

GEMSCAB®
CABLES

THE RIGHT CONNECTION

HT-XLPE
C A B L E S



IS-7098
Part-2(1985)

INTRODUCTION

“GEMSCAB” has been associated with marketing and manufacturing of Electric Cables for over a period 4 decades now. Customer satisfaction has been the prime focus of “GEMSCAB” and today it has established itself as a consistence, competent and a compatible manufacturer of LT Power, Control, Instrumentation and Flexible Cables.

“GEMSCAB” is proud to have succeeded in creating a pool of resources to provide quality products and services.

“GEMSCAB” has a state-of-the-art manufacturing plant at Bhiwadi (Rajasthan) and has been supplying cables to Industries, Process Industries, Automobile, Power Generation, Transmission and Distribution, Housing and Commercial Projects.

“GEMSCAB” has been growing during the last 5 years at a consistent growth rate of 30% to 50% and is expected to grow further in coming years by doubling its capacities and adding new product lines.

“GEMSCAB” has now set-up a state-of-the-art HT Cables manufacturing plant to meet the increasing demand in infrastructure projects like Power, Steel, Cement Industries etc. and to associate itself with the growing economy of the country.

“GEMSCAB” HT XLPE cables are being manufactured and tested at its Bhiwadi Complex. The cables are manufactured with triple extrusion process and provided with Normal PVC Outer Sheath / FR Outer Sheath / FRLS Outer Sheath. These Cables are manufactured as per IS:7098 / (Part-2) upto 33 KV voltage grade in both earthed and unearthed system.

“GEMSCAB” Bhiwadi Plant is an ISO-9001:2000 certified unit, where cables are manufactured as per National & International Standards and customers' specifications. A well-equipped Test Lab and modern instruments are constantly upgraded to carry out quality checks and testing on all incoming and finished material.

“GEMSCAB” is approved by prestigious clients and consultants. It has established its name in providing LT range of cables to its customers. Team “GEMSCAB” is confident that it will provide the same service for HT range of cables also.

C CONSTRUCTION OF CABLES

Conductor:

The conductors made from E.C. grade aluminium wires are stranded together and compacted. All sizes of conductors of single or three core cables for HT cable are circular compacted.

Conductor construction and testing comply to IS 8130-1984 as amended up to date & IEC: 60228.

Cables with copper conductor are also manufactured by GEMSCAB.

Conductor Screening:

Conductor screening is provided for all cables above 3.3 KV grade in the form of an extruded layer of semi conducting extrusion over the conductor.

XLPE Insulation:

High quality XLPE unfilled insulating compound of natural colour is used for insulation. Insulation is applied by extrusion process and is as per IS:7098 / (Part-2) & IEC: 60502.

Insulation Screening:

The cables rated above 3.3 KV are provided with insulation shielding over the insulation. The screening is provided with an extruded layer of semi conducting compound. Over the semi conducting covering, a metallic screen in the form of copper tape is provided.

Core Shielding:

XLPE insulation and insulation shielding are all extruded in one operation by a special process called Triple Extrusion i.e. all three layers in one operation. This process ensures perfect bonding of inner and outer shielding. The bond prevents the formation of cavities at the surface of the conductor when the cable is subjected to bends. The void formation, at the interface of the semiconducting layer and insulation, too is eliminated even during heating and cooling cycles in the operation.

Core Identification:

The Core identification complies with the requirements of IS-7098 (Part II) as shown below:

By numerals (1, 2, 3) printed on cores.

OR

By colored strips applied on the cores.

Inner Sheath (Common Covering)

In case of multi core cables, cores are laid up together with suitable non-hygroscopic fillers in the interstices and provided with common covering of plastic tapes wrapping. As an alternative to wrapped inner sheath, extruded PVC inner sheath is also provided.

Armouring:

Armouring is applied over the inner sheath and normally comprise of galvanized Steel Wire or galvanized Steel Strips for multi core Cables. For Mining use and other special applications, double Wire/Strip armoured cables with Tinned Copper wires can also be offered. Single core armoured cables are provided with non-magnetic armour consisting of hard drawn flat or round aluminum wires to avoid magnetic hysteresis losses on A.C. System.

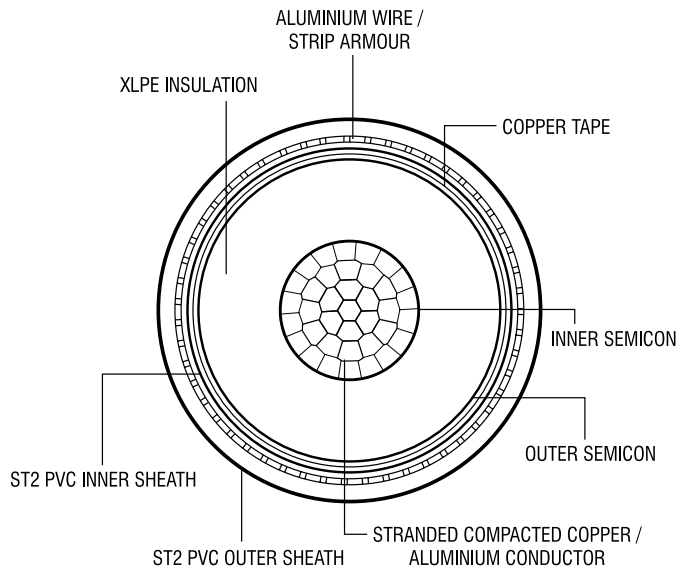
Outer Sheath:

A tough Outer Sheath of Heat Resisting PVC compound (Type ST2) as per IS : 5831 is extruded over the armouring in case of armoured cables or over non-magnetic metallic tape covering the insulation or over the non-magnetic metallic part of insulation screening in case of unarmoured single core cables. This is always black in color for best resistance to outdoor exposure.

