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DICABS™

EHV (XLPE) CABLES

TECHNICAL CATALOGUE

DICABS™

EHV (XLPE) CABLES

UPTO 66KV-550KV

CONTENTS

DICABS™

PREFACE - 66kV 550kV XLPE CABLES

'Dicabs' is one of the world's leading manufacturers of Extra High Voltage cables and also one of a few total solution providers of underground transmission systems. We have decades of heritage as a cable manufacturer, along with in-depth capabilities and facilities to research, design, develop and manufacture products and solutions . We are also ceaselessly investing in quality control.

We provide power systems from 1kV to 500kV such as XLPE cable. Due to rapid industrial and economic growth it has become necessary to transmit bulk power to sustain growth. It is also very important that while transmitting bulk power, logistics and safety consideration are given due weightage.

At Dicabs, we understand our responsibility and our potential in leading society to remarkable improvements in varied facets of human life and society. For the past many decades we successfully took the challenge of providing our clients with solutions and support systems to service their global business. We recognize the significance of our customer oriented services for the betterment of society and its operations.

We believe that our responsibility should not end in mere execution of our customer's project but should extend towards contributing our knowledge and expertise in returning value to the company and to the society within which they live. Our vision is to provide world class services and products to our clients with a sense of responsibility and accountability towards them, their employees and ultimately society.

The most ideal solution considering all the aspects is to transmit bulk power through an EHV cable network. Keeping in line with the basic philosophy of the organization, Dicabs is now manufacturing Extra High Voltage cables from 66kV to 550kV, called XLPE cables.

Salient Features of Hybrid CCV Line Manufacturing Process

The system adopted for triple extrusion of EHV XLPE Cables with dry cure dry cooled process in a Hybrid CCV line ensures the following excellent characteristics:

- The Insulation has no eccentricity.
- The cross-linking of XLPE is of the highest grade which guarantees excellent electro-mechanical characteristics.
- The simultaneous extrusion of the inner and outer semi conducting layers and the insulation prevents treeing and other irregularities.
- Uniformity of quality is maintained for all products, as the manufacturing processes are controlled.

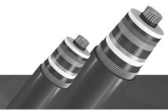
EHV cables are manufactured and supplied in accordance to the following applicable standards:

• IEC – 62067 • IEC – 60840 • IS 7098 (Part III)

And any other international specifications like ASTM, BS, DIN, JIS etc.

At Diamond Power Infrastructures Ltd. state of the art manufacturing and testing facilities for Extra High Voltage cables up to and including 500 kV are available, which is unique in the country.

Manufacturing		
Conductor	Compacted circular conductors	
	Aluminium	Up to 1000 sqmm
	Copper	Up to 800 sqmm
	Segmental (Milliken) type circular conductor	
	Aluminium	1200 sqmm and above
	Copper	1000 sqmm and above
Compound handling and clean room	The material handling system at DPIL ensures ultimate cleanliness and state of the art feeding system. The semi-conducting feeding area is maintained at clean class 10000, whereas the XLPE insulation compound feeding area is maintained at cleen class 1000. The gravity feeding system of the compound reduces the inter granular friction .	
Triple Extrusion	The extrusion of semi-conducting conductor screen, XLPE insulation and semi-conducting insulation screen in one operation by triple extrusion through single cross head ensures perfect bonding of all the layers and results in optically smooth interface which removes all possibilities of irregularities and microvoids formation.	
Curing under inert (Nitrogengas) atmosphere.	The cross linking process under inert atmosphere keeps the insulation absolutely dry which eliminates all chances of electro-mechanical treeing during whole life of the cable.	
Testing		
High Voltage Test system	The series resonance test system 700 kV/28000 kVA at DPIL test lab is capable of testing long lengths of Extra High Voltage up to 500 kV rating at a small input power. This helps in a major saving to its customers in time and money required for extra joints in the cable system.	
Impulse voltage test	The impulse voltage test equipment at DPIL lab is rated 2400 kV - 240 kV Jules. The high energy rating of the test equipment can test extra high voltage cable samples up to 500 kV rating having very low capacitances.	
Partial discharge test	The shielded room of DPIL cable testing is capable of detecting partial discharges of less than 2 pc.	
Other electrical and physical tests	DPIL cable laboratory is fully equiped to perform all routine, acceptance and type tests for Extra High Voltage cables up to 500 kV rating. As per the requirements of IEC 62067, IEC 60840, IS 7098 part-3 and other relevant international specifications.	



ADVANTAGES OF XLPE

XLPE is an abbreviation of cross-linked polyethylene. This has been recognized world-wide as excellent dielectric material for wires and cables. It first went into commercial production in the 1960. Polyethylene, which is a thermoplastic materials converted into a thermosetting material by a process of cross-linking. The linear chain structure of polyethylene is changed into three-dimensional network structure. By this change, polyethylene, which has outstanding dielectric properties, is made resistant to extreme temperatures. Following are the special advantages of the XLPE cable:

High Continuous Current Ratings: Higher continuous operating temperature 90°C for conductor permits XLPE cables to carry higher current than PVC or Paper Insulated cables.

High Short Circuit Ratings: Maximum allowable continuous temperature during short circuit for XLPE insulated cables is 250°C, which increases the short circuit rating of XLPE cables drastically compared to PVC & Paper insulated cables.

Low Deformation at High Temperature: Under combined heat and mechanical pressure XLPE suffers less deformation compared to other solid dielectrics.

High Emergency Over Load Capacity: XLPE cables can be operated at 130°C during emergency. This should not exceed 100 Hours in any 12 consecutive months and 500 Hours during the lifetime of the cable.

Low Dielectric Loss: The dielectric losses of XLPE is much below the conventional solid dielectrics like PVC & EPR. This results in considerable saving in costs when power transmission at higher voltages is done through XLPE cables.

Low Charging Currents: The charging currents are considerably lower than other dielectrics. This permits close setting of protection relays.

The high resistance to heat deformation and ageing in hot air provide an important advantage in cable rating and is of special significance at locations where the ambient temperature is high. These, along with better resistance to environment stress cracking and a low dielectric constant, make XLPE cables particularly suitable for high voltage and extra high voltage applications.

GENERAL PROPERTIES OF EHV XLPE INSULATED CABLES

Specific Gravity	0.93
Tan δ at rated voltage	
1.at ambient temperature (20°C)	10x10-4
2.at operating temperature (90°C)	10x10-4
Volume resistivity at 20°C	1017
Max. Permissible operating conductor Temp °C	90°C
Max. Permissible Temp during short circuit °C	250°C
Short Time overload Temp °C	130°C
Dielectric constant at 20°C	2.35

CONSTRUCTION DETAILS OF EHV XLPE CABLES

The XLPE Cable has the construction of a conductor (copper or aluminium) insulated with cross-linked polyethylene and then shielded with metallic screen (seam welded corrugated aluminum or copper wire shield), to be covered by PVC or polyethylene for anticorrosion followed by a semiconducting layer.

Conductor

The conductor consists of annealed copper or hard aluminium stranded wires and classified into two major types vizcompacted circular and segmental compacted circular (Milliken Conductor).

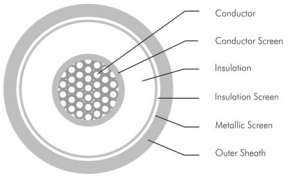
The compacted circular conductor consists of annealed copper or hard drawn aluminium stranded wires. The Milliken (segmented compacted circular) conductor consists of wires stranded together in segmental form, normally 4-5 segments and then compacted to get a circular shape. Conductor sizes up to and including 1000 sq. mm. may be compacted circular and 1200 sq. mm. and above size of conductors are made in 4-5 segments. The segmental conductors help in minimizing the increase in AC resistance caused by skin effect and proximity effect.

