.0 | 728 | 19.5 | 5 |
| 48X1.0 mm | 32/0.2 | 0.6 | 1.9 | 22.5 | 27.8 | 960 | 19.5 | 5 |

## FLEXIBLE CONTROL
## MULTI-CORE (CU/PVC/PVC)


### CONSTRUCTION

1. CONDUCTOR : Flexible, plain annealed copper, Class 5 to IEC 60228
2. INSULATION : PVC, PVC/D to IEC 60227-1
3. BINDER : Polyester or Non-woven tape
4. OUTER SHEATH : PVC, ST-9 to IEC 60227-1 Color ■ Black

### APPLICATION

The auxiliary cable is used in supervisory electrical equipment and station control circuits, in light, ordinary or heavy duty industry where power distribution device is needed to transmit control signals or measure signal operations.

**STANDARD: IEC 60227-7**
**VOLTAGE GRADE: $U_o/U$: 300/500V** **OPERATING TEMPERATURE: -20°C to +70°C**

| PHYSICAL DATA | | | | | | | ELECTRICAL DATA | |
|---|---|---|---|---|---|---|---|---|
| No. of pairs & Cross sectional area of conductor | No. of strands & Diameter of wire | Nominal thickness of insulation | Nominal Thickness of sheath | Approx. Overall diameter Lower Limit | Approx. Overall diameter Upper Limit | Approx. Weight of cable* | Max. DC Resistance of Conductor at 20°C | Current Carrying Capacity in Air at 35°C ambient temp. |
| core x mm² | No./mm | mm | mm | mm | mm | kg/km | Ω/km | Amps |
| **FLEXIBLE CONTROL** | | | | | | | | |
| 2X1.5 FM | 30/0.25 | 0.7 | 0.8 | 6.8 | 8.8 | 78 | 13.3 | 17 |
| 3X1.5 FM | 30/0.25 | 0.7 | 0.8 | 7.4 | 9.4 | 97 | 13.3 | 17 |
| 5X1.5 FM | 30/0.25 | 0.7 | 1.0 | 9.1 | 11.4 | 160 | 13.3 | 13 |
| 7X1.5 FM | 30/0.25 | 0.7 | 1.2 | 11.3 | 14.1 | 205 | 13.3 | 11 |
| 12X1.5 FM | 30/0.25 | 0.7 | 1.3 | 13.8 | 17.0 | 352 | 13.3 | 8 |
| 18X1.5 FM | 30/0.25 | 0.7 | 1.5 | 16.5 | 20.9 | 520 | 13.3 | 8 |
| 36X1.5 FM | 30/0.25 | 0.7 | 2.0 | 23.0 | 28.2 | 1035 | 13.3 | 6 |
| 48X1.5 FM | 30/0.25 | 0.7 | 2.2 | 26.2 | 32.5 | 1370 | 13.3 | 6 |
| 2X2.5 FM | 50/0.25 | 0.8 | 0.8 | 8.2 | 10.3 | 102 | 7.98 | 24 |
| 3X2.5 FM | 50/0.25 | 0.8 | 1.0 | 8.0 | 11.2 | 146 | 7.98 | 24 |
| 5X2.5 FM | 50/0.25 | 0.8 | 1.1 | 11.0 | 13.7 | 244 | 7.98 | 18 |
| 7X2.5 FM | 50/0.25 | 0.8 | 1.3 | 13.6 | 16.8 | 315 | 7.98 | 16 |
| 12X2.5 FM | 50/0.25 | 0.8 | 1.5 | 16.8 | 20.6 | 550 | 7.98 | 13 |
| 18X2.5 FM | 50/0.25 | 0.8 | 1.8 | 20.2 | 24.8 | 820 | 7.98 | 11 |
| 36X2.5 FM | 50/0.25 | 0.8 | 2.3 | 28.0 | 34.2 | 1630 | 7.98 | 8 |
| 48X2.5 FM | 50/0.25 | 0.8 | 2.4 | 32.1 | 39.1 | 2135 | 7.98 | 8 |

# FLEXIBLE CONTROL SHIELD
# MULTI-CORE (CU/PVC/CWS/PVC)



## CONSTRUCTION

| | | |
|---|---|---|
| 1. CONDUCTOR | : Flexible, plain annealed copper, Class 5 to IEC 60228 | |
| 2. INSULATION | : PVC, PVC/D to IEC 60227-1 | |
| 3. BINDER | : Polyester or Non-woven tape | |
| 4. INNER SHEATH | : PVC, ST-5 to IEC 60227-1 | |
| 5. SHIELDED | : plain annealed copper or Tinned copper, Braided | |
| 6. OUTER SHEATH | : PVC, ST-9 to IEC 60227-1 | Color ■ Black |

## APPLICATION

The auxiliary cable is used in supervisory electrical equipment and station control circuits, in light, ordinary or heavy duty industry where power distribution device is needed to transmit control signals or measure signal operations.

**STANDARD: IEC 60227-7**
**VOLTAGE GRADE: $U_o/U$: 300/500V**

| PHYSICAL DATA | | | | | | | | ELECTRICAL DATA | |
|---|---|---|---|---|---|---|---|---|---|
| No. of pairs & Cross sectional area of conductor | No. of strands & Diameter of wire | Nominal thickness of insulation | Diameter of braided wire | Nominal Thickness of sheath | Approx. Overall diameter: Lower Limit | Upper Limit | Approx. Weight of cable | Max. DC Resistance at Conductor at 20°C | Current Carrying Capacity in Air at 35°C ambient temp. |
| core x mm² | No./mm | mm | mm | mm | mm | mm | kg/km | Ω/km | Amps |
| **FLEXIBLE CONTROL SHIELD** | | | | | | | | | |
| 2X0.5 mm | 16/0.2 | 0.6 | 0.15 | 0.9 | 7.7 | 9.6 | 96 | 39.0 | 7 |
| 3X0.5 mm | 16/0.2 | 0.6 | 0.15 | 0.9 | 8.0 | 10.0 | 105 | 39.0 | 7 |
| 5X0.5 mm | 16/0.2 | 0.6 | 0.15 | 1.0 | 9.3 | 11.6 | 142 | 39.0 | 6 |
| 7X0.5 mm | 16/0.2 | 0.6 | 0.15 | 1.1 | 10.8 | 13.5 | 185 | 39.0 | 4 |
| 12X0.5 mm | 16/0.2 | 0.6 | 0.2 | 1.3 | 13.3 | 16.5 | 288 | 39.0 | 4 |
| 18X0.5 mm | 16/0.2 | 0.6 | 0.2 | 1.3 | 15.1 | 18.6 | 375 | 39.0 | 3 |
| 2X0.75 mm | 24/0.2 | 0.6 | 0.15 | 0.9 | 8.0 | 10.0 | 101 | 26.0 | 11 |
| 3X0.75 mm | 24/0.2 | 0.6 | 0.15 | 0.9 | 8.3 | 10.4 | 118 | 26.0 | 11 |
| 5X0.75 mm | 24/0.2 | 0.6 | 0.15 | 1.0 | 9.7 | 12.1 | 160 | 26.0 | 8 |
| 7X0.75 mm | 24/0.2 | 0.6 | 0.15 | 1.2 | 11.5 | 14.3 | 208 | 26.0 | 7 |
| 12X0.75 mm | 24/0.2 | 0.6 | 0.2 | 1.3 | 13.9 | 17.2 | 332 | 26.0 | 6 |
| 18X0.75 mm | 24/0.2 | 0.6 | 0.2 | 1.5 | 16.2 | 19.9 | 468 | 26.0 | 4 |
| 2X1.0 mm | 32/0.2 | 0.6 | 0.15 | 0.9 | 8.2 | 10.3 | 116 | 19.5 | 14 |
| 3X1.0 mm | 32/0.2 | 0.6 | 0.15 | 1.0 | 8.8 | 11.0 | 136 | 19.5 | 14 |
| 5X1.0 mm | 32/0.2 | 0.6 | 0.15 | 1.1 | 10.3 | 12.8 | 184 | 19.5 | 11 |
| 7X1.0 mm | 32/0.2 | 0.6 | 0.15 | 1.2 | 12.2 | 15.1 | 238 | 19.5 | 8 |
| 12X1.0 mm | 32/0.2 | 0.6 | 0.2 | 1.4 | 14.7 | 18.1 | 388 | 19.5 | 6 |
| 18X1.0 mm | 32/0.2 | 0.6 | 0.2 | 1.5 | 16.9 | 20.9 | 535 | 19.5 | 6 |
| 2X1.5 mm | 30/0.25 | 0.7 | 0.15 | 1.0 | 9.3 | 11.6 | 148 | 13.3 | 17 |
| 3X1.5 mm | 30/0.25 | 0.7 | 0.15 | 1.0 | 9.7 | 12.1 | 178 | 13.3 | 17 |
| 5X1.5 mm | 30/0.25 | 0.7 | 0.15 | 1.2 | 11.8 | 14.7 | 265 | 13.3 | 13 |
| 7X1.5 mm | 30/0.25 | 0.7 | 0.2 | 1.3 | 14.1 | 17.4 | 326 | 13.3 | 11 |
| 12X1.5 mm | 30/0.25 | 0.7 | 0.2 | 1.5 | 16.7 | 20.5 | 510 | 13.3 | 8 |
| 18X1.5 mm | 30/0.25 | 0.7 | 0.2 | 1.7 | 19.6 | 24.1 | 720 | 13.3 | 8 |
| 2X2.5 mm | 50/0.25 | 0.8 | 0.15 | 1.1 | 10.7 | 13.3 | 196 | 7.98 | 24 |
| 3X2.5 mm | 50/0.25 | 0.8 | 0.15 | 1.1 | 11.3 | 14.0 | 235 | 7.98 | 24 |
| 5X2.5 mm | 50/0.25 | 0.8 | 0.2 | 1.3 | 13.9 | 17.2 | 370 | 7.98 | 18 |
| 7X2.5 mm | 50/0.25 | 0.8 | 0.2 | 1.5 | 16.5 | 20.5 | 460 | 7.98 | 16 |
| 12X2.5 mm | 50/0.25 | 0.8 | 0.2 | 1.7 | 19.9 | 24.4 | 745 | 7.98 | 13 |
| 18X2.5 mm | 50/0.75 | 0.8 | 0.2 | 2.0 | 23.3 | 28.5 | 1060 | 7.98 | 11 |

# ALL ALUMINIUM CONDUCTOR (AAC)

## CONSTRUCTION

1. CONDUCTOR : Stranded Aluminium wire to BS 2627

## APPLICATION

All Aluminium Conductor are the favoured type for use on relative short spans, particularly low and medium voltage distribution lines.

**STANDARD: BS 215, IEC 61089**

| PHYSICAL DATA | | | | | | ELECTRICAL DATA | | |
|---|---|---|---|---|---|---|---|---|
| Code Name | Nominal Aluminium Area | Total Area | No. of strands & Diameter of wire | Approx. Overall Diameter | Approx. Weight of cable | Nominal Breaking Load | Max. DC Resistance of Conductor at 20°C | Current Carrying Capacity in Air at 35°C ambient temp. |
| | mm² | mm² | no./mm | mm | kg/km | kgf | Ω/km | Amps |
| **ALL ALUMINIUM CONDUCTOR (ACC)** | | | | | | | | |
| MIDGE | 22 | 23.8 | 7/2.06 | 6.2 | 64 | 408 | 1.227 | 114 |
| APHIS | 25 | 26.4 | 7/2.21 | 7.2 | 73 | 419 | 1.081 | 139 |
| GNAT | 25 | 26.9 | 7/2.21 | 6.6 | 74 | 468 | 1.068 | 124 |
| WEEVIL | 30 | 31.6 | 3/3.66 | 7.8 | 87 | 496 | 0.9092 | 144 |
| MOSQUITO | 35 | 36.9 | 7/2.59 | 7.8 | 102 | 617 | 0.7791 | 147 |
| LADYBIRD | 40 | 42.9 | 7/2.79 | 8.4 | 119 | 701 | 0.6694 | 159 |
| ANT | 50 | 52.8 | 7/3.10 | 9.3 | 145 | 848 | 0.5419 | 181 |
| FLY | 60 | 63.6 | 7/3.40 | 10.2 | 174 | 1010 | 0.4505 | 199 |
| BLUEBOTTLE | 70 | 73.8 | 7/3.66 | 11.0 | 203 | 1156 | 0.3884 | 218 |
| EARWIG | 75 | 78.6 | 7/3.78 | 11.4 | 215 | 1218 | 0.3645 | 227 |
| GRASSHOPPER | 80 | 84.1 | 7/3.91 | 11.7 | 232 | 1303 | 0.3405 | 238 |
| CLEGG | 90 | 95.6 | 7/4.17 | 12.5 | 264 | 1482 | 0.2994 | 256 |
| WASP | 100 | 106.0 | 7/4.39 | 13.2 | 290 | 1632 | 0.2702 | 271 |
| BEETLE | 100 | 106.4 | 19/2.67 | 13.4 | 293.9 | 1776 | 0.2695 | 274 |
| BEE | 125 | 132.0 | 7/4.50 | 14.7 | 363.5 | 2033 | 0.2169 | 308 |
| CRICKET | 150 | 157.9 | 7/5.06 | 16.1 | 435.5 | 2032 | 0.1814 | 342 |
| HORNET | 150 | 157.5 | 19/3.25 | 16.3 | 434.6 | 2519 | 0.1825 | 346 |
| CATERPILLER | 175 | 185.9 | 19/3.53 | 17.7 | 512.7 | 2970 | 0.1547 | 380 |
| CHAFER | 200 | 213.2 | 19/3.78 | 18.9 | 576.9 | 3304 | 0.1349 | 414 |
| SPIDER | 225 | 237.0 | 19/3.99 | 20.0 | 655 | 3672 | 0.1214 | 439 |
| COCKROACH | 250 | 265.7 | 19/4.22 | 21.1 | 732.7 | 4120 | 0.1083 | 470 |
| BUTERFLY | 300 | 322.7 | 19/4.65 | 23.3 | 889.8 | 4966 | 0.08915 | 529 |
| MOTH | 350 | 373.1 | 19/5.00 | 25.0 | 1028.8 | 5748 | 0.07709 | 572 |
| DRONE | 350 | 372.4 | 37/3.58 | 25.1 | 1026.8 | 5858 | 0.07723 | 572 |
| LOCUST | 400 | 426.7 | 19/5.36 | 26.8 | 1182 | 6601 | 0.06714 | 626 |
| CENTIPED | 400 | 415.2 | 37/3.78 | 26.5 | 1144.8 | 6434 | 0.06944 | 615 |
| MAYBUG | 450 | 486.1 | 37/4.09 | 28.6 | 1340.2 | 7547 | 0.05921 | 676 |
| SCORPION | 500 | 529.8 | 37/4.27 | 29.9 | 1460.8 | 8156 | 0.05445 | 710 |
| CICADA | 600 | 636.3 | 37/4.65 | 32.6 | 1752.4 | 9682 | 0.04567 | 784 |
| TARANTULA | 750 | 753.9 | 37/5.23 | 36.5 | 2191.5 | 12247 | 0.03628 | 880 |

## ALL ALUMINIUM CONDUCTOR (AAC)

### CONSTRUCTION

1. CONDUCTOR : Stranded Aluminium H14 to ASTM B 231

### APPLICATION

All Aluminium Conductor are the favoured type for use on relative short spans, particularly low and medium voltage distribution lines.

**STANDARD: B 231, IEC 61089**

| Code Name | Total Area | | No. of strands & Diameter of wire | Approx. Overall Diameter | Approx. Weight of cable | Nominal Breaking Load | Max. DC Resistance of Conductor at 20°C | Current Carrying Capacity in Air at 35°C ambient temp. |
|---|---|---|---|---|---|---|---|---|
| | AWG/MCM | mm² | no./mm | mm | kg/km | kgf | Ω/km | Amps |
| **ALL ALUMINIUM CONDUCTOR (ACC)** | | | | | | | | |
| ROSE | 4 | 21.15 | 7/1.96 | 5.9 | 58 | 375 | 1.362 | 104 |
| IRIS | 2 | 33.61 | 7/2.47 | 7.4 | 92 | 574 | 0.8574 | 136 |
| POPPY | 1/0 | 53.48 | 7/3.12 | 9.4 | 148 | 846 | 0.539 | 180 |
| ASTER | 2/0 | 67.42 | 7/3.50 | 10.5 | 186 | 1066 | 0.4276 | 207 |
| PHLOX | 3/0 | 85.03 | 7/3.93 | 11.8 | 234 | 1281 | 0.339 | 237 |
| OXLIP | 4/0 | 107.2 | 7/4.42 | 13.3 | 296 | 1628 | 0.2689 | 273 |
| VALERIAN | 250 | 126.7 | 19/2.91 | 14.6 | 348 | 2044 | 0.2275 | 305 |
| DAISY | 266.8 | 135.2 | 7/4.86 | 14.8 | 373 | 2053 | 0.2133 | 313 |
| PEONY | 300 | 152 | 19/3.15 | 15.0 | 419 | 2404 | 0.1895 | 340 |
| TULIP | 336.4 | 170.5 | 19/3.38 | 16.9 | 470 | 2697 | 0.1592 | 364 |
| DAFFODIL | 350 | 177.4 | 19/3.45 | 17.3 | 490 | 2805 | 0.1525 | 373 |
| GOLDENTUFT | 450 | 228 | 19/3.91 | 19.6 | 629 | 3462 | 0.1264 | 432 |
| COSMOS | 477 | 242 | 19/4.02 | 20.1 | 665 | 3670 | 0.1193 | 447 |
| ZINNIA | 500 | 253 | 19/4.12 | 20.6 | 699 | 3847 | 0.1137 | 458 |
| DAHLIA | 556.5 | 282 | 19/4.35 | 21.8 | 779 | 4282 | 0.1023 | 486 |

## ALL ALUMINIUM CONDUCTOR (AAC-INSULATED)


### CONSTRUCTION

1. CONDUCTOR : Stranded Galvanized Steel wire to BS 4565 Started Aluminium wire to BS 2627
2. INSULATION : PVC, TII to BS 7655

### APPLICATION

All Aluminium Conductor are the favoured type for use on relative short spans, particularly low and medium voltage distribution lines.

**STANDARD: BS 215-1, IEC 61089**

| | PHYSICAL DATA | | | | | | | | ELECTRICAL DATA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code Name | Nominal Aluminium Area | Cross Sectional area of conductor | Number of Strands & Diameter of wire | Approx. Diameter of bare conductor | Approx. Weight of bare conductor | Minimum thickness of insulation | Approximate overall diameter | Approx. Weight of insulated conductor | Minimum breaking load | Max. DC Resistance of Conductor at 20°C | Current Carrying at 35°C ambient temp. |
| | mm² | mm² | no./mm | mm | kg/km | mm | mm | kg/km | kgf | Ω/km | Amps |
| **ALL ALUMINIUM CONDUCTOR (AAC-INSULATED)** | | | | | | | | | | | |
| MIDGE | 22 | 23.9 | 7/2.09 | 6.18 | 64 | 0.8 | 8.2 | 88 | 408 | 1.227 | 106 |
| GNAT | 25 | 25.8 | 7/2.21 | 6.6 | 74 | 0.8 | 8.6 | 110 | 468 | 1.068 | 115 |
| MOSQUITO | 35 | 35.9 | 7/2.53 | 7.8 | 102 | 0.8 | 9.8 | 143 | 617 | 0.7731 | 134 |
| ANT | 50 | 52.8 | 7/3.10 | 9.8 | 145 | 0.8 | 11.3 | 192 | 848 | 0.5419 | 172 |
| FLY | 60 | 63.6 | 7/3.40 | 10.2 | 174 | 0.8 | 12.2 | 230 | 1010 | 0.4505 | 191 |
| BLUEBOTTLE | 70 | 73.6 | 7/3.65 | 11.0 | 203 | 0.9 | 13.0 | 281 | 1158 | 0.3864 | 210 |
| EARWIG | 75 | 76.6 | 7/3.78 | 11.4 | 216 | 0.8 | 13.4 | 275 | 1218 | 0.3645 | 216 |
| GRASSHOPPER | 80 | 84.1 | 7/3.91 | 11.7 | 232 | 0.8 | 13.8 | 292 | 1302 | 0.3405 | 228 |
| CLEGG | 90 | 95.6 | 7/4.17 | 12.5 | 264 | 0.8 | 14.6 | 330 | 1482 | 0.2994 | 245 |
| WASP | 100 | 108.0 | 7/4.39 | 13.2 | 280 | 0.8 | 15.6 | 872 | 1692 | 0.2702 | 260 |

# ALUMINIUM CONDUCTOR STEEL REINFORCED (ACSR)

## CONSTRUCTION

1. CONDUCTOR : Stranded Aluminium wire to BS 2627 & Stranded Galvanized Steel wire to BS 4565

## APPLICATION

ACSR is recommended for use as a transmission cable between the power station and substations and as primary and secondary distribution cable.

