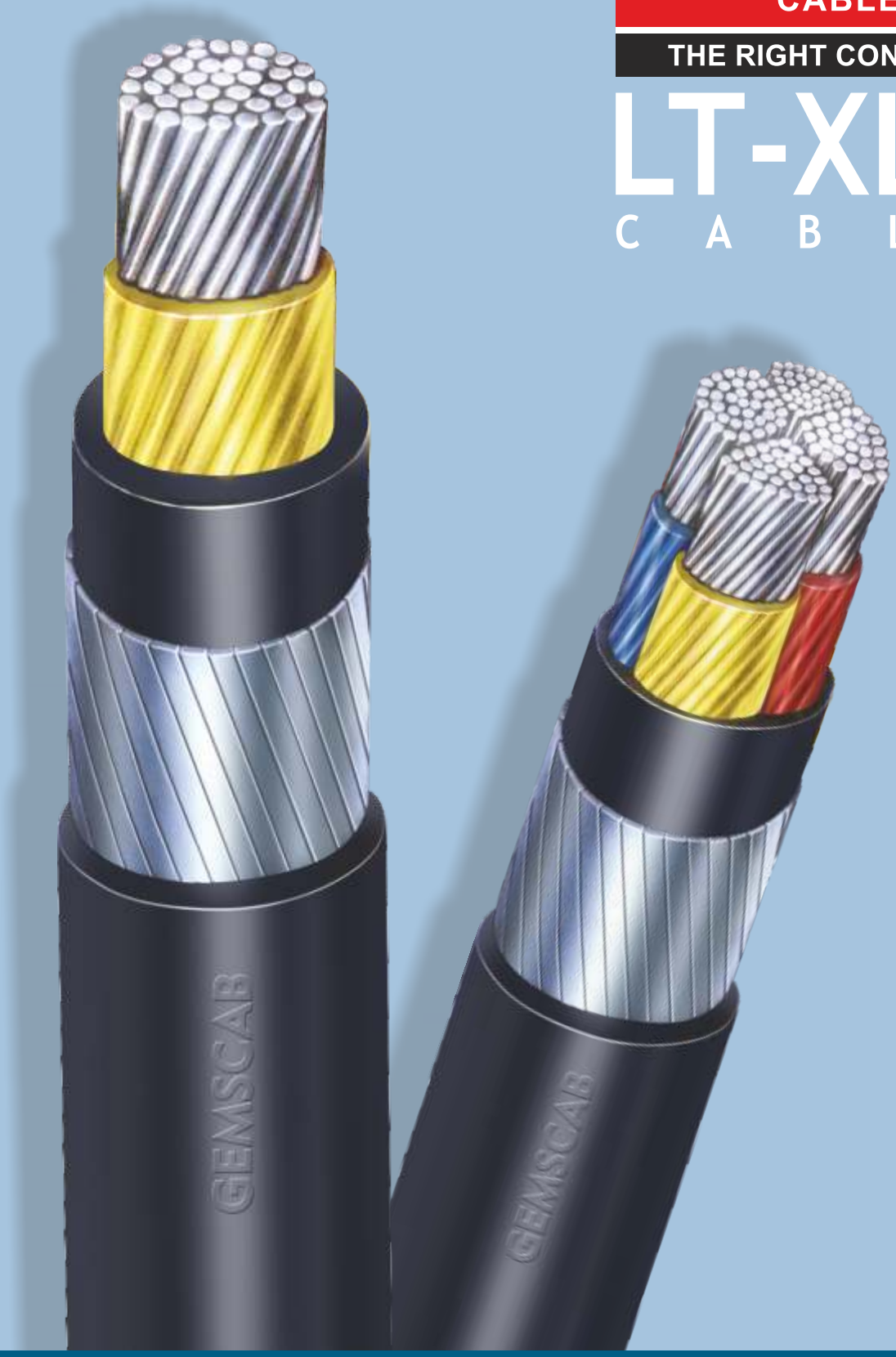
GEMSCAB®
CABLES

THE RIGHT CONNECTION

LT-XLPE
CABLES



IS-7098
PT(I)1988

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 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 two state-of-the-art manufacturing plants at Bhiwadi and Pathredi in 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 at Pathredi (Rajasthan) to manufacture HT Cables by Dry Curing method (CCV Line). It will help the company to meet increasing demand in infrastructure projects like Power, Steel, Cement Industries etc. and provide fast deliveries.

"GEMSCAB" LT XLPE cables are being manufactured and tested at its Bhiwadi Complex. The cables are manufactured on latest machinery and provided with Normal PVC Outer Sheath / FR Outer Sheath / FRLS Outer Sheath. These Cables are manufactured as per IS:7098 / (Part-1) and as per customer specifications.

"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.

LT-XLPE Cables Application

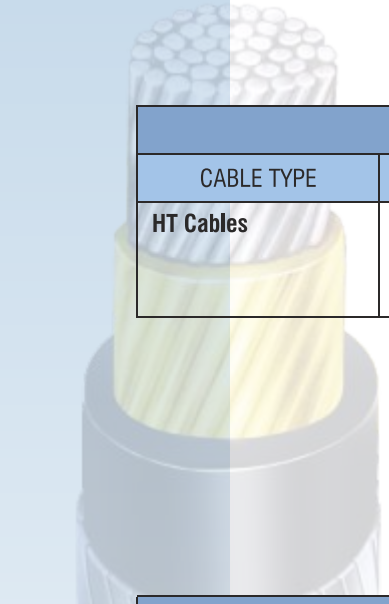
'GEMSCAB' LT-XLPE Cables

'GEMSCAB' LT-XLPE Cables are manufactured as per IS:7098 / Part-I to be suitable for conductor temperature of 90^{0}C and short circuit capacity 250^{0}C. 'GEMSCAB' LT-XLPE Cables have excellent Mechanical, Electrical and Thermal Properties surpassing those of conventional polymeric dielectrics. The superior properties of XLPE have led to lower insulation thickness, high current carrying capacity, reduced weight and dimension. 'GEMSCAB' LT-XLPE Cable is the economic solution for low tension power distribution with high efficiency and total reliability.