Conductor Screen

The conductor screen consists of an extruded semi-conducting polyethylene to minimize electrical stresses due to the stranded configuration of the conductor. The semi-conducting material used for conductor screen has no deleterious effect on the conductor. Semi-conducting tape is generally applied over the conductor before the extruded semi-conducting layer.

Insulation Screen

The insulation screen is provided over the insulation by extruded semi-conducting compound. This minimizes the possibility of ionization on the outer surface of insulation to make the dielectric stresses radial.



Insulation

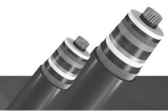
The insulation material is extruded cross-linked polyethylene. The conductor screen, the insulation and the insulation screen are extruded simultaneously in one process (TRIPLE EXTRUSION) to ensure that the screen and insulation are intimately bonded together and free from all possibilities of voids between layers.The extrusion process is carried out under strictly controlled atmospheric conditions.The dry cured & dry cooled process under the inert atmosphere (N2 Gas) enables to enhance the electromechanical and thermal characteristics of XLPE insulation, which further helps in increasing conductor stress, thereby reducing the thickness of insulation.

Metallic Screen

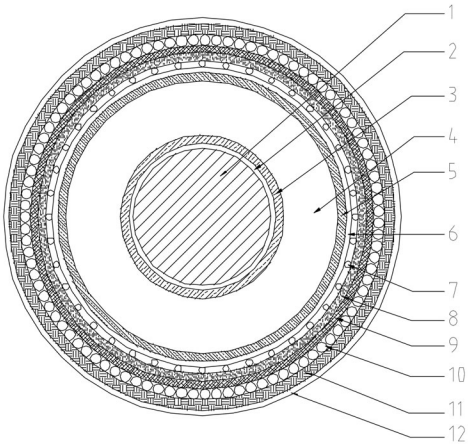
The metallic screen consists of wire shield, corrugated aluminium sheath or lead sheath. The lead sheath is provided with or without copper wire screen to withstand the SC rating of screen. The corrugated aluminium sheath and lead sheath also provides a radial moisture barrier to the cable construction.

Outer Sheath

To protect the metallic sheath from electrical or chemical corrosion, it is covered by PE or PVC sheath.

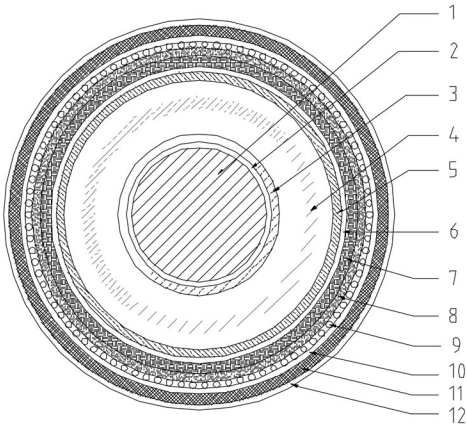


66 kV 1 CORE 630 sqmm COMPACTED CIRCULAR ALUMINIUM CONDUCTOR HIGH VOLTAGE CABLE AS PER CUSTOMER SPECIFICATIONS

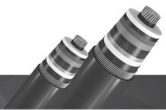


1 Compacted circular Aluminium conductor
2 Semi-conducting tapes
3 Extruded semi conducting thermosetting layer Conductor Screen
4 Cross-linked Polythylene insulation dry cured
5 Extruded semi conducting thermosetting layer insulation screen
6 Water swellable semi-conducting tapes applied helically with suitable overlap longitudinal water barrier
7 Concentric copper wire screen with open helix copper tape
8 Semi conducting water swellable tape
9 Poly laminated aluminium tape with HDPE inner sheath
10 H.D. Aluminium wire armour
11 PVC outer sheath
12 Over all extruded semi-conducting layer

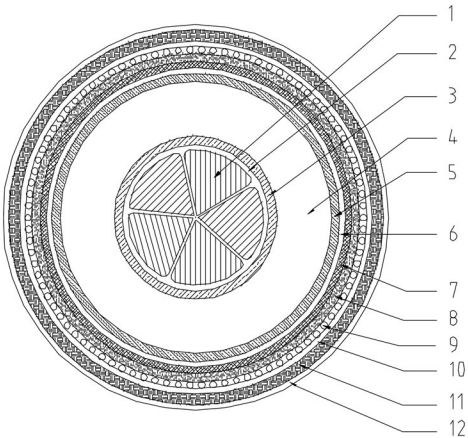
132 kV 1 CORE 800 sqmm COMPACTED CIRCULAR COPPER CONDUCTOR EXTRA HIGH VOLTAGE CABLE AS PER IEC-62067



1 Compacted circular copper conductor
2 Semi-conducting tapes
3 Extruded semi conducting thermosetting layer conductor screen
4 Cross-linked Polyethylene insulation as per IEC 62067 dry cured
5 Extruded semi conducting thermosetting layer insulation screen
6 Water swellable semi-conducting tapes applied helically with suitable overlap longitudinal water barrier
7 Poly laminated aluminium tape with PE inner sheath
8 Semi conducting water swellable tape
9 Concentric copper wire screen with open helix copper tape
10 Non conducting water swellable tape
11 PE outer sheath
12 Over all extruded semi-conducting layer

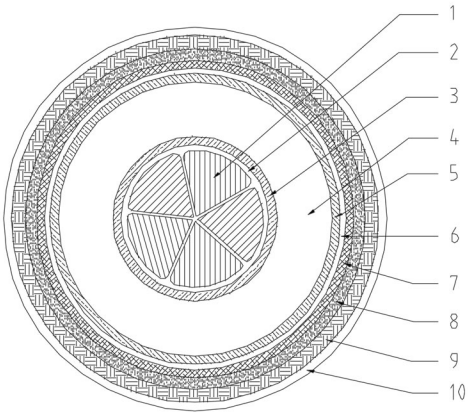


220 kV 1 CORE 1200 sqmm SEGMENTAL TYPE MILLIKEN COPPER CONDUCTOR EXTRA HIGH VOLTAGE CABLE AS PER IEC-62067

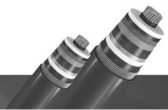


1 Annealed copper segmental milliken conductor
2 Semi-condcting tapes
3 Extruded semi-conducting thermosetting layer conductor screen
4 Cross-linked Polyethylene insulation as per IEC 62067 dry cured
5 Extruded semi-conducting thermosetting layer insulation screen
6 Water swellable semi-conducting tapes applied helically with suitable overlap longitudinal water barrier
7 Lead alloy E Sheath
8 Semi conducting water swellable tape
9 Concentric copper wire screen with open helix copper tape
10 Non conducting water swellable tape
11 PE outer sheath
12 Over all extruded semi-conducting layer

220 kV 1 CORE 1200 sqmm SEGMENTAl TYPE MILLIKEN COPPER CONDUCTOR EXTRA HIGH VOLTAGE CABLE AS PER IEC-62067

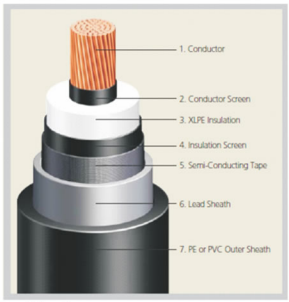


1 Annealed copper segmental milliken conductor
2 Semi-conducting tape
3 Extruded semi-conducting thermosetting layer conductor screen
4 Cross-linked polyethylene insulation as per EC 62067 dry cured
5 Extruded semi-conducting thermosetting layer insulation screen
6 Wate swellable semi conducting tapes applied helically with suitable overlap longitudinal water barrier
7 Copper woven semi-conducting tape
8 Corrugated Aluminium seamwelded sheath with anti carrosion protection, Radil water barrier
9 Extruded, Black HOPE type ST-7 to IEC 62067 outer sheath
10 Over all extruded semi-conducting layer