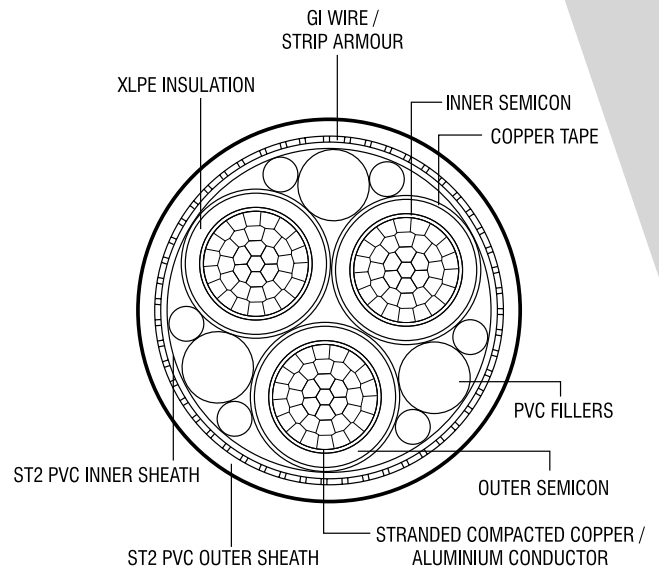
Marking on Outer Sheath

The outer sheath is embossed with "GEMSCAB" voltage grade, cable size, and year of manufacturing as desired. Cables are also sequentially marked for length at every meter.

C CONSTRUCTION OF HT-XLPE CABLES



“GEMSCAB” 1 Core HT XLPE Cable



“GEMSCAB” 3 Core HT XLPE Cable

Testing and quality control:

XLPE Cables are manufactured under advanced manufacturing and testing facilities. The cables are type tested and routine tested in accordance with IS : 7098 (Part – 2) 1985.

The following tests are carried out as routine tests on every length of cables manufactured:

- Conductor resistance test
- Partial discharge test
- High voltage test

Test Voltages:

The following test voltage is applied between conductor and screen / armour.

Voltage Rating of Cables

3.8 / 6.6 KV (E)
 6.35 / 11 KV (E)
 11 / 11 KV (UE)
 12.7 / 22 KV (E)
 19 / 33 KV (E)

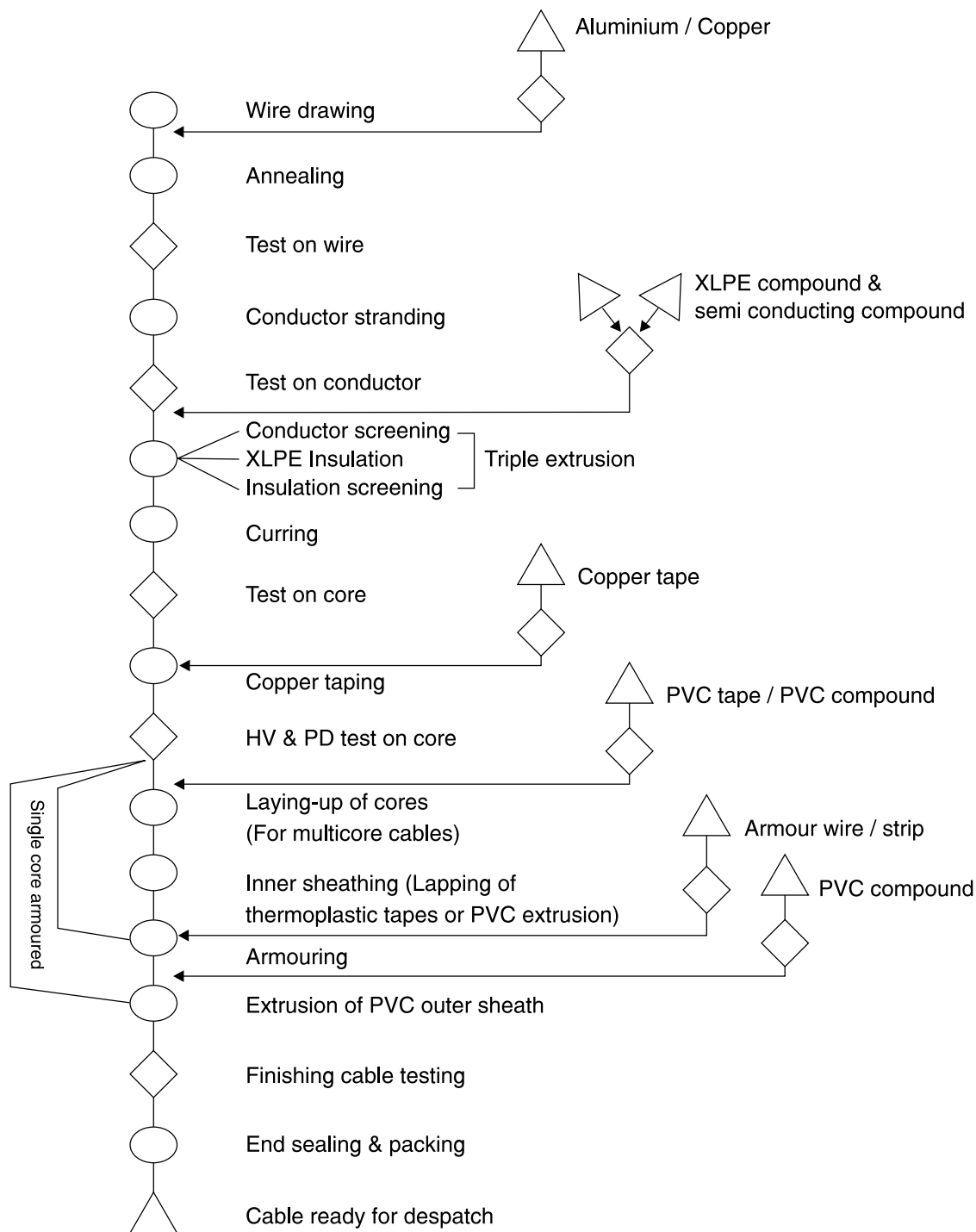
Test Voltage

12 KV (rms) for 5 Minutes
 17 KV (rms) for 5 Minutes
 28 KV (rms) for 5 Minutes
 32 KV (rms) for 5 Minutes
 48 KV (rms) for 5 Minutes

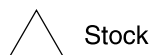
In order to achieve consistency in quality, in addition to above tests, rigorous quality control measures are taken at every stage of production. Accordingly every batch of raw materials and process cables are tested to check for their physical and electrical properties.

