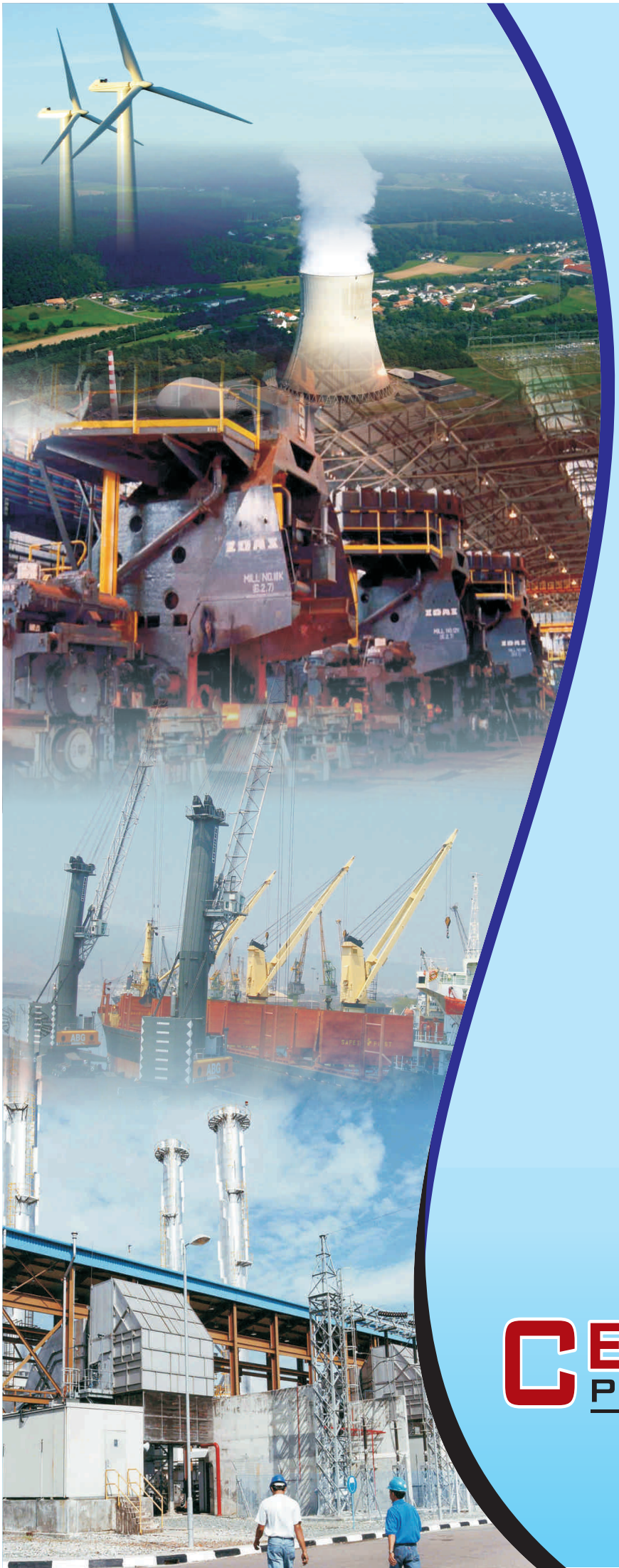


TM

CENTURION®

CABLES

Accredited by
United Kingdom
Accereditation Service

ISO 9001-2008
Registration No. 10518

IS : 7098 (P-1)
IS : 1554 (P-1)
IS : 694 / 1990
IS : 9968 (P-1)
IS : 9857/1990

CE

CENTURION
POWER CABLES PVT.LTD.

Dependable Cable in Undependable World

INTRODUCTION

We would like to take this opportunity of briefly introducing M/s. **CENTURION POWER CABLES PVT. LTD.,** which is a well established organization for the past 8 years (with experience of over 30 years in cable industries), with business transactions being carried out in India as well as International.

The company deals with a varied range of products, namely – such as Silicon Rubber Cables, Instrumentation Cables, Control Cables, Flat Cables, Electrometric Cables, H.T. Cables, PVC Cables, XLPE Cables, Armoured Cables, Welding Cables, Mining Cables, Fire Survival Cables & any Special Cables.

Under Brand Name **CENTURION® CABLES**

The name and business strength that has been earned by our organization today, is due to the highly equipped machines and able staff, who have a varied experience of the Indian market and good knowledge of serving the customers to their satisfaction. This is further enhanced by the innovative ideas of the management, who strive from time to time in creating awareness and keeping the company at par to the latest development of today's world by emphasising on better quality time to time.

We hold following BIS licences :-

| IS: 7098(Pt-1) | IS: 1554(Pt-1) | IS: 694/90 | IS: 9968(Pt-1) | IS: 9857/90 |

CM/L-3000823 CM/L-3000722 CM/L-3001219 CM/L-8620272 CM/L-8620171

| ISO 9001:2008 | "CE" Certified by URS-UKAS |

OUR SOME VALUED CLIENTALE

BAJAJ Bajaj Electricals Limited Inspiring Trust · BHEL · BHUSHAN LIMITED · BIRLA CORPORATION LIMITED MP BIRLA GROUP · WMI Cranes Ltd MATERIAL HANDLING EQUIPMENT · PORT OF CHENNAI · FSNL · HSL · IFFCO · INDIA GLYCOLS LIMITED · IndianOil · ESSEL MINING ADITYA BIRLA GROUP · Ispat Industries Limited · LARSEN & TOUBRO It's all about Imagineering · MECON मेकान ISO 9001:2000 Company · ESSAR · BRP · JNPT · BHPV · Northern Coalfields Ltd. · vedanta SESA GOA · MPT मुरगांव पत्तन न्यास · MUKAND Infinite resolve · INDIAN RAILWAY · ONGC · JINDAL STAINLESS · JINDAL · NTPC · PSEB · Reliance Industrial Infrastructure Limited · SAIL सेल · Shriram epc Engineering the future · TATA TATA CHEMICALS LIMITED

RANGE OF PRODUCTS

	Description	Reference Standard
	1100 volts grade Elastomeric Flexible Trailing Cables & Cords. VIR/EPR insulated, TRS/PCP/CSP/NBR-PVC sheathed with flexible ATC conductor. upto 630 Sq.mm. in Single core & upto 300 Sq.mm. four core.	IS-9968/Part-I/1988 | BS:6007 IEC:60245-1 | UL-44
	Silicon Rubber Insulated Single Core & Multi Core with Fibre Glass braided & Varnished Flexible Cords & Cable.	IS-9968/Part-I/1988. | BS:6007 IEC:60245-1
	Elastomeric Trailing Cable	IS-9968/Part-I/1988. | IS:4289(Pt-1) IEC:60245-1 | UL:44
	H.T. Elastomeric Cable upto & Including 11KV (Single core & upto 5 core)	As per IS-9968/Part-II/02. | BS:7835
	Flexible Welding Cable in both General purpose & Heat oil & flame retardent compound with Copper/Aluminium Conductor	IS:9857/1990
	Mining Cable	As per IS:14494/98
	Ship Wiring & Instrumentation Cable	As Per DGS 211&212 | UL:1309 IEC: 92-3 | IEC:350, 353
	Elastomeric Control Cable / Pair Cable	IS: 9968(Pt-1) | IEC-92-3
	Elastomeric Flat Cable	IS: 9968 (Pt-1)
	Wind Power Cable	IS : 9968 / IS 1554
	Submersible Cable	As per IS:694/1990 | IS:1554 (Pt-1)
	Elastomeric Composite Cable	As per IS: 9968 (Part-1)
	Solar Power Cable (Ultra Violet Protected)	IS:1554 | IS:7098 | IS:694
	Fibre Glass Wire (Braided & Varnished)	As per IS: 9968 (Part-1)
	Instrumentation Cable	As per BS: 5308 (Part-2) | Pt-1
	Thermocouple Extension / Compensating Cable	As per IS: 8784/1987 | ANSIMC:96.1 DIN 43714 & 43710 | IEC:60584-3
	Flexible P.V.C. Insulated & Sheathed Cable / Cords / Fixed Wiring Cable	IS: 694/1990 | BS:6500
	Copper / Aluminium Conductor P.V.C. Armoured/Unarmoured/FRLS Cable	IS: 1554 (Part-1)1988 | BS:6346
	Copper Conductor P.V.C. Insulated Multi Core Cable	IS: 1554 (Part-1)1988 | IS:694/90
	Copper / Aluminium Conductor XLPE Armoured/Unarmoured Cable	IS: 7098 (Part-1)1988 BS:5467 | BS:6724
	Fire Survival & Fire Alarm Cable / High Temperature Cable	BS:6387
	T.P.R. Insulated and Shethed Cable	As per IS:9968 (Part-1) 1988 | IS:4289 (P+II)
	Arial Bunched Cable	As per IS:14255/1995
	Load Cell Cable	As per BS :5308 (Part-2)

NOTE : WE CAN DESIGN & MANUFACTURE ANY TYPE OF P.V.C. FRLS, ZHFR / XLPE / RUBBER INSULATED CABLE AS PER CUSTOMER'S REQUIREMENT.

MATERIAL

1. CONDUCTOR : Conducting materials are composed of high conductivity, 99.9% pure Annealed Bare Copper (ABC) or Annealed Tinned Copper (ATC) wires which are flexible enough to withstand constant flexing and to prevent the formation open circuit faults. The conductors are completely free open ends and joints as the basic wires are drawn, tinned, bunched rope stranded in the long continuous lengths. The design of flexible conductors are such that it provides high circuit integrity and excellent physical properties.

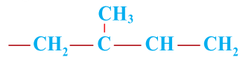
PHYSICAL AND ELECTRICAL PROPERTIES OF COPPER AND ALUMINIUM

S.No.	PROPERTY	UNIT	COPPER	ALUMINIUM
1.	Relative Conductivity at 20°C	%	95-99A, 100B	61
2.	Resistivity at 20°C	Ohm mm^2/m	17.41_18.10A 17.241B	28.264
3.	Density at 20°C	g/cm^3	8.89	2.703
4.	Co-efficient of Thermal expansion	°C	$17x10^{-6}$	$23x10^{-6}$
5.	Melting point	°C	1083	659
6.	Elastic Modules	Kg/mm^2	11.950	7.030

Note : **A-Annealed Tinned Copper, B-Annealed Bare Copper**

2. INSULATION : Natural Rubber is still employed as insulation for 1100 volts type cables but the recent trend is towards synthetic rubber like EPR and MEPR which permit higher conductor operating temperature and current rating.

i) NATURAL RUBBER (NR) : NR is a dried or coagulated solids obtained from certain trees. In chemical term NR is cis-1,4 Polyisoprene with the structure unit.

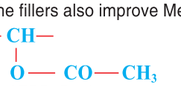


Raw rubber is difficult to extrude satisfactory. It needs to be masticated to the required viscosity and compounded with fillers, accelerators, and other additives periodically one by one. The process control and machinery available for compounding in CENTURION POWER CABLES PVT. LTD., Cross linking of NR is achieved by Sulpher, Which may react with copper, Such conductors are usually tinned. Natural Rubber tends to compare unfavorable with synthetic polymers in term of maximum operating temperature and ageing performance. It also show cracks in the presence of ozone.

ii). ETHYLENE PROPYLENE RUBBER : EPR is a saturated Co-Polymer of Ethylene and Propylene

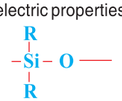
In CENTURION POWER CABLES PVT. LTD. Dicumyl Peroxide used for cross linking. Peroxides betters long term resistance to ageing and the electrical properties. They decompose under the action of heat to give radicals which react with the polymers and result in stable carbon_carbon cross link. Calcium Carbonate corporate in large quantity for better physical properties and reduce moisture absorption are obtained by replacing Calcium Carbonate with Calcium Clay. An unsaturated Silane which binds to the fillers also improve Melting Point. Other additives includes Red Lead to give better water resistance and oil to help processing.

III). ETHYL VINYL ACETATE (EVA) : Its ethylene copolymer containing vinyl acetate.



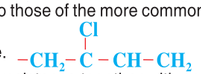
The polymers are cross linked by peroxides or by radiations and the formation is generally similar to that of EPR. Resistance to ageing in air is slightly superior to that of EPR, service temperature up to 110°C being possible, but electric properties such as permittivity are inferior. EVA is also used as the base for extruded semi conducting dielectric screening materials.

iv). SILICON RUBBER : Silicon rubber have general chemical structure is



Where R is usually methyl or phenyl. Silicon have outstanding properties, especially in resistance to high temperature, 150°C being the normal operating limit. However, at ambient temperatures the mechanical properties are somewhat inferior to those of the more commonly used materials. For this Fibre Glass Braiding and H or S grade Varnish provides over Silicon.

v). POLYCHLOROPRENE RUBBER (PCP). PCP was the first commercial synthetic rubber it has the structure.



Its major use is as a very tough flexible sheathing material. PCP compounds have good abrasion and tear resistance together with good resistance to swelling and to chemical attack by a wide range of natural oils and Aliphatic Hydrocarbons. They do not normally support combustion.

vi). CHLOROSULPHONATED POLYETHYLENE RUBBER (CSP) : CSP is obtained when polyethylene is reacted in carbon tetra chloride with chlorine and sulpher dioxide. CSP compound have superior electrical properties to compounds based on PCP and are particularly advantageous for Insulation & Sheathing which is required to be Oil Resisting. CSP also have good resistance to ozone and weathering. When blended with EVA of EPR and filled with a suitable carbon black. CSP compound provide a strippable dielectric screening materials for high voltage EPR cables.

vii). ACRYLONITRILE BUTADIENE RUBBER (NBR/PVC BLENDS) : The copolymer of acrylonitrile with butadiene produces a range of polymers characterised by good oil resistance. They have the structural units

The additive of PVC improves resistance to Ozone, weathering and abrasion. By suitable choice of Plasticisers improve process ability and Flame Retardant also obtained. These materials are used solely for Sheathing.