CONSTRUCTION DETAILS OF DIFFERENT CABLES

Corrugated Aluminium Sheath

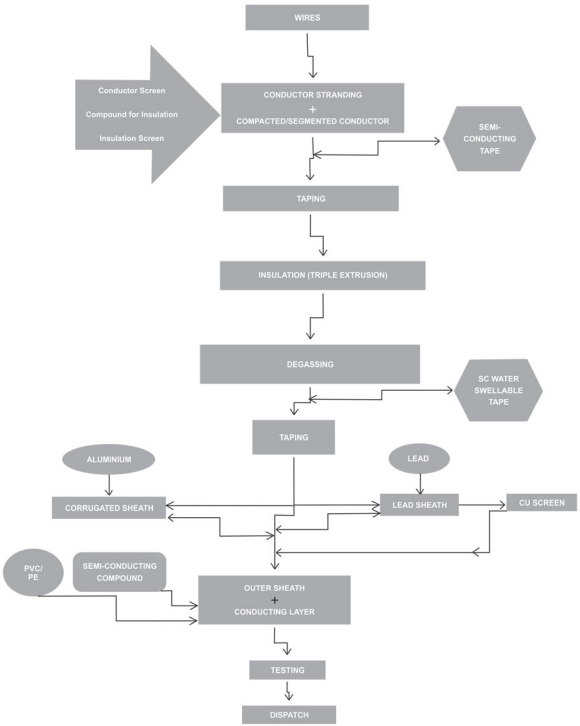


Lead Sheath

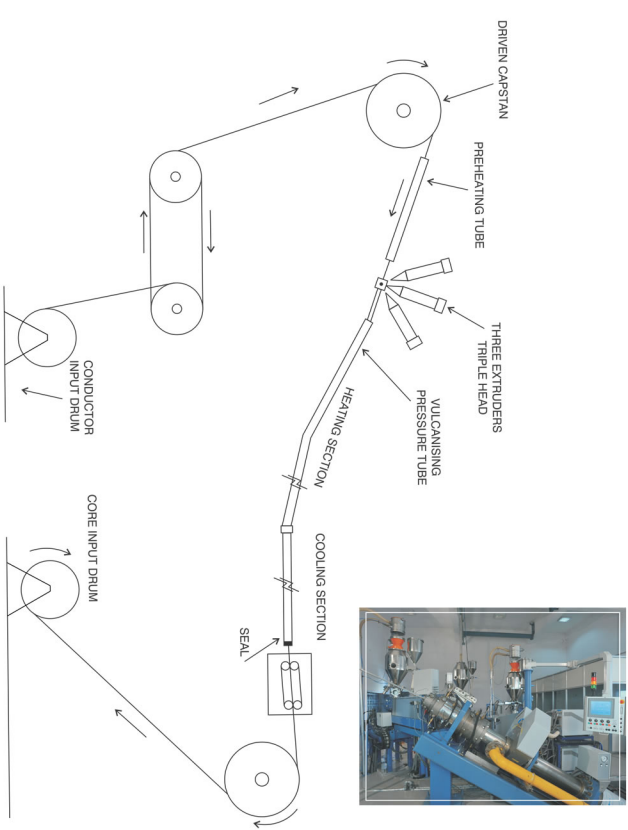
Copper Wire Shield with
Poly Laminated AL Sheath

Copper Wire Shield with Lead Sheath

MANUFACTURING FLOW CHART OF HV/EHV CABLES



SCHEMATIC DIAGRAM OF CONTINUOUS CATENARY VULCANISATION (CCV) LINE



ELECTRICAL TEST PARAMETERS

Voltage Designation	Highest System Voltage	High Voltage Test		Partial Discharge Test	Impulse Voltage Test	Voltage Test After Impulse Test	
		Voltage kV	Duration Min				Duration
Uo/U	Um			1.5Uo	kV	kV	Min
38/66	72.5	95	30	57	325	95	15
64/110	123	160	30	96	550	160	15
76/132	145	190	30	114	650	190	15
127/220	245	318	30	190	1050	254	15
220/380	420	440	60	330	1425	440	15
290/500	550	580	60	435	1550	580	15

THICKNESS OF METALLIC SHEATH

*Calculated Diameter Under Metallic Sheath, mm		Min. Thickness of Metallic Sheath, mm		
		Lead	Aluminium Sheath	
Over	Upto & Including		Smooth	Corrugated
-	40	1.9	1.9	0.6
40	45	2.0	2.2	0.6
45	50	2.1	2.4	0.6
50	55	2.2	-	0.6
55	60	2.3	-	0.8
60	65	2.4	-	0.8
65	70	2.5	-	0.8
70	75	2.6	-	0.8
75	80	2.7	-	0.8
80	85	2.8	-	0.9
85	90	2.8	-	0.9
90	95	2.9	-	0.9
95	100	3.0	-	0.9
100	105	3.1	-	1.0
105	110	3.2	-	1.0
110	115	3.3	-	1.0

***Note:** Fictitious diameter calculated as described in Annex B of IS 7098 (Part-3)

THICKNESS OF INNER SHEATH

*Calculated Diameter Under Inner Sheath mm		Minimum Thickness of Inner Sheath mm
Over -	UP to and Including	
-	40	0.9
40	45	1.0
45	50	1.1
50	55	1.2
55	60	1.2
60	65	1.3
65	70	1.4
70	75	1.5
75	80	1.6
80	85	1.6
85	90	1.7
90	95	1.8
95	100	1.9
100	105	2.0
105	110	2.0
110	115	2.1
115		2.2

***Note:** Fictitious diameter calculated as described in Annexe B of IS 7098 (Part -3)

DIMENSIONS OF ARMOUR ROUND WIRE

*Calculated Diameter Under Armour mm		Nominal Diameter of Round Wire mm
Above	UP to and Including	
40	40	2.00
55	55	2.50
70	70	3.15
		4.00

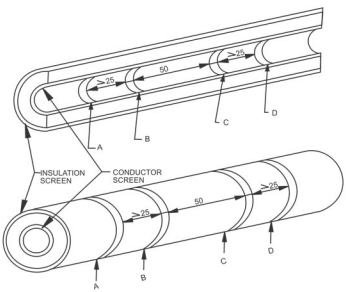
***Note:** Fictitious diameter calculated as described in Annexe B of IS 7098 (Part-3)

THICKNESS OF OUTER SHEATH EHV CABLE

*Calculated Diameter Under Outer Sheath mm		Thickness of Outer Sheath for Unarmoured Cables		Minimum of Outer Sheath for Armoured Cables
Above	UP to and Including	Nominal mm	minimum mm	mm
	40	2.4	1.72	1.72
40	45	2 6	1.88	1.88
45	50	2.8	2.04	2.04
50	55	3.0	2.20	2.20
55	60	3.2	2.36	2.36
60	65	3.4	2.52	2.52
65	70	3.6	2 68	2 68
70	75	3.8	2.84	2.84
75	-	4.0	3.00	3.00

***Note:** Fictitious diameter calculated as described in Annexe B of IS 7098 (Part-3)

RESISTIVITY TEST FOR SEMI-CONDUCTOR LAYER



The resistivity test for extruded semi-conducting layers applied over the conductor and over the insulation shall be determined by measurements on test pieces taken from core.

The procedure for measurement shall be in accordance with Annexe C of IS 7098 (Part-3).

The measurement shall be made at a temperature within $\pm 2^{\circ}C$ of the rated maximum normal operating conductor temperature.