Because of the excellent mechanical and electrical properties 'GEMSCAB' LT-XLPE CABLES can be used extensively in Power Stations, Industrial Units, Projects and Power Transmission and Distributions. They are ideally suited for Steel, Chemical, Fertilizers & Process Industry where cables are exposed to chemical corrosion or in heavy industries, where severe load fluctuations occour and for systems with frequent over voltages. "GEMSCAB" LT-XLPE CABLES can also be used at higher ambient temperature on account of their higher operating temperature. Their excellent installation properties permit the cable to be used even under most difficult cable routing conditions and also in cramped conditions. Single core cable due to their excellent installation properties are used in Power Station, Sub-Station and Industrial Plants.

Product Range

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



HT – XLPE CABLES				
CABLE TYPE	CONDUCTOR	GRADE	MFG. RANGE SPECIFICATION	RELEVANT
HT Cables	Aluminium & Copper Conductor	3.3 KV to 66 KV	Single core upto 1000mm^2 and Multicore upto 400 mm^2 Armoured / Unarmoured	IS:7098 / Part-2 / 2011

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 / 2010

Product Range

LT-XLPE CABLES

Main Features

- LT-XLPE Cables have longer life as compared to conventional PVC Cables
- LT-XLPE Cables have a higher conductor temperature rating i.e. 90^{0}C
- LT-XLPE Cables have a higher emergency overload capacity 120^{0}C
- Max. temperature limit under short circuit conditions for LT-XLPE Cables is 250^{0}C. Hence XLPE Cables have higher short circuit rating
- Insulation resistance of LT-XLPE Cable is excellent & superior to Identical PVC Cables
- LT-XLPE Cables have high corrosion resistance in polluted atmosphere
- LT-XLPE Cables have better properties of resistance to chemical and corrosive gases
- LT-XLPE Cables have low installation cost because of light weight, dimensions and are far more flexible
- LT-XLPE Cables have better properties to withstand vibrations, hot impacts
- Jointing of LT-XLPE Cables is easier and quicker

PRODUCT CODE

As per IS:7098-Part:1

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

Construction

Conductor

Conductors are made from electrolytic grade aluminium / copper conforming to IS:8130, and are Compact circular or Compact shaped, Solid / Stranded circular.

Insulation

GEMSCAB XLPE cables use specially made from high grade cross-linked polyethylene for insulation by extrusion process.

Core Identification

The cores are identified by different colours:

Single core	Red, Black, Yellow, Blue or natural
Two core	Red and Black
Three core	Red, Yellow and Blue
Four core	Red, Yellow, Blue and Black
Three and half core	Red, Yellow, Blue and reduced neutral core in Black
Five core	Red, Yellow, Blue, Black and Grey
Six core and above	Two adjacent cores (counting and direction core) in each layer Blue and Yellow. Remaining cores Grey

Core numbering and different colours are also for control cables

Laying up

In multicore 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.

Armouring

Armouring is provided over the inner sheath to guard against mechanical damage. Armouring is generally of galvanised steel wires or strips (in single core cables used in AC system armouring is by non-magnetic hard drawn aluminium wires / strips). Round steel wires are used where the diameter over the inner sheath does not exceed 13 mm, flat steel strip' armour is used above 13 mm dia. Round wire of different sizes can be provided against specific request.

Outer Sheath

Specially formulated heat resistant black PVC compound conforming to the requirement to type ST2 of IS:5831-1984, extruded to form the outer sheath. GEMSCAB XLPE also offers a specially formulated Flame Retardant Low Smoke compound (FRLS) for outer sheath used in fire hazardous environment.

Operating Characteristic

A.	Max. Conductor Temperature for continuous operaton	:	90°C
B.	Ambient Air Temperature	:	40°C
C.	Standard Ground Temperature	:	30°C
D.	Thermal Resistivity of Soil	:	150°C Cm/Watt
E.	Thermal Resistivity	:	350°C Cm/Watt
F.	Depth of Laying (for Cables laid direct in ground)	:	75 Cm
G.	Minimum Bending Radius (for Multi Core Cables)	:	12D (D-Dia of Cable)
H.	Max. Conductor temperature during short circuit	:	250°C
I.	Maximum Ambient, Air temperature	:	85°C