FLOW CHART

FLOW CHART FOR MANUFACTURING PROCESS & QUALITY CONTROL CHECKS FOR XLPE CABLES CONFORMING TO IS:7098(PART-2) 1985



Note: Inprocess quality assurance checks are carried out at each stage of manufacturing as per our Quality Assurance Plan.



Stock



Process



Test

P PRODUCT RANGE

HT – XLPE CABLES				
CABLE TYPE	CONDUCTOR	GRADE	MFG. RANGE SPECIFICATION	RELEVANT
HT Cables	Aluminium & Copper Conductor	3.3 KV to 33 KV	Single core upto 1000mm ² and Multicore upto 400 mm ² Armoured / Unarmoured	IS:7098 / Part-2/1985

LT – XLPE CABLES				
CABLE TYPE	CONDUCTOR	GRADE	MFG. RANGE SPECIFICATION	RELEVANT
Power Cables	Aluminium & Copper Conductor	1.1 KV	S/core upto 1000mm ² and Multicore upto 630mm ²	IS:7098 / Part-1/1988
Control Cables	Copper Conductor	1.1 KV	Upto 61 Core	IS:7098 / Part-1/1988

P.V.C. CABLES				
CABLE TYPE	CONDUCTOR	GRADE	MFG. RANGE SPECIFICATION	RELEVANT
Power Cables	Aluminium & Copper Conductor	1.1 KV	Single core upto 1000mm ² and Multicore upto 630mm ²	IS:1554/ Part-I / 1988
Power Cables	Aluminium & Copper Conductor	3.3 KV	Single core upto 1000mm ² Three core upto 400 mm ²	IS:1554 Part-II / 1988
Control / Railway Signalling Screened / Unscreened Cables	Copper Conductor	1.1 KV	Upto 61 core	IS:1554 / Part-I / 1988
Mining Cables	Copper Conductor	3.3 KV	Multicore upto 185 mm ²	IS:1554/ Part-II / 1988
Mining Cables	Copper Conductor	1.1 KV	Multicore upto 185mm ²	IS:1554/ Part-I / 1988
HR & FRLS Cables	Aluminium & Copper Conductor	1.1 KV	Single core upto 1000mm ² Multicore upto 630mm ² Control Cables upto 61 Cores	IS:1554/ Part-I / 1988
Flexible Wires & Cables	Aluminium / Copper	1.1 KV	Different Sizes	IS:694 / 1990

P PRODUCT RANGE

HT-XLPE CABLES

Main Features

- HT-XLPE Cables have longer life as compared to conventional PVC Cables
- HT-XLPE Cables have a higher conductor temperature rating i.e. 90°C
- HT-XLPE Cables have a higher emergency overload capacity 130°C
- Max. temperature limit under short circuit conditions for HT-XLPE Cables is 250°C. Hence XLPE Cables have higher short circuit rating
- Insulation resistance of HT-XLPE Cable is excellent & superior to Identical PVC / PILC Cables
- HT-XLPE Cables have high corrosion resistance in polluted atmosphere
- HT-XLPE Cables have better properties of resistance to chemical and corrosive gases
- HT-XLPE Cables have low installation cost because of light weight, dimensions and are far more flexible
- HT-XLPE Cables have better properties to withstand vibrations, hot impacts
- Jointing of HT-XLPE Cables is easier and quicker

PRODUCT CODE

As per IS:7098-Part:2

CONSTITUENT	CODE
Aluminium Conductor	A
XLPE Insulation	2X
Round Steel Wire	W
Flat Steel Strip Armour	F
Double Round Steel Wire Armour	WW
Double Flat Steel Strip Armour	FF
Non Magnetic (Al) Round Wire Armour	Wa
Non Magnetic (Al) Strip Armour	Fa
PVC Outer Sheath	Y

C ONTINUOUS CURRENT RATINGS OF XLPE CABLES

The current carrying capacity values mentioned in the table are valid for one circuit in a three phase system under conditions specified. However while deciding the size of the cable the user should consider the grouping cable rating factors.

The current carrying capacity mentioned in table are given to assist engineers for selection of cables.

The current rating of XLPE cables given in the subsequent tables are based on the following assumptions and calculated in accordance with the recommendations of IEC-287.

BASIC ASSUMPTION	Maximum conductor temperature of continuous load	90°C
	Ambient air temperature	40°C
	Ground temperature	30°C
	Thermal resistivity of soil	150°C cm/W
	Thermal resistivity of XLPE insulation	350°C cm/W
	Thermal Resistivity of PVC Sheath	650°C cm/W
	Depth of laying in ground	
	3.3 & 3.8 / 6.6, 11 KV cables	900 mm
	22 KV cables	1000 mm
	33 KV cables	1050

Method of installation:

- 1) Multicore cables installed singly.
- 2) Single core cables :
 - (a) in trefoil touching
 - (b) 3 cables laid flat touching

R ATING FACTORS

RATING FACTORS FOR OTHER CONDITIONS OF INSTALLATION ARE GIVEN IN TABLES

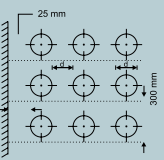
RATING FACTORS FOR VARIATION IN AMBIENT AIR TEMPERATURE:

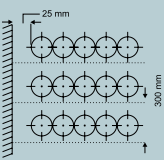
Air Temperature – °C		15	20	25	30	35	40	45	50	55	60
Rating Factors	Conductor Temp. 90°C	1.25	1.20	1.16	1.11	1.05	1.00	0.94	0.88	0.82	0.76