The resistivity shall not exceed the following:

Conductor Screen 1000 ohm-metre \ / Core Screen 500 ohm-metre

ELECTRICAL AND PHYSICAL DIMENSIONS

66 kV (E) Lead Sheathed Cables

Nom. Cross Section of conduction	Nom. Thickness of insulation	Minimum Lead Sheath thickness	Nom. Area of copper screen	Nom. Outer Sheath thickness	Approx. overall cable diameter	Approx. wt. of cable (Cu-cond uctor)	Approx. wt. of cable (Al- cond uctor)	Maximum Capacitance	Maximum charging current
(sqmm)	(mm)	(mm)	(sqmm)	(mm)	(mm)	(Kg/m)	(Kg/m)	(µF/km)	(A/km)
240	9.0	1.8	187	2.7	56	8.5	-	0.22	2.6
300	9.0	1.8	186	2.7	58	9.2	-	0.21	2.9
400	9.0	1.9	183	2.8	61	10.5	8.1	0.26	3.1
500	9.0	2.0	180	2.9	64	11.9	8.9	0.28	3.3
630	9.0	2.1	176	3.0	68	13.7	9.9	0.31	3.7
800	9.0	2.2	171.	3.2	75	16.3	11.4	0.36	4.3
1000	9.0	2.3	167	3.3	79	18.7	12.6	0.38	4.5
1200	9.0	2.4	162	3.4	84	21.7	14.0	0.42	5.0
1400	9.0	2.5	156	3.5	90	24.5	15.5	0.47	5.6
1600	9.0	2.6	152	3.6	93	27.0	16.6	0.48	5.7
2000	9.0	2.7	145	3.8	99	31.0	18.8	0.53	6.3

Note: Fault rating of Lead Sheath in combination with copper screen is 31.5 kA for one second duration

110 kV (E) Lead Sheathed Cables

Nom. Cross Section of conduction	Nom. Thickness of insulation	Minimum Lead Sheath thickness	Nom. Area of copper screen	Nom. Outer Sheath thickness	Approx. overall cable diameter	Approx. wt. of cable (Cu-cond uctor)	Approx. wt. of cable (Al- cond uctor)	Maximum Capacitance	Maximum charging current
(sqmm)	(mm)	(mm)	(sqmm)	(mm)	(mm)	(Kg/m)	(Kg/m)	(µF/km)	(A/km)
240	17.0	2.2	172	3.2	73	11.7	-	0.14	2.8
300	15.0	2.2	172	3.2	72	12.0	-	0.16	3.2
400	15.0	2.3	169	3.3	76	13.4	11.1	0.17	3.4
500	15.0	2.4	165	3.4	79	15.0	12.0	0.19	3.8
630	15.0	2.4	163	3.5	82	16.6	12.8	0.21	4.2
800	15.0	2.5	157	3.6	88	19.3	14.4	0.24	4.8
1000	15.0	2.7	150	3.7	93	22.2	16.1	0.25	5.0
1200	15.0	2.8	144	3.8	98	25.3	17.6	0.28	5.6
1400	15.0	2.8	140	4.0	103	28.1	19.1	0.30	6.0
1600	15.0	2.8	138	4.1	106	30.4	20.0	0.32	6.4
2000	15.0	3.0	128	4.3	113	34.9	22.7	0.34	6.8

Note: Fault rating of Lead Sheath in combination with copper screen is 31.5 kA for one second duration

ELECTRICAL AND PHYSICAL DIMENSIONS

132 kV (E) Lead Sheathed Cables

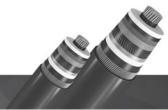
Nom. Cross Section of conduction	Nom. Thickness of insulation	Minimum Lead Sheath thickness	Nom. Area of copper screen	Nom. Outer Sheath thickness	Approx. overall cable diameter	Approx. wt. of cable (Cu-cond uctor)	Approx. wt. of cable (Al- cond uctor)	Maximum Capacitance	Maximum charging current
(sqmm)	(mm)	(mm)	(sqmm)	(mm)	(mm)	(Kg/m)	(Kg/m)	(μF/km)	(A/km)
240	21.5	2.5	160	3.6	84	14.1	-	0.12	2.9
300	20.5	2.5	160	3.6	84	14.6	-	0.13	3.1
400	19.0	2.5	160	3.6	84	15.2	12.9	0.15	3.6
500	18.0	2.5	160	3.6	85	16.2	13.3	0.17	4.1
630	18.0	2.6	155	3.7	89	18.3	14.5	0.18	4.3
800	17.5	2.7	149	3.8	94	20.9	16.0	0.21	5.0
1000	17.5	2.8	144	3.9	98	23.6	17.5	0.23	5.5
1200	17.5	2.8	141	4.0	103	26.6	18.8	0.25	6.0
1400	17.5	2.9	134	4.1	109	34.4	25.4	0.27	6.4
1600	17.5	3.0	129	4.2	111	32.3	21.9	0.28	6.7
2000	17.5	3.2	118	4.4	118	36.9	24.7	0.30	7.2

Note: Fault rating of Lead Sheath in combination with copper screen is 31.5 kA for one second duration

220 kV (E) Lead Sheathed Cables

Nom. Cross Section of conduction	Nom. Thickness of insulation	Minimum Lead Sheath thickness	Nom. Area of copper screen	Nom. Outer Sheath thickness	Approx. overall cable diameter	Approx. wt. of cable (Cu-cond uctor)	Approx. wt. of cable (Al- cond uctor)	Maximum Capacitance	Maximum charging current
(sqmm)	(mm)	(mm)	(sqmm)	(mm)	(mm)	(Kg/m)	(Kg/m)	(μF/km)	(A/km)
500	26	2.9	195	4.2	103	22.3	19.4	0.13	5.2
630	25	2.9	193	4.2	105	23.8	20.0	0.15	6.0
800	25	3.0	186	4.4	111	26.9	22.0	0.17	6.8
1000	25	3.2	177	4.5	115	30.1	24.0	0.18	7.2
1200	25	3.3	170	4.6	120	33.7	25.9	0.19	7.6
1400	25	3.4	162	4.7	126	37.1	28.1	0.20	8.0
1600	25	3.4	160	4.8	129	39.5	29.2	0.21	8.0
2000	25	3.6	148	5.0	136	44.6	32.4	0.23	9.2

Note: Fault rating of Lead Sheath in combination with copper screen is 31.5 kA for one second duration



ELECTRICAL AND PHYSICAL DIMENSIONS

66kV(E) Corrugated Aluminium Sheathed Cables

Nom. Cross Section of conduction	Nom. Thickness of insulation	Nom. Aluminium Sheath Thickness	Nom. Outer Sheath thickness	Approx. overall cable diameter	Approx. wt. of cable (Cu-conductor)	Approx. wt. of cable (Al- conductor)	Maximum Capacitance	Maximum charging current
(sqmm)	(mm)	(mm)	(mm)	(mm)	(Kg/m)	(Kg/m)	(µF/km)	(A/km)
240	9	2.1	2.7	60	4.7	-	0.22	2.6
300	9	2.0	2.8	62	5.4	-	0.24	2.9
400	9	1.9	2.9	65	6.3	4.0	0.26	3.1
500	9	1.8	3.0	68	7.3	4.4	0.28	3.3
630	9	1.7	3.1	72	8.8	5.0	0.31	3.7
800	9	1.7	3.3	80	10.8	5.9	0.36	4.3
1000	9	1.7	3.4	84	12.9	6.8	0.38	4.5
1200	9	1.8	3.5	89	15.4	7.6	0.42	5.0
1400	9	1.9	3.7	97	17.7	8.7	0.47	5.6
1600	9	1.9	3.8	100	19.8	9.4	0.48	5.7
2000	9	2.0	4.0	107	23.2	11.0	0.53	6.3

