A SMART WAY TO POWER YOUR PROJECTS

# SPECIALITY CABLES
# CATALOGUE

## Highlights

- Superior Flexibility, Runs straight from a distribution point
- Superior longevity
- No corrosion and Environment friendly
- Provides more enhanced crosstalk and attenuation protection
- Circuit integrity upto 95°C for 3 hrs
- Inhouse fire testing facility

## Corporate Profile

HPL is India's leading electric equipment manufacturer with a formidable presence across six key verticals: Metering Solutions, Switchgears, LED Lighting, Wire & Cables, Modular Switches & Solar.
Our backward integrated facilities have capabilities across product design and development, component designing, tool manufacturing and commercial production. An established brand with a proven track record of over four decades.
HPL enjoys strong recall across various customer segments. Through our innovative offerings, certified to conform to Indian and International standards such as ISI, CE and KEMA, we are proud to partner emerging India's electrical requirements.

## HPL is well-placed to seize emerging opportunities

**60+** Years of Industry Experience
**7** State-of-art Manufacturing Facilities with 2 R&D Centers
**19** Logistic centres in India & Union Territories
**90+** Branch & Representative Offices
**Strong** Dealer & Distribution Network
Exporting to over **42** Countries

## Manufacturing products and the parts

Inputs such as sheet metal components, copper components and industrial plastic moulded components are also made within the HPL facilities, reinforcing our quality edge.

## Key Strengths

Integrated Manufacturing Facilities
Located across North India in the states of Haryana and Himachal Pradesh. We have seven state-of-the-art manufacturing capabilities. These are equipped to manufacture customised products for institutional customers and undertake modifications in products for OEMs and other corporate customers as well as for the retail consumers. We manufacture all our products in-house, as well as several components used therein.

## Certifications

HPL's manufacturing facilities are ISO:9001 certified for Quality Management System, ISO:14001 certified for Environmental System and OHSAS-18001 certified for implementing an occupational Health and Safety Management System. HPL products are also ISI Certified by the Bureau of Indian Standards, a mark of quality products in India.
Certain range of products have KEMA certification for energy utilization and have CE certificate to give acceptability of the products in Europe and other international markets. With these awards, accolades and certificates, HPL continues its journey towards a brighter and innovative future.

## Our state-of-the-art manufacturing units are equipped with:

Ultra Modern Testing Labs
World Class R&D Facilities
State-of-the-art Moulding Plants
Latest Milling Machines

# Content

## Reliability

HPL constantly monitors its manufacturing processes and operates stringent quality assurance procedures to give long term reliability. This is of vital significance where cables are to be installed in locations where future access would be difficult and this is where HPL reputation and resources give peace of mind.

## Performance

Optimum cable performance can be provided only by a company such as HPL, with access to the latest developments in materials technology. In addition, HPL knowledge of application requirements throughout is an assurance of high performance.

Our experienced Technical Staff can provide guidance on cable selection and installation and can ensure that you get the right cable for the job.

## Health & Safety Management System Certified to OHSAS 45001

HPL ensure that its products are designed and constructed to be hazard-free under the prescribed conditions of use.

HPL uses only tried and tested materials and processes in full compliance with all relevant Indian, British and International Standards. Our cables are therefore manufactured for safe use without risk to health on the understanding that users will exercise the same degree of care in their selection and application. Safety is an important issue for HPL, and the strict standards are adhered to throughout the company. HPL is proud of its safety record.

Certification to OHSAS 45001 provides a recognizable Occupational Health and Safety Management standard against which an organization management system can be assessed and certified. Based on the structure of OHSAS 45001, the standard requires continual improvement in health and safety related activities.

## Quality Management System Certified to ISO 9001

HPL Quality Management System conforms to the ISO 9001 Quality System Standard. Certification to the ISO 9001 standard demonstrates that HPL has drawn up written procedures to ensure full compliance with all requirements of the standard and that these procedures are followed by every department in the company, thus ensuring that goods leaving HPL factory are of the highest quality and meet each customer's requirements in every respect.

## Environmental Management System Certified to ISO 14001

HPL Environmental Management System conforms to the ISO 14001 Environmental Management Standard.

Certification to the ISO 14001 standard shows that HPL has a well defined Structure and established working practices aimed at limiting its impact on the environment. Measurement and monitoring of effects, issuing work instructions, training of personnel and taking corrective actions are all essential elements to limiting the impact on the environment. HPL has set improvement targets to reduce the significant environmental impacts associated with its activities.

# Instrumentation Cables Adapted to EN 50288-7 / BS 5308 -2


## Cable Description

| | |
|---|---|
| Conductor | Annealed copper wires according to BS EN 60228 |
| Insulation | Polyvinyl chloride PVC |
| Pairs | Twisted |
| Identification Pairs | Blue & white, continuously numbered on white core (1, 2, 3...) for multi-element. |
| Wrapping | 1 layer of PETP tape |
| Collective Screen | Aluminium / PETP tape over tinned copper drain wire |
| Cable Sheath | Polyvinyl Chloride PVC |

## Technical Data

| | |
|---|---|
| Flame Propagation | EN 60332-1-2 |
| Operating Temperature Range | -5˚C to +70˚C |
| Bending Radius | 12 x cable diameter (Min) |
| Operating Voltage | 500V<br>*Also available in 300V variant on request.<br>n - No. of pairs<br>m - Pairs<br>a - Cross sectional area |

## Electrical Properties

| Conductor Cross Section (Sq.mm) | Class of Conductor | No. of Strands/ Max. Strand Diameter (mm) | Max. DC Conductor Resis-tance at 20°C (Ω/ km) | Max. L/R Ratio (µH/Ω) | Min. Insulation Resistance (MΩ x Km) | Max. Mutual Ca-pacitance (nF/km) | Max. Inductance (mH/km) | Test Volt-age Vrms (Core-Core) | Test Voltage Vrms (Core-Screen) |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 2 | 7/0.3 | 36.0 | 25 | 20 | 250 | 1 | 2000 | 2000 |
| 0.5 | 5 | 16/0.2 | 39.0 | 25 | 20 | 250 | 1 | 2000 | 2000 |
| 0.75 | 2 | 7/0.37 | 24.5 | 25 | 20 | 250 | 1 | 2000 | 2000 |
| 0.75 | 5 | 24/0.2 | 26.0 | 25 | 20 | 250 | 1 | 2000 | 2000 |
| 1 | 2 | 7/0.43 | 18.1 | 25 | 20 | 250 | 1 | 2000 | 2000 |
| 1 | 5 | 32/0.2 | 19.5 | 25 | 20 | 250 | 1 | 2000 | 2000 |
| 1.5 | 2 | 7/0.53 | 12.1 | 40 | 20 | 250 | 1 | 2000 | 2000 |
| 2.5 | 2 | 7/0.67 | 7.41 | 60 | 20 | 250 | 1 | 2000 | 2000 |

| Class | No. of Pairs & Nom. Cross Sectional Area (Sq. mm) | Min. Insulation Thickness (mm) | Nominal Sheath Thickness (mm) | Approx. Cable Diameter (mm) | Approx. Cable Weight (kg/km) |
|---|---|---|---|---|---|
| Class 5 | 1 x 2 x 0.5 | 0.44 | 1.0 | 6.4 | 48.2 |
| | 2 x 2 x 0.5 | 0.44 | 1.0 | 7.7 | 74.2 |
| | 3 x 2 x 0.5 | 0.44 | 1.1 | 9.0 | 100.8 |
| | 4 x 2 x 0.5 | 0.44 | 1.1 | 10.1 | 126.5 |
| | 5 x 2 x 0.5 | 0.44 | 1.2 | 11.1 | 151.8 |
| | 8 x 2 x 0.5 | 0.44 | 1.3 | 13.6 | 225.5 |
| | 10 x 2 x 0.5 | 0.44 | 1.3 | 15.0 | 274.0 |
| | 12 x 2 x 0.5 | 0.44 | 1.4 | 16.2 | 321.9 |
| | 16 x 2 x 0.5 | 0.44 | 1.4 | 18.4 | 416.1 |
| | 20 x 2 x 0.5 | 0.44 | 1.5 | 20.4 | 510.0 |
| | 24 x 2 x 0.5 | 0.44 | 1.6 | 22.2 | 603.1 |
| | 1 x 2 x 0.75 | 0.44 | 1.0 | 6.8 | 56.7 |
| | 2 x 2 x 0.75 | 0.44 | 1.1 | 8.3 | 89.5 |
| | 3 x 2 x 0.75 | 0.44 | 1.1 | 9.7 | 122.9 |
| | 4 x 2 x 0.75 | 0.44 | 1.2 | 10.9 | 155.8 |
| | 5 x 2 x 0.75 | 0.44 | 1.2 | 12.0 | 188.0 |
| | 8 x 2 x 0.75 | 0.44 | 1.3 | 14.7 | 282.2 |
| | 10 x 2 x 0.75 | 0.44 | 1.4 | 16.2 | 345.0 |
| | 12 x 2 x 0.75 | 0.44 | 1.4 | 17.6 | 406.3 |
| | 16 x 2 x 0.75 | 0.44 | 1.5 | 20.0 | 527.7 |
| | 20 x 2 x 0.75 | 0.44 | 1.6 | 22.2 | 649.5 |
| | 24 x 2 x 0.75 | 0.44 | 1.6 | 24.1 | 769.0 |
| | 1 x 2 x 1 | 0.44 | 1.0 | 7.1 | 64.1 |
| | 2 x 2 x 1 | 0.44 | 1.1 | 8.7 | 103.4 |
| | 3 x 2 x 1 | 0.44 | 1.1 | 10.2 | 143.1 |
| | 4 x 2 x 1 | 0.44 | 1.2 | 11.5 | 182.2 |
| | 5 x 2 x 1 | 0.44 | 1.2 | 12.6 | 220.5 |
| | 8 x 2 x 1 | 0.44 | 1.3 | 15.5 | 333.8 |
| | 10 x 2 x 1 | 0.44 | 1.4 | 17.1 | 408.9 |
| | 12 x 2 x 1 | 0.44 | 1.4 | 18.6 | 482.3 |
| | 16 x 2 x 1 | 0.44 | 1.5 | 21.2 | 629.0 |
| | 20 x 2 x 1 | 0.44 | 1.6 | 23.5 | 776.5 |
| | 24 x 2 x 1 | 0.44 | 1.7 | 25.5 | 920.3 |
| Class 2 | 1 x 2 x 0.5 | 0.44 | 1.0 | 6.4 | 48.0 |
| | 2 x 2 x 0.5 | 0.44 | 1.0 | 7.7 | 73.9 |
| | 3 x 2 x 0.5 | 0.44 | 1.1 | 9.0 | 100.4 |
| | 4 x 2 x 0.5 | 0.44 | 1.1 | 10.1 | 125.9 |
| | 5 x 2 x 0.5 | 0.44 | 1.2 | 11.1 | 151.2 |
| | 8 x 2 x 0.5 | 0.44 | 1.3 | 13.6 | 224.5 |
| | 10 x 2 x 0.5 | 0.44 | 1.3 | 15.0 | 272.7 |
| | 12 x 2 x 0.5 | 0.44 | 1.4 | 16.2 | 320.4 |
| | 16 x 2 x 0.5 | 0.44 | 1.4 | 18.4 | 414.1 |
| | 20 x 2 x 0.5 | 0.44 | 1.5 | 20.4 | 507.5 |
| | 24 x 2 x 0.5 | 0.44 | 1.6 | 22.2 | 600.1 |
| | 1 x 2 x 0.75 | 0.44 | 1.0 | 6.8 | 56.7 |
| | 2 x 2 x 0.75 | 0.44 | 1.1 | 8.3 | 89.5 |
| | 3 x 2 x 0.75 | 0.44 | 1.1 | 9.7 | 123.4 |
| | 4 x 2 x 0.75 | 0.44 | 1.2 | 10.9 | 155.9 |
| | 5 x 2 x 0.75 | 0.44 | 1.2 | 12.0 | 188.0 |
| | 8 x 2 x 0.75 | 0.44 | 1.3 | 14.7 | 282.4 |
| | 10 x 2 x 0.75 | 0.44 | 1.4 | 16.3 | 345.1 |
| | 12 x 2 x 0.75 | 0.44 | 1.4 | 17.6 | 406.4 |
| | 16 x 2 x 0.75 | 0.44 | 1.5 | 20.1 | 527.9 |
| | 20 x 2 x 0.75 | 0.44 | 1.6 | 22.2 | 649.7 |
| | 24 x 2 x 0.75 | 0.44 | 1.6 | 24.2 | 769.4 |
| | 1 x 2 x 1 | 0.44 | 1.0 | 7.2 | 65.2 |
| | 2 x 2 x 1 | 0.44 | 1.1 | 8.8 | 105.6 |
| | 3 x 2 x 1 | 0.44 | 1.1 | 10.4 | 146.7 |
| | 4 x 2 x 1 | 0.44 | 1.2 | 11.7 | 186.8 |
| | 5 x 2 x 1 | 0.44 | 1.2 | 12.9 | 226.1 |
| | 8 x 2 x 1 | 0.44 | 1.3 | 15.8 | 342.3 |
| | 10 x 2 x 1 | 0.44 | 1.4 | 17.4 | 419.3 |
| | 12 x 2 x 1 | 0.44 | 1.5 | 19.0 | 495.5 |
| | 16 x 2 x 1 | 0.44 | 1.6 | 21.6 | 646.0 |
| | 20 x 2 x 1 | 0.44 | 1.6 | 23.9 | 796.2 |
| | 24 x 2 x 1 | 0.44 | 1.7 | 26.0 | 945.0 |
| | 1 x 2 x 1.5 | 0.44 | 1.0 | 7.9 | 81.9 |
| | 2 x 2 x 1.5 | 0.44 | 1.1 | 9.7 | 136.4 |
| | 3 x 2 x 1.5 | 0.44 | 1.2 | 11.5 | 191.5 |
| | 4 x 2 x 1.5 | 0.44 | 1.2 | 13.0 | 246.0 |
| | 5 x 2 x 1.5 | 0.44 | 1.3 | 14.3 | 299.7 |
| | 8 x 2 x 1.5 | 0.44 | 1.4 | 17.7 | 457.6 |
| | | 0.44 | 1.5 | 19.5 | 563.2 |
| | 12 x 2 x 1.5 | 0.44 | 1.5 | 21.2 | 666.6 |
| | 16 x 2 x 1.5 | 0.44 | 1.6 | 24.2 | 872.3 |
| | 20 x 2 x 1.5 | 0.44 | 1.7 | 26.8 | 1079.7 |
| | 24 x 2 x 1.5 | 0.44 | 1.8 | 29.2 | 1283.9 |
| | 1 x 2 x 2.5 | 0.53 | 1.1 | 9.3 | 113.8 |
| | 2 x 2 x 2.5 | 0.53 | 1.2 | 11.5 | 195.3 |
| | 3 x 2 x 2.5 | 0.53 | 1.3 | 13.6 | 278.3 |
| | 4 x 2 x 2.5 | 0.53 | 1.3 | 15.5 | 360.2 |
| | 5 x 2 x 2.5 | 0.53 | 1.4 | 17.1 | 441.1 |
| | 8 x 2 x 2.5 | 0.53 | 1.5 | 21.1 | 680.6 |
| | 10 x 2 x 2.5 | 0.53 | 1.6 | 23.4 | 840.3 |
| | 12 x 2 x 2.5 | 0.53 | 1.7 | 25.5 | 998.3 |
| | 16 x 2 x 2.5 | 0.53 | 1.8 | 29.1 | 1310.9 |
| | 20 x 2 x 2.5 | 0.53 | 1.9 | 32.3 | 1627.1 |
| | 24 x 2 x 2.5 | 0.53 | 2.1 | 35.2 | 1938.7 |

For multi-pair maximum resistance shall be increased by 2%
Cable Design Parameters

# Fire Survival Cables as per BS : 7846


HPL Fire Survival Cable are installed in areas whereby there is a need to maintain circuit integrity for prolonged period of time in a fire situation, these cables provides vital additional time to accomplish the evacuation of personnel, to contain and minimize the damage to equipment, plant and buildings, and to mount an effective fire fighting operation. These cables are specially used in wiring applications in critical life safety systems (e.g. Building management systems, emergency lightings, standby power supplies, lifts & elevators) in public such as airports, hotels, hospitals, subways, train stations, etc. Plant engineering and construction, industrial machinery and power stations.

| | | |
|---|---|---|
| **Design** | | |
| Standard | BS 7846 | |
| Conductor | Annealed bare copper conductor – IS 8130 / IEC 60228 | |
| Flame barrier tape | Suitable flame barrier tape (mica tape) to sustain fire test. | |
| Insulation | Cross linked polyethylene insulated – BS 7655 / IS 7098 | |
| Inner Sheath | Low smoke zero halogen with flame retardant properties | |
| Armouring | GI round wire/ GI strip | |
| Outer Sheath | Low smoke zero halogen with flame retardant properties | |
| **Electrical Properties** | | |
| Nominal voltage | 600 / 1000 V | |
| Test voltage | 3500 V AC for 5 minutes core to core. | |
| **Mechanical Properties** | | |
| Min. bending radius | fixed installation | 12 x cable OD |
| Temperature range | fixed installation | -5°C up to +90°C max. Conductor temperature |
| **Flame and Other Tests** | | |
| Flammability | In acc. with IEC 60332-1-2 & IEC 60332-3-24 (BS EN 50266-2-4) | |
| Flame test | Ss per BS 6387 | |
| Oxygen index | >30 % in acc. to ASTM-D 2863 | |
| Temperature index | >250°C in acc. to ASTM-D 2863 | |
| Smoke density | 70% Light Transmittance in acc. to EN 61034-2 or max. 20% in acc. to ASTM D 2843 | |
| Acid gas generation | Max 0.5% in acc. to BS EN 50267-2-1 or IEC 60754-1 | |
| **Special Properties** | | |

