

**Paragon Cable India** started production of Wires & Cables in 1991. Under the dynamic leadership of Mr. Vikas Lal Nagpal an Engineer by education and with an experience of three decades of family business of Cables manufacturing behind him, the company has grown into a National Level Producer of Wires & Cables in the small scale sector.

Having worked with zeal & innovation, we at PCI have gained experience and expertise to supply Wires & Cables to the most stringent of Specification. Our Cables normally are made to the established Indian Standards, but may also be designed to suit any International Standard & requirement of our precious customers. In Order to bring to the market a quality standard highest in it's field PCI introduced the **ELEKTRON** brand Wires & Cables. **ELEKTRON** brand stands for Uncompromising Quality & we at PCI shall always remain committed to the cause.

Over the Past Years we have supplied Cables to the Central Govt. Departments including Railways, MES, Defence, CPWD, BSNL & others; to the State Governments through the Electricity Boards & PWD; to the Private Sector including RELIANCE Group, L&T, JINDAL Group, UNITECH, Jai Prakash Associates, JK Group & many others. Our products have been accredited & approved by EngineerInChief, Army HQ, C.E. CPWD, Northern Railways, NF Railways, Sr. DDG(E) BSNL, PWD s of almost all the states. Our Products have been type tested by reputed Test Houses including CPRI.

Our Cables are available on Rate Contracts through DGS&D, through our authorized dealers in the open Market located all over India. We closely follow the new upcoming projects and remain keen to develop long term contracts with the Builders & Electrical Contractors for the complete requirements of the Projects. We have parallel production lines for different range of products, thus enabling us to cater to the urgent demands efficiently.

The Success of our Company based largely on the hard Work, trade ethics and constant striving towards Quality makes us proud of ourselves. We have given special attention to Human Resource Development within our Organization, resulting there in an excellent system, which has learnt from it's own mistakes and today has become self propelling. We have developed inhouse fabrication division too, which caters to our requirements of machines & maintenance.

Wires & Cables form the infrastructure of a developing economy. Our Country having large resources of aluminium has been able to utilize it, thus becoming self sufficient in Cables. We are proud to be part of this process & pledge to work with all our might to help our nation to achieve it's goals.



## Introduction To XLPE

XLPE, Cross Linked Polyethylene, is basically a chemically crosslinkable form of polyethylene(PE). PE has very good electrical properties, like good dielectric strength, very low dissipation factor etc. However, PE has a linear molecular structure of long chains of atoms which can move freely with respect to each other as the temperature is raised. Consequently, the mechanical strength of polyethylene decreases significantly at 75 deg C and above 100 deg C, thus resulting deformation becomes considerable. The improved thermal characteristics of PE are obtained by converting the linear molecular structure having a large number of cross links between molecular chains. The rigid structure of XLPE greatly increases the resistance to deformation at elevated temperatures & significant increase in mechanical strength at temperatures well above the melting point of the base polymer, resulting in higher continuous rating of 90 deg C & short circuit temperature of 250 deg C.

## Product Range

### 1. L.T. Power Cables upto 1.1 KV

- Aluminium/copper conductor
- PVC/XLPE insulated
- Armoured/Unarmoured
- HR-FR-FRLS type
- Single core upto 1000 sq.mm
- Multi core upto 630 sq. mm
- as per IS:1554 (part-1)
- as per IS:7098 (part-1)

### 2. Control Cables

- PVC /XLPE insulated
- HR-FR-FRLS type
- upto 61 cores
- as per IS:1554 (part-1)
- as per IS:7098 (part-1)

### 3. Mining Cables

- Copper Conductor
- Round Wire /Strip Armoured
- PVC /XLPE insulated
- as per IS:1554 (part-1)
- as per IS:7098 (part-1)

### 4. Flexible Wires & Cables

- Copper Solid / Multi Strand
- Aluminium Solid / Multi Strand
- PVC insulated
- HR -FR-FRLS type
- upto 240 sq. mm single core
- upto 240 sq. mm multi core
- as per IS:694

### 5. Domestic Wires

- Copper Conductor
- 1/18 to 37/16
- as per BS:2004

### 6. Co. Axial Cables

- RG Series

### 7. L. T. Aerial Bunched Cables

- Aluminium Conductor
- XLPE / Polyethylene insulated
- as per IS:14255-1995

# XLPE Insulated Cables

## LV XLPE Cables

### Sioplas Technology-Silane Process


Silane Crosslinkable Polyethylene compound is curable by exposure to moist conditions for insulation of Power Cables. This compound is based on a high molecular weight polymer and it is especially developed for Low Voltage cable insulation.

This compound utilises the system for Crosslinking of Polyethylene known as SIOPLAS. It is a two component system comprising of silylated ethylene polymer known as the graft copolymers and a masterbatch material containing a crosslinking catalyst, the two materials normally being added in the ratio of 95:5. This system thus attain a high level of crosslinking in the processed form and the finished product has all the properties associated with crosslinked polyethylene cable.

### Advantages

- Higher current rating permits to select lower size of XLPE cable compared to PVC cables.
- Higher short circuit rating than PVC cables.
- Resistant to heat deformation while PVC is prone to heat deformation.
- Repetitive short circuit/overload condition is reliable.
- Lower Dielectric Loss.
- Lighter weight considering lower overall diameter.
- Easy of handling & jointing.

### Construction :

 Brand Low Voltage XLPE Insulated Cables are manufactured conforming to IS : 7098 (Part-1) 1988 for 1.1 kv voltage range.

### Conductor :

The construction of the conductors shall be as follows :

Nominal Cross-Sectional Area		Solid/Stranded	Flexibility Class
Copper sq mm	Aluminium sq mm		
1.5	1.5	Solid	Class 1 (Table 1) of IS:8130
2.5 to 6	2.5 to 10	Solid/Stranded	Class 1/2 (Table 1/2) of IS:8130
10 & above	16 & above	Stranded	Class 2 (Table 2) of IS:8130

Conductors of nominal area less than 16 sqmm are circular only. Conductors of nominal area 16 sq. mm and above may be circular or sector shaped.

## Insulation :

The conductors are insulated with XLPE (Crosslinked Polyethylene) by extrusion process.

## Core Identification :

Cores are identified by coloured XLPE insulation. Following colour schemes are adopted :

1 Core	: Red, Black, Yellow or Blue
2 Cores	: Red and Black
3 Cores	: Red, Yellow and Blue
3½ Cores	: Red, Yellow, Blue and Reduced neutral core shall be black
4 Cores	: Red, yellow, Blue and Black
5 Cores	: Red, yellow, blue, black and grey
6 Cores and above	: (a) Two adjacent cores (counting and direction core) in each layer, blue and yellow, remaining cores grey. (b) As an alternate to colour coding single colour insulation with number printing can also be provided for easy core identification.

## Inner Sheath :

The cores of multicore cables are laid up and surrounded by PVC covering either by extrusion or by wrapping.

## Armour :

Armouring are of two types - galvanised round steel wire or galvanised steel strip.

## Outer Sheath :

This is provided by means of extruded Poly vinyl chloride (PVC) compound conforming to the requirements of Type ST-2 compound of IS :5831.

The following tests as specified in relevant specification are carried out before the cable is delivered to the customers :

## Type Test :

1. Test on conductor
2. Test for Armour wires / Strips
3. Test for thickness of Insulation and sheath
4. Physical Tests for insulation and PVC sheath.
5. Insulation resistance
6. High Voltage Test
7. Flammability Test

## Routine Test :

1. Conductor Resistance Test
2. High Voltage Test.

This Publication deals with Constructional and Electrical particulars in respect of LV XLPE Cables up to 1.1 K.V. range.

Please note that the figures quoted in this publication are approximate for general information and reference only.

## Constructions, Dimensions & Weights

<b>ELEKTRON 1.1 KV Single Core XLPE Insulated Unarmoured and Armoured Cable with Aluminium Conductor conforming to IS:7098 (Part 1) 1988.</b>													
Area Of Cond.	Unarmoured Construction				Round Wire Armoured Construction					Flat Strip Armoured Construction			
	Nominal Thickness Of Insln.	Nominal Thickness Of Ou.sh	Max. OD Of Cable	Max. Weight Of Cable	Nominal Thickness Of Insln.	Nominal Dia Of Arm.wire	Minimum Thickness Of Ou.sh	Max. OD Of Cable	Max. Weight Of Cable	Nominal Thickness Of Strip	Minimum Thickness Of Ou.sh	Max. OD Of Cable	Max. Weight Of Cable
sqmm	mm	mm	mm	kg/km	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km
10	0.7	1.8	9.5	90	1.0	1.4	1.24	13.5	180	-	-	-	-
16	0.7	1.8	10.5	110	1.0	1.4	1.24	14.5	210	-	-	-	-
25	0.9	1.8	12.0	150	1.2	1.4	1.24	16.0	260	-	-	-	-
35	0.9	1.8	13.5	180	1.2	1.4	1.24	17.5	310	-	-	-	-
50	1.0	1.8	14.5	230	1.3	1.4	1.24	18.5	360	-	-	-	-
70	1.1	1.8	16.5	300	1.4	1.4	1.24	20.6	450	-	-	-	-
95	1.1	1.8	18.0	380	1.4	1.6	1.40	23.0	590	0.8	1.40	21.5	520
120	1.2	1.8	19.5	460	1.5	1.6	1.40	24.5	680	0.8	1.40	23.0	610
150	1.4	2.0	22.5	580	1.7	1.6	1.40	26.5	810	0.8	1.40	25.0	730
185	1.6	2.0	24.0	700	1.9	1.6	1.40	28.5	940	0.8	1.40	26.5	850
240	1.7	2.0	26.5	880	2.0	1.6	1.40	31.0	1150	0.8	1.40	29.5	1050
300	1.8	2.0	29.5	1070	2.1	1.6	1.56	34.0	1400	0.8	1.56	32.5	1290
400	2.0	2.2	33.5	1370	2.4	2.0	1.56	39.0	1800	0.8	1.56	36.5	1600
500	2.2	2.2	36.5	1660	2.6	2.0	1.56	42.0	2130	0.8	1.56	39.5	1910
630	2.4	2.2	40.5	2100	2.8	2.0	1.72	46.5	2670	0.8	1.72	44.0	2420
800	2.6	2.4	46.0	2670	3.1	2.0	1.88	52.0	3320	0.8	1.88	50.0	3670
1000	2.8	2.6	50.5	3310	3.3	2.5	1.88	57.5	4170	0.8	1.88	54.0	4400

<b>ELEKTRON 1.1 KV Twin Core XLPE Insulated Unarmoured and Armoured Cables with Aluminium Conductor conforming to IS : 7098 (Part 1) 1988.</b>													
Nominal Area Of Cond.	Unarmoured Construction					Armoured Construction							
	A2XY					Single Layer - Wire (A2XWY)				Single Layer - Strip (A2XFY)			
	Nominal Thickness of Insulation	Minimum Thickness of Inner sheath	Nominal Thickness of outer sheath	Maximum Overall Diameter of Cable	Maximum Weight of Cable	Nominal Diameter of Armour Wire	Minimum Thickness of outer sheath	Maximum Overall Diameter of Cable	Maximum Weight of Cable	Nominal Thickness of Armour Strip	Minimum Thickness of outer sheath	Maximum Overall Diameter of Cable	Maximum Weight of Cable
sq.mm	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
6	0.7	0.3	1.8	14.5	330	1.4	1.24	16.0	550	-	-	-	-
10	0.7	0.3	1.8	17.0	350	1.4	1.24	18.0	650	-	-	-	-
16	0.7	0.3	1.8	17.0	310	1.4	1.40	18.5	700	-	-	-	-
25	0.9	0.3	2.0	19.0	400	1.6	1.40	21.0	850	0.8	1.40	20.0	650
35	0.9	0.3	2.0	20.0	480	1.6	1.40	23.0	950	0.8	1.40	21.0	750
50	1.0	0.3	2.0	22.0	590	1.6	1.40	25.0	1100	0.8	1.40	23.0	900
70	1.1	0.3	2.0	25.0	760	1.6	1.56	28.0	1400	0.8	1.56	26.0	1100
95	1.1	0.4	2.2	28.0	1000	2.0	1.56	31.0	1850	0.8	1.56	29.0	1300
120	1.2	0.4	2.2	31.0	1200	2.0	1.56	34.0	2150	0.8	1.56	31.0	1600
150	1.4	0.4	2.2	33.0	1400	2.0	1.72	37.0	2450	0.8	1.72	34.0	1900
185	1.6	0.5	2.4	37.0	1750	2.0	1.88	40.0	2900	0.8	1.72	37.0	2250
240	1.7	0.5	2.6	41.0	2000	2.5	2.04	45.0	3850	0.8	1.88	42.0	2800
300	1.8	0.6	2.8	44.0	2700	2.5	2.20	49.0	4450	0.8	2.04	45.0	3300
400	2.0	0.6	3.0	48.0	3350	2.5	2.36	52.0	5350	0.8	2.36	50.0	4100
500	2.2	0.7	3.4	54.0	4200	3.15	2.68	60.0	7100	0.8	2.52	55.0	5000
630	2.4	0.7	3.6	62.0	5300	3.15	2.84	66.0	8500	0.8	2.68	63.0	6100

**Note :** The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by  $\pm 3$  mm

## Constructions, Dimensions & Weights

<b>ELEKTRON 1.1 KV Three Core XLPE Insulated Unarmoured and Armoured Cable with Aluminium Conductor conforming to IS : 7098 (Part 1) 1988.</b>													
Area Of Cond.	Nominal Thickness Of Insln.	Minimum Thickness Of Inner Sheath	Unarmoured Construction			Round Wire Armoured Construction				Flat Strip Armoured Construction			
			Nominal Thickness Of Ou.sh	Maximum OD Of Cable	Maximum Weight Of Cable	Nominal Dia Of Arm.wire	Minimum Thickness of Ou.sh	Maximum OD Of Cable	Maximum Weight Of Cable	Nominal Thickness Of Strip.	Minimum Thickness of Ou.sh	Maximum OD Of Cable	Maximum Weight Of Cable
sqmm	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km	mm	mm	mm	kg/km
10	0.7	0.3	1.8	17.5	250	1.4	1.24	20.5	630	-	-	-	-
16	0.7	0.3	1.8	19.5	310	1.6	1.40	23.5	810	0.8	1.24	21.5	590
25	0.9	0.3	2.0	21.0	440	1.6	1.40	24.5	940	0.8	1.40	23.0	730
35	0.9	0.3	2.0	22.5	540	1.6	1.40	26.5	1090	0.8	1.40	25.0	870
50	1.0	0.3	2.0	25.5	680	1.6	1.56	29.5	1320	0.8	1.40	27.5	1050
70	1.1	0.4	2.2	29.5	920	2.0	1.56	34.0	1840	0.8	1.56	31.5	1360
95	1.1	0.4	2.2	33.0	1170	2.0	1.56	37.5	2180	0.8	1.56	35.0	1660
120	1.2	0.4	2.2	36.0	1430	2.0	1.72	41.0	2580	0.8	1.56	38.0	1970
150	1.4	0.5	2.4	40.0	1760	2.0	1.88	45.0	3030	0.8	1.72	42.5	2360
185	1.6	0.5	2.6	44.5	2180	2.5	2.04	50.5	3960	0.8	1.88	47.5	2850
240	1.7	0.6	2.8	50.5	2790	2.5	2.20	56.0	4790	0.8	2.04	52.5	3550
300	1.8	0.6	3.0	55.0	3420	2.5	2.36	61.0	5630	0.8	2.20	57.5	4250
400	2.0	0.7	3.2	62.0	4310	3.15	2.68	69.5	7510	0.8	2.52	64.5	5300
500	2.2	0.7	3.6	69.0	5370	3.15	2.84	76.0	8860	0.8	2.68	71.0	6410
630	2.4	0.7	3.8	77.0	6810	4.0	3.00	86.0	11760	0.8	2.84	79.5	7980

<b>ELEKTRON 1.1 KV Three &amp; Half Core XLPE Insulated Unarmoured and Armoured Cables with Aluminium Conductor conforming to IS : 7098 (Part 1) 1988.</b>														
Area Of Power Cond.	Area Of Neutral Cond.	Nominal Thickness Of Insln.	Minimum Thickness Of Inner Sheath	Unarmoured Constructions			Round Wire Armoured Construction				Flat Strip Armoured Construction			
				Nominal Thickness Of Ou.sh	Maximum OD Of Cable	Maximum Weight Of Cable	Nominal Dia Of Arm.wire	Minimum Thickness of Ou.sh	Maximum OD Of Cable	Maximum Weight Of Cable	Nominal Thickness Of Strip	Minimum Thickness of Ou.sh	Maximum OD Of Cable	Maximum Weight Of Cable
Sq mm	Sq mm	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
25	16	0.9	0.3	2.0	23.0	512	1.6	1.40	26.5	1060	0.8	1.40	24.0	830
35	16	0.9	0.3	2.0	24.5	613	1.6	1.40	28.0	1212	0.8	1.40	27.5	970
50	25	1.0	0.3	2.0	28.5	791	1.6	1.56	32.5	1490	0.8	1.40	30.5	1200
70	35	1.1	0.4	2.2	32.5	1060	2.0	1.56	37.5	2070	0.8	1.56	34.0	1540
95	50	1.1	0.4	2.2	36.5	1362	2.0	1.56	40.0	2471	0.8	1.56	38.5	1900
120	70	1.2	0.4	2.2	39.5	1682	2.0	1.72	44.5	2962	0.8	1.72	42.0	2312
150	70	1.4	0.5	2.4	44.5	2021	2.0	1.88	49.0	3420	0.8	1.72	46.0	2682
185	95	1.6	0.5	2.6	49.5	2512	2.5	2.04	55.5	4473	0.8	1.88	51.0	3260
240	120	1.7	0.6	2.8	55.0	3210	2.5	2.20	61.0	5420	0.8	2.04	57.5	4060
300	150	1.8	0.6	3.0	61.5	3942	2.5	2.36	67.5	6392	0.8	2.20	63.5	4860
400	185	2.0	0.7	3.4	68.0	5010	3.15	2.68	76.5	8500	0.8	2.52	71.0	6062
500	240	2.2	0.7	3.6	76.5	6210	3.15	2.84	83.0	10032	0.8	2.68	78.0	7370
630	300	2.4	0.7	4.0	86.5	7902	4.0	3.00	94.0	13332	0.8	3.00	88.0	9212