Note: Fault rating of Alluminium Sheath is 31.5 kA for one second duration

110kV(E) Corrugated Aluminium Sheathed Cables

Nom. Cross Section of conduction	Nom. Thickness of insulation	Nom. Aluminium Sheath Thickness	Nom. Outer Sheath thickness	Approx. overall cable diameter	Approx. wt. of cable (Cu-conductor)	Approx. wt. of cable (Al- conductor)	Maximum Capacitance	Maximum charging current
(sqmm)	(mm)	(mm)	(mm)	(mm)	(Kg/m)	(Kg/m)	(µF/km)	(A/km)
240	17.0	1.7	3.3	79	6.3	-	0.14	2.8
300	15.5	1.7	3.3	78	6.7	-	0.16	3.2
400	15.5	1.7	3.4	81	7.7	5.4	0.17	3.4
500	15.5	1.8	3.5	85	9.0	6.0	0.19	3.8
630	15.0	1.8	3.6	87	10.4	6.6	0.21	4.2
800	15.0	1.9	3.7	94	12.6	7.7	0.24	4.8
1000	15.0	2.0	3.9	100	14.8	8.7	0.25	5.0
1200	15.0	2.0	4.0	105	17.4	9.6	0.28	5.6
1400	15.0	2.1	4.1	111	19.8	10.8	0.3	6.0
1600	15.0	2.2	4.2	114	22.0	11.6	0.32	6.4
2000	15.0	2.3	4.5	122	25.6	13.4	0.34	6.8

Note: Fault rating of Alluminium Sheath is 31.5 kA for one second duration

ELECTRICAL AND PHYSICAL DIMENSIONS

110kV(E) Corrugated Aluminium Sheathed Cables

Nom. Cross Section of conduction	Nom. Thickness of insulation	Nom. Aluminium Sheath Thickness	Nom. Outer Sheath thickness	Approx. overall cable diameter	Approx. wt. of cable (Cu-cond uctor)	Approx. wt. of cable (Al- cond uctor)	Maximum Capacitance	Maximum charging current
(sqmm)	(mm)	(mm)	(mm)	(mm)	(Kg/m)	(Kg/m)	(µF/km)	(A/km)
240	21.5	1.9	3.6	89	7.7	-	0.12	2.9
300	20.5	1.9	3.6	89	8.1	-	0.13	3.1
400	19.5	1.9	3.6	89	8.8	6.4	0.15	3.6
500	18.5	1.9	3.7	90	9.7	6.8	0.17	4.1
630	18.0	1.9	3.8	94	11.4	7.5	0.18	4.3
800	17.5	2.0	3.9	101	13.4	8.6	0.21	5.0
1000	17.5	2.1	4.1	105	15.7	9.6	0.23	5.5
1200	17.5	2.1	4.2	111	18.3	10.6	0.25	6.0
1400	17.5	2.2	4.4	119	20.8	11.8	0.27	6.4
1600	17.5	2.3	4.5	121	23.1	12.7	0.28	6.7
2000	17.5	2.4	4.7	128	26.7	14.5	0.30	7.2

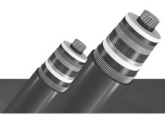
Note: Fault rating of Alluminium Sheath is 31.5 kA for one second duration

220 kV (E) Corrugated Aluminium Sheathed Cables

Nom. Cross Section of conduction	Nom. Thickness of insulation	Nom. Aluminium Sheath Thickness	Nom. Outer Sheath thickness	Approx. overall cable diameter	Approx. wt. of cable (Cu-cond uctor)	Approx. wt. of cable (Al- cond uctor)	Maximum Capacitance	Maximum charging current
(sqmm)	(mm)	(mm)	(mm)	(mm)	(Kg/m)	(Kg/m)	(µF/km)	(A/km)
500	26	2.2	4.3	110	12.5	9.6	0.13	5.2
630	25	2.2	4.3	112	13.9	10.0	0.15	6.0
800	25	2.3	4.6	120	16.3	11.5	0.17	6.8
1000	25	2.4	4.7	124	18.7	12.6	0.18	7.2
1200	25	2.4	4.8	129	21.4	13.7	0.19	7.6
1400	25	2.5	5.0	138	24.1	15.1	0.20	8.0
1600	25	2.6	5.1	140	26.4	16.1	0.21	8.4
2000	25	2.7	5.3	147	30.2	18.1	0.23	9.2

Note: Fault rating of Aluminium Sheath is 40 kA for one second duration

NOTE: Constructional Data given in above tables are for guidance only. Cables as per National (IS 7098 – Part 3)/ International specifications IEC 62067, IEC 60502, IEC 60840 shall be offered on request.



Assumptions for Calculation of CONTINUOUS CURRENT RATING as per IEC 60287.
The continuous current carrying capacity of XLPE cables is calculated as per the following standard conditions:

a)	Ground Temperature	:	30°C	
b)	Ambient Air Temperature	:	40°C	
c)	Max. Conductor Temperature	:	90 °C	
d)	Depth of Laying	:	1.0 Mtr	
e)	Soil Thermal Resistivity	:	150°C-cm/W	
f)	Cable Installation formation with bonding		:	Trefoil Touching with single point or cross bonding OR Flat 70mm clearance (Surface to surface) single point or Cross
g)	Frequency	:	50 Hz	
h)	Load Factor	:	100%	

Maximum Permissible Conductor Temperature and Recommended conductor temperatures for various conditions are as under:

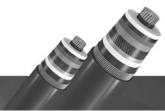
A. Normal Operation : 90°C
B. Emergency Operation : 130°C
C. Short Circuit : 250°C

CONDUCTOR RESISTANCE

Cross Sectional area of Conductor	DC Resistance of Conductor at 20°C		AC Resistance of Conductor at 90°C	
	AL	CU	AL	CU
sq.mm.	Ω/km	Ω/km	Ω/km	Ω/km
95	0.3200	0.1930	0.4110	0.2460
120	0.2530	0.1530	0.3250	0.1960
150	0.2060	0.1240	0.2640	0.1590
185	0.1640	0.0991	0.2110	0.1270
240	0.1250	0.0754	0.1610	0.0972
300	0.1000	0.0601	0.1290	0.0780
400	0.0778	0.0470	0.10 10	0.0618
500	0.0605	0.0366	0.0791	0.0491
630	0.0469	0.0283	0.0622	0.0393
800	0.0367	0.0221	0.0497	0.0322
1000	0.0291	0.0176	0.0380	0.0236
1200	0.0247	0.0151	0.0326	0.0207
1600	0.0186	0.0113	0.0251	0.0163

Conductor Short Circuit Rating

Cross Sectional Area	Short Circuit Rating (1 Sec)	
	AL	CU
sq.mm	kA	kA
95	8.9	13.6
120	11.3	17.2
150	14.1	21.5
185	17.4	26.5
240	22.6	34.3
300	28.2	42.9
400	37.6	57.2
500	47.0	71.5
630	59.2	90.1
800	75.2	114.4
1000	94.0	143.0
1200	112.8	171.6
1600	150.4	228.8
2000	188.0	286.0



Current Rating of Single Core 66 kV Cable

Cross-sectional area of conductor	Single Point Bonding / Cross Bonding							
	Trefoil Formation				Flat Formation			
	In Ground		In Air		In Ground		In Air	
Sq mm	Aluminium Amp	Copper Amp	Aluminium Amp	Copper Amp	Aluminium Amp	Copper Amp	Aluminium Amp	Copper Amp
95	194	250	271	349	202	261	295	380
120	221	383	312	401	230	296	341	438
150	246	316	352	452	257	331	385	496
185	277	354	402	515	290	372	440	566
240	319	407	471	602	335	429	519	666
300	358	455	537	685	377	483	594	762
400	408	513	624	789	431	548	692	882
500	462	576	722	904	491	620	806	1021
630	523	644	835	1033	560	701	938	1179
800	585	708	953	1161	632	781	1080	1341
1000	686	816	1111	1372	723	905	1264	1592
1200	722	871	1235	1503	790	977	1416	1763
1600	815	965	1434	1716	907	1108	1669	2055
2000	892	1038	1613	1897	1008	1216	1904	2317