This product conforms to RoHS directive (Restriction of the use of certain hazardous substances)

| No. of cores & (mm) per conductor | Nominal outer dia. (mm) | Copper Weight (kg/km) Approx. | Weight (kg/km) Approx. |
|---|---|---|---|
| 2x1.5 | 14.2 | 26.75 | 360.59 |
| 2x1.5 | 14.2 | 26.75 | 360.59 |
| 2x2.5 | 15.6 | 43.43 | 436.09 |
| 2x2.5 | 15.6 | 43.43 | 436.09 |
| 3x1.5 | 14.8 | 40.13 | 394.86 |
| 3x1.5 | 14.8 | 40.13 | 394.86 |
| 3x2.5 | 16.3 | 65.15 | 481.30 |
| 3x2.5 | 16.3 | 65.15 | 481.30 |
| 4x1.5 | 15.7 | 53.51 | 444.80 |
| 4x1.5 | 15.7 | 53.51 | 444.80 |
| 4x2.5 | 17.4 | 86.86 | 552.43 |
| 4x2.5 | 17.4 | 86.86 | 552.43 |
| 5x1.5 | 16.9 | 66.88 | 508.43 |
| 5x1.5 | 16.9 | 66.88 | 508.43 |
| 5x2.5 | 18.6 | 108.58 | 630.49 |
| 5x2.5 | 18.6 | 108.58 | 630.49 |
| 6x1.5 | 18.0 | 80.26 | 575.70 |
| 6x1.5 | 18.0 | 80.26 | 575.70 |
| 6x2.5 | 19.8 | 130.30 | 717.14 |
| 6x2.5 | 19.8 | 130.30 | 717.14 |
| 7x1.5 | 18.0 | 93.64 | 581.92 |
| 7x1.5 | 18.0 | 93.64 | 581.92 |
| 7x2.5 | 19.8 | 152.01 | 728.84 |
| 7x2.5 | 19.8 | 152.01 | 728.84 |
| 8x1.5 | 20.5 | 107.01 | 792.74 |
| 8x1.5 | 20.5 | 107.01 | 792.74 |
| 8x2.5 | 22.8 | 173.73 | 991.81 |
| 8x2.5 | 22.8 | 173.73 | 991.81 |
| 9x1.5 | 21.8 | 120.39 | 885.99 |
| 9x1.5 | 21.8 | 120.39 | 885.99 |
| 9x2.5 | 24.3 | 195.44 | 1118.00 |
| 9x2.5 | 24.3 | 195.44 | 1118.00 |
| 10x1.5 | 22.5 | 133.77 | 944.56 |
| 10x1.5 | 22.5 | 133.77 | 944.56 |
| 10x2.5 | 25.1 | 217.16 | 1191.70 |
| 10x2.5 | 25.1 | 217.16 | 1191.70 |
| 11x1.5 | 22.5 | 147.14 | 950.78 |
| 11x1.5 | 22.5 | 147.14 | 950.78 |
| 11x2.5 | 25.1 | 238.88 | 1203.40 |
| 11x2.5 | 25.1 | 238.88 | 1203.40 |
| 12x1.5 | 23.1 | 160.52 | 1005.61 |
| 12x1.5 | 23.1 | 160.52 | 1005.61 |
| 12x2.5 | 25.8 | 260.59 | 1273.09 |
| 12x2.5 | 25.8 | 260.59 | 1273.09 |
| 13x1.5 | 24.2 | 173.90 | 1088.38 |
| 13x1.5 | 24.2 | 173.90 | 1088.38 |
| 13x2.5 | 28.1 | 282.31 | 1556.90 |
| 13x2.5 | 28.1 | 282.31 | 1556.90 |
| 14x1.5 | 24.2 | 187.27 | 1094.60 |
| 14x1.5 | 24.2 | 187.27 | 1094.60 |
| 14x2.5 | 28.1 | 304.02 | 1568.60 |
| 14x2.5 | 28.1 | 304.02 | 1568.60 |
| 15x1.5 | 25.2 | 200.65 | 1183.22 |
| 15x1.5 | 25.2 | 200.65 | 1183.22 |
| 15x2.5 | 29.4 | 325.74 | 1707.99 |
| 15x2.5 | 29.4 | 325.74 | 1707.99 |
| 16x1.5 | 25.2 | 214.03 | 1189.44 |
| 16x1.5 | 25.2 | 214.03 | 1189.44 |
| 16x2.5 | 29.4 | 347.46 | 1719.70 |
| 16x2.5 | 29.4 | 347.46 | 1719.70 |

| No. of cores & (mm) per conductor | Nominal outer dia. (mm) | Copper Weight (kg/km) Approx. | Weight (kg/km) Approx. |
|---|---|---|---|
| 17x1.5 | 26.3 | 227.40 | 1276.39 |
| 17x1.5 | 26.3 | 227.40 | 1276.39 |
| 17x2.5 | 30.6 | 369.17 | 1840.58 |
| 17x2.5 | 30.6 | 369.17 | 1840.58 |
| 18x1.5 | 26.3 | 240.78 | 1282.61 |
| 18x1.5 | 26.3 | 240.78 | 1282.61 |
| 18x2.5 | 30.6 | 390.89 | 1852.28 |
| 2x4 | 16.6 | 70.02 | 504.90 |
| 2x4 | 16.6 | 70.02 | 504.90 |
| 2x6 | 17.8 | 105.37 | 599.34 |
| 2x6 | 17.8 | 105.37 | 599.34 |
| 2x10 | 19.8 | 176.37 | 764.89 |
| 2x10 | 19.8 | 176.37 | 764.89 |
| 2x16 | 22.7 | 281.41 | 1101.62 |
| 2x16 | 22.7 | 281.41 | 1101.62 |
| 2x25 | 23.5 | 443.90 | 1184.45 |
| 2x25 | 23.5 | 443.90 | 1184.45 |
| 2x35 | 26.7 | 615.71 | 1631.98 |
| 2x35 | 26.7 | 615.71 | 1631.98 |
| 2x50 | 29.0 | 832.75 | 1974.73 |
| 2x50 | 29.0 | 832.75 | 1974.73 |
| 2x70 | 31.9 | 1204.87 | 2512.19 |
| 2x70 | 31.9 | 1204.87 | 2512.19 |
| 2x95 | 35.7 | 1677.93 | 3395.57 |
| 2x95 | 35.7 | 1677.93 | 3395.57 |
| 3x4 | 17.4 | 105.03 | 570.50 |
| 3x4 | 17.4 | 105.03 | 570.50 |
| 3x6 | 18.7 | 158.05 | 683.96 |
| 3x6 | 18.7 | 158.05 | 683.96 |
| 3x10 | 21.5 | 264.55 | 999.22 |
| 3x10 | 21.5 | 264.55 | 999.22 |
| 3x16 | 24.1 | 422.11 | 1302.19 |
| 3x16 | 24.1 | 422.11 | 1302.19 |
| 3x25 | 27.7 | 665.85 | 1736.53 |
| 3x25 | 27.7 | 665.85 | 1736.53 |
| 3x35 | 29.9 | 923.56 | 2118.72 |
| 3x35 | 29.9 | 923.56 | 2118.72 |
| 3x50 | 32.1 | 1249.13 | 2582.99 |
| 3x50 | 32.1 | 1249.13 | 2582.99 |
| 3x70 | 36.2 | 1807.31 | 3373.25 |
| 3x70 | 36.2 | 1807.31 | 3373.25 |
| 3x95 | 42.9 | 2516.90 | 4722.65 |
| 3x95 | 42.9 | 2516.90 | 4722.65 |
| 4x4 | 18.6 | 140.04 | 658.48 |
| 4x4 | 18.6 | 140.04 | 658.48 |
| 4x6 | 20.9 | 210.74 | 907.26 |
| 4x6 | 20.9 | 210.74 | 907.26 |
| 4x10 | 23.1 | 352.74 | 1174.82 |
| 4x10 | 23.1 | 352.74 | 1174.82 |
| 4x16 | 26.0 | 562.82 | 1553.47 |
| 4x16 | 26.0 | 562.82 | 1553.47 |
| 4x25 | 29.7 | 887.80 | 2086.70 |
| 4x25 | 29.7 | 887.80 | 2086.70 |
| 4x35 | 31.5 | 1231.41 | 2555.42 |
| 4x35 | 31.5 | 1231.41 | 2555.42 |
| 4x50 | 34.4 | 1665.51 | 3160.97 |
| 4x50 | 34.4 | 1665.51 | 3160.97 |
| 4x70 | 39.8 | 2409.75 | 4472.35 |
| 4x70 | 39.8 | 2409.75 | 4472.35 |
| 4x95 | 43.3 | 3355.87 | 5659.42 |

# Fire Alarm Cables BS 7629-1, BS EN 50200.


## Application

These cables are used in high rise buildings, commercial complexes, schools and educational institutions, hospitals, etc. for the connection with security systems like smoke detectors, emergency lightings, exit signboards and fire command center. These cables are used where the fire safety is utmost important.

## Technical Data

| | |
|---|---|
| Voltage Rating | 300/500V |
| Temperature Range | -30˚C to + 70˚C (The cable should not be flexed when either the ambient or cable temperature is below 0˚C) |
| Minimum Bending Radius | 6D |

## Cable Construction

- Plain annealed copper conductor to BS EN 60288, class 2.
- Primary insulation of glass mica fire resistant tape.
- Secondary insulation to BS EN 50363-5, Type EI 5, Low smoke zero halogen (LSZH) cross-linkable flame retardant insulation.

## Core Colours

- 2 Core : blue, brown.
- 3 Core : blue, brown, black.
- 4 Core : blue, brown, black, grey.
- Glass fibre tape.
- Earth/Drain wire of annealed tinned copper to BS EN 60228.
- Electrostatic screen of aluminium fire barrier.
- Sheath Type LTS3 to BS 7655 section 6.1.

## Properties

*Low smoke zero halogen (LSOH), flame retardant.

## Fire Performance Tests

BS 7629 -1, 300 / 500V fire resistant electric cables with non corrosive gases and low emission of smoke when affected by fire.

Category STANDARD 60 when tested in accordance with BS EN 50200-Method of test for resistance to fire of unprotected small cables for use in emergency circuits. In addition, it shall meet the 30 min survival time when tested in accordance with BS EN 502000, Annex E.

Meets requirement for the fire resistant cables as described in clause 262d of BS 5839-1

## Cable Design Parameters

| No. of Cores & Nominal Cross Section Area (Sq. mm) | No. of Strands / Strand Diameter (mm) | Nominal Overall Diameter (mm) |
|---|---|---|
| 2 x 1.5 | 7/0.53 | 10.0 |
| 2 x 2.5 | 7/0.67 | 11.5 |
| 3 x 1.5 | 7/0.53 | 10.8 |
| 3 x 2.5 | 7/0.67 | 12.3 |
| 4 x 1.5 | 7/0.53 | 12.0 |
| 4 x 2.5 | 7/0.67 | 13.5 |

## Electrical Properties

| No. of Cores & Nominal Cross Section Area (Sq. mm) | Max. Conductor Resistance at 20°C (Ω/km) | Current Rating (A) | | Voltage Drop DC or Single Phase AC (mV/A/m) |
|---|---|---|---|---|
| | | DC or Single Phase AC enclosed | DC or Single Phase AC Clipped | |
| 2 x 1.5 | 12.1 | 17.5 | 20.0 | 29 |
| 2 x 2.5 | 7.41 | 24.0 | 27.0 | 18 |
| 3 x 1.5 | 12.1 | 17.5 | 20.0 | 29 |
| 3 x 2.5 | 7.41 | 24.0 | 27.0 | 18 |
| 4 x 1.5 | 12.1 | 17.5 | 20.0 | 29 |
| 4 x 2.5 | 7.41 | 24.0 | 27.0 | 18 |

# CAT 6 Cables

## Description

HPL LAN Cable Cat.6 is an installation cable for structured horizontal cabling. These cables are ideal for LAN data transmission in all Ethernet (IEEE 802.3) applications up to 1000 Base-T. IEC 61156-5/ISO/IEC11801, EN 50173-1, EIA/TIA 568C.2

## Technical Data

| | |
|---|---|
| Conductor | Solid bare copper wire, AWG 24/1 |
| Insulation. | Solid polyethylene |
| Core identification code | Pair 1: White/Blue – Blue<br>Pair 2: White/Orange – Orange<br>Pair 3: White/Green – Green<br>Pair 4: White/Brown - Brown |
| Stranding | Two cores stranded to pairs, pairs are separated by a central cross element |
| Outer sheath | PVC compound<br>Outer O: Approx. 6.0 mm<br>Color: Grey, similar to RAL 7035 |

## Mechanical Characteristics

| | |
|---|---|
| Minimum bending radius | At installation : 4 x cable O<br>Fixed installation : 8 x cable O |
| Permissible temperature range | At installation : 0˚C up to +50˚C<br>Fixed installation: -20˚C up to +60˚C |
| Flame propagation | Flame retardant acc. to IEC 60332-1-2 |
| Classification of fire Behaviour Acc. to EU Regulation 305/2011 (CPR) | ECA<br>(Acc. to EN13501-6 and EN50575) |

## Electrical Characteristics

| | |
|---|---|
| DC-Resistance (loop) | Max. 172.0 Ω/km |
| Insulation resistance | Min. 5 GΩ x km |
| Mutual capacitance | Nom. 50 nF/km at 1 kHz |
| Characteristic impedance | Nom. 100 Ω acc. to IEC 61156-5 |
| Operating peak voltage | 100 V (not for power purposes) |
| velocity of propagation | Approx. 0.68 c |
| Test voltage | Core/core : 1000V |

## Transmission Properties

Transmission properties acc. to IEC 61156-5 for Category Cat.6 :

| f [MHz] | Attenuation [dB/100m] | | PS NEXT [dB] | | EL FEXT [dB] | | Return Loss [dB] | |
|---|---|---|---|---|---|---|---|---|
| | Standard | Typical | Standard | Typical | Standard | Typical | Standard | Typical |
| 1* | 2.1 | 1.8 | 75 | 90 | 68 | 82 | 20.0 | 25 |
| 4 | 3.8 | 3.5 | 66 | 80 | 56 | 75 | 23.0 | 30 |
| 10 | 6.0 | 5.6 | 60 | 75 | 48 | 67 | 25.0 | 34 |
| 16 | 7.6 | 7.2 | 57 | 70 | 44 | 65 | 25.0 | 35 |
| 31,25 | 10.7 | 10.1 | 53 | 68 | 38 | 60 | 23.6 | 35 |
| 62,5 | 15.5 | 14.4 | 48 | 62 | 32 | 53 | 21.5 | 33 |
| 100 | 19.9 | 18.4 | 45 | 60 | 28 | 50 | 20.1 | 30 |
| 250 | 33.0 | 29.1 | 39 | 57 | 20 | 44 | 17.3 | 25 |
| 300 | - | 34.8 | - | 53 | - | 41 | - | 23 |
| 350 | - | 38.5 | - | 48 | - | 39 | - | 22 |

*Extract of normative minimum requirements

# CAT 6A Cables

## HPL 10 GB/s Ethernet In A Smaller, More Rugged Cable for Military And Aerospace Environments

Achieve 10 Gb/s speeds while saving space and helping to meet the demands of harsh military and aerospace environments. HPL Cat 6A cables are fully shielded four-pair cables meeting the electrical requirements of ANSI/TIA-568-C.2 for Category 6A cable.
The cable's FEP insulation and jacket allow a reduced- diameter cable, when compared to standard commercial Cat 6A cables, while stranded conductors provide high flexibility in routing.

## Engineered to Perform

The HPL cable is highly engineered to provide excellent 10G signal integrity and performance stability over a temperature range as wide as -55˚C to +200˚C.
The cable comes in two wire gauges: the industry-standard 24 AWG and a smaller 26 AWG as required in certain military and aerospace applications.

## High Speed, High Compatibility

Compared to commonly used tape-wrapped cables, HPL Cat 6a cables are easier to terminate. Plus the cable is compatible with common high-speed aerospace and military connectors. This compatibility includes TE's high-performance 10 Gb/s CeeLok FAS-T and CeeLok FAS-X connectors.

**HIGH PERFORMANCE**
- Excellent signal integrity at 10 Gb/s
- Stable performance in extreme conditions
- Support full 100 m links

**COMPACT AND RUGGED**
- Ruggedized to survive in harsh environments
- Reduced size and weight

**EASY TO USE**
- Easier to terminate compared to tape-wrapped designs
- Flexible with tight bend radius for easier routing

**COMPATIBLE**
- Fit most high-speed aerospace connectors, including Te's CeeLok FAS-T and CeeLok FAS-X connectors

**APPLICATIONS**
- Military and Commercial Aerospace
- In-Flight Entertainment Systems
- Flight Control
- Avionics
- Cabin Management Systems
- Military Ground Vehicles
- Formula 1 Motorsport

## Specifications:

### MATERIALS

- **Conductors :**
24 AWG: Stranded silver-coated copper alloy
26 AWG: Stranded silver-coated high-strength copper alloy

- **Dielectric : FEP**
Core Wrap: PTFE (26 AWG cables only)

- **Shielding :**
200˚C Rated Cables: Silver-coated copper braid an aluminum/ polyimide foil wrap 150˚C Rated Cables: Tin-coated copper braid an aluminum/polyester foil wrap

- **Jacket :**
FEP, in colors per MIL-

### ENVIRONMENTAL/MECHANICAL

- Temperature Range: -55˚C to 150˚C or 200˚C
- Bend Radius (Min.):
- 24 AWG: 1.0 in.
- 26 AWG: 0.75 in.

### ELECTRICAL

- Standard Impedance (Nom): 100 ohms
- Attenuation (Max.) at 500 MHz:
  24 AWG: 54.4 ohms/100m
  26 AWG: 67.9 ohms/100m
- Mutual Capacitance (Max.) at 1 kHz: 5.6 nF/100 m
- DC Resistance (Nom.) at 20˚C: 43.9 ohms/1000 ft.
- Velocity of Propagation (Nom.): 70%

### STANDARDS/SPECIFICATIONS

- Ethernet Cable: ANSI/TIA-568-C.2 and IEEE 801.3
- Environmental Testing: WC 27500/AS6070
- Smoke and toxicity: Boeing and Airbus ABD0031 standards FAR Part 25, Appendix F, Part 1
- TE Product Specification: 1200/1400

# DC Solar Cables

DC SOLAR CABLES for ON-GRID / OFF -GRID APPLICATION - SPECIFICATION


## General Description

Flexible Single core cable with flexible electroplated tinned copper conductor insulated with special Halogen free cross linked Polyofin (XLPO).
As per EN - 50618 (XLPO), low smoke zero halogen sheathed,
UV and Ozone resistant. The cable is able to satisfy the latest requirement for PV systems as per EN 50618, IEC-60227/60502, IS-694.

## Applications

Flexible cables suitable for:

- Mobile & fixed installations.
- Connection between photovoltaic
- Panels to junction Box/Inverter.
- Indoor & outdoor use in dry,
- Damp and wet situations.
- On trays and in ducts open and closed.