**STANDARD: BS 215-2, IEC 61089**

| PHYSICAL DATA | | | | | | | | | ELECTRICAL DATA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code Name | Nominal Aluminium Area | Area of conductor | | | Number of wires & diameter of the | | Approximate overall diameter of conductor | Approx. Weight of conductor | Minimum breaking load of conductor | Max. DC Resistance of Conductor at 20°C | Current Carrying at 35°C ambient temp. |
| | | Al | Steel | Total | Al | Steel | | | | | |
| | mm² | mm² | mm² | mm² | no./mm | no./mm | mm | kg/km | kgf | Ω/km | Amps |
| **ALUMINIUM CONDUCTOR STEEL REINFORCED (ACSR)** | | | | | | | | | | | |
| SQUIRREL | 20 | 20.98 | 3.50 | 24.48 | 6/2.11 | 1/2.11 | 6.33 | 85 | 805 | 1.37 | 105 |
| GOPHER | 25 | 26.25 | 4.37 | 30.62 | 6/2.36 | 1/2.36 | 7.08 | 106 | 979 | 1.093 | 120 |
| WEASEL | 30 | 31.81 | 5.27 | 36.88 | 6/2.59 | 1/2.59 | 7.77 | 129 | 1163 | 0.9077 | 134 |
| FOX | 35 | 36.59 | 6.11 | 42.70 | 6/2.79 | 1/2.79 | 8.37 | 149 | 1346 | 0.7827 | 147 |
| FERRET | 40 | 42.41 | 7.07 | 49.48 | 6/3.00 | 1/3.00 | 9.00 | 173 | 1552 | 0.6766 | 161 |
| RABBIT | 50 | 52.88 | 8.81 | 61.69 | 6/3.35 | 1/3.35 | 10.05 | 215 | 1878 | 0.5426 | 185 |
| HORESE | 70 | 73.36 | 42.80 | 116.16 | 12/2.79 | 7/2.79 | 13.95 | 536 | 8241 | 0.3936 | 268 |
| RACOON | 75 | 79.22 | 13.20 | 92.42 | 6/4.10 | 1/4.10 | 12.30 | 321 | 2774 | 0.3823 | 231 |
| CAT | 90 | 95.43 | 15.90 | 111.33 | 6/4.50 | 1/4.50 | 13.50 | 387 | 3335 | 0.3008 | 248 |
| HARE | 100 | 104.99 | 17.50 | 122.48 | 6/4.72 | 1/4.72 | 14.16 | 425 | 3671 | 0.2733 | 273 |
| DOG | 100 | 104.98 | 13.55 | 118.53 | 6/4.72 | 7/1.57 | 14.15 | 395 | 6665 | 0.2733 | 273 |
| TIGER | 125 | 131.1 | 30.62 | 161.86 | 30/2.36 | 7/2.36 | 16.52 | 603 | 5814 | 0.2204 | 323 |
| WOLF | 150 | 158.06 | 36.88 | 194.94 | 30/2.59 | 7/2.59 | 18.13 | 726 | 7056 | 0.1828 | 355 |
| DINGO | 150 | 158.65 | 5.81 | 167.49 | 18/3.35 | 1/3.35 | 16.75 | 506 | 3640 | 0.1815 | 345 |
| CARACAL | 175 | 184.24 | 10.24 | 194.48 | 18/3.81 | 1/3.81 | 19.05 | 588 | 4181 | 0.1563 | 383 |
| PANTHER | 200 | 212.06 | 49.48 | 261.54 | 30/3.00 | 7/3.00 | 21.00 | 974 | 9402 | 0.1363 | 421 |
| LION | 225 | 238.27 | 55.50 | 293.87 | 30/3.18 | 7/3.18 | 22.26 | 1094 | 10258 | 0.1212 | 448 |
| ELK | 450 | 477.13 | 111.33 | 588.46 | 80/4.50 | 7/4.50 | 31.50 | 2190 | 20211 | 0.06058 | 679 |

# ALUMINIUM CONDUCTOR STEEL REINFORED (ACSR)

## CONSTRUCTION

1. CONDUCTOR : Stranded Galvanized Steel wire, Class-A to ASTM B-498
Stranded Aluminium wire, 1350 H19 to ASTM B-232

## APPLICATION

ACSR is recommended for use as a transmission cable between the power station and substations and as primary and secondary distribution cable.

**STANDARD: ASTM B-232, IEC 61089**

| Code Name | PHYSICAL DATA | | | | | | | | ELECTRICAL DATA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nominal cross sectional area of conductor | | | | Number of strands & diameter of wire | | Approximate overall diameter of conductor | Approx. Weight of conductor | Minimum breaking load of conductor | Max. DC Resistance of Conductor at 20°C | Current Carrying at 65°C ambient temp. |
| | AWG or MCM | Aluminium mm² | Steel mm² | Total mm² | Aluminium no./mm | Steel no./mm | mm | kg/km | kgf | Ω/km | Amps |
| **ALUMINIUM CONDUCTOR STEEL REINFORED (ACSR)** | | | | | | | | | | | |
| SWAN | 4 | 21.15 | 3.55 | 24.71 | 6/2.12 | 1/2.12 | 6.36 | 85 | 848 | 1.356 | 105 |
| SWALLOW | 3 | 26.65 | 4.45 | 31.1 | 6/2.38 | 1/2.38 | 7.14 | 109 | 1040 | 1.076 | 121 |
| SPARROW | 2 | 33.61 | 5.61 | 39.22 | 6/2.67 | 1/2.67 | 8.01 | 138 | 1280 | 0.869 | 139 |
| ROBIN | 1 | 42.39 | 7.10 | 49.49 | 6/3.00 | 1/3.00 | 9.00 | 171 | 1620 | 0.6765 | 160 |
| RAVEN | 1/0 | 53.48 | 8.90 | 62.38 | 6/3.37 | 1/3.37 | 10.11 | 216 | 1990 | 0.5364 | 183 |
| QUAIL | 2/0 | 67.42 | 11.23 | 78.65 | 6/3.78 | 1/3.78 | 11.34 | 272 | 2400 | 0.4255 | 210 |
| PIGEON | 3/0 | 85.03 | 14.16 | 99.22 | 6/4.25 | 1/4.25 | 12.75 | 345 | 3010 | 0.3373 | 241 |
| PENGUIN | 4/0 | 107.23 | 17.87 | 125.1 | 6/4.77 | 1/4.77 | 14.31 | 433 | 3760 | 0.2676 | 276 |
| WAXWING | 266.8 | 135.16 | 7.48 | 142.64 | 18/3.09 | 1/3.09 | 15.45 | 490 | 3120 | 0.2139 | 319 |
| OSTRICH | 300 | 152.00 | 24.77 | 176.77 | 26/2.73 | 1/2.12 | 17.28 | 614 | 5760 | 0.1906 | 345 |
| MERLIN | 336.4 | 170.45 | 9.48 | 179.99 | 18/3.47 | 1/3.47 | 17.35 | 543 | 3940 | 0.1692 | 356 |
| CHICKADEE | 397.5 | 201.42 | 11.16 | 212.58 | 18/3.77 | 1/3.77 | 18.85 | 642 | 4510 | 0.1432 | 403 |
| PELICAN | 477 | 241.68 | 13.42 | 255.1 | 18/4.14 | 1/4.14 | 20.70 | 774 | 5330 | 0.1193 | 448 |
| HAWK | 477 | 241.58 | 39.35 | 281.03 | 26/3.44 | 7/2.68 | 21.80 | 977 | 8870 | 0.1168 | 455 |
| HEN | 477 | 241.58 | 56.35 | 298.07 | 30/3.20 | 7/3.20 | 22.40 | 1105 | 10800 | 0.1202 | 457 |
| GROSBEAK | 636 | 322.28 | 52.52 | 374.78 | 26/3.97 | 7/3.09 | 25.15 | 1302 | 11400 | 0.08989 | 508 |

# ALL ALUMINIUM ALLOY CONDUCTOR (AAAC)

## CONSTRUCTION

1. CONDUCTOR : Stranded Aluminium Alloy wire, T81 to ASTM B-398

## APPLICATION

AAAC is recommended for use as bare overhead conductor for primary and secondary distribution and in cases where high strength-to-weight ratio is required.

**STANDARD: ASTM B-398 & B-399, IEC 61089**

| PHYSICAL DATA | | | | | | | ELECTRICAL DATA | |
|---|---|---|---|---|---|---|---|---|
| Mill Item Code | Code Name | size | Nominal Area of conductor | Number of strands & diameter of wire | Approx. diameter of conductor | Approx. weight of conductor | Minimum breaking load of conductor | Max. DC Resistance of Conductor at 20°C |
| | | kcmil | mm² | no./mm | mm | kg/km | kgf | Ω/km |
| **ALL ALUMINIUM ALLOY CONDUCTOR (AAAC)** | | | | | | | | |
| 0-29 | AMES | 77.47 | 40 | 7/2.87208 | 8.0264 | 108.5 | 1270 | 0.8592 |
| 0-30 | AZUSA | 123.9 | 80 | 7/3.37058 | 10.1092 | 172.5 | 2023 | 0.595 |
| 0-31 | ALLIANCE | 245.9 | 125 | 7/4.77012 | 14.3002 | 345.7 | 3883 | 0.2378 |
| 0-32 | DARIEN | 558.5 | 280 | 19/4.35864 | 21.7833 | 783.2 | 8578 | 0.119 |
| 0-33 | GREELY | 827.2 | 470 | 37/4.02082 | 28.1457 | 1289 | 13600 | 0.0715 |

## GROUND WIRE & TIE WIRE

### CONSTRUCTION

1. CONDUCTOR — Hard Drawn Bare Aluminium wire, H14 to ASTM B-233 Soft Drawn Bare Aluminium wire, 1350-0 to ASTM B-609

### APPLICATION

Hard Drawn bare Aluminum wore suitable for use as grounding wire/jumper wire on electric distribution lines. Soft bare aluminium wire suitable for use as tie wire on electric distribution lines.

**STANDARD: ASTM B-233 & B-609**

| | | PHYSICAL DATA | | | | | ELECTRICAL DATA | |
|---|---|---|---|---|---|---|---|---|
| BEB Item Code | Code Name | Size of conductor | Nominal Area of conductor | Number of strands | Diameter of wire | Approx. weight of conductor | Breaking Strength | Max. DC Resistance at Conductor at 20°C |
| | | AWG | mm² | no. | mm | kg/km | kgf | Ω/km |
| **GROUND WIRE & TIE WIRE** | | | | | | | | |
| B-4 | ground wire | 4 | 21.15 | 1 | 5.189 | 57.2 | 342 (min) | 1.3393 |
| B-5 | TIE WIRE | 4 | 21.15 | 1 | 5.189 | 57.2 | 167 (MAX) | 1.3751 |

## JUMPER WIRE

### CONSTRUCTION

1. CONDUCTOR — Soft Bare Copper wire to ASTM B-3

### APPLICATION

Soft Bare Copper wire for use as jumper on electric distribution lines.

**STANDARD: ASTM B-3 & B-193**

| | | PHYSICAL DATA | | | | | ELECTRICAL DATA | |
|---|---|---|---|---|---|---|---|---|
| BEB Item Code | Code Name | Size of conductor | Nominal Area of conductor | Number of strands | Diameter of wire | Approx. weight of conductor | Minimum Breaking load | Max. DC Resistance at Conductor at 20°C |
| | | AWG | mm² | no. | mm | kg/km | kgf | Ω/km |
| **JUMPER WIRE** | | | | | | | | |
| B-8 | Jumper Wire | 8 | 13.30 | 1 | 4.1148 | 116.4 | 346 | 1.404 |

## STRANDED GALVANIZED GUY WIRE

### CONSTRUCTION

1. CONDUCTOR : Stranded Galvanized Steel wire to Class A to ASTM B-498

### APPLICATION

Guy Wire is composed of galvanized steel wires in various strengths and zinc coatings. Messenger Wire, Overhead Ground or Static Wire, Guy Wire.

**STANDARD: ASTM A-475 & ASTM B-498**

| PHYSICAL DATA | | | | | ELECTRICAL DATA |
|---|---|---|---|---|---|
| Name of item | Nominal cross sectional area of conductor | Number of strands & diameter of wire | Overall diameter | Approx. Weight of cable | Minimum breaking load |
| | sq.mm | no./mm | mm | kg/km | kgf |
| **STRANDED GALVANIZED GUY WIRE** | | | | | |
| GUY WIRE | 30.62 | 7/2.98 | 7.1 | 240 | 3885 |
| GUY WIRE | 54.55 | 7/3.15 | 8.5 | 430 | 6400 |

## HDPE INSULATED ACSR CONDUCTOR


### CONSTRUCTION

1. CONDUCTOR : Stranded Galvanized Steel wire, Class A to ASTM B-498
  Stranded Aluminium wire, 1350-H19 to ASTM B-232
2. INSULATION : HDPE, NEMA WC-7

### APPLICATION

High density polyethylene covered steel reinforced concentric-ly-stranded aluminium conductors (ACSR), to be used as 15 kV insulated tree wire on distribution lines.

**STANDARD: ASTM B-230, 232, 498 NEMA WC-7**

| PHYSICAL DATA | | | | | | | | ELECTRICAL DATA | |
|---|---|---|---|---|---|---|---|---|---|
| REB Item Code | Conductor Size | Number of Strands & Diameter of wire | | Insulation Thickness | Approx. Overall diameter of conductor | Approx. Weight of conductor | Minimum breaking strength | Maximum D.C. resistance of conductor at 20°C | Current rating at 35°C ambient temp. |
| | | Al | Steel | | | | | | |
| | AWG | no./mm | no./mm | mm | mm | kg/km | kgf | Ω/km | Amps |
| **HDPE INSULATED ACSR CONDUCTOR** | | | | | | | | | |
| 0-59 | 2 | 6/2.67 | 1/2.67 | 3.81 | 16.848 | 274 | 1228 | 0.858 | 128 |
| 0-61 | 1/0 | 6/3.37 | 1/3.37 | 3.81 | 17.728 | 370 | 1887 | 0.535 | 168 |
| 0-62 | 4/0 | 6/4.77 | 1/4.77 | 3.81 | 21.92 | 834 | 3588 | 0.2572 | 260 |

# MEDIUM HARD DRAWN COPPER CONDUCTOR

## CONSTRUCTION

1. CONDUCTOR : MHD Bare Copper conductor to ASTM B-2

## APPLICATION

Medium Hard Drawn (MHD) bare copper conductor are to be used on electric distribution systems.

**STANDARD: ASTM B-2 & B-193**

| | | PHYSICAL DATA | | | | | ELECTRICAL DATA | |
|---|---|---|---|---|---|---|---|---|
| BIS Item Code | Name of conductor | Size of conductor | Nominal Area of conductor | Number of strand & diameter of wire | Conductor diameter | Approx. weight of conductor | Minimum Breaking load of conductor | Maximum D.C resistance of conductor at 20°C |
| | | AWG or MCM | mm² | no./mm | mm | kg/km | kgf | Ω/km |
| **MEDIUM HARD DRAWN COPPER CONDUCTOR** | | | | | | | | |
| B-7 | MHD COPPER CONDUCTOR | 5 | 26.668 | 3/3.360 | 7.254 | 240 | 1079 | 0.683 |
| B-8 | MHD COPPER CONDUCTOR | 1/0 | 53.488 | 7/3.119 | 9.347 | 485 | 2155 | 0.344 |
| B-9 | MHD COPPER CONDUCTOR | 4/0 | 107.284 | 7/4.417 | 13.259 | 956 | 3654 | 0.166 |
| B-10 | MHD COPPER CONDUCTOR | 2/0 | 67.429 | 7/3.502 | 10.510 | 615 | 2694 | 0.275 |
| BS-9 | MHD COPPER CONDUCTOR | 4/0 | 107.156 | 19/2.679 | 13.410 | 973 | 4071 | 0.173 |
| BS-10 | MHD COPPER CONDUCTOR | 2/0 | 67.766 | 19/2.131 | 10.655 | 619 | 2166 | 0.271 |
| BS-37 | MHD COPPER CONDUCTOR | 350 | 177.291 | 37/3.470 | 17.290 | 1620 | 5662 | 0.101 |
| BS-38 | MHD COPPER MHD COPPER | 500 | 253.054 | 37/2.951 | 20.657 | 2267 | 10231 | 0.070 |

## XLPE INSULATED MHD COPPER CONDUCTOR


### CONSTRUCTION

1. CONDUCTOR : MHD Copper conductor to ASTM B-2
2. INSULATION : XLPE to NEMA WC-7

### APPLICATION

All Aluminium Conductor are the favoured type for use on relative short spans, particularly low and medium voltage distribution lines

**STANDARD: ASTM B-2 & B-8**

| | PHYSICAL DATA | | | | ELECTRICAL DATA | | |
|---|---|---|---|---|---|---|---|
| BSB Hen Code | Size of conductor | No. of Strand & Diameter of Wire | Nominal thickness of insulation | Approx. Overall diameter | Approx. weight of conductor | Minimum breaking load | Maximum D. C resistance of conductor at 20°C |
| | AWG | no./mm | mil/mm | mil/mm | kg/km | kgf | Ω/km |
| **XLPE INSULATED MHD COPPER CONDUCTOR** | | | | | | | |
| B-16 | 8 | 3/3.99 | 80/1.02 | 405/10.29 | 282 | 1070 | 0.883 |
| B-17 | 1/0 | 7/3.12 | 82/1.67 | 481/12.22 | 541 | 2155 | 0.344 |
| B-18 | 4/0 | 7/4.42 | 82/1.67 | 530/18.00 | 1050 | 3884 | 0.166 |
| B-19 | 1000 MCM | 61/3.25 | 94/2.38 | 1339/34.01 | 4830 | 17570 | 0.0358 |

## XLPE INSULATED AERIAL CABLE

### CONSTRUCTION

PHASE :
1. CONDUCTOR : Stranded Aluminium wire to ASTM B-231
2. INSULATION : XLPE to NEMA WC-7

MESSENGER :
1. CONDUCTOR : Stranded Galvanized Steel wire, Class A to ASTM B-498
Stranded Aluminium wire, 1350-H19 to ASTM B-232

### APPLICATION

Pre-assembled cross-linked polyethylene insulated aluminium cables supported by a bare ACSR messenger wire shall be used as aerial single phase and three phase service drop cable.

**STANDARD: ASTM B-230, 231, 232 & B-498**

| BIS Item Code | Conductor assembly | PHYSICAL DATA | | | | | | | ELECTRICAL DATA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Phase Conductor (AAC) | | | Messenger conductor (ACSR) | | | Approx. Weight of conductor | Maximum D.C resistance of conductor at 20°C | | Current rating at 35°C ambient temp |
| | | Size of conductor | No. of Strand & diameter of wire | Nominal thickness of insulation | Size of conductor | No. of Strand & diameter of wire | | | Phase | Messenger | |
| | | | | | | Aluminium | Steel | | | | |
| | | AWG | no./mm | milli/mm | AWG | no./mm | no./mm | kg/km | Ω/km | Ω/km | Amps |
| **XLPE INSULATED AERIAL CABLE** | | | | | | | | | | | |
| B-11 | DUPLEX | 6 | 7/1.68 | 45/1.143 | 6 | 6/1.68 | 1/1.68 | 114 | 2.188 | 2.157 | 70 |
| B-12 | DUPLEX | 3 | 7/2.20 | 45/1.143 | 3 | 6/2.38 | 1/2.38 | 217 | 1.076 | 1.074 | 89 |
| B-14 | QUADRUPLEX | 3 | 7/2.20 | 45/1.143 | 3 | 6/2.38 | 1/2.38 | 420 | 1.076 | 1.074 | 68 |
| B-15 | QUADRUPLEX | 1/0 | 7/3.12 | 80/1.524 | 1/0 | 6/3.97 | 1/3.97 | 835 | 0.5372 | 0.535 | 155 |
| B-20 | QUADRUPLEX | 4 | 7/1.98 | 45/1.143 | 4 | 6/2.12 | 1/2.12 | 340 | 1.032 | 1.35 | 92 |
| B-24 | QUADRUPLEX | 4/0 | 7/4.42 | 80/1.524 | 4/0 | 6/4.77 | 1/4.77 | 1580 | 0.2688 | 0.2679 | 198 |
| B-25 | QUADRUPLEX | 6 | 7/1.58 | 45/1.143 | 6 | 6/1.68 | 1/1.68 | 230 | 2.188 | 2.157 | 60 |

# PVC INSULATED AERIAL CABLE


## CONSTRUCTION

| | |
|---|---|
| PHASE | |
| 1. CONDUCTOR | Stranded Aluminium wire to ASTM B-231 |
| 2. INSULATION | PVC to NEMA WC-7 |
| MESSENGER | |
| 1. CONDUCTOR | Stranded Galvanized Steel wire, Class A to ASTM B-498<br>Stranded Aluminium wire, 1350-H19 to ASTM B-232 |

## APPLICATION

Pre-assembled cross-linked polyethylene insulated aluminium cables supported by a bare ACSR messenger wire shall be used as aerial single phase and three phase service drop cable.

**STANDARD: ASTM B-230, 231, 232 & B-498**

| PHYSICAL DATA | | | | | | | | | ELECTRICAL DATA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BSB Item Code | Conductor assembly | Phase Conductor (AAC) | | | Messenger conductor (ACSR) | | | Approx. Weight of conductor | Maximum D. C resistance of conductor at 20°C | | Current rating at 35°C ambient temp. |
| | | Size of conductor | No. of Strand & diameter of wire | Nominal thickness of insulation | Size of conductor | No. of Strand & diameter of wire | | | Phase | Messenger | |
| | | | | | | Aluminium | Steel | | | | |
| | | AWG | no./mm | mil/mm | AWG | no./mm | no./mm | kg/km | Ω/km | Ω/km | Amps |
| **PVC INSULATED AERIAL CABLE** | | | | | | | | | | | |
| B-03 | DUPLEX | 6 | 7/1.58 | 80/1.524 | 6 | 6/1.58 | 1/1.88 | 140 | 2.169 | 2.157 | 58 |

## PVC INSULATED SERVICE DROP CABLE

### CONSTRUCTION

1. CONDUCTOR : Stranded Copper wire to ASTM B-3
2. INSULATION : PVC, PVC/A to IEC 60502-1

### APPLICATION

PVC insulated copper cables supported by a PVC insulated copper messenger wire. Suitable for used in electricity supply in low voltage installation system for service voltage 600/1000 volts shall be used as aerial single phase and three phase service drop cable.