RATING FACTORS FOR VARIATION IN GROUND TEMPERATURE:

Ground Temperature – °C		15	20	25	30	35	40	45	50	55	60
Rating Factors	Conductor Temp. 90°C	1.12	1.08	1.04	1.00	0.96	0.91	0.87	0.82	0.82	0.76

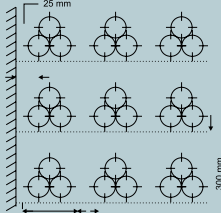
RATING FACTORS FOR MULTICORE CABLES LAID ON OPEN RACKS IN AIR:

Arrangement 1 	No. of racks	No. of cables per rack				
		1	2	3	6	9
	1	1.00	0.98	0.96	0.93	0.92
	2	1.00	0.95	0.93	0.90	0.89
	3	1.00	0.94	0.92	0.89	0.88
	6	1.00	0.93	0.90	0.87	0.86

Arrangement 2 	No. of racks	No. of cables per rack				
		1	2	3	6	9
	1	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

RATING FACTORS




RATING FACTORS FOR SINGLE CORE CABLE IN TREFOIL CIRCUITS LAID ON OPEN RACKS IN AIR:

Arrangement		No. of racks	No. of circuits per rack		
			1	2	3
		1	1.00	0.98	0.96
		2	1.00	0.95	0.93
		3	1.00	0.94	0.92
		6	1.00	0.93	0.90

RATING FACTORS FOR GROUPING OF MULTICORE CABLES LAID DIRECT IN GROUND, IN HORIZONTAL FORMATION:

Spacing Diagram	No. of cables in group					
	2	3	4	6	8	10
Cables touching	0.79	0.69	0.62	0.54	0.50	0.46
15 cm	0.82	0.72	0.66	0.59	0.54	0.51
30 cm	0.86	0.76	0.72	0.65	0.62	0.59

RATING FACTORS FOR GROUPING OF MULTICORE CABLES LAID DIRECT IN GROUND IN TIER FORMATION:

Spacing	Formation of cables		
			
Cables touching	0.60	0.51	0.43
15 cm	0.64	0.55	0.46
30 cm	0.69	0.60	0.50

RATING FACTORS FOR GROUPING OF SINGLE CORE CABLE LAID IN TREFOIL CIRCUITS LAID DIRECT IN GROUND IN HORIZONTAL FORMATION:

Spacing	NO. OF CIRCUITS IN GROUP					
	2	3	4	6	8	10
Cables touching	0.78	0.68	0.61	0.53	0.48	0.45
15 cm	0.81	0.71	0.65	0.57	0.53	0.50
30 cm	0.85	0.76	0.71	0.64	0.60	0.58

RATING FACTORS FOR DEPTH OF LAYING FOR CABLES LAID DIRECT IN THE GROUND:

Depth of laying (cm)	90	105	120	150	180 or more
6.6 KV & 11 KV	1.00	0.99	0.98	0.96	0.95
22 KV & 33 KV	-	1.00	0.99	0.97	0.96

RATING FACTORS

RATING FACTORS FOR VARIATION IN THERMAL RESISTIVITY OF SOIL (MULTICORE CABLES LAID DIRECT IN THE GROUND)

Nominal area of conductor sq. mm.	Rating Factors for value of Thermal Resistivity of Soil in °C cm / watt					
	100	120	150	200	250	300
25	1.14	1.08	1.00	0.91	0.84	0.78
35	1.15	1.08	1.00	0.91	0.84	0.77
50	1.15	1.08	1.00	0.91	0.84	0.77
70	1.15	1.08	1.00	0.90	0.83	0.76
95	1.15	1.08	1.00	0.90	0.83	0.76
120	1.17	1.09	1.00	0.90	0.82	0.76
150	1.17	1.09	1.00	0.90	0.82	0.76
185	1.18	1.09	1.00	0.89	0.81	0.75
240	1.18	1.09	1.00	0.89	0.81	0.75
300	1.18	1.09	1.00	0.89	0.81	0.75
400	1.19	1.10	1.00	0.89	0.81	0.75
500	1.21	1.10	1.00	0.89	0.81	0.75
630	1.22	1.10	1.00	0.89	0.81	0.74

RATING FACTORS FOR VARIATION IN THERMAL RESISTIVITY OF SOIL, THREE SINGLE CORE CABLES LAID DIRECT IN THE GROUND (THREE CABLES IN TREFOIL TOUCHING)

Nominal area of conductor sq. mm.	Rating Factors for value of Thermal Resistivity of Soil in °C cm / watt					
	100	120	150	200	250	300
25	1.19	1.09	1.00	0.88	0.80	0.74
35	1.20	1.09	1.00	0.88	0.80	0.74
50	1.20	1.09	1.00	0.88	0.80	0.74
70	1.21	1.10	1.00	0.88	0.80	0.74
95	1.22	1.10	1.00	0.88	0.80	0.74
120	1.22	1.10	1.00	0.88	0.79	0.74
150	1.22	1.10	1.00	0.88	0.79	0.73
185	1.22	1.10	1.00	0.88	0.79	0.73
240	1.22	1.10	1.00	0.88	0.79	0.73
300	1.22	1.10	1.00	0.88	0.79	0.72
400	1.24	1.11	1.00	0.88	0.79	0.72
500	1.24	1.11	1.00	0.88	0.79	0.72
630 to 1000	1.24	1.11	1.00	0.88	0.79	0.72

DIMENSIONS

UNARMoured / ARMoured TYPE

AA: HT – SINGLE CORE CABLES

3.3 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, UNSCREENED, ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS:7098/PART-2/1985