## Construction

**Conductor :** Electrolytic annealed electroplated tinned copper conductor, Class - 5 IEC 60228/ IS 8130.

**Insulation & Outer Sheath :-**
Halogen free cross linked Polyofin (XLPO) As per EN – 50618 (XLPO).
1x1014 Ohm cm @ 20˚C & 1x1012 Ohm cm @ 90˚C.
(Specific volume resistance to IEC: 50395-8.2)

## Technical Data Sheet For Solar Cable

Photovoltaic Cable (Solar Cable)

**TYPE-1**

**Dimensions of Solar D.C. Cables From PV Module to Array Junction Box & MIB to Inverter as per EN - 50618 : 2014**

| Single Core Size (sqmm) | Maximum Wire size | No of wire | XL-LSOH Insulation Thickness Nominal (mm) | XL-LSOH Sheath Thickness Nominal (mm) | Overall Diameter Nominal (mm) | Maximum Conductor Resistance at 20°C ohm/km (Tinned Copper) | Current Carrying capacity of DC solar cable with XL-LSOH insulation & XL-LSOH sheathing at 60°C | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Single cable in Air (Amp.) | Single cable on surface (Amp.) | Two adjacent cable on surface (Amp.) |
| 1.50 | 0.26 | 30 | 0.70 | 0.80 | 5.40 | 13.70 | 30 | 29 | 24 |
| 2.50 | 0.26 | 50 | 0.70 | 0.80 | 5.90 | 8.21 | 41 | 39 | 33 |
| 4.00 | 0.31 | 56 | 0.70 | 0.80 | 6.60 | 5.09 | 55 | 52 | 44 |
| 6.00 | 0.31 | 84 | 0.70 | 0.80 | 7.40 | 3.39 | 70 | 67 | 57 |
| 10.00 | 0.41 | 80 | 0.70 | 0.80 | 8.80 | 1.95 | 98 | 93 | 79 |
| 16.00 | 0.41 | 126 | 0.70 | 0.90 | 10.10 | 1.24 | 132 | 125 | 107 |
| 25.00 | 0.41 | 196 | 0.90 | 1.00 | 12.50 | 0.795 | 176 | 167 | 142 |
| 35.00 | 0.41 | 276 | 0.90 | 1.10 | 14.00 | 0.565 | 218 | 207 | 176 |
| 50.00 | 0.41 | 396 | 1.00 | 1.20 | 16.30 | 0.393 | 274 | 260 | 219 |
| 70.00 | 0.41 | 556 | 1.00 | 1.20 | 18.70 | 0.277 | 406 | 386 | 325 |
| 95.00 | 0.41 | 756 | 1.10 | 1.30 | 20.80 | 0.210 | 491 | 467 | 393 |

| TYPE-2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Dimensions of Solar D.C. Cables From PV Module to Array Junction Box (As per IS : 694 & IS:1554 Part-1 Guideline)** | | | | | | | | | |
| Single Core Size (sqmm) | Maximum Wire size | No of wire | HR 105°C Insulation Thickness Nominal (mm) | UV-HR 105°C Sheath Thickness Nominal (mm) | Overall Diameter Nominal (mm) | Maximum Conductor Resistance at 20°C ohm/ km (Bare Copper) | Current Carrying capacity of DC solar cable with HR 105°C Insulation & UV stabilised HR 105°C sheathing at 40°C | | |
| | | | | | | | Single cable in Air (Amp.) | Single cable on surface (Amp.) | Two adjacent cable on surface (Amp.) |
| 1.50 | 0.26 | 30 | 0.70 | 0.80 | 5.40 | 13.70 | 28 | 26 | 22 |
| 2.50 | 0.26 | 50 | 0.70 | 0.80 | 5.90 | 8.21 | 39 | 37 | 31 |
| 4.00 | 0.31 | 56 | 0.70 | 0.80 | 6.60 | 5.09 | 50 | 48 | 40 |
| 6.00 | 0.31 | 84 | 0.70 | 0.80 | 7.40 | 3.39 | 64 | 61 | 51 |
| 10.00 | 0.41 | 80 | 0.70 | 0.80 | 8.80 | 1.95 | 89 | 84 | 71 |
| 16.00 | 0.41 | 126 | 0.70 | 0.90 | 10.10 | 1.24 | 119 | 113 | 95 |
| 25.00 | 0.41 | 196 | 0.90 | 1.00 | 12.50 | 0.795 | 150 | 143 | 120 |
| 35.00 | 0.41 | 276 | 0.90 | 1.10 | 14.00 | 0.565 | 191 | 182 | 153 |
| 50.00 | 0.41 | 396 | 1.00 | 1.20 | 16.30 | 0.393 | 253 | 240 | 202 |
| 70.00 | 0.41 | 556 | 1.00 | 1.20 | 18.70 | 0.277 | 374 | 350 | 299 |
| 95.00 | 0.41 | 756 | 1.10 | 1.30 | 20.80 | 0.210 | 451 | 429 | 361 |

| TYPE-3 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Dimensions of Solar D.C. Cables From PV Module to Array Junction Box (As per IS : 7098 Part-1 Guideline)** | | | | | | | | | |
| Single Core Size (sqmm) | Maximum Wire size | No of wire | XLPE Insulation Thickness Nominal (mm) | UV ST-2 Sheath Thickness Nominal (mm) | Overall Diameter Nominal (mm) | Maximum Conductor Resistance at 20°C ohm/km (Bare Copper) | Current Carrying capacity of DC solar cable with XLPE Insulation & UV stabilised PVC ST-2 sheathing at 40°C | | |
| | | | | | | | Single cable in Air (Amp.) | Single cable on surface (Amp.) | Two adjacent cable on surface (Amp.) |
| 1.50 | 0.26 | 30 | 0.70 | 0.80 | 5.40 | 13.70 | 25 | 24 | 20 |
| 2.50 | 0.26 | 50 | 0.70 | 0.80 | 5.90 | 8.21 | 35 | 33 | 28 |
| 4.00 | 0.31 | 56 | 0.70 | 0.80 | 6.60 | 5.09 | 45 | 43 | 36 |
| 6.00 | 0.31 | 84 | 0.70 | 0.80 | 7.40 | 3.39 | 58 | 55 | 46 |
| 10.00 | 0.41 | 80 | 0.70 | 0.80 | 8.80 | 1.95 | 80 | 76 | 64 |
| 16.00 | 0.41 | 126 | 0.70 | 0.90 | 10.10 | 1.24 | 106 | 101 | 85 |
| 25.00 | 0.41 | 196 | 0.90 | 1.00 | 12.50 | 0.795 | 135 | 128 | 108 |
| 35.00 | 0.41 | 276 | 0.90 | 1.10 | 14.00 | 0.565 | 173 | 164 | 138 |
| 50.00 | 0.41 | 396 | 1.00 | 1.20 | 16.30 | 0.393 | 226 | 215 | 181 |
| 70.00 | 0.41 | 556 | 1.00 | 1.20 | 18.70 | 0.277 | 336 | 319 | 269 |
| 95.00 | 0.41 | 756 | 1.10 | 1.30 | 20.80 | 0.210 | 406 | 386 | 325 |

# Coaxial Cables (RG6)


HPL Coaxial Cables are designed to be used at homes for television sets and also in security agencies for advanced data transmission.

## Salient Features

- Protects signals from external electromagnetic interference
- Very low Attenuation or signal losses
- For both analog and digital transmission
- Special jacketing offers increased life even in rugged conditions
- Jelly flooded

## Technical Details

- **Conductor:** The central conductor is made of solid electrolytic grade annealed bare copper (BC) conductor or copper clad steel (CCS) conductor.
- **Insulation:** The insulation provided over the conductor is of foam PE dielectric insulator with gas injucted in it to reduce signal loss.
- **Screen:** Aluminium mylar tape is provided over the insulated conductor to shield the conductor and ensure disturbance-free transmission of signals.
- **Braiding:** The braiding is generally provided with 60% coverage of Aluminium-Magnesium alloy.
- **Packing:** Available in 100 meter packed in carton and 305 meter packed in easy pull box. Higher lengths available on special request.

## Cable Cross Section View

| TECHNICAL SPECIFICATION OF RG6 COAXIAL CABLE (JELLY FLOODED) | | |
|---|---|---|
| **Properties** | **Unit** | **Specification** |
| **Construction Parameters** | | |
| Conductor Material | --- | Solid bare copper / CCS |
| Nominal Diameter | mm | 1.02 ± 0.01 |
| Insulation Material | --- | Foam P.E |
| Nominal Diameter of Foam | mm | 4.57 ± 0.1 |
| Centricity | % | ≥ 85 |
| Shield Material | --- | Bonded Aluminium Foil |
| Braiding Material | --- | Aluminium - Magnesium Alloy |
| Braiding Coverage | --- | 16□6□0.12mm (63%) |
| Jacket Material | --- | PVC |
| Nominal Diameter of PVC Jacket | mm | 7.0 ± 0.1 |
| Colour | --- | Black |
| Bending Radius | mm | 60 |
| **Electrical Parameters** | | |
| Nominal Impedance | Ω | 75±3 |
| Nominal Velocity of Propagation | % | 85 |
| Nominal Capacitance | pf/mtr | 50 |
| Insulation Resistance | MΩ/km | ≥100000 |
| Structural Return Loss (5 to 300 MHz) | dB | 20 |
| Structural Return Loss (300 to 1000 MHz) | dB | 18 |
| **Performance** | | |
| **Frequency MHz** | | **Attenuation @ 68°F (20°C)** |
| 55 | dB/100 m (Max) | 5.2 |
| 200 | dB/100 m (Max) | 9.9 |
| 400 | dB/100 m (Max) | 13.3 |
| 750 | dB/100 m (Max) | 18.3 |
| 865 | dB/100 m (Max) | 19.9 |
| 1000 | dB/100 m (Max) | 21.4 |

# Telephone Cables


HPL twisted paired cables are best suited for telephone and switchboard cabling applications. The cables can be used for switchboard and internal telephone wiring in apartments, high-rise buildings, offices, factories, hotels, residential complexes, etc. The most common sizes are 2 Pair, 3 Pair, 4 Pair and 5 Pair in conductor of 0.4 mm or 0.5 mm.

## Salient Features

- Low Power Loss
- Low Crosstalk
- Fire Retardant Sheath
- Low attenuation

## Range of Product

- 1 Pair to 20 Pair (0.4 mm / 0.5 mm)

## Technical Details:

- **Conductor:** The central conductor is made of bare annealed solid electrolytic grade of copper.
- **Insulation:** Premium quality HDPE is used. This serves for low attenuation and minimized cross talk.
- **Twisted Pairs:** The cores are carefully twisted with suitable lays and bunched together.
- **Packing:** Available in 90 meter packed in carton and 500 meter packed in easy pull box. Higher lengths available on special request.

| S. No. | Technical Parameters | Requirements | | | | |
|---|---|---|---|---|---|---|
| **A** | **Physical Parameter** | | | | | |
| 1 | Construction | 1 Pair | 2 Pair | 3 Pair | 5 Pair | 5 Pair |
| 2 | Conductor Material: 0.4 mm diameter (nom.) & 0.5 mm diameter (nom.) | Solid Annealed Bare Copper of Conductivity 102% IACS & Purity 99.97% | | | | |
| 3 | Insulation Material (0.4 & 0.5 mm dia.) | High Density Polyethylene | | | | |
| 4a | Insulation Thickness (Average) for 0.4 mm dia. | 0.17 mm | 0.17 mm | 0.17 mm | 0.17 mm | 0.17 mm |
| 4b | Insulation Thickness (Average) for 0.5 mm dia. | 0.20 mm | 0.20 mm | 0.20 mm | 0.20 mm | 0.20 mm |
| 5a | Diameter of Insulated Conductor for 0.4 mm dia. | 0.74 mm | 0.74 mm | 0.74 mm | 0.74 mm | 0.74 mm |
| 5b | Diameter of Insulated Conductor for 0.5 mm | 0.92 mm | 0.92 mm | 0.92 mm | 0.92 mm | 0.92 mm |
| 6 | Rip cord (0.4 & 0.5 mm dia.) | Nylon | | | | |
| 7 | Colour Combination | White-Blue | White-Blue | White-Blue | White-Blue | White-Blue |
| | | - | White-Orange | White-Orange | White-Orange | White-Orange |
| | | - | - | White-Green | White-Green | White-Green |
| | | - | - | - | White-Brown | White-Brown |
| | | - | - | - | - | White-Grey |
| 8a | PVC Jacket (0.4mm & 0.5mm diameter) | FR-PVC compound with high oxygen index (LOI = 29%)* | | | | |
| 8b | PVC Thickness Minimum (in mm) | 1.1 | 1.1 | 1.1 | 1.2 | 1.2 |
| 9 | Approx. Outer Diameter (for 0.4 mm) | 2.4 | 3.1 | 3.5 | 3.9 | 4.3 |
| 10 | Approx. Outer Diameter (for 0.5 mm) | 3.1 | 3.9 | 4.2 | 5.1 | 5.6 |
| 11 | Packing Length (meters) | 90 | 90 | 90 | 90 | 90 |
| **B** | **Electrical Parameters** | | | | | |
| 1 | Conductor Resistance (max.) ohms/km at 20°C | 143 Ω / km for 0.4 mm diameter & 92.2 Ω / km for 0.5 mm diameter | | | | |
| 2 | Mutual Capacitance (max.) Nano Farads/km | 50 | 50 | 50 | 50 | 50 |
| 3 | Insulation Resistance in Air (min.) Meg-ohms/km | 10000 | 10000 | 10000 | 10000 | 10000 |
| 4 | Capacitance Unbalance Pair to Pair (max.) | 250 | 250 | 250 | 250 | 250 |

# CCTV Cables


HPL CCTV Cables are offered in two types normally 4+1 CCTV Cables & 3+1 CCTV Cables. Co-axial Cables form the carrier for video signal and the other '4cores' or 3 cores' form the carriers for power. Co-axial cables are designed to transmit the complete video frequency range with minimum distortion or attenuation, making them an excellent choice for CCTV. HPL CCTV cables are designed to optimize the quality of video signal, which are transmitted through the Coaxial cable in the CCTV cable. The Coaxial cable consists of solid annealed bare copper conductor of electrolytic grade which is insulated with special grade HDPE dielectric, braided with aluminium Alloy or copper braiding and then jacketed with FR PVC.

Topmost quality of construction of co-axial cable in HPL CCTV cables ensures distortion free video signals and thus a clear picture over complete low frequency bandwidth of transmission in such applications. The impedance of coaxial cable is 75, which matches the CCTV equipment. This matching ensures adequate signal strength, no reflection and best picture quality. In CCTV the coaxial Cable is of type RG-59 which has highest attenuation compared to RG-6 and RG-11. Hence, it is recommended for us only electrical properties such as low capacitance and high velocity of propagation. This results in lowloss characteristic and reduced attenuation of the video signal.

Aluminium foil and Aluminium Alloy braiding of 60% coverage ensures complete elimination of EMI/RFI from the video signals and also provides a reduced DC resistance ground path. Jacketing with FR PVC is ideal for all indoor and outdoor applications.

## Technical Data

| PARAMETERS | | | CCTV (3 + 1) | CCTV (4 + 1) |
|---|---|---|---|---|
| Name of Manufacturer | | Unit | HPL ELECTRIC & POWER LTD. | HPL ELECTRIC & POWER LTD. |
| **A. CONDUCTOR** | | | | |
| (i) | Conductor for 3 & 4 core (Electric Wire) | | | |
| | (a) Type | - | ABC Flexible Conductor | ABC Flexible Conductor |
| | (b) No of wire | Nos. | 14 | 14 |
| | (c) Nominal Strand Diameter | mm | 0.120 | 0.120 |
| (ii) | Conductor for Coxial Cable | | | |
| | (a) Type | - | Solid Annealed Bare Copper Conductor | Solid Annealed Bare Copper Conductor |
| | (b) No of wire | Nos. | 1 | 1 |
| | (c) Nominal Strand Diameter | mm | 0.500 | 0.500 |
| **B. Braiding for Coaxial Cable** | | | | |
| | (a) Type | - | Aluminium Alloy Braiding | Aluminium Alloy Braiding |
| | (b) Total no of wire | Nos. | 64 | 64 |
| | (c.)No. of wires in each spindle | Nos. | 4 | 4 |
| | (d) Total no of spindle | Nos. | 12 | 12 |
| | (e) Nominal Diameter of Braiding wire | mm | 0.112 | 0.112 |
| | (f) Minimum Coverage | % | 60 | 60 |
| **C. Polyster Tape over laid up** | | | | |
| | (a) Dimension | mm | 16.00 x 0.050 | 16.00 x 0.050 |
| | (b) Minimum Overlap | % | 25 | 25 |
| **D. Insulation** | | | | |
| 1 | Dimension for 3 Core | | | |
| | (a) Type of Insulation | - | HDPE | HDPE |
| | (b) Core Colour | Visual | Red, Yellow & Blue | Red, Yellow, Blue & Black |
| | (c) Maximaum Diameter of Core | mm | 1.40 | 1.40 |
| | (d) Nominal Thickness of Insulation | mm | 0.45 | 0.45 |
| 2 | Dimension for Coaxial Cable | | | |
| (i) | (a) Type of Insulation | - | HDPE | HDPE |
| | (b) Core Colour | Visual | Natural | Natural |
| | (c) Maximaum Diameter of Core | mm | 1.50 | 1.50 |
| | (d) Nominal Thickness of Insulation | mm | 0.50 | 0.50 |
| (ii) | (a) Type of Jacket | - | PVC | PVC |
| | (b) Core Colour | Visual | Black | Black |
| | (c) Maximaum Diameter of Jacket | mm | 2.70 | 2.70 |
| | (d) Nominal Thickness of Jacket | mm | 0.45 | 0.45 |
| **E. Outer Sheath** | | | | |
| | (a) Type of Outer Sheath | - | ST-1 | ST-1 |
| | (b) Sheath Colour | Visual | White | Grey |
| | (c) Maximaum Diameter of Core | mm | 6.00 | 6.70 |
| | (d) Nominal Thickness of Insulation | mm | 0.80 | 0.80 |
| | (e) Bending Radius | mm | 65 | 65 |
| **F. Rib Cord** | | - | Applicable | Applicable |
| **G. Electrial Parameters** | | | | |
| | (a) Maximum Resistance at 20°C | ohm/km | 110 .00 | 110 .00 |
| | (b) Nominal Capacitance | pf/mtr | 53.0 | 53.0 |
| | (c) Impeadence | ohm | 75.0 | 75.0 |
| | (e) Nominal Velocity Ratio | % | 85.0 | 85.0 |
| **H. Printing :- HPL 3+1 (COPPER) CCTV DIGITAL PERFORMANCE 1 GHz 100 % SIGNAL TRANSMISSION ……..MTRS** | | | | |

# Speaker Cables:

Insulated with specially formulated FR (Fire Retardant) grade PVC compound. HPL twin parallel type speaker cables are manufactured with multi wire, bright annealed flexible bare electrolytic grade conductor, insulated with specially formulated and manufactured in FR (Fire retardant) grade PVC compound. Each core is uniquely designed for easy identification. The distance between the two conductors is maintained consistently for uniform capacitance throughout the length. This highest safety against the fire is offered by the use of FR grade crystal PVC compound with high value of Oxygen and temperature Index. These cables are uniquely available in natural color. These are highly recommended for use in connecting Speakers, used in Public Address systems installed in large residential complexes, (as per new building code) for clear and distortion free voice with very low db loss.

## Illustration:

To use this table for the selection of the cable is for example we can use maximum length of 14 AWG cable in 8 ohm speaker system with power loss of 21% (3.2db)

| S. No. | Size in Sqmm | Radial Thickness in mm | Core Diameter in mm | Maximum Conductor Resistance at 20°C (ohm/km) | Nominal Overall Diameter in mm |
|---|---|---|---|---|---|
| | | Nom. | Avg. | | Width X Hight |
| 1 | 2C x 0.75 | 0.90 | 2.90 | 26.00 | 6.10 x 2.90 |
| 2 | 2C x 1.00 | 1.00 | 3.30 | 19.5 | 6.90 x 3.30 |
| 3 | 2C x 1.50 | 1.10 | 3.70 | 13.3 | 7.80 x 3.70 |
| 4 | 2C x 2.50 | 1.10 | 4.15 | 7.98 | 8.70 x 4.12 |

# Flat Elevator Cables


HPL Flat Elevator cables is a harmonized, flexible, 450/750 volt, PVC flat festoon control cable. Mainly used as a trailing cable for crane installations, floor conveyor systems, elevator control cables, shelf control units and in supply lines for moving machine parts. The flat construction allows cables to be stacked for applications where space is at a minimum and require smaller bending radius over that of round cables. Suitable for installations in dry and damp rooms. The outer PVC jacket is extensively resistant to oil, fat, acid and lye. standards and only available in 20AWG (0.50mm2), 18 AWG (0.75mm2) and 17 AWG (1.0mm2) 15 AWG (1.5mm2) sizes.