**STANDARD: ASTM B-231, 232 & 498**

| PHYSICAL DATA | | | | | | ELECTRICAL DATA | | | |
|---|---|---|---|---|---|---|---|---|---|
| Nominal cross section area of conductor | No. of strands & diameter of wires | Nominal thickness of insulation | Approx. Overall diameter of cable | Approx. weight of cable | | Maximum D. C resistance of conductor at 20°C | | Current rating at 30°C ambient temp. | |
| | | | | Cu | Al | Cu | Al | | |
| sq.x mm² | no.x mm | mm | mm | kg/km | kg/km | Ω/km | Ω/km | amp. | amp. |
| **PVC INSULATED SERVICE DROP CABLE** | | | | | | | | | |
| 2.5 mm X 2.5 mm | 1X1.78/1X1.78 | 1.5 | 10.0 | 55 | 70 | 7.41/7.41 | 12.10/12.10 | 27 | 21 |
| 2.5 mm X 2.5 mm | 7X0.67/7X0.67 | 1.5 | 10.0 | 100 | 71 | 7.41/7.41 | 12.10/12.10 | 27 | 21 |
| 4 mm X 4 mm | 7X0.85/1X2.28 | 1.5 | 11.5 | 135 | 90 | 4.61/4.61 | 7.41/7.41 | 35 | 29 |
| 4 mm X 4 mm | 7X0.85/7X0.85 | 1.5 | 11.8 | 140 | 91 | 4.61/4.61 | 7.41/7.41 | 35 | 29 |
| 6 mm X 6 mm | 7X1.05/1X2.77 | 1.5 | 12.5 | 182 | 103 | 3.08/3.08 | 4.61/4.61 | 45 | 37 |
| 6 mm X 6 mm | 7X1.05/7X1.05 | 1.5 | 13.0 | 180 | 105 | 3.08/3.08 | 4.61/4.61 | 45 | 37 |
| 10 mm X 10 mm | 7X1.35/7X1.35 | 1.5 | 14.5 | 270 | 138 | 1.83/1.83 | 3.08/3.08 | 62 | 47 |
| 16 mm X 16 mm | 7X1.71/7X1.71 | 1.5 | 16.6 | 369 | 180 | 1.15/1.15 | 1.91/1.91 | 84 | 65 |
| 25 mm X 25 mm | 7X2.14/7X2.14 | 1.5 | 19.2 | 585 | 244 | 0.727/0.727 | 1.20/1.20 | 110 | 85 |

## QUADRUPLEX CABLE

**STANDARD: ASTM B-231, 232 & 498**

| PHYSICAL DATA | | | | | | ELECTRICAL DATA | | | |
|---|---|---|---|---|---|---|---|---|---|
| Nominal cross section area of conductor | No. of strands & diameter of wires | Nominal thickness of insulation | Approx. Overall diameter of cable | Approx. weight of cable | | Maximum D. C resistance of conductor at 20°C | | Current rating at 30°C ambient temp. | |
| | | | | Cu | Al | Cu | Al | | |
| sq.x mm² | no.x mm | mm | mm | kg/km | kg/km | Ω/km | Ω/km | amp. | amp. |
| **QUADRUPLEX CABLE** | | | | | | | | | |
| 3X4 mm/1X4 mm | 7X0.85/ 1X2.26 | 1.5 | 15.0 | 275 | 190 | 4.16/4.61 | 7.41/7.41 | 32 | 27 |
| 3X4 mm/1X4 mm | 7X0.85/ 7X0.85 | 1.5 | 15.5 | 280 | 192 | 4.16/4.61 | 7.41/7.41 | 32 | 27 |
| 3X6 mm/1X6 mm | 7X1.05/ 7X1.05 | 1.5 | 16.0 | 370 | 205 | 3.08/3.08 | 4.61/4.61 | 41 | 34 |
| 3X10 mm/1X10 mm | 7X1.35/ 7X1.35 | 1.5 | 18.5 | 538 | 270 | 1.83/1.83 | 3.08/3.08 | 56 | 48 |
| 3X16 mm/1X16 mm | 7X1.71/ 7X1.71 | 1.5 | 21.0 | 782 | 380 | 1.15/1.15 | 1.91/1.91 | 75 | 64 |
| 3X25 mm/1X25 mm | 7X2.14/ 7X2.14 | 1.5 | 24.5 | 1180 | 488 | 0.727/0.727 | 1.20/1.20 | 98 | 79 |

# POLY CABLES

## CONSTRUCTION

1. CONDUCTOR : Plain Annealed Copper (Class 2 & Class 1)
2. INSULATION : Polyvinyl Chloride (PVC) / Cross Linked Polyethylene (XLPE), Brown Color
3. SEPARATORS : Non-Hygroscopic String Separators
4. BINDER : One or More Overlapped Polyester Tape
5. SHEATH : Polyvinyl Chloride (PVC), Black Color

## APPLICATION

Split concentric cables are generally used by Distribution Network Operators linking electrical networks and towers to a person's home or business. The cables are designed to be installed in air (indoors and/or outdoors), or may be buried directly in free draining soil or in ducts. Suitable for direct burial, they are also used for sub mains in high rise towers and street lighting systems, etc., for continuous permissible service voltage of 720/1200 volts. The cable consists of a plain annealed stranded copper phase conductor, an PVC/XLPE insulation surrounded by a concentric layer of plain annealed solid copper neutral conductors, with a Blue Polymeric Compound insulated and plain annealed solid strand bare copper earth conductors and a black PVC Oversheath.

**STANDARD: BS: 6360, BS: 7870, IEC: 60288, IEC: 60502 Part 1**
**VOLTAGE GRADE: 600/1000 (1200)V** **OPERATING TEMPERATURE: -15°C to +70°C**

| Cross Sectional Area of Conductor | No. and Nominal Diameter of Wire | Approximate Diameter of Bare Conductor | Nominal Thickness of Insulation | Number and Approx. Diameter of Wire for Concentric Conductor | | Minimum Lay Length | Nominal Thickness of Sheath | Approx. Overall Diameter of Cable | Approx. Cable Weight | Maximum DC Resistance of Cable at 20°C | | | Current Rating | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Neutral Conductor | Earth Continuity | | | | | Phase Conductor | Neutral Conductor | Earth Continuity Conductor | In Ground at 30°C | In Air at 30°C |
| mm² | no./mm | mm | mm | no./mm | no./mm | mm | mm | mm | kg/km | Ω/km | Ω/km | Ω/km | Amps | Amps |
| 4 | 7/0.85 | 2.55 | 0.80 | 7/0.85 | 8/1.85 | ---- | 1.80 | 16.50 | 420 | 4.61 | 4.80 | 4.80 | 38 | 32 |
| 6 | 7/1.05 | 3.15 | 1.00 | 7/1.04 | 4/1.53 | ---- | 1.80 | 18.00 | 580 | 3.08 | 3.20 | 3.20 | 48 | 41 |
| 10 | 7/1.35 | 4.05 | 1.00 | 7/1.35 | 4/1.78 | ---- | 1.80 | 21.40 | 820 | 1.83 | 1.90 | 1.90 | 64 | 56 |
| 16 | 7/1.71 | 5.13 | 1.00 | 7/1.70 | 4/2.25 | 144 | 1.80 | 24.70 | 1160 | 1.15 | 1.20 | 1.20 | 83 | 75 |
| 25 | 7/2.14 | 6.42 | 1.20 | 11/1.70 | 4/2.25 | 199 | 2.00 | 28.80 | 1880 | 0.727 | 0.76 | 1.20 | 110 | 88 |
| 35 | 19/1.53 | 6.85 | 1.20 | 15/1.70 | 6/2.25 | 258 | 2.00 | 2990 | 2170 | 0.524 | 0.55 | 0.76 | 130 | 120 |

**STANDARD: BS: 6360, BS: 7870, IEC: 60288, EC: 60502 Part 1**
**VOLTAGE GRADE: 600/1000 (1200)V** **OPERATING TEMPERATURE: -20°C to +90°C**

| Cross Sectional Area of Conductor | No. and Nominal Diameter of Wire | Approximate Diameter of Bare Conductor | Nominal Thickness of Insulation | Number and Approx. Diameter of Wire for Concentric Conductor | | Minimum Lay Length | Nominal Thickness of Sheath | Approx. Overall Diameter of Cable | Approx. Cable Weight | Maximum DC Resistance of Cable at 20°C | | | Current Rating | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Neutral Conductor | Earth Continuity | | | | | Phase Conductor | Neutral Conductor | Earth Continuity Conductor | In Ground at 30°C | In Air at 30°C |
| mm² | no./mm | mm | mm | no./mm | no./mm | mm | mm | mm | kg/km | Ω/km | Ω/km | Ω/km | Amps | Amps |
| 4 | 7/0.85 | 2.55 | 0.70 | 7/0.85 | 8/1.35 | ---- | 1.80 | 16.00 | 395 | 4.61 | 4.80 | 4.80 | 48 | 41 |
| 6 | 7/1.05 | 3.15 | 0.70 | 7/1.04 | 4/1.53 | ---- | 1.80 | 17.10 | 530 | 3.08 | 3.20 | 3.20 | 64 | 56 |
| 10 | 7/1.35 | 4.05 | 0.70 | 7/1.35 | 4/1.78 | ---- | 1.80 | 20.30 | 750 | 1.83 | 1.90 | 1.90 | 83 | 75 |
| 16 | 7/1.71 | 5.13 | 0.70 | 7/1.70 | 4/2.25 | 144 | 1.90 | 23.30 | 1090 | 1.15 | 1.20 | 1.20 | 110 | 98 |
| 25 | 7/2.14 | 6.42 | 0.90 | 11/1.70 | 4/2.25 | 199 | 2.00 | 27.30 | 1680 | 0.727 | 0.76 | 1.20 | 130 | 120 |
| 35 | 19/1.53 | 6.85 | 0.90 | 15/1.70 | 6/2.25 | 258 | 2.00 | 28.60 | 2050 | 0.524 | 0.55 | 0.76 | 150 | 150 |

NOTE:- 4mm² to 25mm² Non-Compact Circular Conductor, 35mm² to Above: Compact Circular Conductor

## FIRE ALARM CABLE 300/500 v



### CONSTRUCTION

1. CONDUCTOR : Stranded Plain Annealed Copper Wire, According to IEC 60228 Class 2
2. FLAME BARRIER : Mica Based Fire Resistance Tape
3. INSULATION : Cross-Linked Polyethylene (XLPE)
4. WRAPPING : Mylar Tape (Optional)
5. SCREENING : Aluminium/Mylar Tape Screen in Contact with Drain Wire
6. OUTER SHEATH : Low Smoke Zero Halogen (LSZH), Orange Color

### APPLICATION

Specially Designed to be Use for Wiring Applications in Critical Life Safety System in Public and Industrial Buildings such as Airport, Hotels, Hospitals, Subways, Train Station, In Building Management Systems, Emergency Lightings, Standby Power Supplies, Lifts and Elevators, Plant Engineering and Construction, Industrial Machinery, Power Station.

**STANDARD: BS; 7629 Part 2 BS: 5308 Part 1 BS: 6387 BS: 6360 IEC: 60228 IEC: 60502 Part 1**

**VOLTAGE GRADE: 300/500V** **OPERATING TEMPERATURE: -20°C to +90°C**

| Number of Pairs and Cross Sectional Area of Conductor | No. and Nominal Diameter of Wire | Maximum DC Resistance of conductor at 20°C | Maximum AC Resistance of conductor at 90°C | Nominal Thickness of Insulation | Nominal Thickness of Sheath | Approx. Overall Diameter of Cable | Approximate Cable Weight | Approximate Capacitance (Mil/core) Core/Core | Approximate Capacitance (Core to Screen) | Current Rating | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | In Ground at 30°C | In Duct at 30°C | In Air at 35°C |
| mm² | no./mm | Ω/km | | mm | mm | | kg/km | pF/km | pF/km | Amps | Amps | Amps |
| 2X1.0 | 7/0.44 | 18.10 | 27.0 | 0.80 | 0.80 | 8.0 | 75 | 86 | 170 | 22 | 14 | 17 |
| 2X1.5 | 7/0.53 | 12.10 | 17.3 | 0.70 | 0.80 | 8.6 | 86 | 95 | 180 | 33 | 22 | 28 |
| 2X2.5 | 7/0.07 | 7.41 | 9.46 | 0.80 | 1.00 | 10.3 | 123 | 100 | 190 | 48 | 29 | 35 |
| 2X4.0 | 7/0.85 | 4.16 | 5.88 | 0.80 | 1.20 | 11.60 | 163 | 100 | 190 | 54 | 38 | 44 |

### TECHNICAL DATA

**CORE IDENTIFICATION CODE**
Pair: Black / Red or Blue / Brown
Multipair: Black / White with Numbering

**MINIMUM BENDING RADIUS**
10 X Cable Diameter

**TEST VOLTAGE**
$U_{ac}$=2000V, Between Conductors
$U_{ac}$=1500V, Between Conductors and Screen

### CABLE CHARACTERISTICS


Max. Operating temperature | Max. Short circuit temperature | Flame spread IEC 60332.3-24 (C) | Fire resistant IEC 60331, BS 6387 | Low smoke emission IEC 61034 | Halogen free IEC 60754-1 | Acidity and toxicity IEC 60754-2

## FIRE ALARM- FIR (SHIELD)
## TWO CORE (CU/MICA TAPE/PVC-FR/CAM+ATC DRAIN WIRE/PVC-FRLS/LSZH)


### CONSTRUCTION

1. CONDUCTOR : Solid /Stranded Circular, Plain Annealed Copper, Class-1 or Class- 2 to IEC 60228
2. FIRE BARRIER : Mica Tape (Synthetic or Glass Fiber)
3. INSULATION : Flame Retardant (FR) PVC, TI1-FR to BS 7655

COLOR OF INSULATION : For Two Core Cables ■ Red ■ Black

4. DRAIN WIRE : Annealed Tinned Copper, Class-1 to IEC 60228
5. COLLECTIVE SHIELD : Aluminium Mylar Tape
7. OUTER SHEATH : Flame Retardant (FR) PVC, TM1-FRLS to BS 7655

COLOR OF SHEATH : ■ Red ■ Orange

### APPLICATION

These cables are designed for emergency lighting, fire alarms, fire detection, audio circuits, control circuits and essential equipment un fire situations where an uninterrupted power supply has to be guaranteed. For fixed installation typically in fire alarm and emergency lighting circuits where circuit integrity must be maintained.

**STANDARD: BS 5308-2 & BS 7629-1 BS 6387, IEC 60331–21**

**VOLTAGE GRADE: 300/500 (550) V**

**OPERATING TEMPERATURE: -20°C to +70°C**

| PHYSICAL DATA | | | | | | | ELECTRICAL DATA | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Cross Sectional Area of Conductor | No. of strands & diameter of wire | Thickness of Mica tape | Nominal thickness of insulation | Nominal size of circuit protective conductor | Nominal thickness of sheath | Approx. Overall diameter | Approx. weight of cable | Max. DC Resistance of Conductor at 20°C | Current Carrying Capacity in conduit at 30°C | Current Carrying Capacity in air at 35°C |
| Core x mm² | No./mm | mm | mm | mm² | mm | mm | kg/km | Ω/km | Amps | Amps |
| **TWO CORE** | | | | | | | | | | |
| 2 X 1.5 FE | 1/1.38 | 0.11 | 0.7 | 1.5 FE | 0.9 | 9.2 | 125 | 12.1 | 14 | 22 |
| 2 X 1.5 FRI | 7/.53 | 0.11 | 0.7 | 1.5 FE | 0.9 | 9.5 | 130 | 12.1 | 14 | 22 |
| 2 X 2.5 FE | 1/1.78 | 0.11 | 0.8 | 2.5 FE | 1.0 | 10.5 | 175 | 7.41 | 18 | 30 |
| 2 X 2.5 FRI | 7/0.67 | 0.11 | 0.8 | 2.5 FE | 1.0 | 11.0 | 182 | 7.41 | 18 | 30 |
| **TWO CORE** | | | | | | | | | | |
| 2 X 1.5 FE | 1/1.38 | 0.11 | 0.7 | 1.5 FE | 0.9 | 9.2 | 120 | 12.1 | 16 | 25 |
| 2 X 1.5 FRI | 7/0.53 | 0.11 | 0.7 | 1.5 FE | 0.9 | 9.5 | 125 | 12.1 | 16 | 25 |
| 2 X 2.5 FE | 1/1.78 | 0.11 | 0.8 | 2.5 FE | 1.0 | 10.5 | 170 | 7.41 | 20 | 33 |
| 2 X 2.5 FRI | 7/0.67 | 0.11 | 0.8 | 2.5 FE | 1.0 | 11.0 | 175 | 7.41 | 20 | 33 |

# 25 & 35 KV 90°C PIC


## CONSTRUCTION

1. CONDUCTOR : Compact round stranded hard-drawn aluminium wires
2. CONDUCTOR SCREEN : Semi conductive cross-linked polyethylene (XLPE) compound
3. INSULATION : Black cross-linked polyethylene (XLPE)

Color ■ Black

## APPLICATION

Aeiral power transmission and distribution line.

| Nominal cross section area | Insulation thickness (+cond. screen) min. | Overall Diameter (approx.) | Maximum conductor resistance at 20°C | Capacitance (approx) | Current rating in air | Cable weight (approx) | Standard Length |
|---|---|---|---|---|---|---|---|
| sq.mm | mm | mm | ohm/km | uF/km | A | kg/km | m |
| **25 & 35 KV 90°C PIC** | | | | | | | |
| | | | PIC 25 KV | | | | |
| 35 | 2.22 | 12.8 | 0.868 | 0.354 | 146 | 176 | 1000 |
| 50 | 2.35 | 14.3 | 0.641 | 0.371 | 176 | 223 | 1000 |
| 70 | 2.45 | 16.2 | 0.443 | 0.408 | 222 | 298 | 1000 |
| 95 | 2.55 | 18.2 | 0.320 | 0.442 | 274 | 382 | 1000 |
| 120 | 2.60 | 19.8 | 0.253 | 0.474 | 319 | 479 | 1000 |
| 150 | 2.65 | 21.3 | 0.206 | 0.506 | 363 | 571 | 1000 |
| 185 | 2.70 | 23.3 | 0.164 | 0.3544 | 421 | 691 | 1000 |
| 240 | 2.80 | 25.9 | 0.125 | 0.584 | 502 | 880 | 1000 |
| | | | PIC 35 KV | | | | |
| 50 | 3.40 | 17.0 | 0.641 | 0.257 | 180 | 276 | 1000 |
| 70 | 3.55 | 19.0 | 0.443 | 0.281 | 224 | 358 | 1000 |
| 95 | 3.70 | 21.2 | 0.320 | 0.303 | 275 | 469 | 1000 |
| 120 | 3.80 | 22.9 | 0.253 | 0.323 | 319 | 559 | 1000 |
| 150 | 3.85 | 24.4 | 0.206 | 0.344 | 363 | 658 | 1000 |
| 185 | 3.90 | 26.3 | 0.164 | 0.371 | 420 | 785 | 1000 |
| 240 | 3.95 | 28.8 | 0.125 | 0.406 | 501 | 980 | 1000 |


## CONSTRUCTION

1. CONDUCTOR : Compact round stranded hard drawn Aluminium wires
2. CONDUCTOR SCREEN : Semi conductive cross linked polyethylene (XLPE) compound
3. INSULATION : Cross-linked polyethylene (XLPE) Color Natural
4. OUTER SHEATH : Cross linked polyethylene (XLPE) Color Black

## APPLICATION

Aeiral power transmission and distribution line

| Nominal cross sectional area | Insulation thickness nominal | Jacket thickness nominal | Overall diameter (approx) | Maximum cond. resi. at 20°C | Capacitance (approx) (approx) | Current rating in air | Cable weight (approx) | Standard length |
|---|---|---|---|---|---|---|---|---|
| sq.mm | mm | mm | mm | ohm/km | uF/km | A | kg/km | m |
| **25 & 35 KV 90°C SAC** | | | | | | | | |
| | | | SAC 25 KV | | | | | |
| 35 | 3.175 | 3.175 | 27.4 | 0.868 | 0.143 | 150 | 398 | 500 |
| 50 | 3.175 | 3.175 | 28.6 | 0.351 | 0.159 | 181 | 456 | 500 |
| 70 | 3.175 | 3.175 | 29.3 | 0.443 | 0.175 | 226 | 548 | 500 |
| 95 | 3.175 | 3.175 | 27.0 | 0.320 | 0.193 | 276 | 658 | 500 |
| 120 | 3.175 | 3.175 | 28.5 | 0.253 | 0.209 | 319 | 769 | 500 |
| 150 | 3.175 | 3.175 | 29.9 | 0.206 | 0.224 | 362 | 866 | 500 |
| 185 | 3.175 | 3.175 | 31.6 | 0.164 | 0.242 | 418 | 1003 | 500 |
| 240 | 3.175 | 3.175 | 34.0 | 0.125 | 0.268 | 47 | 1211 | 500 |
| | | | SAC 35 KV | | | | | |
| 50 | 4.445 | 3.175 | 28.4 | 0.641 | 0.139 | 185 | 549 | 500 |
| 70 | 4.445 | 3.175 | 29.0 | 0.443 | 0.154 | 225 | 645 | 500 |
| 95 | 4.445 | 3.175 | 29.8 | 0.320 | 0.170 | 274 | 762 | 500 |
| 120 | 4.445 | 3.175 | 31.2 | 0.253 | 0.183 | 317 | 868 | 500 |
| 150 | 4.445 | 3.175 | 32.6 | 0.206 | 0.198 | 360 | 980 | 500 |
| 185 | 4.445 | 3.175 | 34.4 | 0.164 | 0.212 | 415 | 1123 | 500 |
| 240 | 4.445 | 3.175 | 36.8 | 0.125 | 0.233 | 493 | 1341 | 500 |

## CURRENT CARRYING CAPACITY OF CABLES MADE ACCORDING TO BDS 900 & BS 6004

### 1. DEFINED CONDITIONS:

The basic of the current ratings of cables has been so chosen for normal ambient temperature of 35°C and for normal laying conditions as follows:

**A. For Groups of unenclosed systems of single core cable:**

1) The horizontal clearance between the system is around 150 mm and not less than six times the individual cables diameter or one time the overall width of the individual system.