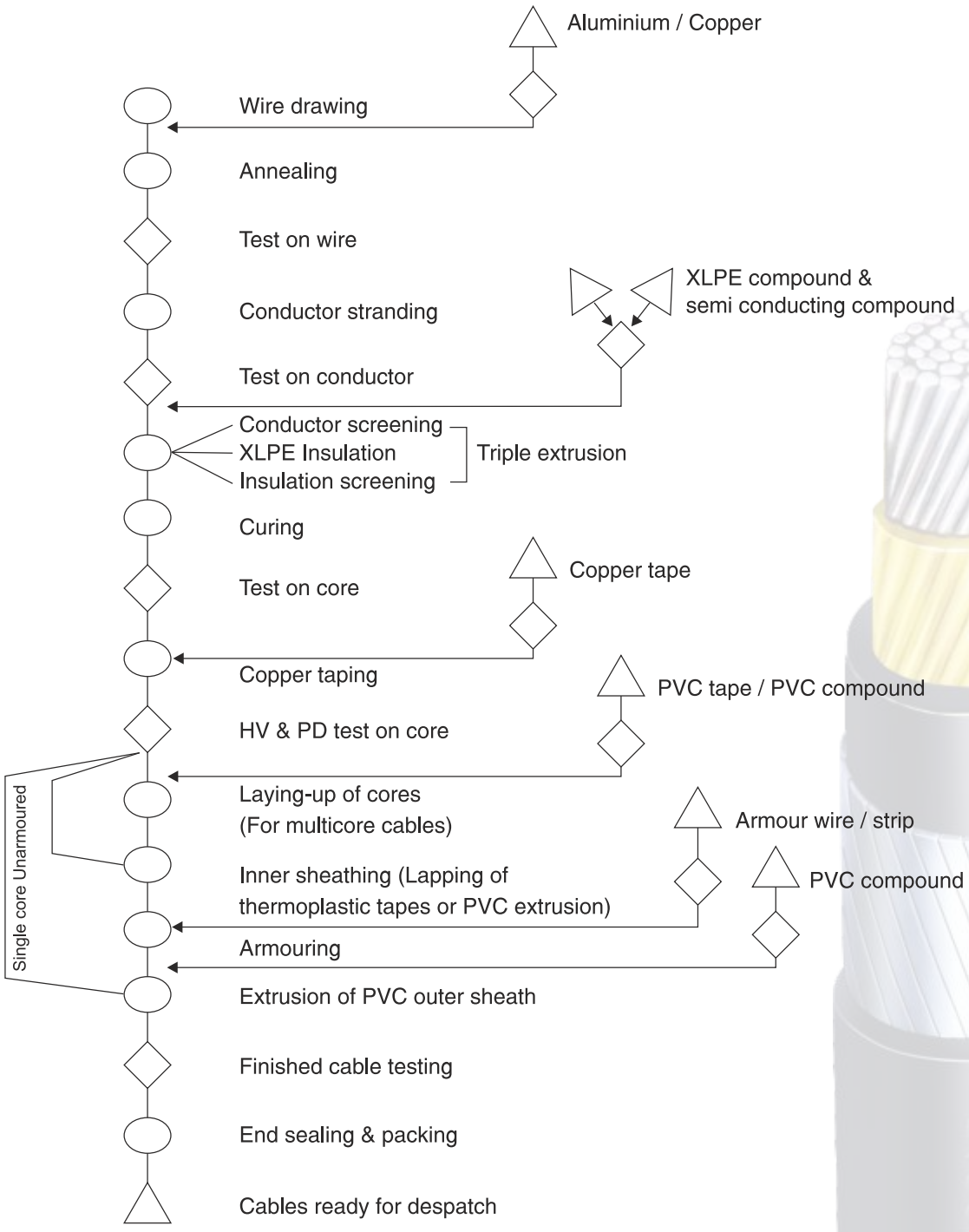
J. **Type of Installation**

i. 3 Core Cable – Installed Independently
– Three cables in Trefoil

ii. Single Core Cables – Touching each other

Flow Chart

Flow Chart for manufacturing process & quality control checks for XLPE Cables conforming to IS:7098 (Part-1) 1988



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

Stock Process Test

Quality Control System

1. Test on Raw Material Stage

'GEMSCAB' XLPE Cables are manufactured from high quality Raw Materials which are tested in our laboratory strictly according to our works standards. For XLPE Cables, the Raw Material used and tests conducted are as under.

i. Aluminium / copper wire

Conductor resistance, wire diameter tensile strength, annealing and wrapping test.

ii. XLPE / PVC compound

Density, tensile strength, elongation at break, volume resistivity and shrinkage test.

iii. Steel strip / wire

Dimensions, tensile strength elongation at break, torsion, resistivity and zinc coating test.

2. Production shop preventive test i.e. process inspection

The Process control tests are carried out at every stage of manufacture for checking the adequate manufacturing process, and taking necessary steps to remove any defects.

The following are the process inspections carried out by us for XLPE cables.

i. Conductor stranding

a. Dimensions
b. Surface and shape of conductor
c. Lay and direction of lay
d. D.C. resistance
e. No. of wires in each conductor

ii. Insulation

a. Dimension of cores
b. Thickness of insulation
c. Surface

iii. Curing

a. Temperature
b. Pressure
c. Time
d. Hot-set-test

iv. Laying up

a. Sequence of cores
b. Direction of laying up and lay
c. Circularity of cable
d. Diameter over laid up cores
e. Application of filler in the interstices

v. Inner sheath

a. Surface
b. Concentricity
c. Thickness
d. Diameter over inner sheath

vi. Armouring

a. Lay and direction of lay of armouring wire / strips
b. No. of wires / strips
c. Uniformity of application
d. Diameter over armouring
e. Dimension of wires-strips

vii. Outer sheath

a. Thickness
b. Concentricity
c. Diameter over sheath
d. Surface
e. Embossing with requisite information on outer sheath

3. Finished Cable Test

'GEMSCAB' have a well equipped air-conditioned laboratory with state-of-the-art Testing equipment. All routine, acceptance and type tests are conducted as per relevant specifications and testing schemes i.e. IS:7098 Part-I amended upto date.

