L&T SWITCHGEAR
SAFE & SURE

# Wires & Cables

LARSEN & TOUBRO

# About us

Larsen & Toubro is a technology-driven USD 9.8 billion company that infuses engineering with imagination. The Company offers a wide range of advanced solutions in the field of Engineering, Construction, Electrical & Automation, Machinery and Information Technology.

L&T Switchgear, which forms part of the Electrical & Automation business, is India's largest manufacturer of low voltage switchgear, with the scale, sophistication and range to meet global benchmarks. With over four decades of experience in this field, the Company today enjoys a leadership position in the Indian market with growing presence in international markets.

It offers a complete range of products including controlgear, powergear, motor starters, energy meters, wires and host of other accessories. The products conform to international standards, carry CE markings and are KEMA certified.

L&T offers a complete range of low voltage switchgear products that includes Air Circuit Breakers, Moulded Case Circuit Breakers, Switch Disconnector Fuse Units, HRC Fuses, Contactors, Overload Relays, Motor Starters, Timers etc. This apart, L&T manufactures associated products viz., Control and automation equipment, metering and protection systems.

Switchgear Factory, Mumbai

# FR (Flame Retardant) PVC Insulated House Wires


L&T House Wires are made of Electrolytic grade, bright, plain annealed copper conductor, as per **IS : 8130 -1984.** These wires are suitable for all Commercial & Domestic wiring applications.

For additional safety, the insulation is of Flame Retardant - **FR PVC** compound. It has high oxygen and temperature index.

L&T House Wires are twin coated for superior insulation. The House Wires have uniform diameter and are available in standard lengths of 90 metre and 180 metre coils.

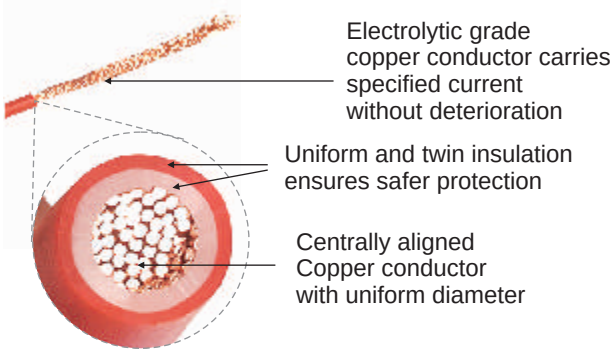
Single core, twin insulated wires in voltage grade 1100V, conforming to IS:694-1990 with additional FR properties.

| Nominal area of conductor | Number/Nom. Dia of wire | Thickness of insulation (Nom) | Approx. overall Diameter | Current carrying capacity* 2 cables, single phase | | Max Resistance per km at 20°C |
|---|---|---|---|---|---|---|
| | | | | In conduit/ Trunking | Unenclosed-clipped directly to surface or on cable tray | |
| Sq. mm | mm | mm | mm | Amp. | Amp. | Ohms |
| 1.0 | # 14/.3 | 0.7 | 2.8 | 11 | 12 | 18.10 |
| 1.5 | # 22/.3 | 0.7 | 3.1 | 14 | 16 | 12.10 |
| 2.5 | # 36/.3 | 0.8 | 3.8 | 19 | 22 | 7.41 |
| 4.0 | $ 56/.3 | 0.8 | 4.4 | 26 | 29 | 4.95 |
| 6.0 | $ 84/.3 | 0.8 | 5.0 | 31 | 37 | 3.30 |

Standard Colour : Red, Yellow, Blue, Green, Black. * As per IS: 3961 (Part V) -1968.
**#** As per Conductor Class 2 of IS : 8130 - 1984. **$** As per Conductor Class 5 of IS : 8130 - 1984.

Above data is indicative. L&T will not be liable for damage arising out of incorrect applications

# Special Insulation wires




**L&T Flame Retardant Low Smoke (FRLS) wire -** These wires are made of special insulation material with higher oxygen and temperature indices and lower smoke density rating and acid gas generation. This insulation retards flame propagation and generates low smoke under fire condition.

**L&T Zero Halogen Flame Retardant (ZHFR) wire -** The insulation is free from halogen, thus preventing emission of corrosive gases under conditions of fire. These wires are primarily used where critical control supply is essential during a

**Oxygen Index** is used as a measure of flame retardant property of the insulating material. The oxygen index indicates percentage of oxygen required for supporting combustion of insulating material at room temperature. Higher oxygen index is desirable.