2) The vertical clearance between system is not less than 150 mm.

3) If the numbers of systems are more four, they are installed in a horizontal plane.

**B. For Groups of unenclosed multi core cable:**

1) The horizontal clearance between the system is around 150 mm and not less than six times the individual cables diameter

2) The vertical clearance between cables is not less than 150 mm

3) If the numbers of cables are more than four, they are installed in a horizontal plane

### 2. DVIATED CONDITIONS:

If the actual conditions of installations are not same as normal conditions the current rating given are to be multiplied with the rating factors as given below:

| Ambient Temperature °C | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
|---|---|---|---|---|---|---|---|---|
| Rating factors for cables having excess-current protection which will operate within four hours at 1.5 times of the designed local current. | 1.13 | 1.06 | 1.0 | 0.93 | 0.84 | 0.76 | 0.65 | 0.53 |
| Rating factors for cables having no excess current protection as above | 1.05 | 1.03 | 1.0 | 0.97 | 0.94 | 0.91 | 0.79 | 0.65 |

**Rating Factors for the Grouping of Cables**

| | Number of multicore cable or number of alternating and rotary current circuits for single-core cables (2 and 3 current carrying conductors) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 14 | 16 | 18 | 20 |
|  | Laid in bundles directly on the wall, on the floor, in electro-installation ducts or conduits and on or in the wall | | | | | | | | | | | | | | |
| | 1.0 | 0.80 | 0.70 | 0.65 | 0.60 | 0.57 | 0.54 | 052 | 0.50 | 0.48 | 0.45 | 0.43 | 0.41 | 0.39 | 0.38 |
|  | Single-layer on the wall or on the floor in contact with one another | | | | | | | | | | | | | | |
| | 1.0 | 0.85 | 0.79 | 0.75 | 0.73 | 0.72 | 0.72 | 0.71 | 0.70 | | | | | | |
|  | Single-Layer on the wall or on the floor. Distance between two cables: diameter of cable | | | | | | | | | | | | | | |
| | 1.0 | 0.94 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
|  | Single-Layer Under the ceiling in contract with one another | | | | | | | | | | | | | | |
| | 0.95 | 0.81 | 0.72 | 0.68 | 0.66 | 0.64 | 0.63 | 0.62 | 0.61 | | | | | | |
|  | Single-Layer Under the ceiling. Distance between two cables: diameter of cable | | | | | | | | | | | | | | |
| | 0.95 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 |

1) according to IECTC 64 (Sec) 261, edition March 1979

## CURRENT CARRYING CAPACITY OF CABLES MADE ACCORDAING TO VDE 0271, IEC 60502-1

### 1. General

The Current Carrying Capacity of cable depends on the maximum permissible conductor temperature, thermal resistivity of the materials from the Insulation to the outer sheath surface and the ambient conditions which affect the dissipation of heat from the cable surface.

For a given cable design the inner thermal resistance of the materials between conductor and cable surface is definite and constant. On the contrary, the external thermal resistance surrounding the cable along its way, hence the external dissipation is dependent on several variable factors below:

A. Thermal resistivity of soil which depends on the nature of the soil and moisture content.
B. The variation of thermal resistivity along the cable path for different earth conditions, such as, filled up earth, trenches etc.
C. The increase of thermal resistivity by the drying of the soil due to continuous full loading of the cable and due to grouping of cables.
D. Reduce heat dissipation owing to air pockets which may be enclosed under protective covers, in channels, in pipes or in ducts.
E. Heating of cable due to grouping of cables, proximity of heating pipes or direct sun rays.
F. Smaller heat dissipation of cables installed free in air.

In order to determined correctly the above conditions the correct measurement of thermal resistivity of earth/air and the ambient temperature along the cable path are to be determined for one complete cycle of the seasons of a year.

### 2. Normal Conditions

The basis of the current ratings has been so chosen that they, without considering any multiplication factors, are suitable for cable laid in our country under the following defined conditions:

### A. Cable Laying In Ground

1. Temperature of the soil at the depth of laying = 30°C
2. Depth of laying = 700 mm / 70.0 cm / 0.70 meter
3. Cable way is covered with laying of sand and brick
4. Thermal resistivity of the soil at continuous full loading of the cables = 120°C.cm/W
5. One single core d.c cable installed separately or one multicore cable installed separately or three single core cables in three phase system installed in flat formation with clearance of 7 cm or in trefoil formation, touching each other.
6. The cable way is through a pipe of length not more than 6 meters.

### B. Cable Laying In Air

1. Ambient air temperature = 35°C
2. One single core d.c cable installed separately free in air or one multicore cable installed separately free in air or one three phase system, comprising cable three single core cables installed separately free air in flat formation with a clearance of one diameter between individual single core cables or in trefoil formation each individual single core cable being in touch with each other.
3. One single core d.c cable, one multicore cable or one there phase system of three single core cables installed free in air with minimum clearance of.
   a) 2 cm from floor, wall or roof of the room.
   b) Twice the cable diameter between two cables and four times the cable diameter two systems.
   c) 30 cm vertically between laying installed one above the other.
4. Cable is protected against radiation of heat from sun or any other source.

## KEY INFORMATION FOR CURRENT CARRYING CAPACITY OF CABLE

- Radiation of heats and solar influence must be taken into consideration, where a good air circulation is needed
- A sufficient large distance is to be retained between the cables and the heating elements, because badly insulated heating
- Elements often raise additionally the temperature of the cable
- Distance between the cable and the wall, floor or ceiling = 2 cm
- Distance between the cable being laid one above the other = 2 x D (where D is the overall cable diameter)
- Distance between the cable system being laid one above the other = 20 cm
- Distance between the cable being laid side by side = 2 x D (where D is the overall cable diameter)
- Approximate value of Specific Ground (Soil) Thermal Resistivity:

  Vary moist area = 70°C.cm/W
  Moist area = 100°C.cm/W
  Dry area = 200°C.cm/W
  Vary dry area = 300°C.cm/W

## DEVIATED CONDITIONS FOR UNDERGROUND

If the actual conditions of cable laying are not same as normal conditions, the current rating value of cables are to be multiplied with rating factors given in the following tables:

### Variation of Depth of Laying (Twin or Multicore Cables)

| | Depth of Laying in cm | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | < 70 | < 90 | < 105 | < 120 | < 150 | < 180 | < 270 | < 360 | < 450 | 540 or more |
| Rating Factor | 1 | 0.99 | 0.98 | 0.97 | 0.96 | 0.95 | 0.92 | 0.91 | 0.90 | 0.89 |

### Rating Factor for Cables Laid in Sand

| Condition of Laying | | |
|---|---|---|
| Pumned down sand and cover of bricks | Single core or Multicore cable laid in ground and added Mechanical protection for cable with air gilled hollow | Single core or Multicore cable direct in the ground with added mechanical protection and hollow filled with sand |
|  |  |  |
| Conversion Factors for above | | |
| 1 | 0.80 | 0.90 |

### Variation of Specific Thermal Resistivity of Soil for Cables : Factor A

| | Specific Thermal Resistivity of Soil in °C.cm/W | | | | | | |
|---|---|---|---|---|---|---|---|
| Cross Sectional Area of Conductor | 70 | 100 | 120 | 150 | 200 | 250 | 300 |
| 25 mm² and Below | 1.18 | 1.07 | 1.00 | 0.93 | 0.83 | 0.77 | 0.71 |
| 35 mm² to 95 mm² | 1.22 | 1.08 | 1.00 | 0.93 | 0.82 | 0.75 | 0.69 |
| 120 mm² to 240 mm² | 1.23 | 1.08 | 1.00 | 0.93 | 0.82 | 0.74 | 0.69 |
| 300 mm² and Above | 1.25 | 1.08 | 1.00 | 0.93 | 0.82 | 0.74 | 0.69 |

## Variation of Specific Thermal Resistivity of Soil for Cables : Factor B

| Cable Type | Voltage ($U_0/U$) | Specific Thermal Resistivity of Soil on °C.cm/W | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | kV | 70 | 100 | 120 | 150 | 200 | 250 | 300 |
| 3 and 4 Core Cable | 0.6/1.0 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Twin core Cable | 0.6/1.0 | 0.97 | 0.99 | 1.00 | 1.00 | 1.01 | 1.01 | 1.02 |
| Single Core D.C | 0.6/1.0 | 0.97 | 0.99 | 1.00 | 1.00 | 1.01 | 1.01 | 1.02 |
| 3 unarmoured Single Core Cable | 0.6/1.0 | 1.01 | 1.00 | 1.00 | 0.98 | 0.97 | 0.97 | 0.96 |

For variation of specific thermal resistivity of soil form 120°C.cm/W, the current rating values are to be multiplied by both the Factor A (Cross-Sectional Area) and Factor B (Voltage Grade) to obtain the actual rating.

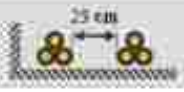
## Rating Factors for Variation of Ambient Temperature for Cables Laid in Underground

| Insulation Type | Voltage ($U_0/U$) | Ambient Temperature °C | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | kV | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| PVC | 0.6/1.0 | 1.18 | 1.12 | 1.07 | 1.00 | 0.95 | 0.87 | 0.79 | 0.70 | 0.60 |
| XLPE | 0.6/1.0 | 1.12 | 1.11 | 1.05 | 1.00 | 0.95 | 0.89 | 0.82 | 0.72 | 0.62 |

## Group Rating Factors for Multicore and Single Core D.C Cables in the Ground

| Condition of Cable Laying | | Number of Systems or Cables | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2 | 3 | 4 | 5 | 6 | 8 | 10 |
| Cable laid direct in the Ground in Flat Formation, clearance 7 cm (thickness of a brick) between the cables |   | 0.85 | 0.75 | 0.68 | 0.64 | 0.60 | 0.56 | 0.53 |

## Group Rating Factors for Single Core in Three Phase System in the Ground

| Condition of Cable Laying | | Number of Systems or Cables | | |
|---|---|---|---|---|
| | | 2 | 3 | 4 |
| Cable laid direct in the ground in Flat Formation, clearance 7 cm between systems and also between individual cables in each system |   | 0.82 | 0.74 | 0.68 |
| Cable laid direct in the ground in Trefoil formation, touching each other, clearance 25 cm between systems |   | 0.85 | 0.77 | 0.72 |

## Multicore Cables in Steel or Earthenware Pipe

| | One Multicore Cable in each Pipe | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Rating Factor | 0.82 | 0.74 | 0.70 | 0.67 | 0.65 | 0.63 | 0.63 | 0.60 | 0.59 | 0.58 |

## Cables in Trench, Pipes and Pipe Block

In these cases the current rating factor may vary. The permissible values of rating factor for individual cases are to be determined separately by special arrangements.

## DEVIATED CONDITIONS FOR AIR

## Rating Factors for Variation of Ambient Temperature for Cables Laid Free in Air

| Insulation Type | Voltage ($U_0/U$) | Ambient Temperature °C | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | kV | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| PVC | 0.6/1.0 | 1.13 | 1.06 | 1.00 | 0.93 | 0.84 | 0.76 | 0.65 | 0.53 |
| XLPE | 0.6/1.0 | 1.08 | 1.04 | 1.00 | 0.96 | 0.87 | 0.79 | 0.68 | 0.57 |

## Group Rating Factors for Multicore and Single Core D.C Cables Laid in Air

Clearance d = One Cable Diameter between adjacent cables and Distance from the wall not less than 2 cm

| Arrangements of Cable | | Number of Adjacently Laid Cables | | | | |
|---|---|---|---|---|---|---|
| Cables Laid on Ground in Flat Formation |  | 1 | 2 | 3 | 6 | 9 |
| | | 0.95 | 0.90 | 0.88 | 0.85 | 0.84 |

| Arrangements of Cable | | Number of troughs | 1 | 2 | 3 | 6 | 9 |
|---|---|---|---|---|---|---|---|
| Cable laid on troughs (Restricted air circulation) in Flat Formation |  | 1 | 0.95 | 0.90 | 0.88 | 0.85 | 0.84 |
| | | 2 | 0.90 | 0.85 | 0.83 | 0.81 | 0.80 |
| | | 3 | 0.88 | 0.83 | 0.81 | 0.79 | 0.78 |
| | | 6 | 0.86 | 0.81 | 0.79 | 0.77 | 0.76 |

| Arrangements of Cable | | Number of Rack | 1 | 2 | 3 | 6 | 9 |
|---|---|---|---|---|---|---|---|
| Cable laid on racks in Flat Formation |  | 1 | 1.00 | 0.98 | 0.96 | 0.93 | 0.92 |
| | | 2 | 1.00 | 0.95 | 0.93 | 0.90 | 0.89 |
| | | 3 | 1.00 | 0.94 | 0.92 | 0.89 | 0.88 |
| | | 6 | 1.00 | 0.93 | 0.90 | 0.87 | 0.86 |

| Arrangements of Cable | | 1 | 2 | 3 | 6 | 9 |
|---|---|---|---|---|---|---|
| Cable Arranged Vertically on Structures or on Wall |  | 1.00 | 0.93 | 0.90 | 0.87 | 0.86 |
| Arrangement where reduction of current is not necessary | | This applies only when the cable temperature has no effect on the ambient temperature. | | | | |

Cables Touching each other and in Contact with the Wall

| Arrangements of Cable | | Number of Adjacently Laid Cables | | | | |
|---|---|---|---|---|---|---|
| Cables Laid on Ground in Flat Formation |  | 1 | 2 | 3 | 6 | 9 |
| | | 0.90 | 0.84 | 0.80 | 0.75 | 0.73 |

| Arrangements of Cable | | Number of troughs | 1 | 2 | 3 | 6 | 9 |
|---|---|---|---|---|---|---|---|
| Cable laid on troughs (Restricted air circulation) in Flat Formation |  | 1 | 0.95 | 0.84 | 0.80 | 0.75 | 0.73 |
| | | 2 | 0.95 | 0.80 | 0.76 | 0.71 | 0.69 |
| | | 3 | 0.95 | 0.78 | 0.74 | 0.70 | 0.68 |
| | | 6 | 0.95 | 0.76 | 0.72 | 0.68 | 0.66 |

| Arrangements of Cable | | Number of Rack | 1 | 2 | 3 | 6 | 9 |
|---|---|---|---|---|---|---|---|
| Cable laid on racks in Flat Formation |  | 1 | 0.95 | 0.84 | 0.80 | 0.75 | 0.73 |
| | | 2 | 0.95 | 0.80 | 0.76 | 0.71 | 0.69 |
| | | 3 | 0.95 | 0.78 | 0.74 | 0.70 | 0.68 |
| | | 6 | 0.95 | 0.76 | 0.72 | 0.68 | 0.66 |

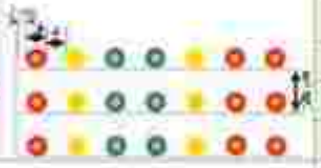
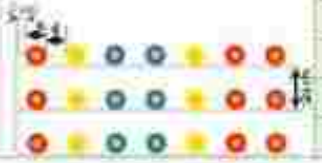
Cables Touching each other and in Contact with the Wall

| Arrangements of Cable | | Number of Adjacently Laid Cables | | | | |
|---|---|---|---|---|---|---|
| Cable Arranged Vertically on Structures or on Wall |  | 1 | 2 | 3 | 6 | 9 |
| | | 0.95 | 0.78 | 0.73 | 0.69 | 0.66 |

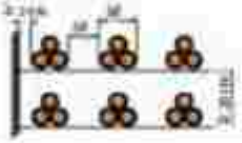
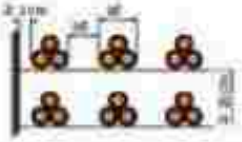
| | |
|---|---|
| Arrangement where reduction of current is not necessary | This applies only when the cable temperature has no effect on the ambient temperature. |

## Group Rating Factors for Single Core Cables in Three Phase System in Air

Clearance d = One Cable Diameter between adjacent cables and Distance from the wall not less than 2 cm

| Arrangements of Cable | | Number of Adjacently Laid System | | |
|---|---|---|---|---|
| Cables Laid on Ground in Flat Formation |  | 1 | 2 | 3 |
| | | 0.92 | 0.89 | 0.88 |
| Cable laid on troughs (Restricted air circulation) in Flat Formation |  | Number of troughs | 1 | 2 | 3 |
| | | 1 | 0.92 | 0.89 | 0.88 |
| | | 2 | 0.87 | 0.84 | 0.83 |
| | | 3 | 0.84 | 0.82 | 0.81 |
| | | 6 | 0.82 | 0.80 | 0.79 |
| Cable laid on racks in Flat Formation |  | Number of Rack | 1 | 2 | 3 |
| | | 1 | 1.00 | 0.97 | 0.96 |
| | | 2 | 0.97 | 0.94 | 0.93 |
| | | 3 | 0.96 | 0.93 | 0.92 |
| | | 6 | 0.94 | 0.91 | 0.90 |
| Cable Arranged Vertically on Structures or on Wall |  | 1 | 2 | 3 |
| | | 0.94 | 0.91 | 0.89 |

Cable in Trefoil Formation, Clearance 2 x One Diameter between systems and Distance from the wall not less than 2 cm

| Arrangements of Cable | | Number of Adjacently Laid System | | |
|---|---|---|---|---|
| Cables Laid on Ground in Trefoil Formation |  | 1 | 2 | 3 |
| | | 0.95 | 0.90 | 0.88 |
| Cable laid on troughs (Restricted air circulation) in Trefoil Formation |  | Number of troughs | 1 | 2 | 3 |
| | | 1 | 0.95 | 0.90 | 0.88 |
| | | 2 | 0.90 | 0.85 | 0.83 |
| | | 3 | 0.88 | 0.83 | 0.81 |
| | | 6 | 0.86 | 0.81 | 0.79 |
| Cable laid on racks in Trefoil Formation |  | Number of Rack | 1 | 2 | 3 |
| | | 1 | 1.00 | 0.98 | 0.96 |
| | | 2 | 1.00 | 0.95 | 0.93 |
| | | 3 | 1.00 | 0.94 | 0.92 |
| | | 6 | 1.00 | 0.93 | 0.90 |
| Cable Arranged Vertically on Structures or on Wall |  | 1 | 2 | 3 |
| | | 0.89 | 0.86 | 0.84 |

## CURRENT CARRYING CAPACITY OF CABLES MADE ACCORDAING TO IEC 60502–2

### DEFINED CONDITON:

- Maximum Conductor Temperature in Normal Operation — 90°C
- Ambient Air Temperature — 30°C
- Ground Temperature — 20°C
- Depth of Laying — 0.80 Meter
- Thermal Resistivity of Soil — 1.5 k·m/W
- Thermal Resistivity of Earthenware Duct — 1.2 k·m/W
- Type of Installation:
  - Single Core Cables Installed in Trefoil Formation
  - Multicore Cables Installed in Singly
- For Buried Cables:
  - Directly in the Sail at 20°C
  - In Duct in the Ground at 20°C

### Correction Factors for Ambient Air temperatures others than 30°C

| Maximum Conductor Temperature, °C | Ambient ground temperature, °C | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20 | 25 | 35 | 40 | 45 | 50 | 55 | 60 |
| 90 | 1.08 | 1.04 | 0.96 | 0.91 | 0.87 | 0.82 | 0.76 | 071 |

### Correction Factors for Ambient Ground Temperatures others than 20°C

| Maximum Conductor temperature, °C | Ambient ground temperature, °C | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 10 | 15 | 25 | 30 | 35 | 40 | 45 | 50 |
| 90 | 1.07 | 1.04 | 0.96 | 0.93 | 0.89 | 0.85 | 0.80 | 0.76 |

### Correction Factors for Depths of Laying other than 0.8 m for Direct Buried Cables

| Depth of Laying, Meter | Single-Core Cables Nominal Conductor Size, mm² | | Three-Core Cables |
|---|---|---|---|
| | ≤ 185 mm² | > 185 mm² | |
| 0.50 | 1.04 | 1.06 | 1.04 |
| 0.60 | 1.02 | 1.04 | 1.03 |
| 1.00 | 0.98 | 0.97 | 0.98 |
| 1.25 | 0.96 | 0.95 | 0.96 |
| 1.50 | 0.95 | 0.93 | 0.95 |
| 1.75 | 0.94 | 0.91 | 0.94 |
| 2.00 | 0.93 | 0.90 | 0.93 |
| 2.50 | 0.91 | 0.88 | 0.91 |
| 3.00 | 0.90 | 0.86 | 0.90 |

## Correction Factors for Depths of Laying other than 0.8 m for Cable in Ducts

| Depth of Laying, Meter | Single-Core Cables Nominal Conductor Size, mm² | | Three-Core Cables |
|---|---|---|---|
| | ≤ 185 mm² | > 185 mm² | |
| 0.50 | 1.04 | 1.05 | 1.03 |
| 0.60 | 1.02 | 1.03 | 1.02 |
| 1.00 | 0.98 | 0.97 | 0.99 |
| 1.25 | 0.96 | 0.95 | 0.97 |
| 1.50 | 0.95 | 0.93 | 0.96 |
| 1.75 | 0.94 | 0.92 | 0.95 |
| 2.00 | 0.93 | 0.91 | 0.94 |
| 2.50 | 0.91 | 0.89 | 0.93 |
| 3.00 | 0.90 | 0.88 | 0.92 |