3. SCREEN / ARMOUR : To prevent mechanical damage to the insulated cores, to retain a certain extent of flexibility and to carry earth fault current during installation and in service the Elastomer Insulated Flexible Cables are protected by an additional stranded galvanised steel wire armour called PLAIABLE ARMOUR. For small sizes of cables, where good flexibility is required braided construction using tinned copper wires are usually adopted. The process control and machinery available for screening in CENTURION POWER CABLES PVT. LTD. enable no open ends and minimum joints in the screen along the entire lengths of cable. The screen also permits maximum flexibility.

PHYSICAL PROPERTIES OF COMMONLY USED ELASTOMERIC CABLE INSULATING AND SHEATHING MATERIAL

S.No.	Material	Tensile Strength (Min.) (N/mm^2)	Elongation at break (Min.) (%)	Max. Cond. Temp. for Continuous Operation (°C)	Max. Cond. Temp. for Short Circuit (°C)	Min. Cond. Temp. for Continuous Operation (°C)
1.	Natural Rubber (VIR/TRS)	5.0A/7.0B/14.OC	300	60	200	-55
2.	Ethylene Propylene Rubber (EPR)	4.2	200	90	250	-50
3.	Polychloroprene (PCP)	8.0B/11.0C	250	90	250	-40
4.	Nitrile Butadiene Rubber & PVC Blend	8.0B/11.0C	250	80	200	-30
5.	Chlorosulphonated Polyethylene (CSP)	8.0B/11.0C	250	90	250	-35
6.	Silicon Rubber	5.0	150	150	350	-55
7.	Butyl Rubber	4.2	300	85	220	-55

Note : **A Insulation grade B-General purpose C-Heavy Duty**

ELECTRICAL PROPERTIES OF COMMONLY USED ELASTOMERIC CABLE INSULATING AND SHEATHING MATERIAL

S.No.	Material	Insulation Resistance Constant M Ohm Km (Min.)		Type Code	Application / Usage
		at 27°C	at Max. Temp.		
1.	Natural Rubber (VIR/TRS)	700	N/A	IE1/SE1/SE2	Insulation / sheath general services
2.	Ethylene Propylene Rubber (EPR)	3670	3.67	IE2/IE3	Insulation Heat Resisting
3.	Polychloroprene (PCP)	N/A	N/A	SE3/SE4	Normal / Heavy duty sheath heat resisting
4.	Nitrile Butadiene Rubber & PVC Blend (NBR-PVC)	N/A	N/A	SE3/SE4	Normal/Heavy duty sheath heat resisting
5.	Chlorosulphonated Polyethylene (CSP)	N/A	N/A	SE3/SE4	Normal / Heavy duty sheath heat resisting oil resisting & flame retardant
6.	Silicon Rubber	870	N/A	IE5	Insulation for temp. upto 200°C
7.	Butyl Rubber	3670	3.67		Insulation Heat Resisting

COMPARATIVE PERFORMANCE DATA FOR TYPICAL ELASTOMERIC INSULATING AND SHEATHING MATERIALS

Materials	Natural Rubber Including Blends with SBR	HOFR PCP Neoprene	NBR/CSP	BUTYLE	EPR	EPR/CSP	CSP	SILICONE RUBBER
Resistance to Ozone	Poor	Good	Good	Good	Very Good	Very Good	Very Good	Very Good
Corona	"	"	"	"	"	"	Good	Good
Weather	"	"	"	Fair	Good	"	Very Good	Very Good
Oil	"	"	Very Good	Poor	Poor	Good	Good	Fair
Water	Good	Fair	Good	Good	Good	Good to fair	Good to Fair	Fair
Chemicals	Fair	"	Fair	"	Fair	Good	Good	Fair
Solvents	Poor	Good	Good	Poor	Poor	Fair	Fair	Poor
Abrasion	Good to Fair	Good	Good	Poor	Poor	Good	Good	Fair
Flame	Poor	Good	Good	Poor	Poor	Good	Good	Fair
Insulation Resistance	Good	Poor	Poor	Good	Good	Good	Fair	Good
Voltage Breakdown	Good	Fair	Fair	Good	Good	Good	Good	Good
A.C. Losses	Good	Poor	Poor	Good	Good	Fair	Fair	Good

Our Quality Control Department active at following process stage

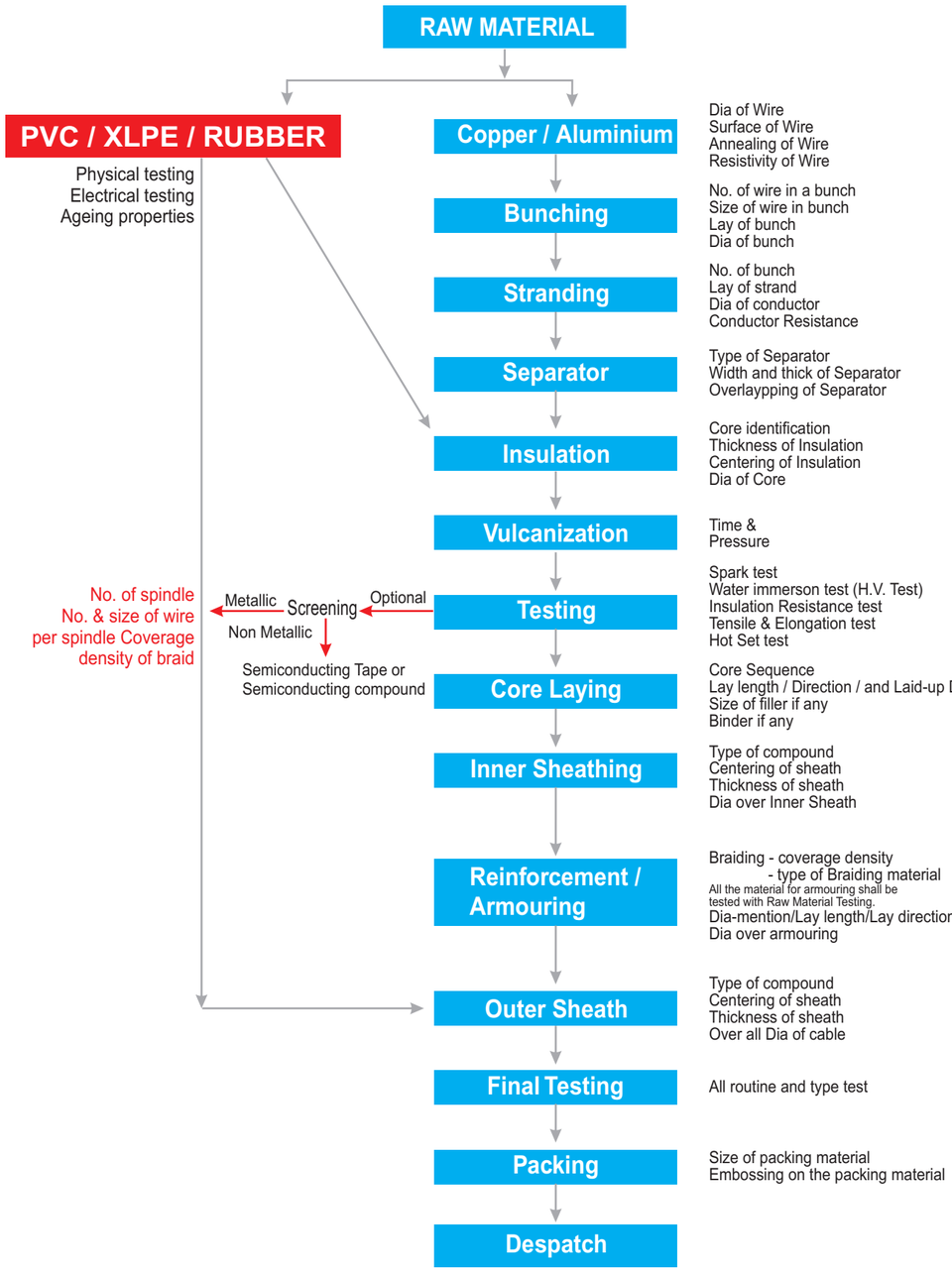


Fig. No. 1 Process Flow Chart

TECHNICAL DATA - HOFR OR TRS WELDING CABLES Conf. to IS : 9857

Size (Sq. mm.)	Nominal Thickness of Covering (mm)	Diameter of Cable (mm)	Copper Conductor		Aluminium Conductor	
			Max. Conductor Resistance at 20°C (Ohm/Km)	Approx. Wt. of 100 Mtrs. Coils (Kgs.)	Max. Conductor Resistance at 20°C (Ohm/Km)	Approx. Wt. of 100 Mtrs. Coils (Kgs.)
16	2.00	10.0	1.210	23	.....	.....
25	2.00	11.0	0.780	33	1.230	17
35	2.00	12.5	0.554	42	0.901	20
50	2.20	15.0	0.386	58	0.634	28
70	2.40	17.5	0.272	82	0.445	39
95	2.60	20.5	0.206	110	0.334	50
120	2.80	22.0	.....	.....	0.256	61

RECOMMENDED CABLE SIZE FOR WELDING ELECTRODES

Electrode Size		Equivalent Cable as per IS : 434	MANUAL WELDING			
			HOFR		TRS	
(SWG)	(mm)		Copper (Sq. mm.)	Aluminium (Sq. mm.)	Copper (Sq. mm.)	Aluminium (Sq. mm.)
14	2.00	.....	16	25	16	25
12	2.50	.....	16	25	16	25
10	3.25	150A	16	25	25	35
8	4.00	230A	25	35	35	50
8*	*4.00	400A*	35	50	50	70
6	5.00	600A	50	70	70	95
4	6.00	800A	70	95	95	120
2	7.00	1000A	95	120	.....	.....

ELASTOMER INSULATED, SINGLE CORE, CIRCULAR, TWIN CORE, THREE CORE AND FOUR CORE, ELASTOMER SHEATHED FLEXIBLE CABLE Conf. to IS : 9968 (Pt.-1)

Nominal Cross Sectional Area of Conductor (Sq. mm.)	Nominal Thickness of Insulation (mm)	Nominal Thickness of Sheath				Overall Diameter (Max.)			
		S/c (mm)	2 core (mm)	3 core (mm)	4 Core (mm)	S/c (mm)	2 core (mm)	3 core (mm)	4 Core (mm)
0.5	1.0	1.0	1.0	1.0	1.0	7.0	11.7	12.5	13.6
0.75	1.0	1.0	1.0	1.0	1.1	7.2	12.2	13.0	14.3
1.0	1.0	1.0	1.0	1.0	1.1	7.4	12.6	13.4	14.8
1.5	1.0	1.0	1.0	1.1	1.1	7.7	13.2	14.2	15.5
2.5	1.0	1.0	1.1	1.1	1.1	8.2	14.2	15.1	16.5
4.0	1.0	1.0	1.2	1.2	1.2	8.8	15.7	16.7	18.3

CURRENT RATING & CONDUCTOR RESISTANCE

Conductor Size (Sq.mm.)	No. of Wires / Wire Diameter (No. s/mm)	Maximum Conductor Resistance at 20°C (Ohms / Km)	Current Rating	
			D.C. or Single Phase A.C. (A)	3 Phase A.C. (A)
0.5	16/0.20	40.1	3	3
0.75	24/0.20	26.7	6	6
1.0	32/00.20	20.0	10	10
1.5	48/0.20 or 30/0.25	13.7	16	16
2.5	80/0.20 or 50/0.25	8.21	25	20
4.0	56/0.30 or 128/0.20	5.09	41	36

ELASTOMER INSULATED SINGLE CORE, CIRCULAR, TWIN CORE, THREE CORE, FOUR CORE AND FIVE CORE ELASTOMER SHEATHED FLEXIBLE CABLES

Nominal Cross Sectional Area (Sq. mm.)	Nominal Thickness of Insulation (mm)	Nominal Thickness of Sheath				
		Single Core (mm)	Twin Core (mm)	Three Core (mm)	Four Core (mm)	Five Core (mm)
6	1.0	1.6	2.0	2.1	2.5	2.5
10	1.2	1.8	2.4	2.5	2.7	2.9
16	1.2	1.9	2.5	2.7	2.9	3.2
25	1.4	2.0	3.2	3.3	3.4	--
35	1.4	2.2	3.3	3.4	3.5	--
50	1.6	2.4	3.5	3.6	3.7	--
70	1.6	2.6	3.6	3.7	3.9	--
95	1.8	2.8	3.8	4.0	4.1	--
120	1.8	3.0	4.0	4.1	4.3	--
150	2.0	3.2	4.2	4.3	4.5	--
185	2.2	3.4	4.3	4.5	4.8	--
240	2.4	3.5	4.6	4.8	5.1	--
300	2.6	3.5	4.9	5.1	5.4	--
400	2.8	3.8	5.2	5.4	5.8	--
500	3.0	4.0	--	--	--	--
630	3.0	4.1	--	--	--	--

CONTINUOUS CURRENT RATING & CONDUCTOR RESISTANCE

Continuous current rating capacity is an important factor for the selection of the optimum size of the conductor in a cable. The sustained current carrying capacity of Trailing & Mining Cables given in the table are for a single circuit and based on an ambient temperature of 30°C.