Rating Factors

a. Rating factors for variation in ambient air temperature

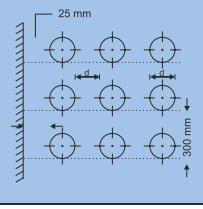
Air Temperature - °C		20	25	30	35	40	45	50	55	60
Rating Factors	Conductor Temp. 90°C	1.18	1.14	1.10	1.05	1.00	0.95	0.89	0.84	0.77

Rating factors for variation in ground temperature

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

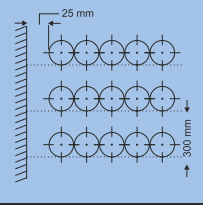
b. Rating factors for multicore cables laid on open racks in air

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

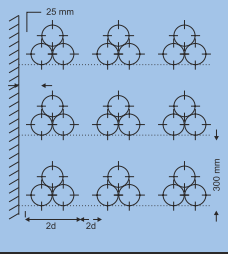
Arrangement 2



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

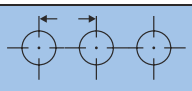
c. Rating factors for single core cable in trefoil circuits laid on open racks in air

Arrangement



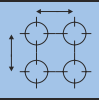
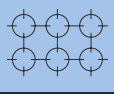
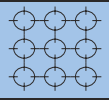
No. of racks	No. of circuits per rack		
	1	2	3
1	1.00	0.98	0.96
2	1.00	0.95	0.93
3	1.00	0.94	0.92
6	1.00	0.93	0.90

d. Rating factors for grouping of multicore cables laid direct in ground, in horizontal formation

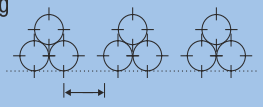
Spacing Diagram 	No. of cables in group					
	2	3	4	6	8	10
Cables touching	0.79	0.69	0.62	0.54	0.50	0.46
15 cm	0.82	0.72	0.66	0.59	0.54	0.51
30 cm	0.86	0.76	0.72	0.65	0.62	0.59

Rating Factors

e. 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

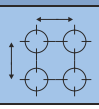
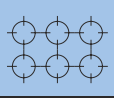
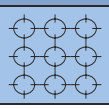
f. Rating factors for grouping of single core cable laid direct in ground in horizontal formation

Spacing 	No. of cables per rack					
	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

g. Rating factors for various depths of laying
(for cables laid direct in ground)

Depth of laying (mm)	Upto to 25 sq. mm.	above 25 sq. mm	above 300 sq. mm
75	1.0	1.0	1.0
90	0.99	0.98	0.97
105	0.98	0.97	0.96
120	0.97	0.97	0.95
150	0.96	0.94	0.92
180 or more	0.95	0.93	0.91

h. 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

i. Ruling factor for Variation in thermal resistivity of soil (multicore cables laid direct in ground)

Nominal area of conductor sq. mm.	Rating Factors for value of Thermal Resistivity of Soil in ^{0}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

j. Ruling factor for Variation in thermal resistivity of soil, three single core cables laid direct in ground (three cables in trefoil touching)

Nominal area of conductor sq. mm.	Rating Factors for value of Thermal Resistivity of Soil in ^{0}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 & Weights

SINGLE CORE AL CABLES

1.1 KV Single core XLPE insulated unarmoured and armoured cable with aluminium conductor conforming to IS:7098(Part 1) 1988

Un-armoured cables					Armoured cables								
					Single layer round wire armoured					Single layer flat strip armoured			
Nominal Area of Conductor (mm2)	Nominal thickness of XLPE insulation (mm)	Nominal thickness of PVC outer sheath (mm)	Approx. Overall diameter of cable (mm)	Approx. weight of cable (Kg/Km)	Nominal thickness of XLPE insulation (mm)	Nominal diameter of round wire (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal thickness of flat Strip (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of cable (mm)	Approx. weight of cable (Kg/Km)
10	0.7	1.80	9.5	90	1.0	1.40	1.24	11.5	180	-	-	-	-
16	0.7	1.80	10.0	110	1.0	1.40	1.24	12.5	210	-	-	-	-
25	0.9	1.80	12.0	150	1.2	1.40	1.24	14.0	260	-	-	-	-
35	0.9	1.80	13.0	180	1.2	1.40	1.24	15.0	310	-	-	-	-
50	1.0	1.80	14.0	230	1.3	1.40	1.24	16.5	360	-	-	-	-
70	1.1	1.80	16.0	300	1.4	1.40	1.24	18.5	450	-	-	-	-
95	1.1	1.80	17.5	380	1.4	1.60	1.40	21.0	590	0.8	1.40	19.0	520
120	1.2	1.80	19.0	460	1.5	1.60	1.40	22.0	680	0.8	1.40	20.5	610
150	1.4	2.00	21.0	580	1.7	1.60	1.40	23.5	810	0.8	1.40	22.0	730
185	1.6	2.00	23.0	700	1.9	1.60	1.40	26.0	940	0.8	1.40	24.5	850
240	1.7	2.00	25.5	880	2.0	1.60	1.40	28.5	1150	0.8	1.40	27.0	1050
300	1.8	2.00	28.0	1070	2.1	1.60	1.56	31.0	1400	0.8	1.56	29.5	1290
400	2.0	2.20	31.5	1370	2.4	2.00	1.56	35.5	1800	0.8	1.56	33.0	1600
500	2.2	2.20	36.0	1660	2.6	2.00	1.56	40.0	2130	0.8	1.56	37.5	1910
630	2.4	2.20	39.0	2100	2.8	2.00	1.72	43.0	2670	0.8	1.72	40.5	2420
800	2.6	2.40	45.0	2670	3.1	2.00	1.88	49.0	3670	0.8	1.88	46.5	3320
1000	2.8	2.60	50.5	3310	3.3	2.50	2.04	55.0	4170	0.8	1.88	51.5	4030