## Correction Factors for Soil Thermal Resistivity's other than 1.5 K-m/W for Direct Buried Single-Core Cables

| Nominal area of conductor, mm² | Values of soil thermal resistivity, K-m/W | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.7 | 0.8 | 0.9 | 1.0 | 2.0 | 2.5 | 3.0 |
| 16 | 1.29 | 1.24 | 1.19 | 1.15 | 0.89 | 0.82 | 0.75 |
| 25 | 1.30 | 1.25 | 1.20 | 1.16 | 0.89 | 0.81 | 0.75 |
| 35 | 1.30 | 1.25 | 1.21 | 1.16 | 0.89 | 0.81 | 0.75 |
| 50 | 1.32 | 1.26 | 1.21 | 1.16 | 0.89 | 0.81 | 0.74 |
| 70 | 1.33 | 1.27 | 1.22 | 1.17 | 0.89 | 0.81 | 0.74 |
| 95 | 1.34 | 1.28 | 1.22 | 1.18 | 0.89 | 0.80 | 0.74 |
| 120 | 1.34 | 1.28 | 1.22 | 1.18 | 0.88 | 0.80 | 0.74 |
| 150 | 1.35 | 1.28 | 1.23 | 1.18 | 0.88 | 0.80 | 0.74 |
| 185 | 1.35 | 1.29 | 1.23 | 1.18 | 0.88 | 0.80 | 0.74 |
| 240 | 1.36 | 1.29 | 1.23 | 1.18 | 0.88 | 0.80 | 0.73 |
| 300 | 1.36 | 1.30 | 1.24 | 1.19 | 0.88 | 0.80 | 0.73 |
| 400 | 1.37 | 1.30 | 1.24 | 1.19 | 0.88 | 0.79 | 0.73 |

## Correction Factors for Soil Thermal Resistivity's other than 1.5 K-m/W for Direct Buried Single-Core Cables

| Nominal area of conductor, mm² | Values of soil thermal resistivity, K-m/W | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.7 | 0.8 | 0.9 | 1.0 | 2.0 | 2.5 | 3.0 |
| 16 | 1.20 | 1.17 | 1.14 | 1.11 | 0.92 | 0.85 | 0.79 |
| 25 | 1.21 | 1.17 | 1.14 | 1.12 | 0.91 | 0.85 | 0.79 |
| 35 | 1.21 | 1.18 | 1.15 | 1.12 | 0.91 | 0.84 | 0.79 |
| 50 | 1.21 | 1.18 | 1.15 | 1.12 | 0.91 | 0.84 | 0.78 |
| 70 | 1.22 | 1.19 | 1.15 | 1.12 | 0.91 | 0.84 | 0.78 |
| 95 | 1.23 | 1.19 | 1.16 | 1.13 | 0.91 | 0.84 | 0.78 |
| 120 | 1.23 | 1.20 | 1.16 | 1.13 | 0.91 | 0.84 | 0.78 |
| 150 | 1.24 | 1.20 | 1.16 | 1.13 | 0.91 | 0.83 | 0.78 |
| 185 | 1.24 | 1.20 | 1.17 | 1.13 | 0.91 | 0.83 | 0.78 |
| 240 | 1.25 | 1.21 | 1.17 | 1.14 | 0.90 | 0.83 | 0.77 |
| 300 | 1.25 | 1.21 | 1.17 | 1.14 | 0.90 | 0.83 | 0.77 |
| 400 | 1.25 | 1.21 | 1.17 | 1.14 | 0.90 | 0.83 | 0.77 |

## Correction Factors for Soil Thermal Resistivity's other than 1.5 K·m/W for Direct Buried Three –Core Cables

| Nominal area of conductor, mm² | Values of soil thermal resistivity, K·m/W | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.7 | 0.8 | 0.9 | 1.0 | 2.0 | 2.5 | 3.0 |
| 16 | 1.23 | 119 | 1.16 | 1.13 | 0.91 | 0.84 | 0.78 |
| 25 | 1.24 | 1.20 | 1.16 | 1.13 | 0.91 | 0.84 | 0.78 |
| 35 | 1.25 | 1.21 | 1.17 | 1.13 | 0.91 | 0.83 | 0.78 |
| 50 | 1.25 | 1.21 | 1.17 | 1.14 | 0.91 | 0.83 | 0.77 |
| 70 | 1.26 | 1.21 | 1.18 | 1.14 | 0.90 | 0.84 | 0.77 |
| 95 | 1.26 | 1.22 | 1.18 | 1.14 | 0.90 | 0.84 | 0.77 |
| 120 | 1.26 | 1.22 | 1.18 | 1.14 | 0.90 | 0.84 | 0.77 |
| 150 | 1.27 | 1.22 | 1.18 | 1.15 | 0.90 | 0.83 | 0.77 |
| 185 | 1.27 | 1.23 | 1.18 | 1.15 | 0.90 | 0.83 | 0.77 |
| 240 | 1.28 | 1.23 | 1.19 | 1.15 | 0.90 | 0.83 | 0.77 |
| 300 | 1.28 | 1.23 | 1.19 | 1.15 | 0.90 | 0.83 | 0.77 |
| 400 | 1.28 | 1.23 | 1.19 | 1.15 | 0.90 | 0.83 | 0.76 |

## Correction Factors for Soil Thermal Resistivity's other than 1.5 K·m/W for Three –Core Cables in Ducts

| Nominal area of conductor, mm² | Values of soil thermal resistivity, K·m/W | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.7 | 0.8 | 0.9 | 1.0 | 2.0 | 2.5 | 3.0 |
| 16 | 1.12 | 1.11 | 1.09 | 1.08 | 0.94 | 0.89 | 0.84 |
| 25 | 1.14 | 1.12 | 1.10 | 1.08 | 0.94 | 0.89 | 0.84 |
| 35 | 1.14 | 1.12 | 1.10 | 1.08 | 0.94 | 0.88 | 0.84 |
| 50 | 1.14 | 1.12 | 1.10 | 1.08 | 0.94 | 0.88 | 0.84 |
| 70 | 1.15 | 1.13 | 1.11 | 1.09 | 0.94 | 0.88 | 0.83 |
| 95 | 1.15 | 1.13 | 1.11 | 1.09 | 0.94 | 0.88 | 0.83 |
| 120 | 1.15 | 1.13 | 1.11 | 1.09 | 0.93 | 0.88 | 0.83 |
| 150 | 1.16 | 1.13 | 1.11 | 1.09 | 0.93 | 0.88 | 0.83 |
| 185 | 1.16 | 1.14 | 1.11 | 1.09 | 0.93 | 0.87 | 0.83 |
| 240 | 1.16 | 1.14 | 1.12 | 1.10 | 0.93 | 0.87 | 0.82 |
| 300 | 1.17 | 1.14 | 1.12 | 1.10 | 0.93 | 0.87 | 0.82 |
| 400 | 1.17 | 1.14 | 1.12 | 1.10 | 0.92 | 0.86 | 0.81 |

## Correction Factors for Groups of Three-Core Cables in Horizontal Formation Laid Direct in the Ground

| Number of cables in group | Spacing Between Cable Centres, mm | | | | |
|---|---|---|---|---|---|
| | Touching | 200 | 400 | 600 | 800 |
| 2 | 0.80 | 0.86 | 0.90 | 0.92 | 0.94 |
| 3 | 0.69 | 0.77 | 0.82 | 0.86 | 0.89 |
| 4 | 0.62 | 0.72 | 0.79 | 0.83 | 0.87 |
| 5 | 0.57 | 0.68 | 0.76 | 0.81 | 0.85 |
| 6 | 0.54 | 0.65 | 0.74 | 0.80 | 0.84 |
| 7 | 0.51 | 0.63 | 0.72 | 0.78 | 0.83 |
| 8 | 0.49 | 0.61 | 0.71 | 0.78 | - |
| 9 | 0.47 | 0.60 | 0.70 | 0.77 | - |
| 10 | 0.46 | 0.59 | 0.69 | - | - |
| 11 | 0.45 | 0.57 | 0.69 | - | - |
| 12 | 0.43 | 0.56 | 0.68 | - | - |

## Correction Factors for Groups of Three-Phase Circuits of Single-Core Cables Laid Direct in the Ground

| Number of cables in group | Spacing Between Cable Centres, mm | | | | |
|---|---|---|---|---|---|
| | Touching | 200 | 400 | 600 | 800 |
| 2 | 0.73 | 0.83 | 0.88 | 0.90 | 0.92 |
| 3 | 0.60 | 0.73 | 0.79 | 0.83 | 0.86 |
| 4 | 0.54 | 0.68 | 0.75 | 0.80 | 0.84 |
| 5 | 0.49 | 0.63 | 0.72 | 0.78 | 0.82 |
| 6 | 0.46 | 0.61 | 0.70 | 0.76 | 0.81 |
| 7 | 0.43 | 0.58 | 0.68 | 0.75 | 0.80 |
| 8 | 0.41 | 0.57 | 0.67 | 0.74 | - |
| 9 | 0.39 | 0.55 | 0.66 | 0.73 | - |
| 10 | 0.37 | 0.54 | 0.65 | - | - |
| 11 | 0.36 | 0.53 | 0.64 | - | - |
| 12 | 0.35 | 0.52 | 0.64 | - | - |

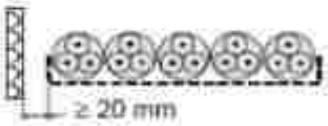
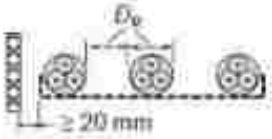
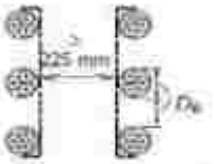
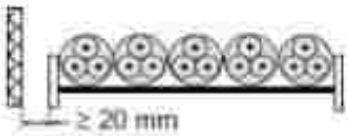
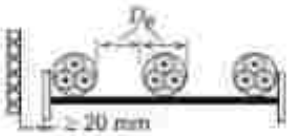
## Correction Factors for Groups of Three-Core Cables in Single Way Ducts in Horizontal Formation

| Number of cables in group | Spacing Between Cable Centres, mm | | | | |
|---|---|---|---|---|---|
| | Touching | 200 | 400 | 600 | 800 |
| 2 | 0.85 | 0.88 | 0.92 | 0.94 | 0.95 |
| 3 | 0.75 | 0.80 | 0.85 | 0.88 | 0.91 |
| 4 | 0.69 | 0.75 | 0.82 | 0.86 | 0.89 |
| 5 | 0.65 | 0.72 | 0.79 | 0.84 | 0.87 |
| 6 | 0.62 | 0.69 | 0.77 | 0.83 | 0.87 |
| 7 | 0.59 | 0.67 | 0.76 | 0.82 | 0.86 |
| 8 | 0.57 | 0.65 | 0.75 | 0.81 | - |
| 9 | 0.55 | 0.64 | 0.74 | 0.80 | - |
| 10 | 0.54 | 0.63 | 0.73 | - | - |
| 11 | 0.52 | 0.62 | 0.73 | - | - |
| 12 | 0.51 | 0.61 | 0.72 | - | - |

## Correction Factors for Groups of Three-Phase Circuits of Single-Core in Single Way Ducts

| Number of cables in group | Spacing Between Cable Centres, mm | | | | |
|---|---|---|---|---|---|
| | Touching | 200 | 400 | 600 | 800 |
| 2 | 0.78 | 0.85 | 0.89 | 0.91 | 0.93 |
| 3 | 0.66 | 0.75 | 0.81 | 0.85 | 0.88 |
| 4 | 0.59 | 0.70 | 0.77 | 0.82 | 0.86 |
| 5 | 0.55 | 0.66 | 0.74 | 0.80 | 0.84 |
| 6 | 0.51 | 0.64 | 0.72 | 0.78 | 0.83 |
| 7 | 0.48 | 0.61 | 0.71 | 0.77 | 0.82 |
| 8 | 0.46 | 0.60 | 0.70 | 0.76 | - |
| 9 | 0.44 | 0.58 | 0.69 | 0.76 | - |
| 10 | 0.43 | 0.57 | 0.68 | - | - |
| 11 | 0.42 | 0.56 | 0.67 | - | - |
| 12 | 0.40 | 0.55 | 0.67 | - | - |

## Reduction Factors for Groups of more than One Multi-Core Cable in Air-to be Applied to the Current-Carrying Capacity for One Multi-Core Cable in Free Air

| Method of Installation | | Number of Trays | Number of Cables | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 6 | 9 |
| Cables on Perforated Trays | Touching   | 1 | 1.00 | 0.88 | 0.82 | 0.79 | 0.76 | 0.73 |
| | | 2 | 1.00 | 0.87 | 0.80 | 0.77 | 0.73 | 0.68 |
| | | 3 | 1.00 | 0.86 | 0.79 | 0.76 | 0.71 | 0.66 |
| | Spaced   | 1 | 1.00 | 1.00 | 0.98 | 0.95 | 0.91 | - |
| | | 2 | 1.00 | 0.99 | 0.96 | 0.92 | 0.87 | - |
| | | 3 | 1.00 | 0.98 | 0.95 | 0.91 | 0.85 | - |
| Cables on Vertical Perforate Trays |   Touching | 1 | 1.00 | 0.88 | 0.82 | 0.78 | 0.73 | 0.72 |
| | | 2 | 1.00 | 0.88 | 0.81 | 0.76 | 0.71 | 0.70 |
| |   Spaced | 1 | 1.00 | 0.91 | 0.89 | 0.88 | 0.87 | - |
| | | 2 | 1.00 | 0.91 | 0.88 | 0.87 | 0.85 | - |
| Cables on Ladder Supports, Cleats, etc. | Touching   | 1 | 1.00 | 0.87 | 0.82 | 0.80 | 0.79 | 0.78 |
| | | 2 | 1.00 | 0.86 | 0.80 | 0.78 | 0.76 | 0.73 |
| | | 3 | 1.00 | 0.85 | 0.79 | 0.76 | 0.73 | 0.70 |
| | Spaced   | 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | - |
| | | 2 | 1.00 | 0.99 | 0.98 | 0.97 | 0.96 | - |
| | | 3 | 1.00 | 0.98 | 0.97 | 0.96 | 0.93 | - |

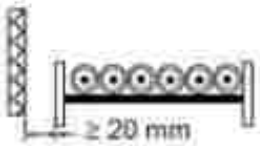
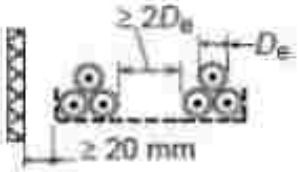
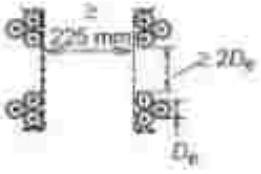
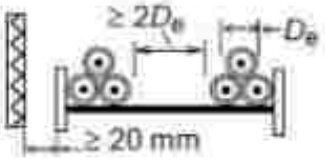
NOTE 1 Values given are averages for the cable types and range of conductor sizes considered. The spread of values is generally less than 5%.

NOTE 2 Factors apply to single layer groups of cables as shown above and do not apply when cables are installed in more than one layer touching each other. Values for such installations may be significantly lower and must be determined by an appropriate method.

NOTE 3 Values are given for vertical spacings between trays of 300 mm and at least 20 mm between trays and wall. For closer spacing, the factors should be reduced.

NOTE 4 Values are given for Horizontal spacing between trays of 225 mm with trays mounted back to back. For closer spacing, the factors should be reduced.

## Reduction Factors for Groups of more than One Circuit of Single-Core Cables (Note 2) - to be Applied to the Current-Carrying Capacity for One Circuit of Single-Core cables in Free Air

| Method of installation | | Number of trays | Number of three-phase circuits (Note 5) 1 | 2 | 3 | Use as a multiplier to rating for |
|---|---|---|---|---|---|---|
| Perforated trays (Note 3) | Touching   | 1 | 0,98 | 0,91 | 0,87 | Three Cables in Horizontal Formation |
| | | 2 | 0,96 | 0,87 | 0,81 | |
| | | 3 | 0,95 | 0,85 | 0,78 | |
| Ladder Supports, Cleats etc. (Note 3) | Touching   | 1 | 1,00 | 0,97 | 0,96 | Three Cables in Horizontal Formation |
| | | 2 | 0,98 | 0,93 | 0,89 | |
| | | 3 | 0,97 | 0,90 | 0,86 | |
| Perforated trays (Note 3) |   | 1 | 1,00 | 0,98 | 0,96 | |
| | | 2 | 0,97 | 0,93 | 0,89 | |
| | | 3 | 0,96 | 0,92 | 0,86 | |
| Vertical Perforated trays (Note 3) |   Spaced | 1 | 1,00 | 0,91 | 0,89 | Three Cables in Trefoil Formation |
| | | 2 | 1,00 | 0,90 | 0,86 | |
| Ladder Supports, Cleats etc. (Note 3) |   | 1 | 1,00 | 1,00 | 1,00 | |
| | | 2 | 0,97 | 0,95 | 0,93 | |
| | | 3 | 0,96 | 0,94 | 0,90 | |

NOTE 1 Values given are averages for the cable types and range of conductor sizes considered. The spread of values is generally less than 5%.

NOTE 2 Factors apply to single layer groups of cables (or trefoil groups) as shown in the table and do not apply when cables are installed in more than one layer touching each other. Values for such installations may be significantly lower and must be determined by an appropriate method.

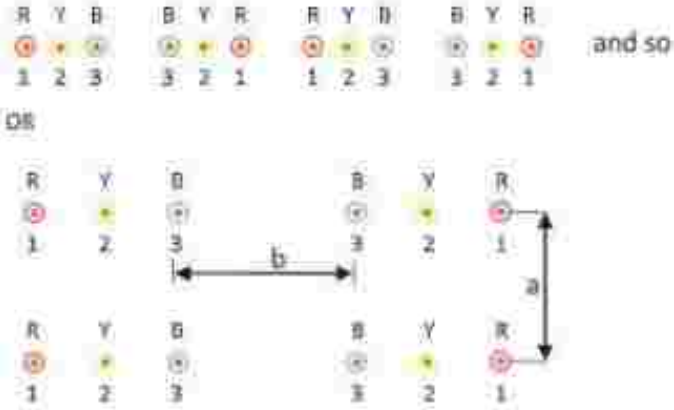
NOTE 3 Values are given for vertical spacings between trays of 300 mm.For closer spacing, the factors should be reduced.

NOTE 4 Values are given for Horizontal spacing between trays of 225 mm with trays mounted back to back. For closer spacing, the factors should be reduced.

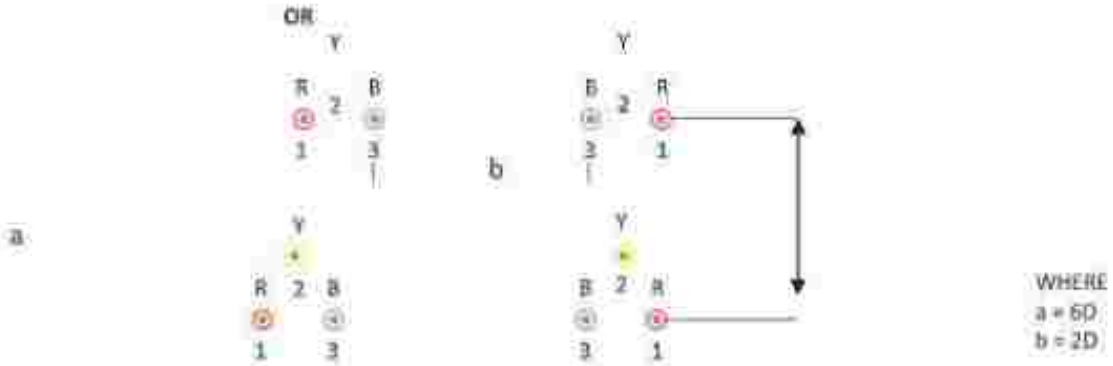
NOTE 5 For circuits having more than one cable in parallel per phase, each three phase set of conductors should be considered as a circuit for the purpose of this table.