**Note :** The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by  $\pm 3$  mm

## Constructions, Dimensions & Weights

<b>ELEKTRON 1.1 KV Four Core XLPE Insulated Unarmoured and Armoured Cable with Aluminium Conductor conforming to IS:7098 (Part 1) 1988.</b>																
Area Of Cond.	Nominal Thickness Of Insulation	Minimum Thickness Of Innersheath	Unarmoured			Round Wire Armoured						Strip Armoured				
			Nominal Thickness Of Outer Sheath	Maximum Overall Dia Of Cable	Maximum Cable Weight	Nominal Dia Of Armour Wire	Minimum Thickness Of Outer Sheath	Maximum Overall Dia Of Cable		Maximum Cable Weight		Minimum Thickness Of Outer Sheath	Maximum Overall Dia Of Cable		Maximum Cable Weight	
								Taped Inner Sheath	Extruded Inner Sheath	Taped Inner Sheath	Extruded Inner Sheath		Taped Inner Sheath	Extruded Inner Sheath	Taped Inner Sheath	Extruded Inner Sheath
sq mm	mm	mm	mm	mm	kg/km	mm	mm	mm	mm	kg/km	kg/km	mm	mm	mm	kg/km	kg/km
25	0.9	0.3	2.00	23.00	620	1.60	1.40	26.00	27.50	1280	1380	1.40	24.50	25.50	985	1070
35	0.9	0.3	2.00	25.00	750	1.60	1.40	29.00	30.00	1500	1600	1.40	26.50	28.00	1175	1300
50	1.0	0.3	2.00	28.50	980	1.60	1.56	32.00	33.50	1850	1960	1.56	30.50	31.50	1500	1620
70	1.1	0.4	2.20	33.00	1350	2.00	1.56	37.00	38.50	2550	2700	1.56	35.00	36.50	1950	2060
95	1.1	0.4	2.20	37.00	1760	2.00	1.72	42.00	43.50	3150	3190	1.56	39.00	40.50	2400	2500
120	1.2	0.5	2.40	41.50	2150	2.00	1.72	45.50	47.00	3650	3840	1.72	43.00	44.50	2900	3010
150	1.4	0.5	2.40	45.50	2650	2.00	1.88	50.50	52.50	4750	4610	1.88	48.00	48.50	3500	3600
185	1.6	0.5	2.60	51.00	3280	2.50	2.04	57.00	58.50	5700	2980	2.04	53.00	55.00	4200	4400
240	1.7	0.6	3.00	58.00	4220	2.50	2.36	64.00	65.50	6980	7250	2.20	59.50	61.50	5200	5500
300	1.8	0.7	3.20	64.00	5180	2.50	2.52	70.50	72.50	8750	9100	2.36	65.50	67.50	6300	6550
400	2.0	0.7	3.40	72.00	6700	3.15	2.68	78.50	80.50	10750	11200	2.52	73.50	76.00	8060	8380

## Current Ratings

<b>Single and Multi Core 1.1 KV Cables with Aluminium Conductor</b>							
Area of Cond. Nom.	Max D.C. Resistance At 20°C	1.1 KV					
		Single Core				3, 3½ & 4 Core	
		In Ground		In Air		In Ground	In Air
		TT Amps	FT Amps	TT Amps	FT Amps	Amps	Amps
Sqmm	Ohm/Km						
6	4.61	48	51	45	47	43	39
10	3.08	54	62	53	56	57	53
16	1.91	76	80	73	77	73	70
25	1.200	100	105	105	110	95	100
35	0.868	115	120	130	135	110	125
50	0.641	140	145	160	170	130	150
70	0.443	165	170	190	205	160	180
95	0.320	205	215	235	255	190	220
120	0.253	225	230	275	290	215	250
150	0.206	255	260	315	335	245	290
185	0.164	285	295	360	385	275	330
240	0.125	330	340	435	460	320	390
300	0.100	375	385	505	535	360	455
400	0.0778	425	440	600	630	410	530
500	0.0605	485	500	695	735	-	-
630	0.0469	550	570	815	855	-	-
800	0.0367	625	640	970	1015	-	-
1000	0.0291	690	720	1100	1150	-	-

Note : The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

## Current Ratings

Single and Multi Core 1.1 KV Cables with Copper Conductor Current Ratings in AMPS						
Nom. Area sq. mm	Single Core				3, 3½ & 4 Core	
	In Ground		In Air		In Ground	In Air
	TT	FT	TT	FT		
6	57	60	51	74	55	51
10	76	80	71	75	73	70
16	97	102	95	102	97	90
25	124	128	133	143	119	125
35	148	153	163	175	142	154
50	175	179	176	210	170	185
70	213	219	247	264	205	231
95	254	262	360	325	245	282
120	288	297	383	376	278	325
150	324	333	408	433	312	373
185	364	375	464	494	350	423
240	420	434	553	588	405	501
300	474	489	643	681	453	574
400	537	554	753	795	508	660
500	602	623	865	912	-	-
630	675	698	1001	1052	-	-

T.T = Trefoil Touching

F.T = Flat Touching

### Continuous Current Ratings - Standard Conditions Of Installation

- Thermal Resistivity of XLPE Insulation : 350°cm/w
- Thermal Resistivity of PVC Sheath : 700°cm/w
- Thermal Resistivity of Soil : 150°cm/w
- Depth of Laying in-ground 1.1 kV Cables : 750 mm
- Ground temperature : 30° C.
- Ambient Air temperature : 40° C.
- Max. Cond. temperature under continuous operation : 90° C.
- Max. Cond. temperature under short circuit condition : 250° C.

### Method Of Installation :

1. Multicore Cables installed singly
2. Single core Cables
  - i) In Trefoil Touching
  - ii) 3 Cables laid Flat Touching.

## RATING FACTORS

Rating Factors For Variation In Ambient Temperature									
Temp	15	20	25	30	35	40	45	50	55
Ground	1.12	1.09	1.04	1.00	0.97	0.92	0.86	0.83	-
Air	-	1.20	1.16	1.12	1.05	1.00	0.96	0.89	0.82

Rating Factors For Variation In Thermal Resistivity of Soil						
Voltage Rating of Cables	Thermal Resistivity of Soil C cm/w					
	100	120	150	200	250	300
1.1 KV	1.18	1.08	1.00	0.88	0.81	0.74

## Short Circuit Ratings

Permissible Maximum Short-Circuit Current Ratings		
Conductor Area Sq. mm	Short-Circuit Rating for One Second Duration	
	Copper Conductors Amp	Aluminium Conductors Amp
16	2280	1510
25	3570	2360
35	5000	3300
50	7150	4720
70	10000	6600
95	13580	8960
120	17160	11320
150	21450	14160
185	26450	17460
240	34320	22650
300	42900	28320
400	57200	37760
500	71500	47200
630	90000	59470
800	-	75520
1000	-	94400

Initial / Final Temperature 90°C/250°C

For durations other than one second, the short circuit current may be calculated from the following formula

$$I_{sc} = \sqrt{\frac{I^2 t}{t}}$$

where  $I_{sc}$  = Short-circuit current during time t, amperes.

$I$  = Short-circuit current during time one second, as given in above table.

$t$  = short-circuit current duration, seconds.

Note : For large currents, the force between the conductors must be considered especially when single core cables are used.

Rating Factors For Depth Of Laying (for Cables Laid Direct In Ground)	
Depth of Laying (mm)	1.1 kV Cables
500 - 750	1.00
750 - 900	0.98
900 - 1050	0.96
1050 - 1200	0.94
1200 - 1500	0.92
1500 - 1800	0.90

Group Rating Factors For Multicore Cables Or Group of Single Core Cables In Horizontal Formation Laid Direct In Ground					
Number of cables or groups of single core cables in same trench	2	3	4	5	6
Spacing between cables or groups					
Touching	0.80	0.69	0.63	0.58	0.56
70 mm	0.85	0.75	0.68	0.64	0.60
250 mm	0.88	0.80	0.75	0.72	0.70

### Recommended spacing

(i) For multicore cables equal to cable diameter.

(ii) For single core cables in trefoil equal to twice the diameter of cable between groups.

Note : For other conditions of installation and in cases where spacing is not maintained group rating factor can be calculated separately for each particular installation.

<b>Group Rating Factors For Multicore Cables Or Groups Of Single Core Cables In Air on Ladder Supports, Metal Trays, Walls Etc. With Maintained Spacing Between Cables Or Groups</b>						
Number of cables or groups of single core cables	Horizontally					
	1	2	3	4	5	6
Vertically						
1	1.00	0.93	0.87	0.84	0.83	0.82
2	0.89	0.83	0.79	0.76	0.75	0.74
3	0.80	0.76	0.72	0.70	0.69	0.68
4	0.77	0.72	0.68	0.67	0.66	0.65

### Some Important Points For Cable Installations

The following are the important points to be taken care of during cable installations, at site :

**1. General :** The cable should be paid off from the top of the Cable drum, held in the normal position. Sufficient care should be taken to prevent twists, acute bends etc, while laying the Cable.

### 2. Minimum Bending Radius :

	Single Core	Multi Core
- Cables of 1100 V Grade :	15 D	12 D

Where D is the overall dia of the Cable.

### 3. Maximum Pulling Tension during Installation :

- - Cables having Aluminium Conductor : 30 N/Sq. mm. Max.
- - Cables having Copper Conductor : 50 N/Sq. mm. Max.

**4. Cable support Spacing :** The disposition of cable support and its spacing should be such, as to prevent undue strain or damage of the cable.

**5. Prevention of Moisture Ingress :** Care should be exercised at site during installation to prevent damage to cable coverings and ends which may cause the ingress of moisture.

**6. Tests after Installations :** Voltage withstand and Insulation Resistance Tests should be conducted on cables after laying or after jointing and terminations. The test method, voltage and duration should be as stipulated in IS:1255-1983, for various voltage grades of the cables.

# PVC Insulated Cables

## Outstanding Properties

- High Resistance to ageing and abrasion.
- High Mechanical strength.
- Moisture-proof, corrosion-proof, weather-proof.
- Resistant to effect of the majority of acids and alkalis.
- Resistant to occasional temporary contact with oils and liquid fluids.
- Flame-retarding-does not support combustion and is self-extinguishing when the source of ignition is removed.

## Installation

- Easy to instal.
- Neat appearance.
- Light weight.
- Good bending properties.
- Smooth Surface.
- Easy Stripping of conductor ends.
- Elimination of indoor cable boxes (three phase conductors can be directly connected to distribution boards / motor terminal boxes).
- High resistance to D.C. voltage effects.
- Suitable at steep gradient.

During the process of change over to cables with plastic insulation and sheathing, tremendous amount of development work had been done with the result that PVC Insulated Power and Control Cables have been firmly established not only for industrial and other applications but also for power transmission.

## Construction

 Brand PVC Power and Control Cables are manufactured confirming to IS : 1554 and details are given ahead.

## Conductor

The construction of the conductors shall be as follows :

Nominal Cross-Sectional Area	Solid/Stranded	Flexibility Class
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Copper mm<sup>2</sup></p> <p>1.5</p> <p>2.5 to 6</p> <p>10 and above</p> </div> <div style="text-align: center;"> <p>Aluminium mm<sup>2</sup></p> <p>-</p> <p>2.5 to 10</p> <p>16 and above</p> </div> </div>	<p>Solid</p> <p>Solid / Stranded</p> <p>Stranded</p>	<p>Class 1 of IS : 8130*</p> <p>Class 1/Class 2 of IS : 8130*</p> <p>Class 2 of IS : 8130*</p>

\*Specification for conductors for insulated electric cables and flexible cords.

Conductors of nominal area less than 16 mm<sup>2</sup> shall be circular only. Conductors of nominal area 16 mm<sup>2</sup> and above may be circular or shaped. Cables with reduced neutral conductor shall comply with the main power conductor combination given in the following Table.

Nominal Cross Sectional Area of Main power Conductor (mm <sup>2</sup> )	Cross-Sectional Area of Reduced Neutral Conductor (mm <sup>2</sup> )
25	16
35	16
50	25
70	35
95	50
120	70
150	70
185	95
240	120
300	150
400	185
500	240
630	300

## Insulation

The conductors are insulated with PVC compound by extrusion process.

## Core Identification

Cores shall be identified by different colouring of PVC insulation. Following colour scheme shall be adopted :

- 1 Core : Red, black, yellow or blue
- 2 Core : Red and black
- 3 Core : Red, yellow and blue
- 3½ Core : Red, Yellow, Blue and Reduced Neutral core shall be black
- 4 Core : Red, yellow, blue and black
- 5 Core : Red, yellow, blue, black and grey
- 6 Core and above : (a) Two adjacent cores (counting and direction core) in each layer, blue and yellow, remaining cores grey.  
(b) As an alternate to colour coding single colour insulation with number printing can also be provided for easy core identification.

# PVC Insulated Cables

## Inner Sheath

The cores of multicore cables are laid up and surrounded by PVC covering either by PVC extrusion or by wrapping.

### Armouring

**Application** - Armouring shall be applied over the insulation in case of single core cables and over the inner sheath in case of twin-three and multi-core cables.

The armour wires/strips shall be applied as closely as practicable.

The direction of lay of the armour shall be left hand. For double wire/strip armoured cables, this requirement shall apply to inner layer of wires/strips. The outer layer shall, except in special cases, be applied in the reverse direction to the inner layer and there shall be a separator or suitable non-hygroscopic material, such as plastic tape, bituminized cotton tape, bituminized hessian tape, rubber tape, proofed tape, etc. between the layers of armour wires/strips.

**Type of armour** - Where the calculated diameter below armouring does not exceed 13 mm the armour shall consist of galvanised round steel wires. Where the calculated diameter below armouring is greater than 13 mm, the armour shall consist of either galvanized round steel wires or galvanized steel strips. Single Core Cable are generally armoured with wires of non-magnetic materials.

**Dimensions** - The dimensions of galvanized steel wires and strips shall be as specified in the tables.'

## Outer Sheath

This is provided by means of an extruded PVC over the armour for armoured cables; over inner sheath for unarmoured cables. Unarmoured multicore cables shall have mono sheath (single extrusion covering inner & outer sheath). and over the Insulation for single core unarmoured cable.

PVC usually used to manufacture the type of cables are of general purpose PVC, suitable to operate at a maximum conductor temperature of 70°C.

## HR PVC Cables

**Paragon Cable India** also manufactures PVC Power cables using heat resisting PVC compound.(Type C/ST2 of IS : 5831). HR PVC cable can be operated at a maximum conductor temperature of 85°C and are also suitable for intermittent use at temperature upto 105°C.

## FRLS Cables

**Paragon Cable India** has successfully developed, tested and manufactured new generation FRLS (Flame Retardant Low Smoke) Cables. These cables with special PVC formulation for sheathing material prevents the propagation of flame along the length of the cable when exposed to fire. In addition these cables emit very low-smoke and halogen emission is also reduced under fire conditions. These properties help immensely in fire fighting operations and prevention of further loss to costly equipment to which the cables are connected.

Function of the test	Test	Specified values	Specification
To determine percentage of oxygen required for supporting combustion at room temperature of sheathing material.	Critical oxygen Index	Oxygen Index minimum 29%.	ASTM-D 2863
To determine of what temperature normal oxygen content of 21% in air will support combustion of sheathing material.	Temperature index	The minimum temperature index 250°C	ASTM-D 2863 & BICC Hand Book Chapter No.6
To determine the visibility (light transmission) under fire of sheathing material	Smoke Density	The minimum overage light transmission of 40%	ASTM-D 2843
To ascertain the amount of Hydrochloric acid gas evolved from PVC sheath of cable under fire conditions	Acid Gas Generation	Hydrochloric acid gas released 20% maximum	IEC 754-1
To determine flame propagation of cables in installed conditions	Flammability test on group of cables	In total 20 minutes of burning the cables with flame temperature of 1500 °F of 8 feet length samples the burning of cables does not go up to the top.	IEEE-383
1) To determine ignition resistance and flame propagation under specified conditions 2) To determine ignition resistance and flame propagation under specified conditions 3) To determine ignition resistance and flame propagation, especially for bunch of cables, under specified conditions	Flammability test	From test sample of 850 mm length, the unburnt portion shall be more than 300 mm from the top.  In calculated time duration of burning the cable sample of 600 mm ± 25 mm length, the length of unburnt portion to be minimum 50 mm from the top.  From the test samples of 3.5 m lengths affected portion during burning, shall not reach 2.5 m or above from bottom edge of the burner.	1) Swedish Standard No. SS 424-14-75 Class F3 2) IEC 332-1  3) IEC 332-3
To determine fire resistance property of cable	Fire Resistance test	In the time duration of 60 seconds of burning of cable sample of 600 mm length of the burnt portion to be maximum 200 mm.	IS 5831

## Constructional Details, Dimensions And Weight Of 'FRLS' Cables :

The details furnished in the relevant tables and Annexures, will remain the same of 'FRLS' Cables, both PVC insulated & HR-PVC insulated. The FRLS cables will fully confirm to IS : 1554 (Part-I) - 1988, as applicable.

# PVC Insulated Cables

## Electrical Characteristics, Rating And Installation Data Of 'FRLS' Cables :


There will be no change in the relevant parameters furnished in the various Tables and Annexures, on account of the additional 'FRLS' properties in the PVC sheath of the cables. The cables will fully conform to the Electrical test requirements of IS : 1554 (Part-I) - 1988.

### Cable Marking

The 'FRLS' Cables will bear an additional legend 'FRLS' on the sheath, which will be in addition to the relevant Cable-identification and Manufacturer's identification, stipulated in IS : 1554 (Part-I) - 1988 and will be marked similarly.

### Cables To Other Specification

In order to meet various requirements cables with special features other than mentioned above are required by important customers like Steel Plants, Power Plants, Heavy Engineering, Nuclear Power Corporation etc. for their specific uses and applications.

 brand power and control cables are also manufactured and supplied conforming to customer's specification and International Specifications.

### Quality Control

In  the quality of the products is checked by inspecting the products at different points of production. Some of the checking points are indicated below :

<b>Process</b>	<b>To Check</b>
Rod Rolling Stage	: Tensile strength & elongation, Diameter
Wire Drawing	: Diameter and surface of Single Wire. Tensile Strength and wrapping test on Aluminium Wires
	: Elongation on annealed Copper wires. (in case of copper wires)
	: Resistance of the Wire.
Stranding	: Dimension of the Conductor. Lay ratio Surface of the Conductor. Electric Resistance of the Conductor.
PVC Extrusion (Insulation)	: Insulation thickness. Eccentricity of the insulated wall. Spark testing.
Laying up	: Sequence of Cores. Circularity of Cable. Laid-up Diameter. Direction of Lay.
Inner Sheathing	: Thickness. Diameter over Sheath.
Armouring	: Number and size of armour wire//strip. Lay/Direction of lay. Uniformity and circularity of Cable Diameter over armouring.
PVC Extrusion (Outer Sheathing)	: Sheath Thickness Concentricity and overall diameter of the cable and finished surface. Embossing

All the cable drums leaving PCI Works undergo the following tests at the final stages of manufacture.

## Routine Test

- i) Conductor Resistance test.
- ii) High Voltage Test.

## Type Tests

- i) Annealing test (Copper).
- ii) Tensile test (Aluminium)
- iii) Wrapping test (Aluminium).
- iv) Conductor Resistance test.
- v) Test for armour wires/Strips
- vi) Test for thickness of insulation and sheath.
- vii) Physical tests for insulation and sheath.
- viii) Fire resistance test.
- ix) Insulation resistance test.
- x) High voltage test (Water Immersion test).
- xi) Cold bend and cold impact test (optional).