TWIN CORE AL CABLES

1.1 KV Twin core XLPE insulated unarmoured and armoured cable with aluminium conductor conforming to IS:7098(Part 1) 1988

Un-armoured cables						Armoured cables							
						Single layer round wire armoured				Single layer flat strip armoured			
Nominal Area of Conductor (mm^2)	Nominal thickness of XLPE insulation (mm)	Minimum thickness of PVC inner sheath (mm)	Nominal thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal diameter of round wire (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal thickness of flat Strip (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of cable (mm)	Approx. weight of cable (Kg/Km)
10	0.7	0.3	1.80	16.0	270	1.40	1.24	17.5	610	-	-	-	-
16	0.7	0.3	1.80	16.0	290	1.40	1.40	17.5	720	-	-	-	-
25	0.9	0.3	2.00	18.0	340	1.60	1.40	20.0	740	0.8	1.40	19.0	600
35	0.9	0.3	2.00	20.0	410	1.60	1.40	22.0	900	0.8	1.40	21.0	700
50	1.0	0.3	2.00	22.0	510	1.60	1.40	25.0	1060	0.8	1.40	22.0	840
70	1.1	0.3	2.00	25.0	670	1.60	1.56	28.0	1320	0.8	1.56	26.0	1040
95	1.1	0.4	2.20	28.0	860	2.00	1.56	31.0	1760	0.8	1.56	29.0	1280
120	1.2	0.4	2.20	32.0	1050	2.00	1.56	34.0	2040	0.8	1.56	31.0	1520
150	1.4	0.4	2.20	34.0	1260	2.00	1.72	37.0	2360	0.8	1.72	34.0	1800
185	1.6	0.5	2.40	39.0	1700	2.00	1.88	40.0	2920	0.8	1.72	37.0	2280
240	1.7	0.5	2.60	43.0	2120	2.50	2.04	45.0	3830	0.8	1.88	42.0	2760
300	1.8	0.6	2.80	46.0	2560	2.50	2.20	49.0	4450	0.8	2.04	45.0	3280
400	2.0	0.6	3.00	50.0	3160	2.50	2.36	52.0	5270	0.8	2.36	50.0	4010
500	2.2	0.7	3.40	56.0	3920	3.15	2.68	60.0	6910	0.8	2.52	55.0	4820
630	2.4	0.7	3.60	64.0	4910	3.15	2.84	66.0	8230	0.8	2.68	63.0	5920

Dimensions & Weights

THREE CORE AL CABLES

1.1 KV Three core XLPE insulated unarmoured and armoured cable with aluminium conductor conforming to IS:7098(Part 1) 1988

Un-armoured cables						Armoured cables							
						Single layer round wire armoured				Single layer flat strip armoured			
Nominal Area of Conductor (mm^2)	Nominal thickness of XLPE insulation (mm)	Minimum thickness of PVC inner sheath (mm)	Nominal thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal diameter of round wire (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal thickness of flat Strip (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of cable (mm)	Approx. weight of cable (Kg/Km)
10	0.7	0.3	1.80	17.0	250	1.40	1.24	18.5	630	-	-	-	-
16	0.7	0.3	1.80	17.0	310	1.60	1.40	19.5	810	0.8	1.24	18.0	590
25	0.9	0.3	2.00	21.0	440	1.60	1.40	23.0	940	0.8	1.40	21.0	730
35	0.9	0.3	2.00	22.0	540	1.60	1.40	25.0	1090	0.8	1.40	22.0	870
50	1.0	0.3	2.00	26.0	680	1.60	1.56	28.0	1320	0.8	1.40	26.0	1050
70	1.1	0.4	2.20	29.0	920	2.00	1.56	32.0	1840	0.8	1.56	29.0	1360
95	1.1	0.4	2.20	33.0	1170	2.00	1.56	35.0	2180	0.8	1.56	33.0	1660
120	1.2	0.4	2.20	36.0	1430	2.00	1.72	38.0	2580	0.8	1.56	36.0	1970
150	1.4	0.5	2.40	40.0	1760	2.00	1.88	43.0	3030	0.8	1.72	40.0	2360
185	1.6	0.5	2.60	45.0	2180	2.50	2.04	47.0	3960	0.8	1.88	44.0	2850
240	1.7	0.6	2.80	51.0	2790	2.50	2.20	53.0	4790	0.8	2.04	49.0	3550
300	1.8	0.6	3.00	55.0	3420	2.50	2.36	56.0	5630	0.8	2.20	53.0	4250
400	2.0	0.7	3.20	61.0	4310	3.15	2.68	65.0	7510	0.8	2.52	59.0	5300
500	2.2	0.7	3.60	68.0	5370	3.15	2.84	72.0	8860	0.8	2.68	66.0	6410
630	2.4	0.7	3.80	75.0	6810	4.00	3.00	81.0	11760	0.8	2.84	74.0	7980