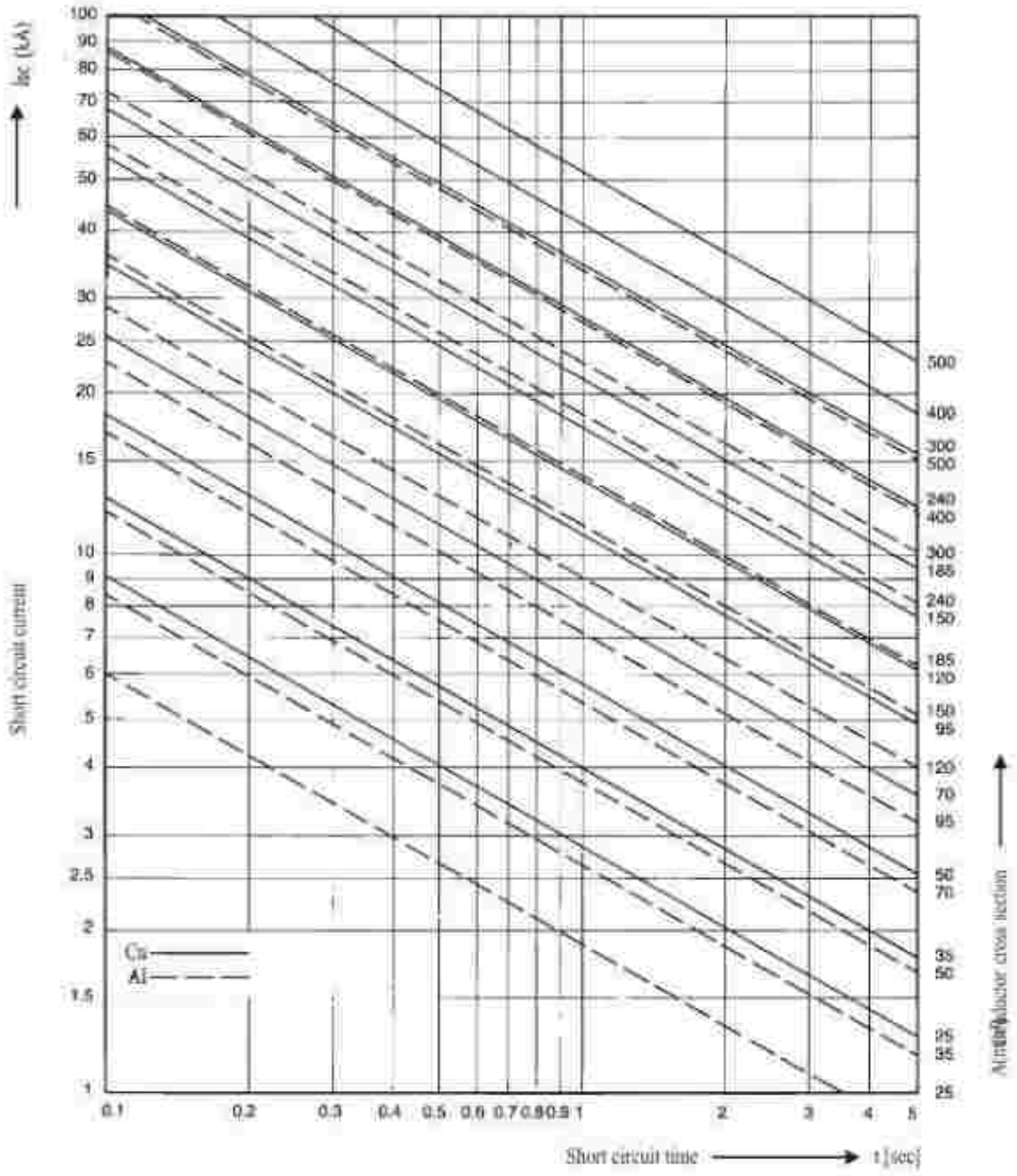
## SPECIAL NOTES FOR SINGLE CORE CABLES

1. The spacing between three cables laid in one plane should be not less than the cable diameter. When the cables are arranged in a duct or a rack inthis way, each one should be secured either to be base or to the others by non-magnetic, non-corrosive clamps every 0.5 to 0.8m.
2. When the cable run is several kilometers long, the cables should be transposed at one-third and at two-thirds of the the total lengths.
3. Cables can also be laid in trefoil arrangement in ducts or on racks which improves current distribution and reduce sheath losses. Non-magneticclamps may not be essential in this case and it suffices to bind the cable with steel, copper, aluminium or plastics tapes every 0.5 to 0.6m.
4. The cables do not have to be bound/ clamped when laid in ground. Single core cables should not be installed individually in protective steel ducts;instead, all three should be laid together in one single duct.
5. If several single core cables are laid per phase, these should be arranged as follows to ensure balanced current distribution; and so on.










## SHORT CIRCUIT RATINGS FOR XLPE INSULATED CABLES:

Copper conductor: $I_{sc} = 0.143 \frac{A}{\sqrt{t}}$ Aluminimum conductor: $I_{sc} = 0.094 \frac{A}{\sqrt{t}}$

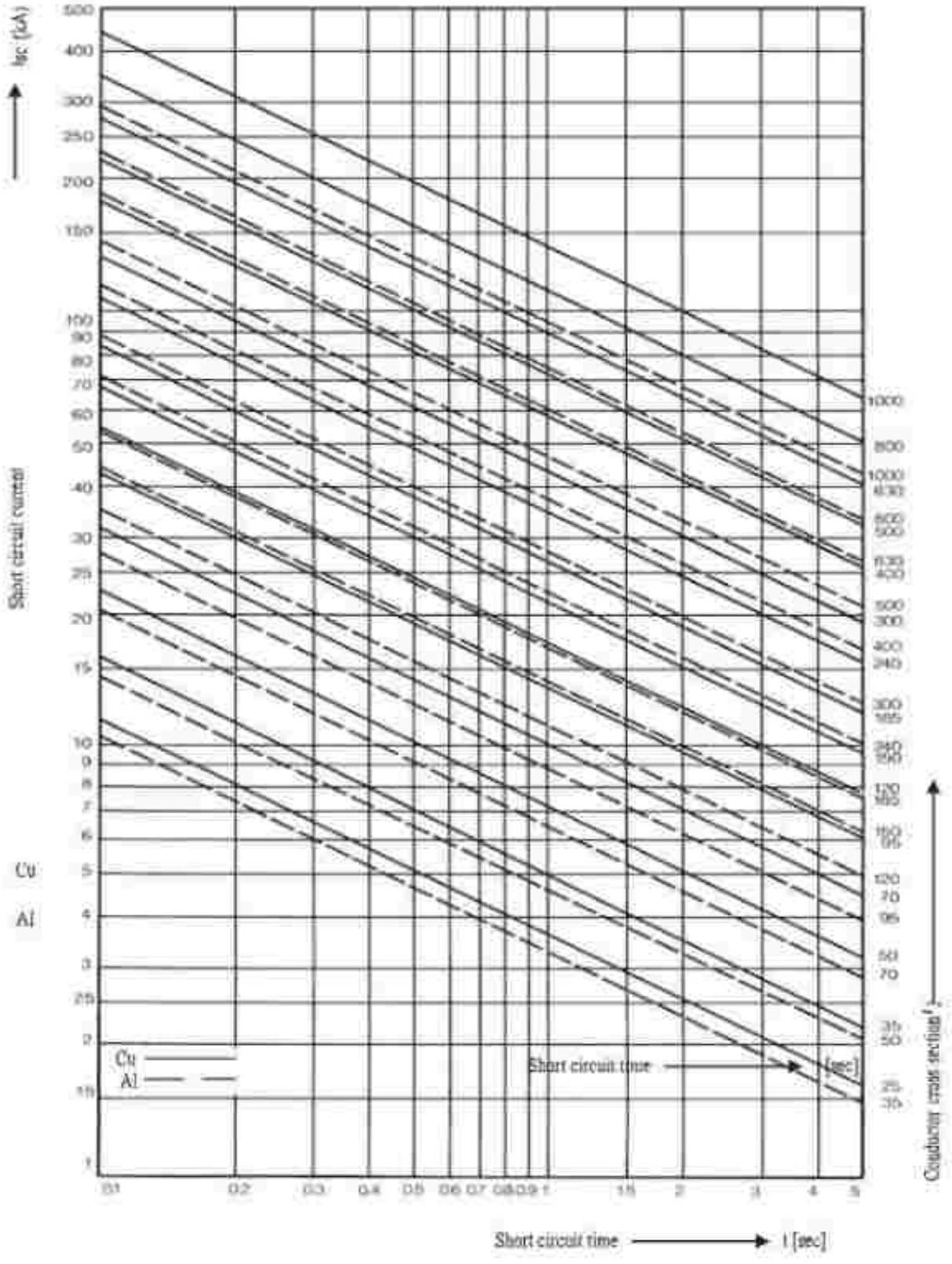
$I_{sc}$ = Short Circuit Current in kA

A = Conductor Area in mm²

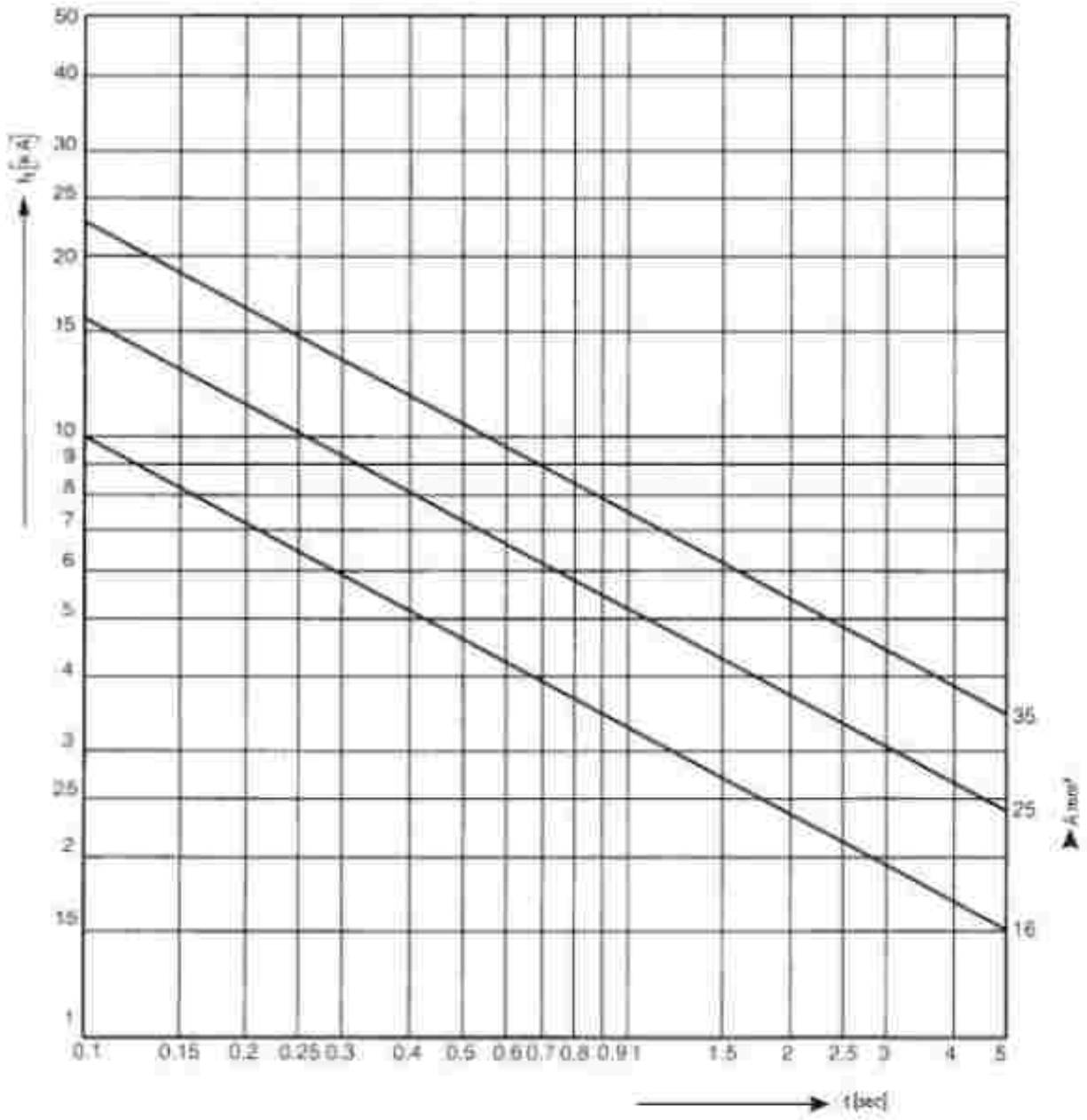
t = Short Circuit Time in sec.

[Note: Maximum Permissible conductor temperature during short circuit = 250°C]

## PERMISSIBLE SHORT-CIRCUIT CURRENT FOR VARIOUS CROSS SECTIONS OF SCREENS



## PERMISSIBLE SHORT-CIRCUIT CURRENT FOR VARIOUS CROSS SECTIONS OF SCREENS




| cross sections of conductor mm² | screen mm² |
|---|---|
| 35... 120 | 16 |
| 150... 300 | 25 |
| 400... 500 | 35 |

## FORMULA FOR ELECTRICAL CALCULATION

| To calculate | Given | D.C. | A.C. single phase | A.C. Three phase |
|---|---|---|---|---|
| Current (A) | KW | $A=\frac{1000\times KW}{V}$ | $A=\frac{1000\times KW}{V\times cos\phi}$ | $A=\frac{1000\times KW}{\sqrt{3}(V\times cos\phi)}$ |
| Current (A) | KVA | | $A=\frac{1000\times KVA}{V}$ | $A=\frac{1000\times KVA}{\sqrt{3}\cdot V}$ |
| Current (A) | HP | $A=\frac{746\times HP}{V\times eff.}$ | $A=\frac{746\times HP}{V\times eff.\times cos\phi}$ | $A=\frac{746\times HP}{\sqrt{3}(V\times eff.\times cos\phi)}$ |
| Power (KW) | V.A | $KW=\frac{A\times V}{1000}$ | $KW=\frac{A\times V\times cos\phi}{1000}$ | $KW=\frac{\sqrt{3}(A\times V\times cos\phi)}{1000}$ |
| Apparent Power (KW) | V.A | | $KVA=\frac{A\times V}{1000}$ | $KVA=\frac{\sqrt{3}(A\times V)}{1000}$ |

**Cosϕ = Power factor of equipment of system under consideration**
**eff. = Efficiency of mother or machinery**
**V = Line voltage**

### VOLTAGE DROP (per core/ per amp. / per km)

When the current flows in conductor, there is a voltage drop between the ends of the conductor. For low voltage cable network of normal operation, it is advisable of a voltage drop of 3-5%.

To calculate voltage drop, use the following:

1. For single phase circuit:

$$Vd = 2I\,L\,(R\cos\phi + X\sin\phi)$$

2. For three phase circuit:

$$Vd = \sqrt{3}I\,L\,(R\cos\phi + X\sin\phi)$$

Where:

Vd = Voltage drop (V)
I = Load current (A)
R = AC resistance (Ω/km)
X = Reactance (Ω/km)
L = Length (km)
cosϕ = Power factor

Relation between cosϕ and sinϕ as following:

| | | | | | | |
|---|---|---|---|---|---|---|
| cosϕ | 1.0 | 0.90 | 0.80 | 0.71 | 0.60 | 0.50 |
| sinϕ | 0.0 | 0.44 | 0.60 | 0.71 | 0.80 | 0.87 |

### SHORT CIRCUIT RATINGS FOR PVC INSULATED CABLES:

Copper conductor: $I_{sc} = 0.115\frac{A}{\sqrt{t}}$ Aluminiminum conductor: $I_{sc} = 0.076\frac{A}{\sqrt{t}}$

$I_{sc}$ = Short Circuit Current in kA
A = Conductor Area in $mm^2$
t = Short Circuit Time in sec.
[Note: Maximum Permissible conductor temperature during short circuit = 160°C]

## MAXIMUM PULLING TENSIONS

The maximum tension must not be exceeded when pulling a cable into ducts and conduits:

a. Using a pulling eye:

Tm = 7.16 X n X A

Tm = Maximum tension, (kg)

n = No. of conductors

A = Area of each conductor, sq. mm

b. Using a cable grip:

Tg = p x k x t x (D - t)

Tg = Maximum tension, (kg)

t = Jacket thickness, mm

D = Cable overall diameter, mm

k = 0.7 Kg/sq. mm for PVC, PE & Neoprene

The tension required to pull the cable in a straight duct can be calculated as follows:

Ts = L x w x f

Ts = Tension required to pull cable, KgL

= Length of cable, m

w = Weight of cable,

Kg/mf = Coefficient of

friction

COEFFICIENT OF FRICTIO

## COEFFICIENT OF FRICTION

| Duct Material | Jacket Material | | |
|---|---|---|---|
| | PE | PVC | Neoprene |
| Asbestos cement | 0.56 | 0.56 | 0.68 |
| Rigid PVC | 0.34 | 0.52 | 0.53 |
| Met | 0.36 | 0.55 | 0.60 |

## ECOMMENDED MINIMUM BENDING RADIUS OF CABLES

| | Bending radius up to & including 11 kV | 15 kV to 33 kV |
|---|---|---|
| PVC Insulated Cables 1000 Volt | | |
| Multi and Single Core 16-50 sq mm | 8 x d | – |
| Armoured Multi & Single Core 70 sq mm and greater | 10 x d | – |
| XLPE Insulated Cables | | |
| Single Core | 20 x d | 20 x d |
| Multi-core | 15 x d | 15 x d |

Where d is the diameter over the outer sheath

| MAIN TECHNICAL CHARACTERISTICS | | COMPARISION OF PVC vs XLPE | |
|---|---|---|---|
| Permitivity (50 Hz, 20° C) | | 4-6 | 2.3 |
| Dielectric Loss Factor (50 Hz, 20° C) | | 0.05-0.07 | 0.0004 |
| Volume Resistivity (20° C) | Ohm cm | $10^{13}$ | $10^{16}$ |
| Max. conductor temperature | °C | 70 | 90 |
| Max. short circuit temperature of conductor | °C | 160 | 250 |
| Tensile strenght of insulation min. | $N/mm^2$ | 12.5 | 12.5 |
| Elongation of insulation at break min. | % | 125 | 300 |
| Flexibility at+20° C | | Outstanding | Medium |
| Flexibility at-10° C | | Poor | Good |
| Thermal ageing characteristics | | | |
| Tested at 100° C | | Medium | Outstanding |
| Tested at 120° C | | Medium | Good |
| Resistance to abrasion | | Medium | Good |

| Characteristics | Units | | COPPER | ALUMINIUM | |
|---|---|---|---|---|---|
| | Hard Drawn | | Annealed | Hard Drawn | Annealed |
| Melting Point | °C | | 1083 | | 658 |
| Specific Gravity | - | | 8.89 | | 2.70 |
| Tensil Strength | kgf/mm2 | 34-47 | 20-28 | 12-20 | 7-14 |
| Electrical Resistivity at 20°C | mW-cm | 1.777 | 1.724 | 2.8264 | 2.803 |
| Conductivity at 20°C | %IACS | 97 | 100 | 60 | 61 |
| Temperature Coefficient of Resis. at 20°C per °C | - | 0.00381 | 0.00393 | 0.0040 | 0.0042 |
| Coefficient of Linear Expansion | $10^6$/°C | | 17 | | 23 |
| Thermal Conductivity | W/°C.cm | | 3.85 | | 2.39 |
| | Cal/°C.s.cm | | 0.92 | | 0.53 |
| Specific Heat | J/°C.$cm^3$ | | 3.4 | | 2.4 |
| | Cal/°C.g | | 0.092 | | 0.21 |

# Handling & Installation of XLPE Cables

1. **Minimum bending redius & permissible maximum pulling tension.**
   **For satety installation without damaging electrical & physical peroperties, the following minimum bending redius & permissible maximum pulling tension must be observed :**

## Minimum Bending Redius

D: Overall dia. of cable

| Type oc cable / Number of core | Single Core | | Multi core |
|---|---|---|---|
| | Round conductor | Four segmental stranded conductor | |
| 600V cable | 8D | 12D | 6D |
| 3,300V cable & higher | 10D | 12D | 8D |
| Triplex type cable | - | - | 8D |
| Corrugated metal armoured cable | 10D | 12D | 8D |
| Flat tape armoured cable | 10D | 12D | 8D |
| Wire armoured cable | 10D | 12D | 8D |
| Lead sheathed cable | 10D | 12D | 10D |

## Permissible Maximum Pulling Tension

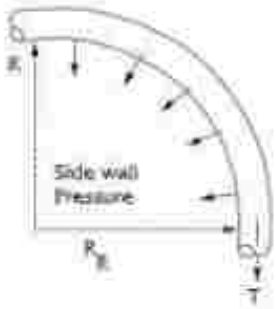
| Pulling tool | Meterial of conductor | Permissible maximum pulling tension (kg) |
|---|---|---|
| Pulling eye | Copper<br>Aluminium | 7 x (number of core) x (Cross-sectional of conductor)<br>4 x (number of core) x (Cross-sectional of conductor) |
| Cable grip | Copper &<br>Aluminium | The same as using the pulling eye, but the maximum tension should be less than two tons. |

Note : When cable grip is used it should cover more than 500 mm in length of the cable end and be hound to the cable sheath

2. **Side wall pressure to cable**
   Permissible maximum side wall pressure to the cable at bending point during installation is 500 kg/m

Note :
Side wall pressure to cable = $\frac{\text{Pulling tension (kg)}}{\text{Bending redius (m)}} = \frac{T}{R}$

T : Pulling tension (kg)
R : Bending radius (m)




3. **Removal of sheath or tape**
   Special care must be taken not to harm the insulation when removing the sheath or tapes with a knife other wise it may result in a dielectric breakdown

4. **Cleaning the surface of insulation**
   The surface of insulation should be cleaned to avoid a flash over at the cable termination or joint.

5. **Applying of self adhesive tape**
   When applying a self advesive tape after joplining or terminating of XLPE cable, stretch it properly about 1.2 times as long as the original one. If it is over-stretched crack may occur on the tape in the long run & if not stretched perperly, tape will not be advered between each layer.

6. **Water proof treatmeat for out-door termination**
   For out-door termination water proof treatment is necessary to avoid the water penetrating into the cable end and special care must be taken to apply tapes terminals. It is desirable to use a compression or solder type terminal.

# XLPE Cable is

Crosslinked polythylene insulated cable. It is stable intermolecular bonds between polythylene particles created by thermochemical action, due to the presence of organic peroxide, XLPE has the same electrical properties as the conventional polythylene and, as a result of stable intermolecular bonds, has better themal and mechanical properties.