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE		HARD DRAWN ALUMINIUM WIRE ARMOUR				CURRENT RATING	
		Nominal thickness of sheath	Approx Overall dia of cable	Nominal Thickness	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx Overall dia of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	mm	mm	Amps	Amps
25	2.2	1.8	14.0	2.5	1.4	1.24	17.0	97	104
35	2.2	1.8	15.0	2.5	1.4	1.24	18.0	115	127
50	2.2	1.8	17.0	2.5	1.4	1.4	19.0	136	153
70	2.2	1.8	18.0	2.5	1.6	1.4	21.0	166	192
95	2.2	2.0	20.0	2.5	1.6	1.4	23.0	196	237
120	2.2	2.0	22.0	2.5	1.6	1.4	24.0	225	275
150	2.2	2.0	23.0	2.5	1.6	1.4	26.0	253	317
185	2.2	2.0	25.0	2.5	1.6	1.4	28.0	285	362
240	2.2	2.0	27.0	2.5	1.6	1.56	30.0	330	433
300	2.2	2.0	29.0	2.5	1.6	1.56	33.0	373	504
400	2.2	2.2	33.0	2.6	2.0	1.56	36.0	427	598
500	2.4	2.2	36.0	2.8	2.0	1.56	40.0	485	694
630	2.6	2.2	40.0	3.0	2.0	1.72	44.0	551	815
800	2.8	2.4	45.0	3.3	2.0	1.88	50.0	625	969
1000	3.0	2.6	50.0	3.5	2.5	2.04	55.0	692	1103

3.8 / 6.6 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED, ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS:7098/(PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE		HARD DRAWN ALUMINIUM WIRE ARMOUR			CURRENT RATING	
		Nominal thickness of sheath	Approx Overall dia of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx Overall dia of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	mm	Amps	Amps
25	2.8	1.8	18.0	1.6	1.40	21.0	97	106
35	2.8	2.0	19.0	1.6	1.40	22.0	118	130
50	2.8	2.0	20.0	1.6	1.40	23.0	136	156
70	2.8	2.0	22.0	1.6	1.40	26.0	166	196
95	2.8	2.0	23.0	1.6	1.40	27.0	197	239
120	2.8	2.0	25.0	1.6	1.40	29.0	224	277
150	2.8	2.0	26.0	1.6	1.56	31.0	252	312
185	2.8	2.0	28.0	1.6	1.56	33.0	284	368
240	2.8	2.2	31.0	2.0	1.56	36.0	329	440
300	3.0	2.2	33.0	2.0	1.56	38.0	372	509
400	3.3	2.2	37.0	2.0	1.72	43.0	427	602
500	3.5	2.4	41.0	2.0	1.72	46.0	485	699
630	3.5	2.4	44.0	2.0	1.88	50.0	551	817
800	3.5	2.6	51.0	2.5	2.04	57.0	624	965
1000	3.6	2.8	56.0	2.5	2.20	61.0	692	1096

DIMENSIONS

UNARMoured / ARMoured TYPE

AA: HT – SINGLE CORE CABLES

6.35 / 11 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS:7098/(PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE		HARD DRAWN ALUMINIUM WIRE ARMOUR			CURRENT RATING	
		Nominal thickness of sheath	Approx Overall dia of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx Overall dia of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	mm	Amps	Amps
25	3.6	2.0	20.0	1.6	1.40	22.0	97	107
35	3.6	2.0	21.0	1.6	1.40	24.0	115	134
50	3.6	2.0	22.0	1.6	1.40	25.0	135	160
70	3.6	2.0	24.0	1.6	1.40	27.0	165	200
95	3.6	2.0	26.0	1.6	1.40	29.0	197	245
120	3.6	2.0	27.0	1.6	1.56	31.0	224	286
150	3.6	2.0	29.0	1.6	1.56	32.0	251	324
185	3.6	2.2	31.0	2.0	1.56	35.0	283	373
240	3.6	2.2	34.0	2.0	1.56	36.0	328	445
300	3.6	2.2	36.0	2.0	1.56	39.0	371	513
400	3.6	2.2	39.0	2.0	1.72	43.0	425	603
500	3.6	2.4	43.0	2.0	1.72	46.0	484	705
630	3.6	2.4	46.0	2.0	1.88	50.0	550	821
800	3.6	2.6	52.0	2.5	2.04	55.0	623	964
1000	3.6	2.8	56.0	2.5	2.20	60.0	690	1094

11 / 11 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS:7098/(PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE		HARD DRAWN ALUMINIUM WIRE ARMOUR			CURRENT RATING	
		Nominal thickness of sheath	Approx Overall dia of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx Overall dia of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	mm	Amps	Amps
25	5.5	2.0	24.0	1.6	1.40	26.0	97	112
35	5.5	2.0	25.0	1.6	1.40	27.0	115	137
50	5.5	2.0	26.0	1.6	1.56	29.0	136	165
70	5.5	2.0	28.0	1.6	1.56	31.0	166	206
95	5.5	2.0	30.0	1.6	1.56	32.0	198	250
120	5.5	2.2	32.0	2.0	1.56	35.0	225	291
150	5.5	2.2	33.0	2.0	1.56	36.0	252	330
185	5.5	2.2	35.0	2.0	1.56	38.0	285	379
240	5.5	2.2	37.0	2.0	1.72	41.0	350	450
300	5.5	2.2	39.0	2.0	1.72	43.0	373	518
400	5.5	2.4	43.0	2.0	1.88	47.0	427	608
500	5.5	2.4	46.0	2.0	1.88	50.0	486	709
630	5.5	2.6	50.0	2.5	2.04	54.0	553	822
800	5.5	2.8	55.0	2.5	2.20	60.0	628	964
1000	5.5	2.8	60.0	2.5	2.20	63.0	697	1090