THREE & HALF CORE AL CABLES

1.1 KV Three & A Half core XLPE insulated unarmoured and armoured cable with aluminium conductor conforming to IS:7098(Part 1) 1988

Un-armoured cables							Armoured cables							
							Single layer round wire armoured				Single layer flat strip armoured			
Nominal Area of Conductor (mm^2)	Nominal Area of reduced neutral Conductor (mm^2)	Nominal thickness of XLPE insulation Main/Neutral (mm)	Minimum thickness of PVC inner sheath (mm)	Nominal thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal diameter of round wire (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal thickness of flat Strip (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of cable (mm)	Approx. weight of cable (Kg/Km)
25	16	0.9/0.7	0.3	2.00	22.0	510	1.60	1.40	25.0	1060	0.8	1.40	23.0	830
35	16	0.9/0.7	0.3	2.00	23.0	610	1.60	1.40	26.0	1210	0.8	1.40	24.0	970
50	25	1.0/0.9	0.3	2.00	27.0	790	1.60	1.56	30.0	1490	0.8	1.40	28.0	1200
70	35	1.1/0.9	0.4	2.20	31.0	1060	2.00	1.56	35.0	2070	0.8	1.56	32.0	1540
95	50	1.1/1.0	0.4	2.20	34.0	1360	2.00	1.56	38.0	2470	0.8	1.56	35.0	1900
120	70	1.2/1.1	0.4	2.20	38.0	1680	2.00	1.72	41.0	2960	0.8	1.72	38.0	2310
150	70	1.4/1.1	0.5	2.40	43.0	2020	2.00	1.88	45.0	3420	0.8	1.72	42.0	2680
185	95	1.6/1.1	0.5	2.60	48.0	2510	2.50	2.04	50.0	4470	0.8	1.88	47.0	3260
240	120	1.7/1.2	0.6	2.80	53.0	3210	2.50	2.20	55.0	5420	0.8	2.04	52.0	4060
300	150	1.8/1.4	0.6	3.00	58.0	3940	2.50	2.36	60.0	6390	0.8	2.20	56.0	4860
400	185	2.0/1.6	0.7	3.40	67.0	5010	3.15	2.68	70.0	8500	0.8	2.52	65.0	6060
500	240	2.2/1.7	0.7	3.60	75.0	6210	3.15	2.84	79.0	10030	0.8	2.68	74.0	7370
630	300	2.4/1.8	0.7	4.00	84.0	7900	4.00	3.00	88.0	13330	0.8	3.00	82.0	9210

Dimensions & Weights

FOUR CORE AL CABLES

1.1 KV Four core XLPE insulated unarmoured and armoured cable with aluminium conductor conforming to IS:7098(Part 1) 1988

Un-armoured cables						Armoured cables							
						Single layer round wire armoured				Single layer flat strip armoured			
Nominal Area of Conductor (mm^2)	Nominal thickness of XLPE insulation (mm)	Minimum thickness of PVC inner sheath (mm)	Nominal thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal diameter of round wire (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of Cable (mm)	Approx. weight of cable (Kg/Km)	Nominal thickness of flat Strip (mm)	Minimum thickness of PVC outer sheath (mm)	Approx. Overall diameter of cable (mm)	Approx. weight of cable (Kg/Km)
10	0.7	0.3	1.80	18.0	300	1.40	1.40	20.0	720	-	-	-	-
16	0.7	0.3	1.80	18.5	370	1.60	1.40	21.0	850	0.8	1.40	19.5	670
25	0.9	0.3	2.00	24.0	540	1.60	1.40	26.0	1110	0.8	1.40	24.0	880
35	0.9	0.3	2.00	26.0	680	1.60	1.40	28.0	1310	0.8	1.40	27.0	1050
50	1.0	0.3	2.00	29.0	860	1.60	1.56	32.0	1590	0.8	1.56	29.0	1320
70	1.1	0.4	2.20	34.0	1170	2.00	1.56	37.0	2220	0.8	1.56	34.0	1670
95	1.1	0.4	2.20	37.0	1500	2.00	1.72	40.0	2700	0.8	1.56	37.0	2070
120	1.2	0.5	2.40	42.0	1870	2.00	1.88	44.0	3210	0.8	1.72	41.0	2330
150	1.4	0.5	2.60	44.0	2300	2.50	2.04	47.0	4150	0.8	1.88	44.0	3000
185	1.6	0.5	2.80	50.0	2840	2.50	2.20	52.0	4910	0.8	2.04	49.0	3620
240	1.7	0.6	3.00	58.0	3650	2.50	2.36	60.0	5970	0.8	2.20	56.0	4530
300	1.8	0.7	3.20	65.0	4490	3.15	2.52	68.0	7750	0.8	2.36	60.0	5470
400	2.0	0.7	3.60	72.0	5690	3.15	2.84	76.0	9300	0.8	2.68	71.0	6780
500	2.2	0.7	3.80	76.0	7020	4.00	3.00	86.0	12150	0.8	2.84	76.0	8230
630	2.4	0.7	4.00	88.0	8910	4.00	3.00	94.0	14600	0.8	3.00	88.0	10280