### Maximum Allowable Conductor Temperature

| | Normal Condition | Emergency Condition | Shor-Circuit Conductor |
|---|---|---|---|
| Polythylene (PE) | 70° C | 90° C | 140° C |
| XLPE | 90° C | 130° C | 250° C |

### Properties of Plastics & Rubbers

| Item / Material | XLPE | PE | PVC | EPR |
|---|---|---|---|---|
| Specific gravity | 0.92-0.95 | 0.92-0.95 | 1.2-1.5 | 1.3-1.4 |
| Mechanical properties Tensile | | | | |
| Tensile Strength Minimum (n/mm²) | 12.5 | 10.0 | 12.5 | 4.2 |
| Elongation (%) | 200 | 300 | 150 | 200 |
| Electrical properties | | | | |
| Volume Resistivity (at 20° C) cm | $10^{16}$ | $10^{16}$ | $10^{13}$ | $10^{15}$ |
| Dielectric constant. (50 Hz) | 2.3 | 2.3 | 5-9 | 4-5 |
| Power factor (tan) (%) | 0.03 | 0.03 | 4-12 | 1-2 |
| Dielectric Strength (KV/mm) | 30-50 | 30-50 | 20-35 | 30-45 |
| Oil Resistitity | Excellent | Excellent | Good | Unsuitable |

## XLPE Vs PVC-Comparative Properties Summary

| Sl No. | Properties | XLPE | PVC |
|---|---|---|---|
| 01. | Temperature rating degree C | Partial Crystalline | Amorphous |
| | a) Operating | 90 | 70 |
| | b) Emergency overload | 130 | 90 |
| | c) Short Circuit | 250 | 135 |
| 02. | Deformation resistance at 150° C | Good | Poor |
| 03. | Fungus resistance | Good | Poor |
| 04. | Moisture penetration resistance | Excellent | Good |
| 05. | Oil resistance | Excellent | Fair |
| 06. | Solvent resistance | Excellent | Poor |
| 07. | Acid resistance | Excellent | Fair |

## TABLE 1A: TECHNICAL DATA FOR CLASS-2 CONDUCTOR AS PER IEC: 60228-2004

| Conductor cross sectional Area (Note 1) | Minimum No of wires | | | | Maximum D.C. Resistance | | | Maximum A.C. Resistance | | | Maximum A.C. Resistance | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Non Compacted | | Compacted | | @ 20 deg. C | | | @ 90 deg. C | | | @ 70 deg. C(PVC) | | |
| | Circular | | (Circular/ Shaped) | | Plain Copper | Tinned Copper | Aluminium | Plain Copper | Tinned Copper | Aluminium | Plain Copper | Tinned Copper | Aluminium |
| sq.mm | CU | AL | CU | AL | ohm/km | ohm/km | ohm/km | ohm/km | ohm/km | ohm/km | ohm/km | ohm/km | ohm/km |
| 1.50 | 7 | - | - | - | 12.10 | 12.20 | - | 15.50 | 15.63 | - | 14.50 | 14.62 | 21.70 |
| 2.50 | 7 | - | - | - | 7.41 | 7.56 | - | 9.48 | 9.67 | - | 8.87 | 9.08 | 14.50 |
| 4 | 7 | - | - | - | 4.61 | 4.70 | - | 5.90 | 6.01 | - | 5.52 | 5.63 | 8.90 |
| 6 | 7 | - | - | - | 3.08 | 3.11 | - | 3.94 | 3.98 | - | 3.68 | 3.73 | 5.54 |
| 10 | 7 | 7 | - | - | 1.83 | 1.84 | 3.08 | 2.34 | 2.35 | 3.94 | 2.19 | 2.20 | 3.70 |
| 16 | 7 | 7 | 6 | 6 | 1.15 | 1.16 | 1.91 | 1.47 | 1.48 | 2.44 | 1.38 | 1.39 | 2.30 |
| 25 | 7 | 7 | 6 | 6 | 0.727 | 0.734 | 1.20 | 0.93 | 0.94 | 1.54 | 0.87 | 0.88 | 1.44 |
| 35 | 7 | 7 | 6 | 6 | 0.524 | 0.529 | 0.868 | 0.671 | 0.68 | 1.11 | 0.63 | 0.64 | 1.04 |
| 50 | 19 | 19 | 6 | 6 | 0.387 | 0.391 | 0.641 | 0.495 | 0.500 | 0.820 | 0.464 | 0.469 | 0.770 |
| 70 | 19 | 19 | 12 | 12 | 0.268 | 0.270 | 0.443 | 0.319 | 0.323 | 0.567 | 0.321 | 0.323 | 0.533 |
| 95 | 19 | 19 | 15 | 15 | 0.193 | 0.196 | 0.320 | 0.247 | 0.250 | 0.410 | 0.232 | 0.234 | 0.385 |
| 120 | 37 | 37 | 18 | 15 | 0.153 | 0.154 | 0.253 | 0.195 | 0.197 | 0.324 | 0.184 | 0.185 | 0.305 |
| 150 | 37 | 37 | 18 | 15 | 0.124 | 0.126 | 0.206 | 0.159 | 0.162 | 0.264 | 0.150 | 0.157 | 0.249 |
| 185 | 37 | 37 | 30 | 30 | 0.0991 | 0.100 | 0.164 | 0.127 | 0.128 | 0.210 | 0.121 | 0.122 | 0.198 |
| 240 | 37 | 37 | 34 | 30 | 0.0754 | 0.0762 | 0.1250 | 0.0965 | 0.0975 | 0.1600 | 0.0930 | 0.0940 | 0.1520 |
| 300 | 61 | 61 | 34 | 30 | 0.0601 | 0.0607 | 0.1000 | 0.0769 | 0.0777 | 0.1280 | 0.0750 | 0.0757 | 0.1220 |
| 400 | 61 | 61 | 53 | 53 | 0.0470 | 0.0475 | 0.0778 | 0.0602 | 0.0608 | 0.1000 | 0.0604 | 0.0610 | 0.0961 |
| 500 | 61 | 61 | 53 | 53 | 0.0366 | 0.0369 | 0.0605 | 0.0468 | 0.0472 | 0.0774 | 0.0480 | 0.0484 | 0.0761 |
| 630 | 61 | 61 | 53 | 53 | 0.0283 | 0.0286 | 0.0469 | 0.0362 | 0.0366 | 0.0600 | 0.0401 | 0.0405 | 0.0606 |
| 800 | 61 | 61 | 53 | 53 | 0.0221 | 0.0224 | 0.0367 | 0.0283 | 0.0287 | 0.0470 | 0.0335 | 0.0343 | 0.0495 |
| 1000 | 61 | 61 | 53 | 53 | 0.0176 | 0.0177 | 0.0291 | 0.0226 | 0.0228 | 0.0372 | 0.0287 | 0.0288 | 0.0416 |

## TABLE 1B: TECHNICAL DATA FOR CLASS-5 FLEXIBLE COPPER CONDUCTOR AS PER IEC: 60228-2004

| Conductor cross sectional Area | Maximum dia of individual strand in conductor | Maximum D.C.Resistance | | Maximum A.C.Resistance | | Maximum A.C. Resistance | |
|---|---|---|---|---|---|---|---|
| | | @ 20 deg. C | | @ 90 deg. C | | @ 70 deg. C(PVC) | |
| | | Plain Copper | Tinned Copper | Plain Copper | Tinned Copper | Plain Copper | Tinned Copper |
| sq.mm | mm | ohm/km | ohm/km | ohm/km | ohm/km | ohm/km | ohm/km |
| 0.50 | 0.21 | 39.00 | 40.10 | 49.75 | 51.16 | 48.69 | 48.01 |
| 0.75 | 0.21 | 26.00 | 26.70 | 33.18 | 34.07 | 31.14 | 31.98 |
| 1.00 | 0.21 | 19.50 | 20.00 | 24.89 | 25.53 | 23.36 | 23.98 |
| 1.50 | 0.26 | 13.30 | 13.70 | 17.03 | 17.54 | 15.94 | 16.41 |
| 2.50 | 0.29 | 7.98 | 8.21 | 10.21 | 10.50 | 9.56 | 9.86 |
| 4 | 0.31 | 4.85 | 5.09 | 6.33 | 6.51 | 5.93 | 6.09 |
| 6 | 0.31 | 3.30 | 3.39 | 4.22 | 4.34 | 3.95 | 4.06 |
| 10 | 0.41 | 1.91 | 1.95 | 2.44 | 2.49 | 2.29 | 2.33 |
| 16 | 0.41 | 1.21 | 1.24 | 1.55 | 1.58 | 1.45 | 1.48 |
| 25 | 0.41 | 0.780 | 0.795 | 0.9976 | 1.0167 | 0.933 | 0.951 |
| 35 | 0.41 | 0.554 | 0.565 | 0.7088 | 0.7233 | 0.663 | 0.676 |
| 50 | 0.41 | 0.386 | 0.393 | 0.4937 | 0.5027 | 0.463 | 0.471 |
| 70 | 0.51 | 0.272 | 0.277 | 0.3357 | 0.3815 | 0.304 | 0.310 |
| 95 | 0.51 | 0.206 | 0.210 | 0.2636 | 0.2687 | 0.248 | 0.252 |
| 120 | 0.51 | 0.161 | 0.164 | 0.2062 | 0.2100 | 0.194 | 0.197 |
| 150 | 0.51 | 0.129 | 0.132 | 0.1654 | 0.1692 | 0.156 | 0.160 |
| 185 | 0.51 | 0.106 | 0.108 | 0.1358 | 0.1383 | 0.126 | 0.132 |
| 240 | 0.51 | 0.0801 | 0.0817 | 0.1025 | 0.1045 | 0.0966 | 0.1005 |
| 300 | 0.51 | 0.0641 | 0.0654 | 0.0820 | 0.0897 | 0.0798 | 0.0818 |
| 400 | 0.51 | 0.0485 | 0.0495 | 0.0622 | 0.0634 | 0.0623 | 0.0634 |
| 500 | 0.61 | 0.0384 | 0.0391 | 0.0491 | 0.0500 | 0.0512 | 0.0520 |
| 630 | 0.61 | 0.0287 | 0.0292 | 0.0367 | 0.0373 | 0.0406 | 0.0412 |

## TABLE: 2 - CAPACITANCE

### 1KV CABLES - APPROXIMATE CAPACITANCE (microfarads/km)

| Nominal Conductor cross sectional Area | XLPE | | | | PVC | | | |
|---|---|---|---|---|---|---|---|---|
| | Single Core | | Two Core | Multicore (More than Two Cores) | Single Core | | Two Core | Multicore (More than Two Cores) |
| sq.mm | Unarmoured | Armoured | | | Unarmoured | Armoured | | |
| 1.50 | 0.188 | - | 0.094 | 0.161 | 0.439 | - | 0.153 | 0.380 |
| 2.50 | 0.223 | - | 0.071 | 0.151 | 0.481 | - | 0.165 | 0.408 |
| 4 | 0.308 | - | 0.081 | 0.244 | 0.676 | - | 0.186 | 0.492 |
| 6 | 0.354 | - | 0.087 | 0.283 | 0.673 | - | 0.201 | 0.554 |
| 10 | 0.441 | - | 0.096 | 0.347 | 0.831 | - | 0.221 | 0.571 |
| 16 | 0.515 | 0.371 | 0.100 | 0.401 | 0.965 | 0.776 | 0.238 | 0.770 |
| 25 | 0.512 | 0.381 | 0.105 | 0.406 | 1.005 | 0.839 | 0.245 | 0.809 |
| 35 | 0.592 | 0.450 | 0.111 | 0.464 | 1.150 | 0.955 | 0.259 | 0.922 |
| 50 | 0.598 | 0.483 | 0.115 | 0.479 | 1.160 | 0.982 | 0.268 | 0.933 |
| 70 | 0.675 | 0.512 | 0.117 | 0.490 | 1.306 | 1.102 | 0.275 | 1.024 |
| 95 | 0.723 | 0.552 | 0.122 | 0.554 | 1.341 | 1.159 | 0.282 | 1.060 |
| 120 | 0.774 | 0.641 | 0.127 | 0.505 | 1.539 | 1.320 | 0.297 | 1.207 |
| 150 | 0.734 | 0.507 | 0.125 | 0.569 | 1.494 | 1.302 | 0.295 | 1.165 |
| 185 | 0.712 | 0.617 | 0.127 | 0.563 | 1.615 | 1.338 | 0.300 | 1.180 |
| 240 | 0.763 | 0.665 | 0.130 | 0.594 | 1.654 | 1.395 | 0.304 | 1.218 |
| 300 | 0.790 | 0.693 | 0.130 | 0.616 | 1.570 | 1.412 | 0.305 | 1.220 |
| 400 | 0.839 | 0.705 | 0.132 | 0.649 | 1.693 | 1.488 | 0.309 | 1.314 |
| 500 | 0.857 | 0.707 | 0.133 | 0.666 | 1.646 | 1.471 | 0.310 | 1.282 |
| 630 | 0.917 | 0.766 | 0.137 | 0.714 | 1.690 | 1.493 | 0.316 | 1.334 |
| 800 | 0.946 | 0.779 | - | - | 1.867 | 1.647 | - | - |
| 1000 | 0.965 | 0.803 | - | - | 2.031 | 1.791 | - | - |

## TABLE: 3 - REACTANCE

### 1KV CABLES - APPROXIMATE REACTANCE (ohms/km)

| Conductor cross sectional Area | XLPE | | | PVC | | |
|---|---|---|---|---|---|---|
| | Single Core | | Multicore | Single Core | | Multicore |
| sq.mm | Unarmoured | Armoured | | Unarmoured | Armoured | |
| 1.50 | 0.120 | - | 0.108 | 0.1239 | - | 0.1116 |
| 2.50 | 0.113 | - | 0.1007 | 0.1201 | - | 0.1077 |
| 4 | 0.107 | - | 0.0947 | 0.1160 | - | 0.1085 |
| 6 | 0.103 | - | 0.0902 | 0.1106 | - | 0.0980 |
| 10 | 0.098 | - | 0.0852 | 0.1045 | - | 0.0918 |
| 16 | 0.094 | 0.101 | 0.0815 | 0.0999 | 0.1058 | 0.0871 |
| 25 | 0.085 | 0.100 | 0.0816 | 0.0989 | 0.1097 | 0.0861 |
| 35 | 0.082 | 0.097 | 0.0784 | 0.0962 | 0.1004 | 0.0833 |
| 50 | 0.087 | 0.096 | 0.0787 | 0.0966 | 0.0957 | 0.0837 |
| 70 | 0.088 | 0.091 | 0.0752 | 0.0910 | 0.0937 | 0.0780 |
| 95 | 0.086 | 0.085 | 0.0734 | 0.0905 | 0.0926 | 0.0775 |
| 120 | 0.0857 | 0.0879 | 0.0726 | 0.0895 | 0.0909 | 0.0755 |
| 150 | 0.0853 | 0.0888 | 0.0732 | 0.0889 | 0.0911 | 0.0768 |
| 185 | 0.0858 | 0.0875 | 0.0727 | 0.0891 | 0.0886 | 0.0750 |
| 240 | 0.0851 | 0.0886 | 0.0719 | 0.0876 | 0.0851 | 0.0745 |
| 300 | 0.0843 | 0.0857 | 0.0711 | 0.0870 | 0.0884 | 0.0740 |
| 400 | 0.0837 | 0.0855 | 0.0705 | 0.0865 | 0.0880 | 0.0730 |
| 500 | 0.0835 | 0.0851 | 0.0703 | 0.0863 | 0.0879 | 0.0732 |
| 630 | 0.0828 | 0.0843 | 0.0697 | 0.0859 | 0.0876 | 0.0728 |
| 800 | 0.0826 | 0.0841 | - | 0.0846 | 0.0853 | - |
| 1000 | 0.0823 | 0.0836 | - | 0.0838 | 0.0851 | - |

## TABLE 4A - IMPEDANCE (Plain Copper Conductor)

## 1KV CABLES - APPROXIMATE IMPEDANCE (ohms/km)

| Conductor cross sectional Area | XLPE | | | PVC | | |
|---|---|---|---|---|---|---|
| | Single Core @ 90 deg. C | | Multicore @ 90 deg. C | Single Core @ 70 deg. C | | Multicore @ 70 deg. C |
| sqmm | Unarmoured | Armoured | | Unarmoured | Armoured | |
| 1.50 | 15.5005 | - | 15.5004 | 14.5005 | - | 14.5004 |
| 2.50 | 9.4807 | - | 9.4806 | 8.8008 | - | 8.8007 |
| 4 | 5.9010 | - | 5.9008 | 5.5212 | - | 5.5210 |
| 6 | 3.9413 | - | 3.9410 | 3.6917 | - | 3.6913 |
| 10 | 2.3421 | - | 2.3416 | 2.1925 | - | 2.1919 |
| 16 | 1.4730 | 1.4735 | 1.4723 | 1.3836 | 1.3840 | 1.3827 |
| 25 | 0.9348 | 0.9353 | 0.9336 | 0.8755 | 0.8782 | 0.8743 |
| 35 | 0.6773 | 0.6780 | 0.6757 | 0.6378 | 0.6379 | 0.6355 |
| 50 | 0.5035 | 0.5041 | 0.5013 | 0.4739 | 0.4746 | 0.4715 |
| 70 | 0.3542 | 0.3548 | 0.3511 | 0.3336 | 0.3344 | 0.3303 |
| 95 | 0.2617 | 0.2625 | 0.2577 | 0.2460 | 0.2469 | 0.2446 |
| 120 | 0.2139 | 0.2148 | 0.2080 | 0.2042 | 0.2051 | 0.1988 |
| 150 | 0.1809 | 0.1820 | 0.1750 | 0.1744 | 0.1755 | 0.1681 |
| 185 | 0.1533 | 0.1542 | 0.1453 | 0.1497 | 0.1507 | 0.1424 |
| 240 | 0.1286 | 0.1297 | 0.1204 | 0.1278 | 0.1288 | 0.1192 |
| 300 | 0.1141 | 0.1151 | 0.1048 | 0.1148 | 0.1159 | 0.1054 |
| 400 | 0.1031 | 0.1045 | 0.0927 | 0.1055 | 0.1067 | 0.0947 |
| 500 | 0.0957 | 0.0971 | 0.0845 | 0.0992 | 0.1006 | 0.0881 |
| 630 | 0.0904 | 0.0917 | 0.0785 | 0.0948 | 0.0963 | 0.0831 |
| 800 | 0.0873 | 0.0888 | - | 0.0913 | 0.0927 | - |
| 1000 | 0.0859 | 0.0866 | - | 0.0899 | 0.0901 | - |

## TABLE 4B - IMPEDANCE (Aluminium Conductor)

## 1KV CABLES - APPROXIMATE IMPEDANCE (ohms/km)

| Conductor cross sectional Area | XLPE | | | PVC | | |
|---|---|---|---|---|---|---|
| | Single Core @ 90 deg. C | | Multicore @ 90 deg. C | Single Core @ 70 deg. C | | Multicore @ 70 deg. C |
| sqmm | Unarmoured | Armoured | | Unarmoured | Armoured | |
| 1.50 | 23.1703 | - | 23.1702 | 21.7004 | - | 21.7003 |
| 2.50 | 15.5004 | - | 15.5003 | 14.5005 | - | 14.5004 |
| 4 | 9.4805 | - | 9.4805 | 8.9009 | - | 8.9006 |
| 6 | 5.9009 | - | 5.9007 | 5.5411 | - | 5.5409 |
| 10 | 3.5412 | - | 3.5408 | 3.7015 | - | 3.7011 |
| 16 | 2.4418 | 2.4421 | 2.4414 | 2.3022 | 2.3024 | 2.3018 |
| 25 | 1.5429 | 1.5432 | 1.5422 | 1.4434 | 1.4437 | 1.4426 |
| 35 | 1.1138 | 1.1142 | 1.1128 | 1.0444 | 1.0449 | 1.0433 |
| 50 | 0.8252 | 0.8256 | 0.8238 | 0.7780 | 0.7784 | 0.7745 |
| 70 | 0.5738 | 0.5743 | 0.5720 | 0.5407 | 0.5412 | 0.5367 |
| 95 | 0.4190 | 0.4195 | 0.4165 | 0.3955 | 0.3960 | 0.3927 |
| 120 | 0.3351 | 0.3357 | 0.3320 | 0.3176 | 0.3182 | 0.3142 |
| 150 | 0.2777 | 0.2785 | 0.2740 | 0.2644 | 0.2651 | 0.2603 |
| 185 | 0.2269 | 0.2275 | 0.2222 | 0.2187 | 0.2174 | 0.2117 |
| 240 | 0.1812 | 0.1819 | 0.1754 | 0.1754 | 0.1762 | 0.1693 |
| 300 | 0.1532 | 0.1540 | 0.1464 | 0.1489 | 0.1507 | 0.1427 |
| 400 | 0.1304 | 0.1315 | 0.1224 | 0.1289 | 0.1303 | 0.1207 |
| 500 | 0.1138 | 0.1150 | 0.1048 | 0.1151 | 0.1168 | 0.1058 |
| 630 | 0.1023 | 0.1034 | 0.0920 | 0.1061 | 0.1085 | 0.0947 |
| 800 | 0.0950 | 0.0964 | - | 0.0982 | 0.0995 | - |
| 1000 | 0.0903 | 0.0915 | - | 0.0933 | 0.0947 | - |

## TABLE 5A - VOLTAGE DROP (Plain Copper Conductor)

## 1KV CABLES - APPROXIMATE VOLTAGE DROP (mV/A/m)

| Conductor cross sectional Area | XLPE | | | PVC | | |
|---|---|---|---|---|---|---|
| | Single Phase @ 90 deg. C | | 3 Phase @ 90 deg. C | Single Phase @ 70 deg. C | | 3 Phase @ 70 deg. C |
| sqmm | Unarmoured | Armoured | | Unarmoured | Armoured | |
| 1.50 | 31.0009 | - | 26.8156 | 25.0011 | - | 25.0857 |
| 2.50 | 18.6014 | - | 16.4013 | 17.8015 | - | 15.3981 |
| 4 | 11.8020 | - | 10.2089 | 11.0424 | - | 9.5513 |
| 6 | 7.8827 | - | 6.8180 | 7.3833 | - | 6.3860 |
| 10 | 4.6841 | - | 4.0508 | 4.3850 | - | 3.7920 |
| 16 | 2.9491 | 2.9469 | 2.5470 | 2.7672 | 2.7681 | 2.3922 |
| 25 | 1.8696 | 1.8706 | 1.6151 | 1.7512 | 1.7523 | 1.5125 |
| 35 | 1.3549 | 1.3559 | 1.1699 | 1.2746 | 1.2758 | 1.0994 |
| 50 | 1.0070 | 1.0093 | 0.8673 | 0.9479 | 0.9492 | 0.8157 |
| 70 | 0.7089 | 0.7097 | 0.6075 | 0.6673 | 0.6688 | 0.5715 |
| 95 | 0.5234 | 0.5250 | 0.4459 | 0.4881 | 0.4897 | 0.4232 |
| 120 | 0.4279 | 0.4298 | 0.3616 | 0.4084 | 0.4102 | 0.3441 |
| 150 | 0.3618 | 0.3640 | 0.3028 | 0.3467 | 0.3610 | 0.2908 |
| 185 | 0.3085 | 0.3085 | 0.2532 | 0.2984 | 0.3014 | 0.2463 |
| 240 | 0.2573 | 0.2593 | 0.2082 | 0.2555 | 0.2576 | 0.2081 |
| 300 | 0.2292 | 0.2302 | 0.1812 | 0.2297 | 0.2318 | 0.1823 |
| 400 | 0.2061 | 0.2091 | 0.1604 | 0.2110 | 0.2135 | 0.1639 |
| 500 | 0.1914 | 0.1942 | 0.1461 | 0.1985 | 0.2013 | 0.1524 |
| 630 | 0.1808 | 0.1834 | 0.1359 | 0.1886 | 0.1927 | 0.1438 |
| 800 | 0.1748 | 0.1775 | - | 0.1825 | 0.1854 | - |
| 1000 | 0.1706 | 0.1732 | - | 0.1778 | 0.1803 | - |