## Construction

Fine bare copper strands
Strands to Class-5, IEC 60228 Cl-5
PVC core insulation
Color code IEC 60227 with ground
Cores laying parallel
PVC outer jacket - Black
Extremely oil & chemical resistant

## Technical

**Working Voltage :** 300/500 V (H05)
**Working Voltage :** 450/750 V (H07)
**Test Voltage :** 3000 volts
**Flexing Bending Radius :** 10 x O
**Flexing Temp :** -5oC to +70oC
**Static Temp :** -30oC to +70oC
**Flame Retardant :** IEC 60332.1
**Insulation Resistance :** > 36.7 MΩ km

| SIZE (IN SQ.MM) | NO. OF WIRE/SIZE (NOS./MM) | NO. OF CORE (NOS.) | NOMINAL OD WxH (MM x MM) |
|---|---|---|---|
| 0.5 | 16/0.20 | 12 | 30.70 x 4.40 |
| 0.75 | 24/0.20 | 12 | 33.15 x 4.65 |
| 1.0 | 32/0.20 | 12 | 35.50 x 4.80 |
| 1.5 | 48/0.20 | 12 | 39.00 x 5.10 |
| 0.5 | 16/0.20 | 6 | 17.70 x 4.40 |
| 0.75 | 24/0.20 | 6 | 18.90 x 4.65 |
| 1.0 | 32/0.20 | 6 | 20.10 x 4.80 |
| 1.5 | 48/0.20 | 6 | 21.90 x 5.10 |

# HPL OIL Resistant Battery Cables

Battery cables are used in Original Equipment by Indian Leading vehicle manufacturers. These cables are manufactured from electrolytic grade bright Annealed, bunched, bare copper conductors & insulated with a special grade PVC compound. This PVC is impervious to water, Petrol, Diesel, Acids, Engine & Lubricating oils & grease etc. These cables are ideally suited for extreme weather conditions & undergo stringent quality checks during manufacturing process & at final stage too. They are available in Red & Black colour or Red & White colours in 100 meter coils/Drums or as per customer Requirement.

| PVC INSULATED BATTERY CABLES AS PER IS - 2465:1984 | | | | |
|---|---|---|---|---|
| Conductor | | | Cable Parameter | |
| Nominal Area | No of Wire / Dia of Strands (Nom.) | Resistance at 20°C (max.) | Radial Thickness of Insulation (Nom.) | Overall Diameter (Approx.) |
| Sqmm | mm | ohm/km | mm | mm |
| 10 | 80/0.4 | 1.910 | 1.00 | 6.30 |
| 16 | 126/0.4 | 1.210 | 1.00 | 7.25 |
| 25 | 196/0.4 | 0.780 | 1.20 | 8.80 |
| 35 | 276/0.4 | 0.554 | 1.20 | 10.35 |
| 50 | 396/0.4 | 0.386 | 1.40 | 12.25 |
| 70 | 556/0.4 | 0.272 | 1.40 | 13.90 |
| 95 | 756/0.4 | 0.206 | 1.60 | 15.85 |
| 120 | 954/0.4 | 0.161 | 1.60 | 17.75 |
| 150 | 1192/0.4 | 0.129 | 1.80 | 18.85 |
| 185 | 1472/0.4 | 0.106 | 2.00 | 22.00 |
| 240 | 1910/0.4 | 0.0801 | 2.20 | 25.00 |

| PVC INSULATED HIGH TENSION CABLES (IGNITION CABLES ) IN BLACK COLOUR | | | | | |
|---|---|---|---|---|---|
| Conductor | | | Cable Parameter | | |
| Nominal Area | No of Wire / Dia of Strands (Nom.) | Resistance at 20°C (max.) | Radial Thickness of Inner (Red) | Radial Thickness of Outer (Black) | Overall Diameter (Approx.) |
| Sqmm | mm | ohm/km | mm | mm | mm |
| 1.2* | 17/0.3 | 15.36 | 1.0 | 1.75 | 7.10 |
| 1.3* | 19/0.3 | 14.01 | 1.0 | 1.75 | 7.10 |

*These sizes are not covered under IS 2465 : 1984

# CONTROL CABLES

- PVC insulated and PVC sheathed
- PVC insulated , Copper tape screened and PVC sheathed
- PVC insulated , Steel Wire armored and PVC sheathed
- XLPE insulated and PVC sheathed
- XLPE insulated, copper tape screened and PVC sheathed
- XLPE insulated, steel wire armored and PVC sheathed

# PVC insulated and PVC sheathed to IEC 60502 0.6/1 kV

## Cable Description

| | |
|---|---|
| Conductor | Plain annealed stranded copper |
| Sizes | 1.5 $mm^2$, 2.5 $mm^2$, 4 $mm^2$ |
| Core insulation | PVC ( polyvinyl chloride ) |
| Color coding | 5 Cores Identification is Red, Yellow, Blue, Black, Y/G<br>>5 cores will be black continuously numbered |
| Assembly | Cores twisted together to form a round assembly cable with fillers when necessary |
| Outer sheath | PVC ( polyvinyl chloride ) |

## Application

For outdoor and indoor installations in damp and wet locations, connecting signaling and control units in industry, in railways, in traffic signals, in thermo power and hydropower stations. They are laid in air, in ducts, In trenches, in steel support brackets or direct in ground, when well protected

| S. No. | Nominal Cross sectional area ( mm2 ) | No. of Cores | Nominal Thick-ness of insulation (mm) | Current Rating ( A ) | | | Approx. Overall Diameter (mm) | Approx. Net Weight (kg/km) |
|---|---|---|---|---|---|---|---|---|
| | | | | Ground | Duct | Air | | |
| 1 | 1.5 | 5 | 0.8 | 14.7 | 12.6 | 13.5 | 11.5 | 210 |
| 2 | | 7 | 0.8 | 12.6 | 10.8 | 11.7 | 12.7 | 242 |
| 3 | | 10 | 0.8 | 10.5 | 9 | 9.9 | 15.9 | 333 |
| 4 | | 12 | 0.8 | 9.4 | 8.1 | 9 | 16.4 | 382 |
| 5 | | 14 | 0.8 | 9.4 | 8.1 | 9 | 17.2 | 434 |
| 6 | | 16 | 0.8 | 8.4 | 7.2 | 8.1 | 18.1 | 492 |
| 7 | | 19 | 0.8 | 8.4 | 7.2 | 8.1 | 19.1 | 564 |
| 8 | | 24 | 0.8 | 7.3 | 6.3 | 7.2 | 22.2 | 702 |
| 9 | | 30 | 0.8 | 6.3 | 5.4 | 6.3 | 23.5 | 850 |
| 10 | | 37 | 0.8 | 6.3 | 5.4 | 6.3 | 25.4 | 1026 |
| 11 | | 44 | 0.8 | 4.2 | 3.6 | 4.5 | 28.5 | 1212 |
| 12 | 2.5 | 5 | 0.8 | 18.9 | 16.1 | 16.5 | 12.8 | 280 |
| 13 | | 7 | 0.8 | 16.2 | 13.8 | 14.3 | 14.1 | 328 |
| 14 | | 10 | 0.8 | 13.5 | 11.5 | 12.1 | 17.7 | 456 |
| 15 | | 12 | 0.8 | 12.1 | 10.3 | 11 | 18.3 | 528 |
| 16 | | 14 | 0.8 | 12.1 | 10.3 | 11 | 19.2 | 602 |
| 17 | | 16 | 0.8 | 10.8 | 9.2 | 9.9 | 20.2 | 685 |
| 18 | | 19 | 0.8 | 10.8 | 9.2 | 9.9 | 21.3 | 789 |
| 19 | | 24 | 0.8 | 9.4 | 8 | 8.8 | 24.9 | 985 |
| 20 | | 30 | 0.8 | 8.1 | 6.9 | 7.7 | 26.4 | 1199 |
| 21 | | 37 | 0.8 | 8.1 | 6.9 | 7.7 | 28.5 | 1454 |
| 22 | | 44 | 0.8 | 5.4 | 4.6 | 5.5 | 32.3 | 1733 |
| 23 | 4 | 5 | 1.0 | 24.5 | 21 | 23.2 | 15.2 | 412 |
| 24 | | 7 | 1.0 | 21 | 18 | 20.1 | 16.8 | 483 |
| 25 | | 10 | 1.0 | 17.5 | 15 | 17 | 21.3 | 675 |
| 26 | | 12 | 1.0 | 15.7 | 13.5 | 15.5 | 22.1 | 786 |
| 27 | | 14 | 1.0 | 15.7 | 13.5 | 15.5 | 23.2 | 901 |
| 28 | | 16 | 1.0 | 14 | 12 | 13.9 | 24.5 | 1028 |
| 29 | | 19 | 1.0 | 14 | 12 | 13.9 | 25.9 | 1189 |
| 30 | | 24 | 1.0 | 12.2 | 10.5 | 12.4 | 30.5 | 1494 |
| 31 | | 30 | 1.0 | 10.5 | 9 | 10.8 | 32.4 | 1835 |
| 32 | | 37 | 1.0 | 10.5 | 9 | 10.8 | 35.2 | 2239 |

Notes: For different insulation and sheathing materials other than PVC, Customer has to specify.

# PVC insulated , Copper tape screened and PVC sheathed to IEC 60502 - 0.6/1 kV

## Cable Description

| | |
|---|---|
| Conductor | Plain annealed stranded copper |
| Sizes | 1.5 $mm^2$ 2.5 $mm^2$ 4 $mm^2$ |
| Core insulation | PVC ( polyvinyl chloride ) |
| Color coding | 5 Cores Identification is Red, Yellow, Blue, Black, Y/G<br>>5 cores will be black continuously numbered |
| Assembly | Cores twisted together to form a round assembly cable with fillers when necessary |
| Inner sheath | PVC ( polyvinyl Chloride ) or binder tape |
| Screening | Copper tape helically applied |
| Outer sheath | PVC ( polyvinyl chloride ) |

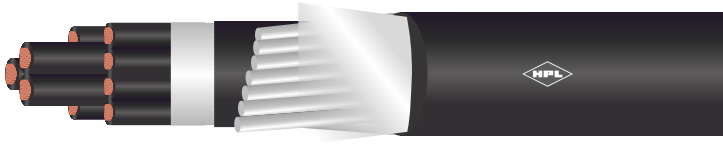
## Application

For outdoor and indoor installations in damp and wet locations, connecting signaling and control units in industry, in railways, in traffic signals, in thermo power and hydropower stations. They are laid in air, in ducts,In trenches, in steel support brackets or direct in ground, when well protected

| S. No. | Nominal Cross sectional area ( mm2 ) | No. of Cores | Nominal Thickness of insulation (mm) | Current Rating ( A ) | | | Approx. Overall Diameter (mm) | Approx. Net Weight (kg/km) |
|---|---|---|---|---|---|---|---|---|
| | | | | Ground | Duct | Air | | |
| 1 | 1.5 | 5 | 0.8 | 13.9 | 11.9 | 12.8 | 13.3 | 290 |
| 2 | | 7 | 0.8 | 11.9 | 10.2 | 11.1 | 14.5 | 330 |
| 3 | | 10 | 0.8 | 9.9 | 8.5 | 9.4 | 1707 | 443 |
| 4 | | 12 | 0.8 | 8.9 | 7.6 | 8.5 | 1802 | 496 |
| 5 | | 14 | 0.8 | 8.9 | 7.6 | 8.5 | 19 | 553 |
| 6 | | 16 | 0.8 | 7.9 | 6.8 | 7.6 | 19.9 | 617 |
| 7 | | 19 | 0.8 | 7.9 | 6.8 | 7.6 | 20.9 | 696 |
| 8 | | 24 | 0.8 | 6.9 | 5.9 | 6.8 | 24 | 856 |
| 9 | | 30 | 0.8 | 5.9 | 5.1 | 5.9 | 25.3 | 1012 |
| 10 | | 37 | 0.8 | 5.9 | 5.1 | 5.9 | 27.2 | 1201 |
| 11 | | 44 | 0.8 | 3.9 | 3.4 | 4.2 | 30.3 | 1407 |
| 12 | 2.5 | 5 | 0.8 | 17.9 | 15.2 | 15.6 | 14.6 | 369 |
| 13 | | 7 | 0.8 | 15.3 | 13.1 | 13.5 | 15.9 | 425 |
| 14 | | 10 | 0.8 | 12.8 | 10.9 | 11.4 | 19.5 | 578 |
| 15 | | 12 | 0.8 | 11.5 | 9.8 | 10.4 | 20.1 | 654 |
| 16 | | 14 | 0.8 | 11.5 | 9.8 | 10.4 | 21 | 734 |
| 17 | | 16 | 0.8 | 10.2 | 8.7 | 9.4 | 22 | 824 |
| 18 | | 19 | 0.8 | 10.2 | 8.7 | 9.4 | 23.1 | 936 |
| 19 | | 24 | 0.8 | 8.9 | 7.6 | 8.3 | 26.7 | 1157 |
| 20 | | 30 | 0.8 | 7.6 | 6.5 | 7.3 | 28.2 | 1381 |
| 21 | | 37 | 0.8 | 7.6 | 6.5 | 7.3 | 30.3 | 1651 |
| 22 | | 44 | 0.8 | 5.1 | 4.3 | 5.2 | 34.4 | 1981 |
| 23 | 4 | 5 | 1.0 | 23.2 | 19.9 | 22 | 17 | 517 |
| 24 | | 7 | 1.0 | 19.9 | 17.1 | 19.1 | 18.6 | 599 |
| 25 | | 10 | 1.0 | 16.6 | 14.2 | 16.1 | 23.1 | 822 |
| 26 | | 12 | 1.0 | 14.9 | 12.8 | 14.7 | 23.9 | 938 |
| 27 | | 14 | 1.0 | 14.9 | 12.8 | 14.7 | 25 | 1060 |
| 28 | | 16 | 1.0 | 13.3 | 11.4 | 13.2 | 26.3 | 1197 |
| 29 | | 19 | 1.0 | 13.3 | 11.4 | 13.2 | 27.7 | 1367 |
| 30 | | 24 | 1.0 | 11.6 | 9.9 | 11.7 | 32.6 | 1730 |
| 31 | | 30 | 1.0 | 9.9 | 8.5 | 10.3 | 34.6 | 2085 |
| 32 | | 37 | 1.0 | 9.9 | 8.5 | 10.3 | 37.4 | 2514 |

Notes: For different insulation and sheathing materials other than PVC, Customer has to specify.
Values are approximate and subjected to normal manufacturing tolerance.

# PVC insulated , Steel wire armored and PVC sheathed to IEC 60502-1 0.6/1 KV



## Cable Description

| | |
|---|---|
| Conductor | Plain annealed stranded copper |
| Sizes | 1.5 $mm^2$ 2.5 $mm^2$ 4 $mm^2$ |
| Core insulation | PVC ( polyvinyl chloride ) |
| Color coding | 5 Cores Identification is Red, Yellow, Blue, Black, Y/G<br>>5 cores will be black continuously numbered |
| Assembly | Cores twisted together to form a round assembly cable with fillers when necessary |
| Inner sheath | PVC ( polyvinyl Chloride ) |
| Screening | Galvanized round steel wire |
| Outer sheath | PVC ( polyvinyl chloride ) |

## Application

For outdoor installation in damp and wet locations, laid direct in the ground, where mechanical damages are expected to occur. They are normally used in connecting signaling and control units in industry, in railways, in traffic signals, in thermo power and hydropower stations.

| S. No. | Nominal Cross sectional area ( mm2 ) | No. of Cores | Nominal Thick-ness of insulation (mm) | Current Rating ( A ) | | | Approx. Overall Diameter (mm) | Approx. Net Weight (kg/km) |
|---|---|---|---|---|---|---|---|---|
| | | | | Ground | Duct | Air | | |
| 1 | 1.5 | 5 | 0.8 | 13.9 | 11.9 | 12.8 | 15 | 425 |
| 2 | | 7 | 0.8 | 11.9 | 10.2 | 11.1 | 16.2 | 478 |
| 3 | | 10 | 0.8 | 9.9 | 8.5 | 9.4 | 20.3 | 765 |
| 4 | | 12 | 0.8 | 8.9 | 7.6 | 8.5 | 20.8 | 826 |
| 5 | | 14 | 0.8 | 8.9 | 7.6 | 8.5 | 21.6 | 900 |
| 6 | | 16 | 0.8 | 7.9 | 6.8 | 7.6 | 22.5 | 981 |
| 7 | | 19 | 0.8 | 7.9 | 6.8 | 7.6 | 24.1 | 1203 |
| 8 | | 24 | 0.8 | 6.9 | 5.9 | 6.8 | 27.3 | 1448 |
| 9 | | 30 | 0.8 | 5.9 | 5.1 | 5.9 | 28.6 | 1633 |
| 10 | | 37 | 0.8 | 5.9 | 5.1 | 5.9 | 30.6 | 1872 |
| 11 | | 44 | 0.8 | 3.9 | 3.4 | 4.2 | 33.9 | 2178 |
| 12 | 2.5 | 5 | 0.8 | 17.9 | 15.2 | 15.6 | 16.2 | 517 |
| 13 | | 7 | 0.8 | 15.3 | 13 | 13.5 | 18.5 | 417 |
| 14 | | 10 | 0.8 | 12.8 | 10.9 | 11.4 | 22.1 | 933 |
| 15 | | 12 | 0.8 | 11.5 | 9.8 | 10.4 | 22.6 | 1017 |
| 16 | | 14 | 0.8 | 11.5 | 9.8 | 10.4 | 24.2 | 1240 |
| 17 | | 16 | 0.8 | 10.2 | 8.7 | 9.4 | 25.3 | 1395 |
| 18 | | 19 | 0.8 | 10.2 | 8.7 | 9.4 | 26.4 | 1499 |
| 19 | | 24 | 0.8 | 8.9 | 7.6 | 8.3 | 30.1 | 1827 |
| 20 | | 30 | 0.8 | 7.6 | 6.5 | 7.3 | 31.6 | 2085 |
| 21 | | 37 | 0.8 | 7.6 | 6.5 | 7.3 | 33.9 | 2422 |
| 22 | | 44 | 0.8 | 5.1 | 4.3 | 5.2 | 38.9 | 3112 |
| 23 | 4 | 5 | 1 | 24.5 | 21 | 23.2 | 19.6 | 822 |
| 24 | | 7 | 1 | 21 | 18 | 20.1 | 21.2 | 739 |
| 25 | | 10 | 1 | 17.5 | 15 | 17 | 26.4 | 1385 |
| 26 | | 12 | 1 | 15.7 | 13.5 | 15.5 | 27.12 | 1531 |
| 27 | | 14 | 1 | 15.7 | 13.5 | 15.5 | 28.3 | 1682 |
| 28 | | 16 | 1 | 14 | 12 | 13.9 | 29.7 | 1851 |
| 29 | | 19 | 1 | 14 | 12 | 13.9 | 31.1 | 2054 |
| 30 | | 24 | 1 | 12.2 | 10.5 | 12.4 | 37.1 | 2789 |
| 31 | | 30 | 1 | 10.5 | 9 | 10.8 | 39 | 3215 |
| 32 | | 37 | 1 | 10.5 | 9 | 10.8 | 41.8 | 3739 |

Notes: For different insulation and sheathing materials other than PVC, Customer has to specify.
Values are approximate and subjected to normal manufacturing tolerance.