Current Rating of Single Core 66 kV Cable

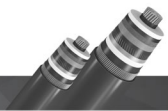
Cross-sectional area of conductor	Both End Bonding							
	Trefoil Formation				Flat Formation			
	In Ground		In Air		In Ground		In Air	
Sq mm	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper
	Amp	Amp	Amp	Amp	Amp	Amp	Amp	Amp
95	191	242	267	341	189	234	284	357
120	215	272	307	390	211	258	324	404
150	239	301	345	437	231	281	362	449
185	267	334	391	494	255	305	408	501
240	305	378	456	571	284	335	469	570
300	339	417	516	642	309	359	524	629
400	80	461	593	728	337	384	591	697
500	424	507	678	821	365	407	662	767
630	471	554	772	920	391	429	737	837
800	516	595	866	1013	415	447	806	900
1000	554	631	961	1115	437	465	884	976
1200	587	660	1048	1198	453	477	946	1032
1600	639	704	1176	1317	474	493	1030	1105
2000	678	736	1285	1415	490	505	1101	1166

Current Rating of single Core 110 / 132 kV Cable

Cross-sectional area of conductor	Single Point Bonding / Cross Bonding							
	Trefoil Formation				Flat Formation			
	In Ground		In Air		In Ground		In Air	
Sq mm	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper
	Amp	Amp	Amp	Amp	Amp	Amp	Amp	Amp
185	277	354	398	510	289	371	429	551
240	319	407	467	598	335	429	505	649
300	358	456	533	680	377	483	578	742
400	408	514	618	783	431	548	673	859
500	463	577	715	898	491	620	783	992
630	523	646	826	1027	560	701	910	1145
800	586	712	943	1155	632	782	1046	1302
1000	666	817	1098	1362	723	905	1223	1544
1200	721	873	1219	1492	789	977	1368	1708
1600	816	969	1417	1707	906	1108	1612	1992
2000	893	1043	1595	1890	1007	1217	1838	2247

Current Rating of single Core 110 / 132 kV Cable

Cross-sectional area of conductor	Both End Bonding							
	Trefoil Formation				Flat Formation			
	In Ground		In Air		In Ground		In Air	
Sq mm	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper
	Amp	Amp	Amp	Amp	Amp	Amp	Amp	Amp
185	268	336	390	494	256	308	403	499
240	306	381	455	574	286	338	465	570
300	341	421	516	646	312	363	521	632
400	383	466	593	735	341	389	591	705
500	428	513	679	830	369	414	664	778
630	475	561	775	933	396	436	741	853
800	522	605	871	1030	420	454	815	920
1000	559	639	970	1138	443	473	897	1003
1200	593	668	1057	1222	459	485	961	1060
1600	645	713	1190	1347	480	500	1050	1137
2000	685	746	1303	1449	496	512	1123	1200



Current Rating of Single Core 220 kV Cable

Cross-sectional area of conductor	Single Point Bonding / Cross Bonding							
	Trefoil Formation				Flat Formation			
	In Ground		In Air		In Ground		In Air	
Sq mm	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper
	Amp	Amp	Amp	Amp	Amp	Amp	Amp	Amp
400	406	513	608	771	430	546	651	831
500	461	576	703	885	490	619	756	960
630	522	645	811	1212	558	699	878	1106
800	585	712	927	1141	630	780	1009	1258
1000	664	815	1077	1342	720	902	1178	1490
1200	728	870	1195	1470	785	973	1316	1647
1600	809	961	1386	1678	899	1101	1546	1916
2000	896	1010	1544	1833	990	1191	1756	2147

Current Rating of Single Core 220 kV Cable

Cross-sectional area of conductor	Both End Bonding							
	Trefoil Formation				Flat Formation			
	In Ground		In Air		In Ground		In Air	
Sq mm	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper	Aluminium	Copper
	Amp	Amp	Amp	Amp	Amp	Amp	Amp	Amp
400	384	469	589	734	344	394	585	706
500	429	518	674	831	373	419	660	784
630	478	566	770	935	400	442	740	862
800	525	612	869	1038	425	461	818	935
1000	562	646	971	1152	448	480	904	1024
1200	595	674	1059	1237	465	493	971	1085
1600	643	713	1188	1358	493	516	1071	1174
2000	670	728	1286	1440	537	561	1186	1288

Rating factor for Variation in ambient air temperature :

Air temperature °C conductor temp 90°c	15	20	25	30	35	40	45	50	55	60
Rating Factors	1.25	1.20	1.16	1.11	1.05	1.00	0.94	0.88	0.82	0.76

Rating factor for Variation in ground temperature:

Air temperature °C conductor temp 90°c	15	20	25	30	35	40	45	50
Rating Factors	1.12	1.08	1.04	1	0.96	0.91	0.87	0.82

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

Distance between Centres of Circuits		Number of Circuits in Group							
mm		1	2	3	4	5	6	7	8	9
120		1	0.76	0.67	0.59	0.55	0.51	0.49	0.47	0.46
200		1	0.81	0.71	0.65	0.61	0.58	0.56	0.53	0.52
400		1	0.85	0.77	0.72	0.69	0.66	0.64	0.63	0.62
600		1	0.88	0.81	0.77	0.74	0.72	0.71	0.70	0.69
800		1	0.90	0.84	0.81	0.79	0.77	0.76	0.75	0.75
2000		1	0.96	0.93	0.92	0.91	0.91	0.91	0.90	0.90

Rating factor for thermal resistivity of soil

Soil thermal resistivity Deg. C cm/watt	70	100	120	150	200	250	300
Rating factor	1.36	1.19	1.11	1.00	0.88	0.78	0.73

Rating factor for depth of laying

Depth of laying cm	90	100	120	150	160	170	180	190	200
Rating factor	1.06	1.05	1.03	1.00	0.99	0.99	0.98	0.98	0.97

Rating factor for phase spacing in flat formation

Phase Spacing (s) cm	D	D+70	D+200	D+250	D+300	D+350	D+400
Rating factor	0.93	1.00	1.03	1.05	1.07	1.08	1.10

Note: D is the overall diameter of Cable

GROUP RATING FACTORS

Group rating factors for cables aid in formed concrete trenches with removable covers on cable troughs where air circulation is restricted. The cables spaced by one cable diameter and trays in tiers by 300 mm. The clearance of the cable from the wall is 20 mm.

No. of troughs	No. of Groups (circuits)		
	1	2	3
1	0.92	0.89	0.88
2	0.87	0.84	0.83
3	0.84	0.82	0.81
4	0.82	0.80	0.79

Group rating factors for cables laid on racks. The cables spaced by one cable diameter and racks in tiers by 300mm, the clearance between the wall and the cable is 20 mm.

No. of troughs	No. of Groups (circuits)		
	1	2	3
1	1.0	0.97	0.96
2	0.97	0.94	0.93
3	0.96	0.93	0.92
6	0.94	0.91	0.90

INSTALLATION

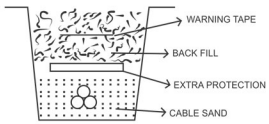
A. Underground Installation of EHV XLPE Cables

1.1 Bending Radius - The minimum bending radius for EHV XLPE cable is 20xD, where D is the overall diameter of the cable.

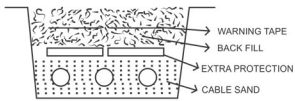
1.2 Installation in ground Underground XLPE cables are usually buried directly in the ground.

Single core cables can be laid in flat or trefoil formation as shown in figures.

THREE SINGLE CORE CABLES IN TREFOIL FORMATION



THREE SINGLE CORE CABLES IN FLAT FORMATION



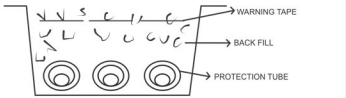
1.3 Depth of laying - As a general rule EHV cables are laid at a depth of 1 to 1.5 m. The laying depth is chosen depending on obstacles in the ground e.g. telephone cables or water pipes. There may be reasons for deeper laying, which then means a reduction of current carrying capacity.