## Acceptance Tests

Tests carried out by buyer on samples taken from a lot for the purpose of acceptance of the lot :

- i) Annealing test (for copper).
- ii) Tensile test (for aluminium).
- iii) Wrapping test (for aluminium).
- iv) Conductor resistance test.
- v) Test for Thickness of insulation and sheath.
- vi) Insulation resistance test.
- vii) High voltage test.
- viii) Tensile strength and elongation at break of insulation and sheath.

## General Criteria For Selection Of Cables For Power Installations

It is quite imperative that detailed Cable-planning needs to be made taking full consideration of various operating factors, system parameters, earthing, environmental conditions, present and future load patterns and capacities etc. determining the most suitable and economic cable-sizes, in any power installation. Following are some of the parameters which should be examined before the selection is made. These should form part of any enquiry for cable-procurement :

- 1. System voltage & frequency**
  - Nominal voltage of the network  $U_0$
  - Maximum operating voltage  $U_m$
  - Frequency
  - Type of current (3 Ph, 1 Ph, D.C. etc.)
  - Voltage & frequency variations (Percent)
  - Rated impulse withstand capacity.
  - Allowable voltage drop.
  
- 2. Earthing**
  - Solid (Neutral) earthing.
  - Resistance earthing (or Impedence)
  - Earthed via Arc-Suspension Coils of similar
  - Insulated Neutral.
  
- 3. Operating Conditions**
  - Type of Installation-in Ground, in Air, in Ducts, Channels, Tunnels etc.
  - Normal Ambient temperature, Max. & Min. operating temperature
  - Soil - Thermal Resistivity
  - External heat-input, if any
  - Cable run - No. of cables, grouping, bends routing etc.
  
- 4. Short-Circuit Conditions**
  - Symmetrical Short-Circuit Current duration and capacity.
  - Peak short circuit duration and capacity.
  - Phase to Earth fault requirements.
  
- 5. Load Capacity**
  - Normal duty cycle
  - Short-temperature overload & duration, if any
  - Cycle ratings, if any
  - Anticipated future capacities & additional arrangements, if any
  
- 6. Environmental Conditions**
  - Normal Temperature & Humidity, Wet or Dry location etc.
  - Altitude
  - Special conditions like chemicals, oil, vibrations/bumps, harmful organisms etc.
  
- 7. other special conditions,  
(if any)**

## Installation Of PVC Power Cable

1. Installation radius should be as large as possible. The following minimum installation radius are recommended in IS : 1255.

Voltage rating	Single Core	Multi-Core
Upto 1.1 kV	15 D	12 D

'D' is outer diameter of cable

When planning trenches or ducts, a bending radius of 2.8m should be considered a minimum for high voltage cable : for cable upto 1.1 kV a minimum of 2 m if desirable, where possible.

2. Cable should be taken from the top of the drum, with a supporting ramp is necessary, the drum being braked to avoid over running.
3. Cables should be warmed in cold weather before handling. They should be installed when both cable and ambient temperatures are above 0°C and have not fallen to that figure during the previous 24 hours.
4. Moisture tests should be made on jointing materials before jointing.
5. Cable drums, required to be shifted at site, should generally be drawn by means of cable wheels. In case cable drums are rolled, it should be done in the direction as shown by the arrow mark inscribed on the flange of the cable drum.
6. Insulation resistance test on the cable should be made before and after jointing and figures should be recorded.

## Maximum Permissible Tensile Strength For Cables For Cables Pulled With Stocking

PVC Insulated armoured power cables       $P=9 D^2$

PVC Insulated unarmoured power cables       $P=5 D^2$

where

P= pulling forces in Newtons, and

D= outer diameter of cables in mm

**For Cables Pulled by Puling Eye** - If the cables are pulled by gripping the conductor directly with pulling eye, the maximum permissible tensile strees depends on the material of the conductor and their cross-section as given below :

For aluminimum conductors      30N/mm<sup>2</sup>

For copper conductors      50N/mm<sup>2</sup>


The cable pulling eyes should seal off the Cable ends so that they are watertight. They are specially made for each type of cable.

## Conductor Data

### Stranded Conductors For Single Core And Multicore Cables, Class - 2 Conforming To IS : 8130

Nominal Cross Sectional area sq.mm	Minimum no. wires in the conductor				Maximum Resistance of Conductor at 20°C		
	Circular Conductor (Non Compacted)		Circular Compacted or Shaped Conductor		Copper Conductor		Aluminium Conductor ohm/km
	Cu	AL	Cu	Al	Plain Wires ohm/km	Tinned Wires ohm/km	
1	3	-	-	-	18.1	18.2	-
1.5	3	3	-	-	12.1	12.2	18.1
2.5	3	3	-	-	7.41	7.56	12.1
4	7	3	-	-	4.61	4.70	7.41
6	7	3	-	-	3.08	3.11	4.61
10	7	7	6	-	1.83	1.84	3.08
16	7	7	6	6	1.15	1.16	1.91
25	7	7	6	6	0.727	0.734	1.20
35	7	7	6	6	0.524	0.529	0.868
50	19	19	6	6	0.387	0.391	0.641
70	19	19	12	12	0.268	0.270	0.443
95	19	19	15	15	0.193	0.195	0.320
120	37	37	18	15	0.153	0.154	0.253
150	37	37	18	15	0.124	0.126	0.206
185	37	37	30	30	0.0991	0.100	0.164
240	61	37	34	30	0.0754	0.0762	0.125
300	61	61	34	30	0.0601	0.0607	0.100
400	61	61	53	53	0.0470	0.0475	0.0778
500	61	61	53	53	0.0366	0.0369	0.0605
630	91	91	53	53	0.0283	0.0286	0.0469
800	91	91	53	53	0.0221	0.0224	0.0367
1000	91	91	53	53	0.0176	0.0177	0.0291

## Reactance

 <b>Single/Three Core PVC Cables To IS : 1554 (Parts 1&amp;2)</b> Approximate reactance of 50Hz in ohm per km											
Nominal Cross Sectional area sq.mm	Single Core						Three Core				
	1100V		3300V		3.8/6.6kV		6.35/11kV		1100V	3300V	3.8/6.6kV
	Unarm	Arm	Unarm	Arm	Unarm	Arm	Unarm	Arm			
1.5	0.167	-	-	-	-	-	-	-	0.109	-	-
2.5	0.156	-	-	-	-	-	-	-	0.105	-	-
4	0.147	-	-	-	-	-	-	-	0.101	-	-
6	0.137	-	-	-	-	-	-	-	0.0949	-	-
10	0.126	-	-	-	-	-	-	-	0.0890	-	-
16	0.116	0.130	-	-	-	-	-	-	0.0858	-	-
25	0.111	0.122	0.120	0.129	0.129	0.140	0.146	0.153	0.0842	0.0992	0.113
35	0.105	0.166	0.113	0.122	0.122	0.133	0.138	0.145	0.0824	0.0950	0.107
50	0.0984	0.108	0.105	0.116	0.115	0.124	0.128	0.135	0.0794	0.0887	0.100
70	0.0934	0.105	0.100	0.110	0.109	0.117	0.120	0.128	0.0764	0.0850	0.0950
95	0.0914	0.100	0.0959	0.104	0.103	0.111	0.114	0.121	0.0761	0.0820	0.0910
120	0.0878	0.0962	0.0920	0.100	0.0991	0.106	0.110	0.116	0.0738	0.0791	0.0874
150	0.0866	0.0945	0.0895	0.0970	0.0963	0.104	0.108	0.115	0.0738	0.0775	0.0852
185	0.0852	0.0924	0.0868	0.0948	0.0932	0.100	0.104	0.110	0.0738	0.0760	0.0830
240	0.0834	0.0908	0.0840	0.0912	0.0906	0.0978	0.0996	0.106	0.0732	0.0742	0.0806
300	0.0830	0.0902	0.0834	0.0906	0.0878	0.0945	0.0959	0.102	0.0729	0.0738	0.0787
400	0.0815	0.0879	0.0818	0.0891	0.0852	0.0919	0.0933	0.0991	0.0725	0.0733	0.0769
500	0.0808	0.0874	0.0808	0.0874	0.0835	0.0892	0.0924	0.0988	0.0727	0.0731	0.0753
630	0.0804	0.0863	0.0805	0.0863	0.0811	0.0868	0.0898	0.0956	0.0725	0.0729	0.0735
800	0.0788	0.0852	0.0787	0.0852	0.0793	0.0856	-	-	-	-	-
1000	0.0774	0.0834	0.0774	0.0833	0.0780	0.0833	-	-	-	-	-

## Capacitance

<b>ELEKTRON PVC Armoured/Unarmoured Cable To IS : 1554 (Parts 1&amp;2)</b>								
Nominal area of Conductor in sq. mm.	Approx-Capacitance in microfarads/km							
	1100Volts		3300Volts		3.8/6.6kV		6.35/11kV	
	Single Core	Multi Core	Single Core	Multi Core	Single Core	Multi Core	Single Core	Multi Core
1.5	-	-	-	-	-	-	-	-
2.5	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-
25	1.0	1.19	0.71	0.58	0.51	0.43	0.48	0.41
35	1.18	1.36	0.77	0.62	0.55	0.46	0.51	0.44
50	1.35	1.38	0.88	0.80	0.62	0.59	0.58	0.55
70	1.70	1.61	1.13	0.94	0.78	0.68	0.72	0.63
95	1.73	1.65	1.23	1.03	0.85	0.74	0.78	0.68
120	1.75	1.81	1.40	1.16	0.69	0.82	0.87	0.75
150	1.80	1.80	1.51	1.23	1.02	0.87	0.93	0.79
185	1.85	1.80	1.66	1.35	1.13	0.95	1.00	0.86
225	1.90	1.82	1.84	1.48	1.24	1.04	1.11	0.94
240	2.00	1.88	1.93	1.55	1.32	1.10	1.18	0.98
300	2.00	1.92	1.95	1.58	1.40	1.12	1.25	1.04
400	2.13	1.93	2.13	1.64	1.64	1.34	1.46	1.20
500	2.20	1.95	2.18	1.66	1.76	1.43	1.56	1.29
630	2.30	1.96	2.27	1.66	1.97	1.59	1.62	1.42
800	2.30	-	2.29	-	2.18	-	1.92	-
1000	2.50	-	2.55	-	2.42	-	1.96	-


### Multiplier Constants For Determining The Insulation Resistance Values At 27°C For Cables (Insulated With Type A or B Compounds)

Temp °C	Temp correction factor	Temp °C	Temp correction factor	Temp °C	Temp correction factor	Temp °C	Temp correction factor
0	0.013	18	0.236	36	4.24	54	76.12
1	0.015	19	0.277	37	4.98	55	89.37
2	0.018	20	0.325	38	5.84	56	104.92
3	0.021	21	0.382	39	6.86	57	123.18
4	0.025	22	0.448	40	8.05	58	144.62
5	0.029	23	0.527	41	9.45	59	169.80
6	0.034	24	0.618	42	11.10	60	199.35
7	0.040	25	0.725	43	13.03	61	234.04
8	0.047	26	0.852	44	15.30	62	270.78
9	0.056	27	1.00	45	17.96	63	322.60
10	0.065	28	1.17	46	21.09	64	378.75
11	0.077	29	1.38	47	24.76	65	444.67
12	0.090	30	1.62	48	29.07	66	522.06
13	0.106	31	1.90	49	34.12	67	612.93
14	0.124	32	2.23	50	40.06	68	719.60
15	0.146	33	2.62	51	47.04	69	844.85
16	0.171	34	3.07	52	55.22	70	1000.00
17	0.201	35	3.61	53	64.84	-	-

## Insulation Resistance

Multiplier constants for determining the insulation resistance At 27°C for HR PVC cables (Insulated with type C compounds)							
Temp °C	Temp correction factor	Temp °C	Temp correction factor	Temp °C	Temp correction factor	Temp °C	Temp correction factor
0	0.040	22	0.552	44	7.56	66	103.48
1	0.045	23	0.621	45	8.51	67	116.55
2	0.051	24	0.700	46	9.58	68	131.28
3	0.057	25	0.788	47	10.80	69	147.86
4	0.065	26	0.888	48	12.16	70	166.54
5	0.073	27	1.00	49	13.70	71	187.58
6	0.082	28	1.13	50	15.43	72	211.27
7	0.093	29	1.27	51	17.37	73	237.96
8	0.104	30	1.43	52	19.57	74	268.03
9	0.117	31	1.61	53	22.04	75	301.88
10	0.132	32	1.81	54	24.83	76	340.01
11	0.159	33	2.04	55	27.96	77	382.96
12	0.168	34	2.30	56	31.49	78	431.34
13	0.189	35	2.59	57	35.47	79	485.83
14	0.213	36	2.92	58	39.95	80	547.20
15	0.240	37	3.28	59	45.00	81	616.33
16	0.270	38	3.70	60	50.64	82	694.18
17	0.304	39	4.17	61	57.09	83	781.88
18	0.343	40	4.69	62	64.30	84	880.65
19	0.386	41	5.29	63	72.42	85	1000.00
20	0.435	42	5.96	64	81.57	-	-
21	0.490	43	6.71	65	91.88	-	-

## Insulation Resistance

 PVC/HRPVC Cables To IS : 1554 (Parts 1&2)						
Nominal area of Conductor sq. mm.	Minimum Insulation Resistance in Megohms/KM at 27°C					
	1100V		1.9/33 or 3.3/3.3kV		3.6/6.6kV	
	S.C. Unarm & Multi Core	S. Core Arm	S.C. Unarm & Multi Core	S. Core Arm	S.C. Unarm & Multi Core	S. Core Arm
1.5	12.3	-	-	-	-	-
2.5	11.2	-	-	-	-	-
4	10.2	-	-	-	-	-
6	8.7	-	-	-	-	-
10	7.1	-	-	-	-	-
16	5.5	6.8	-	-	-	-
25	5.3	6.4	89.5	98.2	124.2	131.0
35	4.7	5.6	79.5	87.5	112.0	118.0
50	4.7	5.5	70.3	77.5	100.0	105.0
70	4.0	4.8	61.5	68.0	88.0	93.0
95	4.0	4.5	52.8	58.5	76.4	81.0
120	3.5	4.0	47.6	52.8	70.0	74.0
150	3.5	4.0	45.7	48.2	64.0	68.0
185	3.5	4.0	39.6	44.0	58.0	62.2
240	3.5	3.8	35.0	39.0	52.0	56.6
300	3.3	3.8	34.0	39.0	47.0	51.5
400	3.2	3.6	32.5	36.8	42.0	46.0
500	3.2	3.5	31.0	35.0	36.5	41.0
630	3.2	3.5	31.0	35.0	33.0	37.0
800	2.8	3.2	28.0	32.0	30.0	33.5
1000	2.5	2.9	25.0	28.8	26.0	30.0

**Note :** Figures have been calculated on the basis of the following volume Resistivity values specified in IS 5831

1. Type 'A' PVC Insulation	At 27°C	At the max. rate temp. of conductor
2. Type 'B' PVC Insulation	1x10 <sup>13</sup> Ohm-cm	70°C-1x10 <sup>10</sup> Ohm-cm
3. Type 'C' PVC Insulation	1x10 <sup>14</sup> Ohm-cm	70°C-1x10 <sup>11</sup> Ohm-cm
	1x10 <sup>13</sup> Ohm-cm	85°C-1x10 <sup>10</sup> Ohm-cm

## Dimensions And Weights

<b>ELEKTRON 1.1 KV Control Cables 1.5 sq.mm PVC Insulated Unarmoured and Armoured cable with Copper (Solid) conductor conforming to IS: 1554 (Part 1) 1988.</b>																			
No. of Cores	Conductor No. / Nom. Dia.	Thickness of Insulation	Unarmoured Construction			Round Wire Armoured Construction						Flat Strip Armoured Construction							
			Total Thickness of Sheath †	Overall Dia-meter	Net Weight	Thickness of Inner Sheath	Dia. of Armour wire	Thickness of Outer Sheath	Cables with Taped Inner Sheath		Cables with Ext. Inner Sheath		Thickness of Inner Sheath	Thickness of Flat Strip	Thickness of Outer Sheath	Cables with Taped Inner Sheath		Cables with Ext. Inner Sheath	
									Overall Dia-meter	Net Weight	Overall Dia-meter	Net Weight				Overall Dia-meter	Net Weight	Overall Dia-meter	Net Weight
No.	No./mm	Nom mm	Nom mm	Max. mm	Max. kg/km	Min mm	Non mm	Min mm	Max. mm	Max. kg/km	Max. mm	Max. kg/km	Min mm	Non mm	Min mm	Max. mm	Max. kg/km	Max. mm	Max. kg/km
2	1/1.38	0.8	2.1	11.0	157	0.3	1.4	1.24	13.3	353	14.2	445	-	-	-	-	-	-	-
3	"	0.8	2.1	11.5	180	0.3	1.4	1.24	13.8	393	14.6	481	-	-	-	-	-	-	-
4	"	0.8	2.1	12.4	212	0.3	1.4	1.24	14.6	450	15.5	540	-	-	-	-	-	-	-
5	"	0.8	2.1	13.3	240	0.3	1.4	1.24	15.5	507	16.4	586	-	-	-	-	-	-	-
6	"	0.8	2.1	14.2	280	0.3	1.4	1.24	16.5	576	17.4	639	-	-	-	-	-	-	-
7	"	0.8	2.1	14.2	293	0.3	1.4	1.24	16.5	588	17.4	651	-	-	-	-	-	-	-
9	"	0.8	2.1	16.8	365	0.3	1.4	1.24	19.1	746	20.0	829	-	-	-	-	-	-	-
10	"	0.8	2.1	17.4	398	0.3	1.4	1.4	20.0	782	21.0	867	-	-	-	-	-	-	-
12	"	0.8	2.1	17.9	450	0.3	1.6	1.4	21.0	899	21.9	997	0.3	0.8	1.24	19.0	675	19.9	749
14	"	0.8	2.1	18.7	495	0.3	1.6	1.4	21.8	984	22.7	1067	0.3	0.8	1.4	20.2	770	21.1	847
17	"	0.8	2.1	19.7	525	0.3	1.6	1.4	22.7	1078	23.6	1165	0.3	0.8	1.4	21.1	832	22.0	912
18	"	0.8	2.3	21.1	560	0.3	1.6	1.4	23.7	1162	24.6	1267	0.3	0.8	1.4	22.1	925	23.0	1008
19	"	0.8	2.3	21.1	590	0.3	1.6	1.4	23.7	1174	24.6	1279	0.3	0.8	1.4	22.1	937	23.0	1020
24	"	0.8	2.3	24.3	740	0.3	1.6	1.4	26.9	1421	28.2	1518	0.3	0.8	1.4	25.3	1139	26.6	1229
27	"	0.8	2.3	24.7	800	0.3	1.6	1.4	27.4	1514	28.7	1612	0.3	0.8	1.4	25.8	1215	27.1	1306
30	"	0.8	2.3	25.6	870	0.3	1.6	1.4	28.2	1607	29.5	1725	0.3	0.8	1.4	26.6	1318	27.9	1412
37	"	0.8	2.3	27.5	1040	0.3	1.6	1.4	30.1	1857	31.8	1961	0.3	0.8	1.4	28.5	1528	30.2	1625
52	"	0.8	2.6	32.6	1450	0.4	2.0	1.56	36.0	2668	37.5	2814	0.4	0.8	1.56	33.6	2062	35.1	2207
61	"	0.8	2.6	34.5	1680	0.4	2.0	1.56	37.9	2980	39.4	3130	0.4	0.8	1.56	35.5	2347	37.0	2473