Nominal Cross Sectional Area (Sq. mm.)	No. of Wires / Nom. Wire Diameter (No.s/mm)	Current Rating for Cable with General Purpose Insulation (A)	Current Rating Cable with Heat Resisting Insulation (A)	Maximum Conductor Resistance at 20°C (Ohms / Km)
0.50	16/0.20	4	5	40.1
0.75	24/0.20	8	10	26.7
1.0	32/0.20	12	14	20.0
1.5	48/0.20	20	24	13.70
2.5	80/0.20	22	27	8.21
4	56/0.30	28	34	5.09
6	85/0.30	36	44	3.39
10	80/0.40	49	60	1.95
16	126/0.40	66	81	1.24
25	196/0.40	85	105	0.795
35	276/0.40	100	125	0.565
50	396/0.40	130	160	0.393
70	356/0.50	160	195	0.277
95	484/0.50	190	235	0.210
120	610/0.50	220	270	0.164
150	764/0.50	250	305	0.132
185	942/0.50	285	350	0.108
240	1221/0.50	330	405	0.0817
300	1527/0.50	385	470	0.0654
400	2037/0.50	450	530	0.0495
500	2546/0.50	570	670	0.0391
630	3210/0.50	720	800	0.0292

RATING FACTORS FOR AMBIENT TEMPERATURE

Ambient Temprature (°C)	35	40	45	50	55	60	70
Factor for VIR Insulation	0.91	0.82	0.71	0.58	0.41	---	---
Factor for EPR Insulation	0.95	0.90	0.85	0.80	0.74	0.67	0.52
Ambient Temperature (°C)	**35 - 85**	**90**	**100**	**110**	**120**	**130**	**140**
Factor for SILICON Insulation	1.0	0.96	0.88	0.78	0.68	0.55	0.39

Elastomeric : Silicon Rubber insulated single core, three-core and four core glass braided and varnished cables & cards. Conforming to IS : 9968 Pt.-1/88

Nominal Cross Sectional Area of Conductor sq.mm	Nominal Thickness of Insulation
	Flexible Cables and Cards mm
0.5	1.0
0.75	1.0
1.0	1.0
1.5	1.0
2.5	1.0
4.0	1.0
6.0	1.0
10	1.20
16	1.20
25	1.40
35	1.40
50	1.60

APPLICATIONS OF RUBBER CABLES

1. Main Application of Elastomeric Cable where flexibility is involved, like reeling un-reeling trailing festooning purpose.
2. Lifts, Cranes, Conveyors & other mobile machine used in Steel Plants, Cement Plants, Sugar Mills etc.
3. Flexible cords upto 4.0 Sq.mm. (Domestic type) for the connection of Electric Iron, Fans, Motors, Coolers etc.
4. Flexible cords upto 4.0 Sq.mm. (Workshop type) for the connection of Industrial equipments.
5. Welding cable.
6. Earthing cables.
7. Wind Mill Cables.
8. Ship Wiring & Railways wiring.
9. Coal mines cable for mobile production machine U/G application.
10. High temperature cable with Silicon Rubber Insulation.

ELASTOMER FLEXIBLE CABLES

(As per IS : 9968/Pt-II/02)

Conductor	SIZES OF GROUNDING CONDUCTOR						Sizes (Sq.mm.)		
Power conductor	16	25	35	50	70	95	120	150	185
Grounding conductor	16	16	16	25	35	50	70	70	95

INSULATION THICKNESS

Conductor Size (Sq.mm.)	Insulation Thickness			
	1.9/3.3 and 3.3/3.3 kV (mm)	3.8/6.6 kV (mm)	6.6/6.6 and 6.35/11 kV (mm)	11/11 kV (mm)
16	2.2	3.0	4.0	6.0
25	2.2	3.0	4.0	6.0
35	2.2	3.0	4.0	6.0
50	2.2	3.0	4.0	6.0
70	2.2	3.0	4.0	6.0
95	2.4	3.0	4.0	6.0
120	2.4	3.0	4.0	6.0
150	2.4	3.0	4.0	6.0
185	2.4	3.0	4.0	6.0

THICKNESS OF SHEATHS

Diameter Under Inner Sheath		Thickness of Sheath	
Above (mm)	Up to & Including (mm)	Inner (mm)	Outer (mm)
---	10	1.0	1.6
10	15	1.2	2.0
15	20	1.4	2.2
20	25	1.6	2.5
25	30	1.8	3.0
30	40	2.0	3.5
40	50	2.4	4.0
50	60	2.8	4.5
60	70	3.2	5.0
70	80	3.6	5.5
80	---	4.0	6.0

MINING CABLES

(As per IS : 14494/98)

SIZE OF POWER, EARTHING & PILOT CONDUCTORS

Power Conductor		Sq. mm.	2.5	4	6	10	16	25	35	50	70	95	120	150	185
Earthing Conductor	Type-A	Sq. mm.	2.5	4	6	10	16	16	16	25	35	50	70	70	95
	Type-B	Sq. mm.	2.5	4	6	10	16	25	35	50	70	95	120	150	185
Pilot Conductor		Sq. mm.	2.5	4	6	10	16	16	16	25	35	50	70	70	95

INSULATION THICKNESS

Nom. Area of Conductor (Sq.mm.)	Nom. Thickness of Insulation For Power Cores			
	1.1 kV (mm)	3.3 kV (mm)	3.8/6.6 kV (mm)	6.35/11kV (mm)
2.5	1.0	---	---	---
4	1.0	---	---	---
6	1.0	---	---	---
10	1.2	---	---	---
16	1.2	2.2	3.0	4.0
25	1.4	2.2	3.0	4.0
35	1.4	2.2	3.0	4.0
50	1.6	2.2	3.0	4.0
70	1.6	2.2	3.0	4.0
95	1.8	2.4	3.0	4.0
120	1.8	2.4	3.0	4.0
150	2.0	2.4	3.0	4.0
185	2.2	2.4	3.0	4.0

Note : 1. The nominal thickness of insulation for pilot core(s) shall be 1.0mm. However, higher thickness whenever required to build up the diameter is permitted.
2. The thickness of covering on earth conductor(s) shall be suitably selected for covered earth conductor(s).

THICKNESS OF INNER AND OUTER SHEATH
(except for Collective Metallic Screened and Pliable Wire Armoured Cables)

Calculated Dia. Under Inner Sheath		Thickness of Sheath	
Over (mm)	Up to and Including (mm)	Inner Min. (mm)	Outer Nom. (mm)
---	10	1.4	2.0
10	15	1.6	2.4
15	20	1.8	2.6
20	25	2.0	2.8
25	30	2.2	3.0
30	40	2.4	3.2
40	50	2.8	3.6
50	60	3.2	4.0
60	70	3.6	4.5
70	80	4.0	5.0
80	---	4.4	5.5

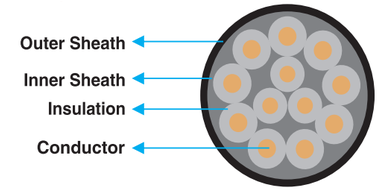
THICKNESS OF INNER AND OUTER SHEATH
(for Collective Metallic Screened and Pliable Wire Armoured Cables)

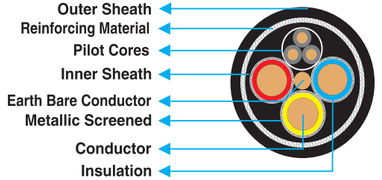
Calculated Diameter Under Inner Sheath for Choosing Thickness of Inner Sheath and Calculated Dia. Under Outer sheath for Choosing Thickness of Outer Sheath		Thickness of Sheath	
Over (mm)	Up to and Including (mm)	Inner Min. (mm)	Outer Nom. (mm)
---	10	1.6	2.5
10	15	1.8	2.8
15	20	2.0	3.2
20	25	2.2	3.6
25	30	2.4	4.0
30	40	2.6	4.5
40	50	3.0	5.0
50	60	3.5	5.7
60	70	4.0	6.4
70	80	4.5	7.1
80	90	5.0	7.8
90	100	5.5	8.5
100	---	6.0	9.0

DIMENSIONS OF PLIABLE WIRE ARMOUR AND BRAIDING WIRE
(As per IS : 9968/Pt-II/81 | IS: 14494/98)

Diameter Under Armour		Size of Armour Strand	Diameter of ★ Braiding Wire
Above (mm)	Up to and Including (mm)	(No.s / mm)	(mm)
---	25	7/0.45	0.3
25	40	7/0.71	0.45
40	60	7/0.90	0.45
60	---	7/1.25	0.45

★Incase of Elastomer Flexible Cable as per IS:9968 (Pt.-II)/02





ELASTOMERIC INSULATED FLEXIBLE CABLES

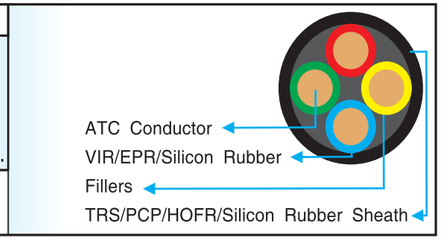
ATC Conductor, VIR Insulated, TRS Sheathed

ATC Conductor, EPR Insulated, PCP/CSP Sheathed

ATC Conductor, Sillicon Insulated Fibre Glass Braided & Varnished

ATC Conductor, Silicon Insulated, Sillicon Sheathed Fibre Glass Braided & Varnished.

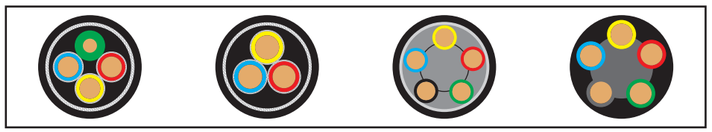
MAIN APPLICATIONS :
Service or Mains Supply Where Flexibility is required.



Core Identification : By Colours

No. of Cores	Colour
Single	Natural Colour
Twin	Red & Black
Three	Red, Yellow & Blue
Four	Red, Yellow, Blue & Green.
Five	Red, Yellow, Blue, Black & Green

Single Sheath and Double Sheath with Synthetic Yarn Reinforcement in case of double sheath.



Why "CENTURION" CABLES are better?

1. High current carrying capacity due to low conductor resistance. **2.** High insulation resistance. **3.**Small bending radius.
4. Long service life. **5.** Good Ageing characteristics. **6.** Heat resisting, Oil resisting & Flame retardent property.
7. Ozone resistant. **8.** Extra flexibility due to super annealed copper wire & good elasticity of compound.
9. Excellent mechanical features of the insulation improves the protection against external effects.
10. Packing material suitable for handling. **11.** Fast service for any Cable.

PROPERTIES OF P.V.C. COMPOUND

Feature	Normal PVC	Heat Resistant HR PVC	Fire Retardent FR-PVC	Fire Retardent Low Smoke FRLS	Zero Halogen Low Smoke
Insulation Material	PVC	PVC	Spl. PVC	Spl. PVC	Spl. Polymer
Insulation Property	Normal	Good	Good	Good	Very Good
Temperature Rating	70°C	85°C	70°C/85°C	70°C/85°C	85°C
Thermal Stability	Normal	Very Good	Good	Good	Very Good
Flame Retardancy	Good	Good	Very Good	Very Good	Excellent
Safety During Burning	Average	Average	Good	Good	Excellent
Requirement of Oxygen to Catch Fire (% in air)	>21	>21	>30	>30	>35
Temperature Required to catch fire (with 21% Oxygen)	Room Temp.	Room Temp.	>250°C	>250°C	>300°C
Visibility during Cable burning %	<20	<20	<35	<40	<80
Release of Halogen Gas during burning 9% by weight	<20	<20	<20	<20	ZERO

Following additional test is offered on these cables :

1) FLAMMABILITY TEST
A) IEEE383 B) IEC 332 (PART-I) C) IEC 332 (PART-III)

1) SWEDISH CHIMNEY TEST
A) SS 4241475

TEST OF FRLS AND HALOGEN FREE CABLES

Test	Function	Specification	Specified Values of FRLS Compound	Specified Values of Halogen Free Compound
Critical Oxygen Index	To Determine Percentage of Oxygen Required for Supporting Combustion of Insulating Material at room temperature	ASTM-D-2863	29% min.	29% min.
Temperature Index	To Determine at what temperature Normal Oxygen Content of 21% in Air will Support Combustion of Insulation Material	ASTM-D-2863& BICC Handbook Chapter No. 6	250 Deg. C min.	250 Deg. C min.
SMOKE DENSITY RATING (Light Transmission)	To Determine the visiability (Light Transmission) under Fire of Insulating Material	ASTM-D-2843	60% Max.	60% max.
Acid Gas Gas Generation	To ascertain the amount of Hydrochloric Acid Gas Evolved from insulation of Cable under Fire.	IEC-754-I	Less than 20%	Less than 0.5%

CONDUCTOR MATERIAL & COLOUR CODES

INDIAN IS : 8784-1987

S.No.	TYPE OF THERMOCOUPLE	MATERIAL OF EXTENSION / COMPENSATING CABLE		SPECIFICATION			COLOUR CODE
		(+) LEAD	(-) LEAD	TEMP.	MV	STANDARD TOLERANCE	
1.	COPPER-CONSTANTAN (Cu-Con) T	COPPER	CONSTANTAN	100°C 200°C	4.239 9.178	±3°C ±3°C	(+) RED (-) BLACK (O) BLACK
2.	IRON-CONSTANTAN (Fe-Con) J	IRON	CONSTANTAN	100°C 200°C	5.28 10.78	±3°C ±3°C	(+) RED (-) BLUE (O) BLUE
3.	NICKEL/CHROMIUM-NICKEL/ ALUMINIUM (Ni/Cr-Ni/Al) K	NICKEL/CHROMIUM	NICKEL/ALUMINIUM	100°C 200°C	4.10 8.13	±3°C ±3°C	(+) RED (-) GREEN (O) GREEN
		(a) IRON •	COPPER-NICKEL ALLOY	100°C	4.10	±3°C	
		(b) COPPER •	COPPER-NICKEL ALLOY	100°C	4.10	±3°C	
4.	PLATINUM/RHODIUM-PLATINUM. (Pt/Rh-Pt) 13% or 10% R/S	COPPER ▲	COPPER NICKEL ALLOY	100°C	0.645	±5°C	(+) RED (-) WHITE (O) WHITE
5.	PLATINUM/RHODIUM-PLATINUM / RHODIUM Pt/Rh-Pt/Rh) B	COPPER ■	COPPER NICKEL ALLOY	100°C		±5°C	(+) RED (-) YELLOW (O) YELLOW
6.	NICKEL / CHROMIUM-CONSTANTAN (Ni/cR-Con) E	NICKEL/CHROMIUM	CONSTANTAN OR EQUIVALENT	100°C	6.317	±3°C	(+) RED (-) VIOLET (O) VIOLET
7.	NICKEL/CHROMIUM-KOPEL (Ni/Cr-Ko) E	NICKEL/CHROMIUM	KOPEL OR EQUIVALENT	100°C	6.95	±3°C	(+) RED (-) VIOLET (O) VIOLET

• COMPENSATING LEADS OF CHEAPER MATERIAL IS : 2054-1962 CONFIRM THE ABOVE LEADS FOR 0-100°C ONLY.
■ IS : 6720-1972 COVERS CONDUCTORS FOR 0-100°C ONLY.
▲ CHROMAL/KOPEL ACCORDING TO GOST NORM 3044-61.

