

PVC/XLPE  
Power &  
Control Cables



**INDO CABLE**



**Indo Alusys Industries Limited**  
SUPERIOR TECHNOLOGY - SUPERIOR SOLUTIONS



connect to experience change







## Introduction

### ABOUT US:

"Indo Alusys Industries Limited" (Formerly Mahavir Aluminum Limited) promoted by Jain Group of Industries, with Turnover nearly to INR 200 Crore and expected to touch INR 800 Crore within next two years. We are one of the leading Manufacturer of Aluminum Products having its Works strategically located at Bhiwadi incorporated in the year 1979 with the main objective to manufacture quality Aluminum Extrusions in India and augmented its diversion capacity by inducting Cable & Conductor that will manufacture LT & HT Power Cables & Overhead Power Conductors upto 61 Strands as per relevant Indian & International standards under the brand name: "**INDO CABLE**". The plant is also accredited with "ISO: 9001:2000" certification for maintaining stringent quality norms for manufacturing Cables & Conductor by KVQA Norway.

### BUSINESS VISION:

Today, the essence of being successful in any business is merely not to apprehend and fulfill the customer requirements but to undertake the job with the cost effective way and also incorporating innovative and qualitative approach for accomplishment of the desired demand of the customer with their great satisfaction. So with this motto, the group is also capable to meet every demand & challenges by way of strict quality conscious approach strengthened by our sound technocrats having experience for last two decades by setting up an enterprises to manufacture Power Transmission conductors & Distribution Conductor & Cables to cater to the needs of the core sector and we are confident to put ourself as one of the largest manufacturer and supplier of LT as well as HT Cables & Overhead Power Transmission Conductors in India. We are also aheading to diversify ourself in Power Sector stepping into the business of EPC contractors for substation & Transmission Line Works.

### OBJECTIVE & ASPIRATION:

Securing a market share did seem difficult with the competition already entrenched in the business. But the groups went ahead with a vision and an unswerving desire for the best and are convinced that offering the best technology and the services are not mere ingredients for success but a surefire way of staying in the business. So, we are moving with our Motto "Superior technology & Superior solution."

### OUR STRENGTH:

The organization was therefore structured to propagate these corporate objectives.

Quality Control, Perfection, Efficiency, Professionalism.....were not just mere buzz words but were given the sanctity of a prayer to be doggedly adhered to.

The results were there to be seen. The group has already established itself as a grand edifice. And Indo Alusys Industries Ltd. has emerged as a force to reckon with.





## Company Information

- A) Year Establishment : 1979
- B) Type Of Company : Public Limited
- C) Board of Directors  
 Managing Director : Mr. Pradeep Jain  
 Director : Mr. M.K. Doogar  
 Director : Mr. A.P. Gandhi  
 Director : Mr. S.P. Singha
- D) Our Banker's : State Bank Of Mysore  
 State Bank Of Bikaner and Jaipur  
 Development Credit Bank  
 Indusind Bank  
 Axis Bank
- E) Registered Office : 606, Tolstoy House, 15 Tolstoy Marg, New Delhi-110001
- F) Factory License No. : RJ9509
- G) Works Address : SP-2/333, Industrial Area, Bhiwadi, Dist Alwar,  
 Rajasthan, Indian
- H) Factory Area : 40 (Acre) [Cables & Conductors Plant in 5 Acre]
- I) Registration With  
 PF Regd. No. : RJ/4004/1383 (Mahavir Aluminium Limited)  
 Excise Regd. No. : AAACH5489LXd001  
 CST/VAT & TIN No. : 08860850236 (Bhiwadi)  
 Pan No. : AAACM5489L  
 IEC No. : 0592055621
- J) Man Power : Total Nos. Strength - 780  
 Managerial - 47  
 Technical People - 15  
 Engineer - 25  
 Office Staff - 68  
 Factory Work Men - 650

- K) Production Capacity for Manufacturing Range :

Total Insulated Capacity (Assorted Sizes)	KMS/Year
1.1 KV Power Cables (PVC/XLPE)	2400
1.1KV Control Cables (PVC/XLPE)	3000
Railway Quad Cables	2400
Aerial Bunched Cables	2400
AAC/ACSR/AAAC Conductors	6000 Tons

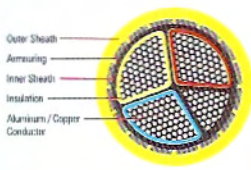
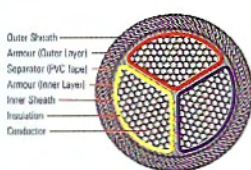
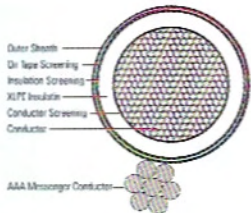
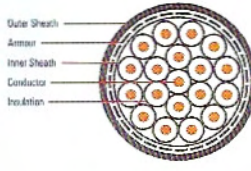
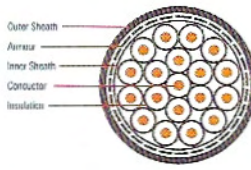
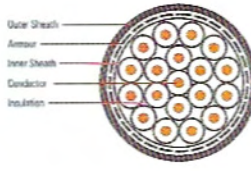
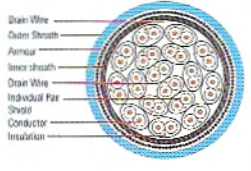
- L) BIS Licenses for Certification :

XLPE Cables	IS: 7098(Pt - I)
PVC Cables	IS: 1554 & 694 (Pt - I)
Aerial Bunch Cables	IS: 14255*
AAC/ACSR/AAAC Conductors	IS: 398 (Pt - 1,2 & 4)





## PRODUCT RANGE AT A GLANCE

Application	Type & Size	Options	Cross Sectional view
Cable for Power Supply to Residential, Commercial & Industrial Units	PVC/XLPE Power cables for 1.1 & 3.3 kv for Electrical Substations as per IS:1554 - 1 & 2 <b>Sizes:</b> Single Core 10-1000 sq. mm Multicore 1.5-630 sq. mm	<b>Conductor</b> - Straded / Solid, Circular / Shaped Aluminium / Copper <b>Insulation</b> - PVC / HR PVC <b>Inner Sheath</b> - PVC / HR PVC / FRLS PVC <b>Unarmoured / Armoured</b> - G. S. Round Wire / Flat Strip or Aluminium Wire / Flat Strip <b>Outer Sheath</b> - PVC / HR PVC / FRLS PVC	
Heavy Duty copper cables for Coal Mines	Stranded bright annealed electrolytic copper conductor, PVC / XLPE insulated / PVC sheathed upto and including 3.3 kv as per IS:1554-1 / IS:7098-1 <b>Sizes:</b> Multicore 25 to 400 sq. mm	<b>Conductor</b> - Straded / Shaped <b>Insulation</b> - PVC / XLPE <b>Inner Sheath</b> - PVC / HR PVC / FRLS <b>Unarmoured / Armoured</b> - Round Wire / Flat Strip with conductivity not less than 75% of the phase Conductor <b>Outer Sheath</b> - PVC / HR PVC / FRLS	
Aerial Bunched / Bundled required for over head power distribution	PE/XLPE insulated 1.1 kv as per IS:14255 & IS:7098-1 & IS:398(part 4)	<b>Conductor</b> - Stranded Circular compacted Aluminium <b>Insulation</b> - PE / XLPE <b>Messenger Conductor</b> - All Aluminium Alloy-Bare / Insulated <b>Street Light Cond.</b> - Stranded Circular Compacted Aluminium. Bare / Insulated	
Copper control Cables for Power Switch yard Control / Relay Equipment	Annealed electrolytic copper conductor, PVC / XLPE insulated, PVC sheathed 650 / 1100V grade as per IS:1554-1 / IS:7098-1 <b>Sizes:</b> 1.5 / 2.5 sq. mm upto 61 core 4 & 6 sq. mm upto 4 core	<b>Conductor</b> - Solid / Stranded. Plain / Tinned <b>Insulation</b> - PVC / HR PVC / XLPE <b>Inner Sheath</b> - PVC / HR PVC / FRLS / Zero Halogen <b>Additional Option:</b> Overall shielding with aluminium mylar tape with 100% coverage & 25% overlap on laid up cores for static noise rejection	
Railway Signaling Cables	Annealed Bare Copper conductor, PVC insulated core laid up PVC sheath as per IRS-S-63/89 RDSO & related specifications <b>Sizes:</b> 1.5 / 2.5 sq. mm upto 61 core 4 & 6 sq. mm upto 4 core	<b>Screened / Unscreened</b> - Aluminium mylar tape <b>Unarmoured / Armoured</b> - G. S. Round Wire / Flat Strip / Galvanised Tape <b>Additional Option:</b> <b>Insulated / Inner / Outer Sheath</b> - PVC <b>Inner / Outer sheath</b> - PVC	
Railway Quad Cable (AXLE Counter Cable)	Annealed Bar Copper Conductor PE Insulated Alu Screened PE Sheathed Cable as per spec IRS-TC-30170 <b>Sizes:</b> 0.9 mm / 1.4 mm 4 Quad & 6 Quad Cable	Aluminium mylar Tape Armoured / Umarmoured Al Screened Wire / Strip	
Instrumentation Signal Cables for Process control & Instrumentation	PVC Sheathes 225 / 650 / 1100 V grade cables as per BS: 5308 / DIN VDE 0815 & 816 / IS: 1554 / IEC: 189 <b>Sizes:</b> 0.5 / 0.75 / 1.0 / 1.5 sq.mm	<b>Conductor</b> - Straded / Solid, plain / tinned <b>Insulation</b> - PVC / HR PVC / PE / Zero Halogen <b>Shielding</b> - Individual Pair / over all pairs <b>Drain Wire</b> - Solid / Stranded <b>Inner Sheath</b> - PVC / HR PVC / Zero Halogen <b>Unarmoured / Armoured</b> - G. S. Round Wire / Flat Strip <b>Outer Sheath</b> - PVC / HR PVC / FRLS PVC / Zero Halogen	



## OUR PRIME MARKET SEGMENT



- Airports
- Automobile Industry
- Building & Construction Industry
  - Cement Industries
- Chemical & Process Industries
  - DGS&D
- Electronic Industries
- Fertiliser Industries
  - Hospitals
- Hotels, Real Estate
- Hydro Power Generation
- Information Technology Industries
  - Mining
- Machine Building Industries
- Nuclear Power Generation
- Ordnance Factories & Defence Installations
  - Port Trust of India
- Petroleum Refineries & Port Terminals
- Petrochemical Industries / LPG Plants
- Power Electricity Distribution Industries
  - Railways
- Shipping & Marine Industries
  - Space Technology
- Steel Plants & Industries
  - Textile Industries
- Thermal Power Generation
- Turnkey Electrical Contractors
- State Electricity Board / Utilities







XLPE/PVC Insulated Power & Control Cables of "INDO CABLE" brand of voltage grade 650/1100 Volts provided with ISI marking against IS:7098, IS:1554 & IS:694 (for flexible) are regularly manufactured following stringent quality checks at all stages by sophisticated testing & measuring equipments in its modern state-of-art located at Bhiwadi meeting huge demand in areas of Power Transmission & Distribution, Control Circuits in Power plants and other industrial installation and signaling network of Railways with or without FR/FRLS properties including House/Industrial wiring.