† Unisheath thickness

## Dimensions And Weights

<b>ELEKTRON 1.1 KV Control Cables 1.5 sq.mm PVC Insulated Unarmoured and Armoured cable with Copper (Stranded) conductor conforming to IS: 1554 (Part 1) 1988.</b>																			
No. of Cores	Conductor No. / Nom. Dia.	Thickness of Insulation	Unarmoured Construction			Round Wire Armoured Construction						Flat Strip Armoured Construction							
			Total Thickness of Sheath †	Overall Dia-meter	Net Weight	Thickness of Inner Sheath	Dia. of Armour wire	Thickness of Outer Sheath	Cables with Taped Inner Sheath		Cables with Ext. Inner Sheath		Thickness of Inner Sheath	Thickness of Flat Strip	Thickness of Outer Sheath	Cables with Taped Inner Sheath		Cables with Ext. Inner Sheath	
									Overall Dia-meter	Net Weight	Overall Dia-meter	Net Weight				Overall Dia-meter	Net Weight	Overall Dia-meter	Net Weight
No.	No./mm	Nom mm	Nom mm	Max. mm	Max. kg/km	Min mm	Non mm	Min mm	Max. mm	Max. kg/km	Max. mm	Max. kg/mm	Min mm	Non mm	Min mm	Max. mm	Max. kg/km	Max. mm	Max. kg/km
2	7/0.53	0.8	2.1	11.4	166	0.3	1.4	1.24	13.7	371	14.6	466	-	-	-	-	-	-	-
3	"	0.8	2.1	12.0	192	0.3	1.4	1.24	14.2	415	15.0	506	-	-	-	-	-	-	-
4	"	0.8	2.1	12.9	225	0.3	1.4	1.24	15.1	473	16.0	567	-	-	-	-	-	-	-
5	"	0.8	2.1	13.8	260	0.3	1.4	1.24	16.1	532	17.0	617	-	-	-	-	-	-	-
6	"	0.8	2.1	14.8	295	0.3	1.4	1.24	17.1	604	18.0	669	-	-	-	-	-	-	-
7	"	0.8	2.1	14.8	312	0.3	1.4	1.24	17.1	617	18.0	682	-	-	-	-	-	-	-
9	"	0.8	2.1	17.5	418	0.3	1.4	1.24	19.8	784	20.7	868	-	-	-	-	-	-	-
10	"	0.8	2.1	18.2	423	0.3	1.4	1.4	20.9	831	21.8	906	-	-	-	-	-	-	-
12	"	0.8	2.1	18.8	478	0.3	1.6	1.4	21.8	959	22.7	1044	0.3	0.8	1.24	19.8	746	20.7	824
14	"	0.8	2.1	19.6	537	0.3	1.6	1.4	22.7	1034	23.6	1136	0.3	0.8	1.4	21.1	804	22.0	883
16	"	0.8	2.1	20.6	565	0.3	1.6	1.4	23.7	1131	24.6	1236	0.3	0.8	1.4	22.1	894	23.0	977
18	"	0.8	2.3	22.1	610	0.3	1.6	1.4	24.7	1237	25.6	1327	0.3	0.8	1.4	23.1	994	24.0	1052
19	"	0.8	2.3	22.1	635	0.3	1.6	1.4	24.7	1250	25.6	1340	0.3	0.8	1.4	23.1	1007	24.0	1065
24	"	0.8	2.3	25.5	786	0.3	1.6	1.4	28.1	1508	29.4	1608	0.3	0.8	1.4	26.5	1219	27.8	1312
27	"	0.8	2.3	26.0	860	0.3	1.6	1.4	28.6	1604	29.9	1705	0.3	0.8	1.4	27.0	1298	28.3	1392
30	"	0.8	2.3	26.9	937	0.3	1.6	1.4	29.5	1722	30.8	1825	0.3	0.8	1.4	27.9	1409	29.2	1505
37	"	0.8	2.3	28.9	1145	0.3	1.6	1.4	31.5	1966	33.2	2075	0.3	0.8	1.4	29.9	1630	31.6	1733
52	"	0.8	2.6	34.3	1565	0.4	2.0	1.56	37.7	2856	39.2	2997	0.4	0.8	1.56	35.3	2223	36.8	2348
61	"	0.8	2.6	36.3	1809	0.4	2.0	1.56	39.7	3157	41.2	3306	0.4	0.8	1.56	37.3	2500	38.8	2631

† Unisheath thickness

Note : The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

## Dimensions And Weights

<b>ELEKTRON 1.1 KV Control Cables 2.5 sq.mm PVC Insulated Unarmoured and Armoured cable with Copper (Solid) conductor conforming to IS: 1554 (Part 1) 1988.</b>																		
No. of cores	Nominal Thickness of insulation	UNARMOURED					ROUND WIRE ARMoured						FLAT STRIP ARMoured					
		Nominal Thickness of outer Sheath	Max. overall Dia of Cable	Max. Weight of Cable	Thick-ness of inner Sheath	Nominal dia of armour wire	Minimum Thick-ness of outer Sheath	Maximum overall dia of cable		Maximum Weight of cable		Thick-ness of inner Sheath	Nominal Tick-ness of formed wire	Minimum Thick-ness of outer Sheath	Maximum overall dia of cable		Maximum Weight of cable	
								Taped bedding	Extruded bedding	Taped bedding	Extruded bedding				Taped bedding	Extruded bedding	Taped bedding	Extruded bedding
Nos.	mm	mm	mm	kg/KM	mm	mm	mm	mm	mm	kg/KM	kg/KM	mm	mm	mm	mm	mm	kg/KM	kg/KM
2	0.9	2.1	12.5	180	0.3	1.4	1.24	15.5	16.0	450	475	-	-	-	-	-	-	-
3	0.9	2.1	13.0	210	0.3	1.4	1.24	16.0	16.5	490	530	-	-	-	-	-	-	-
4	0.9	2.1	14.0	260	0.3	1.4	1.24	17.0	17.5	560	595	-	-	-	-	-	-	-
5	0.9	2.1	15.0	310	0.3	1.4	1.24	18.0	18.5	640	685	-	-	-	-	-	-	-
6	0.9	2.1	16.0	370	0.3	1.4	1.24	19.0	20.5	730	770	-	-	-	-	-	-	-
7	0.9	2.1	16.0	380	0.3	1.4	1.24	19.0	20.5	750	800	-	-	-	-	-	-	-
10	0.9	2.1	20.0	530	0.3	1.6	1.40	23.5	24.5	1080	1150	0.3	0.8	1.40	22.0	23.0	850	900
12	0.9	2.3	21.0	630	0.3	1.6	1.40	24.5	25.0	1150	1200	0.3	0.8	1.40	23.0	23.5	960	1020
14	0.9	2.3	22.0	710	0.3	1.6	1.40	25.5	26.0	1240	1300	0.3	0.8	1.40	23.5	24.5	1080	1130
16	0.9	2.3	23.0	800	0.3	1.6	1.40	26.5	27.0	1380	1420	0.3	0.8	1.40	25.0	25.5	1180	1130
19	0.9	2.3	24.0	910	0.3	1.6	1.40	27.5	28.0	1520	1580	0.3	0.8	1.40	26.0	26.5	1300	1350
24	0.9	2.3	28.0	1130	0.3	1.6	1.56	31.5	32.5	2050	2120	0.3	0.8	1.40	29.5	30.5	1590	1660
27	0.9	2.3	28.5	1240	0.3	1.6	1.56	32.5	33.0	2210	2270	0.3	0.8	1.40	30.5	31.0	1730	1790
30	0.9	2.3	29.5	1360	0.3	1.6	1.56	33.5	34.0	2400	2450	0.3	0.8	1.56	31.5	32.5	1850	1920
37	0.9	2.6	32.5	1680	0.4	2.0	1.56	36.5	37.0	2790	2830	0.4	0.8	1.56	34.0	34.5	2220	2280
44	0.9	2.6	36.0	1980	0.4	2.0	1.56	40.0	40.5	3200	3290	0.4	0.8	1.56	37.5	38.5	2590	2640
52	0.9	2.6	37.5	2280	0.4	2.0	1.56	41.5	42.5	3850	3920	0.4	0.8	1.56	39.0	40.5	3100	3170
61	0.9	2.6	40.0	2630	0.4	2.0	1.56	44.5	45.5	4400	4500	0.4	0.8	1.56	41.5	42.5	3460	3520

## Dimensions And Weights

<b>ELEKTRON 1.1 KV Control Cables 2.5 sq.mm PVC Insulated Unarmoured and Armoured cable with Copper (Stranded) conductor conforming to IS: 1554 (Part 1) 1988.</b>																		
No. of cores	Nominal Thickness of insulation	UNARMOURED			ROUND WIRE ARMoured						FLAT STRIP WIRE ARMoured							
		Nominal Thickness of outer Sheath	Max. overall Dia of Cable	Max. Weight of Cable	Thick-ness of inner Sheath	Nominal dia of armour wire	Minimum Thick-ness of outer Sheath	Max. overall dia of cable		Max. Weight of cable		Thick-ness of inner Sheath	Nominal Tick-ness of formed wire	Minimum Thick-ness of outer Sheath	Max. overall dia of cable		Max. Weight of cable	
								Taped bedding	Extruded bedding	Taped bedding	Extruded bedding				Taped bedding	Extruded bedding	Taped bedding	Extruded bedding
Nos.	mm	mm	mm	kg/KM	mm	mm	mm	mm	mm	kg/KM	kg/KM	mm	mm	mm	mm	mm	kg/KM	kg/KM
2	0.9	2.1	13.0	180	0.3	1.4	1.24	16.0	16.5	450	500	-	-	-	-	-	-	-
3	0.9	2.1	13.5	210	0.3	1.4	1.24	16.5	17.0	490	540	-	-	-	-	-	-	-
4	0.9	2.1	14.5	260	0.3	1.4	1.24	17.5	18.5	560	610	-	-	-	-	-	-	-
5	0.9	2.1	15.5	310	0.3	1.4	1.24	18.5	20.5	640	700	-	-	-	-	-	-	-
6	0.9	2.1	17.0	370	0.3	1.4	1.24	20.0	21.0	730	780	-	-	-	-	-	-	-
7	0.9	2.1	17.0	380	0.3	1.4	1.24	20.0	21.0	750	810	-	-	-	-	-	-	-
10	0.9	2.1	21.0	530	0.3	1.6	1.40	24.5	25.5	1090	1160	0.3	0.8	1.40	23.0	24.0	850	910
12	0.9	2.3	22.0	630	0.3	1.6	1.40	25.5	26.0	1160	1210	0.3	0.8	1.40	23.5	24.5	970	1030
14	0.9	2.3	23.0	710	0.3	1.6	1.40	26.5	27.0	1250	1310	0.3	0.8	1.40	25.0	25.5	1090	1140
16	0.9	2.3	24.0	800	0.3	1.6	1.40	27.5	28.0	1390	1430	0.3	0.8	1.40	26.0	26.5	1190	1240
19	0.9	2.3	25.0	910	0.3	1.6	1.40	28.5	29.5	1530	1590	0.3	0.8	1.40	27.0	28.0	1310	1360
24	0.9	2.3	29.0	1140	0.3	1.6	1.56	33.0	34.0	2070	2140	0.3	0.8	1.40	31.0	32.0	1600	1670
27	0.9	2.3	30.0	1250	0.3	1.6	1.56	33.5	34.5	2230	2290	0.3	0.8	1.40	31.5	32.5	1740	1800
30	0.9	2.3	31.0	1370	0.3	1.6	1.56	35.0	35.5	2420	2470	0.3	0.8	1.56	33.0	34.0	1860	1930
37	0.9	2.6	34.0	1690	0.4	2.0	1.56	38.0	38.5	2810	2850	0.4	0.8	1.56	35.5	36.0	2240	2300
44	0.9	2.6	38.0	2000	0.4	2.0	1.56	42.0	42.5	3230	3320	0.4	0.8	1.56	39.5	40.0	2610	2660
52	0.9	2.6	39.5	2300	0.4	2.0	1.56	43.5	44.5	3880	3950	0.4	0.8	1.56	41.0	42.5	3130	3200
61	0.9	2.6	42.0	2650	0.4	2.0	1.72	46.5	47.5	4440	4540	0.4	0.8	1.56	43.5	44.5	3490	3550

† Unisheath thickness

Note : The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

## Dimensions And Weights

### Single Core 1100 Volts Grade Cables Aluminium Conductor PVC Insulated, Unarmoured and Single Aluminium Wire/Strip Armoured and PVC Sheathed Overall Conforming to IS : 1554 (Part 1)

Nominal areas of conductor	Maximum No. of wires in the conductor	Nominal Thickness of insulation	UNARMOURED			ROUND WIRE ARMoured					FLAT STRIP WIRE ARMoured			
			Nominal Thickness of outer sheath	Max. Overall Dia of Cable	Max. Weight of Cable	Nominal Thickness of Insulation	Nominal Dia of Armour wire	Minimum Thickness of outer Sheath	Max. Overall Dia of Cable	Max. Weight of Cable	Nominal Thickness of flat strip	Minimum Thickness of Outer Sheath	Max. overall Dia of Cable	Max. Weight of Cable
sq. mm	Nos.	mm	mm	mm	kg/km	mm	mm	mm	mm	kg/km	mm	mm	mm	kg/km
4*	1	1.0	1.8	8.5	85	-	-	-	-	-	-	-	-	-
6*	1	1.0	1.8	9.0	102	-	-	-	-	-	-	-	-	-
10*	1	1.0	1.8	10.0	125	-	-	-	-	-	-	-	-	-
16	6	1.0	1.8	11.5	160	1.3	1.4	1.24	14.5	220	-	-	-	-
25	6	1.2	1.8	13.0	210	1.5	1.4	1.24	16.5	280	-	-	-	-
35	6	1.2	1.8	14.0	260	1.5	1.4	1.24	17.5	340	-	-	-	-
50	6	1.4	1.8	15.5	320	1.7	1.4	1.24	19.0	410	-	-	-	-
70	12	1.4	1.8	17.0	400	1.7	1.4	1.40	20.5	510	-	-	-	-
95	15	1.6	1.8	19.5	530	1.9	1.6	1.40	23.5	680	0.8	1.40	22.0	610
120	15	1.6	2.0	21.5	620	1.9	1.6	1.40	25.0	810	0.8	1.40	23.5	710
150	15	1.8	2.0	23.5	740	2.1	1.6	1.40	27.0	960	0.8	1.40	25.5	830
185	30	2.0	2.0	25.5	900	2.3	1.6	1.40	29.0	1160	0.8	1.40	27.5	990
240	30	2.2	2.0	28.0	1130	2.5	1.6	1.56	32.5	1460	0.8	1.40	30.5	1220
300	30	2.4	2.0	31.0	1390	2.8	2.0	1.56	36.0	1800	0.8	1.56	34.0	1500
400	53	2.6	2.2	34.5	1720	3.0	2.0	1.56	39.5	2220	0.8	1.56	37.5	1840
500	53	3.0	2.2	39.5	2130	3.4	2.0	1.72	45.0	2760	0.8	1.56	41.5	2240
630	53	3.4	2.4	44.5	2730	3.9	2.0	1.88	50.0	3540	0.8	1.72	46.0	2840
800	53	3.4	2.4	48.0	3360	3.9	2.0	1.88	53.5	4350	0.8	1.72	50.5	3450
1000	53	3.4	2.6	53.5	4080	4.0	2.5	2.04	60.5	5290	0.8	2.04	55.0	4180

## Dimensions And Weights

### Two Core 1100 Volts Grade Cables Aluminium Conductor, PVC Insulated Taped or Extruded Inner Sheath Unarmoured and Single Round Wire/Flat Strip Armoured and PVC Sheathed Overall, Conforming to IS : 1554 (Part 1)

Nominal area of conductor	Minimum No. of wires in the conductor	Nominal Thickness of insulation	UNARMOURED			ROUND WIRE ARMoured						FLAT STRIP WIRE ARMoured										
			Nominal Thickness of outer Sheath	Max. overall Dia of Cable	Max. Weight of Cable	Thick-ness of inner Sheath	Nominal dia of armour wire	Minimum Thick-ness of outer Sheath	Max. overall dia of cable		Max. Weight of cable		Thick-ness of inner Sheath	Nominal Thick-ness of formed wire	Minimum Thick-ness of outer Sheath	Max. overall dia of cable		Max. Weight of cable				
									Taped bedding	Extruded bedding	Taped bedding	Extruded bedding				Taped bedding	Extruded bedding	Taped bedding	Extruded bedding			
Sq. mm	Nos.	mm	mm	mm	kg/KM	mm	mm	mm	mm	mm	mm	kg/KM	kg/KM	mm	mm	mm	mm	mm	mm	kg/KM	kg/KM	
1.5*	1	0.8	2.1	11.0	125	0.3	1.4	1.24	14.0	15.0	320	360	-	-	-	-	-	-	-	-	-	-
2.5*	1	0.9	2.1	12.5	170	0.3	1.4	1.24	15.5	16.0	400	440	-	-	-	-	-	-	-	-	-	-
**	3	0.9	2.1	13.0	185	0.3	1.4	1.24	16.0	16.5	410	450	-	-	-	-	-	-	-	-	-	-
4*	1	1.0	2.1	13.5	205	0.3	1.4	1.24	17.0	17.5	490	530	-	-	-	-	-	-	-	-	-	-
**	3	1.0	2.1	14.5	230	0.3	1.4	1.24	17.5	18.0	500	540	-	-	-	-	-	-	-	-	-	-
6*	1	1.0	2.1	15.0	255	0.3	1.4	1.24	18.0	18.5	540	580	-	-	-	-	-	-	-	-	-	-
**	3	1.0	2.1	15.5	270	0.3	1.4	1.24	18.5	19.0	550	590	-	-	-	-	-	-	-	-	-	-
10*	1	1.0	2.1	16.5	285	0.3	1.4	1.24	19.5	20.0	630	660	-	-	-	-	-	-	-	-	-	-
**	6	1.0	2.1	17.5	310	0.3	1.4	1.24	20.5	21.0	640	670	-	-	-	-	-	-	-	-	-	-
16	6	1.0	2.1	19.0	320	0.3	1.6	1.40	23.0	23.5	810	890	0.3	0.8	1.40	21.5	22.0	620	700			
25	6	1.2	2.3	19.5	430	0.3	1.6	1.40	23.5	24.0	880	970	0.3	0.8	1.40	21.5	22.0	690	770			
35	6	1.2	2.3	21.0	520	0.3	1.6	1.40	24.5	25.5	1020	1140	0.3	0.8	1.40	23.0	24.0	800	900			
50	6	1.4	2.3	23.5	670	0.3	1.6	1.56	27.0	28.5	1230	1340	0.3	0.8	1.40	25.0	26.5	980	1090			
70	12	1.4	2.3	26.0	840	0.3	1.6	1.56	30.0	31.0	1440	1600	0.3	0.8	1.56	28.0	29.5	1190	1310			
95	15	1.6	2.6	30.0	1060	0.4	2.0	1.56	34.0	35.0	1810	1970	0.4	0.8	1.56	31.5	32.5	1520	1650			
120	15	1.6	2.6	32.0	1300	0.4	2.0	1.72	36.5	38.0	2300	2490	0.4	0.8	1.56	32.5	35.0	1770	1920			
150	15	1.8	2.8	35.5	1540	0.4	2.0	1.72	39.5	41.0	2640	2870	0.4	0.8	1.72	37.0	38.5	2050	2220			
185	30	2.0	2.9	39.0	1870	0.5	2.0	2.04	43.5	44.5	3120	3360	0.5	0.8	1.88	41.0	42.5	2470	2670			
240	30	2.2	3.1	46.0	2390	0.5	2.5	2.04	51.5	53.0	3810	4120	0.5	0.8	2.04	48.0	50.0	3020	3300			
300	30	2.4	3.4	48.5	2940	0.6	2.5	2.20	54.5	55.5	4890	5260	0.6	0.8	2.20	51.0	52.0	3620	3920			
400	53	2.6	3.9	54.5	3670	0.7	3.15	2.52	61.5	63.0	5850	6220	0.7	0.8	2.36	56.5	57.5	4440	4750			
500	53	3.0	4.1	60.5	4580	0.7	3.15	2.84	68.5	69.5	7030	7440	0.7	0.8	2.68	63.0	64.5	5510	5850			
630	53	3.4	4.5	69.0	5910	0.7	4.0	3.00	77.5	79.5	9460	9980	0.7	0.8	2.84	70.5	72.5	6900	7330			