BRITISH BS : 1843

S.No.	TYPE OF THERMOCOUPLE	MATERIAL OF EXTENSION / COMPENSATING CABLE		SPECIFICATION			COLOUR CODE
		(+) LEAD	(-) LEAD	TEMP.	MV	STANDARD TOLERANCE	
1.	COPPER-CONSTANTAN T	COPPER	CONSTANTAN	100°C 200°C	4.277 9.286	±2.2°C ±2.2°C	(+) WHITE (-) BLUE (O) BLUE
2.	IRON-CONSTANTAN J	IRON	CONSTANTAN	100°C 200°C	5.268 10.777	±2.2°C ±2.2°C	(+) YELLOW (-) BLUE (O) BLACK
3.	NICKEL/CHROMIUM-NICKEL/ ALUMINIUM K	NICKEL/CHROMIUM	NICKEL/ALUMINIUM	100°C 200°C	4.095 8.137	±2.2°C ±2.2°C	(+) BROWN (-) BLUE (O) RED
		COPPER IRON	COPPER-NICKEL **VX** COPPER-NICKEL **WX**	100°C 100°C	4.095 4.095	±2.2°C ±2.2°C	(+) WHITE (-) BLUE (O) RED
4.	PLATINUM/RHODIUM-PLATINUM. (Pt/Rh-Pt) 13% or 10% R/S	COPPER	COPPER NICKEL	100°C	0.645	±5°C	(+) WHITE (-) BLUE (O) GREEN
5.	PLATINUM/RHODIUM-PLATINUM/ RHODIUM (Pt/Rh-Pt/Rh) B	COPPER	COPPER NICKEL	100°C		±5°C	(+) WHITE (-) BLUE (O) GREEN
6.	NICKEL / CHROMIUM-CONSTANTAN E	NICKEL/CHROMIUM	CONSTANTAN	100°C	6.317	±2.2°C	(+) BROWN (-) BLUE (O) BROWN

■ COMPENSATING LEADS. BS-1843 REFERS THE (+) Cu (-) Con VARIETY AS VX FOR 'K' COMPENSATING (+) IRON (-) COPPER NICKEL AS WX FOR 'K' COMPENSATING CABLE

CONDUCTOR MATERIAL & COLOUR CODES

AMERICAN ANSI MC : 96.1

S.No.	TYPE OF THERMOCOUPLE	MATERIAL OF EXTENSION / COMPENSATING CABLE		SPECIFICATION			COLOUR CODE
		(+) LEAD	(-) LEAD	TEMP.	MV	STANDARD TOLERANCE	
1.	COPPER-CONSTANTAN T	COPPER	CONSTANTAN	100°C 200°C	4.277 9.286	±2.2°C ±2.2°C	(+) BLUE (-) RED (O) BLUE
2.	IRON-CONSTANTAN J	IRON	CONSTANTAN	100°C 200°C	5.268 10.777	±2.2°C ±2.2°C	(+) WHITE (-) RED (O) BLACK
3.	NICKEL/CHROMIUM-NICKEL/ ALUMINIUM K	NICKEL/CHROMIUM	NICKEL/ALUMINIUM	100°C 200°C	4.095 8.137	±2.2°C ±2.2°C	(+) YELLOW (-) RED (O) YELLOW
		COPPER	CONSTANTAN	100°C	4.095	±2.2°C	(+) YELLOW (-) RED (O) YELLOW
4.	PLATINUM/RHODIUM PLATINUM. 13% OR 10% R/S	COPPER	COPPER NICKEL	100°C	0.645	±5°C	(+) BLACK (-) RED (O) GREEN
5.	PLATINUM/RHODIUM-PLATINUM/ RHODIUM (Pt/Rh-Pt/Rh) B	COPPER	COPPER NICKEL	100°C		±2.2°C	(+) GREY (-) RED (O) GREY
6.	NICKEL/CHROMIUM-CONSTANTAN E	NICKEL/CHROMIUM	CONSTANTAN	100°C	6.317	±2.2°C	(+) PURPLE (-) RED (O) PURPLE

GERMAN DIN-43714 & 43710

S.No.	TYPE OF THERMOCOUPLE	MATERIAL OF EXTENSION / COMPENSATING CABLE		SPECIFICATION			COLOUR CODE
		(+) LEAD	(-) LEAD	TEMP.	MV	STANDARD TOLERANCE	
1.	COPPER-CONSTANTAN T	COPPER	CONSTANTAN	100°C 200°C	4.250 9.200	±3°C ±3°C	(+) RED (-) BROWN (O) BROWN
2.	IRON-CONSTANTAN J	IRON	CONSTANTAN	100°C 200°C	5.370 10.950	±3°C ±3°C	(+) RED (-) BLUE (O) BLUE
3.	NICKEL/CHROMIUM-NICKEL/ ALUMINIUM (KX) K	NICKEL/CHROMIUM	NICKEL/ALUMINIUM	100°C 200°C	4.095 8.137	±3°C ±3°C	(+) RED (-) GREEN (O) GREEN
		IRON	COPPER-NICKEL	100°C 200°C	4.095 8.137	±3°C ±3°C	(+) RED (-) GREEN (O) GREEN
4.	PLATINUM/RHODIUM-PLATINUM. 13% or 10% R/S	COPPER	COPPER NICKEL	100°C	0.645	±3°C	(+) RED (-) WHITE (O) WHITE
5.	PtPh - PtRH B	COPPER	COPPER NICKEL	100°C		±3°C	(+) RED (-) GREY (O) GREY

CENTURION'S house wires is a trusted name for reliable electrical wiring in homes, offices, multistoried buildings, hospitals hotels ,schools .industries etc. and enjoys enviable reputation for its quality and reliability "centurion" wires are manufactured making use of best quality bright annealed electrolytic grade copper with conductivity of more than 102% to save the energy consumption and for smooth flow of electricity PVC used as an insulant is manufactured in house and has good dielectric and physical properties with high insulation resistance value that protects against any electrical fault "centurion wires" are manufactured with solid ,stranded and multi-stranded conductor.

TECHNICAL DATA FOR PVC CABLE

PVC insulated unsheathed single core wire with high conductivity plain annealed electrolytic grade copper conductor 1100 volts as per IS: 694.

Nominal cross sectional area of the conductor	Nos./nominal dia of strand	Nominal thickness of insulation	Approx. overall dia	Max. conductor resistance	Current rating (Amps.) 2 wires, single phase	
Sq.mm.	No./mm	mm	mm	Ohm/Km at 20°C	In Conduit/ Trunking	Clipped directly to surface or on cable tray
1.0	14/.30	0.70	2.80	18.10	11	12
1.5	22/.30	0.70	3.10	12.10	13	16
2.5	36/.30	0.80	3.80	7.41	18	22
4.0	**56/.30	0.80	4.20	4.95	24	29
6.0	**84/.30	0.80	5.10	3.30	31	37

PVC insulated unsheathed single core wire with high conductivity plain annealed electrolytic grade copper conductor 1100 volts as per IS: 694.

Nominal cross sectional area of the conductor	Nos./nominal dia of strand	Nominal thickness of insulation	Approx. overall dia	Max. conductor resistance	Current rating (Amps.) 2 wires, single phase	
Sq.mm.	No./mm	mm	mm	Ohm/Km at 20°C	In Conduit/ Trunking	Clipped directly to surface or on cable tray
1.0	1/1.13	0.7	2.8	18.1	11	12
1.5	1/1.38	0.7	3.0	12.1	13	16
1.5	7/0.52	0.7	3.1	12.1	13	16
2.5	1/1.78	0.8	3.6	7.41	18	22
2.5	7/0.67	0.8	3.8	7.41	18	22
4.0	1/2.25	0.8	4.1	4.61	24	29
4.0	7/0.85	0.8	4.3	4.61	24	29
6.0	1/2.76	0.8	4.6	3.08	31	37
6.0	7/1.04	0.8	5.2	3.08	31	37
10	7/1.35	1.0	6.3	1.83	42	51
16	7/1.70	1.0	7.3	1.15	57	68
25	7/2.14	1.2	9.0	0.727	71	86
35	7/2.52	1.2	10.2	0.524	91	110
50	19/1.78	1.4	12.0	0.387	120	145

* Current rating at ambient temp. 40°C
* Current rating as per IS : 3961 (Part-V)
* PVC insulation : Type 'A' as per IS : 5831 - 1984

* Conductor : Class 2 as per IS : 8130 - 1984
* Normal Packing Length : 100 Mtrs. +/-5%
** Conductor Class V as per IS : 8130

PVC insulated unsheathed single core **flexible wires** with high conductivity plain annealed electrolytic grade copper conductor 1100 volts as per IS: 694

Nominal cross sectional area of the conductor	Nos./nominal dia. of Strand	Nominal thickness of insulation	Approx. overall dia.	Max. Conductor resistance	Current Rating
Sq.mm.	No./ mm.	mm.	mm.	O/Km at 20°C	Amps
0.5	16/0.20	0.6	2.4	39.0	4
0.75	24/0.20	0.6	2.6	26.0	7
1.0	32/0.20	0.6	2.7	19.5	12
1.5	30/0.25	0.6	3.1	13.3	16
2.5	50/0.25	0.7	3.8	7.98	22
4.0	56/0.30	0.8	4.3	4.95	29
6.0	84/0.30	0.8	5.2	3.30	37
10	80/0.40	1.0	6.3	1.91	51
16	126/0.40	1.0	8.0	1.21	68
25	196/0.40	1.2	9.7	0.780	86
35	276/0.40	1.2	11.0	0.554	110
50	396/0.40	1.4	13.2	0.386	145
70	360/0.50	1.4	15.5	0.272	215
95	475/0.50	1.6	18.0	0.206	260
120	608/0.50	1.6	19.5	0.161	305
150	756/0.50	1.8	22.0	0.129	355
185	925/0.50	2.0	24.5	0.106	415
240	1221/0.50	2.2	28.0	0.0801	500

PVC insulated and PVC sheathed **single & multi core flexible cable** with high conductivity plain annealed electrolytic grade copper conductor 1100 volts as per IS: 694

Nominal cross sectional area of the conductor	Nos. /nominal dia. of Strand	Nominal thickness of insulation	Nominal thickness of sheath and maximum overall dia. (mm.)							
			Single Core		Two Core		Three Core		Four Core	
Sq.mm.	No./ mm.	mm.	Sheath thickness	O.D. (max.)	Sheath thickness	O.D. (max.)	Sheath thickness	O.D. (max.)	Sheath thickness	O.D. (max.)
0.5	16/0.20	0.6	0.9	4.5	0.9	7.2	0.9	7.6	0.9	8.2
0.75	24/0.20	0.6	0.9	4.7	0.9	7.8	0.9	8.2	0.9	8.8
1.0	32/0.20	0.6	0.9	4.9	0.9	8.0	0.9	8.6	0.9	9.4
1.5	30/0.25	0.6	0.9	5.4	0.9	8.6	0.9	9.2	1.0	10.5
2.5	50/0.25	0.7	1.0	6.2	1.0	10.5	1.0	11.0	1.0	12.0
4.0	56/0.30	0.8	1.0	7.0	1.0	12.0	1.0	12.5	1.0	14.0

Note :
- Current rating at ambient temp. 40°C.
- Current rating as per IS:3961 (Part-V)
- Normal Packing Length - 100 Mtrs. +/-5%
- Conductor : Class 5 as per IS:8130-1984
- PVC insulation : Type 'A' as per IS:5831/1984
- PVC sheath : Type 'ST-1' as per IS:5831/1984

*30/0.25mm, 50/0.25mm. size can be supplied on request with construction of 48/0.20mm. and 80/0.20mm. respectively.