DIMENSIONS

UNARMoured / ARMoured TYPE

AA: HT – SINGLE CORE CABLES

12.7 / 22 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS:7098/(PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE		HARD DRAWN ALUMINIUM WIRE ARMOUR			CURRENT RATING	
		Nominal thickness of sheath	Approx Overall dia of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx Overall dia of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	mm	Amps	Amps
35	6.0	2.0	26.0	1.6	1.40	29.0	114	143
50	6.0	2.0	27.0	1.6	1.56	30.0	134	167
70	6.0	2.0	28.0	1.6	1.56	32.0	164	207
95	6.0	2.2	31.0	2.0	1.56	35.0	195	253
120	6.0	2.2	33.0	2.0	1.56	36.0	221	291
150	6.0	2.2	34.0	2.0	1.56	38.0	250	333
185	6.0	2.2	36.0	2.0	1.56	40.0	280	380
240	6.0	2.2	38.0	2.0	1.72	42.0	326	450
300	6.0	2.2	40.0	2.0	1.72	44.0	367	521
400	6.0	2.4	43.0	2.0	1.88	48.0	429	616
500	6.0	2.6	47.0	2.5	2.04	52.0	478	709
630	6.0	2.6	50.0	2.5	2.04	56.0	545	828
800	6.0	2.8	55.0	2.5	2.20	61.0	618	975
1000	6.0	3.0	60.0	2.5	2.36	65.0	685	1107

19 / 33 KV, SINGLE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, SCREENED ARMoured / UNARMoured AND PVC SHEATHED CABLES CONFORMING TO IS:7098/(PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	UNARMoured CABLE		HARD DRAWN ALUMINIUM WIRE ARMOUR			CURRENT RATING	
		Nominal thickness of sheath	Approx Overall dia of cable	Nominal dia of Aluminium wire	Minimum thickness of sheath	Approx Overall dia of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm	mm	mm	mm	mm	mm	Amps	Amps
50	8.8	2.2	34.0	2.0	1.56	37.0	135	170
70	8.8	2.2	36.0	2.0	1.56	39.0	165	212
95	8.8	2.2	37.0	2.0	1.72	41.0	196	258
120	8.8	2.2	39.0	2.0	1.72	42.0	223	297
150	8.8	2.2	41.0	2.0	1.72	44.0	250	339
185	8.8	2.4	43.0	2.0	1.72	46.0	282	386
240	8.8	2.4	45.0	2.0	1.88	48.0	326	464
300	8.8	2.6	48.0	2.5	2.04	52.0	369	526
400	8.8	2.6	51.0	2.5	2.04	55.0	423	617
500	8.8	2.8	55.0	2.5	2.20	59.0	481	713
630	8.8	2.8	58.0	2.5	2.20	63.0	549	832
800	8.8	3.0	63.0	2.5	2.36	67.0	620	978
1000	8.8	3.2	67.0	3.15	2.52	72.0	686	1110

DIMENSIONS

ARMOURED TYPE

BB: HT – MULTICORE CORE CABLES

1.9 / 3.3 KV & 3.3 / 3.3 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED AND PVC SHEATHED CABLES CONFORMING TO IS:7098 (PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMOURED			FLAT GALVANISED STEEL STRIP ARMOURED			CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx Overall diameter of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm		mm	mm	mm	mm	mm	mm	Amps	Amps
25	2.2	0.3	1.6	1.56	32.0	4.0 × 0.80	1.40	27.0	93	97
35	2.2	0.3	1.6	1.56	34.0	4.0 × 0.80	1.56	29.0	111	119
50	2.2	0.4	2.0	1.56	36.0	4.0 × 0.80	1.56	32.0	132	148
70	2.2	0.4	2.0	1.56	39.0	4.0 × 0.80	1.56	35.0	160	179
95	2.2	0.4	2.0	1.72	42.0	4.0 × 0.80	1.72	38.0	192	219
120	2.2	0.5	2.0	1.88	47.0	4.0 × 0.80	1.72	41.0	218	253
150	2.2	0.5	2.5	2.04	51.0	4.0 × 0.80	1.88	43.0	245	290
185	2.2	0.5	2.5	2.04	55.0	4.0 × 0.80	2.04	47.0	275	330
240	2.2	0.6	2.5	2.20	61.0	4.0 × 0.80	2.20	51.0	318	391
300	2.2	0.6	2.5	2.36	66.0	4.0 × 0.80	2.20	55.0	360	453
400	2.2	0.7	3.15	2.68	73.0	4.0 × 0.80	2.52	61.0	410	530

3.8 / 6.6 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED AND PVC SHEATHED CABLES CONFORMING TO IS:7098/ PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMOURED			FLAT GALVANISED STEEL STRIP ARMOURED			CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx Overall diameter of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm		mm	mm	mm	mm	mm	mm	Amps	Amps
25	2.8	0.4	2.0	1.72	40.0	4.0 × 0.80	1.56	37.0	94	100
35	2.8	0.4	2.0	1.72	42.0	4.0 × 0.80	1.72	40.0	111	121
50	2.8	0.5	2.0	1.88	46.0	4.0 × 0.80	1.72	43.0	130	145
70	2.8	0.5	2.0	1.88	49.0	4.0 × 0.80	1.88	47.0	160	181
95	2.8	0.5	2.5	2.04	54.0	4.0 × 0.80	1.88	50.0	191	221
120	2.8	0.6	2.5	2.20	57.0	4.0 × 0.80	2.04	54.0	217	254
150	2.8	0.6	2.5	2.20	61.0	4.0 × 0.80	2.20	58.0	243	290
185	2.8	0.6	2.5	2.36	66.0	4.0 × 0.80	2.20	61.0	274	330
240	2.8	0.7	3.15	2.52	72.0	4.0 × 0.80	2.36	68.0	317	390
300	3.0	0.7	3.15	2.68	78.0	4.0 × 0.80	2.52	73.0	358	450
400	3.3	0.7	4.0	3.00	88.0	4.0 × 0.80	2.84	82.0	408	525

DIMENSIONS

ARMOURED TYPE

BB: HT – MULTICORE CORE CABLES

6.6 / 6.6 KV & 6.35 / 11 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED AND PVC SHEATHED CABLES CONFORMING TO IS:7098/ PART-2)/1998