\* Solid Conductor      † Unisheath Construction  
\*\* Stranded Conductor

**Note :** The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

# PVC Insulated Cables

## Dimensions And Weights

Three Core - 1100 Volts Grade Cables Aluminum Conductor PVC Insulated Taped or Extruded Inner Sheath Unarmoured and Single Round Wire/ Flat Strip Armoured and PVC Sheathed Overall Conforming to IS : 1554 (Part 1)																					
Nominal area of conductor	Minimum No. of wires in the conductor	Nominal Thickness of insulation	UNARMOURED				ROUND WIRE ARMOURED						FLAT STRIP WIRE ARMOURED								
			Nominal Thickness of outer Sheath	Max. overall Dia of Cable	Max. Weight of Cable	Thick-ness of inner Sheath	Nominal dia of armour wire	Minimum Thick-ness of outer Sheath	Max. overall dia of cable		Max. Weight of cable		Thick-ness of inner Sheath	Nominal Thick-ness of formed wire	Minimum Thick-ness of outer Sheath	Max. overall dia of cable		Max. Weight of cable			
									Taped bedding	Extruded bedding	Taped bedding	Extruded bedding				Taped bedding	Extruded bedding	Taped bedding	Extruded bedding		
Sq. mm	Nos.	mm	mm	mm	kg/KM	mm	mm	mm	mm	mm	mm	kg/KM	kg/KM	mm	mm	mm	mm	mm	mm	kg/KM	kg/KM
1.5*	1	0.8	2.1	11.5	140	0.3	1.4	1.24	14.5	15.5	370	410	-	-	-	-	-	-	-	-	-
2.5*	1	0.9	2.1	13.0	175	0.3	1.4	1.24	16.0	16.5	430	470	-	-	-	-	-	-	-	-	-
**	3	0.9	2.1	13.5	190	0.3	1.4	1.24	16.5	17.0	440	480	-	-	-	-	-	-	-	-	-
4*	1	1.0	2.1	14.5	220	0.3	1.4	1.24	17.5	18.0	540	610	-	-	-	-	-	-	-	-	-
**	3	1.0	2.1	15.0	240	0.3	1.4	1.24	18.0	19.0	550	620	-	-	-	-	-	-	-	-	-
6	1	1.0	2.1	15.5	265	0.3	1.4	1.24	18.5	19.5	600	660	-	-	-	-	-	-	-	-	-
**	3	1.0	2.1	16.5	290	0.3	1.4	1.24	19.5	20.0	610	670	-	-	-	-	-	-	-	-	-
10*	1	1.0	2.1	17.5	320	0.3	1.4	1.40	21.0	21.5	730	790	-	-	-	-	-	-	-	-	-
10**	6	1.0	2.1	18.5	350	0.3	1.4	1.40	22.0	22.5	740	800	-	-	-	-	-	-	-	-	-
16	6	1.0	2.1	20.0	410	0.3	1.6	1.40	24.0	25.0	940	1040	0.3	0.8	1.40	22.5	23.5	720	820		
25	6	1.2	2.3	21.5	590	0.3	1.6	1.40	25.0	26.0	1080	1210	0.3	0.8	1.40	23.5	24.5	870	980		
35	6	1.2	2.3	23.5	700	0.3	1.6	1.40	26.5	28.0	1240	1380	0.3	0.8	1.40	25.0	26.5	1020	1130		
50	6	1.4	2.3	26.0	900	0.3	1.6	1.56	30.0	31.0	1530	1650	0.3	0.8	1.56	28.5	29.5	1250	1400		
70	12	1.4	2.6	29.5	1140	0.4	2.0	1.56	33.5	34.5	1870	2030	0.4	0.8	1.56	31.0	32.5	1590	1720		
95	15	1.6	2.6	33.5	1530	0.4	2.0	1.72	38.0	39.5	2570	2790	0.4	0.8	1.56	35.0	36.5	2010	2180		
120	15	1.6	2.6	36.5	1810	0.4	2.0	1.72	40.5	42.0	2970	3200	0.4	0.8	1.72	38.5	40.0	2330	2500		
150	15	1.8	2.9	40.0	2160	0.5	2.0	1.88	44.5	46.0	3450	3710	0.5	0.8	1.88	42.0	43.5	2780	2980		
185	30	2.0	3.1	44.5	2680	0.5	2.5	2.04	49.5	51.5	4120	4440	0.5	0.8	1.88	46.0	48.0	3370	3660		
240	30	2.2	3.4	50.0	3420	0.6	2.5	2.20	56.0	57.0	5490	5830	0.6	0.8	2.20	52.5	53.5	4200	4510		
300	30	2.4	3.6	55.0	4230	0.6	2.5	2.36	61.0	62.5	6520	6870	0.6	0.8	2.36	57.5	59.0	5090	5410		
400	53	2.6	4.1	62.0	5300	0.7	3.15	2.68	69.0	70.5	8690	9120	0.7	0.8	2.52	64.5	65.5	6290	6650		

\* Solid Conductor      \*\* Stranded Conductor      †Unisheath Construction

## Dimensions And Weights

Three And Half Core - 1100 Volts Grade Cables Aluminum Conductor PVC Insulated, taped or Extruded Inner Sheath, Unarmoured and Single Round Wire/ Flat Strip Armoured and PVC Sheathed Overall Conforming to IS : 1554 (Part 1)																						
Conductor				Thickness of Insulation		Unarmoured Construction			Round Wire Armoured						Flat Strip Armoured							
Power Condr	Neutral Condr	Power Condr	Neutral Condr	Power Condr	Neutral Condr	Thickness of Inner Sheath †	Max. Overall Diameter	Max. Net Weight	Thickness of Inner Sheath	Dia of Armour Wire	Thickness of Outer Sheath	Cables with Taped Inner Sheath		Cables with Ext. Inner Sheath		Thickness of Inner Sheath	Thickness of Flat Strip	Thickness of Outer Sheath	Cables with Taped Inner Sheath		Cables with Ext. Inner Sheath	
												Max. Overall Diameter	Max. Net Weight	Max. Overall Diameter	Max. Net Weight				Max. Overall Diameter	Max. Net Weight	Max. Overall Diameter	Max. Net Weight
Area of Cross-Section		Number of Wires		Nom mm	Nom mm	Nom mm	Maximum mm	Maximum kg/km	Min mm	Nom mm	Min mm	Maximum mm	Maximum kg/km	Maximum mm	Maximum kg/km	Min mm	Nom mm	Min mm	Maximum mm	Maximum kg/km	Maximum mm	Maximum kg/km
25	16	6	6	1.2	1.0	2.3	23.5	650	0.3	1.6	1.4	27.5	1260	28.0	1300	0.3	0.8	1.4	25.5	980	26.0	1040
35	16	6	6	1.2	1.0	2.3	26.0	770	0.3	1.6	1.4	30.0	1440	30.5	1480	0.3	0.8	1.4	28.0	1190	28.5	1210
50	25	6	6	1.4	1.2	2.3	30.0	1050	0.3	1.6	1.56	34.0	1860	34.5	1890	0.3	0.8	1.56	32.0	1520	33.0	1590
70	35	12	6	1.4	1.2	2.6	32.5	1370	0.4	2.0	1.56	36.5	2400	38.0	2500	0.4	0.8	1.56	34.5	1850	35.5	1950
95	50	15	6	1.6	1.4	2.6	37.0	1750	0.4	2.0	1.72	42.0	3000	45.0	3100	0.4	0.8	1.56	39.0	2350	40.0	2450
120	70	15	12	1.6	1.4	2.9	41.0	2140	0.5	2.0	1.88	46.0	3550	47.5	3650	0.5	0.8	1.72	43.0	2800	44.0	2900
150	70	15	12	1.8	1.4	2.9	44.5	2500	0.5	2.0	1.88	49.5	4050	51.0	4150	0.5	0.8	1.88	46.5	3300	48.0	3400
185	95	30	15	2.0	1.6	3.1	49.5	3100	0.5	2.5	2.04	55.0	5300	57.0	5400	0.5	0.8	2.04	52.0	4000	53.0	4100
240	120	30	15	2.2	1.6	3.6	55.5	3950	0.6	2.5	2.36	61.0	6500	64.0	6700	0.6	0.8	2.20	57.0	5000	59.0	5150
300	150	30	15	2.4	1.8	3.8	62.5	4850	0.6	3.15	2.52	68.0	8350	71.0	8600	0.6	0.8	2.36	63.0	5900	65.0	6150
400	185	53	30	2.6	2.0	4.1	69.5	6100	0.7	3.15	2.68	76.0	9990	78.0	10500	0.7	0.8	2.68	71.0	7400	73.0	7600

†Unisheath Construction

**Note :** The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

## Dimensions And Weights

Four Core - 1100 Volts Grade Cables Aluminium Conductor PVC Insulated, taped or Extruded Inner Sheath, Unarmoured and Single Round Wire / Flat Strip Armoured and PVC Sheathed Overall Conforming to IS : 1554 (Part 1)																				
Nominal area of conductor	Minimum No. of wires in the Conductor	Nominal Thickness of insulation	Unarmoured			Round Wire Armoured							Flat Strip Armoured							
			Nominal Thickness of outer Sheath	Maximum overall Dia. of Cable	Maximum Weight of Cable	Thick-ness of inner Sheath	Nominal dia of armour wire	Minimum Thick-ness of outer Sheath	Maximum overall dia of cable		Maximum Weight of cable		Thickness of inner Sheath	Nominal Thick-ness of formed wire	Minimum Thick-ness of outer Sheath	Maximum overall dia of cable		Maximum Weight of cable		
									Taped bedding	Extruded bedding	Taped bedding	Extruded bedding				Taped bedding	Extruded bedding	Taped bedding	Extruded bedding	
Sq. mm	Nos.	mm	mm	mm	kg/km	mm	mm	mm	mm	mm	mm	kg/km	kg/km	mm	mm	mm	mm	mm	kg/km	kg/km
1.5*	1	0.8	2.1	12.5	160	0.3	1.40	1.24	15.5	16.0	400	440	-	-	-	-	-	-	-	-
2.5*	1	0.9	2.1	14.0	205	0.3	1.40	1.24	17.0	17.5	490	530	-	-	-	-	-	-	-	-
**	3	0.9	2.1	14.5	225	0.3	1.40	1.24	17.5	18.5	500	540	-	-	-	-	-	-	-	-
4*	1	1.0	2.1	15.5	265	0.3	1.40	1.24	18.5	19.5	640	680	-	-	-	-	-	-	-	-
**	3	1.0	2.1	16.5	295	0.3	1.40	1.24	19.5	20.0	650	690	-	-	-	-	-	-	-	-
6*	1	1.0	2.1	17.0	325	0.3	1.40	1.24	20.0	20.5	680	730	-	-	-	-	-	-	-	-
**	3	1.0	2.1	17.5	350	0.3	1.40	1.24	21.0	21.5	690	740	-	-	-	-	-	-	-	-
10*	1	1.0	2.1	19.0	405	0.3	1.60	1.40	22.5	23.5	840	900	0.3	0.8	1.40	21.0	22.0	690	720	-
**	6	1.0	2.1	20.0	430	0.3	1.60	1.40	24.0	24.5	850	910	0.3	0.8	1.40	22.5	23.0	700	730	-
16	6	1.0	2.3	20.0	475	0.3	1.60	1.40	24.0	24.5	980	1050	0.3	0.8	1.40	22.5	23.0	765	800	-
25	6	1.2	2.3	24.5	720	0.3	1.60	1.40	28.0	29.5	1300	1430	0.3	0.8	1.40	26.5	27.5	1060	1180	-
35	6	1.2	2.3	26.5	880	0.3	1.60	1.56	30.5	31.5	1520	1660	0.3	0.8	1.40	28.5	29.5	1240	1390	-
50	6	1.4	2.6	30.0	1170	0.4	2.00	1.56	34.0	35.5	2100	2290	0.4	0.8	1.56	32.0	33.5	1590	1750	-
70	12	1.4	2.6	34.5	1500	0.4	2.00	1.56	38.5	40.0	2570	2760	0.4	0.8	1.56	36.0	37.5	1990	2190	-
95	15	1.6	2.8	39.0	1970	0.4	2.00	1.72	43.0	44.5	3230	3450	0.4	0.8	1.72	40.5	42.0	2570	2760	-
120	15	1.6	2.0	42.5	2380	0.5	2.00	1.88	47.0	49.0	3770	4070	0.5	0.8	1.88	45.0	46.5	3010	3250	-
150	15	1.8	3.1	47.0	2900	0.5	2.50	2.04	49.5	51.0	4850	5190	0.5	0.8	1.88	48.0	50.5	3590	3890	-
185	30	2.0	3.4	52.0	3610	0.6	2.50	2.20	58.0	59.5	5750	6120	0.6	0.8	2.04	54.0	55.5	4370	4650	-
240	30	2.2	3.6	58.5	4590	0.6	2.50	2.36	64.5	66.0	7030	7390	0.6	0.8	2.36	61.5	62.5	5450	5760	-
300	30	2.4	4.1	65.5	5640	0.7	3.15	2.68	72.0	74.0	9140	9700	0.7	0.8	2.52	67.0	69.0	6650	7080	-
400	53	2.6	4.3	72.5	7070	0.7	3.15	2.84	79.5	81.5	11100	11650	0.7	0.8	2.84	75.0	77.0	8270	8740	-

\* Solid Conductor †Unisheath Construction  
\*\* Stranded Conductor

Note : The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

## Current Rating

The Current Ratings of PVC Cables given in the subsequent tables are based on the following assumptions and calculated in accordance with the recommendation of IS : 3961 - (Part-11)

### Basic Assumption

Maximum Conductor Temperature at continuous Load : 70°C/85°C  
70°C for PVC and 85°C for HR-PVC cables

Ambient Air Temperature : 40°C

Ground Temperature : 30°C

Thermal Resistivity of the soil : 150°C cm/W

Thermal Resistivity of PVC : 650°C cm/W

Depth of laying (to the highest point of cable laid direct in ground or to top surface of duct)

1.1 Kv cables : 750 mm

### Method Of Installation

1. Multicore cables : Installed Singly

# PVC Insulated Cables

## 2. Single Core Cables

### Type of Installation

a. Laid direct in the ground

### Method of Installation

1. Three in close trefoil formation or
2. Two touching on horizontal formation

b. In duct

1. Three in trefoil formation or
2. Two in horizontal formation

c. In Air

1. Two single-core cables are installed one above the other hand fixed to a vertical wall as follows, the distance between the wall and the surface of the cable being 25 mm in each case.
  - i. Cables of sizes up to and including 185 sq.mm are installed at a distance between centers of twice the overall diameter of the cables.
  - ii. Cables of sizes 240 sq.mm and above are installed at a distance between centers of 90 mm.

NOTE : The rating for two cables may be applied with safety in cases where such cables are installed in horizontal formation on bracket fixed to a wall, either spaced as indicated above or touching through.

## 3. Three single-core cables are installed in trefoil formation touching

Rating Factor : For other condition of installation, given in three tables, please see RATING FACTOR tables.

NOTE - For single Core screened/non-magnetic armoured Cables, ratings are given with screens bonded at both ends of the Cables.