### **LT XLPE Cables**

Offering a wide gamut of LT XLPE cables of assorted Sizes & type are light in weight and carry higher current capacity. They are capable to withstand short circuit temperature and emergency overload. These cables consist of carbon and hydrogen compounds, which essentially contain low density polyethylene molecules in the form of long flexible chains. On cross-linking, slippage between flexible chains can be prevented. Cross-linked polyethylene (XLPE) is a thermosetting compound. It softens at the melting point of polyethylene (85°C to 115°C) and assumes an elastic rubber like consistency, a property that it retains during further rise of temperature until it becomes carbonized without melting at 250°C to 300°C. All this strengthens LT XLPE cables against stress cracking and gives them a greater resistance to fight ageing in hot air.



### **Constructional overview of XLPE Cables**

#### **Conductor**

Conductors are made from electrolytic grade aluminum/copper conforming to IS:8130, and are compact circular or compact shaped.

#### **Insulation**

INDO CABLE XLPE cables are specially made of high grade crosslinked polyethylene for insulation by extrusion process.

#### **Core Identification**

Different colours identify the cores:

Single core	Black
Two Core	Red & Black
Three Core	Red, Yellow & Blue
Four Core	Red, Yellow, Blue & Black
Three and half Core	Red, Yellow, Blue and reduced neutral core in Black

#### **Laying up**

In multi-core cables, cores are laid up as per the above colour scheme, interstices are filled wherever necessary to make the laid up cores circular.

#### **Inner Sheath**

Laid up cores are bedded over with thermoplastic material for protection against mechanical and electrical damage.





## Armoring

Armoring is provided over the inner sheath to guard against mechanical damage. Armoring is generally of galvanized steel wires or strips (In single core cables used in AC system armoring is by non-magnetic hard aluminum wires/strips). Round steel wires are used where the diameter over the inner sheath does not exceed 13mm, above 13mm, flat steel strip armor is used. Round wire of different sizes can be provided against specific request.

## Outer Sheath

Specially formulated heat resistant black PVC compound conforming to the requirement of type SF-2 of IS:5831-1984, extruded to form the outer sheath. INDO CABLE XLPE offers a specially formulated Flame Retardant Low Smoke Compound (FRLS) for outer sheath used in fire hazardous environment.

## Tests

In addition to all tests as required by IS:7098 Part-1, INDO CABLE XLPE Cables are subjected to a number of in-house tests at every stage of production. Incoming raw material is also tested thoroughly to ensure consistency of quality.

## Advantages & Properties that's makes this LI XLPE Cables most preferable over conventional PVC Cables.

- LI-XLPE Cables have longer life as compared to conventional PVC Cables.
- LI-XLPE Cables have higher conductor temperature rating i.e. 90°C as against 70°C of PVC and hence higher current rating.
- LI-XLPE Cables have higher emergency overload capacity than PVC Cables (upto 60%).
- Max. temperature limit under short circuit conditions for LI-XLPE Cables is 250°C as against 160°C for PVC Cables. Hence XLPE cables have higher short circuit rating.
- The moisture resistance of LI-XLPE Cables is nearly 100 times that of PVC.
- Insulation resistance of LI-XLPE Cables is very high as compared to PVC Cables.
- LI-XLPE Cables have high corrosion resistance in polluted atmosphere as compared to PVC Cables.
- LI-XLPE Cables have better properties of resistance to chemical and corrosive gases.
- LI-XLPE Cables have low installation cost because of light weight, dimensions and are far more flexible.
- LI-XLPE Cables have better properties to withstand vibrations, hot impact INDO CABLE
- Joining of LI-XLPE Cables is easier and quicker.
- LI-XLPE Cables are ideal for transmission and distribution of power.





## 1.1 KV PVC POWER CABLES

The Power Cables are used under ground as well as over head transmission of power in power plants, industries, projects, Transmission & Distribution and all other electrical systems.

Different combinations such as Aluminum, Copper conductors, round solid conductor, stranded conductors, sector shaped conductors, taped inner sheath, extruded inner sheath, Round steel and aluminium wire / Flat galvanized steel strip Armored/ unarmored, single / double outer sheathed etc are available.

Types of insulation include PVC, HR PVC, and XLPE. The inner & outer sheaths can be PVC, HR PVC, FRLS, HR FRLS or FR depending upon the application and requirement of customers.

INDO CABLE manufactures different types of cables with combinations of specifications as mentioned above as per IS 1554 Part I for cables upto 1100V.



## 1.1 KV PVC COPPER POWER & CONTROL CABLES

These cables are also used for under ground as well as over head transmission of power to the control panels in Power plants, Industries, Project and all the electrical systems

Different variations such as round solid conductor / stranded conductors, taped inner sheath / extruded inner sheath, Round steel / aluminium wire / Flat galvanized steel strip Armored/ unarmored, single / double outer sheathed etc are available. Types of insulation include PVC, HR PVC. The sheath can be PVC, HR PVC, FRLS, FR or HR-FRLS depending upon the application. INDO CABLE manufactures all above combinations as of 1.1 KV grade Control cables as per IS 1554 Part I from two cores to 61 cores in 1.5 and 2.5 sq mm sizes.

### Technical Information (1.1 KV Power Cables)

Working Voltage	Upto 1100 V
Temperature Range	-15 deg C to +70 deg C or +85 deg C in HR PVC. -15 deg C to 90 deg C for XLPE
Sizes	2.5 sq mm to 1000 sq mm in single core and upto 400 sq mm in multi core upto 4 cores
Color Codes	2 core - Red & Black 3 core - Red, Yellow, Blue 3 1/2 and 4 core - Red, Yellow, Blue & Black outer sheath Grey sheath on specific request
Specification	IS 1554- Part I cables as per BS 6346 and IEC 502 etc. can also be offered on specific enquiry
Packing	500 / 1000m on drums

### Technical Information (1.1 KV Copper Power Cables)

Working Voltage	Upto 1100 V
Temperature range	-15 deg C to +70 deg C or +85 deg C in HR PVC
Sizes	1.5, 2.5 & 4 sq mm upto 6 cores
Color codes	2 core - Red & Black 3 core - Red, Yellow, Blue 3 1/2 and 4 core - Red, Yellow, Blue & Black 5 core - Red, Yellow, Blue, Black & Grey 6 core & above - adjacent cores are blue for reference and yellow for direction in each layer Black outer sheath Grey sheath on specific request
Specification	IS 1554, Part I & II cables as per BS 6346 and IEC 502 etc. can also be made available
Packing	500 / 1000m on drums





## HEAVY DUTY ARMOURED AND UNARMOURED CABLES

Aluminium/Copper Conductor PVC Insulated, Inner Sheathed Unarmoured & PVC Sheathed Cables Confirming To IS: 1554 (Part-I) Amended Upto Date



Aluminium/Copper Conductor PVC Insulated, Inner Sheathed Armoured & PVC Sheathed Cables Confirming To IS:1554 (Part-I) Amended Upto Date



- α 1.1 Kv Single Core
- α 1.1 Kv Twin Core
- α 1.1 Kv Three Core
- α 1.1 Kv 4/0 Core
- α 1.1 Kv Four Core

### 1.1 KV Annealed 1.5 sq. mm

1.1 Kv Annealed High Conductivity Solid/Stranded Copper Conductor 1.5 Sq. Mm. PVC Insulated Inner Sheathed, Armoured/Unarmoured & PVC Sheathed Control Cables Confirming To Is: 1554 (Part -I) Amended Upto Date

### 1.1 KV Annealed 2.5 sq. mm

1.1 Kv Annealed High Conductivity Solid/Stranded Copper Conductor 2.5 Sq. Mm. PVC Insulated Inner Sheathed, Armoured/ Unarmoured & PVC Sheathed Control Cables Confirming To Is: 1554 (Part -I) Amended Upto Date



Size in sq. mm.	Conductor Construction	Max. cond. resistance in ohm / km at 20°C		Size in sq. mm.	Conductor Construction	Max. cond. resistance in ohm / km at 20°C	
		Single core	Multi core			Single core	Multi core
1.5*	1 / 1.38	11.90	12.10	120	37 / 2.03	0.150	0.153
2.5*	1 / 1.78	7.14	7.28	150	47 / 2.24	0.122	0.124
4.0*	1 / 2.24	4.47	4.56	185	37 / 2.5	0.0972	0.0991
6.0*	1 / 2.76	2.97	3.03	225	37 / 2.76	0.0789	0.0804
10	7 / 1.35	1.78	1.83	240	61 / 2.21	0.0740	0.07541
16	7 / 1.7	1.13	1.15	300	61 / 2.5	0.0590	0.0601
25	7 / 2.14	0.717	0.727	400	61 / 2.85	0.0461	0.0470
35	7 / 2.5	0.514	0.524	500	61 / 3.25	0.0366	0.0373
50	7 / 3.00 19 / 1.78	0.379	0.387	630	91 / 3.00	0.0283	0.0289
70	19 / 2.14	0.267	0.268	800	127 / 2.83	0.0221	0.0226
95	19 / 2.5	0.189	0.193	1000	127 / 3.16	0.0176	0.0179





## PVC FLEXIBLE CABLES

**INDO CABLE** Branded, PVC insulated L.T. Light Duty Cables are as per IS: 694 and are suitable for fixed wiring and flexible operations. The cables are suitable for use on AC, single phase or three phase (earthed or unearthed) system for rated voltage up to and including 1100 volts.

**CONDUCTOR:** The most acceptable metals for conductors are copper and aluminium due to their higher conductivity and ductility. As copper has got higher affinity for sculpture, it corrodes in the atmosphere where sulphur fumes are present. In these conditions tinned copper should be used.