## TABLE 5B - VOLTAGE DROP (Aluminium Conductor)

## 1KV CABLES - APPROXIMATE VOLTAGE DROP (mV/A/m)

| Conductor cross sectional Area | XLPE | | | PVC | | |
|---|---|---|---|---|---|---|
| | Single Phase @ 90 deg. C | | 3 Phase @ 90 deg. C | Single Phase @ 70 deg. C | | 3 Phase @ 70 deg. C |
| sqmm | Unarmoured | Armoured | | Unarmoured | Armoured | |
| 1.50 | 46.3408 | - | 40.0845 | 40.4007 | - | 37.5416 |
| 2.50 | 31.0009 | - | 26.8156 | 29.0010 | - | 25.0857 |
| 4 | 18.6012 | - | 16.4012 | 17.8015 | - | 15.3980 |
| 6 | 11.8019 | - | 10.2087 | 11.0822 | - | 9.5857 |
| 10 | 7.8824 | - | 6.8178 | 7.4030 | - | 6.4030 |
| 16 | 4.6837 | 4.6842 | 4.2295 | 4.6043 | 4.6045 | 3.9815 |
| 25 | 3.0858 | 3.0864 | 2.6679 | 2.8809 | 2.8875 | 2.4956 |
| 35 | 2.2277 | 2.2284 | 1.9257 | 2.0889 | 2.0897 | 1.8050 |
| 50 | 1.6503 | 1.6511 | 1.4252 | 1.5521 | 1.5529 | 1.3390 |
| 70 | 1.1478 | 1.1485 | 0.9895 | 1.0814 | 1.0823 | 0.9319 |
| 95 | 0.8380 | 0.8391 | 0.7205 | 0.7819 | 0.7921 | 0.6784 |
| 120 | 0.6703 | 0.6714 | 0.5744 | 0.6352 | 0.6363 | 0.5436 |
| 150 | 0.5565 | 0.5668 | 0.4740 | 0.5288 | 0.5303 | 0.4503 |
| 185 | 0.4637 | 0.4650 | 0.3845 | 0.4334 | 0.4348 | 0.3603 |
| 240 | 0.3624 | 0.3639 | 0.3085 | 0.3508 | 0.3524 | 0.2928 |
| 300 | 0.3065 | 0.3080 | 0.2539 | 0.2997 | 0.3013 | 0.2469 |
| 400 | 0.2608 | 0.2631 | 0.2117 | 0.2580 | 0.2608 | 0.2098 |
| 500 | 0.2277 | 0.2300 | 0.1809 | 0.2301 | 0.2325 | 0.1827 |
| 630 | 0.2048 | 0.2069 | 0.1591 | 0.2102 | 0.2130 | 0.1639 |
| 800 | 0.1901 | 0.1928 | - | 0.1964 | 0.1990 | - |
| 1000 | 0.1805 | 0.1831 | - | 0.1871 | 0.1894 | - |

# Stranded Plain Annealed Copper Conductor For Insulated Cables

BARE Cu

| Nominal Conductor Area | No & Diameter of Wire | Nominal of Conductor | Maximum Conductor Resistance At 20°C | Nominal Weight Per Km of Cond. |
|---|---|---|---|---|
| mm² | No./mm | mm | ohm/km | kg |
| 1.0 | 1/1.13 | 1.13 | 17.7 | 8.9 |
| 1.0 | 7/0.40 | 1.20 | 20.0 | 9.0 |
| 1.5 | 1/1.38 | 1.38 | 11.9 | 13.3 |
| 1.5 | 7/0.53 | 1.58 | 13.3 | 13.2 |
| 2.5 | 1/1.78 | 1.78 | 7.14 | 22.2 |
| 2.5 | 7/0.67 | 2.01 | 7.72 | 22.4 |
| 4.0 | 1/2.25 | 2.25 | 4.47 | 35.4 |
| 4.0 | 7/0.85 | 2.55 | 4.52 | 36.1 |
| 6.0 | 1/2.76 | 2.76 | 2.97 | 53.2 |
| 6.0 | 7/1.04 | 3.12 | 3.02 | 54.0 |
| 10 | 1/3.57 | 3.57 | 1.77 | 88.0 |
| 10 | 7/1.35 | 4.05 | 1.78 | 90.8 |
| 16 | 1/4.50 | 4.50 | 1.12 | 142 |
| 16 | 7/1.70 | 5.10 | 1.15 | 145 |
| 25 | 7/2.14 | 6.42 | 0.712 | 228 |
| 35 | 19/1.53 | 7.65 | 0.514 | 317 |
| 50 | 19/1.78 | 8.90 | 0.378 | 425 |
| 70 | 19/2.14 | 10.70 | 0.252 | 629 |
| 95 | 19/2.52 | 12.60 | 0.188 | 860 |
| 120 | 37/2.03 | 14.21 | 0.150 | 1086 |
| 150 | 37/2.25 | 15.75 | 0.122 | 1334 |
| 185 | 37/2.52 | 17.64 | 0.0972 | 1673 |
| 240 | 61/2.25 | 20.25 | 0.0740 | 2189 |
| 300 | 61/2.52 | 22.68 | 0.0580 | 2758 |
| 400 | 61/2.85 | 25.65 | 0.0461 | 3528 |
| 500 | 61/3.20 | 28.80 | 0.0366 | 4448 |
| 630 | 127/2.52 | 32.76 | 0.0283 | 5744 |
| 800 | 127/2.85 | 37.05 | 0.0221 | 7348 |
| 1000 | 127/3.20 | 41.60 | 0.0176 | 9260 |

*BS-6360, BARE Cu Conductor*

## MEASUREMENT COMPARISON IN VARUOUS SYSTEMS

| Gauge system | | Diameter | | Cross sectional area | | Approx. Weight (kg/km) | |
|---|---|---|---|---|---|---|---|
| S.W.G | A.W.G. | mm | Inch | $mm^2$ | $Inch^2$ | Copper | Aluminium |
| - | 6/0 | 14.732 | 0.580 | 170.46 | 0.2642 | 1515.39 | 0.7141 |
| - | 5/0 | 13.119 | 0.516 | 135.17 | 0.2091 | 1201.66 | 0.5652 |
| 7/0 | - | 12.700 | 0.500 | 126.68 | 0.1964 | 1126.19 | 0.5309 |
| 6/0 | - | 11.786 | 0.464 | 109.10 | 0.1691 | 969.90 | 0.4571 |
| - | 4/0 | 11.684 | 0.460 | 107.22 | 0.1662 | 953.19 | 0.4492 |
| 5/0 | - | 10.973 | 0.432 | 94.57 | 0.3393 | 840.73 | 0.9171 |
| - | 3/0 | 10.405 | 0.409 | 85.03 | 0.1314 | 755.92 | 0.3552 |
| 4/0 | - | 10.160 | 0.400 | 81.07 | 0.1257 | 720.71 | 0.3398 |
| 3/0 | - | 9.449 | 0.372 | 70.12 | 0.1087 | 623.37 | 0.2938 |
| - | 2/0 | 9.266 | 0.365 | 67.43 | 0.1046 | 599.45 | 0.2827 |
| 2/0 | - | 8.839 | 0.348 | 61.36 | 0.09512 | 545.49 | 0.2571 |
| - | 1/0 | 8.251 | 0.325 | 53.47 | 0.08296 | 475.35 | 0.2242 |
| 0 | - | 8.230 | 0.324 | 53.20 | 0.08245 | 472.95 | 0.2229 |
| 1 | - | 7.620 | 0.300 | 45.60 | 0.07069 | 405.38 | 0.1911 |
| - | 1 | 7.348 | 0.289 | 42.41 | 0.06560 | 377.03 | 0.1773 |
| 2 | - | 7.010 | 0.276 | 38.59 | 0.05983 | 343.07 | 0.1617 |
| - | 2 | 6.544 | 0.257 | 33.63 | 0.05188 | 298.97 | 0.1402 |
| 3 | - | 6.401 | 0.252 | 32.18 | 0.04988 | 286.08 | 0.1348 |
| 4 | - | 5.893 | 0.232 | 27.27 | 0.04227 | 242.43 | 0.1143 |
| - | 3 | 5.827 | 0.229 | 26.67 | 0.04119 | 237.10 | 0.1113 |
| 5 | - | 5.385 | 0.212 | 22.77 | 0.03530 | 202.43 | 0.0954 |
| - | 4 | 5.189 | 0.204 | 21.15 | 0.03269 | 188.02 | 0.0884 |
| 6 | - | 4.877 | 0.192 | 18.68 | 0.02895 | 166.07 | 0.0783 |
| - | 5 | 4.621 | 0.182 | 16.77 | 0.02602 | 149.09 | 0.0703 |
| 7 | - | 4.470 | 0.176 | 15.69 | 0.02433 | 139.48 | 0.0658 |
| - | 6 | 4.115 | 0.162 | 13.30 | 0.02061 | 118.24 | 0.0557 |
| 8 | - | 4.064 | 0.160 | 12.97 | 0.02011 | 115.30 | 0.0544 |
| 9 | 7 | 3.658 | 0.144 | 10.51 | 0.01629 | 93.43 | 0.0440 |
| 10 | 8 | 3.251 | 0.128 | 8.301 | 0.01287 | 73.80 | 0.0348 |
| 11 | - | 2.946 | 0.116 | 6.816 | 0.01057 | 60.59 | 0.0286 |
| - | 9 | 2.906 | 0.114 | 6.633 | 0.01021 | 58.97 | 0.0276 |
| 12 | - | 2.642 | 0.104 | 5.482 | 0.008495 | 48.73 | 0.0230 |
| - | 10 | 2.588 | 0.102 | 5.260 | 0.008171 | 46.76 | 0.0221 |
| 13 | - | 2.337 | 0.092 | 4.289 | 0.006647 | 38.13 | 0.0180 |
| - | 11 | 2.305 | 0.091 | 4.173 | 0.006504 | 37.10 | 0.0176 |
| - | 12 | 2.053 | 0.081 | 3.310 | 0.005153 | 29.43 | 0.0139 |
| 14 | - | 2.032 | 0.080 | 3.243 | 0.005027 | 28.83 | 0.0136 |
| 15 | 13 | 1.829 | 0.072 | 2.627 | 0.004072 | 23.35 | 0.0110 |
| 16 | 14 | 1.626 | 0.064 | 2.076 | 0.003217 | 18.46 | 0.008696 |
| - | 15 | 1.450 | 0.057 | 1.651 | 0.002552 | 14.68 | 0.006898 |
| 17 | - | 1.422 | 0.056 | 1.588 | 0.002463 | 14.12 | 0.006657 |
| - | 16 | 1.291 | 0.051 | 1.014 | 0.002043 | 9.01 | 0.005522 |
| 18 | - | 1.219 | 0.048 | 1.167 | 0.001810 | 10.37 | 0.004892 |
| - | 17 | 1.150 | 0.0453 | 1.039 | 0.001612 | 9.24 | 0.004357 |
| 19 | 18 | 1.016 | 0.0403 | 0.811 | 0.001276 | 7.21 | 0.003449 |
| 20 | 19 | 0.914 | 0.0359 | 0.656 | 0.001012 | 5.83 | 0.002735 |
| 21 | 20 | 0.813 | 0.0320 | 0.519 | 0.0008042 | 4.61 | 0.002174 |
| - | 21 | 0.723 | 0.0285 | 0.411 | 0.0006379 | 3.65 | 0.001724 |
| 22 | - | 0.711 | 0.0280 | 0.397 | 0.0006158 | 3.53 | 0.001665 |
| - | 22 | 0.644 | 0.0253 | 0.326 | 0.0005027 | 2.90 | 0.001359 |
| 23 | - | 0.610 | 0.0240 | 0.292 | 0.0004524 | 2.60 | 0.001223 |
| - | 23 | 0.573 | 0.0226 | 0.258 | 0.0004012 | 2.29 | 0.001084 |
| 24 | - | 0.559 | 0.0220 | 0.245 | 0.0003801 | 2.18 | 0.001027 |
| - | 24 | 0.511 | 0.0201 | 0.205 | 0.0003173 | 1.82 | 0.0008577 |
| 25 | - | 0.508 | 0.0200 | 0.203 | 0.0003142 | 1.81 | 0.0008493 |

## MEASUREMENT COMPARISON IN VARIOUS SYSTEMS

| Gauge system | | Diameter | | Cross sectional area | | Approx. Weight (kg/km) | |
|---|---|---|---|---|---|---|---|
| S.W.G | A.W.G. | mm | Inch | $mm^2$ | $Inch^2$ | Copper | Aluminium |
| 26 | - | 0.457 | 0.0180 | 0.1640 | 0.000254 | 1.458 | 0.0006865 |
| - | 25 | 0.455 | 0.0179 | 0.1626 | 0.000252 | 1.445 | 0.0006812 |
| - | 26 | 0.404 | 0.0159 | 0.1288 | 0.000198 | 1.145 | 0.0005352 |
| 27 | - | 0.416 | 0.0164 | 0.1359 | 0.000211 | 1.208 | 0.0005703 |
| 28 | - | 0.375 | 0.0148 | 0.1104 | | 0.9814 | 0.0004649 |
| - | 27 | 0.361 | 0.0142 | 0.1023 | 0.000158 | 0.9094 | 0.0004271 |
| 29 | - | 0.345 | 0.0136 | 0.0935 | 0.000145 | 0.8312 | 0.0003919 |
| - | 28 | 0.321 | 0.0126 | 0.0809 | 0.000125 | 0.7192 | 0.0003379 |
| 30 | - | 0.315 | 0.0124 | 0.0779 | 0.000121 | 0.6925 | 0.0003271 |
| 31 | - | 0.294 | 0.0116 | 0.0679 | 0.000106 | 0.6036 | 0.0002865 |
| - | 29 | 0.286 | 0.0113 | 0.0642 | 0.0001003 | 0.5707 | 0.0002711 |
| 32 | - | 0.274 | 0.0108 | 0.0590 | 0.0000916 | 0.5245 | 0.0002476 |
| 33 | 30 | 0.254 | 0.0100 | 0.0507 | 0.0000785 | 0.4507 | 0.0002122 |
| 34 | - | 0.234 | 0.0092 | 0.0430 | 0.0000665 | 0.3823 | 0.0001797 |
| - | 31 | 0.227 | 0.00893 | 0.0405 | 0.0000626 | 0.3600 | 0.0001692 |
| 35 | - | 0.213 | 0.00840 | 0.0356 | 0.0000554 | 0.3165 | 0.0001497 |
| - | 32 | 0.202 | 0.00795 | 0.0320 | 0.0000496 | 0.2845 | 0.0001341 |
| 36 | - | 0.193 | 0.00760 | 0.0292 | 0.0000453 | 0.2596 | 0.0001224 |
| - | 33 | 0.180 | 0.00708 | 0.0254 | 0.0000393 | 0.2258 | 0.0001062 |
| 37 | - | 0.173 | 0.00680 | 0.0235 | 0.0000363 | 0.2089 | 0.00009812 |
| - | 34 | 0.160 | 0.00630 | 0.0201 | 0.0000312 | 0.1787 | 0.00008433 |
| 38 | - | 0.152 | 0.00600 | 0.0181 | 0.0000283 | 0.1609 | 0.00007649 |
| - | 35 | 0.143 | 0.00561 | 0.0160 | 0.0000247 | 0.1422 | 0.00006676 |
| 39 | - | 0.132 | 0.00520 | 0.0137 | 0.0000212 | 0.1218 | 0.00005730 |
| - | 36 | 0.127 | 0.00500 | 0.0127 | 0.0000196 | 0.1129 | 0.00005298 |
| 40 | - | 0.122 | 0.00480 | 0.0117 | 0.0000181 | 0.1040 | 0.00004892 |
| - | 37 | 0.113 | 0.00445 | 0.0100 | 0.0000155 | 0.0889 | 0.00004189 |
| 41 | - | 0.112 | 0.00440 | 0.00985 | 0.0000152 | 0.0876 | 0.00004108 |
| 42 | 38 | 0.101 | 0.00397 | 0.00801 | 0.0000124 | 0.0712 | 0.00003352 |
| 43 | - | 0.091 | 0.00360 | 0.00650 | 0.0000102 | 0.0578 | 0.00002757 |
| - | 39 | 0.090 | 0.00353 | 0.00636 | 0.00000978 | 0.0565 | 0.00002643 |
| 44 | - | 0.081 | 0.00320 | 0.00515 | 0.00000804 | 0.0458 | 0.00002173 |
| - | 40 | 0.080 | 0.00314 | 0.00503 | 0.00000774 | 0.0447 | 0.00002092 |
| 45 | 41 | 0.0711 | 0.00280 | 0.00397 | 0.00000616 | 0.0353 | 0.00001665 |
| - | 42 | 0.0635 | 0.00250 | 0.00317 | 0.00000491 | 0.0282 | 0.00001327 |
| 46 | - | 0.0610 | 0.00240 | 0.00292 | 0.00000452 | 0.0259 | 0.00001222 |
| - | 43 | 0.0559 | 0.00220 | 0.00245 | 0.00000380 | 0.0218 | 0.00001027 |
| 47 | 44 | 0.0508 | 0.00200 | 0.00203 | 0.00000314 | 0.01805 | 0.000008487 |
| - | 45 | 0.0447 | 0.00176 | 0.001569 | 0.00000243 | 0.01395 | 0.000006568 |
| 48 | - | 0.0406 | 0.00160 | 0.001295 | 0.00000201 | 0.01151 | 0.000005433 |
| - | 46 | 0.0398 | 0.00157 | 0.001244 | 0.00000193 | 0.01106 | 0.000005217 |
| - | 47 | 0.0355 | 0.00140 | 0.000989 | 0.00000154 | 0.008792 | 0.000004162 |
| - | 48 | 0.0316 | 0.00124 | 0.000784 | 0.00000121 | 0.006969 | 0.000003271 |
| 49 | - | 0.0305 | 0.00120 | 0.000731 | 0.00000113 | 0.006499 | 0.000003054 |
| - | 49 | 0.0281 | 0.00111 | 0.000620 | 0.000000967 | 0.005512 | 0.000002614 |
| 50 | - | 0.0254 | 0.00100 | 0.000507 | 0.000000785 | 0.004507 | 0.000002122 |
| - | 50 | 0.0251 | 0.00099 | 0.000495 | 0.000000770 | 0.004401 | 0.000002081 |


CCV - Up to 132 KV


Standard:
IEC
BS
BDS
ASTM
NSI

ZERTIFIKAT ◆ CERTIFICATE ◆ 認證證書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT ◆ شهادة

# CERTIFICATE

## POLY CABLES INDUSTRIES LIMITED

HEAD OFFICE: HOUSE-15, BLOCK-C, MAIN ROAD, AFTABNAGAR, DHAKA-1212, BANGLADESH

FACTORY: BHITIKANDI, BHOBERCHAR, GOZARIA, MUNSHIGANJ-1362,BANGLADESH

QACS certify that the quality management system of the above organization has been audited and found to be in accordance with the requirements of standard detailed below

## ISO 9001:2015

For The Following Scope

**MANUFACTURER AND SUPPLIER OF ELECTRICAL CABLES INCLUDING HOUSE WIRING CABLES, MV AND LV SINGLE CORE AND MULTICORE CABLES (ARMOURED AND UNARMOURED), AERIAL CABLES, SIGNALING CABLES (SHIELDED AND UNSHIELDED), TELEPHONE CABLES, CONCENTRIC CABLES, FIREPROOF CABLES, OPTICAL FIBER CABLES, COAXIAL CABLES, COPPER AND ALUMINUM WIRS AND RODS**

Certificate No. : QAIS-Q-BAN-PC-09.24.038

IAF Code: 19

*This certificate is issued in accordance with the QACS International Pvt. Ltd. auditing and Certification procedures and it is remain valid subject to annual surveillance audit.

| | | | |
|---|---|---|---|
| Certificate Issue Date | : 20.11.2024 | 1st Surveillance Date | : 19.11.2025 |
| Date of Initial Registration | : 20.11.2024 | 2nd Surveillance Date | : 19.11.2026 |
| Certificate Validity | : 03 Years | *Certificate Expiry Date | : 19.11.2027 |

Note: Certificate shall be valid after surveillance, only if continuation letter by QACS is present.

QACS International Pvt. Ltd.
103 Lakhani Regency, A/2 Old Palasia,
Indore(M.P.)-452001, India
Email: info@qacsworld.com
To check the certificate validity please refer
View: www.qacsworld.com & www.iafcertsearch.org

International Accredited Office:
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Factory Address :

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