## Current Ratings

<b>Copper Conductor Control Cables PVC Insulated Armoured/Unarmoured 1100 V Grade</b>						
No. CORES	NOMINAL AREA OF CONDUCTOR 1.5 sq. mm			NOMINAL AREA OF CONDUCTOR 2.5 sq. mm		
	In the ground amp	In single way duct. amp	In air amp	In the ground amp	In single way duct. amp	In air amp
2	23	20	20	32	27	27
3	21	17	17	27	24	24
4	21	17	17	27	24	24
5	21	17	17	27	24	24
6	15	13	13	21	22	22
7	14	13	13	20	17	17
10	13	11	11	18	15	15
12	12	10	10	17	14	14
14	11	10	10	16	13	13
16	11	9	9	15	13	13
19	10	8	8	14	12	12
24	9	8	8	13	11	11
27	9	8	8	12	10	10
30	9	7	7	12	10	10
37	8	7	7	11	9	9
44	7	6	6	10	9	9
52	7	6	6	10	8	8
61	6	6	6	9	8	8

## Current Ratings

Aluminum Conductor PVC Insulated Armoured/Unarmoured Power Cables 1100V Grade (Max. Conductor Temp. 70°C)																		
Nominal area of conductor sq. mm	Laid in the Ground						In Single Way Duct.						In Air					
	Single Core			Two Core		3.3/4 or 4 core Single amp	Single Core			Two Core		3.3/4 or 4 core Single amp	Single Core			Two Core		3.3/4 or 4 core Single amp
	3 nos a.c. amp	2 nos a.c. amp	2 nos d.c. amp	Single a.c. amp	Single d.c. amp		3 nos a.c. amp	2 nos d.c. amp	2 nos a.c. amp	Single d.c. amp	Single d.c. amp		3 nos a.c. amp	2 nos a.c. amp	2 nos a.c. amp	Single a.c. amp	Single d.c. amp	
1.5	17	21	21	18	18	16	17	19	19	16	16	14	15	18	18	16	16	13
2.5	24	28	28	25	25	21	24	25	25	21	21	18	21	25	25	21	21	18
4	31	36	36	32	32	28	30	33	33	27	27	23	27	32	32	27	27	23
6	39	44	44	40	40	35	37	42	42	34	34	30	35	41	41	35	35	30
10	51	59	59	55	55	46	51	56	56	45	45	39	47	56	56	47	47	40
16	66	75	75	70	70	60	65	71	71	58	58	50	64	72	72	59	59	51
25	86	97	97	90	90	76	84	93	93	76	76	63	84	99	99	78	78	70
35	100	120	120	110	110	92	100	110	110	92	92	77	105	120	120	99	99	86
50	120	145	145	135	135	110	115	130	130	115	115	95	130	150	150	125	125	105
70	140	170	175	160	160	135	135	155	165	140	140	115	155	185	190	150	150	130
95	175	205	210	190	195	165	155	180	195	170	170	140	190	215	225	185	180	155
120	195	230	240	210	220	185	170	200	225	190	190	155	220	240	260	210	210	180
150	220	265	270	240	250	210	190	220	255	210	215	175	250	270	300	240	240	205
185	240	300	305	275	285	235	210	240	285	240	245	200	290	305	345	275	280	240
240	270	335	355	320	330	275	225	270	330	275	280	235	335	350	405	325	335	280
300	295	370	400	355	370	305	245	295	375	305	320	260	380	395	470	365	380	315
400	325	410	460	385	425	335	275	335	435	345	385	290	435	455	560	420	450	375
500	345	435	510	426	470	370	295	355	490	382	426	320	480	490	630	481	515	425
630	390	485	600	502	554	405	320	395	570	450	502	350	550	560	750	575	615	480
800	442	550	680	-	-	-	363	448	646	-	-	-	673	685	918	-	-	-
1000	485	604	747	-	-	-	399	492	709	-	-	-	711	723	969	-	-	-

## Current Ratings

Copper Conductor PVC Insulated Armoured/Unarmoured Power Cables 1100V Grade (Max. Conductor Temp. 70°C)																		
Nominal area of conductor sq. mm	Laid in the Ground						In Single Way Duct.						In Air					
	Single Core			Two Core		3.3/4 or 4 core Single amp	Single Core			Two Core		3.3/4 or 4 core Single amp	Single Core			Two Core		3.3/4 or 4 core Single amp
	3 nos a.c. amp	2 nos a.c. amp	2 nos d.c. amp	Single a.c. amp	Single d.c. amp		3 nos a.c. amp	2 nos a.c. amp	2 nos d.c. amp	Single a.c. amp	Single d.c. amp		3 nos a.c. amp	2 nos a.c. amp	2 nos d.c. amp	Single a.c. amp	Single d.c. amp	
1.5	22	25	25	23	23	21	21	23	23	20	20	17	20	24	24	20	20	17
2.5	30	35	35	32	32	27	29	31	31	27	27	24	27	32	32	27	27	24
4	39	46	46	41	41	36	38	42	42	35	35	30	35	43	43	35	35	30
6	49	57	57	50	50	45	48	54	54	44	44	38	44	54	54	45	45	39
10	65	75	75	70	70	60	64	72	72	58	58	50	60	72	72	60	60	57
16	85	94	94	90	90	77	83	92	92	75	75	64	82	92	92	78	78	65
25	110	125	125	115	115	99	110	120	120	97	97	81	110	125	125	105	105	66
35	130	150	150	140	140	120	125	140	140	120	120	99	130	155	155	125	125	110
50	155	180	180	165	165	145	150	165	165	145	145	125	165	190	190	155	160	135
70	190	220	225	205	205	175	175	200	215	180	180	150	205	235	240	195	195	155
95	220	265	270	240	245	210	200	230	250	215	215	175	245	275	285	230	230	200
120	250	300	310	275	285	240	220	255	285	235	240	195	280	310	335	265	265	230
150	280	340	350	310	320	270	245	280	325	270	275	225	320	345	390	305	310	255
185	305	380	390	350	360	300	260	305	370	300	310	255	370	390	445	350	360	305
240	345	420	455	405	425	345	285	340	425	345	360	295	425	445	520	410	425	355
300	375	465	510	450	480	385	310	370	475	385	410	335	475	500	590	465	490	400
400	400	500	590	490	550	425	335	405	560	425	495	360	550	570	710	530	580	455
500	425	540	650	542	608	470	355	430	630	470	547	398	590	610	800	607	664	521
630	470	590	780	638	716	554	375	485	730	554	644	469	660	680	960	725	794	674
800	533	664	851	-	-	-	425	527	827	-	-	-	808	832	1175	-	-	-
1000	585	733	945	-	-	-	467	579	908	-	-	-	853	879	1241	-	-	-

## Current Ratings

<b>'HR PVC' Insulated Power Cables Armoured / Unarmoured 650/1100V</b>									
<b>Grade Heat Resisting Aluminium Conductor Cables (Max. Conductor Temp. 85 °c)</b>									
Nominal area of Conductor sq. mm.	Laid in the Ground			In Single Way Duct			In Air		
	Single Core (3 Nos.) amp	Two Core (Single) amp	3.3½ 4 Core (Single) amp	Single Core (3 Nos.) amp	Two Core (Single) amp	3.3½ 4 Core (Single) amp	Single Core (3 Nos.) amp	Two Core (Single) amp	3.3½ 4 Core (Single) amp
1.5	20	21	19	20	18	16	18	20	16
2.5	28	29	25	28	24	21	26	26	22
4	36	37	33	35	32	27	33	33	28
6	46	47	41	45	40	35	43	43	37
10	60	64	54	60	53	46	57	57	49
16	77	82	70	76	68	59	78	72	62
25	101	105	89	97	89	74	102	95	85
35	117	129	108	117	108	90	128	121	105
50	140	158	129	135	135	111	159	153	128
70	164	187	158	158	164	135	189	183	159
95	205	222	193	181	199	164	232	226	189
120	228	246	216	199	222	183	268	256	220
150	257	281	246	222	246	205	305	293	250
185	280	332	275	246	281	234	354	336	293
225	304	357	304	258	304	258	390	372	323
240	316	374	322	264	322	275	409	397	342
300	345	415	357	286	357	304	464	445	384
400	380	450	392	322	404	340	531	512	458
500	404	496	433	345	447	368	586	587	519
630	456	587	474	374	527	398	671	701	586
800	517	-	-	424	-	-	821	-	-
1000	568	-	-	466	-	-	867	-	-

## Current Ratings

<b>Copper Conductor Cables HR. PVC Insulated Armoured/Unarmoured 1100 V</b>									
<b>(Max. Conductor Temp. 85 °c)</b>									
Nominal area of Conductor sq. mm.	Laid in the Ground			In Single Way Duct			In Air		
	Single Core (3 Nos.) amp	Two Core amp	3.3½ 4 Core amp	Single Core (3 Nos.) amp	Two Core amp	3.3½ 4 Core amp	Single Core (3 Nos.) amp	Two Core amp	3.3½ 4 Core amp
1.5	26	27	25	25	23	20	24	24	21
2.5	35	37	32	34	32	28	33	33	29
4	46	48	42	44	41	35	43	43	37
6	57	59	53	56	51	44	54	55	48
10	76	82	70	75	68	59	73	73	63
16	99	105	90	97	88	75	100	95	81
25	129	135	116	129	113	95	134	128	110
35	152	164	140	146	140	116	159	153	134
50	181	193	170	176	170	146	201	189	165
70	222	240	205	205	211	176	250	238	201
95	257	281	246	234	252	205	299	281	244
120	293	322	281	257	275	228	342	323	281
150	328	363	316	287	316	263	390	372	323
185	357	410	351	304	351	298	451	427	372
240	404	474	404	333	404	345	519	500	433
300	439	527	450	363	450	392	580	567	488
400	468	573	497	392	497	421	671	647	555
500	497	634	550	415	550	466	720	741	635
630	550	747	648	439	648	549	805	885	759
800	623	-	-	497	-	-	985	-	-
1000	684	-	-	546	-	-	1040	-	-

## Rating Factors

<b>Rating Factors For Depth Of Laying For Cables Laid Directly In The Ground</b> Ref. : IS 3961 (Part 2)				
1100 V				
DEPTH OF LAYING mm	UPTO 25 sq. mm	ABOVE 25 sq.mm UPTO 300 sq.mm	ABOVE 300 sq.mm	3.3 kV & above ALL SIZES
750	1.00	1.00	1.00	—
900	0.99	0.98	0.97	1.00
1050	0.98	0.97	0.96	0.99
1200	0.97	0.96	0.95	0.98
1500	0.96	0.94	0.92	0.96
1800 or More	0.95	0.93	0.91	0.95

<b>Rating Factors For Variation In Thermal Resistivity Of Soil For cables laid directly in the ground</b> (average values) Ref. : IS 3961 (Part 2)						
Type and Size of Cable (sq mm)	Soil Thermal Resistivity in °C cm/w					
	100	120	150	200	250	300
Single Core Cables :						
(3 Cables in Trefoil Touching	1.18	1.09	1.00	0.90	0.82	0.76
upto 10	1.19	1.09	1.00	0.88	0.80	0.74
From 16 to 50	1.22	1.10	1.00	0.88	0.79	0.73
From 70 to 300	1.24	1.11	1.00	0.88	0.79	0.72
From 400 to 630	1.10	1.05	1.00	0.92	0.86	0.81
Multi Core Cables upto 10	1.14	1.08	1.00	0.91	0.84	0.78
From 16 to 50	1.17	1.09	1.00	0.90	0.82	0.76
From 70 to 150	1.18	1.09	1.00	0.89	0.81	0.75
From 185 to 400						

## Rating Factors

<b>Rating Factors For Depth Of Laying Multicore Cables In Single-way Ducts</b> (As per IS : 3961 - Part 2)	
DEPTH OF LAYING (mm)	RATING FACTOR
750	1.00
900	0.99
1050	0.98
1200	0.97
1500	0.96
1800	0.95
2700	0.92
3600	0.91
4500	0.90
5400 or MORE	0.89

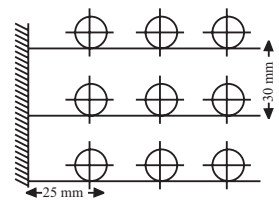
<b>Rating Factors For Three Single-core Cables (ac) In Flat Formation In Air (To Be Applied To The Corresponding Ratings For Trefoil Groups In Air) (as Per Is : 3961 - Part 2)</b>	
DEPTH OF LAYING (mm)	RATING FACTOR
185	1.07
240	1.10
300	1.08
400	1.04
500 and above	1.00

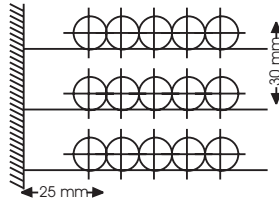
## Rating Factors

Rating Factors For - Variation In Ambient Air Temperature (As per IS : 3961 - Part 2)										
AIR TEMPERATURE °C RATING FACTOR	25	30	35	40	45	50	55	60	65	70
<b>PVC CABLES</b> (Max. Conductor Temp 70°C)	1.25	1.16	1.09	1.00	0.90	0.80	0.69	-	-	-
<b>HEAT RESISTING PVC CABLES</b> (Max. Conductor Temp 85°C)	-	1.10	1.05	1.00	0.94	0.88	0.82	0.74	0.67	0.58

Rating Factors For Variation In Ambient Ground Temperature (For Cables laid directly in ground or in duct) (As per IS : 3961 - Part 2)										
GROUND TEMPERATURE °C RATING FACTOR	15	20	25	30	35	40	45	50	55	
<b>PVC CABLES</b> (Max. Conductor Temp 70°C)	1.17	1.12	1.06	1.00	0.94	0.87	0.79	0.70	0.60	
<b>HEAT RESISTING PVC CABLES</b> (Max. Conductor Temp 85°C)	1.13	1.09	1.04	1.00	0.95	0.90	0.85	0.80	-	

## Current Ratings

Rating Factors For Multi-Core PVC/HR PVC Cables Laid On Racks In Air (with Spacing Between Equal To Diameter Of The Cable) (Ref. IS : 3961 - Part II)						
ARRANGEMENT	No. of Racks	Number of Cable per Rack				
	1	1	2	3	6	9
	RATING FACTOR	1.00	0.98	0.96	0.93	0.92
	2	1.00	0.95	0.93	0.90	0.89
	3	1.00	0.94	0.92	0.89	0.88
6	1.00	0.93	0.90	0.87	0.86	

Rating Factors For Multi-core PVC / HR PVC Cables Laid On Racks In Air (with Cables Touching) (Ref. IS : 3961 - Part II)						
ARRANGEMENT	No. of Racks	Number of Cable per Rack				
	1	1	2	3	6	9
	RATING FACTOR	1.00	0.84	0.80	0.75	0.73
	2	1.00	0.80	0.76	0.71	0.69
	3	1.00	0.78	0.74	0.70	0.68
6	1.00	0.76	0.72	0.68	0.66	

## Short Circuit Ratings

Permissible Maximum Short Circuit Ratings For PVC And HR-PVC Cables (Ref : IEC 724)				
Nominal area of Conductor  Sq. mm.	Short Circuit rating for one second duration			
	Aluminium		Copper	
	PVC Cables in Kilo amps	HR-PVC Cables in Kilo amps	PVC Cables in Kilo amps	HR-PVC Cables in Kilo amps
1.5	0.114	0.102	0.172	0.115
2.5	0.190	0.171	0.287	0.259
4	0.304	0.274	0.460	0.414
6	0.456	0.411	0.690	0.622
10	0.760	0.686	1.150	1.037
16	1.216	1.097	1.840	1.659
25	1.900	1.715	2.875	2.592
35	2.66	2.40	4.02	3.63
50	3.80	3.43	5.75	5.18
70	5.32	4.80	8.05	7.26
95	7.22	6.51	10.92	9.85
120	9.12	8.23	13.80	12.44
150	11.40	10.29	17.25	15.55
185	14.06	12.69	21.27	19.18
240	18.24	16.45	27.60	24.88
300	22.80	20.58	34.50	31.11
400	30.40	27.44	46.00	41.48
500	38.00	34.30	57.50	51.85
630	47.88	43.21	72.45	65.33
800	60.80	54.88	92.00	82.96
1000	76.00	68.60	115.00	103.70

Initial Temperature : 70°C (PVC) & 85°C (HR PVC), Final Temperature : 160°C (PVC) & 160°C (HR PVC)  
For durations other than One Second, the Short Circuit Current may be calculated from the following formula

$$I_{sc} = \frac{I}{\sqrt{t}}$$

where

$I_{sc}$  = Short Circuit Current during time ' $t$ ' - amperes

$I$  = Short Circuit Current during the time 'One Second' as given in the table - amperes

$t$  = Short Circuit Current duration - Seconds.

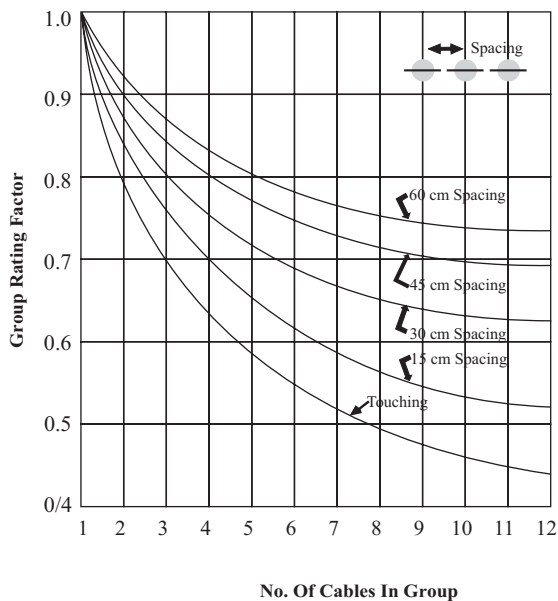
Note : For Large Currents, the force between the conductors must be considered, especially when Single Core Cables are used.

# PVC Insulated Cables

## Rating Factors

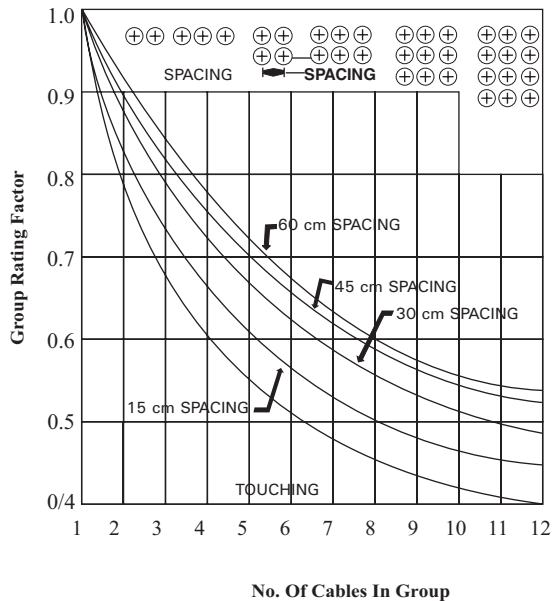
Group Rating Factors For Cables  
(Ref. IS : 3961 - Part II)

**Fig. 1**



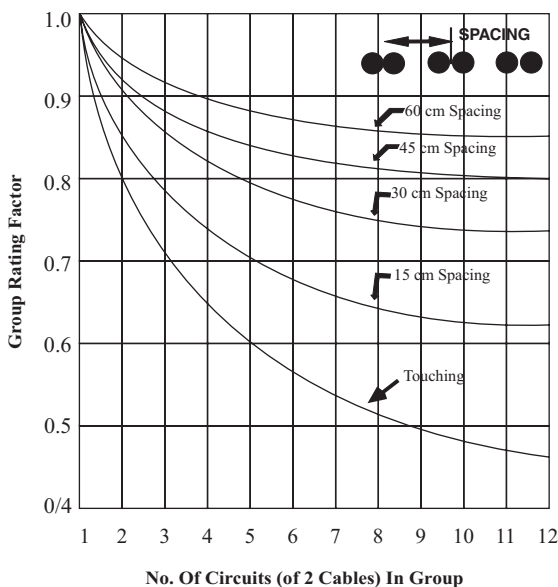
Group rating factors for two and multi-core cables in horizontal formation, laid direct in the ground

**Fig. 2**



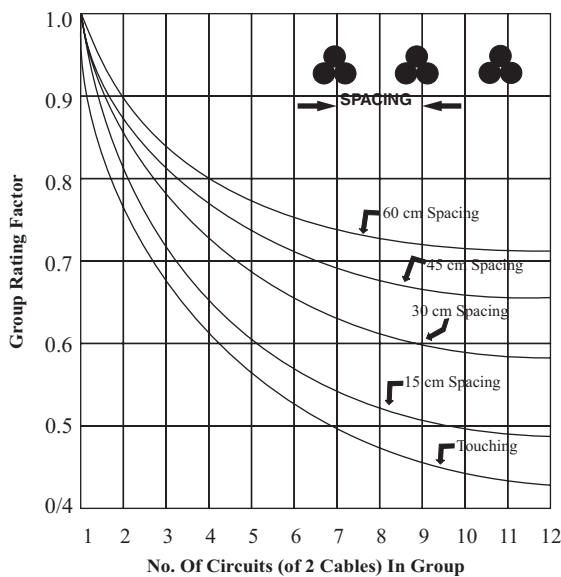
Group rating factors for two and multi-core cables in tier formation, laid direct in the ground

**Fig. 3**



Group rating factors for circuits of two single-core horizontal formation laid direct in the ground

**Fig. 4**



Group rating factors for circuits of three single core cables in trefoil and touching, horizontal formation, laid direct in the ground

**ELEKTRON** expertise in the field of low voltage electrical safety and protection devices ever since 1962 is extended to the requirements of PVC Wires and Cables. The success is attributed to the UNIQUE DESIGN and CONSISTENT QUALITY achieved after a thorough and extensive study of the causes of wire/cable failures. The wires and cables are manufactured with highest possible conductivity in the given sizes with perfect insulation of flame retardant PVC. Special polymer with chemical flame retardants is used in PVC compounds which work by limiting the availability of

### Uniform Lay of Conductor - Easy Stripping & Crimping

Perfect stripping & crimping during installation made possible with uniform layup of conductor strands by the most

### Centric Advantage - Perfect Centre / Uniform Insulation

Automatic self-centering is ensured with the intelligent microprocessor controlled equipment enabling to maintain the conductor perfectly in centre of PVC insulation providing exact and equal protection from all sides of conductor preventing short circuit occurrences due to uneven thickness and eccentricity of PVC insulation.