CENTURION'S Single Core PVC insulated armoured & unarmoured cable with Aluminium/Copper Conductor as per IS:1554(Pt.-1)

Area	Cond. Min. No. of Wires		Thickness of PVC Insulation (nom)		Dimension of Armoured Wire/Strip	Thickness of PVC Outersheath		Approx. Overall diameter		Approx. Net Wt. of Cable				Max. D.C./ resistance at 20 Deg. C		Approx. AC resistance at operating Temp 90°C		Approx. Capacitance per Phase		Current Rating						Short Circuit Rating for 1 Sec.	
			Arm	Un. Arm		Arm	Un. Arm	Arm	Un. Arm	Armoured		Unarmoured						Arm	Un-Arm	Direct in Ground		in duct		in Air			
Sq./mm.	No.		mm		mm	mm		mm		Kg / Km				Ohm/Km		Ohm/Km		uF/KM		Amps		Amps		Amps		KA(rms)	
Al/Cu.	Al	Cu	Al/Cu.	Al/Cu.	Al	Al/Cl.	Al/Cu.	Al/Cu.	Al/Cu.	Al	Cu	Al	Cu	Al	Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
4	1.0	1.0	1.3	1.0	1.4	1.24	1.80	10.7	8.3	145	180	85	110	7.41	4.61	8.9	5.52	-----	0.57	31	39	30	38	27	35	0.304	0.46
6	1.0	1.0	1.3	1.0	1.4	1.24	1.80	11.6	9.2	165	220	100	140	4.61	3.08	5.54	3.69	-----	0.67	39	49	37	48	35	44	0.456	0.69
10	1.0	7.0	1.3	1.0	1.4	1.24	1.80	12.5	10.1	190	280	120	200	3.08	1.83	3.70	2.19	0.67	0.83	51	65	51	64	47	60	0.76	1.15
16	7.0	7.0	1.3	1.0	1.4	1.24	1.80	13.2	10.8	245	350	150	270	1.91	1.15	2.30	1.38	0.80	0.97	66	85	65	83	64	82	1.22	1.84
25	7.0	7.0	1.5	1.2	1.4	1.24	1.80	14.8	12.4	305	480	210	380	1.20	0.727	1.44	0.87	0.83	1.0	86	110	84	110	84	110	1.90	2.88
35	7.0	7.0	1.5	1.2	1.4	1.24	1.80	15.8	13.4	360	600	250	480	0.868	0.524	1.04	0.627	0.95	1.15	100	130	100	125	105	130	2.66	4.03
50	7.0	7.0	1.7	1.4	1.4	1.24	1.80	17.6	15.2	450	750	320	625	0.641	0.387	0.77	0.463	0.95	1.26	120	155	115	150	130	165	3.80	5.75
70	19	19	1.7	1.4	1.4	1.40	1.80	19.6	16.8	570	1000	400	850	0.443	0.268	0.532	0.321	1.12	1.32	140	190	135	175	155	205	5.32	8.05
95	19	19	1.9	1.6	4X1.0	1.40	1.80	20.9	18.9	650	1300	525	1150	0.320	0.193	0.385	0.231	1.17	1.36	175	220	155	200	190	245	7.22	10.9
120	19	19	1.9	1.6	4X1.0	1.40	2.00	22.4	20.8	760	1550	620	1400	0.253	0.153	0.305	0.184	1.28	1.49	195	250	170	220	220	280	9.12	13.8
150	19	19	2.1	1.8	4X1.0	1.40	2.00	24.3	22.7	900	1900	750	1700	0.206	0.124	0.249	0.149	1.32	1.52	220	280	190	245	250	320	11.4	17.3
185	37	37	2.3	2.0	4X1.0	1.40	2.00	26.4	24.8	1065	2300	900	2100	0.164	0.0991	0.199	0.120	1.30	1.47	240	305	210	260	290	370	14.1	21.3
240	37	37	2.5	2.2	4X1.0	1.40	2.00	29.1	27.4	1320	2950	1125	2700	0.125	0.0754	0.152	0.0912	1.37	1.54	270	345	225	285	335	425	18.2	27.6
300	37	37	2.7	2.4	4X1.0	1.56	2.00	32.1	30.0	1595	3600	1380	3350	0.100	0.0601	0.123	0.0739	1.40	1.60	295	375	245	310	380	475	22.8	34.5
400	61	61	3.0	2.6	4X1.0	1.56	2.20	36.0	34.2	1970	4500	1725	4250	0.0778	0.0470	0.0975	0.0592	1.50	1.70	325	400	275	335	435	550	30.4	46.0
500	61	61	3.4	3.0	4X1.0	1.56	2.20	39.6	37.8	2450	5660	2190	5400	0.0665	0.0366	0.0767	0.0468	1.46	1.63	345	425	295	355	480	590	38.0	57.7
630	61	61	3.9	3.4	4X1.0	1.72	2.40	44.7	42.7	3100	7300	2800	6750	0.0469	0.0233	0.0614	0.0379	1.45	1.64	390	470	320	375	550	660	47.9	72.5
800	91	91	3.9	3.4	4X1.0	1.88	2.40	49.4	47.1	3780	9000	3380	8700	0.0367	0.0221	0.0510	0.0314	1.65	1.87	440	530	345	405	600	725	60.8	92.0
1000	91	91	3.9	3.4	4X1.0	2.04	2.60	53.7	51.5	4550	11100	4100	10700	0.0291	0.0176	0.0420	0.0271	1.76	2.05	490	590	370	435	720	870	76.0	115.0

CENTURION'S 2 Core PVC insulated armoured & unarmoured cable with Aluminium/Copper Conductor as per IS:1554 (Pt-1)

Area	Cond. Min. No. of Wires		Thickness of PVC Insulation (non)	Thick of Inner Sheath	Dimension of Armoured Wire / Strip	Thickness of PVC Outersheath		Approx. Overall diameter		Approx. Net Wt. of Cable				Max. D.C./ resistance at 20 Deg. C		Approx. AC resistance at operating Temp 90°C		Approx. Capacitance per Phase		Current Rating						Short Circuit Rating for 1 Sec.	
						Arm	Un. Arm	Arm	Un. Arm	Armoured		Unarmoured						Arm	Un-Arm	Direct in Ground		in duct		in Air			
Sq./mm.	No.		mm	mm	mm	mm		mm		Kg/Km				Ohm/Km		Ohm/Km		µF/KM		Amps		Amps		Amps		KA(rms)	
Al/Cu.	Al	Cu	Al/Cu.	Al/Cu.	Al/Cu	Al/Cu.	Al/Cu.	Al/Cu.	Al/Cu.	Al	Cu	Al	Cu	Al	Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
2.5	1.0	1.0	0.9	0.3	1.4	1.24	1.8	14.8	13.0	425	470	185	235	12.1	7.41	14.5	8.87	0.13	0.13	25	32	21	27	21	27	0.19	0.288
4	1.0	1.0	1.0	0.3	1.4	1.24	1.8	16.1	14.3	500	550	215	280	7.41	4.61	8.9	5.52	0.14	0.14	32	41	27	35	27	35	0.304	0.46
6	1.0	7.0	1.0	0.3	1.4	1.24	1.8	18.1	16.3	550	650	260	350	4.61	3.08	5.54	3.69	0.16	0.16	40	50	34	44	35	45	0.456	0.69
10	1.0	7.0	1.0	0.3	1.4	1.24	1.8	19.5	17.7	635	800	320	450	3.08	1.83	3.70	2.19	0.18	0.18	55	70	45	58	47	60	0.760	1.15
16	7.0	7.0	1.0	0.3	4x0.8	1.40	1.8	17.5	16.4	680	850	350	550	1.91	1.15	2.30	1.38	0.19	0.19	70	90	58	75	59	78	1.22	1.84
25	7.0	7.0	1.20	0.3	4x0.8	1.40	2.0	20.1	19.4	725	1050	450	800	1.20	0.727	1.44	0.87	0.22	0.22	90	115	76	97	78	105	1.90	2.88
35	7.0	7.0	1.20	0.3	4x0.8	1.40	2.0	21.5	20.8	850	1300	550	1000	0.868	0.524	1.04	0.627	0.24	0.24	110	140	92	120	99	125	2.66	4.03
50	7.0	19	1.40	0.3	4x0.8	1.40	2.0	24.1	23.4	1025	1600	725	1300	0.641	0.387	0.77	0.463	0.24	0.24	135	165	115	145	125	155	3.80	5.75
70	19	19	1.40	0.3	4x0.8	1.56	2.0	26.7	25.6	1250	2100	880	1750	0.443	0.268	0.532	0.321	0.26	0.26	160	205	140	180	150	195	5.32	8.05
95	19	19	1.60	0.4	4x0.8	1.56	2.2	30.1	29.4	1550	2750	1190	2350	0.32	0.193	0.384	0.231	0.26	0.26	190	240	170	215	185	230	7.22	10.09
120	19	19	1.60	0.4	4x0.8	1.56	2.2	32.1	31.4	1800	3300	1350	2850	0.253	0.153	0.304	0.184	0.28	0.28	210	275	190	235	210	265	9.12	13.8
150	19	37	1.80	0.4	4x0.8	1.72	2.4	34.7	34.0	2080	3950	1650	3500	0.206	0.124	0.248	0.149	0.28	0.28	240	310	210	270	240	305	11.4	17.3
185	37	37	2.00	0.5	4x0.8	1.88	2.4	38.0	37.0	2500	4800	1950	4300	0.164	0.0991	0.198	0.120	0.28	0.28	275	350	240	300	275	350	14.1	21.3
240	37	37	2.20	0.5	4x0.8	2.04	2.6	43.0	42.0	3100	6100	2450	5500	0.125	0.0754	0.152	0.0912	0.28	0.28	320	405	275	345	325	410	18.2	27.6
300	37	61	2.40	0.6	4x0.8	2.20	2.8	46.5	45.6	3720	7500	2970	6850	0.100	0.0601	0.122	0.0739	0.29	0.29	355	430	305	385	365	465	22.8	34.5
400	61	61	2.60	0.7	4x0.8	2.36	3.2	52.3	51.8	4550	9400	3820	8750	0.0778	0.0470	.0.096	0.0592	0.29	0.29	385	490	345	425	420	530	30.4	46.0
500	61	61	3.00	0.7	4x0.8	2.84	3.4	58.7	57.6	5650	11900	4775	11200	0.0605	0.0366	0.076	0.0468	0.29	0.29	415	520	365	460	455	575	38.0	57.5
630	61	61	3.40	0.7	4x0.8	2.84	3.8	64.8	64.4	6950	15200	6045	14500	0.0469	0.0283	0.061	0.0379	0.29	0.29	460	565	405	510	520	655	47.9	72.5

TECHNICAL DATA

CENTURION'S 3 Core PVC insulated armoured & unarmoured cable with Aluminium/Copper Conductor as per IS:1554(Pt-1)

Area	Cond. Min. No. of Wires		Thickness of PVC Insulation (non)	Thick of Inner Sheath	Dimension of Armoured Wire / Strip	Thickness of PVC Outersheath		Approx. Overall diameter		Approx. Net Wt. of Cable				Max. D.C./ resistance at 20 Deg. C		Approx. A.C. resistance at operating Temp 90°C		Approx. Capacitance per Phase		Current Rating						Short Circuit Rating for 1 Sec.	
						Arm	Un. Arm	Arm	Un. Arm	Armoured		Unamoured						Arm	Un-Arm	Direct in Ground		in duct		in Air			
Sq./mm.	No.		mm	mm	mm	mm		mm		Kg / Km				Ohm/Km		Ohm/Km		uF/KM		Amps		Amps		Amps		KA(rms)	
Al/Cu.	Al	Cu	Al/Cu.	Al/Cu.	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al	Cu	Al	Cu	Al	Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
2.5	1	1	0.9	0.3	1.4	1.24	1.8	15.5	13.7	470	525	210	250	12.1	7.41	14.5	8.87	0.335	3.550	21	27	18	24	18	24	0.190	0.28
4	1	1	1.0	0.3	1.4	1.24	1.8	16.8	15.0	550	625	245	325	7.41	4.61	8.9	5.52	0.395	0.395	28	36	23	30	23	30	0.304	0.46
6	1	1	1.0	0.3	1.4	1.24	1.8	19.0	17.2	620	750	290	410	4.61	3.08	5.54	3.69	0.435	0.435	35	45	30	38	30	38	0.456	0.69
10	1	7	1.0	0.3	4x0.8	1.24	1.8	21.0	18.9	715	975	375	580	3.08	1.83	3.70	2.19	0.495	0.495	46	60	39	50	40	52	0.760	1.15
16	7	7	1.0	0.3	4x0.8	1.4	1.8	20.2	19.1	710	1025	450	750	1.91	1.15	2.30	1.38	0.560	0.560	60	77	50	64	51	66	1.220	1.84
25	7	7	1.2	0.3	4x0.8	1.4	2.0	22.5	21.5	900	1400	600	1100	1.20	0.727	1.44	0.87	0.620	0.620	76	99	63	81	70	90	1.900	2.88
35	7	7	1.2	0.3	4x0.8	1.4	2.0	24.2	23.5	1050	1700	740	1400	0.868	0.524	1.04	0.627	0.660	0.660	92	120	77	99	86	110	2.660	4.03
50	7	7	1.4	0.3	4x0.8	1.56	2.0	27.6	26.5	1300	2200	920	1850	0.641	0.387	0.77	0.463	0.700	0.700	110	145	95	125	105	135	3.800	5.75
70	19	19	1.4	0.4	4x0.8	1.56	2.2	30.9	30.0	1650	2900	1220	2500	0.443	0.268	0.532	0.321	0.730	0.730	135	175	115	150	130	165	5.320	8.05
95	19	19	1.6	0.4	4x0.8	1.56	2.2	34.1	33.2	2050	3800	1570	3320	0.320	0.193	0.385	0.231	0.760	0.760	165	210	140	175	155	200	7.220	10.09
120	19	19	1.6	0.4	4x0.8	1.72	2.2	37.3	36.2	2400	4600	1800	4040	0.253	0.153	0.305	0.184	0.780	0.780	185	240	155	195	180	230	9.120	13.8
150	19	19	1.8	0.5	4x0.8	1.88	2.4	41.0	40.0	2850	5600	2230	5000	0.206	0.124	0.249	0.149	0.795	0.795	210	270	175	225	205	265	11.40	17.3
185	37	37	2.0	0.5	4x0.8	1.88	2.6	44.9	44.3	3400	6850	2750	6200	0.164	0.0991	0.198	0.120	0.810	0.810	235	300	200	255	240	305	14.10	21.3
240	37	37	2.2	0.6	4x0.8	2.2	2.8	50.7	49.8	4250	8800	3440	8000	0.125	0.0754	0.152	0.0912	0.820	0.820	275	345	235	295	280	355	18.20	27.6
300	37	37	2.4	0.6	4x0.8	2.36	3.0	56.0	55.1	5100	10800	4250	9950	0.100	0.0601	0.123	0.0739	0.825	0.825	305	385	260	335	315	400	22.80	34.5
400	61	61	2.6	0.7	4x0.8	2.52	3.4	62.7	62.0	6300	13700	5400	12700	0.0778	0.0470	0.0975	0.0592	0.830	0.830	335	425	290	360	375	455	30.40	46.0
500	61	61	3.0	0.7	4x0.8	2.84	3.6	70.1	69.3	7850	17250	6800	16200	0.0605	0.0366	0.0767	0.0468	1.100	1.100	355	440	315	390	405	500	38.00	57.5