**INSULATION:** The PVC covering over conductor is called insulation and provided by extrusion process. The insulated conductor is called a core. As per IS: 694 the insulation should be of type A PVC compound as per IS-5831 and it is suitable for 70° C continuous operation.

**LAYING UP:** In case of multicore cables the cores are laid up with suitable lay.

**SHEATH:** The PVC coating on core and on laid up cores in case of multicore cables is called SHEATH. As per IS-694 it should be of type ST-1 PVC compound as per IS-5831. It is suitable for 70° C. continuous operation.

**DELIVERY LENGTH:** The cables are generally delivered in 90 Meters coils wrapped with polyethylene and packed in card board boxes. The bigger size cables are supplied on wooden drums.







**TABLE - 1**  
1.1 KV SINGLE CORE ALUMINIUM CONDUCTOR, PVC INSULATED, HARD DRAWN ALUMINIUM  
ARMOURED / UNARMOURED CABLES CONFORMING TO IS:1554 (PART-I)

Nominal Area of conductor	UNARMOURED CABLES				ARMOURED CABLES								
	AYY				Nominal thickness of insulation	Single Layer - Wire (AYWay)				Single Layer - Strip (AYWay)			
	Nominal thickness of insulation	Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable		Nominal diameter of armour Wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
Sq. mm.	mm	mm	mm	Kg/Km	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
6	1.0	1.8	9.0	100	1.3	1.4	1.24	12.0	180	-	-	-	-
10	1.0	1.8	10.0	120	1.3	1.4	1.24	13.0	200	-	-	-	-
16	1.0	1.8	11.0	160	1.3	1.4	1.24	14.0	250	-	-	-	-
25	1.2	1.8	13.0	210	1.5	1.4	1.24	15.0	300	-	-	-	-
35	1.2	1.8	14.0	250	1.5	1.4	1.24	16.0	350	-	-	-	-
50	1.4	1.8	16.0	300	1.7	1.4	1.24	18.0	450	-	-	-	-
70	1.4	1.8	17.0	400	1.7	1.4	1.4	20.0	550	-	-	-	-
95	1.6	1.8	19.0	500	1.9	1.6	1.4	22.0	700	1.0	1.4	21.0	650
120	1.6	2.0	21.0	600	1.9	1.6	1.4	24.0	800	1.0	1.4	23.0	750
150	1.8	2.0	23.0	750	2.1	1.6	1.4	26.0	950	1.0	1.4	24.0	900
185	2.0	2.0	25.0	900	2.3	1.6	1.4	28.0	1100	1.0	1.4	27.0	1050
240	2.2	2.0	28.0	1100	2.5	1.6	1.56	32.0	1400	1.0	1.4	30.0	1300
300	2.4	2.0	30.0	1350	2.7	1.6	1.56	33.0	1650	1.0	1.56	32.0	1600
400	2.6	2.2	35.0	1700	3.0	2.0	1.56	39.0	2100	1.0	1.56	37.0	1950
500	3.0	2.2	38.0	2150	3.4	2.0	1.72	42.0	2700	1.0	1.56	40.0	2400
630	3.4	2.4	43.0	2750	3.9	2.0	1.88	48.0	3300	1.0	1.72	45.0	3100
800	3.4	2.4	48.0	3300	3.9	2.0	1.88	52.0	4000	1.0	1.88	49.0	3700
1000	3.4	2.6	52.0	4100	3.9	2.5	2.04	59.0	4900	1.0	2.04	54.60	4600

**TABLE - 2**  
1.1 KV TWO CORE ALUMINIUM CONDUCTOR, PVC INSULATED, ARMOURD / UNARMOURD  
ALUMINIUM CABLES CONFORMING TO IS : 1554 (PART-II)

Nominal Area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMOURD CABLES			ARMOURD CABLES							
			AYY			Single Layer - Wire (AYWY)				Single Layer - Strip (AYFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
Sq. mm.	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
6	1.0	0.3	1.8	17.0	300	1.4	1.24	19.0	660	-	-	-	-
10	1.0	0.3	1.8	18.0	400	1.4	1.24	20.0	750	-	-	-	-
16	1.0	0.3	1.8	17.0	330	1.6	1.4	20.0	750	0.8	1.4	18.0	580
25	1.2	0.3	2.0	19.0	450	1.6	1.4	22.0	900	0.8	1.4	20.0	700
35	1.2	0.3	2.0	21.0	550	1.6	1.4	23.0	1030	0.8	1.4	22.0	800
50	1.4	0.3	2.0	24.0	700	1.6	1.56	26.0	1300	0.8	1.4	25.0	1000
70	1.4	0.3	2.0	26.0	850	1.6	1.56	29.0	1500	0.8	1.56	27.0	1200
95	1.6	0.4	2.2	30.0	1150	2.0	1.56	33.0	2050	0.8	1.56	30.0	1550
120	1.6	0.4	2.2	32.0	1300	2.0	1.72	35.0	2400	0.8	1.56	32.0	1800
150	1.8	0.4	2.4	34.0	1600	2.0	1.72	37.0	2760	0.8	1.72	35.0	2100
185	2.0	0.5	2.4	38.0	2000	2.0	1.88	41.0	3200	0.8	1.88	38.0	2500
240	2.2	0.5	2.6	42.0	2500	2.5	2.04	47.0	4200	0.8	2.04	43.0	3100
300	2.4	0.6	2.8	46.0	3000	2.5	2.20	50.0	5000	0.8	2.20	48.0	3700
400	2.6	0.7	3.2	52.0	3800	3.15	2.52	58.0	6600	0.8	2.36	53.0	4500
500	3.0	0.7	3.4	54.0	4800	3.15	2.84	64.0	8000	0.8	2.68	56.0	5600
630	3.4	0.7	3.8	65.0	6000	4.0	3.00	72.0	11000	0.8	2.84	66.0	6900





**TABLE - 3**  
**1.1 KV THREE CORE ALUMINIUM CONDUCTOR, PVC INSULATED, ARMoured / UNARMoured**  
**ALUMINIUM CABLES CONFORMING TO IS : 1554 (PART-I)**

Nominal Area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			AYY			Single Layer - Wire (AYWY)				Single Layer - Strip (AYFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
Sq. mm.	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
6	1.0	0.3	1.8	18.0	360	1.4	1.24	19.0	700	-	-	-	-
10	1.0	0.3	1.8	19.0	460	1.4	1.4	21.0	1900	-	-	-	-
16	1.0	0.3	1.8	19.0	440	1.6	1.4	21.0	950	0.8	1.4	20.0	700
25	1.2	0.3	2.0	22.0	620	1.6	1.4	23.0	1100	0.8	1.4	23.0	900
35	1.2	0.3	2.0	24.0	740	1.6	1.4	26.0	1300	0.8	1.4	24.0	1000
50	1.4	0.3	2.0	27.0	940	1.6	1.56	29.0	1600	0.8	1.56	27.0	1300
70	1.4	0.4	2.2	30.0	1200	2.0	1.56	33.0	2150	0.8	1.56	31.0	1600
95	1.6	0.4	2.2	34.0	1600	2.0	1.72	37.0	2650	0.8	1.56	35.0	2000
120	1.6	0.4	2.2	37.0	1900	2.0	1.72	39.0	3000	0.8	1.72	37.0	2401
150	1.8	0.5	2.4	40.0	2300	2.0	1.88	43.0	3550	0.8	1.88	41.0	2800
185	2.0	0.5	2.6	44.0	2750	2.5	2.04	49.0	4000	0.8	1.88	46.0	3400
240	2.2	0.6	2.8	50.0	3500	2.5	2.2	54.0	5000	0.8	2.2	51.0	4200
300	2.4	0.6	3.0	55.0	4300	2.5	2.36	59.0	6000	0.8	2.36	56.0	5050
400	2.6	0.7	3.4	62.0	5450	3.15	2.68	68.0	8700	0.8	2.52	63.0	6300
500	3.0	0.7	3.6	68.0	6900	3.15	3.0	75.0	11000	0.8	2.84	70.0	7800
630	3.4	0.7	4.0	77.0	8700	4.0	3.0	84.0	14000	0.8	3.0	78.0	9700

**TABLE - 4**  
**1.1 KV 3+ CORE ALUMINIUM CONDUCTOR, PVC INSULATED, ARMoured / UNARMoured**  
**ALUMINIUM CABLES CONFORMING TO IS:1554 (PART-I)**

Nominal Area of conductor	Nominal thickness of insulation (main/Neutral)	Minimum thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			AYY			Single Layer - Wire (AYWY)				Single Layer - Strip (AYFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
Sq. mm.	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
25	1.2/1.0	0.3	2.0	24.0	700	1.6	1.4	26.0	1300	0.8	1.40	24.0	1000
35	1.2/1.0	0.3	2.0	26.0	850	1.6	1.4	23.0	1450	0.8	1.40	26.0	1200
50	1.4/1.2	0.3	2.0	29.0	1050	1.6	1.56	31.0	1800	0.8	1.56	30.0	1500
70	1.4/1.2	0.4	2.2	32.0	1400	2.0	1.56	36.0	2400	0.8	1.56	34.0	1800
95	1.6/1.4	0.4	2.2	36.0	1800	2.0	1.72	39.0	3000	0.8	1.56	37.0	2300
120	1.6/1.4	0.5	2.4	40.0	2200	2.0	1.88	43.0	3500	0.8	1.72	41.0	2800
150	1.8/1.4	0.5	2.4	44.0	2600	2.0	1.88	47.0	4000	0.8	1.88	45.0	3200
185	2.0/1.6	0.5	2.6	48.0	3200	2.5	2.04	53.0	5200	0.8	2.04	49.0	3900
240	2.2/1.6	0.6	3.0	54.0	4100	2.5	2.36	58.0	6400	0.8	2.20	55.0	4800
300	2.4/1.8	0.6	3.2	62.0	5000	3.15	2.52	66.0	8200	0.8	2.36	61.0	5800
400	2.6/2.0	0.7	3.4	68.0	6300	3.15	2.68	75.0	9900	0.8	2.68	69.0	7300
500	3.0/2.2	0.7	3.8	77.0	8000	4.0	3.00	84.0	13500	0.8	2.84	77.0	9000
630	3.4/2.4	0.7	4.0	87.0	10000	4.0	3.00	92.0	16000	0.8	3.00	87.0	11500





**TABLE - 5**  
**1.1 KV FOUR CORE ALUMINIUM CONDUCTOR, PVC INSULATED, ARMoured / UNARMoured**  
**ALUMINIUM CABLES CONFORMING TO IS:1554 (PART-I)**