# XLPE insulated and PVC sheathed to IEC 60502-1 0.6/1 KV

## Cable Description

| | |
|---|---|
| Conductor | Plain annealed stranded copper |
| Sizes | 1.5 $mm^2$ 2.5 $mm^2$ 4 $mm^2$ |
| Core insulation | XLPE ( Cross linked Polyethylene ) |
| *Alternatives* | *LSOH ( Low smoke zero halogen )* |
| Color coding | 5 Cores Identification is Red, Yellow, Blue, Black, Y/G |
| Assembly | >5 cores will be black continuously numbered<br>Cores twisted together to form a round assembly cable with fillers when necessary |
| Outer sheath | PVC ( Polyvinyl chloride ) |
| *Alternatives* | *LSOH ( Low smoke zero halogen )* |

## Application

For outdoor and indoor installations in damp and wet locations, connecting signaling and control units in industry, in railways, in traffic signals, in thermo power and hydropower stations. They are laid in air, in ducts,In trenches, in steel support brackets or direct in ground, when well protected

| S. No. | Nominal Cross sectional area ( mm2 ) | No. of Cores | Nominal Thickness of insulation (mm) | Current Rating ( A ) | | | Approx. Overall Diameter (mm) | Approx. Net Weight (kg/km) |
|---|---|---|---|---|---|---|---|---|
| | | | | Ground | Duct | Air | | |
| 1 | 1.5 | 5 | 0.7 | 18.2 | 16.1 | 16.5 | 11 | 181 |
| 2 | | 7 | 0.7 | 15.6 | 13.8 | 14.3 | 21.1 | 206 |
| 3 | | 10 | 0.7 | 13 | 11.5 | 12.1 | 15.1 | 283 |
| 4 | | 12 | 0.7 | 11.7 | 10.3 | 11 | 15.6 | 323 |
| 5 | | 14 | 0.7 | 11.7 | 10.3 | 11 | 16.3 | 356 |
| 6 | | 16 | 0.7 | 10.4 | 9.2 | 9.9 | 17.2 | 413 |
| 7 | | 19 | 0.7 | 10.4 | 9.2 | 9.9 | 18.1 | 472 |
| 8 | | 24 | 0.7 | 9.1 | 8 | 8.8 | 21 | 586 |
| 9 | | 30 | 0.7 | 7.8 | 6.9 | 7.7 | 23.2 | 705 |
| 10 | | 37 | 0.7 | 7.8 | 6.9 | 7.7 | 24 | 849 |
| 11 | | 44 | 0.7 | 5.2 | 4.6 | 5.5 | 27 | 1001 |
| 12 | 2.5 | 5 | 0.7 | 24.5 | 20.3 | 24 | 12.2 | 246 |
| 13 | | 7 | 0.7 | 21 | 17.4 | 20.8 | 13.5 | 286 |
| 14 | | 10 | 0.7 | 17.5 | 14.5 | 17.6 | 16.9 | 396 |
| 15 | | 12 | 0.7 | 15.7 | 13 | 16 | 17.5 | 456 |
| 16 | | 14 | 0.7 | 15.7 | 13 | 16 | 18.3 | 519 |
| 17 | | 16 | 0.7 | 14 | 11.6 | 14.4 | 19.3 | 590 |
| 18 | | 19 | 0.7 | 14 | 11.6 | 14.4 | 20.3 | 678 |
| 19 | | 24 | 0.7 | 12.2 | 10.1 | 12.8 | 23.7 | 846 |
| 20 | | 30 | 0.7 | 10.5 | 8.7 | 11.2 | 25.1 | 1027 |
| 21 | | 37 | 0.7 | 10.5 | 8.7 | 11.2 | 27.1 | 1234 |
| 22 | | 44 | 0.7 | 7 | 5.8 | 8 | 30.6 | 1473 |
| 23 | 4 | 5 | 0.7 | 31.5 | 25.2 | 30.7 | 13.6 | 336 |
| 24 | | 7 | 0.7 | 27 | 21.6 | 26.6 | 15 | 599 |
| 25 | | 10 | 0.7 | 22.5 | 18 | 22.5 | 18.9 | 552 |
| 26 | | 12 | 0.7 | 20.2 | 16.2 | 20.5 | 19.6 | 641 |
| 27 | | 14 | 0.7 | 20.2 | 16.2 | 20.5 | 20.6 | 733 |
| 28 | | 16 | 0.7 | 18 | 14.4 | 18.4 | 21.7 | 835 |
| 29 | | 19 | 0.7 | 18 | 14.4 | 18.4 | 22.9 | 965 |
| 30 | | 24 | 0.7 | 15.7 | 12.6 | 16.4 | 26.8 | 1207 |
| 31 | | 30 | 0.7 | 13.5 | 10.8 | 14.3 | 28.4 | 1474 |
| 32 | | 37 | 0.7 | 13.5 | 10.8 | 14.3 | 30.8 | 1798 |

Notes: For different insulation and sheathing materials other than PVC, Customer has to specify.
Values are approximate and subjected to normal manufacturing tolerance.

# XLPE insulated, copper tape screened and PVC sheathed to IEC 60502-1 0.6/1 KV

## Cable Description

| | |
|---|---|
| Conductor | Plain annealed stranded copper |
| Sizes | 1.5 $mm^2$ 2.5 $mm^2$ 4 $mm^2$ |
| Core insulation | XLPE ( Cross linked Polyethylene ) |
| *Alternatives* | *LSOH ( Low smoke zero halogen )* |
| Color coding | 5 Cores Identification is Red, Yellow, Blue, Black, Y/G<br>>5 cores will be black continuously numbered |
| Assembly | Cores twisted together to form a round assembly cable with fillers when necessary |
| Inner Sheath | PVC ( polyvinyl chloride ) |
| *Alternatives* | *LSOH ( Low smoke zero halogen )* |
| Screening | Copper tape helically applied |
| Outer sheath | PVC ( polyvinyl chloride ) |
| *Alternatives* | *LSOH ( Low smoke zero halogen )* |

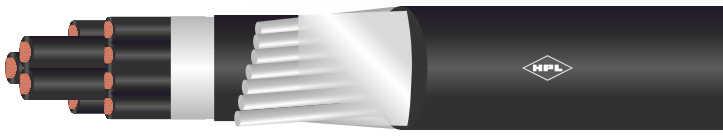
## Application

For outdoor and indoor installations in damp and wet locations, connecting signaling and control units in industry, in railways, in traffic signals, in thermo power and hydropower stations. They are laid in air, in ducts,In trenches, in steel support brackets or direct in ground, when well protected

| S. No. | Nominal Cross sectional area ( mm2 ) | No. of Cores | Nominal Thick-ness of insulation ((mm | Current Rating ( A ) | | | Approx. Overall Diameter ((mm | Approx. Net Weight (kg/km) |
|---|---|---|---|---|---|---|---|---|
| | | | | Ground | Duct | Air | | |
| 1 | 1.5 | 5 | 0.7 | 17.2 | 15.2 | 15.6 | 12.8 | 257 |
| 2 | | 7 | 0.7 | 14.8 | 13.1 | 13.5 | 14 | 290 |
| 3 | | 10 | 0.7 | 12.3 | 10.9 | 11.4 | 16.9 | 387 |
| 4 | | 12 | 0.7 | 11.1 | 9.8 | 10.4 | 17.4 | 430 |
| 5 | | 14 | 0.7 | 11.1 | 9.8 | 10.4 | 18.1 | 478 |
| 6 | | 16 | 0.7 | 9.8 | 8.7 | 9.4 | 19 | 532 |
| 7 | | 19 | 0.7 | 9.8 | 8.7 | 9.4 | 19.9 | 596 |
| 8 | | 24 | 0.7 | 8.6 | 7.6 | 8.3 | 22.8 | 731 |
| 9 | | 30 | 0.7 | 7.4 | 6.5 | 7.3 | 24 | 858 |
| 10 | | 37 | 0.7 | 7.4 | 6.5 | 7.3 | 25.8 | 1014 |
| 11 | | 44 | 0.7 | 4.9 | 4.3 | 5.2 | 28.7 | 1186 |
| 12 | 2.5 | 5 | 0.7 | 23.2 | 19.2 | 22.8 | 14 | 330 |
| 13 | | 7 | 0.7 | 19.9 | 16.5 | 19.7 | 15.3 | 379 |
| 14 | | 10 | 0.7 | 16.6 | 13.7 | 16.7 | 18.7 | 512 |
| 15 | | 12 | 0.7 | 14.9 | 12.3 | 15.2 | 19.3 | 577 |
| 16 | | 14 | 0.7 | 14.9 | 12.3 | 15.2 | 20.1 | 646 |
| 17 | | 16 | 0.7 | 13.3 | 11 | 13.6 | 21.1 | 723 |
| 18 | | 19 | 0.7 | 13.3 | 11 | 13.6 | 22.1 | 818 |
| 19 | | 24 | 0.7 | 11.6 | 9.6 | 12.1 | 25.5 | 1009 |
| 20 | | 30 | 0.7 | 9.9 | 8.2 | 10.6 | 26.9 | 1200 |
| 21 | | 37 | 0.7 | 9.9 | 8.2 | 10.6 | 29 | 1430 |
| 22 | | 44 | 0.7 | 6.6 | 5.5 | 7.6 | 32.8 | 1710 |
| 23 | 4 | 5 | 0.7 | 29.9 | 23.9 | 29.2 | 25.4 | 729 |
| 24 | | 7 | 0.7 | 25.6 | 20.5 | 25.3 | 16.8 | 499 |
| 25 | | 10 | 0.7 | 21.3 | 17.1 | 21.4 | 20.7 | 682 |
| 26 | | 12 | 0.7 | 19.2 | 15.3 | 19.4 | 21.4 | 776 |
| 27 | | 14 | 0.7 | 19.2 | 15.3 | 19.4 | 22.4 | 875 |
| 28 | | 16 | 0.7 | 17.1 | 13.6 | 17.5 | 23.5 | 985 |
| 30 | | 19 | 0.7 | 17.1 | 13.6 | 17.5 | 24.7 | 1123 |
| 31 | | 24 | 0.7 | 14.9 | 11.9 | 15.5 | 28.6 | 1391 |
| 32 | | 30 | 0.7 | 12.8 | 10.2 | 13.6 | 30.2 | 1669 |
| 33 | | 37 | 0.7 | 12.8 | 10.2 | 13.6 | 32.9 | 2036 |

Notes: For different insulation and sheathing materials other than PVC, Customer has to specify.
Values are approximate and subjected to normal manufacturing tolerance.

# XLPE insulated, steel wire armored and PVC sheathed to IEC 60502-1 0.6/1 KV



## Cable Description

| | |
|---|---|
| Conductor | Plain annealed stranded copper |
| Sizes | 1.5 $mm^2$ 2.5 $mm^2$ 4 $mm^2$ |
| Core insulation | XLPE ( Cross linked Polyethylene ) |
| *Alternatives* | *LSOH ( Low smoke zero halogen )* |
| Color coding | 5 Cores Identification is Red, Yellow, Blue, Black, Y/G<br>>5 cores will be black continuously numbered |
| Assembly | Cores twisted together to form a round assembly cable with fillers when necessary |
| Inner Sheath | PVC ( polyvinyl chloride ) |
| *Alternatives* | *LSOH ( Low smoke zero halogen )* |
| Armor | Galvanized round steel wire |
| Outer sheath | PVC ( polyvinyl chloride ) |
| *Alternatives* | *LSOH ( Low smoke zero halogen )* |

## Application

For outdoor and indoor installations in damp and wet locations, connecting signaling and control units in industry, in railways, in traffic signals, in thermo power and hydropower stations. They are laid in air, in ducts,In trenches, in steel support brackets or direct in ground, when well protected

| S. No. | Nominal Cross sectional area ( mm2 ) | No. of Cores | Nominal Thick-ness of insulation (mm) | Current Rating ( A ) | | | Approx. Overall Diameter (mm) | Approx. Net Weight (kg/km) |
|---|---|---|---|---|---|---|---|---|
| | | | | Ground | Duct | Air | | |
| 1 | 1.5 | 5 | 0.7 | 17.2 | 15.2 | 15.6 | 14.5 | 386 |
| 2 | | 7 | 0.7 | 14.8 | 13 | 13.5 | 15.6 | 732 |
| 3 | | 10 | 0.7 | 12.3 | 10.9 | 11.4 | 19.5 | 692 |
| 4 | | 12 | 0.7 | 11.1 | 9.8 | 10.4 | 19.9 | 744 |
| 5 | | 14 | 0.7 | 11.1 | 9.8 | 10.4 | 20.7 | 808 |
| 6 | | 16 | 0.7 | 9.8 | 8.7 | 9.4 | 21.5 | 879 |
| 7 | | 19 | 0.7 | 9.8 | 8.7 | 9.4 | 22.4 | 960 |
| 8 | | 24 | 0.7 | 8.6 | 7.6 | 8.3 | 26.1 | 1295 |
| 9 | | 30 | 0.7 | 7.4 | 6.5 | 7.3 | 27.3 | 1450 |
| 10 | | 37 | 0.7 | 7.4 | 6.5 | 7.3 | 29.1 | 1652 |
| 11 | | 44 | 0.7 | 4.9 | 4.3 | 5.2 | 32.2 | 1907 |
| 12 | 2.5 | 5 | 0.7 | 23.2 | 19.2 | 22.8 | 15.7 | 472 |
| 13 | | 7 | 0.7 | 19.9 | 16.5 | 19.7 | 17.9 | 650 |
| 14 | | 10 | 0.7 | 16.6 | 13.7 | 16.7 | 21.3 | 851 |
| 15 | | 12 | 0.7 | 14.9 | 12.3 | 15.2 | 21.8 | 923 |
| 14 | | 14 | 0.7 | 14.9 | 12.3 | 15.2 | 22.7 | 1009 |
| 16 | | 16 | 0.7 | 13.2 | 11 | 13.6 | 24.4 | 1245 |
| 17 | | 19 | 0.7 | 13.2 | 11 | 13.6 | 25.4 | 1353 |
| 18 | | 24 | 0.7 | 11.6 | 9.6 | 12.1 | 28.8 | 1631 |
| 19 | | 30 | 0.7 | 9.9 | 8.2 | 10.6 | 30.3 | 1870 |
| 20 | | 37 | 0.7 | 9.9 | 8.2 | 10.6 | 23.4 | 2151 |
| 21 | | 44 | 0.7 | 6.6 | 5.5 | 7.6 | 37.2 | 2795 |
| 22 | 4 | 5 | 0.7 | 32.2 | 25.9 | 31.5 | 17.9 | 710 |
| 23 | | 7 | 0.7 | 27.6 | 22.2 | 27.3 | 19.4 | 805 |
| 24 | | 10 | 0.7 | 23 | 18.5 | 23.1 | 24 | 1189 |
| 25 | | 12 | 0.7 | 20.7 | 16.6 | 21 | 24.6 | 1297 |
| 26 | | 14 | 0.7 | 20.7 | 16.6 | 21 | 25.6 | 1424 |
| 27 | | 16 | 0.7 | 18.4 | 14.8 | 18.9 | 26.7 | 1562 |
| 28 | | 19 | 0.7 | 18.4 | 14.8 | 18.9 | 27.9 | 1728 |
| 29 | | 24 | 0.7 | 16.1 | 12.9 | 16.8 | 32.1 | 2112 |
| 30 | | 30 | 0.7 | 13.8 | 11.1 | 14.7 | 33.8 | 2440 |
| 31 | | 37 | 0.7 | 13.8 | 11.1 | 14.7 | 37.4 | 3120 |

Notes: For different insulation and sheathing materials other than PVC, Customer has to specify.
Values are approximate and subjected to normal manufacturing tolerance.

# AUTOMOTIVE CABLES

- PVC insulation
- Heat Resistant PVC Insulation
- Heat Pressure resistant PVC Insulation
- Cold Resistant PVC Insulation
- Concentric Conductors with PVC Insulation
- PVC Thin Insulation

# PVC insulation based on ISO 6722

## Cable Description

| | |
|---|---|
| Conductor | Plain / tinned annealed copper |
| Insulation | PVC (polyvinyl chloride) based on ISO 6722 class A |
| Color code | Color coded with or without stripes upon request |
| Temperature rating | - 40˚C up to + 85˚C |
| Packing | Cables are packed in carton boxes. |

## Application

This wire is used in the manufacture of electrical harnesses for cars and other automotive products.

| S. No. | Conductor | | | Nominal Insulation Thickness (mm) | Maximum Overall Diameter (mm) | Approx. Weight (Kg/Km) |
|---|---|---|---|---|---|---|
| | Nominal Cross sectional area (mm2) | Nominal No. of wires x Max Wire Diameter (No. x mm) | Max Conductor DC Resistance at 20°C (Ohm/Km ) | | | |
| 1 | 0.5 | 16 x 0.21 | 37.1 | 0.6 | 2.3 | 9 |
| 2 | 0.75 | 24 x 0.21 | 24.7 | 0.6 | 2.5 | 12 |
| 3 | 1 | 32 x 0.21 | 18.5 | 0.6 | 2.7 | 15 |
| 4 | 1.5 | 30 x 0.26 | 12.7 | 0.6 | 3.0 | 20 |
| 5 | 2 | 28 x 0.31 | 9.42 | 0.6 | 3.3 | 26 |
| 6 | 2.5 | 50 x 0.26 | 7.6 | 0.7 | 3.6 | 32 |
| 7 | 3 | 44 x 0.31 | 6.15 | 0.7 | 4.1 | 37 |
| 8 | 4 | 56 x 0.31 | 4.71 | 0.8 | 4.4 | 49 |
| 9 | 6 | 84 x 0.31 | 3.14 | 0.8 | 5.0 | 68 |

Notes: Other Automotive wires types can be provided on specific request.
The above data are approximate and subjected to normal manufacturing tolerance.

# Heat - Resistant PVC Insulation based on ISO 6722

## Cable Description

| | |
|---|---|
| Conductor | Plain / tinned annealed copper |
| Insulation | Heat resistant PVC (polyvinyl chloride) based on ISO 6722 class B. |
| Color code | Color coded with or without stripes upon request |
| Temperature rating | - 40˚C up to +100˚C |
| Packaging | Cables are packed in carton boxes. |

## Application

This wire is used in the manufacture of electrical harnesses for cars and other automotive products.

| S. No. | Conductor | | | Nominal Insulation Thickness (mm) | Approx. Overall Diameter (mm) | Approx. Weight (Kg/Km) |
|---|---|---|---|---|---|---|
| | Nominal Cross sectional area (mm2) | No. of Wires x Max Wire Diameter (No. x mm) | Max Conductor DC Resistance at 20°C (Ohm/Km ) | | | |
| 1 | 0.5 | 16 x 0.21 | 37.1 | 0.6 | 2.3 | 9 |
| 2 | 0.75 | 24 x 0.21 | 24.7 | 0.6 | 2.5 | 11 |
| 3 | 1 | 32 x 0.21 | 18.5 | 0.6 | 2.7 | 14 |
| 4 | 1.5 | 30 x 0.26 | 12.7 | 0.6 | 3.0 | 19 |
| 5 | 2.5 | 50 x 0.26 | 7.6 | 0.7 | 3.6 | 31 |
| 6 | 4 | 56 x 0.31 | 4.71 | 0.8 | 4.4 | 49 |
| 7 | 6 | 84 x 0.31 | 3.14 | 0.8 | 5.0 | 68 |

Notes: Other Automotive wires types can be provided on specific request.
The above data are approximate and subjected to normal manufacturing tolerance.