Conductor Resistance

Nominal Area of conductor	Aluminium		Plain Copper	
	Max. D.C. Resistance at 20°C	Approx A.C. Resistance at operating Temp. 90°C	Max. D.C. Resistance at 20°C	Approx A.C. Resistance at operating Temp. 90°C
(Sq. mm)	Ohm / km	Ohm / km	Ohm / km	Ohm / km
1.5	-	-	12.1	15.5
2.5	-	-	7.41	9.50
4	7.41	9.50	4.61	5.91
6	4.61	5.91	3.08	3.95
10	3.08	3.95	1.83	2.35
16	1.91	2.45	1.15	1.47
25	1.20	1.539	0.727	0.932
35	0.868	1.113	0.524	0.672
50	0.641	0.822	0.387	0.496
70	0.443	0.568	0.268	0.343
95	0.320	0.410	0.193	0.247
120	0.253	0.325	0.153	0.196
150	0.206	0.265	0.124	0.159
185	0.164	0.212	0.0991	0.128
240	0.125	0.162	0.0754	0.0977
300	0.100	0.130	0.0601	0.0781
400	0.0778	0.102	0.0470	0.0616
500	0.0605	0.081	0.0366	0.0490
630	0.0469	0.064	0.0283	0.0386
800	0.0367	0.0526	0.0221	0.0317
1000	0.0291	0.0438	0.0176	0.0265

Current Rating

Current Rating for 1.1 KV XLPE insulated-Aluminium Conductor Cables-Armoured and Unarmoured

Nominal Area of cross-section	Cables in Ground					Cables in Air				
	Single Core Cables			Two Core Cables	Three,Three and a half & Four Core Cables	Single Core Cables			Two Core Cables	Three,Three and a half & Four Core Cables
	Two Cables		Three Cables			Two Cables		Three Cables		
	AC	DC	AC	AC	AC	AC	DC	AC	AC	AC
Sq.mm	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)
10	69	69	59	68	57	64	64	55	64	54
16	89	89	76	89	74	84	84	72	83	69
25	115	115	98	114	95	112	112	98	109	93
35	137	137	116	136	114	137	137	119	133	114
50	161	161	137	161	134	165	165	145	162	138
70	198	198	168	197	164	209	209	185	204	175
95	243	243	202	235	197	264	265	235	251	216
120	276	278	230	266	223	308	310	276	287	249
150	308	310	256	296	249	350	352	314	328	284
185	349	352	290	335	282	406	409	366	379	329
240	404	409	335	385	327	480	487	434	448	392
300	454	463	376	432	369	551	561	500	513	452
400	518	533	429	487	420	647	664	589	593	526
500	588	613	485	548	478	751	782	685	683	612
630	663	705	546	612	542	868	921	793	784	712
800	740	809	608	-	-	992	1082	907	-	-
1000	812	923	665	-	-	1117	1264	1022	-	-

Current Rating for 1.1 KV XLPE insulated-Copper Conductor Cables-Armoured and Unarmoured

Nominal Area of cross-section	Cables in Ground					Cables in Air				
	Single Core Cables			Two Core Cables	Three,Three and a half & Four Core Cables	Single Core Cables			Two Core Cables	Three,Three and a half & Four Core Cables
	Two Cables		Three Cables			Two Cables		Three Cables		
	AC	DC	AC	AC	AC	AC	DC	AC	AC	AC
Sq.mm	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)	(Amps)
1.5	32	32	28	31	26	28	28	24	27	23
2.5	42	42	36	41	34	37	37	31	36	30
4.0	54	54	47	54	45	48	48	41	48	41
6.0	67	67	58	67	56	61	61	52	61	52
10	90	90	77	89	74	83	83	71	83	70
16	115	115	98	115	95	108	108	94	108	89
25	148	148	126	147	122	144	144	126	140	119
35	177	177	150	176	146	176	176	154	172	147
50	208	208	177	208	173	212	212	187	208	179
70	255	255	216	253	212	269	269	238	262	226
95	312	314	260	302	254	340	342	303	322	279
120	355	358	295	340	287	396	399	354	368	320
150	396	401	329	379	321	450	455	403	419	365
185	447	455	371	425	362	519	528	468	482	422
240	515	528	427	486	418	613	628	553	566	500
300	576	598	477	541	469	700	726	634	644	574
400	651	687	537	602	528	813	857	737	734	662
500	727	790	598	665	593	930	1008	844	831	760
630	806	911	661	728	661	1056	1189	961	936	870
800	877	1046	721	-	-	1179	1398	1077	-	-
1000	935	1190	772	-	-	1288	1629	1188	-	-

Capacitance

Approximate Capacitance (Micro Farads / Km) 1.1 KV XLPE Insulated Cables

Nominal Area of Cross Section	Single Core Cable		Twin & Multicore Cables
Sq.mm	Unarmoured	Armoured	
1.5	0.2	0.16	0.07
2.5	0.24	0.19	0.09
4	0.29	0.22	0.11
6	0.34	0.26	0.13
10	0.43	0.31	0.15
16	0.52	0.38	0.18
25	0.52	0.40	0.20
35	0.60	0.47	0.23
50	0.63	0.50	0.24
70	0.68	0.55	0.26
95	0.79	0.64	0.29
120	0.79	0.67	0.29
150	0.79	0.67	0.29
185	0.79	0.67	0.29
240	0.84	0.72	0.31
300	0.86	0.75	0.33
400	0.88	0.75	0.33
500	0.90	0.77	0.34
630	0.94	0.81	0.36
800	0.97	0.88	-
1000	1.01	0.88	-