Nominal Area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			AYY			Single Layer - Wire (AYWY)				Single Layer - Strip (AYFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer Sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
Sq. mm.	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
6	1.0	0.3	1.8	18.0	390	1.4	1.24	21.0	880	-	-	-	-
10	1.0	0.3	1.8	20.0	540	1.6	1.40	22.0	900	0.8	1.40	21.0	750
16	1.0	0.3	2.0	20.0	560	1.6	1.40	23.0	1120	0.8	1.40	22.0	860
25	1.2	0.3	2.0	25.0	750	1.6	1.40	27.0	1400	0.8	1.40	25.0	1100
35	1.2	0.3	2.0	27.0	940	1.6	1.56	30.0	1600	0.8	1.40	28.0	1300
50	1.4	0.4	2.2	31.0	1250	1.6	1.56	34.0	2200	0.8	1.56	32.0	1600
70	1.4	0.4	2.2	34.0	1550	2.0	1.56	37.0	2600	0.8	1.56	35.0	2000
95	1.6	0.4	2.4	39.0	2050	2.0	1.72	42.0	3300	0.8	1.72	41.0	2600
120	1.6	0.5	2.4	43.0	2400	2.0	1.88	47.0	3850	0.8	1.88	43.0	3050
150	1.8	0.5	2.6	47.0	2950	2.0	2.04	51.0	4850	0.8	1.88	48.0	3600
185	2.0	0.6	2.8	52.0	3650	2.5	2.20	56.0	5800	0.8	2.04	53.0	4300
240	2.2	0.6	3.0	58.0	4600	2.5	2.36	62.0	7000	0.8	2.36	59.0	5400
300	2.4	0.7	3.4	60.0	5000	2.5	2.68	72.0	9200	0.8	2.52	67.0	6000
400	2.6	0.7	3.6	68.0	6250	3.15	2.84	79.0	11000	0.8	2.84	74.0	8200
500	3.0	0.7	4.0	77.0	8000	4.0	3.00	90.0	15000	0.8	3.00	83.0	10500
630	4.0	0.7	4.0	87.0	10000	4.0	3.00	90.0	18000	0.8	3.00	83.0	13000

**TABLE - 6**  
**1.1 KV 1.5 Sq. mm STRANDED COPPER CONDUCTOR, PVC INSULATED, ARMoured / UNARMoured**  
**COPPER CONTROL CABLES CONFORMING TO IS : 1554 (PART-I)**

Number of Cores	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			YY			Single Layer - Wire (YWY)				Single Layer - Strip (YFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
Sq. mm.	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
2	0.8	0.3	1.8	13.0	210	1.4	1.24	15.0	480	-	-	-	-
3	0.8	0.3	1.8	13.0	230	1.4	1.24	16.0	520	-	-	-	-
4	0.8	0.3	1.8	14.0	270	1.4	1.24	17.0	590	-	-	-	-
5	0.8	0.3	1.8	15.0	320	1.4	1.24	18.0	660	-	-	-	-
6	0.8	0.3	1.8	16.0	340	1.4	1.24	19.0	700	-	-	-	-
7	0.8	0.3	1.8	16.0	360	1.4	1.24	19.0	720	-	-	-	-
8	0.8	0.3	1.8	17.0	410	1.4	1.24	20.0	800	-	-	-	-
9	0.8	0.3	1.8	18.0	450	1.4	1.24	21.0	900	-	-	-	-
10	0.8	0.3	1.8	20.0	480	1.4	1.4	22.0	950	-	-	-	-
12	0.8	0.3	1.8	20.0	550	1.6	1.4	23.0	1110	0.8	1.24	21.0	870
14	0.8	0.3	1.8	21.0	600	1.6	1.4	24.0	1180	0.8	1.4	22.0	920
16	0.8	0.3	1.8	22.0	700	1.6	1.4	25.0	1290	0.8	1.4	24.0	1000
19	0.8	0.3	2.0	24.0	770	1.6	1.4	27.0	1390	0.8	1.4	25.0	1120
24	0.8	0.3	2.0	27.0	950	1.6	1.4	30.0	1680	0.8	1.4	28.0	1360
27	0.8	0.3	2.0	28.0	1040	1.6	1.4	31.0	1780	0.8	1.4	29.0	1440
30	0.8	0.4	2.0	29.0	1130	1.6	1.4	32.0	1900	0.8	1.4	30.0	1550
37	0.8	0.3	2.0	32.0	1320	1.6	1.4	34.0	2170	0.8	1.4	32.0	1790
44	0.8	0.3	2.0	35.0	1650	1.6	1.56	39.0	2890	0.8	1.56	36.0	2140
61	0.8	0.4	2.2	39.0	2110	2.0	1.56	41.0	3400	0.8	1.56	40.0	2670

Note: These Cables are available with solid Conductors also.





TABLE - 7

1.1 KV 2.5 Sq. mm STRANDED COPPER CONDUCTOR, PVC INSULATED, ARMoured / UNARMoured  
COPPER CONTROL CABLES CONFORMING TO IS : 1554 (PART-I)

Number of Cores	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			YY			Single Layer - Wire (YWY)				Single Layer - Strip (YFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer Sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	
2	0.9	0.3	1.8	14.0	260	1.4	1.24	16.0	560	-	-	-	-
3	0.9	0.3	1.8	15.0	300	1.4	1.24	17.0	620	-	-	-	-
4	0.9	0.3	1.8	16.0	350	1.4	1.24	18.0	700	-	-	-	-
5	0.9	0.3	1.8	17.0	400	1.4	1.24	19.0	780	-	-	-	-
6	0.9	0.3	1.8	18.0	450	1.4	1.24	20.0	860	-	-	-	-
7	0.9	0.3	1.8	18.0	470	1.4	1.24	20.0	880	-	-	-	-
8	0.9	0.3	1.8	20.0	540	1.4	1.4	22.0	1080	-	-	-	-
9	0.9	0.3	1.8	21.0	610	1.6	1.4	24.0	1190	0.8	1.4	23.0	940
10	0.9	0.3	1.8	23.0	640	1.6	1.4	25.0	1270	0.8	1.4	24.0	980
12	0.9	0.3	2.0	23.0	760	1.6	1.4	27.0	1390	0.8	1.4	25.0	1110
14	0.9	0.3	2.0	24.0	830	1.6	1.4	28.0	1490	0.8	1.4	26.0	1180
16	0.9	0.3	2.0	25.0	960	1.6	1.4	29.0	1640	0.8	1.4	27.0	1330
19	0.9	0.3	2.0	28.0	1060	1.6	1.4	30.0	1770	0.8	1.4	29.0	1450
24	0.9	0.3	2.0	31.0	1320	1.6	1.56	35.0	2180	0.8	1.4	33.0	1780
27	0.9	0.3	2.0	32.0	1440	1.6	1.56	36.0	2330	0.8	1.4	33.0	1930
30	0.9	0.3	2.0	33.0	1570	1.6	1.56	37.0	2480	0.8	1.56	35.0	2070
37	0.9	0.4	2.2	37.0	1920	2.0	1.56	40.0	3140	0.8	1.56	38.0	2440
40	0.9	0.4	2.2	41.0	2290	2.0	1.56	45.0	3700	0.8	1.56	42.0	2870
61	0.9	0.4	2.2	44.0	2950	2.0	1.72	49.0	4510	0.8	1.56	46.0	3630

Note: These Cables are available with solid Conductors also.

TABLE - 8

1.1 KV SINGLE CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, HARD DRAWN ALUMINIUM  
ARMoured / UNARMoured CABLES CONFORMING TO IS : 7098 (PART-I)

Nominal Area of conductor	UNARMoured CABLES				ARMoured CABLES								
	A2XY				Nominal thickness of insulation	Single Layer - Wire (A2XWαY)				Single Layer - Strip (A2XFαY)			
	Nominal thickness of insulation	Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable		Nominal diameter of armour Wire	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
Sq. mm.	mm	mm	mm	Kg/Km	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
6	0.7	1.8	8.2	80	1.0	1.4	1.24	10.5	130	-	-	-	-
10	0.7	1.8	9.2	100	1.0	1.4	1.24	11.5	160	-	-	-	-
16	0.7	1.8	10.5	130	1.0	1.4	1.24	13.0	200	-	-	-	-
25	0.9	1.8	12.0	180	1.2	1.4	1.24	14.0	300	-	-	-	-
35	0.9	1.8	13.0	230	1.2	1.4	1.24	15.0	350	-	-	-	-
50	1.0	1.8	15.0	300	1.3	1.4	1.24	17.0	420	-	-	-	-
70	1.1	1.8	16.0	370	1.4	1.4	1.24	19.0	520	-	-	-	-
95	1.1	1.8	18.0	460	1.4	1.6	1.4	22.0	650	1.0	1.4	21.0	600
120	1.2	1.8	20.0	560	1.5	1.6	1.4	24.0	750	1.0	1.4	23.0	700
150	1.4	2.0	22.0	620	1.7	1.6	1.4	25.0	850	1.0	1.4	24.0	800
185	1.6	2.0	24.0	820	1.9	1.6	1.4	28.0	1000	1.0	1.4	26.0	950
240	1.7	2.0	27.0	1000	2.0	1.6	1.4	30.0	1250	1.0	1.4	30.0	1200
300	1.8	2.0	30.0	1200	2.1	1.6	1.56	33.0	1500	1.0	1.56	32.0	1400
400	2.0	2.2	33.0	1550	2.4	2.0	1.56	38.0	1900	1.0	1.56	36.0	1750
500	2.2	2.2	36.0	1900	2.6	2.0	1.56	41.0	2350	1.0	1.56	39.0	2150
630	2.4	2.2	40.0	2400	2.8	2.0	1.72	46.0	2900	1.0	1.72	44.0	2700
800	2.6	2.4	47.0	3000	3.1	2.0	1.88	51.0	3600	1.0	1.72	48.0	3350
1000	2.8	2.6	51.0	3750	3.3	2.5	2.04	56.0	4600	1.0	1.88	54.0	4100





**TABLE - 9**  
**1.1 KV TWO CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UNARMoured**  
**ALUMINIUM CABLES CONFORMING TO IS : 7098 (PART-I)**