1.4 Sand bedding - The cable shall be completely surrounded by well compacted sand to such a thickness and of such a grain size that the cable is protected against damage. The thickness of the sand bedding should normally be a minimum of 10 cm in all directions from the cable surface. Sand with a grain size less than 8 mm is considered to give the cable a good protection.

1.5 Extra protection - Important feeders and cables at places where extended digging activity is expected can be further protected against damage by means of tubes, slabs, troughs or warning tapes.

Ducts of non-magnetic material for single core cables can be mainly used at road crossing etc. The duct diameter should not be less than 1.5 times the cable diameter.

SINGLE CORE CABLES IN PROTECTING DUCTS, FLAT FORMATION



In trenches normally extra protection is obtained by means of concrete slabs and its size is to be chosen according to the expected damage. The slabs are placed directly on the cable sand.

1.6 Back filling - Normally, the back fill consists of the material earlier excavated. However, bigger stones or pieces of rock should be removed.

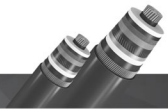
1.7 Warning Tape - A pre-warning tape, e.g. of yellow PVC tape should be laid in the ground.

1.8 Transportation - In order to avoid damage to the cable, the cable drum must be handled carefully during transportation.

It is very important that the cable drum stands on the flanges during transportation, well fixed to the transport vehicle. Loading and unloading should be made by crane or fork-truck, not by rolling.

Rolling of the drum should be done slowly and carefully in the direction of the arrow on the drum flange.

1.9 Cable Pulling - During the pulling, the cable drum is normally placed on jacks at the starting point and a wire winch at the other end of the trench. The pulling wire can be connected to the cable either by a cable stocking or pulling eye to the conductor in such a manner that water or soil can not enter into the cable.



The pulling force should be restricted to the following values

- For aluminium conductor 30 N / sqmm
- For copper conductor 50 N / sqmm

The cable should preferably be pulled from the top of the drum.

To prevent crossing of turns on the drum at a sudden pulling stop, a brake should be arranged at the cable drum and a man placed there to operate this brake, which must be applied rapidly at a stop.

To protect the cable from damage during the pulling out, cable rollers should be used and placed at suitable intervals. At bends, angle rollers & guide rollers as required must be used in order to maintain the desired bending radius of the cable.

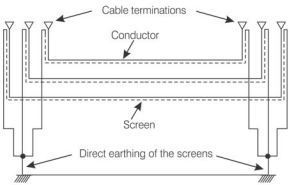
During the cable pulling, telephones or walkie-talkie should be used to ensure the internal communication is established in order to prevent accidents and to enable a safe pulling operation.

B) Installation of XLPE cable in air

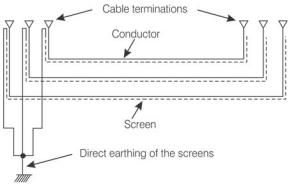
The requirement for bending radii, transportation and pulling of the cables are the same as for underground installation. For fixing of the cables, the following has to be taken into consideration.

Cable fixing	After laying of three Nos cables, the cable shall be tied up with non-magnetic metals trefoil/single clamp depending upon the laying configurations ie. trefoil/flat.
Horizontal Distance between cleats	At 1 to 1.2 meter interval or as per customer's choice.
Vertical distance between cleats	If the cable circuits are laid in tiers than the vertical spacing between the tiers shall not be less then 300mm.

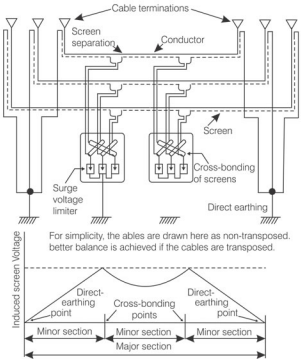
SCREEN BONDING METHOD



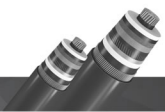
Both-ends bonding of screens, means that the screens are connected and earthed at both ends of the cable route. In this case a current will appear in the screen. This will cause losses in the screen, which reduces the cable current-carrying capacity. These losses are smaller for cables in trefoil formation than in flat formation.



Single-point bonding of screens, means that the screens are connected and earthed at one end of the cable route. In this case, a voltage will be induced between screen and earth, but no current will appear. This induced voltage is proportional to the cable length and current. Single-point bonding can only be used for limited route lengths.



Cross-bonding of screens, means that the screens belonging to adjoining cables are connected as in the figure. In this case, a voltage will be induced between screen and earth, but no current will appear. The maximum induced voltage will appear at the link boxes for cross-bonding, see figure. This method permits a cable current- carrying capacity as high as with single-point bonding but longer route lengths than the latter. It requires screen separation and additional link boxes.



DICABS™

CERTIFICATE OF REGISTRATION

THIS IS TO CERTIFY THAT THE
INTEGRATED MANAGEMENT SYSTEMS OF

Diamond Power Infrastructure Limited

Factory:-
Phase II, Village Vadadala, Taluka Savli Dist. Vadodara
Gujarat 391 520 INDIA

Office:-
5/12, B.I.D.C Gorwa Baroda,
Gujarat 390016 INDIA

Has been assessed and registered as complying with the requirements of the International Standards shown below for the following Goods and Services: -

Design & Development, Manufacturing & Marketing of Distribution & Transmission Conductors, LT Power & Control Cables up to 1.1 KV, HV / EHV XLPE Cables up to 500 KV, Aluminium & Alloy Wire Rods and Transmission Tower up to 765 KV.

ISO 9001 — International Standards Certifications — ISO 9001:2008

ISO 14001 — International Standards Certifications — ISO 14001:2004

OHSAS 18001 — International Standards Certifications — OHSAS 18001:2007

Tony Wilde
Group Chairman
ISC Pty Ltd. A.B.N. 31 245 846 984

Registration No:	QMS/R91/0107	EMS/R91/0107	OHS/R91/0107
Original Registration Date:	20-Aug-2010	03-May-2012	03-May-2012
Recertification Date:	26-May-2014	26-May-2014	26-May-2014
Expiry Date:	03-May-2017	03-May-2017	03-May-2017

ISC INTERNATIONAL STANDARDS CERTIFICATIONS

JAS-ANZ
www.jas-anz.org/register

ISC Pty Ltd., Unit 2/10 Gladstone Road, Castle Hill NSW 2154, Sydney, Australia.

This certificate is valid for 3 years from the date of certification on the condition that audits are conducted and paid for as per the Certification Agreement. Should this condition not be met, cancellation procedures will be initiated and the client will be removed from the JAS-ANZ register. This Certificate remains the property of International Standards Certifications Pty Ltd and must be returned upon request. It must not be altered in any way. Intentional misuse of this certificate will result in cancellation without prior notification. Certificates can be checked through certcheck@isc-worldwide.com

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NABL

National Accreditation Board for Testing and Calibration Laboratories
Department of Science & Technology, India

CERTIFICATE OF ACCREDITATION

DIAMOND POWER INFRASTRUCTURE LTD.- ESSEN ULTRA HIGH VOLTAGE TEST LABORATORY

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2005

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

Phase II, Village Vadadala, Tal. Savli, Dist. Vadodara, Gujarat

in the discipline of

ELECTRICAL TESTING

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Certificate Number T-3045

Issue Date 21/07/2014 **Valid Until** 20/07/2016

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the additional requirements of NABL.