# Heat – Pressure resistant PVC Insulation based on ISO 6722

## Cable Description

| | |
|---|---|
| Conductor | Plain / tinned annealed copper |
| Insulation | Heat resistant PVC ( polyvinyl chloride ) based on ISO 6722 class C. (Hot pressure resistance test at 120˚C) |
| Color code | Color coded with or without stripes upon request |
| Temperature rating | - 40˚C up to + 120˚C |
| Packing | Cables are packed in carton boxes. |

## Application

This wire is used in the manufacture of electrical harnesses for cars and other automotive products.

| S. No. | Conductor | | | Nominal Insulation Thickness (mm) | Approx. Overall Diameter (mm) | Approx. Weight (Kg/Km) |
|---|---|---|---|---|---|---|
| | Nominal Cross sectional area (mm2) | No. of Wires x Max Wire Diameter (No. x mm) | Max Conductor DC Resistance at 20°C (Ohm/Km) | | | |
| 1 | 0.5 | 16 x 0.21 | 37.1 | 0.6 | 2.3 | 9 |
| 2 | 0.75 | 24 x 0.21 | 24.7 | 0.6 | 2.5 | 11 |
| 3 | 1 | 32 x 0.21 | 18.5 | 0.6 | 2.7 | 14 |
| 4 | 1.5 | 30 x 0.26 | 12.7 | 0.6 | 3.0 | 19 |
| 5 | 2.5 | 50 x 0.26 | 7.6 | 0.7 | 3.6 | 30 |
| 6 | 3 | 44 x 0.31 | 6.15 | 0.7 | 4.1 | 36 |

Notes: Other Automotive wires types can be provided on specific request.
The above data are approximate and subjected to normal manufacturing tolerance.

# Concentric Conductors with PVC Insulation based on DIN 72551

## Cable Description

| | |
|---|---|
| Conductor | Concentric stranded copper conductor based on DIN 72551, part 6, type A. |
| Insulation | PVC ( polyvinyl chloride ) based on DIN 72551, part 5. |
| Color code | Color coded with or without stripes upon request |
| Temperature rating | - 40˚C up to + 105˚C |
| Packing | Cables are packed in carton boxes. |

## Application

This wire is used in the manufacture of electrical harnesses for cars and other automotive products.

| S. No. | Conductor | | | Minimum Insulation Thickness (mm) | Approx. Overall Diameter (mm) | Approx. Weight (Kg/Km) |
|---|---|---|---|---|---|---|
| | Nominal Cross sectional area (mm2) | No. of Wires x Max Wire Diameter (No. x mm) | Max Conductor DC Resistance at 20°C (Ohm/Km ) | | | |
| 1 | 0.35 | 7 x 0.26 | 52 | 0.2 | 1.3 | 4.5 |
| 2 | 2.5 | 19 x 0.19 | 37.1 | 0.22 | 1.6 | 6.6 |
| 3 | 0.75 | 19 x 0.23 | 24.7 | 0.24 | 1.9 | 9 |
| 4 | 1 | 19 x 0.26 | 18.5 | 0.24 | 2.1 | 11 |
| 5 | 1.5 | 19 x 0.32 | 12.7 | 0.24 | 2.4 | 16 |
| 6 | 2 | 19 x 0.37 | 9.42 | 0.24 | 2.6 | 22.5 |
| 7 | 2.5 | 19 x 0.41 | 7.6 | 0.28 | 3.0 | 26 |

Notes: Other Automotive wires types can be provided on specific request.
The above data are approximate and subjected to normal manufacturing tolerance.

# PVC Thin Insulation based on DIN 72551

## Cable Description

| | |
|---|---|
| Conductor | Concentric stranded copper conductor based on DIN 72551, part 6, type B. |
| Insulation | PVC ( polyvinyl chloride ) based on DIN 72551, part 5. |
| Color code | Color coded with or without stripes upon request |
| Temperature rating | - 40˚C up to + 105˚C |
| Packing | Cables are packed in carton boxes. |

## Application

This wire is used in the manufacture of electrical harnesses for cars and other automotive products.

| S. No. | Conductor | | | Minimum Insulation Thickness (mm) | Approx. Overall Diameter (mm) | Approx. Weight (Kg/Km) |
|---|---|---|---|---|---|---|
| | Nominal Cross sectional area (mm2) | No. of Wires x Max Wire Diameter (No. x mm) | Max Conductor DC Resistance at 20°C (Ohm/Km ) | | | |
| 1 | 0.35 | 12 x 0.21 | 52 | 0.2 | 1.4 | 4.5 |
| 2 | 0.5 | 16 x 0.21 | 37.1 | 0.22 | 1.6 | 6.6 |
| 3 | 0.75 | 24 x 0.21 | 24.7 | 0.24 | 1.9 | 9.0 |
| 4 | 1 | 32 x 0.21 | 18.5 | 0.24 | 2.1 | 11.0 |
| 5 | 1.5 | 30 x 0.26 | 12.7 | 0.24 | 2.4 | 16.0 |
| 6 | 2 | 30 x 0.31 | 9.31 | 0.24 | 2.6 | 22.5 |
| 7 | 2.5 | 50 x 0.26 | 7.6 | 0.28 | 3.0 | 26.0 |
| 8 | 3 | 45 x 0.31 | 6.15 | 0.28 | 3.2 | 32.5 |
| 9 | 4 | 56 x 0.31 | 4.7 | 0.32 | 3.7 | 42.0 |
| 10 | 6 | 84 x 0.31 | 3.1 | 0.32 | 4.3 | 61.0 |

Notes: Other Automotive wires types can be provided on specific request.
The above data are approximate and subjected to normal manufacturing tolerance.

# HARMONIZED CABLES

To BS 6500 - HD 21.5.S3 and BS EN 50525-2- 31

- H05VV-F
- H03VV-F

# H05VV-F

To BS 6500, HD 21.5.S3 and BS EN 50525-2- 31
300/500 V.

## Cable Description

| | |
|---|---|
| Conductor | Flexible plain annealed copper as per BS EN 60228 |
| Core insulation | PVC type TI2 as per BS 7655 |
| Color code | Two Cores<br>Blue, Brown<br>Three Cores<br>Green / Yellow, Blue, Brown<br>Four cores<br>Green / Yellow, Black, Blue, Brown Other colors can be arranged |
| Assembly | Cores are twisted together to form a round cable. |
| Sheath | PVC ( polyvinyl chloride ) TM2 as per BS 7655 Outer sheath varies as per standard and according to application |

## Application

These cables can be used for domestic appliances.

| S. No. | Conductor | | Nominal Insulation Thickness (mm) | Nominal Outer Sheath Thickness (mm) | Approx. Overall Diameter (mm) | Approx. Weight (Kg/Km) |
|---|---|---|---|---|---|---|
| | Nominal Cross sectional area ( mm2 ) | Conductor Max DC Resistance at 20°C (Ohm/Km) | | | | |
| 1 | 2 x 0.75 | 26.0 | 0.6 | 0.8 | 6.5 | 61.0 |
| 2 | 2 x 1.0 | 19.5 | 0.6 | 0.8 | 6.8 | 70.0 |
| 3 | 2 x 1.5 | 13.3 | 0.7 | 0.8 | 7.7 | 91.0 |
| 4 | 2 x 2.5 | 8.0 | 0.8 | 1.0 | 9.4 | 139.0 |
| 5 | 3 x 0.75 | 26.0 | 0.6 | 0.8 | 6.9 | 73.0 |
| 6 | 3 x 1.0 | 19.5 | 0.6 | 0.8 | 7.2 | 85.0 |
| 7 | 3 x 1.5 | 13.3 | 0.7 | 0.9 | 8.4 | 114.0 |
| 8 | 3 x 2.5 | 7.98 | 0.8 | 1.0 | 10.2 | 175.0 |
| 9 | 4 x 0.75 | 26.0 | 0.6 | 0.8 | 7.7 | 91.0 |
| 10 | 4 x 1.0 | 19.5 | 0.6 | 0.9 | 8.1 | 106.0 |
| 11 | 4 x 1.5 | 13.3 | 0.7 | 1.0 | 9.3 | 142 |
| 12 | 4 x 2.5 | 7.98 | 0.8 | 1.1 | 11.1 | 211 |

Notes: Other types can be provided on specific request.
The above data are approximate and subjected to normal manufacturing tolerance.

# H03VV-F

To BS 6500, HD 21.5.S3 and BS EN 50525-2- 31
300/300 V.

## Cable Description

| | |
|---|---|
| Conductor | Flexible plain annealed copper as per BS EN 60228 |
| Core insulation | PVC type TI2 as per BS 7655 |
| Color code | Two Cores<br>Blue, Brown<br>Three Cores<br>Green / Yellow, Blue, Brown<br>Four cores<br>Green / Yellow, Black, Blue, Brown Other colors can be arranged |
| Assembly | Cores are twisted together to form a round cable. For flat cables, two cores are laid parallel. |
| Sheath | PVC ( polyvinyl chloride ) TM2 as per BS 7655 Outer sheath varies as per standard and according to application |
| Temperature rating | - 5˚C up to + 70˚C |

## Application

These cables can be used for domestic appliances.

| S. No. | Conductor | | Nominal Insulation Thickness (mm) | Nominal Outer Sheath Thickness (mm) | Approx. Overall Diameter (mm) | Approx. Weight (Kg/Km) |
|---|---|---|---|---|---|---|
| | Nominal Cross sectional area ( mm2 ) | Conductor Max DC Resistance at 20°C (Ohm/Km) | | | | |
| 1 | 2 x 0.5 Flat | 39 | 0.5 | 0.6 | 3.7 x 5.9 | 30 |
| 2 | 2 x 0.5 | 39 | 0.5 | 0.6 | 5.2 | 38 |
| 3 | 2 x 0.75 Flat | 26 | 0.5 | 0.6 | 3.8 x 6.3 | 34 |
| 4 | 2 x 0.75 | 26 | 0.5 | 0.6 | 5.7 | 49 |
| 5 | 3 x 0.5 | 39 | 0.5 | 0.6 | 5.6 | 48 |
| 6 | 3 x 0.75 | 26 | 0.5 | 0.6 | 6.0 | 60 |
| 7 | 4 x 0.5 | 39 | 0.5 | 0.6 | 6.1 | 58 |
| 8 | 4 x 0.75 | 26 | 0.5 | 0.6 | 6.6 | 72 |

Notes: Other types can be provided on specific request.
The above data are approximate and subjected to normal manufacturing tolerance.

# RUBBER CABLE

# Rubber Cable as per IS 9968 Part-1 / IEC- 60245 Power Cable

## Cable Description

| | |
|---|---|
| Conductor | Class 5 annealed tin electrolytic grade copper conductor as per IS 8130 |
| Insulation | Special EPR compound equivalent to or better than IE2 as per IS 6380 |
| Outer Sheath | Special elastomeric compound based on PCP, CSP, NBR - PVC, CPE equivalent to or better than SE4, HOFR as per IS 6380 |
| Rated Voltage | 1.1kV |
| AC Test Voltage | 3.0 kV |

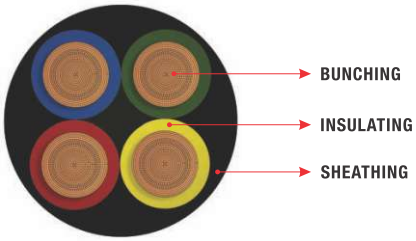
## Working Temperature

| | |
|---|---|
| Fixed Installation | -40˚C to +90˚C |
| In Operation | -25˚C to +90˚C |

## Special Features

Excellent flexibility, Smooth finish, Enhanced resistance to Ozone, Oxygen, Heat, Solvent, Chemicals and Fire

## Construction Diagram




| Nominal Cross Section ($mm^2$) | Nominal Thickness of Insulation (mm) | Max Cond. DC Resistance at 20°C (0hms/Km) | Max Temp. of the Cond. During Operation (°C) | Max Temp. of Cond. During Short Circuit (°C) | Overall Diameter | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 1 Core | 2 Core | 3 Core | 4 Core |
| 4 | 1.0 | 5.09 | 90 | 250 | 7.8 | 13.2 | 13.5 | 15.4 |
| 6 | 1.0 | 3.39 | 90 | 250 | 10.0 | 17.0 | 18.0 | 20.4 |
| 10 | 1.2 | 1.95 | 90 | 250 | 11.8 | 20.6 | 22.0 | 24.2 |
| 16 | 1.2 | 1.24 | 90 | 250 | 13.6 | 24.0 | 25.8 | 28.4 |
| 25 | 1.4 | 0.795 | 90 | 250 | 15.7 | 29.2 | 31.4 | 34.2 |
| 35 | 1.4 | 0.565 | 90 | 250 | 17.4 | 32.2 | 34.4 | 37.6 |
| 50 | 1.6 | 0.393 | 90 | 250 | 20.2 | 37.2 | 39.8 | 43.6 |
| 70 | 1.6 | 0.277 | 90 | 250 | 22.5 | 41.2 | 44.2 | 48.6 |
| 95 | 1.8 | 0.21 | 90 | 250 | 25.4 | 46.6 | 50.2 | 55.2 |
| 120 | 1.8 | 0.164 | 90 | 250 | 27.6 | 50.6 | 54.2 | 60.0 |
| 150 | 2.0 | 0.132 | 90 | 250 | 30.4 | 55.6 | 59.6 | 66.0 |
| 185 | 2.2 | 0.108 | 90 | 250 | 33.4 | 60.6 | 65.2 | 72.5 |
| 240 | 2.4 | 0.0817 | 90 | 250 | 36.8 | 67.6 | 72.8 | 81.0 |
| 300 | 2.6 | 0.0654 | 90 | 250 | 40.0 | 74.6 | 80.4 | 89.4 |
| 400 | 2.8 | 0.0495 | 90 | 250 | 45.0 | 84.0 | 90.6 | 100.8 |

# Rubber Cable as per IS 9968 Part-1 / IEC- 60245
# Control Cable

## Cable Description

| | |
|---|---|
| Conductor | Class 5 annealed tin electrolytic grade copper conductor as per IS 8130 |
| Insulation | Special EPR compound equivalent to or better than IE2 as per IS 6380 |
| Outer Sheath | Special elastomeric compound based on PCP, CSP, NBR - PVC, CPE equivalent to or better than SE4, HOFR as per IS 6380 |
| Rated Voltage | 1.1kV |
| AC Test Voltage | 3.0 kV |

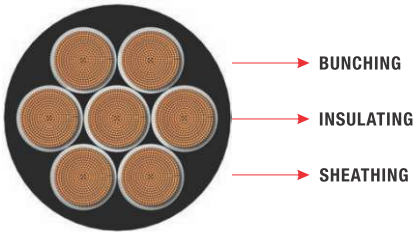
## Working Temperature

| | |
|---|---|
| Fixed Installation | -40˚C to +90˚C |
| In Operation | -25˚C to +90˚C |

## Special Features

Excellent flexibility, Smooth finish, Enhanced resistance to Ozone, Oxygen, Heat, Solvent, Chemicals and Fire

## Construction Diagram



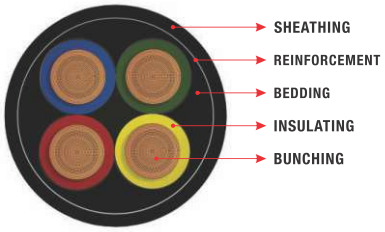

| Nominal Cross Section mm$^2$ | Core Nos | Nominal Thickness of Insulation mm | Max Cond. DC Resistance at 20°C 0hms/Km | Max Temp. of the Cond. During Operation °C | Max Temp. of Cond. During Short Circuit °C | Overall Diameter mm |
|---|---|---|---|---|---|---|
| 1.5 | 7 | 1.0 | 13.7 | 90 | 250 | 14.6 |
| 1.5 | 12 | 1.0 | 13.7 | 90 | 250 | 21.0 |
| 1.5 | 24 | 1.0 | 13.7 | 90 | 250 | 29.0 |
| 2.5 | 7 | 1.0 | 8.21 | 90 | 250 | 16.0 |
| 2.5 | 12 | 1.0 | 8.21 | 90 | 250 | 23.0 |
| 2.5 | 24 | 1.0 | 5.09 | 90 | 250 | 31.5 |

# Rubber Cable as per IS 9968 Part-1 / IEC- 60245 with Reinforcement

## Cable Description

| | |
|---|---|
| Conductor | Class 5 annealed tin electrolytic grade copper conductor as per IS 8130 |
| Insulation | Special EPR compound equivalent to or better than IE2 as per IS 6380 |
| Bedding | Special elastomeric compound conforming to SE3/SE4 as per IS 6380 |
| Reinforcement | Anti-torsional reinforcement between bedding and outer sheath |
| Outer Sheath | Special elastomeric compound based on PCP, CSP, NBR-PVC, CPE equivalent to or better than Se4, HOFR as per IS 6380 |

## Construction Diagram




## Technical Specification

| | |
|---|---|
| Rated Voltage | 1.1 kV |
| AC Test Voltage | 3.0 kV |

## Special Features

Excellent flexibility, Smooth finish, Enhanced resistance to Ozone, Oxygen, Heat, Solvent, Chemicals and Fire

## Application

Reeling & Unreeling application in dry, damp & wet locations as well as outdoors. As universal reeling cables for hoisting, transportation & handling equipment with heavy mechanical stresses, flexible wind energy cable

## Product Range

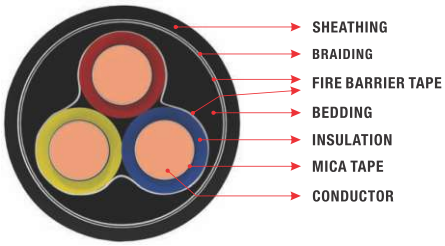
Single core upto 400 sq. mm, Multicore upto 240 sq. mm, Control core 1.5 sq. mm to 2.5 sq. mm upto 36 core

# Rubber Cable Generally as per IS 9968 Part - 1 / IEC- 60245 Fire Survival Cable

## Cable Description

| | |
|---|---|
| Conductor | Class 1 or 2 annealed tin or plain electrolytic grade copper conductor as per IS 8130 |
| Glass Mica Tape | Special Glass Mica Tape suitable for 750˚C or 950˚C |
| Insulation | Special EPR compound equivalent to or better than Ie2 as per IS 6380 |
| Bedding | Special Zero Halogen elastomeric compound |
| Fire Barrier Tape | High temperature resistance glass fibre tape |
| Braiding | Magnetic or non-magnetic metallic wire braiding |
| Outer Sheath | Special zero-halogen LSF (Low Smoke & Fume) elastomeric compound |