Nominal Area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			AZXY			Single Layer - Wire (AZXWY)				Single Layer - Strip (AZXFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer Sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. 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	14.0	330	1.4	1.24	16.0	660	-	-	-	-
10	0.7	0.3	1.8	17.0	350	1.4	1.24	18.0	660	-	-	-	-
16	0.7	0.3	1.8	17.0	370	1.4	1.40	18.5	700	-	-	-	-
25	0.9	0.3	2.0	19.0	400	1.6	1.40	21.0	860	0.8	1.40	20.0	650
35	0.9	0.3	2.0	20.0	430	1.6	1.40	23.0	960	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	780	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	1350
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	31.0	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	46.0	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	2.62	56.0	5000
630	2.4	0.7	3.6	62.0	5300	3.15	2.84	66.0	8600	0.8	2.68	63.0	6100

**TABLE - 10**  
**1.1 KV THREE CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UNARMoured**  
**ALUMINIUM CABLES CONFORMING TO IS : 7098 (PART-I)**

Nominal Area of conductor	Nominal thickness of insulation	Nominal thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			AZXY			Single Layer - Wire (AZXWY)				Single Layer - Strip (AZXFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer Sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. 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	16.0	330	1.4	1.24	18.5	650	-	-	-	-
10	0.7	0.3	1.8	18.0	400	1.4	1.24	20.0	750	-	-	-	-
16	0.7	0.3	1.8	18.5	420	1.6	1.40	20.5	800	0.8	1.40	19.0	590
25	0.9	0.3	2.0	21.0	530	1.6	1.40	23.0	1000	0.8	1.40	21.0	800
35	0.9	0.3	2.0	22.0	640	1.6	1.40	25.0	1200	0.8	1.40	23.0	950
50	1.0	0.3	2.0	25.0	800	1.6	1.56	29.0	1450	0.8	1.40	26.0	1100
70	1.1	0.4	2.2	30.0	1100	2.0	1.56	32.0	2000	0.8	1.56	29.0	1450
95	1.1	0.4	2.2	32.0	1350	2.0	1.56	35.0	2350	0.8	1.56	32.0	1750
120	1.2	0.4	2.2	35.0	1650	2.0	1.72	39.0	2750	0.8	1.56	35.0	2100
150	1.4	0.5	2.4	39.0	2050	2.0	1.88	43.0	3250	0.8	1.72	40.0	2500
185	1.6	0.5	2.6	43.0	2500	2.5	2.04	48.0	4200	0.8	1.88	44.0	3000
240	1.7	0.6	2.8	49.0	3150	2.5	2.20	53.0	5100	0.8	2.04	50.0	3750
300	1.8	0.6	3.0	53.0	3850	2.5	2.36	58.0	6000	0.8	2.20	54.0	4500
400	2.0	0.7	3.2	59.0	4850	3.15	2.68	66.0	7950	0.8	2.52	60.0	5650
500	2.2	0.7	3.6	66.0	6100	3.15	2.84	72.0	9500	0.8	2.68	66.0	6900
630	2.4	0.7	3.8	73.0	7650	4.0	3.00	81.0	12600	0.8	2.84	74.0	8550





TABLE - 11  
1.1 KV 3½ CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UNARMoured  
ALUMINIUM CABLES CONFORMING TO IS : 7098 (PART-I)

Nominal Area of conductor	Nominal thickness of insulation (main/neutral)	Minimum thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			A2XY			Single Layer - Wire (A2XWY)				Single Layer - Strip (A2XFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer Sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. Overall diameter of cable	Approx. weight of cable
Sq. mm.	mm	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km	mm	mm	mm	Kg/Km
25	0.9/0.7	0.3	2.0	22.0	610	1.6	1.40	25.0	1100	0.8	1.40	23.0	900
35	0.9/0.7	0.3	2.0	24.0	730	1.6	1.40	27.0	1300	0.8	1.40	25.0	1050
50	1.0/0.9	0.3	2.0	27.0	920	1.6	1.56	30.0	1600	0.8	1.40	28.0	1250
70	1.1/0.9	0.4	2.2	31.0	1250	2.0	1.56	35.0	2200	0.8	1.56	32.0	1650
95	1.1/1.0	0.4	2.2	34.0	1550	2.0	1.56	38.0	2650	0.8	1.56	35.0	2000
120	1.2/1.1	0.4	2.2	38.0	1900	2.0	1.72	42.0	3150	0.8	1.72	39.0	2450
150	1.4/1.1	0.5	2.4	43.0	2300	2.0	1.88	46.0	3650	0.8	1.72	43.0	2850
185	1.6/1.1	0.5	2.6	46.0	2850	2.5	2.04	51.0	4750	0.8	1.88	48.0	3450
240	1.7/1.2	0.6	2.8	52.0	3600	2.5	2.20	56.0	5750	0.8	2.04	53.0	4300
300	1.8/1.4	0.6	3.0	57.0	4400	2.5	2.36	60.0	6750	0.8	2.20	57.0	5100
400	2.0/1.6	0.7	3.4	65.0	5600	3.15	2.68	71.0	9000	0.8	2.52	66.0	6450
500	2.2/1.7	0.7	3.6	73.0	7000	3.15	2.84	79.0	11000	0.8	2.68	74.0	7950
630	2.4/1.8	0.7	4.0	82.0	8900	4.0	3.00	88.0	14500	0.8	3.00	82.0	9900

TABLE - 12  
1.1 KV FOUR CORE ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMoured / UNARMoured  
ALUMINIUM CABLES CONFORMING TO IS : 7098 (PART-I)

Nominal Area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	UNARMoured CABLES			ARMoured CABLES							
			A2XY			Single Layer - Wire (A2XWY)				Single Layer - Strip (A2XFY)			
			Nominal thickness of outer sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal diameter of armour Wire	Minimum thickness of outer Sheath	Approx. overall diameter of cable	Approx. weight of cable	Nominal thickness of armour strip	Minimum thickness of outer sheath	Approx. overall diameter of cable	Approx. 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	18.5	350	1.4	1.24	19.5	600	-	-	-	-
10	0.7	0.3	1.8	20.0	400	1.4	1.40	21.0	670	-	-	-	-
16	0.7	0.3	1.8	20.0	450	1.6	1.40	22.5	925	0.8	1.40	20.0	700
25	0.9	0.3	2.0	24.0	660	1.6	1.40	26.0	1200	0.8	1.40	24.0	950
35	0.9	0.3	2.0	26.0	800	1.6	1.40	28.0	1450	0.8	1.40	27.0	1150
50	1.0	0.3	2.0	29.0	1000	1.6	1.56	32.0	1750	0.8	1.56	30.0	1400
70	1.1	0.4	2.2	34.0	1410	2.0	1.56	37.0	2400	0.8	1.56	34.0	1800
95	1.1	0.4	2.2	37.0	1750	2.0	1.72	40.0	2900	0.8	1.56	37.0	2200
120	1.2	0.5	2.4	41.0	2150	2.0	1.88	44.0	3500	0.8	1.72	41.0	2700
150	1.4	0.5	2.6	45.0	2650	2.5	2.04	49.0	4500	0.8	1.88	46.0	3200
185	1.6	0.5	2.8	50.0	3250	2.5	2.20	54.0	5250	0.8	2.04	51.0	3900
240	1.7	0.6	3.0	56.0	4100	2.5	2.36	61.0	6400	0.8	2.20	57.0	4850
300	1.8	0.7	3.2	63.0	5050	3.15	2.52	68.0	8350	0.8	2.36	63.0	5850
400	2.0	0.7	3.6	70.0	6400	3.15	2.84	76.0	10000	0.8	2.68	71.0	7300
500	2.2	0.7	3.8	79.0	8000	4.0	3.00	86.0	13500	0.8	2.84	79.0	9000
630	2.4	0.7	4.0	88.0	10000	4.0	3.00	94.0	16000	0.8	3.00	88.0	11000





TABLE - 13  
SOLID/STRANDED CONDUCTOR FOR INSULATED CABLES CONFORMING TO IS : 8130

Nominal Cross-sectional area of conductor	SOLID CONDUCTOR CLASS-I		STRANDED CONDUCTOR CLASS - 2					
	Maximum Resistance of Conductor at 20°C		Minimum number of wires in Conductor				Maximum Resistance of Conductor at 20°C	
	Plain Copper	Aluminium	Circular Conductor (non-Compact)		Circular compact or Shaped Conductor		Plain Copper	Aluminium
Sq. mm.	Ohm/km	Ohm/km	Copper	Aluminium	Copper	Aluminium	Ohm/km	Ohm/km
1.5	12.1	18.1	3	3	-	-	12.1	18.1
2.5	7.41	12.1	3	3	-	-	7.41	12.1
4	4.61	7.41	7	3	-	-	4.61	7.41
6	3.08	4.61	7	3	-	-	3.08	4.61
10	1.83	3.08	7	7	6	-	1.83	3.08
16	1.15	1.91	7	7	6	6	1.15	1.91
25	-	-	7	7	6	6	0.727	1.20
35	-	-	7	7	6	6	0.524	0.868
50	-	-	19	19	6	6	0.387	0.641
70	-	-	19	19	12	12	0.268	0.443
95	-	-	19	19	15	15	0.193	0.320
120	-	-	37	37	18	15	0.153	0.253
150	-	-	37	37	18	15	0.124	0.206
185	-	-	37	37	30	30	0.0991	0.164
240	-	-	61	37	34	30	0.0754	0.125
300	-	-	61	61	34	30	0.0601	0.100
400	-	-	61	61	53	53	0.0479	0.0778
500	-	-	61	61	53	53	0.0366	0.0605
630	-	-	91	91	53	53	0.0283	0.0469
800	-	-	91	91	53	53	0.0221	0.0367
1000	-	-	91	91	53	53	0.0176	0.0291

TABLE - 14  
CALCULATED VALUE OF A.C. RESISTANCE OF ALUMINIUM CONDUCTOR AT MAXIMUM OPERATING TEMPERATURES IN Ohms / Km.

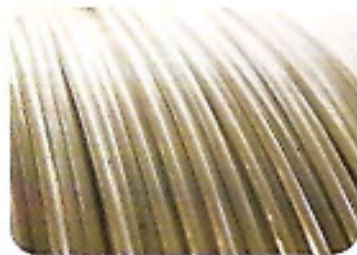
Nominal Cross-sectional Area of Conductor (Sq. mm.)	70°C	85°C	90°C	Nominal Cross-sectional Area of Conductor (Sq. mm.)	70°C	85°C	90°C
1.5	21.72	22.01	-	95	0.384	0.404	0.410
2.5	14.52	15.25	-	120	0.302	0.319	0.325
4	8.89	9.34	-	150	0.248	0.261	0.265
6	5.53	5.81	-	185	0.198	0.208	0.211
10	3.70	3.98	-	240	0.152	0.159	0.162
16	2.29	2.41	-	300	0.122	0.128	0.130
25	1.44	1.51	1.54	400	0.0961	0.1005	0.1023
35	1.04	1.09	1.11	500	0.0760	0.0794	0.0808
50	0.769	0.808	0.820	630	0.0610	0.0636	0.0648
70	0.532	0.558	0.567	800	0.0500	0.0521	0.0530
				1000	0.0422	0.0438	0.0444





TABLE - 15  
REACTANCE OF CABLES AT 50 HZ.