Nominal area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMOURED			FLAT GALVANISED STEEL STRIP ARMOURED			CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx Overall diameter of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm		mm	mm	mm	mm	mm	mm	Amps	Amps
25	3.6	0.4	2.0	1.72	43.0	4.0 × 0.80	1.72	41.0	93	100
35	3.6	0.5	2.0	1.88	46.0	4.0 × 0.80	1.72	43.0	111	121
50	3.6	0.5	2.5	2.04	50.0	4.0 × 0.80	1.88	46.0	130	145
70	3.6	0.5	2.5	2.04	54.0	4.0 × 0.80	1.88	50.0	160	181
95	3.6	0.6	2.5	2.20	58.0	4.0 × 0.80	2.04	54.0	191	221
120	3.6	0.6	2.5	2.36	61.0	4.0 × 0.80	2.20	58.0	217	254
150	3.6	0.6	2.5	2.36	65.0	4.0 × 0.80	2.20	61.0	243	290
185	3.6	0.7	3.15	2.52	71.0	4.0 × 0.80	2.36	65.0	274	330
240	3.6	0.7	3.15	2.68	76.0	4.0 × 0.80	2.52	70.0	317	390
300	3.6	0.7	3.15	2.84	82.0	4.0 × 0.80	2.68	76.0	357	450
400	3.6	0.7	4.0	3.00	89.0	4.0 × 0.80	2.84	83.0	408	525

11 / 11 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED, AND PVC SHEATHED CABLES CONFORMING TO IS:7098/(PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMOURED			FLAT GALVANISED STEEL STRIP ARMOURED			CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx Overall diameter of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm		mm	mm	mm	mm	mm	mm	Amps	Amps
25	5.5	0.5	2.50	2.04	55.0	4.0 × 0.80	1.88	50.0	94	110
35	5.5	0.5	2.50	2.20	57.0	4.0 × 0.80	2.04	53.0	112	133
50	5.5	0.6	2.50	2.20	59.0	4.0 × 0.80	2.20	56.0	131	158
70	5.5	0.6	2.50	2.36	63.0	4.0 × 0.80	2.20	60.0	160	197
95	5.5	0.6	3.15	2.52	69.0	4.0 × 0.80	2.36	64.0	191	237
120	5.5	0.7	3.15	2.52	72.0	4.0 × 0.80	2.52	67.0	217	257
150	5.5	0.7	3.15	2.68	76.0	4.0 × 0.80	2.52	71.0	248	292
185	5.5	0.7	3.15	2.84	80.0	4.0 × 0.80	2.68	75.0	273	331
240	5.5	0.7	3.15	3.00	86.0	4.0 × 0.80	2.84	80.0	316	390
300	5.5	0.7	4.00	3.00	92.0	4.0 × 0.80	3.00	85.0	367	448
400	5.5	0.7	4.00	3.00	98.0	4.0 × 0.80	3.00	92.0	408	523

DIMENSIONS

ARMOURED TYPE

BB: HT – MULTICORE CORE CABLES

12.7 / 22 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED AND PVC SHEATHED CABLES CONFORMING TO IS:7098/(PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMOURED			FLAT GALVANISED STEEL STRIP ARMOURED			CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx Overall diameter of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm		mm	mm	mm	mm	mm	mm	Amps	Amps
35	6.0	0.6	2.5	2.20	59.0	4.0 × 0.80	2.04	56.0	110	132
50	6.0	0.6	2.5	2.36	62.0	4.0 × 0.80	2.20	58.0	129	157
70	6.0	0.6	2.5	2.36	65.0	4.0 × 0.80	2.36	62.0	158	194
95	6.0	0.7	3.15	2.52	70.0	4.0 × 0.80	2.36	66.0	189	224
120	6.0	0.7	3.15	2.68	74.0	4.0 × 0.80	2.52	70.0	213	257
150	6.0	0.7	3.15	2.68	78.0	4.0 × 0.80	2.68	73.0	239	292
185	6.0	0.7	3.15	2.84	82.0	4.0 × 0.80	2.68	77.0	269	332
240	6.0	0.7	4.0	3.00	89.0	4.0 × 0.80	2.84	82.0	312	390
300	6.0	0.7	4.0	3.00	94.0	4.0 × 0.80	3.00	87.0	352	448
400	6.0	0.7	4.0	3.00	100.0	4.0 × 0.80	3.00	94.0	402	523

19 / 33 KV, THREE CORE, ALUMINIUM CONDUCTOR, XLPE INSULATED, ARMOURED AND PVC SHEATHED CABLES CONFORMING TO IS:7098/(PART-2)/1985

Nominal area of conductor	Nominal thickness of insulation	Minimum thickness of inner sheath	ROUND GALVANISED STEEL WIRE ARMOURED			FLAT GALVANISED STEEL STRIP ARMOURED			CURRENT RATING	
			Nominal diameter of round wire	Minimum thickness of outer sheath	Approx overall diameter of cable	Nominal dimensions of flat strip	Minimum thickness of outer sheath	Approx Overall diameter of cable	Direct in ground 30°C	In Air 40°C
Sq mm	mm		mm	mm	mm	mm	mm	mm	Amps	Amps
50	8.8	0.7	3.15	2.68	76.0	4.0 × 0.80	2.52	72.0	130	158
70	8.8	0.7	3.15	2.84	80.0	4.0 × 0.80	2.68	76.0	158	198
95	8.8	0.7	3.15	3.00	84.0	4.0 × 0.80	2.84	80.0	188	236
120	8.8	0.7	4.0	3.00	89.0	4.0 × 0.80	2.84	83.0	214	270
150	8.8	0.7	4.0	3.00	91.0	4.0 × 0.80	3.00	86.0	239	293
185	8.8	0.7	4.0	3.00	96.0	4.0 × 0.80	3.00	89.0	270	348
240	8.8	0.7	4.0	3.00	101.0	4.0 × 0.80	3.00	95.0	312	408
300	8.8	0.7	4.0	3.00	106.0	4.0 × 0.80	3.00	100.0	352	449
400	8.8	0.7	4.0	3.00	112.0	4.0 × 0.80	3.00	106.0	402	522

C ONDUCTOR RESISTANCE

CONDUCTOR TECHNICAL INFORMATION FOR SINGLE CORE AND MULTICORE CABLES CONFORMING TO IS:8130/1984 (STRANDED – CLASS-2) COPPER & ALUMINIUM CONDUCTORS.