## Construction Diagram




## Technical Specification

| | |
|---|---|
| Rated Voltage | 1.1 kV |
| AC Test Voltage | 3.0 kV |

## Special Features

- Circuit integrity test at 750˚C or 950˚C confirming to IEC 60331
- Smoke density test confirming to ASTMD 2843 or IEC 61034
- Vertical flame spread test confirming to IEC 60332
- Halogen acid gas test confirming to IEC 60754-1

## Product Range

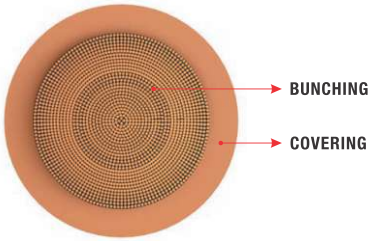
Single core upto 630 sq. mm, Multicore upto 2.5 sq. mm,to 240 sq. mm

# Welding Cable as per IS 9857 / IEC- 60245

## Cable Description

| | |
|---|---|
| Conductor | Ultra flexible class 6 annealed plain electrolytic grade copper conductor as per IS 8130 |
| Covering | Special elastomeric compound equivalent to or better than Se3 as per IS 6380 |

## Construction Diagram




## Special Features

Heat resisting, Oil resisting, Flame retardant (HOFR)
Extremely flexible, smooth finished produced by Continuous Vulcanization (CV) process

## Application

Specifically designed for machine welding and hand welding to work in dry, damp, wet locations & outdoors

## Welding Cable as per IS 9857

| S. No. | Conductor Size<br>$mm^2$ | Thickness of Covering<br>Nominal mm | Outer Diameter<br>mm | Weight<br>Kh/Km |
|---|---|---|---|---|
| 1 | 16 | 2.0 | 9.4 | 200 |
| 2 | 25 | 2.0 | 10.8 | 280 |
| 3 | 35 | 2.0 | 11.9 | 375 |
| 4 | 50 | 2.2 | 13.8 | 525 |
| 5 | 70 | 2.4 | 15.7 | 725 |
| 6 | 95 | 2.6 | 17.7 | 925 |

Upon request we can manufacture higher sizes of welding cables

# XCMK-HF, FXQJ, EXQJ, IFSI

Power cable 0,6/1 kV, with Cu conductors, XLPE insulated and HFFR sheathed, with concentric conductor

## Application

Power cable suitable for fixed installation in dry and damp environment, on or under plaster, on cable trays, same as in walls and concrete. Not intended for direct laying in ground or water. For outdoor application can be laid in tubes, but in that case should be taken all precautionary measures necessary to prevent water penetration into the tubes. Suitable for supply systems in an emergency. Appropriate for application in all situations where people and material goods need to be protected in case of fire. Recommended for public buildings frequented by a lot of people, and for buildings of high material value, for industrial complexes, electric power plants, transformer stations, municipal facilities, hotels, shopping malls, hospitals, schools, airports, underground railways and similar. Concentric conductor serves as electromagnetic screen, which could also be applied as neutral conductor.

## Construction

| | |
|---|---|
| Conductors: | Cu, Class1 or 2 according to EN 60228 |
| Insulation: | XLPE compound |
| Bedding: | Extruded elastomere or plastomere compound or plastic tape |
| Concentric conductor: | Cu wires with counter helix of Cu tape |
| Sheath: | HFFR compound |

## Technical Characteristics

| | |
|---|---|
| CPR class: | Dca – s2, d2, a2 |
| Test voltage: | 4 Kv |
| Rated voltage: | 0,6/1 kV |
| Bending radius (min): | Up to 6 mm² - 6D \| Single Core - 15D \| Multicore - 12D |
| Min. laying temperature: | -15˚C |
| Max. conductor temperature: | 90˚C |
| Max. short-circuit temperature: | 250˚C |

## Standard

SFS 5546, HD 604 S1, SS 424 14 18

## Core Identification

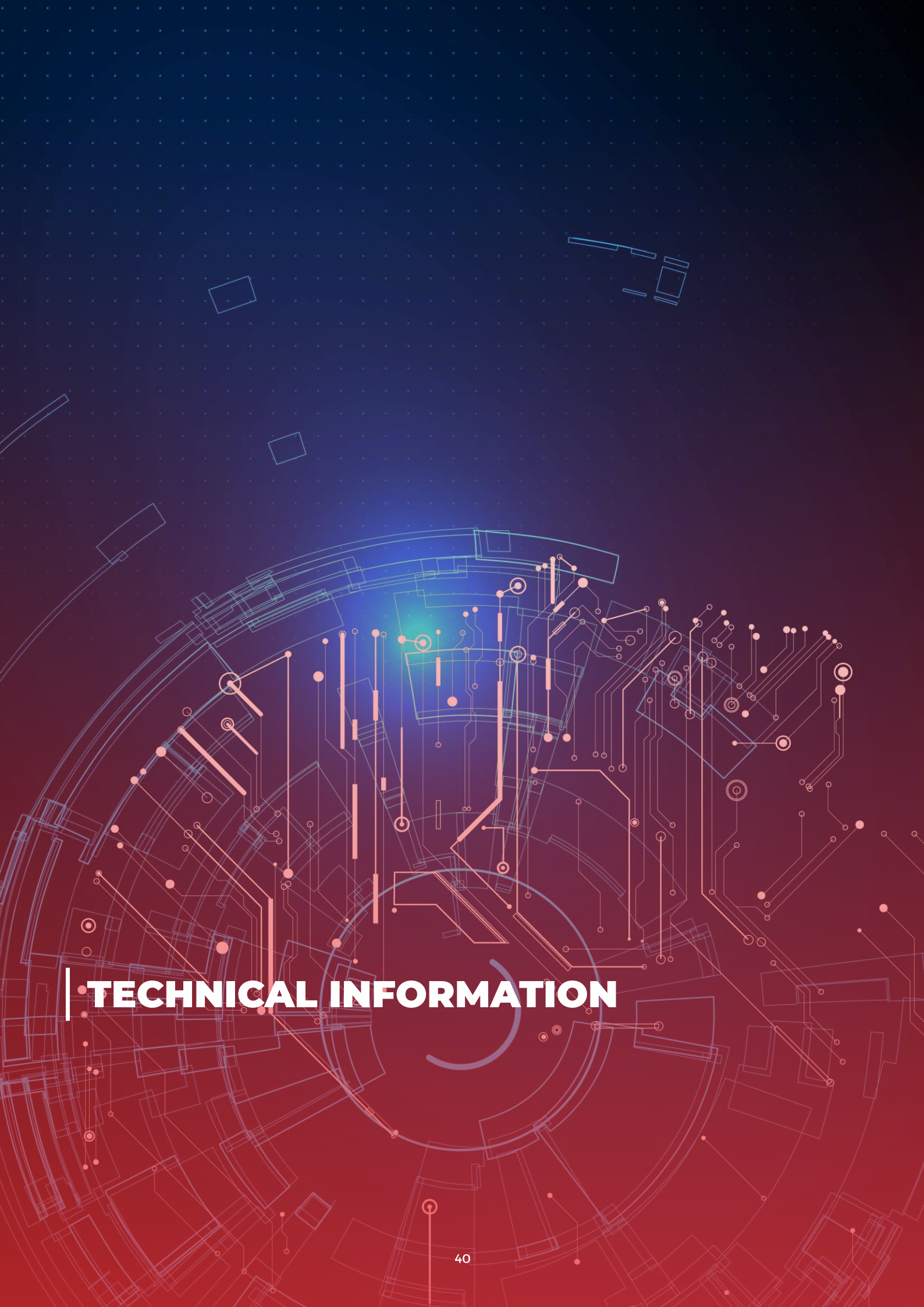
According to HD308 S2

Insulation Color:
Single-core: Green/Yellow or Black
2-core: Brown Blue
3-core (a): Green/Yellow Brown Blue
3-core (b): Black Brown Grey
4-core (a): Green/Yellow Brown Black Grey
4-core (b): Blue Brown Black Grey
5-core: Green/Yellow Blue Brown Black Grey

Outer Sheath Colour:
Black
Other colours available on request

## Certification

CE REACH COMPLIANT - COMPLIANT IEC International Electrotechnical Commission



# TECHNICAL INFORMATION

## TWO-CORE CABLES

| Nominal Cross-Section | Conductor Shape | Max. Resis-Tance At 20°c | Current Capacity In Air | Current Capacity In Ground | Outer Diam. (approx.) | Metal Weight | Cable Weight (approx.) | Packing |
|---|---|---|---|---|---|---|---|---|
| mm² | | Ω/km | A | A | mm | kg/km | kg/km | 500m |
| 2x1,5/1,5 | RE | 12,1 | 18,5 | 26 | 9,4 | 43,2 | 138,87 | K6 |
| 2x2,5/2,5 | RE | 7,410 | 25 | 35 | 10,2 | 72 | 184,76 | K6 |
| 2x4/4 | RE | 4,610 | - | - | 11,3 | 115,2 | 251,02 | K7 |
| 2x6/6 | RE | 3,080 | 43 | 57 | 12,5 | 172,8 | 334,42 | K7 |
| 2x10/10 | RM/RE | 1,830 | 60 | 77 | 14,4 | 288 | 495,33 | K8 |
| 2X10/16 | RM/RE | 1,830 | 60 | 77 | 15,9 | 345,6 | 552,6 | K8 |
| 2x16/16 | RM/RE | 1,150 | 80 | 100 | 16,7 | 460,8 | 726,34 | K8 |
| 2x25/16 | RM/RE | 0,727 | 102 | 130 | 20,0 | 633,6 | 1013 | K9 |
| 2x35/16 | RM | 0,524 | 126 | 160 | 22,5 | 825,6 | 1297,3 | K10 |
| 2x6/2,5 | RE | 3,080 | 43 | 57 | 12,4 | 139,2 | 300 | K7 |
| 2x10/2,5 | RM/RE | 1,830 | 60 | 77 | 14,1 | 216 | 420,6 | K7 |
| 2x16/2,5 | RM/RE | 1,150 | 80 | 100 | 16,0 | 331,2 | 590,9 | K8 |
| 2x25/2,5 | RM/RE | 0,727 | 102 | 130 | 19,2 | 504 | 875,9 | K9 |

*RE - Solid single round conductor, RM - Circular stranded or compacted, SM - Multi stranded shaped conductor

## THREE-CORE CABLES

| Nominal Cross-Section | Conductor Shape | Max. Resis-Tance At 20°c | Current Capacity In Air | Current Capacity In Ground | Outer Diam. (approx.) | Metal Weight | Cable Weight (approx.) | Packing |
|---|---|---|---|---|---|---|---|---|
| mm² | | Ω/km | A | A | mm | kg/km | kg/km | 500m |
| 3x1,5/1,5 | RE | 12,1 | 18,5 | 26 | 9,9 | 57,6 | 157,8 | K6 |
| 3x2,5/2,5 | RE | 7,410 | 25 | 35 | 10,8 | 96 | 213,5 | K6 |
| 3x4/4 | RE | 4,610 | - | - | 11,9 | 153,6 | 294,3 | K7 |
| 3x6/6 | RE | 3,080 | 43 | 57 | 13,2 | 230,4 | 396,9 | K7 |
| 3x10/10 | RM/RE | 1,830 | 60 | 77 | 15,3 | 384 | 595,7 | K8 |
| 3x16/16 | RM/RE | 1,150 | 80 | 100 | 17,7 | 614,4 | 883,2 | K9 |
| 3x25/16 | RM | 0,727 | 102 | 130 | 21,1 | 873,6 | 1254,9 | K10 |
| 3x35/16 | RM | 0,524 | 126 | 160 | 23,7 | 1161,6 | 1629,5 | K11 |
| 3x50/25 | SM | 0,387 | 153 | 190 | 26,4 | 1680 | 1969,9 | K11 |
| 3x70/35 | SM | 0,268 | 195 | 240 | 30,3 | 2352 | 2714,1 | K12 |
| 3x95/50 | SM | 0,193 | 236 | 285 | 34,3 | 3216 | 3649,4 | K14 |
| 3x120/70 | SM | 0,153 | 274 | 325 | 38,4 | 4128 | 4648,7 | K16 |
| 3x150/70 | SM | 0,124 | 317 | 370 | 42,5 | 4992 | 5624,4 | K18 |
| 3x185/95 | SM | 0,0991 | 361 | 420 | 47,3 | 6240 | 7008,2 | K20 |
| 3x240/120 | SM | 0,0754 | 427 | 480 | 53,2 | 8064 | 8994,7 | K22 |
| 3x300/150 | SM | 0,0601 | 492 | 550 | 58,6 | 10080 | 11174,6 | K24 |

*RE - Solid single round conductor, RM - Circular stranded or compacted, SM - Multi stranded shaped conductor

## FOUR-CORE CABLES

| Nominal Cross-Section | Conductor Shape | Max. Resis-Tance At 20°c | Current Capacity In Air | Current Capacity In Ground | Outer Diam. (approx.) | Metal Weight | Cable Weight (approx.) | Packing |
|---|---|---|---|---|---|---|---|---|
| mm² | | Ω/km | A | A | mm | kg/km | kg/km | 500m |
| 4x1,5/1,5 | RE | 12,1 | 18,5 | 26 | 10,7 | 72 | 182,7 | K6 |
| 4x2,5/2,5 | RE | 7,410 | 25 | 35 | 11,7 | 120 | 249,8 | K7 |
| 4x4/4 | RE | 4,610 | - | - | 13,0 | 192 | 347,2 | K7 |
| 4x6/6 | RE | 3,080 | 43 | 57 | 14,4 | 288 | 471,3 | K8 |
| 4x10/10 | RM/RE | 1,830 | 60 | 77 | 16,7 | 480 | 712,3 | K8 |
| 4x10/16 | RM/RE | 1,830 | 60 | 77 | 18,0 | 537,6 | 770 | K9 |
| 4x16/16 | RM/RE | 1,150 | 80 | 100 | 19,3 | 768 | 1061,8 | K9 |
| 4x25/16 | RM | 0,727 | 102 | 130 | 23,2 | 1113,6 | 1530,5 | K10 |
| 4x35/16 | SM | 0,524 | 126 | 160 | 26,0 | 1497,6 | 2007,2 | K11 |
| 4x50/25 | SM | 0,387 | 153 | 190 | 29,2 | 2160 | 2511,2 | K12 |
| 4x70/35 | SM | 0,268 | 195 | 240 | 34,2 | 3024 | 3474 | K14 |
| 4x95/50 | SM | 0,193 | 236 | 285 | 38,0 | 4128 | 4655,7 | K16 |
| 4x120/70 | SM | 0,153 | 274 | 325 | 42,5 | 5280 | 5915,8 | K18 |
| 4x150/70 | SM | 0,124 | 317 | 370 | 47,1 | 6432 | 7208,2 | K20 |
| 4x185/95 | SM | 0,0991 | 361 | 420 | 52,5 | 8016 | 8962,2 | K22 |
| 4x240/120 | SM | 0,0754 | 427 | 480 | 59,0 | 10368 | 11516,9 | K24 |
| 4x300/150 | SM | 0,0601 | 492 | 550 | 65,0 | 12960 | 14313,2 | K24 |

*RE - Solid single round conductor, RM - Circular stranded or compacted, SM - Multi stranded shaped conductor

# Technical Information

### Laying conditions at trefoil formation:
- Soil thermal resistivity 120 ˚C.Cm/Watt
- Burial depth 0.5 m
- Ground temperature 35 ˚C
- Air temperature 40 ˚C
- Frequency 50 Hz
- Cables must be protected from direct solar radiation and other thermal sources in the neighborhood.

### DC resistance of conductor:
DC resistance per unit length of the conductor at another conductor temperature t is given by:
$R=Ro\ [1+\alpha\ 20\ (t-20^{\circ}C)]$

### Where:
R = DC resistance at temperature to ˚C Ω/Km
Ro = DC resistance at temperature 20˚C Ω/Km
t = conductor temperature ˚C
a20 = temperature coefficient at 20˚C 1/˚C

### AC Resistance of Conductor:
To calculate the AC resistance of the conductor at its operating temperature the following formula is used:

$$R_ac = R\ (1 + K_p + K_s)$$

### Where:
KP and KS are proximity effect and skin effect factors

### Inductance:
Self & mutual inductance is defined as follows

$$L = K + 0.2\ Ln\ \left|\ \frac{25}{d}\ \right|$$

### Where:
L = Inductance in mH / Km
K = A constant depending on the number of wires in the conductor
d = Conductor diameter in mm
n = Axial spacing between cables in trefoil formation in mm
= 1.26 x axial spacing between cables in flat formation in mm

### Capacitance:
The mutual Capacitance of the pairs or adjacent cores shall not exceed a maximum of 250 PF/m at a frequency of 1 KHz

1- Mutual capacitance of unshielded twisted pair

$$C = \frac{7.218}{\frac{1.3D}{fd}}$$

2- Mutual capacitance of shielded twisted pair

$$C = \frac{21.14\ \varepsilon}{\frac{1.2D}{fd}}$$

3- Mutual capacitance of overall shielded & cables

$$C = \frac{9.515}{Ln\left(\frac{1.5D}{fd}\right)}$$

### Where:
C : Mutual Capacitance In PF / m
3 : Dielectric constant of insulation material
D : Diameter over insulation in mm
d : Diameter over conductor in mm
f : Stranding factor depend on no. of wires in conductor

### L / R ratio:
The L / R ratio for adjacent cores shall not exceed the following maximum value:

| Conductor $mm^2$ | Maximum L/R ratio µH / Ω |
|---|---|
| 0.5 | 25 |
| 0.75 | 25 |
| 1.5 | 40 |

### Impedance Zo (ohms):
1- Unshielded twisted pair : $Zo = \frac{310\sqrt{\varepsilon}}{C}\ \Omega$

2- Shielded twisted pair : $Zo = \frac{276}{\sqrt{\varepsilon}} \log\left(\frac{1.2D}{f(d)}\right)\ \Omega$

3- Overall shield & cabled : $Zo = \frac{347}{\sqrt{\varepsilon}} \log\left(\frac{1.5D}{f(d)}\right)\ \Omega$

### Where:
C : Mutual Capacitance In PF/m
3 : Dielectric constant of insulation material
f : Stranding factor depend on no. of wires in conductor
D : Diameter over insulation in mm
d : Diameter over conductor in mm

### Attenuation:
The power loss in an electrical system, in cables, generally expressed in decibels (dB) per unit length

$(A) = 86.8 \sqrt{\frac{RGW}{2}}$

### Where:
A : Attenuation in dB per 100 ft
R : Resistance ( AC )
G : Conductance
W : 2π f ( f = test frequency MHZ )

### Velocity of Propagation:
The speed of an electrical signal down a length of cable compared to speed in free space expressed as a percent.
It is inversely proportional to the dielectric constant. Lowering the dielectric constant. Lowering the dielectric constant increases the velocity

$Vp = \frac{1}{\sqrt{\varepsilon}}$ or $Vp = \frac{1}{\sqrt{Lc}}$

**Where:**
3 : Dielectric constant
L : Inductance
C : Capacitance

| Dielectric medium or material | Vp ( % ) |
|---|---|
| Air | 100.0 |
| Solid polyethylene | 65.9 |
| Foamed polyethylene | 80.0 |
| PVC | 45.0 |

## Fire Resistant cables:

A cable can be described as fire resistant when it complies with the severe test in IEC 60331 in which the middle portion of a sample of cable 1200 mm long is supported by two metal rings 300 mm apart and exposed to the flame from a tube type gas burner at 750 °C. Simultaneously the rated voltage of the cable is applied continuously throughout the test period. Furthermore, not less than 12 hours after the flame has been extinguished, the cable is reenergized. No electrical failure must occur under these conditions.