Reactance

Approximate Reactance at 50H_z (Ohm / Km) 1.1 KV XLPE Insulated Cables

Nominal Area of Cross Section	Single Core Cable		Twin & Multicore Cables
Sq.mm	Unarmoured	Armoured	
1.5	0.155	-	0.107
2.5	0.142	-	0.0985
4	0.132	-	0.0927
6	0.123	-	0.0884
10	0.114	-	0.0837
16	0.108	-	0.0808
25	0.102	0.116	0.080
35	0.097	0.110	0.080
50	0.092	0.103	0.078
70	0.088	0.099	0.077
95	0.085	0.097	0.074
120	0.082	0.093	0.072
150	0.082	0.091	0.072
185	0.082	0.090	0.072
240	0.079	0.086	0.072
300	0.078	0.085	0.071
400	0.077	0.085	0.070
500	0.076	0.083	0.070
630	0.075	0.082	0.0698
800	0.075	0.081	-
1000	0.068	0.081	-

Short Circuit Rating

Short Circuit rating for 1 second duration of XLPE Cable (Kilo Amps.)

Nominal Area of Conductor	With Aluminium Conductor	With Copper Conductor
Sq.mm	K.Amp	K.Amp
1.5	0.141	0.215
2.5	0.235	0.358
4	0.376	0.572
6	0.564	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	8.930	13.590
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	75.2	114.4
1000	94	143

1. Max. Conductor temperature before short circuit: 90°C
2. Max Conductor temperature during short circuit: 250°C
3. Max. duration of short circuit - 1 second

Formula for calculating the short circuit rating for other duraion

Ish: $\frac{KA}{\sqrt{t}}$ Where Ish = Short circuit current in KA

K = Constant (0.094 for Aluminium & 0.143 for Copper)

A = Area of cross section in sq.mm

t = Duration of short circuit in second

Recomanded minimum bending radius

Single Core : 15 x D Where D = Diameter of cable in mm

Multicore : 12 x D

Recomanded safe pulling force when pulled with pulling eye:

a) Aluminium conductor cable (Newton) - 30 x Total conductor are in sq.mm

b) Copper conductor cable (Newton) - 50 x Total conductor are in sq.mm

Recomanded safe pulling force with stockings:

a) Unarmoured Cables 1.1 KV (Newton) - 5 x D^2 Where D = Diameter of cable in mm

b) Armoured Cables 1.1 KV (Newton) - 9 x D^2

Recommended "GEMSCAB" Cable Sizes (XLPE Cable)

For Motors with Start-Delta Starter								For Motors with DOL Starters				
3 Phase 415 V Hp	415 V 50 Hz KW	Approx. full load current in Amps	Phase Current in Amps	Typical Cable Size Aluminium		Typical Cable Size Copper		3 Phase 415 V, 50 Hz Hp	415 V, 50Hz Kw	Approx full load current in Amps	Typical Cable Size	
				Supply side	Motor side	Supply side	Motor side				Aluminium (sq.mm)	Copper (sq.mm)
3	2.2	5	2.88	1.5	1.5	1.5	1.5	0.50	0.40	1.2	1.5	1.5
5	3.75	7.5	4.32	1.5	1.5	1.5	1.5	0.75	0.55	1.6	1.5	1.5
7.5	5.50	11	6.34	1.5	1.5	1.5	1.5	1.0	0.75	1.8	1.5	1.5
10	7.50	14	8.10	2.5	1.5	1.5	1.5	1.5	1.1	2.6	1.5	1.5
12.5	9.30	18	10.02	4	1.5	2.5	1.5	2.0	1.5	3.5	1.5	1.5
15	11.0	21	12.10	4	1.5	4	1.5	3.0	2.2	5	1.5	1.5
20	15.0	28	16.0	6	2.5	6	2.5	4.0	3.0	6.2	1.5	1.5
25	18.5	35	20.2	10	4	6	2.5	5.0	3.75	7.5	1.5	1.5
30	22.0	40	23.0	16	6	10	4	6.0	4.5	9	1.5	1.5
35	26.0	47	27.0	16	6	10	4	7.5	5.5	11	1.5	1.5
40	30.0	55	30.30	25	10	16	6	10	7.5	14	2.5	1.5
45	33.5	60	34.6	25	10	25	6	12.5	9.3	18	4	2.5
50	37.0	66	35.0	35	10	25	10	15	11	21	4	2.5
60	44.0	80	45.0	50	16	35	10	17.5	13	24	6	4
65	48.5	87	50	50	25	35	16	20	15	28	6	4
70	52	94	54	70	25	35	16	25	18.5	35	10	10
75	55	100	57.5	70	25	50	16	30	22	40	16	10
90	67.5	120	69	95	35	50	25	35	26	47	25	10
100	75.0	135	78	95	50	70	25	40	30	55	25	16
125	90	165	95	120	70	95	35	45	33.5	60	25	25
150	110	200	115	185	70	120	50	50	37	66	35	25
175	132	230	133	240	95	150	70	60	44	80	50	35
200	150	275	159	300	120	185	95	75	55	100	70	50
240	175	320	184.5	400	150	240	95	90	67.5	120	95	70
250	187.5	323	185	400	185	240	95	100	75	135	95	70
275	204	360	206	500	185	300	120	150	110	150	120	70
300	225	385	222	500	240	300	150	200	150	175	150	95
400	300	500	300	630	300	500	240	225	168	200	185	120

ACCREDITED
Management System
Certification
MSCB-119

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GEMSCAB INDUSTRIES LIMITED

An ISO 9001, ISO 14001, OHSAS 18001 Certified Company

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