### Double Insulation / Colour Skin - Extra Protection

Double protection assured with the use of non-contaminated PVC as insulation in two layers with the primary wall

### Consistent Quality

Supporting the unique design, our wires & cables are manufactured from the purest of Copper and PVC compounds with rigorous testing at every stage of manufacturing. FR/FRLS characteristics like Oxygen Index, Temperature Index, Smoke Density, % Halogen, Flammability etc. are maintained as per applicable ASTM/IEC international standards. The extra technical expertise in the manufacturing process has earned **ELEKTRON** wires & cables the certification of

Single Core FR PVC Insulated Copper Conductor (Unsheathed) Heavy Duty Electric Wires In Voltage Grade upto and including 1100v						
Nominal Cross Sectional area of conductor	Number/ Nom. Dia of cond. strands*	Thickness of Insulation (Nom)	Maximum Overall Diameter	Current Carrying Capacity		Resistance Max. Per K.M. @ 20°C
				2 Cables	Single Core	
mm <sup>2</sup>	mm	mm	mm	Conduit/ Trunking Amps	Unenclosed clipped directly to a surface or on cable trays Amps	Ohms
0.5	16/0.20	0.6	2.2	4	5	39.00
0.75	10/0.30	0.7	2.6	7	8	26.00
1.0	14/0.30	0.7	2.8	11	12	18.10
1.5	22/0.30	0.7	3.1	13	16	12.10
2.5	36/0.30	0.8	3.8	18	22	7.41
4.0	56/0.30	0.8	4.4	24	29	4.95
6.0	84/0.30	0.8	5.0	31	37	3.30

**Note :** Supplied in 90 metre lengths in carton packaging.

**Note :** The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

\* The number and diameter of conductor strands are for reference only. Conductor resistance as per IS: 8130 is the governing criteria.

Single Core FR PVC Insulated Copper Conductor (Unsheathed) Flexible Cables in Voltage Grade upto and including 1100v						
Norminal Cross Sectional area of conductor	Number/ Nom. Dia of cond. Strands *	Thickness of Insulation (Nom)	Maximum Overall Diameter	Current Carrying Capacity 2 Cables Single Core		Resistance Max. per K.M. @ 20°C
				Conduit/ Trunking	Unenclosed clipped directly to a surface or on cable trays	
mm <sup>2</sup>	mm	mm	mm	Amps	Amps	Ohms
10	80/0.40	1.0	6.6	42	51	1.91
16	126/0.40	1.0	7.8	57	68	1.21
25	196/0.40	1.2	9.7	71	86	0.780
35	276/0.40	1.2	10.9	91	110	0.554
50	396/0.40	1.4	13.2	120	145	0.386

**Note :** Supplied in 100 metre lengths as per IS:694

\* The number and diameter of conductor strands are for reference only. Conductor resistance as per IS: 8130 is the governing criteria.

Single Core FR PVC Insulated Copper Conductor (Unsheathed) Heavy Duty Domestic Wires in Voltage Grade upto and including 1100v					
Number of Wires/SWG	Number/ Nom. Dia of cond. Strands *	Standard Resistance at 20 deg. C	Radial Thickness of insulation	Overall Diameter	Current Carrying Capacity
mm <sup>2</sup>	mm	ohm/km	mm	mm (Maximum)	Amps
1/18	1/1.12	17.58	1.14	3.5	5
3/22	3/0.74	13.76	1.14	4.0	10
3/20	3/0.91	8.927	1.14	4.4	15
7/22	7/0.74	5.879	1.14	4.6	20
7/20	7/0.91	3.815	1.30	5.4	28
7/18	7/1.12	2.555	1.30	6.0	36
7/16	7/1.62	1.207	1.30	7.5	53

**Note :** The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

**Note :** Supplied in 90 metre lengths generally as per BS : 2004 / 1961.

\* The number and diameter of conductor strands are for reference only. Conductor resistance as per relevant specifications shall be the governing criteria.

Single Core FR PVC Insulated Copper Conductor (Unsheathed) Heavy Duty Electric Wires in Voltage Grade upto and including 1100v							
Nominal Cross Sectional area of cond.	Number/Nom. Dia of cond. Strands*	Stranding No./ Nom. Dia of Cond. Strands*	Thickness of Insulation (Nom)	Maximum Overall Diameter	Current Carrying Capacity 2 Cables Single Core		Resistance Max. Per km @20 deg. C
					Conduit/ Trunking	Unenclosed clipped directly to a surface or on cable trays	
mm <sup>2</sup>	mm	mm	mm	mm	Amps	Amps	Ohms
1.0	1/1.13	7/0.43	0.7	2.8	11	12	18.10
1.5	1/1.38	7/0.52	0.7	3.1	13	16	12.10
2.5	1/1.78	7/0.67	0.8	3.8	18	22	7.41
4.0	-	7/0.85	0.8	4.3	24	29	4.61
6.0	-	7/1.04	0.8	5.1	31	41	3.08
10	-	7/1.35	1.0	6.5	42	55	1.83
16	-	7/1.70	1.0	7.5	57	74	1.15
25	-	7/2.14	1.2	9.5	71	97	0.727
35	-	7/2.50	1.2	10.5	91	119	0.524
50	-	19/1.78	1.4	12.5	120	145	0.387

**Note :** Supplied in 100 metre lengths In attractive packaging. Generally as per IS:694.

\* The number and diameter of conductor strands are for reference only. Conductor resistance as per IS: 8130 is the governing criteria.

Multicore Round FR PVC Insulated Copper Conductor and Sheathed Black Cables in Voltage Grade upto and including 1100v												
Nominal Cross. Sectional area of Conductor	Number/ Nom. Dia of cond. Strands*	Thickness of Insulation (Nom)	Nominal Thickness of sheath			Appx. Overall diameter			Current Rating AC	Voltage Drop/ Amp/Meter		Resistance Max. per km @20°C
			Two Core	Three Core	Four Core	Two Core	Three Core	Four Core		DC or 1Ø AC	3.Ø AC	
mm <sup>2</sup>	mm	mm	mm	mm	mm	mm	mm	mm	Amps	mv	mv	Ohms
0.5	16/0.20	0.6	0.9	0.9	0.9	6.2	6.6	7.2	4	83	72	39.0
0.75	24/0.20	0.6	0.9	0.9	0.9	6.5	6.9	7.6	7	56	48	26.0
1.0	14/0.30	0.6	0.9	0.9	0.9	6.9	7.3	8.2	11	43	37	19.5
1.5	22/0.30	0.6	0.9	0.9	1.0	7.6	8.2	9.3	15	31	26	13.3
2.5	36/0.30	0.7	1.0	1.0	1.0	9.0	9.6	10.5	20	18	16	7.98
4.0	56/0.30	0.8	1.0	1.0	1.0	10.3	10.9	12.3	26	11	9.6	4.95

**Note :** The maximum diameter of the cable has been denominated to facilitate correct selection of duct for cable laying purpose. The actual diameter may vary by ±3 mm

**Note :** Supplied in 100 metre lengths. Any colour on specific request can be supplied.


\* The number and diameter of conductor strands are for reference only. Conductor resistance as per IS: 8130 is the governing criteria.

# Flame Retardant (FR) PVC Wires & Cables

Multicore FR PVC Insulated Copper Conductor and Sheathed Black Cables for Fixed Wiring in Voltage Grade upto and including 1100v (2 Core, 3 Core, 4 Core Cables)												
Nominal Cross Sectional area of cond.	Number/ Nom. Dia of cond. Strands*	Thickness of Insulation (Nom)	Nominal Thickness of sheath			Overall diameter (Max)			Current Rating	Voltage Drop /Amp/Meter		Resistance Max. Per km @20 deg. C
			Two Core	Three Core	Four Core	Two Core	Three Core	Four Core		DC or 3Ø	1Ø AC Ac	
mm <sup>2</sup>	mm	mm	mm	mm	mm	mm	mm	mm	Amps	mv	mv	Ohms
1	7/0.43	0.6	0.9	0.9	0.9	8.2	8.6	9.2	11	42	37	18.1
1.5	7/0.52	0.6	0.9	0.9	0.9	8.8	9.2	10	15	28	24	12.1
2.5	7/0.67	0.7	1	1	1	10.5	11	12	20	17	15	7.41
4	7/0.85	0.8	1.1	1.1	1.1	12	13	14	26	11	9.2	4.61
6	7/1.04	0.8	1.1	1.1	1.2	13.5	14.5	15.5	31	7.1	6.2	3.08
10	7/1.35	1.0	1.2	1.2	1.3	16.5	17.5	19.5	42	4.2	3.7	1.83
16	7/1.70	1.0	1.3	1.3	1.4	19	20	22.5	57	2.7	2.3	1.15
25	7/2.14	1.2	1.5	1.5	1.6	23	24.5	27.5	71	1.7	1.5	0.727
35	7/2.50	1.2	1.6	1.6	1.7	25.5	27.5	30.5	91	1.3	1.1	0.524
50	19/1.78	1.4	1.7	1.7	1.8	29.5	31.5	35	120	0.97	0.84	0.387

**Note :** Supplied in 100 metre lengths. Any colour on specific request can be supplied.

\* The number and diameter of conductor strands are for reference only. Conductor resistance as per IS:8130 is the governing criteria.

 Equivalent Sizes of Conductors in Wires					
Area sq. mm.	CONSTRUCTION OF CONDUCTORS				No. /SWG
	No. of strands / size of each strand (mm)				
1.0	14/0.3	32/0.2	1/1.13	7/0.43	3/22
1.5	22/0.3	48/0.2	1/1.38	7/0.52	3/20
2.5	36/0.3	80/0.2	1/1.78	7/0.67	7/22
4.0	-	56/0.3	-	7/0.85	7/20
6.0	-	85/0.3	-	7/1.04	7/18

**Note :** The above sizes are for comparison only. The current carrying capacities and resistance shall be different for which data is available on request and shall be the selection criteria.

<b>Specifications For Wires &amp; Cables Covered Under IS : 694</b>			
<b>Construction of Conductor</b>			
Nominal Cross-Sectional Area		Solid / Stranded	Flexibility Class
Copper mm <sup>2</sup>	Aluminium mm <sup>2</sup>		
Up to and including 6 mm <sup>2</sup>	Up to and including 10 mm <sup>2</sup>	Solid / Stranded	Class/1 or Class/2 of IS 8130 : 1984
Above 6 mm <sup>2</sup>	Above 10 mm <sup>2</sup>	Stranded	Class 2 of IS 8130 : 1984

<b>Single Core PVC Insulated Unsheathed Cables</b>					
Nominal Cross Sectional Area of Conductor mm <sup>2</sup>	Nominal Thickness of Insulation mm	Overall Diameter Max. mm	Nominal Cross-Sectional Area of Conductor mm <sup>2</sup>	Nominal Thickness of Insulation mm	Overall Diameter Max mm
1*	0.7	3.2	70	1.4	15.0
1.5	0.7	3.4	95	1.6	17.5
2.5	0.8	4.2	120	1.6	19.0
4	0.8	4.8	150	1.8	21.0
6	0.8	5.6	185	2.0	23.5
10	1.0	7.0	240	2.2	26.5
16	1.0	8.2	300	2.4	29.5
25	1.2	10.0	400	2.6	33.5
35	1.2	11.5	500	2.8	37.5
50	1.4	13.0	630	2.8	42.5

\* For Copper Conductors Only

<b>Flexible PVC Insulated Unsheathed Cords</b>				
Nominal Cross Sectional Area of Conductor mm <sup>2</sup>	Nominal Thickness of Insulation mm	Overall Dimensions, Max		
		Single Core mm	Parallel Twin mm	Twisted Twin mm
0.5	0.6	2.6	2.6 x 5.2	5.2
0.75	0.6	2.8	2.8 x 5.6	5.6
1	0.6	3.0	3.0 x 6.0	6.0
1.5	0.6	3.3	3.3 x 6.6	6.6
2.5	0.7	4.0	4.0 x 8.0	8.0
4	0.8	4.8	4.8 x 9.6	9.6

<b>Single Core Unsheathed Flexible Cables</b>		
Nominal Cross-Sectional Area of Conductor mm <sup>2</sup>	Nominal Thickness of Insulation mm	Overall Diameter Max mm
6	0.8	6.4
10	1.0	8.0
16	1.0	9.6
25	1.2	11.5
35	1.2	13.0
50	1.4	15.0

PVC Insulated Sheathed Cables													
Nominal Cross Sectional Area of Conductor mm <sup>2</sup>	Nominal Thickness of Insulation mm	Nominal Thickness of Sheath				Nominal Cross-Sectional Area of ECC mm <sup>2</sup>	Overall Dimensions Max.						
		Single Core mm	Twin Core mm	Three Core mm	Four Core mm		Single Core mm	Twin Core Circular mm	Three Core Circular mm	Four Core Circular mm	Flat twin Core With Out ECC mm	Flat Twin Core With ECC mm	Flat Three Core With Out ECC mm
1*	0.6	0.8	0.9	0.9	0.9	1.0	4.7	8.2	8.6	9.2	7.8 x 5.0	9.2 x 5.0	10.5 x 5.0
1.5	0.6	0.8	0.9	0.9	0.9	1.5	5.0	8.8	9.2	10.0	8.4 x 5.4	10.2 x 5.4	11.5 x 5.4
2.5	0.7	0.8	1.0	1.0	1.0	1.5	5.8	10.5	11.0	12.0	10.0 x 6.4	12.0 x 6.4	14.0 x 6.4
4	0.8	0.9	1.0	1.1	1.1	1.5	6.8	12.0	13.0	14.0	11.5 x 7.2	13.5 x 7.2	16.5 x 7.2
6	0.8	0.9	1.1	1.1	1.2	2.5	7.8	13.5	14.5	15.5	13.0 x 8.0	15.5 x 8.0	18.0 x 8.0
10	1.0	0.9	1.2	1.2	1.3	4.0	8.8	16.5	17.5	19.5	16.0 x 9.6	19.0 x 9.6	22.5 x 9.6
16	1.0	1.0	1.3	1.3	1.4	6.0	10.5	19.0	20.0	22.5	18.5 x 11.0	22.0 x 11.0	26.5 x 11.0
25	1.2	1.1	1.4	1.5	1.6	–	12.5	23.0	24.5	27.5	22.5 x 13.0	–	32.5 x 13.0
35	1.2	1.1	1.5	1.6	1.7	–	13.5	25.5	27.5	30.5	25.5 x 14.5	–	36.0 x 15.0
50	1.4	1.2	1.6	1.7	1.8	–	15.5	29.5	31.5	35.0	29.0 x 16.5	–	41.5 x 17.0


\* For Copper Conductors Only

Flexible PVC Insulated and Sheathed Cords												
Nominal Cross Sectional Area of Conductor mm <sup>2</sup>	Nominal Thickness of Insulation mm	Nominal Thickness of Sheath					Nominal Thickness of Sheath					
		Single Core	Two Core	Three Core	Four Core	Five Core	Single Core	Flat Twin	Circular Twin	Three Core Circular	Four Core Circular	Five Core Circular
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0.5	0.6	0.9	0.9	0.9	0.9	0.9	4.5	4.9 x 7.2	7.2	7.6	8.2	9.0
0.75	0.6	0.9	0.9	0.9	0.9	0.9	4.7	5.2 x 7.8	7.8	8.2	8.8	9.6
1	0.6	0.9	0.9	0.9	0.9	1.0	4.9	5.4 x 8.0	8.0	8.6	9.4	10.5
1.5	0.6	0.9	0.9	0.9	1.0	1.0	5.4	5.6 x 8.6	8.6	9.2	10.5	11.0
2.5	0.7	1.0	1.0	1.0	1.0	1.0	6.2	6.6 x 10.5	10.5	11.0	12.0	13.0
4	0.8	1.0	1.0	1.0	1.0	1.1	7.0	7.4 x 12.0	12.0	12.5	14.0	15.5


## FRLS Wires (flame Retardant Low Smoke)


FRLS wires are recommended for use in Fire Prone Zones and locations where the Possibilities of Short Circuit, Peep of Flames occur. The hazards of electrical fires are primarily:

- #1. Thick smoke barring vision.
- #2. Strong pungent gas release choking eyes and lungs.
- #3. The burning fire itself.

 FRLS wires are made from specially formulated & compounded PVC Polymers that restrict the toxic gases and smoke as they are self extinguishing and do not allow the fire to spread.

FRLS wires find most use in multistoried buildings, hotels, benquets, heavily equipped shops and commercial offices, hospitals and industrial control rooms with cluttered panels, instruments and areas where safety is the primary concern.

 continuous R&D supported by most modern testing facilities ensure the actual properties of flame retardancy, low smoke and halogen free in our FRLS wires.