Nominal area of Conductor	APPROX. REACTANCE OF CABLE IN Ohms / Km at 50 Hz					
	1.1 KV PVC Insulated Cables			1.1 KV XLPE Insulated Cables		
	Single Core Cables		Twin & Multicore Cables	Single Core Cables		Twin & Multicore Cables
	Unarmoured	Armoured		Unarmoured	Armoured	
Sq. mm.						
6	0.127	0.148	0.096	-	-	-
10	0.118	0.138	0.091	-	-	-
16	0.110	0.128	0.85	-	-	-
25	0.105	0.120	0.083	0.102	0.116	0.080
35	0.100	0.114	0.082	0.097	0.110	0.080
50	0.098	0.110	0.082	0.092	0.103	0.070
70	0.091	0.103	0.076	0.088	0.099	0.077
95	0.088	0.101	0.076	0.085	0.097	0.074
120	0.086	0.096	0.075	0.082	0.093	0.072
150	0.085	0.094	0.074	0.082	0.091	0.072
185	0.084	0.092	0.074	0.082	0.090	0.072
240	0.082	0.090	0.073	0.079	0.086	0.072
300	0.080	0.088	0.073	0.078	0.085	0.071
400	0.080	0.088	0.072	0.077	0.085	0.070
500	0.079	0.087	0.072	0.076	0.083	0.070
630	0.077	0.086	0.072	0.075	0.082	-
800	0.077	0.083	-	0.075	0.081	-
1000	0.076	0.082	-	0.068	0.081	-







**TABLE - 16**  
**CAPACITANCE OF CABLES**

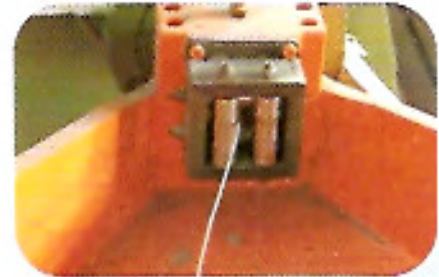
Nominal area of Conductor	CAPACITANCE OF CABLES IN MICRO Farads / Km					
	1.1 KV PVC Insulated Cables			1.1 KV XLPE Insulated Cables		
	Single Core Cables		Twin & Multicore Cables	Single Core Cables		Twin & Multicore Cables
Sq. mm.	Unarmoured	Armoured		Unarmoured	Armoured	
6	0.68	0.50	0.28	-	-	-
10	0.83	0.67	0.34	-	-	-
16	1.01	0.81	0.40	-	-	-
25	1.05	0.87	0.42	0.52	0.40	0.20
35	1.22	1.00	0.48	0.60	0.47	0.23
50	1.22	1.03	0.49	0.63	0.50	0.24
70	1.43	1.21	0.56	0.68	0.55	0.26
95	1.47	1.27	0.58	0.79	0.64	0.29
120	1.67	1.42	0.63	0.79	0.67	0.29
150	1.62	1.42	0.63	0.79	0.67	0.29
185	1.62	1.44	0.64	0.79	0.67	0.29
240	1.72	1.53	0.67	0.84	0.72	0.31
300	1.74	1.56	0.68	0.86	0.75	0.33
400	1.81	1.59	0.70	0.88	0.75	0.33
500	1.86	1.67	0.70	0.90	0.77	0.34
630	1.87	1.67	0.70	0.94	0.81	0.36
800	1.98	1.75	-	0.97	0.88	-
1000	2.20	1.94	-	1.01	0.88	-

Note: For Multicore Cables value is given between two adjacent cores.

**TABLE - 17**  
**ESTIMATED VOLTAGE DROPS IN PVC/XLPE ALUMINIUM CABLES FOR AC. SYSTEM**

Nominal area of conductor	Voltage drop Volts/Km/Amps			
	P.V.C. Cables		XLPE Cables	
	Single Phase	Three Phase	Single Phase	Three Phase
Sq. mm.				
1.5	43.44	37.62	46.34	40.13
2.5	29.04	25.15	30.98	26.03
4	17.78	15.40	18.98	16.44
6	11.06	9.58	11.80	10.22
10	7.40	6.41	7.88	6.82
16	4.58	3.97	4.90	4.24
25	2.89	2.50	3.08	2.67
35	2.10	1.80	2.23	1.94
50	1.55	1.30	1.65	1.44
70	1.10	0.94	1.15	1.00
95	0.79	0.68	0.83	0.70
120	0.63	0.55	0.66	0.56
150	0.52	0.46	0.55	0.48
185	0.42	0.37	0.44	0.40
240	0.34	0.30	0.35	0.30
300	0.28	0.26	0.30	0.26
400	0.24	0.22	0.24	0.22
500	0.23	0.20	0.23	0.20
630	0.20	0.18	0.21	0.18
800	0.19	-	0.20	-
1000	0.18	-	0.18	-

\*\* Above voltage drops (volts/km/amps) shall be multiplied with rated current & length of Cables in K.M. to calculate total voltage drop in particular length and size of cables.







## SHORT CIRCUIT RATINGS

The conductor size in a Cable for an installation is also governed by its ability to carry short circuit current of the system. Short circuit ratings are based on the assumption that the duration of short circuit is so small and apparently there is no transmission of heat, produced during short circuit through the insulation and the whole of it is absorbed by the conductor.

The short circuit current ratings (r.m.s. values) of PVC & XLPE insulated cables with aluminium and copper conductors for one second duration are given as under. These ratings have been calculated on the following assumptions.

	UNIT	ALUMINIUM	COPPER
1) Temperature of conductor just prior to short circuit.			
a) With general purpose insulation	°C	70	70
b) With Heat resisting insulation	°C	85	85
c) With XLPE insulation	°C	90	90
2) Max. permissible temperature of conductor during short circuit			
a) With PVC insulation	°C	160	160
b) XLPE insulation	°C	250	250
3) Volumetric Specific heat of conductor at 20 °C	J/°C mm <sup>3</sup>	2.5x10 <sup>3</sup>	3.45x10 <sup>3</sup>
4) Resistivity of conductor at 20 °C	ohm-mm	28.264x10 <sup>-8</sup>	17.241x10 <sup>-8</sup>
5) Reciprocal of temperature co-efficient of resistance of conductor at 0 °C	°C mm <sup>2</sup>	228	234.5

With the above assumptions the short circuit rating 'Ish' is given by the following formula.

$$I_{sh} = \frac{KA}{\sqrt{t}} \text{ Kilo Amps}$$

### Where

K = Constant (depends upon the type of insulation material and conductor material)

A = Nominal cross-sectional area of conductor in mm<sup>2</sup>

t = duration of short circuit in seconds

**TABLE - 18**  
SHORT CIRCUIT RATINGS OF 1100 VOLTS GRADE PVC INSULATED HEAVY DUTY CABLES (FOR DURATION OF ONE SECOND)

Nominal area of conductor	Aluminium Conductor		Copper Conductor	
	With General Purpose Insulation	With Heat resisting Insulation	With General purpose insulation	With Heat resisting Insulation
Sq. mm.	K. Amp	K. Amp	K. Amp	K. Amp
1.5	0.114	0.103	0.173	0.56
2.5	0.190	0.172	0.288	0.260
4.0	0.304	0.274	0.460	0.416
6.0	0.456	0.417	0.690	0.624
10	0.760	0.686	1.150	1.040
16	1.220	1.100	1.840	1.660
25	1.900	1.720	2.880	2.600
35	2.660	2.400	4.030	3.640
50	3.800	3.430	5.750	5.200
70	5.320	4.800	8.050	7.280
95	7.220	6.570	10.900	9.800
120	9.120	8.230	13.800	12.500
150	11.400	10.300	17.300	15.600
185	14.100	12.700	21.300	19.200
240	19.200	16.500	27.300	25.000
300	27.800	24.600	34.500	31.200
400	38.400	34.000	46.000	41.600
500	50.000	44.300	57.500	52.000
630	67.900	60.200	72.500	65.500
800	90.800	81.900	92.000	83.200
1000	120.000	108.000	115.000	104.000

**TABLE - 19**  
SHORT CIRCUIT RATINGS FOR XLPE INSULATED CABLES (FOR DURATION OF ONE SECOND)

Nominal area conductor	With Aluminium conductor		With Copper conductor	
	Sq. mm.	K. Amp	Sq. mm.	K. Amp
1.5	0.141	0.215		
2.5	0.235	0.358		
4.0	0.370	0.572		
6.0	0.504	0.858		
10	0.940	1.430		
16	1.504	2.290		
25	2.350	3.580		
35	3.290	5.000		
50	4.700	7.150		
70	6.580	10.000		
95	9.030	13.690		
120	11.280	17.160		
150	14.100	21.450		
185	17.390	26.450		
240	22.560	34.320		
300	28.200	42.900		
400	37.600	57.200		
500	47.000	71.500		
630	59.220	90.100		
800	75.200	114.400		
1000	94.000	143.000		





**TABLE - 22**  
**CHARACTERISTICS OF CONDUCTOR MATERIAL**

Particulars	Annealed Copper	Hard Drawn Copper	Hard Drawn Aluminium	Steel (Galvanised)
	<b>Conductivity percent</b>	100 (average)	97 (minimum)	61 (minimum)
Volume resistivity at 20 °C in ohm-mm <sup>2</sup> /m	0.017241 (standard)	0.01771 (average)	0.028264 (maximum)	
Mass resistivity at 20 °C in ohm gms/m	0.15328	0.15741	0.076388	
Resistance at 20 °C in ohm mm <sup>2</sup> /km	17.241	17.71	28.264	
Density at 20 °C in gms/cm <sup>3</sup>	8.89	8.89	2.703	7.78
Weight in Kg/mm <sup>2</sup> /km	8.89	8.89	2.703	7.78
Temperature coefficient of resistance at 20 °C per °C	.00393	.00381	.00403	-
Coefficient of linear expansion at 20 °C per °C	17 x 10 <sup>-6</sup>	17 x 10 <sup>-6</sup>	23 x 10 <sup>-6</sup>	11.5 x 10 <sup>-6</sup>
Ultimate tensile stress (approx.) in kg/mm <sup>2</sup>	25.3	47.2	16.5	36
Modulus of elasticity in kg/mm <sup>2</sup>	9 to 10.5 x 10 <sup>7</sup>	12.06 x 10 <sup>7</sup>	6.66 x 10 <sup>7</sup>	19.7 x 10 <sup>7</sup>