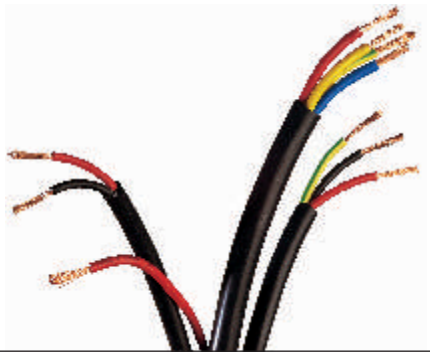
**Temperature Index** indicates the temperature at which normal oxygen content of 21% in air will support combustion of insulating material. Higher temperature index is better.

**Smoke Density** indicates the loss of light transmission from insulation material under fire. Lower the Smoke Density, the better is the visibility & efficacy of fire fighting operations.

**Acid Gas Generation** indicates the amount of hydrochloric

| Characteristics | Standard | Typical value |
|---|---|---|
| Oxygen index | ASTM-D 2863 | More than 29% |
| Temperature index | ASTM-D 2863 | More than 250°C |
| Smoke density rating | ASTM-D 2843 | Less than 60% |
| Acid gas generation | IEC 754-1 | Less than 20% |

# Flexible Wires



L&T Flexible wires are made of bright, plain multi-stranded annealed copper conductor, as per Class 5 of **IS : 8130 - 1984** with PVC insulation. These wires are used for all industrial wiring applications and are available in single and multicores in standard lengths of 100 metre and 300 metre coils.

Single unsheathed cable (Flexible) voltage grade 1100 V, conforming to IS: 694-1990

| Nominal area of conductor | Number/ Nom. Dia of wire | Thickness of insulation (Nom) | Approx. overall Diameter | Current carrying Capacity as per IS:3961 | Max Resistance per km at 20°C |
|---|---|---|---|---|---|
| Sq. mm | mm | mm | mm | Amp. | Ohms |
| 0.5 | 16/.2 | 0.6 | 2.20 | 04 | 39.00 |
| 0.75 | 24/.2 | 0.6 | 2.40 | 07 | 26.00 |
| 1.0 | 32/.2 | 0.6 | 2.60 | 11 | 19.50 |
| 1.5 | 30/.25 | 0.6 | 2.90 | 14 | 13.30 |
| 2.5 | 50/.25 | 0.7 | 3.50 | 19 | 7.98 |
| 4.0 | 56/.3 | 0.8 | 4.30 | 26 | 4.95 |
| 6.0 | 84/.3 | 0.8 | 4.80 | 31 | 3.30 |
| 10 | 140/.3 | 1.0 | 6.10 | 42 | 1.91 |
| 16 | 126/.4 | 1.0 | 7.00 | 57 | 1.21 |
| 25 | 196/.4 | 1.2 | 8.70 | 71 | 0.78 |
| 35 | 276/.4 | 1.2 | 10.00 | 91 | 0.55 |
| 50 | 396/.4 | 1.4 | 12.00 | 120 | 0.38 |
| 70.0 | 360/.5 | 1.6 | 14.30 | 160 | 0.27 |

Above data is indicative. L&T will not be liable for damage arising out of incorrect applications

**Core Colours :** • **2 Cores -** Red, Black • **3 Cores -** Red, Black, Yellow / Green • **4 Cores -** Red, Yellow, Blue, Yellow / Green
**Sheath Color :** Black

# Some Useful Electrical Data*

## Capacities of PVC conduits*

| Cable Size | Conduit Size and Gauge | | | |
|---|---|---|---|---|
| Nominal conductor Size $mm^2$ | 16 mm or 5/8" | 20 mm or 3/4" | 25 mm or 1" | 32 mm or 1¼" |
| | Number of Cables (maximum) | | | |
| 1.0 | 6 | 7 | 19 | 30 |
| 1.5 | 5 | 5 | 15 | 24 |
| 2.5 | 3 | 4 | 11 | 17 |
| 4 | 2 | 3 | 8 | 13 |
| 6 | 2 | 2 | 6 | 10 |
| 10 | - | - | 4 | 6 |
| 16 | - | - | 3 | 4 |
| 25 | - | - | 2 | 3 |
| 35 | - | - | - | 2 |

## The human body's reaction to electric shock*

Electrical shock currents, passing through the human body, confuse its internal nervous system. This causes the body to react to the passage of current through it as follows :