Signed for and on behalf of NABL

Jagat Patel, Program Manager — Anil Relia, Director — Prof. K. VijayRaghavan, Chairman

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CENTRAL POWER RESEARCH INSTITUTE

CPRI

TEST REPORT

Test Report Number	: DCCD- 12792 **Dated** : 11.09.2012
Name & Address of the Customer	: M/s.Diamond Power Infrastructures Ltd., Vadadala Village, Savli Taluk, Vadodara Dist, Gujarat.,
Name & Address of the Manufacturer	: M/s.Diamond Power Infrastructures Ltd., Vadadala Village, Savli Taluk, Vadodara Dist, Gujarat
Particulars of sample tested	: 1 X630 mm² 76/132 kV(E) XLPE Cable,
Condition of the sample on receipt	: New.
Type	: 2XA2Y
Designation	: Conductor Material : Copper; No. of cores : One; Size : 630 mm²; Insulation: XLPE; Metallic Sheath : Corrugated Aluminium; Outer sheath : HDPE Red colour with extruded semiconducting layer black colour; Voltage Rating : 76/132 kV; Embossing : DICABS ® ELECTRIC 1CX630 SQ MM 76/132 KV,YEAR OF MANUFACTURE 2011
Serial Number	: Nil
Number of Samples tested	: One
Date(s) of Test(s)	: 10.07.2102 to 10.09.2012
CPRI Sample Code no(s)	: DCCDCAB12S0123
Particulars of test conducted	: Type Test, except corbon black content test on red colour outer sheath HDPE
Test in accordance with Standard /Specification	: As Per IS- 7098 Part III- 1993, Am1 -2001,Am2-2007, Am3-2007
Sampling plan	: Not Applicable
Customer's requirement	: Nil
Deviation if any	: Nil
Name of the witnessing persons	
Customer's representatives	: None
Other than customer's representatives	: None
Test subcontracted with address of the laboratory	: Nil
Documents constituting this report	**(in words)**
Number of sheets	: Nine
Number of oscillogram/s	: Four (One Sheet)
Number of graphs	: Nil
Number of photos	: Nil
Number of test circuit diagrams	: Nil
Number of drawings	: One.Drg.No.:DPIL-EHV-DRG-D21

(Thirumurthy)
TEST ENGINEER

(K.Mallikarjunappa)
Joint Director

Sheet 1of 9

EUROCERT CERTIFICATIONS (UK) LTD.

CERTIFICATE

Certificate of Compliance

We hereby declare that the technical file of

DIAMOND POWER INFRASTRUCTURE LTD.

OFFICE:- 5/12, B.I.D.C. GORWA, VADODARA-390016, GUJARAT (INDIA)
FACTORY:- PHASE-II, VILLAGE VADADALA TAL. SAVLI, DIST. VADODARA-391520, GUJARAT (INDIA)

has been assessed & found to be in conformance with the provisions set forth by the requirement of Directive Low Voltage Directive 2006/95/EC

PRODUCT DESCRIPTION:- CABLES & CONDUCTORS.

(More Details as per Appendix-1)

Certificate No.	EU3000		
Date of Initial Registration	19th Dec. 2015	*Issue Date*	19th Dec. 2015
1st Surveillance on or before	19th Dec. 2016	*Expiry Date*	18th Dec. 2018
2nd Surveillance on or before	19th Dec. 2017		

Authorized Signatory

CE

CENTRAL POWER RESEARCH INSTITUTE

CPRI

TYPE TEST CERTIFICATE

Test Certificate Number	: DCCD-13671 **Dated:** 23.12.2013
Name & Address of the Customer	: M/s Diamond Power Infrastructure. Ltd., Vill: Vadadala, Tal: Savli, distt: Vadodara, Gujarat.
Name & Address of the Manufacturer	: M/s Diamond Power Infrastructure. Ltd., Vill: Vadadala, Tal: Savli, distt: Vadodara, Gujarat.
Particulars of sample tested	: 1 X 1200 mm² 220 kV XLPE Cable with One end outdoor Porcelain Termination, One End outdoor composite Termination & One straight through Screen Separation joint
Condition of the sample on receipt	: New
Type	: XLPE Cable System (Cable With two outdoor terminations & One straight through Screen separation Joint)
Designation	: Conductor Material : Copper Segmental (Milliken); Size : 1200 mm²; Number of cores : One; Insulation : XLPE; Metallic Sheath : Corrugated Aluminum sheath; Outer sheath : HDPE (Red) With Extruded Semiconducting Layer (Black); Voltage Rating : 220 kV (E); Embossing: DICABS(R) ELECTRIC 1C X 1200 SQ.MM 127/220 KV YEAR OF MANUFACTURE 2011; Accessories :; Terminations : Two outdoor (One Porcelain and One composite); Joint : One Straight through screen separation Joint; Make : NKT Cables, Germany
Serial Number	: Nil
Number of Samples tested	: One
Date(s) of Test(s)	: 04.10.2013 to 20.12.2013
CPRI Sample Code no(s)	: DCCDCAB13S0091
Particulars of test conducted	: Type Test
Test in accordance with Standard /Specification	: As per IEC 62067-2011
Sampling plan	: Not Applicable
Customer's requirement	: Nil
Deviation if any	: Nil
Name of the witnessing persons	
Customer's representatives	: Mr. R.R. Mishra &Mr. Kaushal Bhatiya
Other than customer's representatives	: None
Test subcontracted with address of the laboratory	: Nil

(Thirumurthy)
Test Engineer

(K.Mallikarjunappa)
Joint Director

केन्द्रीय विद्युत अनुसंधान संस्थान

CENTRAL POWER RESEARCH INSTITUTE
(A Govt of India Society under Min. of Power)
Prof. Sir C.V. Raman Road, Sadashivanagar P.O., P.B. No. 8066, Bangalore - 560 080, India
वेबसाइट/website : http://www.cpri.in

E-mail: mallik@cpri.in

By Hand

DIAGNOSTIC, CABLES & CAPACITORS DIVISION

CABLES LAB

No. 2/1/CABLES/11-12 Date: 19.10.2012

M/s.Diamond Power Infrastructures Ltd.,
Vadadala Village, Savli Taluk, Vadodara Dist,
Gujarat.

Dear Sir,

This has reference to your letter regarding type testing of 1 core X 630 Sq.mm 38/66 kV (E) XLPE Cable as per IS 7098 Part III.

As requested, the test have been completed and our test report No. DCCD-12851 dated 18.10.2012 is enclosed.

In order to prevent tampering of test report, CPRI has introduced hologram on the first page of the test report with effect from 01.10.2007.

Any discrepancy in these test reports may be brought to notice within forty five days from the date of issue of test reports. Please acknowledge the receipt of the test report.

Thanking you
Yours faithfully

(K. Mallikarjunappa)
Joint director

THICKNESS OF OUTER SHEATH EHV CABLE

*Calculated Diameter Under Outer Sheath mm		Thickness of Outer Sheath for Unarmoured Cables		Minimum of Outer Sheath for Armoured Cable
Above	UP to and Including	Nominal mm	minimum mm	mm
	40	2.4	1.72	1.72
40	45	2 6	1.88	1.88
45	50	2.8	2.04	2.04
50	55	3.0	2.20	2.20
55	60	3.2	2.36	2.36
60	65	3.4	2.52	2.52
65	70	3.6	2 68	2 68
70	75	3.8	2.84	2.84
75	-	4.0	3.00	3.00

***Note:** Fictitious diameter calculated as described in Annex B of IS 7098 (Part-3)

RESISTIVITY TEST FOR SEMI-CONDUCTOR LAYER

The resistivity test for extruded semi-conducting layers applied over the conductorand over the insulation shall be determined by measurements on test pieces taken from core.

The procedure for measurement shall be in accordance with Annex Cof IS 7098 (Part-3).

The measurement shall be made at a temperature within ± 2°C of the rated maximum normal operating conductor temperature.

The resistivity shall not exceed the following:

Conductor Screen 1000 ohm-metre

Core Screen 500 ohm-metre

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Reliance Energy
ADITYA BIRLA
HINDALCO
Hindalco Industries Limited
Ceylon Electricity Board (CEB)
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Corporate Office
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