CENTURION'S 3 ½ Core PVC insulated armoured & unarmoured cable with aluminium / Copper Conductor as per IS:1554(Pt-1)

Area	Cond. Min. No. of Wires		Thickness of PVC Insulation (non)	Thick of Inner Sheath	Dimension of Armoured Wire / Strip	Thickness of PVC Outersheath		Approx. Overall diameter		Approx. Net Wt. of Cable				Max. D.C./ resistance at 20 Deg. C		Approx. A.C. resistance at operating Temp 90°C		Approx. Capacitance per Phase		Current Rating						Short Circuit Rating for 1 Sec.	
						Arm	Un. Arm	Arm	Un. Arm	Armoured		Unamoured						Arm	Un-Arm	Direct in Ground		in duct		in Air			
Sq./mm.	No.		mm	mm	mm	mm		mm		Kg/Km				Ohm/Km		Ohm/Km		uF/KM		Amps		Amps		Amps		KA(rms)	
Al/Cu	Al	Cu	Al/Cu.	Al/Cu.	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al	Cu	Al	Cu	Al	Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
25	7	7	1.2/1.0	0.3	4x0.8	1.4	2.0	24.0	23.5	1010	1600	690	1295	1.20	0.727	1.44	0.873	0.86	0.86	76	99	63	81	70	90	1.9	2.88
35	7	7	1.2/1.0	0.3	4x0.8	1.4	2.0	26.1	25.5	1200	1950	825	1600	0.868	0.525	1.04	0.629	0.98	0.98	92	120	77	99	86	110	2.66	4.03
50	7	7	1.4/1.20	0.3	4x0.8	1.56	2.0	29.4	28.5	1520	2600	1075	2200	0.641	0.387	0.77	0.465	1.00	1.00	110	145	95	125	105	135	3.8	5.75
70	19	19	1.4/1.20	0.4	4x0.8	1.56	2.2	33.0	32.0	1850	3400	1400	3000	0.443	0.268	0.532	0.322	1.16	1.16	135	175	115	150	130	165	5.32	8.05
95	19	19	1.6/1.40	0.4	4x0.8	1.56	2.2	37.0	36.0	2320	4450	1810	4000	0.32	0.193	0.385	0.233	1.18	1.18	163	210	140	175	155	200	7.22	10.9
120	19	19	1.6/1.40	0.5	4x0.8	1.72	2.4	40.5	40.0	2750	5550	2190	5000	0.253	0.153	0.305	0.185	1.31	1.31	185	240	155	195	180	230	9.12	13.8
150	19	19	1.8/1.40	0.5	4x0.8	1.88	2.4	44.3	43.5	3220	6550	2550	5900	0.206	0.124	0.249	0.145	1.28	1.28	210	270	175	225	205	265	11.4	17.3
185	37	37	2.0/1.6	0.5	4x0.8	2.04	2.6	48.9	48.0	3900	8150	3150	7400	0.164	0.0991	0.198	0.121	1.30	1.30	235	300	200	255	240	305	14.1	21.3
240	37	37	2.2/1.6	0.6	4x0.8	2.20	3.0	55.0	55.0	4850	10300	4050	9500	0.125	0.0754	0.152	0.094	1.34	1.34	275	345	235	295	280	355	18.2	27.6
300	37	37	2.4/1.8	0.6	4x0.8	2.36	3.2	60.6	60.1	5800	12700	4950	11800	0.100	0.0601	0.123	0.075	1.37	1.37	305	385	260	335	315	400	22.8	34.5
400	61	61	2.6/2.0	0.7	4x0.8	2.68	3.4	69.1	68.5	7250	16300	6300	15000	0.0778	0.0470	0.0975	0.061	1.43	1.43	335	425	290	360	375	455	30.4	46.0
500	61	61	3.0/2.2	0.7	4x0.8	2.84	3.8	76.9	76.5	9100	20200	7900	19000	0.0605	0.0366	0.0767	0.049	1.41	1.41	355	440	315	390	405	500	38.0	57.50

TECHNICAL DATA

CENTURION'S 4 Core PVC insulated armoured & unarmoured Cable with Aluminium / Copper Conductor as per IS:1554(Pt-1)

Area	Cond. Min. No. of Wires		Thickness of PVC Insulation (nom)	Thick of Inner Sheath	Dimension of Armoured Wire / Strip	Thickness of PVC Outersheath		Approx. Overall diameter		Approx. Net Wt. of Cable				Max. D.C./ resistance at 20 Deg. C		Approx. A.C. resistance at operating Temp 90°C		Approx. Capacitance per Phase		Current Rating						Short Circuit Rating for 1 Sec.	
						Arm	Un. Arm	Arm	Un. Arm	Armoured		Unarmoured						Arm	Un-Armoured	Direct in Ground		in duct		in Air			
Sq./mm.	No.		mm	mm	mm	mm		mm		Kg/Km				Ohm/Km		Ohm/Km		uF/KM		Amps		Amps		Amps		KA(rms)	
Al/Cu	Al	Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al	Cu	Al	Cu	Al	Cu	Al/Cu	Al/Cu	Al/Cu	Al/Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu
2.5	1	1	0.9	0.3	1.4	1.24	1.8	16.5	14.8	520	580	230	320	12.1	7.41	14.5	8.87	0.355	0.355	21	27	18	24	18	24	0.19	0.288
4	1	1	1.0	0.3	1.4	1.24	1.8	17.5	15.8	610	720	285	400	7.41	4.61	8.9	5.52	0.395	0.395	28	36	23	30	23	30	0.3	0.46
6	1	1	1.0	0.3	1.4	1.24	1.8	18	17.5	680	850	340	500	4.61	3.08	5.54	3.69	0.435	0.435	35	45	30	38	30	39	0.46	0.69
10	1	1	1.0	0.3	4X0.8	1.4	1.8	21.5	20.5	700	1000	430	710	3.08	1.83	3.70	2.19	0.495	0.495	46	60	39	50	40	52	0.765	1.15
16	7	7	1.0	0.3	4X0.8	1.4	2.0	22	21.5	840	1250	550	950	1.91	1.15	2.30	1.38	0.56	0.56	60	77	50	64	51	66	1.22	1.84
25	7	7	1.2	0.3	4X0.8	1.4	2.0	25	25	1080	1750	720	1400	1.20	0.727	1.44	0.87	0.62	0.62	76	99	63	81	70	90	1.9	2.88
35	7	7	1.2	0.3	4X0.8	1.4	2.0	27.5	27	1300	2200	890	1800	0.868	0.524	1.04	0.627	0.66	0.66	92	120	77	99	86	110	2.66	4.03
50	7	7	1.4	0.4	4X0.8	1.56	2.2	33	31	1650	2850	1200	2400	0.641	0.387	0.77	0.463	0.7	0.7	110	145	95	125	105	135	3.8	5.57
70	19	19	1.4	0.4	4X0.8	1.56	2.2	35	34.5	2050	3750	1520	3250	0.443	0.268	0.532	0.321	1.16	1.16	135	175	115	150	130	165	6.32	8.05
95	19	19	1.6	0.4	4X0.8	1.72	2.4	40	38.5	2570	4950	2000	4400	0.32	0.193	0.385	0.231	1.18	1.18	165	210	140	175	155	200	7.22	10.9
120	19	19	1.6	0.5	4X0.8	1.88	2.4	43	42	3100	6050	2350	5400	0.253	0.153	0.305	0.184	1.31	1.31	185	240	155	195	180	230	9.12	13.8
150	19	19	1.8	0.5	4X0.8	1.88	2.6	47	46.5	3570	7300	2890	6600	0.206	0.124	0.249	0.149	1.28	1.28	210	270	175	225	205	265	11.4	17.3
185	37	37	2.0	0.6	4X0.8	2.04	2.8	52	51.5	4350	9000	3600	8250	0.164	0.0991	0.198	0.120	1.3	1.3	235	300	200	255	240	305	14.1	21.3
240	37	37	2.2	0.6	4X0.8	2.36	3.0	59	58	5450	11500	4550	10650	0.125	0.0754	0.152	0.0912	1.34	1.34	275	345	235	295	280	355	18.2	27.6
300	37	37	2.4	0.7	4X0.8	2.52	3.4	66	65	6540	14300	5650	13300	0.100	0.0601	0.123	0.0739	1.37	1.37	305	385	260	335	315	400	22.8	34.5
400	61	61	2.6	0.7	4X0.8	2.68	3.6	73.5	73	8160	18000	7100	16800	0.0778	0.0470	0.0975	0.0592	1.43	1.43	335	425	290	360	375	455	30.4	46.0
500	61	61	3.0	0.7	4X0.8	3.0	4.0	83.5	83	10200	22800	9000	21500	0.0605	0.0366	0.0767	0.0468	1.41	1.41	370	440	320	390	540	500	37.9	57.5

CENTURION'S 1100 Volts Control Cable Unarmoured / Armoured Cable Type : YY/YFY/YWY as per IS:1554(Pt-1)

Nominal cross sectional area of conductor 1.5sqmm													
Number of Cores		2	3	4	5	6	7	10	12	14	19	24	30	37
Nom. Insulation thickness	mm.	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Nom. Overall cable dia	mm.	9	10	11	12	13	14	16	17	18	20	23	24	26
Approx. Weight	Kg/Km.	140	160	190	250	260	275	350	400	450	590	720	860	1020
Armoured YFY/YWY 1.5 Sq.mm.														
Type		YWY	YWY	YWY	YWY	YWY	YWY	YWY	YFY	YFY	YFY	YFY	YFY	
Nom. Overall dia	mm.	12	13	14	15	16	17	18	18	19	21	24	25	27
Approx. Weight	Kg/Km.	380	400	455	524	573	595	752	673	743	915	1105	1267	1463
Current carrying capacity														
- In ground	Amps.	23	21	21	21	15	14	13	12	11	10	9	9	8
- In air	Amps.	20	17	17	17	13	13	11	10	10	9	8	7	7
Nominal cross sectional area of conductor 2.5sqmm														
Number of Cores		2	3	4	5	6	7	10	12	14	19	24	30	37
Nom. Insulation thickness	mm.	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Nom. Overall dia	mm.	11	12	13	14	15	16	19	20	21	23	26	28	31
Approx. Weight	Kg/Km.	184	216	258	306	345	355	508	588	680	865	1063	1285	1586
Armoured YFY/YWY 2.5 Sq.mm.														
Type		YWY	YWY	YWY	YWY	YWY	YWY	YFY	YFY	YFY	YFY	YFY	YFY	YFY
Nom. Overall dia	mm.	13	14	15	16	17	18	20	21	22	24	28	29	32
Approx. Weight	Kg/Km.	455	495	560	650	705	722	812	912	985	1224	1486	1765	2050
Current carrying capacity														
- In ground	Amps.	32	27	27	27	22	20	18	17	16	14	13	12	11
- In air	Amps.	27	24	24	24	18	17	15	14	13	12	11	10	9

Note : ABOVE CABLE ALSO AVAILABLE UP TO 91 CORES

TECHNICAL DATA FOR XLPE CABLE

CENTURION'S 1.1 KV single core, Aluminium conductor, XLPE insulated, Hard Drawn Aluminium Armoured/Unarmoured, PVC sheathed cables as per IS:7098 (Part-I)