## Halogen Free Material:

What are Halogens?
Halogens are salts of the elements Fluorine, Chlorine, Bromine and Iodine.
Fluorine and chlorine are important in cable design. For exampl e; Flourine, Chlorine and Bromine are common components of flame protection additives.

When is a cable Halogen free?
The burning behavior of cables is very important for the safety of buildings and also in control plants.

Consequently the following points are important:
• Behavior under flame influence ie. the inflammability as the propagation of fire.

• Development of smoke density (darkening of emergency exits, hindrance of the fire fighters).

Cables produced of non halogen free materials such as those with chlorine in the molecule chain :
polyvinylchloride (PVC), chloroprene rubber (CR), chlorinated polyethylene (CM), have a better behavior in case of fire.

These are barely combustible or not flammable and self extinguishing, in case of fire molecules of Chlorine (or Fluorine) are released which hinder the access of oxygen at the fire location and hence suffocate the flame. The disadvantage of these materials is that the released Chlorine (or Flourine) atoms combine with hydrogen which is decomposed from the plastic material as well as hydro choleric acid or hydroflouoric acid from the existing air. These compounds are extremely corrosive and toxic in consequence, damage by corrosion may be higher than the damage caused by fire.

Halogen free cables contain no halogens, ie. the insulation and sheath materials of these cables are composed of polymers of pure hydrocarbons. Burning these materials, produce no corrosive compounds or toxic gases, only water vapor and carbon dioxide gas. For maximum security halogen free cable must be hardly flammable and self extinguishing . This is achieved by using special polymer compounds, containing high percentages of flame protective materials.

## Application:

Halogen free cable are increasingly specified for public buildings and areas where large numbers of people may be present.

## LAN Cables:

The necessity to communicate through digital information, to share data, to reach calculation resources and to share costly devices has encourages the development of local area networks. A local area network (LAN) is a computer network linking users in a small area. Generally, a local area network connects users located either in the same office, or at the same floor, or in the same building. The success of local area networks is due to their ability to satisfy communication needs at a reasonable price. Compatibility is a critical element. Local area networks require high speed channels for data transmission, permitting the transfer of large blocks of data, images, and video signals. The technology used in local networks can reach a transmission rate which is higher than 100 Mbps, ie. higher than that of traditional direct connections. Moreover, the traditionally low transfer capacity of public telecommunications is increasing therefore the distinction between direct connection, local area networks and wide area networks is going to loose significance, at least as far as transmission capacity is concerned. The transmission media is the cable. Common media are phone pairs, coaxial cables and purpose designed LAN cables which are essentially extremely high performance telephone pairs, sometimes provided with shielding. This kind of shielded cable is more immune to electrical interference and permits high speed transmission over longer distances. Pairs are still the most versatile media for transmission and are often the best choice for new network installations.

## Attenuation:

The reduction in a transmitted signal as it passes through wires or equipment in an electrical circuit.

Maximum attenuation values of Cat 5e

| Frequency ( MHz ) | Maximum attenuation dB |
|---|---|
| 0.1 | N / A |
| 1.0 | 2.5 |
| 4.0 | 4.8 |
| 10.0 | 7.5 |
| 16.0 | 9.4 |
| 20.0 | 10.5 |
| 31.25 | 13.1 |
| 62.5 | 18.4 |
| 100.0 | 23.2 |

## Characteristic Impedance:

The nominal differential characteristic impedance of a cabling link shall be 100Ω at frequencies between 1 MHZ and the highest specified frequency for the cabling class. The tolerance of the characteristic impedance in a given link shall not exceed the chosen nominal impedance by more than +15Ω from 1 MHz up to the highest specified frequency for the class.

## Near end crosstalk loss (Next):

The near end crosstalk loss of a link shall meet or exceed the values shown in table below, and shall be consistent with the design values of cable length and cabling materials used.

Maximum next loss of Cat 5e

| Frequency ( MHz ) | Maximum attenuation dB |
|---|---|
| 1.0 | 54 |
| 4.0 | 45 |
| 10.0 | 39 |
| 16.0 | 36 |
| 120.0 | 35 |
| 31.25 | 32 |
| 62.5 | 27 |
| 100 | 24 |

## Attenuation to crosstalk loss ratio (ACR) :

This is the difference between the crosstalk and the attenuation of the link in dB.
ACR( dB ) = an ( dB ) - a( dB ).

## Return loss:

The return loss of the cabling, measured at any interface, shall meet or exceed the values shown in the table below:

| Frequency ( MHz ) | Maximum attenuation dB |
|---|---|
| 1 ≤ F < 10 | 18 |
| 10 ≤ F < 16 | 15 |
| 16 ≤ F < 20 | 15 |
| 20 ≤ F < 100 | 10 |

## Coaxial Cable :

A cable consisting of two cylindrical with a common axis, separated by a dielectric.

## Electrical Parameters:

1- Characteristic Impedance : $Zo = \frac{138}{\sqrt{\varepsilon}} \quad LN \left(\frac{D}{d}\right) \quad \Omega$

2- Velocity of Propagation : $Vp = \frac{100\%}{\sqrt{\varepsilon}}$

3- Capacitance :

$$C = \frac{24.148\,\varepsilon}{LN \left(\frac{D}{d}\right)} \quad PF / m$$

4- Inductance : $L = 0.459\ LN \left(\frac{D}{d}\right)$

5- Braiding Details:

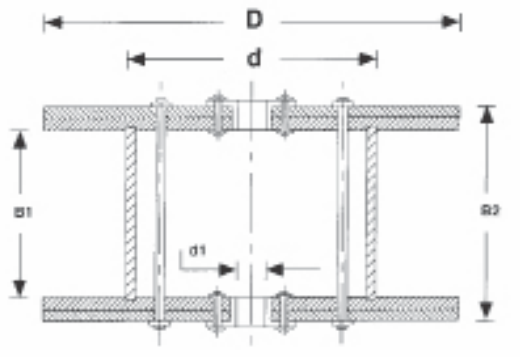
Braid angle : $\Phi = \tan^{-1} \left(\frac{2\pi(d+e)^p}{C}\right)$ degrees

Braid picks per cm : $P = \frac{0.394\ (c)\ \tan \Phi}{2\pi\ M}$

Braid resistance : $R = \frac{r}{n\ (C)\ (\cos\Phi)} \quad \Omega/km$

## 5- Instrumentation, fire resistant, control cables, LV cables, ...etc

International practice is to supply cables on wooden drums.
At the customers request we will also supply on steel drums for improved on-site performance and handling.




## 5- Instrumentation, fire resistant, control cables, LV cables, ...etc

| D | D | d1 | B1 | B2 | W1 | W2 |
|---|---|---|---|---|---|---|
| 630 | 300 | 85 | 410 | 530 | 16 | 300 |
| 700 | 350 | 85 | 410 | 530 | 20 | 350 |
| 800 | 400 | 85 | 410 | 530 | 24 | 400 |
| 1000 | 500 | 85 | 610 | 70 | 46 | 800 |
| 1250 | 580 | 85 | 580 | 680 | 60 | 1700 |
| 1400 | 700 | 85 | 800 | 950 | 160 | 2000 |
| 1600 | 700 | 110 | 800 | 950 | 170 | 2500 |
| 1800 | 920 | 110 | 900 | 1050 | 240 | 3000 |
| 2000 | 1020 | 110 | 1200 | 1350 | 335 | 4000 |

| :Where | |
|---|---|
| D : Flange diameter | .mm |
| d : Barrel diameter | .mm |
| d1: Axis hole diameter | .mm |
| B1 : Distance be tween flanges | .mm |
| B2 : Overall width | .mm |
| W1: Approximate net weight of drum | .kg |
| W2: Maximum gross weight of drum | .kg |

| Multiply | By | To |
|---|---|---|
| **Weight – Imperial** | | |
| Ounces | 28.495 | grams |
| Pounds (AV) | 453.59 | grams |
| Pounds (AV) | 0.45359 | kilograms |
| Tons (short) | 907.19 | kilograms |
| Tons (long) | 1016.05 | kilograms |
| **Weight – Metric** | | |
| Grams | 0.03527 | Ounces |
| Grams | 0.002205 | Pounds |
| Kilograms | 35.274 | Ounces |
| Kilograms | 2.2046 | Pounds |
| Kilograms | 0.001102 | Tons (short) |
| Kilograms | 0.0009842 | Tone (long) |
| **Miscellaneous – Imperial** | | |
| Pounds per 1000 feet | 1.48816 | Kg/ Km |
| Pounds per mile | 0.28185 | Kg/ Km |
| Pounds per square inch | 0.0007031 | Kg. per square mm. |
| Pounds per square inch | 0.07031 | Kg. per square cm |
| Pounds per cubic | 27.68 | Grams per cubic cm |
| Feet per second | 18.288 | Meters per minute |
| Feet per second | 1.09728 | Kilometers per hour |
| Miles per hour | 1.60935 | Kilometers per hour |
| Ohms per 1000 feet | 3.28083 | Ohms per kilometer |
| Ohms per mile | 0.62137 | Ohms per kilometer |
| Decibels per 1000 feet | 3.28083 | Decibels per kilometer |
| Decibels per mile | 0.62137 | Decibels per kilometer |
| Decibels | 0.1153 | nepers. |
| **Miscellaneous – Metric** | | |
| Kg / Km | 0.67197 | Pounds per 100 feet |
| Kg / Km | 3.54795 | Pound per mile |
| Kg. per square mm | 1422.34 | Pound per square inch |
| Kg. per square cm | 14.2234 | Pound per square inch |
| Grams per cubic cm | 0.03613 | Pound per cubic inch |
| Meters per minute | 0.05468 | Feet per second |
| Kilometers per hour | 0.91134 | Feet per second |
| Kilometers per hour | 0.62137 | Miles per hour |
| Ohms per kilometer | 0.3048 | Ohms per 1000 feet. |
| Ohms per kilometer | 1.6093 | Ohms per mile |
| Decibels per kilometer | 0.3048 | Decibels per 1000 feet |
| Decibels per kilometer | 1.6093 | Decibels per mile |
| **Temperature** | | |
| Fahrenheit | 5/9(*F)-32 | *Celsius |
| Celsius | 9/5 (*C)+32 | * Fahrenheit |

| Multiply | By | To obtain |
|---|---|---|
| **Length – Imperial** | | |
| Mils | 0.001 | Inches |
| Mils | 0.0254 | mm |
| Inches | 1000 | Mils |
| Inches | 25.40 | Mm |
| Inches | 2.54 | Cm |
| Feet | 30.48 | Cm |
| Feet | 0.3048 | Meters |
| Feet (thousands of) | 0.3048 | Kilometers |
| Yards | 0.9144 | Meters |
| miles | 1.3093 | Kilometers |
| **Length-metric** | | |
| Millimeters | 39.37 | Mils |
| Millimeters | 0.03937 | inches |
| Centimeters | 0.3937 | Inches |
| Centimeters | 0.032808 | Feet |
| Meters | 39.37 | Inches |
| Meters | 3.2808 | Feet |
| Meters | 1.0936 | Yards |
| Kilometers | 3280.83 | Feet |
| Kilometers | 0.62137 | Miles |
| **Area – Imperial** | | |
| Square mils | 1.2732 | Circular mils |
| Square mils | 0.000001 | Square inches |
| Circular mils | 0.7854 | Square mils |
| Circular mils | 0.0000007954 | Square inches |
| Square mils | 0.0005037 | Square mm. |
| Square inches | 1000000 | Square mils |
| Square inches | 1273240 | Circular mils |
| Square inches | 645.16 | Square mm |
| Square inches | 645.16 | Square cm. |
| Square feet | 0.09290 | Square meters |
| Square yards | 0.8361 | Square meters |
| **Area – Metric** | | |
| Square millimeters | 1973.52 | Circular mils |
| Square millimeters | 0.00155 | Square inches |
| Square centime-ters | 0.155 | Square inches |
| | 10.7638 | Square feet |
| Square meters | 1.19599 | Square yards |
| Square meters | | |
| **Volume – Imperial** | | |
| Cubic inches | 16.38716 | Cubic cm. |
| Cubic feet | 0.028317 | Cubic meters. |
| **Volume – U. S.** | | |
| Quarts (liquid) | 0.9463 | Liters |
| Gallons | 3.7854 | Liters |
| **Volume – Imperial** | | |
| Cubic cm | 0.06102 | Cubic incuse |
| Cubic meters | 35.3145 | Cubic feet. |
| Liters | 1.05668 | Quarts.(liquid U.S) |
| Liters | 0.26417 | Gallons (U.S.) |

NOTES

## Branch Offices:

**AHMEDABAD**
B-802, Iscon Elegance, Nr. Prahlad
Nagar Corner, Opp. Karnavati Club,
S.G. Highway, Ahmedabad-380051
Ph.: 079 - 66168835/36
E-mail: ahmedabad@hplindia.com

**BANGALORE**
No.2D, IInd Floor,
Farah Winsford, 133, Infantry Road,
Bangalore - 560001
Ph.: 080-22863068/69
E-mail: bangalore@hplindia.com

**BHUBANESWAR**
The Metropolis,
Plot No. A- 167, Saheed Nagar,
Bhubaneswar - 751007 (Orissa).
Ph.: 91+ 9861374379, 8018027834
E-mail: orissa@hplindia.com

**CHANDIGARH**
SCO-14, 1st Floor,
Industrial & Business Park,
Phase-II, Chandigarh-160002
Ph.: 0172-2639157/ 8146404442
E-mail: chandigarh@hplindia.com

**CHENNAI**
"Amar Sindur" S-4, 2nd Floor,
No.-43, Pantheon Road,
Egmore, Chennai-600 008
Ph.: 044-28551530, 28551537
Fax: 044-42638243
E-mail: chennai@hplindia.com

**COCHIN**
1st Floor, A.K.S. Mahal Building,
XL/7813J, Achutha Warrier Lane,
M.G.Road, Ernakulam, Cochin-682035
Telefax: 0484-2354595
E-mail: cochin@hplindia.com

**DEHRADUN**
09/4/6, Ist Floor, East Canal Road,
(Near Doon Defence Academy)
Dehradun-248001
Ph.: 0135-2664387, 2664367
E-mail: uttranchal@hplindia.com

**GUWAHATI**
Rajgarh Road, Opposite China Town
Restaurant, Guwahati-781003
Ph.: 0361-2450889
E-mail: guwahati@hplindia.com

**HYDERABAD**
No. 7-1-58, Flat No.403,
4th Floor, Concourse Building,
Green Lands Road,
Hyderabad-500016,
Ph.: 040-66687878
E-mail: hyderabad@hplindia.com

**INDORE**
203, Millinda Manor 2, RNT Marg,
Near Ravindra Natya Grah,
Indore-452001,
Ph.: 0731-4280525, 4225540
E-mail: Indore@hplindia.com

**JAIPUR**
512, 5th Floor, Plot No. 8-9,
Corporate Park, Gopal Bari,
Ajmer Road, Jaipur-302001
Ph.: 0141-4021035
E-Mail: jaipur@hplindia.com

**KOLKATA**
69, Ganesh Chandra Avenue,
India House, 7th Floor,
Block-C, Kolkata-700013
Ph.: +91 9038094379
E-Mail: calcutta@hplindia.com

**LUCKNOW**
1st Floor, Jain Building,
14/A5, Park Road Hazratganj,
Lucknow-226001
Ph.: 0522-4021687
E-Mail: lucknow@hplindia.com

**MUMBAI**
2C/H, Rushabh Chambers,
2nd Floor, Off-Makwana Road,
Near Rubi Hotel, Marol,
Andheri East, Mumbai-400059
E-mail: mumbai@hplindia.com

**NAGPUR**
Jagtap House,
Plot No. 07, Ist Floor,
Ganesh Gruh Nirman Society,
Near Ganesh Mandir,
Ring Road, Pratap Nagar,
Nagpur-440022,
Ph.: 0712-2222988
E-mail: nagpur@hplindia.com

**PATNA**
Hem Plaza, 5th Floor - 510,
Frazer Road,
Patna-800001(Bihar),
Ph.: +91 9334697299
E-mail: patna@hplindia.com

**PUNE**
Sunrise Skyline 3rd Floor,
Plot No. 28/2 Scheme No. 11 B
Opp. MSEB Office Somwar Peth
Pune-411001
Ph.: +91 9028032724
E-mail: pune@hplindia.com

**RAIPUR**
1st Floor, Near Holy Heart School
Chattisgarh College Road,
Civil Line, Raipur (C.G.)-492006,
Ph.: 0771-4218002/04
E-mail: raipur@hplindia.com

**VADODARA**
409/410, Silver Oak Complex,
Near Shrenik Park,
Char Rasta, Productivity Road,
Akota, Vadodara - 390020 Gujarat
Ph.: 0265-4000583,
Fax:0265-2352107
E-mail: baroda@hplindia.com

**VIJAYAWADA**
D.No.-29-37-135,
2nd Floor, G. R. Plaza,
Eluru Road, Beside Canara Bank,
Vijayawada-520002
Ph.: 0866-6622291
E-mail: vijayawada@hplindia.com

## Resident Offices:

| | | | | | | |
|---|---|---|---|---|---|---|
| Agartala | Balasore | Cuttack | Jamshedpur | Malda | Rajkot | Tirupati |
| Agra | Belgaum | Davangere | Jalandhar | Mangalore | Rourkela | Trichy |
| Allahabad | Berhampur | Durg | Jharsuguda | Meerut | Salem | Trivandrum |
| Anantpuram | Bhilai | Goa | Jodhpur | Moradabad | Silchar | Udaipur |
| Aurangabad | Bhopal | Gorakhpur | Kanyakumari | Mysore | Siliguri | Vapi |
| Amravati | Bilaspur | Gulbarga | Kolhapur | Nagerkoil | Surat | Varanasi |
| Akola | Bijapur | Hubli | Kota | Nasik | Sholapur | Vellore |
| Angul | Calicut | Jabalpur | Ludhiana | Patiala | Srinagar | Vizag |
| Bareilly | Coimbatore | Jabli | Madurai | Pondicherry | Sambalpur | |


**HPL Electric & Power Ltd**
*Corp. Office:* Windsor Business Park, B-1D,
Sector-10, Noida, U.P. - 201301, INDIA.
Tel.: +91-120-4656300, Fax: +91-120-4656333
*Registered Office:* 1/20, Asaf Ali Road, New Delhi - 110 002, INDIA.
E-mail: hpl@hplindia.com

Customer Care No. : 18004190198

www.hplindia.com