Nominal Size of Conductor	MINIMUM NO. OF WIRE		MAX. D.C. RESISTANCE AT 20°C		A.C. RESISTANCE AT 90°C	
	Compacted Round / Shaped		Plain Copper	Aluminium	Plain Copper	Aluminium
Sq. mm	CU.	ALU.	Ohm / Km	Ohm / Km	Ohm / Km	Ohm / Km
25	6	6	0.727	1.20	0.930	1.54
35	6	6	0.524	0.868	0.671	1.11
50	6	6	0.387	0.641	0.495	0.82
70	12	12	0.268	0.443	0.343	0.567
95	15	15	0.193	0.320	0.247	0.410
120	18	15	0.153	0.253	0.196	0.324
150	18	15	0.124	0.206	0.159	0.264
185	30	30	0.0991	0.164	0.127	0.210
240	34	30	0.0754	0.125	0.0965	0.160
300	34	30	0.0601	0.100	0.0769	0.130
400	53	53	0.0470	0.0778	0.0602	0.10
500	53	53	0.0366	0.0605	0.0468	0.0774
630	53	53	0.0283	0.0469	0.0362	0.060
800	53	53	0.0221	0.0367	0.0283	0.0470
1000	53	53	0.0176	0.0291	0.0225	0.0372

C APACITANCE

APPROXIMATE CAPACITANCE (MICROFARADS/KM) FOR SINGLE / THREE CORE CABLES

Size	Voltage Grade (KV)					
	1.9 / 3.3 & 3.3 / 3.3	3.8 / 6.6	6.6 / 6.6 & 6.35 / 11	11 / 11	12.7 / 22	19 / 33
Sq. mm						
25	0.22	0.21	0.19	0.13	-	-
35	0.25	0.24	0.22	0.15	0.14	-
50	0.30	0.27	0.23	0.16	0.15	0.12
70	0.34	0.31	0.27	0.18	0.17	0.14
95	0.39	0.34	0.31	0.20	0.19	0.15
120	0.43	0.37	0.33	0.22	0.20	0.16
150	0.49	0.42	0.36	0.24	0.22	0.17
185	0.52	0.44	0.39	0.25	0.24	0.18
240	0.59	0.50	0.43	0.28	0.26	0.20
300	0.67	0.53	0.48	0.32	0.30	0.23
400	0.76	0.55	0.53	0.36	0.33	0.25
500	0.77	0.57	0.50	0.39	0.36	0.27
630	0.81	0.64	0.69	0.43	0.40	0.29
800	0.86	0.73	0.79	0.49	0.45	0.33
1000	0.88	0.80	0.88	0.53	0.49	0.35

REACTANCE

APPROXIMATE REACTANCE AT 50 HZ (OHMS/KM) FOR THREE CORE CABLES

Size Sq. mm	Voltage Grade (KV)					
	1.9 / 3.3 & 3.3 / 3.3	3.8 / 6.6	6.6 / 6.6 & 6.35 / 11	11 / 11	12.7 / 22	19 / 33
25	0.098	0.109	0.116	0.152	–	–
35	0.094	0.104	0.111	0.144	0.147	–
50	0.087	0.098	0.104	0.137	0.140	0.133
70	0.084	0.094	0.100	0.129	0.132	0.125
95	0.081	0.090	0.095	0.123	0.125	0.121
120	0.078	0.087	0.092	0.117	0.120	0.116
150	0.076	0.085	0.089	0.114	0.116	0.112
185	0.075	0.083	0.087	0.110	0.113	0.110
240	0.073	0.081	0.085	0.106	0.108	0.105
300	0.072	0.079	0.082	0.103	0.105	0.100
400	0.071	0.078	0.079	0.099	0.101	0.097

Short Circuit Rating for 1 Second duration for Copper & Aluminium XLPE Cables (KA-Ish)

Nominal Size Sq. mm	XLPE Insulated	
	Copper	Aluminium
25	3.58	2.35
35	5.0	3.29
50	7.15	4.7
70	10.0	6.58
95	13.6	18.93
120	17.2	11.3
150	21.5	14.1
185	26.5	17.4
240	34.3	22.6
300	42.9	28.2
400	57.2	37.6
500	71.5	47.0
630	90.1	59.0
800	114.4	75.2
1000	143.0	94.0

RATING FOR ANY OTHER DURATION:

XLPE Cables as per IS:7098/(Part-2)/1985

- 1) Max. Conductor Temperature during operation : 90°C
- 2) Max. Conductor Temperature during Short circuit: 250°C

Formula relating short circuit rating with “t” second duration

$$I_{sh} : \frac{KA}{\sqrt{t}}$$

- Ish : Short circuit current in KA
 K : Constant 10.094 for Aluminium & 0.143 for copper
 A : Area of cross section in Sq.mm.
 t : Duration of short circuit in seconds

Recommended minimum bending radius for HT cables:

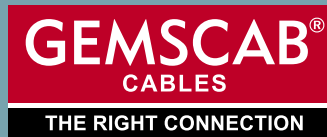
- Single Core : 20 × D Where D = Diameter of cable in mm
 Multicore : 15 × D

Recommended safe pulling force with stockings:

- a) For Unarmoured Cable : P = 5 D² Where P = Pulling Force
 b) For Armoured Cable : P = 9 D² D = Diameter of cable in mm

Recommended safe pulling force when pulled with pulling eye:

- a) For Aluminium Conductors : 30 N / mm²
 b) For Copper Conductor : 50 N / mm²



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