Nominal cross sectional area of conductor	Unarmoured					Armoured			
	Nominal thickness of insulation	Nominal thickness of Outer Sheath	Approx. Overall diameter	Approx. weight of cable	Nominal thickness of Insulation	Armours dimensions (wire/strip)	Minimum thickness of outer sheath	Approx. overall diameter	Approx. weight of cable
Sq.mm.	mm.	mm.	mm.	kg./km.	mm.	mm.	mm.	mm.	kg./km.
1.5	0.70	1.80	6.70	53	-	-	-	-	-
2.5	0.70	1.80	7.10	60	-	-	-	-	-
4	0.70	1.80	7.60	70	-	-	-	-	-
6	0.70	1.80	8.20	83	1.00	1.40	1.24	10.60	140
10	0.70	1.80	9.00	100	1.00	1.40	1.24	11.40	170
16	0.70	1.80	10.20	131	1.00	1.40	1.24	12.70	210
25	0.90	1.80	12.00	180	1.20	1.40	1.24	14.20	275
35	0.90	1.80	13.00	220	1.20	1.40	1.24	15.20	350
50	1.00	1.80	14.50	290	1.30	1.40	1.24	16.80	400
70	1.10	1.80	16.20	350	1.40	1.40	1.24	18.70	500
95	1.10	1.80	18.00	450	1.40	4x0.80	1.40	20.00	580
120	1.20	1.80	19.90	550	1.50	4x0.80	1.40	21.50	700
150	1.40	2.00	22.20	650	1.70	4x0.80	1.40	23.50	810
185	1.60	2.00	24.30	825	1.90	4x0.80	1.40	25.50	970
240	1.70	2.00	26.50	1020	2.00	4x0.80	1.40	28.50	1200
300	1.80	2.00	29.50	1200	2.10	4x0.80	1.56	31.00	1450
400	2.00	2.20	33.00	1550	2.40	4x0.80	1.56	35.00	1750
500	2.20	2.20	36.50	1950	2.60	4x0.80	1.56	38.00	2200
630	2.40	2.20	40.50	2425	2.80	4x0.80	1.72	42.50	2750
800	2.60	2.40	46.50	3050	3.10	4x0.80	1.72	47.50	3350
1000	2.80	2.60	50.00	3750	3.30	4x0.80	1.88	53.50	4170

CENTURION'S 1.1 KV 2 core, Aluminium conductor, XLPE insulated, Armoured/Unarmoured, PVC sheathed cables as per IS:7098 (Part-I)

Nominal cross sectional area of conductor	Nominal thickness of insulation	Minimum thickness of Inner Sheath	Unarmoured			Armoured			
			Nominal thickness of outer sheath	Approx. Overall diameter	Approx. weight of cable	Armours dimensions (wire/strip)	Minimum thickness of outer sheath	Approx. overall diameter	Approx. weight of cable
Sq.mm.	mm.	mm.	mm.	mm.	kg./km.	mm.	mm.	mm.	kg./km.
1.5	0.70	0.30	1.80	11.50	172	1.40	1.24	13.40	355
2.5	0.70	0.30	1.80	12.20	193	1.40	1.24	14.20	400
4	0.70	0.30	1.80	13.00	225	1.40	1.24	15.00	450
6	0.70	0.30	1.80	14.30	280	1.40	1.24	16.00	525
10	0.70	0.30	1.80	16.00	325	1.40	1.24	17.50	600
16	0.70	0.30	1.80	17.00	384	1.40	1.40	18.00	630
25	0.90	0.30	2.00	18.50	425	4x0.80	1.40	19.50	650
35	0.90	0.30	2.00	20.00	525	4x0.80	1.40	21.00	750
50	1.00	0.30	2.00	22.00	650	4x0.80	1.40	23.00	915
70	1.10	0.30	2.00	24.80	775	4x0.80	1.56	26.00	1120
95	1.10	0.40	2.20	27.80	1028	4x0.80	1.56	28.50	1400
120	1.20	0.40	2.20	30.50	1208	4x0.80	1.56	31.00	1650
150	1.40	0.40	2.20	32.50	1453	4x0.80	1.72	34.00	1900
185	1.60	0.50	2.40	36.00	1760	4x0.80	1.72	37.00	2250
240	1.70	0.50	2.60	40.50	2225	4x0.80	1.88	41.50	2810
300	1.80	0.60	2.80	43.50	2750	4x0.80	2.04	44.50	3300
400	2.00	0.60	3.00	49.00	3400	4x0.80	2.36	50.50	4160
500	2.20	0.70	3.40	54.50	4250	4x0.80	2.52	55.00	5060
630	2.40	0.70	3.60	61.00	5350	4x0.80	2.68	62.00	6150

TECHNICAL DATA FOR XLPE CABLE

CENTURION'S 1.1 KV 3 core, Aluminium conductor, XLPE insulated, Armoured/Unarmoured, PVC sheathed cables as per IS:7098 (Part-I)

Nominal cross sectional area of conductor	Nominal thickness of insulation	Minimum thickness of Inner Sheath	Unarmoured			Armoured			
			Nominal thickness of Outer Sheath	Approx. overall diameter	Approx. Weight of cable	Armours dimensions (wire/strip)	Minimum thickness of outer sheath	Approx. overall diameter	Approx. weight of cable
Sq.mm.	mm.	mm.	mm.	mm.	kg/km.	mm.	mm.	mm.	kg/km.
1.5	0.70	0.30	1.80	12.00	175	1.40	1.24	13.80	405
2.5	0.70	0.30	1.80	13.00	195	1.40	1.24	14.80	455
4	0.70	0.30	1.80	14.00	225	1.40	1.24	15.50	500
6	0.70	0.30	1.80	15.00	300	1.40	1.24	17.00	550
10	0.70	0.30	1.80	17.00	350	1.40	1.24	18.50	650
16	0.70	0.30	1.80	18.00	400	4x0.80	1.24	19.00	700
25	0.90	0.30	2.00	21.00	550	4x0.80	1.40	21.30	800
35	0.90	0.30	2.00	22.80	700	4x0.80	1.40	23.50	1000
50	1.00	0.30	2.00	25.00	850	4x0.80	1.40	25.80	1150
70	1.10	0.40	2.20	30.00	1150	4x0.80	1.56	30.00	1590
95	1.10	0.40	2.20	32.00	1400	4x0.80	1.56	32.50	1800
120	1.20	0.40	2.20	35.50	1700	4x0.80	1.56	35.50	2175
150	1.40	0.50	2.40	39.00	2050	4x0.80	1.72	40.00	2600
185	1.60	0.50	2.60	43.00	2560	4x0.80	1.88	43.00	3050
240	1.70	0.60	2.80	49.00	3210	4x0.80	2.04	49.00	3800
300	1.80	0.60	3.00	53.50	3920	4x0.80	2.20	53.50	4600
400	2.00	0.70	3.20	59.50	4910	4x0.80	2.52	61.00	5750
500	2.20	0.70	3.60	66.50	6150	4x0.80	2.68	67.00	7000
630	2.40	0.70	3.80	74.00	7710	4x0.80	2.84	75.00	8650

CENTURION'S 1.1 KV 3½ core, Aluminium conductor, XLPE insulated, Armoured/Unarmoured, PVC sheathed cables as per IS:7098 (Part-I)

Nominal cross sectional area of conductor	Nominal thickness of insulation	Minimum thickness of Inner Sheath	Unarmoured			Armoured			
			Nominal thickness of outer sheath	Approx. Overall diameter	Approx. weight of cable	Armours dimensions (wire/strip)	Minimum thickness of outer sheath	Approx. overall diameter	Approx. weight of cable
Sq.mm.	mm.	mm.	mm.	mm.	kg/km.	mm.	mm.	mm.	kg/km.
25	0.90/0.70	0.30	2.0	21.80	630	4x0.80	1.40	23.20	910
35	0.90/0.70	0.30	2.0	25.00	760	4x0.80	1.40	25.00	1050
50	1.00/0.90	0.30	2.0	27.00	930	4x0.80	1.40	28.00	1250
70	1.10/0.90	0.40	2.20	31.00	1260	4x0.80	1.56	32.00	1700
95	1.10/1.00	0.40	2.20	35.00	1680	4x0.80	1.56	35.00	2030
120	1.20/1.10	0.40	2.20	38.00	1930	4x0.80	1.72	39.00	2460
150	1.40/1.10	0.50	2.40	42.50	2330	4x0.80	1.72	43.00	2840
185	1.60/1.10	0.50	2.60	46.80	2900	4x0.80	1.88	48.00	3430
240	1.70/1.20	0.60	2.80	52.50	3630	4x0.80	2.04	53.00	4320
300	1.80/1.40	0.60	3.00	57.50	4400	4x0.80	2.20	58.00	5150
400	2.00/1.60	0.70	3.40	65.80	5625	4x0.80	2.52	67.00	6550
500	2.20/1.70	0.70	3.60	73.00	7000	4x0.80	2.68	73.50	8000
630	2.40/1.80	0.70	4.00	82.50	8950	4x0.80	3.00	83.00	9970

TECHNICAL DATA FOR XLPE CABLE

CENTURION'S 1.1 KV 4 core, Aluminium conductor, XLPE insulated, Armoured/Unarmoured, PVC sheathed cables as per IS:7098 (Part-I)

Nominal cross sectional area of conductor	Nominal thickness of insulation	Minimum thickness of Inner Sheath	Unarmoured			Armoured			
			Nominal thickness of outer sheath	Approx. Overall diameter	Approx. weight of cable	Armours dimensions (wire/strip)	Minimum thickness of outer sheath	Approx. overall diameter	Approx. weight of cable
Sq.mm.	mm.	mm.	mm.	mm.	kg/km	mm.	mm.	mm.	kg/km
1.5	0.70	0.30	1.80	13.00	210	1.40	1.24	14.50	425
2.5	0.70	0.30	1.80	14.00	230	1.40	1.24	16.00	510
4	0.70	0.30	1.80	15.00	280	1.40	1.24	16.50	560
6	0.70	0.30	1.80	16.00	305	1.40	1.24	18.50	630
10	0.70	0.30	1.80	18.50	405	1.40	1.40	20.50	760
16	0.70	0.30	1.80	19.50	450	4x0.80	1.40	21.00	740
25	0.90	0.30	2.00	23.50	700	4x0.80	1.40	24.00	960
35	0.90	0.30	2.00	26.00	825	4x0.80	1.40	26.50	1230
50	1.00	0.30	2.00	29.00	1050	4x0.80	1.56	30.00	1460
70	1.10	0.40	2.20	33.70	1450	4x0.80	1.56	34.30	1870
95	1.10	0.40	2.20	36.80	1800	4x0.80	1.56	37.50	2230
120	1.20	0.50	2.40	41.00	2200	4x0.80	1.72	41.50	2840
150	1.40	0.50	2.60	45.50	2750	4x0.80	1.88	46.00	3300
185	1.60	0.50	2.80	50.00	3330	4x0.80	2.04	51.00	3900
240	1.70	0.60	3.00	56.50	4200	4x0.80	2.20	57.00	4900
300	1.80	0.70	3.20	63.00	5120	4x0.80	2.36	64.00	5860
400	2.00	0.70	3.60	70.50	6460	4x0.80	2.68	71.20	7320
500	2.20	0.70	3.80	79.00	8050	4x0.80	2.84	80.00	9140
630	2.40	0.70	4.00	88.50	10130	4x0.80	3.00	89.00	11250

Current Rating (A.C.) for 1.1 KV XLPE insulated Aluminium conductor power cable

Nominal area of Conductor	Single Core		Multi Core	
	in Ground	in Air	in Ground	in Air
Sq.mm.	amp.	amp.	amp.	amp.
6	45	40	43	40
10	59	53	57	53
16	76	73	78	70
25	99	115	95	99
35	117	140	116	117
50	138	170	140	140
70	168	210	170	176
95	204	255	200	221
120	230	300	225	258
150	265	342	255	294
185	295	385	285	339
240	340	450	325	402
300	390	519	370	461
400	450	605	435	542
500	500	700	481	624
630	555	809	537	723
800	625	935	--	--
1000	690	1065	--	--

Rating factors for variation in ambient air temperature

Ambient air temperature deg.c	25	30	35	40	45	50	55	60
Rating factor (max. cond. temp. 90deg. c.)	1.16	1.11	1.06	1.00	0.94	0.88	0.81	0.74

Rating factors for depth of laying for cables laid direct in the ground

Depth of laying (mm)	900	1050	1200	1500	1800	2000	2500	3000 or More
1.1 KV Cables	1.00	0.99	0.97	0.95	0.94	0.93	0.91	0.90

Rating factors for variation in ground temperature for cables laid direct in the ground

Ground temperature °c	15	20	25	30	35	40	45	50
Rating factor	1.12	1.08	1.04	1.00	0.96	0.91	0.87	0.82

REQUIRED PARAMETERS FOR MANUFACTURING OF CENTURION® CABLES

- Voltage grade
- No. of core
- Relevant standard
- Size of conductor ·Type of conductor material
- Type of insulation material
- Type of inner sheath material
- Type of Armouring material
- Type of outer sheath material

SELECTION OF CABLE:-

- Maximum Operating Temp.
- Maximum Operating Voltage
- Insulation level.
- Load to be carried
- Possible overloading duration & magnitude
- Mode of installation environment
- Flame retardent properties
- Plant safety requirements

WIND POWER CABLE

Wind power generation cables connect the primary generator motor in the turbine nacelle with the transformers and relay the electricity produced to the power grid. The cables must be highly flexible so that they are not damaged even if the generators rotate thousands of cycles.