 <b>WIRES - Comparative Properties</b>						
S.No.	Feature	Conventional Wire	Heat Resistant HR	Special Range		Zero Halogen Low Smoke OHLS
				Flame Retardant FR	Flame Retardant Low Smoke FRLS	
1.	Insulation Material	PVC	PVC	Spl. PVC	Spl. PVC	Spl. Polymer
2.	Insulation Property	Good	Good	Good	Good	Very Good
3.	Temperature Rating	70 Deg'C	85 Deg'C	70 Deg'C	70 Deg'C	105 Deg'c
4.	Thermal Stability	Good	Very Good	Good	Good	Very Good
5.	Flame Retardancy	Good	Good	Very Good	Very Good	Excellent
6.	Safety during Burning	Average	Average	Good	Good	Excellent
7.	Requirements of oxygen to catch fire (%)	NA	NA	>29 Good	>29 Good	>32 Very Good
8.	Temperature Index	NA	NA	>250 Deg'C Very Good	>250 Deg'C Very Good	>300 Deg' C Excellent
9.	Visibility during Cable Burning (%)	NA	NA	NA	>40 Good	> 80 Excellent
10.	Release of Halogen Gas During Burning (%)	NA	NA	NA	> 20 Good	Zero Excellent
11.	Abraslon Resistance During Installation	Good	Good	Good	Good	Good

# Co-Axial TV Cables

## Application

Used in cable TV operations, Computer net working etc.

## Construction

Solid annealed bare copper conductor polyethylene insulated shielded with polyester backed aluminium tape and additional shielding with fine tinned copper braid protected with polyester tape wrapping and sheathed with PVC.

## Design / Material Options

Conductor : 0.7/0.9/1.0/1.15/1.6mm

## Important Parameters

	Dielectric	
	Solid PE	Foam PE
Impedance	75 ± 3ohms	75 ± 3ohms
Capacitance	67 pf/metre	53 pf/metre
Velocity of propagation	66%	80%

## Salient Features for Co-Axial Cables.

1. Polyester backed aluminium tape shielding is done with 100% Coverage and additional layer of shielding is provided with fine tinned copper braid. This ensures high quality in the reception and transmission of signals.
2. Manufacturing is done on automatic modern machines and under precisely controlled conditions such that in usage losses are kept at lowest possible.
3. For lower values of Capacitance and attenuation

Technical Data									
S.NO.	TYPE/PARAMETER	RG 59		RG 6		RG 8		RG 9	RG 11
		SOLID	FOAM	SOLID	FOAM	SOLID	FOAM	SOLID	FOAM
1.	<b>Conductor</b> (a) Material (b) Diameter (mm)	Annealed Bare Electrolytic Copper							
		0.7	0.7	0.9	0.9	1.01	1.01	1.15	1.62
2.	<b>Dielectric</b> (a) Material (b) Dia Over Dielectric (mm)	Polyethylene - Natural							
		4.0	4.0	4.6	5.6	5.1	5.6	6.0	7.6
3.	<b>Screen</b> (a) Primary Shield (b) Secondary Shield	<b>Double Screened</b> Polyester Laminated Aluminium Tape With 100% Coverage Electrolytic Tinned Copper Fine Wire Braid							
4.	<b>Protective Tape</b>	Polyester Tape Between Screen And Sheath							
5.	<b>Outer Sheath</b> Material	Pvc Type St-1 (black Colour)							
6.	<b>Overall Diameter (mm)</b>	6.2	6.2	7.0	7.5	7.7	8.3	8.7	10.5
7.	<b>Mechanical Characteristics</b> (a) Temperature Range (b) Bending Radius "n D"	Minus 10 Deg C To 50 Deg C							
		35	35	40	40	45	45	50	55
8.	<b>Packing</b>	Coils of 100 / 305 Metres							
9.	<b>Electrical Parameters</b> (a) Impedance Ohms (b) Conductor Dc Resistance Ohms/km At 20 Deg C (c) Capacitance Pf/metre (d) Velocity Of Propagation % (e) Attenuation Db / 100 Yds at 100 MHz at 200 MHz at 300 MHz at 500 MHz	75 46 67 66 8 12 16 21	75 46 53 80 6 12 16 21	75 28 67 66 6 10 14 19	75 28 53 80 5 9 12 16	75 22 67 66 5 9 12 16	75 22 53 80 4.5 8 11 15	75 17 67 66 4 8 11 15	75 8.8 53 80 3.5 6 8 11

All The Parameters Indicated Above are at 20° C Lab Test Conditions and are Subject to Variation

### Application

Cables used for Indoor Telephones, Telephone Exchanges, Satellite Telecommunication Systems, Industrial Plant Communication Systems, EPBAX Systems, Closed Circuit Security Systems, In-House Telephone wiring and various other equipments involving telephones.

### Standard

Cables are generally made as per TEC. specification No.G/WIR-06/02 or as per customer specification.

### Construction

Solid annealed tinned/bare copper conductor. PVC insulated cores suitably colour coded for distinct identification, twisted to form pairs, laid up\* PVC sheathed. Armoured Cables are provided with Galvanised steel wire/strip armouring and then sheathed again with PVC.

### Salient Features for Telephone Cable

1. Hard grade PVC insulation is used for long life and stable properties of cables.
2. Staggered lays of twisted pairs are used to ensure minimum cross talk.
3. Sizing and processing of conductor and insulated cores is done in precisely controlled manner on automatic modern machines to have optimum values of capacitance, capacitance Unbalance, image and cross talk attenuation and characteristic impedance.
4. Shielding is done to protect from outside / inter pair interference as per specific needs.

### Design / Material Options

Conductor	: Tinned copper / Bare copper
Insulation	: PVC / HR PVC / Polyethylene
Shielding	: Over all shielded / Individual pair shielded and over all shielded with polyester backed aluminium tape or fine copper wire braid.
Sheathing	: PVC / HR PVC / FR PVC / FRLS PVC / Polyethylene
Conductor size	: 0.4 / 0.5 / 0.6 / 0.7 / 0.8 / 0.9mm
Cable Configuration	: 1-p, 2-p, 3-p, 4-p, 5-p, 10-p, 20-p, 50-p, 100-p upto 200-p

### Buyers

BSNL. C. DOT, Switching equipment manufacturers contractors of BSNL and C. DOT, every industrial and commercial establishment, construction industry and many more beside the general dealer market.

# PVC Insulated Flexible Cables And Cords



**TABLE 1 : ELEKTRON PVC Insulated Flexible Single and Multicore Cable with Bright Annealed Copped Conductor Insulated with High Quality PVC Compound and / or PVC Sheathed - 1100V, Grade (Resistant to Oil, Water Petrol, Acid and Grease etc.) as per IS:694/1990**

Conductor			Current Rating*		Insulation	Sheath Thickness					Overall Diameter					
Nominal Cross Sectional Area	Diameter	Max. Resistance at 20°C	Bunched & Clipped direct to Enclosed in Surface on a Cable Couduit or Tray Bunched or Trunking unenclosed		Nominal Thickness 1cr to 37 cr	Nominal (mm)					Maximum (mm)					
			Cables, Single Phase AC or DC			1 cr	2 cr	3 cr	4 cr	5 cr	SCUNSH	SCSH	2 cr	3 cr	4 cr	5 cr
MM <sup>2</sup>	(mm)	(ohms/km)	Amps	Amps	(mm)	1 cr	2 cr	3 cr	4 cr	5 cr	SCUNSH	SCSH	2 cr	3 cr	4 cr	5 cr
0.50	0.940	39.00	-	4	0.60	0.90	0.90	0.90	0.90	0.90	2.6	4.5	7.2	7.6	8.2	9.0
0.75	1.200	26.00	-	7	0.60	0.90	0.90	0.90	0.90	0.90	2.8	4.7	7.8	8.2	8.8	9.6
1.00	1.340	19.50.	11	12	0.60	0.90	0.90	0.90	0.90	0.90	3.0	4.9	8.0	8.6	9.4	10.5
1.50	1.605	13.30	13	16	0.60	0.90	0.90	0.90	1.00	1.00	3.8	5.4	8.6	9.2	10.5	11.0
2.50	2.100	7.98	18	22	0.70	1.00	1.00	1.00	1.00	1.00	4.0	6.2	10.5	11.0	12.0	13.0
4.00	2.610	4.95	24	29	0.80	1.00	1.00	1.00	1.00	1.00	4.8	7.0	12.0	12.5	14.0	15.5

**TABLE - 2 ELEKTRON Multicore Flexible Cables - 1100V (6 Core To 37 Cores) Generally As Per IS:694/1990**

CORES	Sheath Thickness/ Apprx. Overall Diameter	SIZES					
		0.5 mm <sup>2</sup>	0.75 mm <sup>2</sup>	1.00 mm <sup>2</sup>	1.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>	4.0 mm <sup>2</sup>
6	Sheath Thickness (mm)	0.90	1.00	1.00	1.00	1.10	1.20
	Overall Diameter (mm)	8.95	9.90	10.35	11.10	13.40	15.70
7	Sheath Thickness (mm)	0.90	1.00	1.00	1.00	1.10	1.20
	Overall Diameter (mm)	8.95	9.90	10.35	11.10	13.40	15.70
8	Sheath Thickness (mm)	1.00	1.00	1.00	1.10	1.20	1.30
	Overall Diameter (mm)	9.65	10.50	10.95	12.00	14.45	16.90
10	Sheath Thickness (mm)	1.00	1.10	1.10	1.10	1.30	1.40
	Overall Diameter (mm)	11.45	12.65	13.25	14.25	17.45	20.45
12	Sheath Thickness (mm)	1.00	1.10	1.10	1.10	1.30	1.40
	Overall Diameter (mm)	11.80	13.05	13.65	14.70	18.00	21.10
14	Sheath Thickness (mm)	1.10	1.10	1.10	1.20	1.30	1.40
	Overall Diameter (mm)	12.65	13.75	14.40	15.70	19.0	22.30
16	Sheath Thickness (mm)	1.10	1.20	1.20	1.20	1.40	1.50
	Overall Diameter (mm)	13.40	14.80	15.50	16.65	20.35	23.85
19	Sheath Thickness (mm)	1.10	1.20	1.30	1.30	1.40	1.50
	Overall Diameter (mm)	14.20	15.65	16.60	17.85	21.55	25.25
24	Sheath Thickness (mm)	1.10	1.20	1.30	1.30	1.30	1.50
	Overall Diameter (mm)	17.50	19.50	20.60	22.00	27.00	29.40
30	Sheath Thickness (mm)	1.20	1.20	1.30	1.30	1.30	1.50
	Overall Diameter (mm)	18.50	20.50	21.70	23.00	28.40	33.10
37	Sheath Thickness (mm)	1.30	1.30	1.40	1.40	1.40	1.60
	Overall Diameter (mm)	20.20	22.50	23.70	25.75	30.80	36.20

Note : Nominal Thickness of Insulation will be as per Table : 1

**TABLE - 3 ELEKTRON Sheathed Heavy Duty Multicore Flexible Cables 1100 V Grade Generally As Per IS:694/1990**

CONDUCTOR		INSULATION	Thickness of Sheath			Overall Diameter Max.			Current Rating
Nominal Cross Sectional Area	Max. Resistance at 20°C		Nominal Thickness				(mm)		
MM <sup>2</sup>	(ohms/km)	(mm)		2 Core	3 Core	4 Core	2 Core	3 Core	4 Core
6.0	3.30	0.80	1.10	1.10	1.20	12.9	13.80	16.00	31
10.0	1.91	1.00	1.20	1.20	1.30	16.0	17.10	19.10	42
16.0	1.21	1.00	1.30	1.30	1.50	18.7	20.00	22.50	57
25.0	0.780	1.20	1.40	1.50	1.60	22.7	24.50	27.00	71
35.0	0.554	1.20	1.50	1.60	1.70	25.7	27.60	30.80	91
50.0	0.386	1.40	1.60	1.70	1.80	30.3	32.40	36.50	120
70.0	0.272	1.40	1.80	1.80	1.90	35.0	38.00	42.00	165
95.0	0.206	1.60	2.00	2.10	2.20	40.0	43.50	48.00	200
120.0	0.161	1.60	2.00	2.10	2.20	49.8	49.50	54.90	225

All information given here is in good faith. ELEKTRON Cables shall not be liable for any damages arising out of incorrect application or interpretation.

**ELEKTRON** PVC Insulated Single Core Unsheathed Copper Conductor  
Heavy Duty Flexible Cables in 1100 volts Grade. As Per IS: 694:1990

Nominal Cross Sectional Area	No./Dia of Strands	Nominal Thickness of Insulation	Overall Diameter Max.	Max. Conductor Resistance	Current Rating
mm <sup>2</sup>	mm	mm	mm	Ohms/km	Amp.
0.50	16/0.20	0.60	2.60	39.00	4
0.75	24/0.20	0.60	2.80	26.00	7
1.00	14/0.30	0.60	3.00	19.50	12
1.50	22/0.30	0.60	3.40	13.30	16
2.50	36/0.30	0.70	4.20	7.98	22
4.00	56/0.30	0.80	4.80	4.95	29
6.00	85/0.30	0.80	5.60	3.30	37
10.00	140/0.30	1.00	7.00	1.91	51
16.00	226/0.30	1.00	8.20	1.21	68
25.00	157/0.45	1.20	10.00	0.780	86
35.00	220/0.45	1.20	11.50	0.554	110
50.00	314/0.45	1.40	13.00	0.386	145
70.00	360/0.50	1.40	15.50	0.272	170
95.00	485/0.50	1.60	18.50	0.206	210
120.00	608/0.50	1.60	20.90	0.161	235
150.00	750/0.50	1.80	22.50	0.129	295
185.00	925/0.50	2.00	24.60	0.106	330
240.00	1221/0.50	2.20	27.60	0.0801	400
300.00	1527/0.50	2.40	32.20	0.0641	475
400.00	2036/0.50	2.60	35.70	0.0486	550

**ELEKTRON House Wiring & Industrial Wiring Cables (conventional Sizes)  
Conforming To BS:2004/1961 Or Latest**

**Single Core nonsheathed Cables 250/440V grade & 660/1100V grade Cables**

Specification : BS:2004/1961 or latest.  
 Conductor : Plain annealed Electrolytic Copper Conductor  
 Insulation : PVC Type 1 of BS : 2746 (General Purpose)  
 Colour code : Red, Blue, Yellow, Black or Grey

Nominal Area of Conductor	Number & diameter of Wires	250/440 Volts Grade		660/1100Volts Grade	
		Radial thickness of Insulation	Overall diameter*	Radial thickness of Insulation	Overall diameter*
Inches <sup>2</sup>	(inch)	(inch)	(inch)	(inch)	(inch)
0.0015	1/0.044	0.035	0.119	0.045	0.139
0.002	3/0.029	0.035	0.135	0.045	0.157
0.003	3/0.036	0.035	0.153	0.045	0.173
0.0045	7/0.029	0.035	0.162	0.045	0.182
0.007	7/0.036	0.040	0.193	0.050	0.213
0.01	7/0.044	0.040	0.217	0.050	0.237
0.0145	7/0.052	0.040	0.241	0.050	0.261
0.0225	7/0.064	0.040	0.277	0.050	0.297
0.03	19/0.044	0.045	0.315	0.050	0.325
0.04	19/0.052	—	—	0.050	0.365
0.06	19/0.064	—	—	0.050	0.425
0.1	19/0.083	—	—	0.055	0.535
0.15	37/0.072	—	—	0.060	0.634
0.20	37/0.083	—	—	0.065	0.721
0.30	37/0.103	—	—	0.075	0.881
0.40	61/0.093	—	—	0.085	1.017
0.50	61/0.103	—	—	0.095	1.127
0.75	91/0.103	—	—	0.105	1.353
1.0	127/0.103	—	—	0.110	1.574

\*Note : The Overall diameter is subject to the tolerance as per BS : 2004/1961.

**ELEKTRON Single Core Sheathed Cables 250/440V grade & 660/1100V grade**

Specification : BS:2004/1961 or latest.  
 Conductor : Plain annealed High Conductivity Copper Conductor  
 Insulation : PVC Type 1 of BS : 2746 (General Purpose)  
 Sheath : PVC Type 6 of BS : 2746 (General Purpose)  
 Colour code : Red or Black  
 Colour of Sheath : Grey / White / Black

Nominal Area of Conductor	Number & diameter of Wires	250/440 Volts Grade			660/1100 Volts Grade		
		Radial thickness of Insulation	Radial thickness of Sheath	Overall Dimensions	Radial thickness of Insulation	Radial thickness of Sheath	Overall Dimensions
Inches <sup>2</sup>	(inch)	Inch	Inch	Inch	Inch	Inch	Inch
0.0015	1/0.044	0.025	0.035	0.169	0.035	0.035	0.189
0.002	3/0.029	0.025	0.035	0.187	0.035	0.035	0.207
0.003	3/0.036	0.025	0.035	0.203	0.035	0.035	0.223
0.0045	7/0.029	0.025	0.035	0.212	0.035	0.035	0.232
0.007	7/0.036	0.030	0.035	0.243	0.040	0.035	0.263
0.01	7/0.044	0.030	0.035	0.267	0.040	0.035	0.287
0.0145	7/0.052	0.035	0.035	0.301	0.040	0.035	0.311
0.0225	7/0.064	0.035	0.045	0.357	0.040	0.045	0.367
0.03	19/0.044	0.040	0.045	0.395	0.045	0.045	0.405
0.04	19/0.052	0.045	0.045	0.445	0.050	0.045	0.455
0.06	19/0.064	—	—	—	0.050	0.045	0.520
0.1	19/0.083	—	—	—	0.055	0.045	0.645
0.15	37/0.072	—	—	—	0.060	0.055	0.744
0.20	37/0.083	—	—	—	0.065	0.055	0.831
0.30	37/0.103	—	—	—	0.075	0.070	1.021
0.40	61/0.093	—	—	—	0.085	0.080	1.177
0.50	61/0.103	—	—	—	0.095	0.080	1.287
0.75	91/0.103	—	—	—	0.105	0.090	1.538
1.0	127/0.103	—	—	—	0.110	0.100	1.774

**Aerial Bunched Cables for working voltage upto & including 1100 volts reference IS: 14255 - 1995**

**Phase Conductor** : Aluminium Conductor Class 2 ( Table 2) of IS: 8130-1984

**Messenger Wire** : Aluminium Alloy as per IS: 398 (PT-4)

**Insulation** : Polyethylene / XLPE compound as per IS: 14255-1995

<b>Insulation Thickness :</b>	
Nominal Cross-Sectional Area of Conductor (Sq mm)	Thickness of Insulation (mm)
16	1.2
25	1.2
35	1.2
50	1.5
70	1.5
95	1.5

<b>Description : Polyethylene / XLPE insulated cables with Aluminium conductor twisted over a central bare / insulated Aluminium Alloy Messenger Wire.</b>						
Designation of Cable	With Bare Messenger Wire		With Insulated Messenger Wire		Approx Current Carrying Capacity (Amps.)	
	Approx over all Dia (mm)	Approx Weight (kg/km)	Approx. Over all Dia (mm)	Approx. Weight (kg/km)	PE insulated	XLPE insulated
3c x 16 + 25	18	270	20	300	52	67
3c x 25 + 25	21	355	23	385	68	100
3c x 35 + 25	23	450	25	480	85	125
3c x 50 + 35	29	600	31	640	103	150
3c x 70 + 50	33	850	36	890	125	190
3c x 95 + 70	37	1130	40	1190	150	236

**Note :-** The first part of the designation refers to the number and size of phase conductor and the second to the size of messenger wire. The sizes represent the nominal cross - sectional areas in sq mm.