**TABLE - 21**  
**CHARACTERISTICS OF DIELECTRIC MATERIALS**

Particulars	Material		
	Cross linked polyethylene	Polyethylene	PVC
Specific Gravity	0.92	0.92	1.3 - 1.6
Dielectric Strength (KV/mm)	35-50	35-50	15 - 25
Volume Resistivity (ohm-Cm)	10 <sup>17</sup>	10 <sup>17</sup>	10 <sup>14</sup> to 10 <sup>15</sup>
Dielectric Constant	2.3	2.3	5 - 8
Power Factor	0.003	0.003	0.08
Tensile Strength (N/mm)	13 to 16	13 to 16	14 to 20
Elongation (%)	250 to 400	250 to 500	200 to 300
Maximum Operating Temperature (°C)	90	70	70
Maximum Conductor Temperature for Short Circuit (°C)	250	130	160
Minimum Working temperature (°C)	40	-40	-20 (GP PVC) -15 (HR PVC)

**TABLE - 22**  
**CHARACTERISTICS OF FRLS PVC COMPOUND**

Particulars	Characteristics
Oxygen Index as per ASTM D-2853 (%)	Min - 29
Temp. Index as per ASTM D 2853 (°C)	Min - 250
Smoke Density Rating as per ASTM D 2843 (%)	Max - 60
Acid Gas Generation as per IEC 754 (j) (% by weight)	Max - 20
Swedish Chimney Test as per SS-424-14-75 (Class F3)	Unaffected length from top 300 mm (min.)
Vertical Tray Flame Propagation Test as per IEEE-383	Flame shall not propagate & burn the total height of eight feet tray.
Single vertical cable fire resistance test as per IEC-332(I)	Min. 50 mm cable unaffected from bottom edge of the top clamp.
Bunched Vertical Cables fire resistance test as per IEC-332(III)	Max. affected length of the cables 2.5 metre from bottom edge of burner







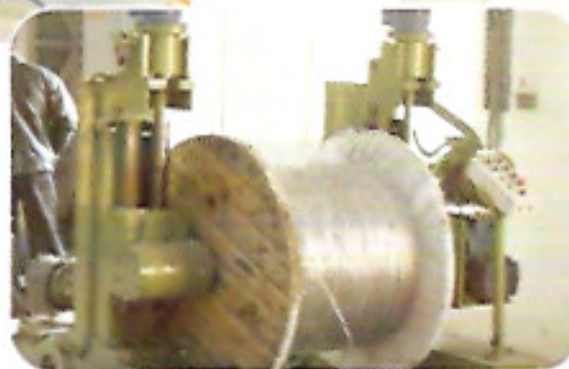
## PACKING DETAILS

TABLE - 23  
DRUM SIZES FOR STANDARD DRUM LENGTH OF 500 M ± 5% FOR POWER CABLES (1.1 KV)

Nominal Cross Sectional Area (mm)	Single Core		Two Core		Three Core		3 1/2 Core		Four Core	
	UA/ASA	Armd AWA	UA/SSA	SWA	UA/FA	SWA	UA/SSA	SWA	UA/SSA	SWA
1.5	0804 S	0804 S	0804 S	0804	0804 S	0804	-	-	0804 S	0804
2.5	0804 S	0804 S	0804 S	0804	0804	0804	-	-	0804	0804
4	0804 S	0804 S	0804	0804	0804	0804	-	-	0804	1005
6	0804 S	0804 S	0804	0905	0804	0804	-	-	0905	1005
10	0804 S	0804 S	0905	1005	0804	0905	-	-	1005	1105
16	0804 S	0804 S	0804	0915	0915	1005	-	-	1005	1105
25	0804 S	0804	1005	1005	1005	1105	1105	1206	1206	1206
35	0804 S	0804	1005	1105	1105	1206	1206	1206	1206	1407
50	0804	0905	1005	1206	1206	1407	1407	1407	1407	1407
70	0905	1005	1206	1206	1407	1407	1407	1507	1507	1507
95	1005	1105	1407	1407	1407	1507	1507	1608	1608	1608
120	1105	1105	1407	1507	1507	1608	1608	1608	1608	1809
150	1206	1206	1406	1507	1608	1608	1608	1800	1809	1809
185	1206	1407	1507	1608	1608	1809	1809	1809	2010	2010
240	1407	1407	1608	1608	1809	2010	2010	2010	2010	2212
300	1407	1507	1809	1809	2010	2010	2010	2212	2212	2414
400	1507	1507	2010	2010	2212	2212	2212	2414	2414	2414
500	1608	1608	-	-	-	-	-	-	-	-
630	1608	1809	-	-	-	-	-	-	-	-
800	1809	2010	-	-	-	-	-	-	-	-
1000	2010	2010	-	-	-	-	-	-	-	-

UA - Unarmoured Cable  
 SWA - Steel Wire Armoured Cable  
 AWA - Aluminium Wire Armoured Cable

SSA - Steel Strip Armoured Cable  
 ASA - Aluminium Strip Armoured Cable







**TABLE - 24**  
**DRUM SIZES FOR STANDARD CABLE LENGTH OF 500 M ± 5% FOR CONTROL CABLES**

No. of	1.5 Sq. mm		2.5 Sq. mm		No. of	1.5 Sq. mm		2.5 Sq. mm	
2	0004 S	0904	0904 S	0904	32	1407	1407	1507	1507
3	0004 S	0904	0904 S	0904	33	1407	1407	1507	1507
4	0004 S	0904	0904 S	0904	34	1407	1407	1507	1507
5	0804	0804	0004	0905	35	1407	1407	1507	1507
6	0804	0804	0905	0905	36	1407	1407	1507	1507
7	0804	0804	0905	0905	37	1407	1407	1507	1507
8	0804	0905	1005	1005	44	1407	1507	1608	1608
9	0804	1005	1005	1105	61	1507	1507	1608	1608
10	0905	1005	1105	1105	<b>DRUM SIZES FOR STANDARD CABLE LENGTH OF 1000 M ± 5%</b>				
11	1005	1005	1105	1206					
12	1005	1105	1105	1206					
13	1005	1105	1105	1206					
14	1005	1105	1206	1206	2	0905	1005	0905	1105
15	1005	1105	1206	1206	3	0905	1005	1005	1105
16	1005	1105	1206	1206	4	1005	1005	1005	1206
17	1105	1206	1206	1206	5	1005	1105	1105	1206
18	1105	1206	1206	1206	6	1005	1206	1206	1206
19	1105	1206	1206	1206	7	1005	1206	1206	1206
20	1105	1206	1206	1407	8	1105	1206	1206	1407
21	1105	1206	1206	1407	9	1206	1206	1407	1407
22	1206	1206	1407	1407	10	1206	1407	1407	1507
23	1206	1407	1407	1407	11	1206	1407	1407	1507
24	1206	1407	1407	1407	12	1206	1407	1407	1507
25	1206	1407	1407	1407	13	1206	1407	1407	1507
26	1206	1407	1407	1407	14	1206	1407	1407	1507
27	1206	1407	1407	1407	15	1407	1407	1507	1507
28	1206	1407	1407	1407	16	1407	1407	1507	1507
29	1407	1407	1407	1407	17	1407	1507	1507	1608
30	1407	1407	1407	1407	18	1407	1507	1507	1608
31	1407	1407	1407	1407	19	1407	1507	1507	1608

UA – Unarmoured Cable  
 SSA – Steel Strip Armoured Cable  
 SWA – Steel Wire Armoured Cable

**TABLE - 25**  
**APPROXIMATE OUTER DIMENSIONS & WEIGHTS OF WOODEN DRUMS**

Drum Type	Flange	Barrel	Outer Traverse	Weight of Empty Drums in Kg. (app.) with M ± 25% tolerance	Drum Type	Flange	Barrel	Weight of Empty Drums in Kg. (app.) with M ± 25% tolerance	
in mm					in mm				
0704	750	350	535	50	1608	1690	780	1090	405
0804 S	830	380	535	50	1809	1900	880	1090	510
0804	870	380	700	72	2010	2040	1020	1195	615
0905	965	430	700	96	2212	3300	1180	1300	845
1005	1050	480	700	110	2214	2270	1370	1350	885
1105	1150	500	700	125	2414	2470	1370	1350	900
1206	1250	600	715	185	2415	2470	1500	1370	1000
1407	1450	600	715	230	2418	2470	1800	1370	1100
1507	1550	690	905	325	2616	2680	1600	1370	1300





## QUALITY CONTROL

In the manufacture of cables, intelligent efforts and standard laid down operating procedures at each and every stage are followed to achieve quality. For quality end products, control starts from proper design of the product. All raw materials are selected carefully and only materials of high quality are used in production. Having done this, stage wise inspection is done to ensure conformity with the requirements of relevant Indian/ International Standards where these apply.

### Stage Wise Inspection

- i) Wire Drawing: Wire diameter  
Surface  
Shape
- ii) Stranding of wires: Quality of joints in the wire  
Quality of joints in the wire  
Compaction of conductor  
Shape of conductor, Dimensions  
Resistance of conductor  
Direction of Lay
- iii) Insulation: Dimension over Insulation  
Thickness of Insulation  
Surface defects
- iv) Curing(for XLPE Insulation): Hot set Test, Tensile strength & elongation test.
- v) Screening(for H.T. Screened Cables) : Dimension over screen,  
Thickness of screen, Visual Examination of surface/ defects.
- vi) Laying Up: Sequence of cores  
Direction of Lay  
Diameter over laid up cores  
Circularity
- vii) Inner Strength: Thickness of Sheath  
Diameter over Sheath  
Surface Uniformity  
Circularity  
Porosity
- viii) Armouring: Diameter of Wires/ Dimensions of Strips, Direction of Lay, Quality of Joints of Wires
- ix) Outer Sheath: Thickness of Sheath  
Diameter over Sheath  
Tightness of Sheath  
Quality, Eccentricity, Porosity, Embossing



## TESTS

The tests on cables have been classified broadly in four categories as follows:

### Routine Tests:

Tests carried out on each Cable to check the requirements which are likely to vary during production.

### Type Tests:

Tests carried out to prove conformity with the specification. These are intended to prove the general qualities and design of a given type of cable.

### Acceptance Tests:

Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

### Optional Tests:

Special tests to be carried out when required by agreement between the purchaser and manufacturer.