The Flexibility of the wind power generator cables developed by CENTURION POWER CABLES PVT. LTD. has been improved greatly in comparison with competitors, products. the cables have all passed 15,000 cycle rotation tests to quality for requirements of the European wind generation industry, which demand a high durability of 10,000 rotation cycles for more than 20 years.

FEATURES :

This products incorporates several environmental friendly features such as non-toxic burn resistant materials that are difficult to ignite and do not release harmful fumes on fire, These features will enable this product to lead the global wind generation power cable market in the future.

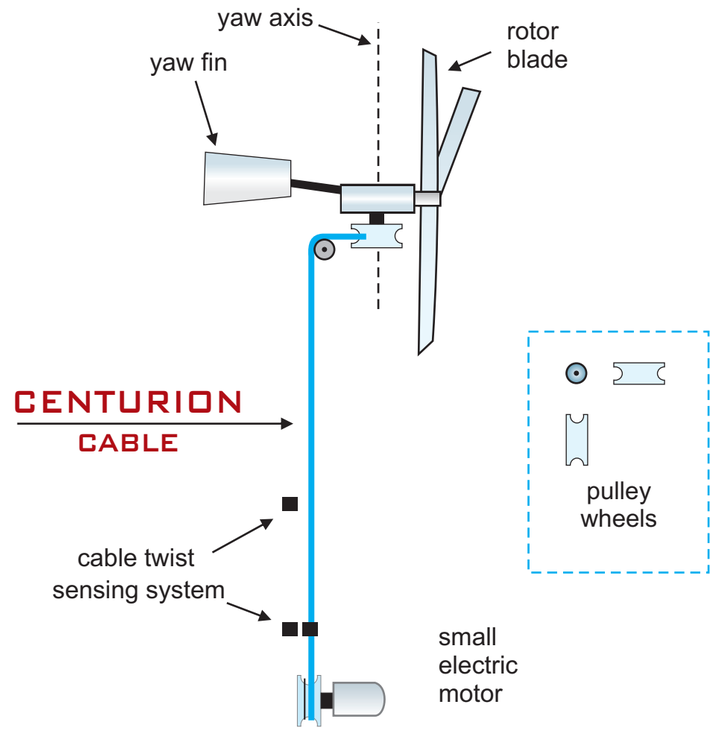


Fig. 2. Cable Untwisting System for Small Wind Turbine

The diagram shows the turbine yawed to the position where its power cables are completely untwisted. In this case, the cable that untwists the yaw system attaches to its topmost pulley wheel in such a way that it is not wrapped around that topmost pulley wheel at all. (The topmost pulley wheel is the one with the axis of rotation that is coincident with the turbine's yaw axis). Now as the turbine yaws, it doesn't matter which direction the turbine waws in, Whichever way the turbine yaws, it wraps the untwist cable around the topmost pulley wheel, and in so doing it draws the twist sensing component that is attached to the untwist cable (colored purple) up to a higher elevation. When this part of the sensor passes close by the topmost twist sensor component (colored red), the control system knows that the power cables are twisted up. To untwist the turbine, the controller simply turns on the small elwctric motor at the base of the tower until the cable mounted twist sensor component passes by the lowest red colored twist sensor component, then turns the motor back off. If the system fails for some reason, the result is that the small untwist motor will burn up or blow a fuse - a minor repair indeed. The controller might wait until the wind isn't blowing before untwisting the power cables.

SENSORLESS VARIATION

In this variation, the controller merely untwists the turbine every time the wind speed drops to zero (rotor blades not turning). Some kind of slip clutch mechanism might be provided to keep the untwist motor from burning up if it runs too long. Alternatively, the motor could be turned off whenever the power it draws jumps up by a large value (indicating the turbine has been completely untwisted). Or a simple mechanical switch could be tripped whenever the turbine is completely untwisted.

MANUAL VARIATION

A manual version of this device might also work well. In this case, the controller might issue some kind of mechanical or telecommunications signal to let someone know that the turbine needs untwisting.

MARINE CABLES

Shipboard cables are used for power, control, insurumentation and communication systems onboard seagoing vessels. These cables have been approved by Indian Register of Shipping.

Features

A.	Suitable for use in commercial marine applications.
B.	High quality, non-corrosion,
C.	Flame retardant to IEC: 60330-3, category-C
D.	Execellent resistance to oils, petrochemicals fluids, moisture and sunlight,
E.	Low smoke to IEC: 61034
F.	Halogen free to IEC: 60754

STANDARDS

IEC: 60092-350
IEC: 60092-351
IEC: 60092-354
IEC: 60092-359
IEC: 60092-375
IEC: 60092-376
IEC: 60332-3, Category-C
IEC: 60331
IEC: 60754
IEC: 61034

INSTRUMENTATION CABLES

ACCORDING TO BS: 5308 STANDARDS
TECHNICAL SPECIFICATION
BS: 5308 (PART-I) PE INSTRUMENTATION CABLES

1 Voltage 300/500V
2 Polyethylene Insulation
3 Type-1 Unarmoured
4 Type-2 Polyethyelene bedding with armoured
5 Operating Temp. Range -40^0 C. to +70^0 C. (After installation)

APPLICATION :-

Generally used within industrial process manufacturing plants for communication, data and voice, transmissions signals and services, typically in the petroleum industries. The armoured version (type-2) are suitable for underground use.

CONSTRUCTION OF BS: 5308 (PART-I) CABLES:-

Conductor	: Plain Annealed Copper wire in acc. To BS: 6360/IS : 8130, Class-1,2 and 5
Insulation	: Polyethylene insulation
Laying up	: Pairs twisted together with maximum lay length of 100 mm.
Screening	: Pairs are individually and overall screened with al. mylar tape applied metallic side down in contact with a 0.5 Sq. mm. ATC drain wire.
Inner sheath	: type-2, Black Polyethylene sheath.
Armour	: Type-2, Single layer steel wire armour in acc. To BS EN 10257-1/BS: 1422/IS: 3975
Outer sheath	: Type-1, PVC sheath reduced propagation in acc. To BS: 4066/BS: 5308 (Part-I), Flame retardant in acc. To IEC: 60332-1

Outer sheath Colour & Marking : Blue / Black & CENTURION Instrumentation cables.

ELECTRICAL PROPERTIES :

1. Test Voltage : 1000V r.m.s. for 1 minute between conductors and between conductors and screen / armour.

Table-1, Electrical Characteristics Performance

Conductor Area Size	mm^2	0.5	0.75	1.0	1.5
Conductor Stranding	No. X mm.	7 X 0.3	7 X 0.37	7 X 0.43	7 X 0.53
Max. DC resistance@20^0 C. (Multicore)	Ohm / km	39.0	24.5	18.1	12.1
Max. DC resistance@20^0 C. (Multipair)	Ohm / km	39.7	25.0	18.5	12.3
Max. Capacitance unbalance at 1KHz (Pair to pair screen)	pF/*250 m.	..... 250			
Max. Mutual Capacitance @ 1kHz for Non OS or OS cables (Except one pair and two pairs)	pf / m	115	115	115	120
Max. Mutula Capacitance @ 1kHZ IS/OS Cables (include 1 pair and 2 pair)	pf / m	75	75	75	85
Max. L/R ration for adjacent cores (Inductance/Resistance)	µH / ohm	25	25	25	40
Max. Inductance value	mH / ohm	..... 0.8			

Note : However, instrumentation cables are not for direct connection to a low impedance source, e.g. the public mains electricity supply.

INSTRUMENTATION CABLES

ACCORDING TO BS: 5308 STANDARDS
TECHNICAL SPECIFICATION
BS: 5308 (PART-2) PE INSTRUMENTATION CABLES

1 Voltage 300/500V
2 Polyethylene Insulation
3 Type-1 Unarmoured
4 Type-2 Polyethyelene bedding with armoured
5 Operating Temp. Range -20^0 C. to +90^0 C. (After installation)

APPLICATION :-

Generally used within industrial process manufacturing plants for communication, data and voice, transmissions signals and services, typically in the petroleum industries. The armoured version (type-2) are suitable for underground use.

CONSTRUCTION OF BS: 5308 (PART-2) CABLES:-

Conductro : Plain Annealed Copper wire in acc. To BS: 6360/IS : 8130, Class-1,2 and 5
Insulation : HR-PVC type -C.
Laying up : Pairs twisted together with maximum lay length of 100 mm.
Screening : Pairs are individually and overall screened with al. mylar tape applied metallic side down in contact with a 0.5 Sq. mm. ATC drain wire.
Inner sheath : Type-2, HR-PVC sheath, Type ST-2
Armour : Type-2, Single layer steel wire armour.
AOuter sheath HR-PVC sheath, type-ST-2 reduced propagation in acc. To BS: 4066/BS: 5308 (Part-I), Flame retardant in acc. To IEC: 60332-1
Outer sheath Colour & Marking : Blue / Black & CENTURION Instrumentation cables.

ELECTRICAL PROPERTIES :

1. Test Voltage : 1000V r.m.s. for 1 minute between conductors and between conductors and screen / armour.

Table-1, Electrical Characteristics Performance

Conductor Area Size	mm^2	0.5	0.75	1.0	1.5	2.5
Conductor Stranding	No. X mm.	7 X 0.3	7 X 0.37	7 X 0.43	7 X 0.53	7 X 0.67
Max. DC resistance@20^0 C. (Multicore)	Ohm / km	39.0	24.5	18.1	12.1	7.41
Max. DC resistance@20^0 C. (Multipair)	Ohm / km	39.7	25.0	18.5	12.3	7.56
Max. Capacitance unbalance at 1KHz (Pair to pair screen)	pF/m	250				
Max. Mutual Capacitance @ 1kHz for Non OS or OS cables (Except one pair and two pairs)	pF / m	450				
Max. L/R ration for adjacent cores (Inductance/Resistance)	µH / ohm	25	25	25	40	80
Max. Inductance value	mH / ohm	..... 1.0				

Note : However, instrumentation cables are not for direct connection to a low impedance source, e.g. the public mains electricity supply.

HAND LING & STORAGE

Handing (Unloading at Site):

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

1. The cable drums should not be droped or thrown from railway wagons or truck during loading operations as the shock may cause serious damage to cable layers. A crane should be used for unloading cable drums. when lifting drums with the crane, it is recommended that the lagging should be kept in not available , a ramp should be prepared with approximate inclination of 1:3 or 1:4 The cable drum should be rolled over the ramp by means of ropes and winches, Additionally a sand bed at the food of the ramp may be prepared too brake the rolling the cable drum.
2. Cable should not be dragged along the earth surface.
3. Cable ends should always be sealed by means of suitable end sealing materials to prevent moisturisation of cores and armour.
4. Drums should be rolling in direction of arrow marked on the drum

Storage :

Cable should be stored in a dry covered place to prevent exposure to climatic conditions and wear & tear of wooden drums. Further, it should preferably be kept on a contrate surface to avoid sinking of drums and decay of flanges which will help easy movement of the drums.

All drums should be stored in such a manner as to leave sufficient space between them for air circulation. it is desirable to drums to stand on battens directly under the flanges.

Laying :

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

1. For laying of cables power cables to be placed at top most layer.
2. Single core power cable for use on A.c. system shall be laid in delta formation supported by non-magnetic material. trefoil clamps of suitable size are to be placed at regular intervals but preferably not more than 800 mm. Axial spacing of two circuits in delta formation shall not be less than 4 times the cable dia.
   Incase of multicore power cables, cables shall be laid side by side, with spacings not less than one cable diamter. However derating factors for cables laid on trenches are to be referred.
   Multicore power cables and single core D.C. circuits may be clamped by means of galvanised mild steel saddles but 1.1KV single core cables should be clamped by means of non-magnetic saddles. The saddles shall not be paced at intervals more than 1500 mm for horizontal and 1200 mm for vertical runs.
3. Multicore control cables can be laid touching each other on cable racks and wherever required may be taken in two layers. They should be clamped by means of PVC straps both for horizontal and vertical runs (alternatively, fabricated aluminium clamps may be used) at regular intervals.
4. a) if the cables are buried directly in ground IS-1255 is to be followed for code of practice. However, generally cables are laid 1000 mm below finished ground level at any point of cable run and 75 mm of sand cushioning to be provided.
   b) In loose soil concrete pillar should be provided for as support and hence pipe are recommended to the used for cable path.
5. If there is possibility of mechanical damage, cables should be protected by means of mild steel covers placed on racks.
6. While laying cables, special care to be taken at bends. Following are the recommended bending radius for power and control cables.

Single Core = 15 x D
Multi Core = 12 x D

Where 'D' is overall diameter of cable.

7. Maximum safe pulling force (When pulled by pulling eye) Aluminium Conductor Cables : 3.0 kg / nm2Copper Conductor cables : 5.0 Kg mm^2 Proper method of pulling of cable should be used.

End Terminations & Jointing :

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

Testing during laying :

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

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

MINIMUM INSULATION RESISTANCE VALUES

NOMINAL CROSS-SECTIONAL AREA OF CONDUCTOR SQ.MM	INSULATION RESISTANCE IN MOHM/ KILOMETRE AT 20^{0}C 650/1100 VOLTS
1.50	10
2.50	9
4.00	8
6.00	7
10.00	7
16.00	6
25.00	5
35.00	5
50.00	5
70.00	5
95.00 AND ABOVE	5

As PVC cables have got higher capacitance, while meggaring, a high charging current will flow intially and hence the meggar will show a lesser reading. As per International specifications the reading after one minute of continuous meggaring should be taken.
It is observed that some electricians check the cables by givn g

CENTURION
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