**3mA** - a tingling sensation is felt.

**10-15mA** - muscle spasm and tightening occurs.

**20-30mA** - the heart may fibrillate; severe shock is felt.

**>50mA** - lethal. Fibrillation of the heart occurs.

## Selection chart for Typical Domestic Loads*

| Sr. No. | Items | Load / Wattage | MCB rating | Wire size Sq. mm |
|---|---|---|---|---|
| 01 | Fan | 60W | - | 1 |
| 02 | Lamp, Tubelight | 40W | - | 1 |
| 03 | Room heater | 200W | 1A | 1.5 |
| 04 | Water Heater | | | |
| | 8 ltrs | 1200 - 2000W | 10A | 2.5 |
| | 15 ltrs | 3000 - 4000W | 20A | 4 |
| | 60 ltrs | 4000 - 6000W | 32A | 6 |
| 05 | Immersion Heater | 1000W | 6A | 1.5 |
| 06 | Hot Plate - single | 1000W | 6A | 1.5 |
| 07 | Iron - non automatic | 500W | 3A | 1.5 |
| | automatic | 1000W | 6A | 1.5 |
| 08 | Mixer / Juicer | 300W | 2A | 1.5 |
| 09 | TV / VCR | 200W | 1A | 1.5 |
| 10 | Music system | 200W | 1A | 1.5 |
| 11 | Refrigerator | | | |
| | 165 ltrs | 400W | 3A | 1.5 |
| | 285 ltrs | 600W | 4A | 1.5 |
| | 350 | 750W | 6A | 1.5 |
| 12 | Toaster | 500W | 3A | 1.5 |
| 13 | Vacuum Cleaner | 400W | 3A | 1.5 |
| 14 | Washing machine | | | |
| | without heater | 300 - 1300W | 10A | 2.5 |
| | with heater | 5000 - 6300W | 32A | 6 |
| 15 | Water cooler | 700W | 6A | 1.5 |
| 16 | Desert cooler | 300W | 2A | 1.5 |
| 17 | Oven | 750W | 6A | 1.5 |
| 18 | Electric Kettle | 1500W | 7.5A | 1.5 |
| 19 | Air Conditioner | | | |
| | | 1 ton | 10A | 2.5 |
| | | 1.5 ton | 16A | 4 |
| | | 2 ton | 16A | 4 |
| 20 | Hair Dryer | 1000W | 7.5A | 1.5 |
| 21 | Microwave | 800W | 6A | 1.5 |

**Formula for Calculations :**

Incomer Rating :

Single Phase = $\frac{\text{Total Load in Watts}}{230 \text{ volts}}$

Three Phase = $\frac{\text{Total Load in Watts}}{3\text{x}230 \text{ volts}}$

The above data is only for guidance and may vary for different manufacturers. The proper load of items should be checked for current requirement and appropriate wire and MCB size should be accordingly chosen.

## Max. Short Circuit current as per Transformer kVA*

| Transformer Rating | Full Load Current at 415 V | Max. Short Circuit Current | |
|---|---|---|---|
| kVA | A | (kA) | |
| | | 4% impedance | 5% impedance |
| 25 | 35 | 0.875 | 0.7 |
| 40 | 56 | 1.4 | 1.1 |
| 63 | 88 | 2.2 | 1.8 |
| 100 | 139 | 3.5 | 2.8 |
| 125 | 174 | 4.4 | 3.5 |
| 160 | 223 | 5.6 | 4.5 |
| 200 | 278 | 7 | 5.6 |
| 250 | 348 | 8.7 | 7 |
| 315 | 438 | 11 | 8.8 |
| 400 | 560 | 14.2 | 11.3 |
| 500 | 695 | 17.4 | 13.9 |
| 630 | 876 | 21.9 | 17.5 |
| 800 | 1112 | 27.8 | 22.2 |
| 1000 | 1390 | 34.8 | 27.8 |
| 1250 | 1740 | 43.5 | 34.8 |
| 1600 | 2230 | 55.8 | 44.6 |
| 2000 | 2780 | 69.5 | 55.6 |
| 2500 | 3480 | 87 | 69.6 |

## Derating of Wires*

| Ambient Temp.°C | 30 | 35 | 40 | 45 | 50 |
|---|---|---|---|---|---|
| Rating factor | 1.09 | 1.04 | 1 | 0.85 | 0.77 |

*Above data is indicative. L&T will not be liable for damage arising out of incorrect applications.

## L&T Wire Range


**FR House Wires**

0.75 $mm^2$ to 25 $mm^2$

**Flexible Wires**

0.5 $mm^2$ to 1000 $mm^2$

**Flat Cables**

1.5 $mm^2$ to 70 $mm^2$