Special tests required for FRLS Cables can also be carried out at our works i.e. Halogen gas generation test to IEC-754 (Part-1), Sulfur generation test to ASTM D -2843, Oxygen index test and Temperature index test to ASTM D -2863, Flammability test to (1) IEC-332-1, (2) Swedish Chimney test to SS-4241475 Class F3 & (3) IEC-332-3, Flame resistance test to IEL-383.

Together with the most advanced equipment available, we are able to offer our valued customers assurances of highest quality and strict adherence to the required specification. As a third party guarantee, our cables rigorous test at various Government recognized test laboratories such as CPRI, Shri Ram Test House, ERDA, National Test House, ERTL, RTC.

Routine tests, Type tests, Acceptance Tests and Optional Tests as per the Indian Standards Specification for Power and Control Cables with PVC insulation, Cross Linked Polyethylene insulation and Special Tests are given in Annexure.





## LIST OF TESTS AS PER IS: 1554 (P-I), IS: 1554 (P-II), IS: 7098 (P-I) AND IS: 7098 (P-II)

### 1. Routine Tests:

- Conductor resistance test
- High Voltage Test
- Armour Resistance Test for mining Type Cables

### 2. Type Tests:

- Tensile Test (for Aluminium Conductor)
- Wrapping Test (for Aluminium Conductor)
- Annealing Test (for Copper Conductor)
- Conductor Resistance Test
- Test for Armour Wires/ Strips
- Test for Thickness of Insulation & Sheath
- Physical Test for Insulation & Outer Sheath
- Test for Bleeding & Blooming of Pigments (deleted)
- Insulation Resistance Test
- High Voltage Test
- Flammability Test
- Hot Set Test (for XLPE Insulation Only)
- Water Absorption Test (for XLPE cable)

### 3. Acceptance Tests:

- Tensile Test (for Aluminium Conductor)
- Wrapping Test (for Aluminium Conductor)
- Annealing Test (for Copper Conductor)
- Conductor Resistance Test
- Test for thickness of Insulation & Sheath
- High Voltages Test
- Insulation Resistance Test
- Tensile Strength & Elongation at break test for Insulation & Sheath
- Hot Set Test (for XLPE Insulation only)

### 4. Optional Tests:

- Cold Bend Test
- Cold Impact Test
- Armour Resistance Test (for other than mining type cables)

### 5. Special Tests:

- Oxygen Index tests as per ASTM D-2863-77
- Temp. Index Test as per ASTM D-2863-77
- Smoke Generation Test as per ASTM D-2843-77
- Acid Gas Generation test as per IEC-754-1
- Flammability test as per IEC-383-1, IEC-383, SS-4241475 Class F3 and IEC 332-3
- Accelerated Water absorption test (by Electrical Method)
- Ultra violet resistance to ASTM-G-53
- Dielectric Strength Retention test
- Test for Antiradical & Antitermite property
- Colour Fastness to water and air
- Vicat Softening Test

## SELECTION GUIDE

For selection of a cable, a first hand knowledge of the system in which the cable is to be used, and the installation conditions under which the cable has to operate, is necessary. A knowledge of statutory restrictions and the manufacturing facilities available in the country will help in finding out as to what type of cable will be available for particular usage. The environmental conditions under which the cable has to operate will decide its protective covering. Thus once voltage grade of the cable, number of cores, conductor material, type of insulation and protective coverings are known, size of conductors remain to be decided. The first and foremost criteria for the size of conductor is continuous current rating for the present load. There after the same should be checked for short circuit, voltage drop, over load capacities and future expansions. Once decided the selection of next higher size compared to what is essential for the requirement, will always be worthwhile.

Economic considerations are also necessary.

## INFORMATION REQUIRED WITH ENQUIRY AND ORDER

The following information should be included in an enquiry:

- Voltage grade
- Whether cable is to be used on earthed or unearthed system (for voltage above 3.3 kv).
- Type of installation whether in air or in ducts or in ground.
- If cables are grouped together, then number of cables in group and vertical and horizontal spacing between them.
- Required value and duration of short circuit current.

Following further informations are also required for offering the exact type of cable for any specific purpose:

- The normal ambient or operating temperature.
- The maximum temperature to which the PVC will be exposed and the duration and frequency of such exposures.
- The material with which the PVC will be in contact i.e. oil, gases, acids, alkalies, etc. at normal and maximum temperature.
- If special flame retardant property is required.
- If any special electrical characteristics needed.





1000 mm below finished ground level at any point of cable run and 75 mm of sand cushioning to be provided.

b) In those soil concrete pillar should be provided for as support and hence pipe are recommended to be used for cable path.

5. If there is possibility of mechanical damage, cables should be protected by means of mild steel covers placed on racks.

6. While laying cables, special care to be taken at bends. Following are the recommended bending radius for power and control cables.

PVC AND XLPE CABLES	VOLTAGE RATING	
	SINGLE CORE	MULTI CORE
UP TO 1.1 KV	15D	12D
	15D	12D
ABOVE 1.1 TO 33 KV	15D	12D

Where 'D' is overall diameter of cable.

7. Maximum safe pulling force (When pulled by pulling eye)  
 Aluminium Conductor Cables : 3.0 kg/mm<sup>2</sup>Copper Conductor Cables : 5.0 Kg/mm<sup>2</sup> Proper method of pulling of cable should be used.

**End Terminations & Joining:**

Termination and joining of power and control cables shall be done by means of compression methods using solder less tinned copper / Aluminium terminal lugs. For control cables terminations, ring tongue or reducer pin type terminal lug can also be used to suit the purpose.

**Testing during laying:**

All new cable drums shall be meggar-tested before joining with a 500/1000 volts meggar. Please note that meggar value decreases with increase in the length, temperature and size of the cables. Before meggaring, both the ends of the cables should be opened out and cleaned to remove dust or metal particles. After the test, the cores should be shorted to discharge the cable, otherwise charged cores may give a shock to a person who may handle it subsequently.

IS-1554 does not mention the minimum meggar value of the PVC cable. The table below gives the minimum meggar values of the PVC cables as per IS-6346-1989:

MINIMUM INSULATION RESISTANCE VALUES	
NOMINAL CROSS-SECTIONAL AREA OF CONDUCTOR	INSULATION RESISTANCE IN MOHM/KILOMETRE AT 20°C
50. MM	650/1100 VOLTS
1.50	10
2.50	9
4.00	8
6.00	7
10.00	7
16.00	6
25.00	5
35.00	5
50.00	5
70.00	5
95.00 AND ABOVE	5

As PVC cables have got higher capacitance, while meggaring, a high charging current will flow initially and hence the meggar will show a lesser continuous meggaring should be taken.

It is observed that some electricians check the cables by giving one phase to one of the cores of the cable and check the other cores by a tester for possible leakage. This is a wrong method as other cores will show an induced voltage when tested with a tester due to capacitance between the cores, which is quite high in case of PVC cables. Capacitance also increases with increase in temperature, length and size of the cable.



**HANDLING & STORAGE**

**Handling (Unloading at Site):**

On receipt of cable drums visual inspection of drums should be made. While unloading the cables certain precautions are to be taken to ensure the safety of the cables.

1. The cable drums should not be dropped or thrown from railway wagons or truck during loading operations as the shock may cause serious damage to cable layers. A crane should be used for unloading cable drums. When lifting drums with the crane, it is recommended that the lagging should be kept in place to prevent the flanges from crushing on to the cable. If the crane is not available, a ramp should be prepared with approximate inclination of 1:3 or 1:4. The cable drum should be rolled over the ramp by means of ropes and winches. Additionally a sand bed at the foot of the ramp may be prepared to brake the rolling the cable drum.

2. Cable should not be dragged along the earth surface.
3. Cable ends should always be sealed by means of suitable and sealing materials to prevent moisturation of cores and armour.
4. Drums should be rolled in direction of arrow marked on the drum.

**Storage:**

Cable should be stored in a dry covered place to prevent exposure to climatic conditions and wear & tear of wooden drums. Further, it should preferably be kept on a concrete surface/ firm surface to avoid sinking of drums and decay of flanges which will help easy movement of the drums. All drums should be stored in such a manner as to leave sufficient space between them for air circulation. It is desirable for drums to stand on ballers placed directly under the flanges.

**Laying:**

For laying of cables special cares to be taken to prevent sharp bending, kinking, twisting. Cable should be unwound from drum by proper mounting, the cable drum on a cable wheel, making sure the spindle is strong enough to carry the weight without bending and that is lying horizontally in the bearing so as to prevent the drum creeping to one side or other while it is rotating. However, following salient points are to be considered during laying procedure of cables laid in racks and in built in trenches.

1. For laying of cables power cables to be placed at the bottom most layer and control cables at top most layer.
2. Single core power cable for use on A.C. system shall be laid in delta formation supported by non-magnetic material. Trench camps of suitable size are to be placed at regular intervals but preferably not more than 800 mm. axial spacing of two circuits in delta formation shall not be less than 4 times the cable dia. Increase of multicore power cables, cables shall be laid side by side, with spacing not less than one cable diameter. However derating factors for cables laid on trenches are to be referred.
3. Multicore power cables and single core D.C. circuits may be clamped by means of galvanized mild steel saddles but 1.1 KV single core cables should be clamped by means of non-magnetic saddles. The saddles not be paced at intervals more than 1500 mm for horizontal and 1200 mm for vertical runs.
4. Multicore control cables can be laid touching each other on cable racks and wherever required may be taken in two layers. They should be clamped by means of PVC straps both for horizontal or vertical runs (alternatively, fabricated aluminium clamps may be used) at regular intervals.
4. If the cables are buried directly in ground IS-1255 is to be followed for code of practice. However, generally cables are laid followed for code of practice. However, generally cables are laid





**Indo Alusys Industries Limited**  
SUPERIOR TECHNOLOGY - SUPERIOR SOLUTIONS

**Head Office :**

606, Tolstoy House, 15-Tolstoy Marg,  
New Delhi-110001, India  
Phone: 0091-11-23738011-12, 23312057,  
23317857, 43564200-252  
Fax: 0091-11-23312677  
E-mail: info@indoalusys.com  
sales\_cables@indoalusys.com  
rsingh@indoalusys.com

**Works :**

SP-2/333, Industrial Area, Bhitwadi,  
Distt: Alwar, Rajasthan, India  
Phone: 0091-1493-220786, 220868, 220924  
Fax: 0091-1493-220786  
Mobile: 91-9672991451  
E-mail: cables@indoalusys.com

