

Paper Insulated Cables

Brochure 2008

ABERDARE
— A MEMBER OF HENG TONG GROUP —
ENLIGHTENING THE FUTURE



COMPANY PROFILE

Aberdare Cables is Southern Africa's largest cable manufacturer and leading supplier of intelligent energy inter connection cable products and services in Africa. Established in 1946, the company offers cable designs, product development, installation support, commissioning and diagnostic testing through their Aberdare Engineering division. In 2021, Aberdare Cables celebrated its 75th Anniversary and since its humble beginnings, the organisation has grown significantly through mergers and acquisitions. In 2016, Aberdare Cables was acquired by Hengtong as a majority shareholder. The Hengtong group operates in 147 countries, with 11 overseas manufacturing bases and owns 7 brands, including Aberdare.

Our Empowerment partner, Golden Consortium Africa (Pty) Ltd, is a 100% women-owned consortium and has a 25.1% shareholding in Aberdare (South African operations). Empowerdex ratings places Aberdare Cables at a Level 1 broad based black economic empowerment company and is 55% black owned with 30% black-women ownership.

Aberdare Cables has two manufacturing sites, Eastern Cape and KwaZulu-Natal. Aberdare Cables headquarters is in Meadowdale, Gauteng. The Meadowdale facility serves as a centralised distribution to South Africa to enable reduced lead times.

The company offers cable and cabling solutions to the mining, utility, building, construction, large industry, renewable energy, retail, original-equipment manufacturer, agriculture and transport sectors.

The company has amongst the most highly trained and experienced employees in the industry. As a technology leader, it is driven by cutting-edge Research and Development (R&D), providing world-class innovative solutions, processes, products and customer service.

The company's 48 000 m² Stanford road facility in Port Elizabeth was the original Aberdare site and manufactures XLPE medium and high voltage cables, paper insulated lead covered medium voltage cables, overhead conductors, medium voltage aerial bundled conductor (ABC) and large low voltage PVC mains cables.

The 38 820 m² Aberdare Pietermaritzburg facility manufactures low voltage ABC, Rubber trailing cables and Nitrile welding cables, as well as low voltage cables comprising of wiring cables: Housewire, Surfex[®], Flat twin, and earth cables. The range also includes Armadac[®], Airdac[®] and Saferdac[®] cables as well as the Flamosafe[®] range of PVC and XLPE insulated armoured and unarmoured cables.

The Aberdare Group's product range and services are wide but specialised. Tried and tested, and carrying the South African Bureau of Standards (SABS) safety and compliance certification marks and complying with International Standards as applicable.

In addition to the organisation's cable portfolio is the long awaited entry of a competitor into the South African high voltage cable market. This strategic move in capital investment by the company, enhances its current cable portfolio of low and medium voltage cables, conductors and specialty cables and is ensuring sustainability and an increase in the company's market presence. It in turn creates a talent pool of future employees in our company.

Aberdare has opened the HV cable offering to initially supply the traditionally accepted (CSA) Corrugated Seamless Aluminum Sheathed cable and plans to add alternative designs and improvements to its portfolio. The goal for the HV project is to establish Aberdare Cables as a competent South African high voltage cable manufacturer and solutions provider. To this end, the organisation manufactures HV cables and supplies HV accessories. The organisation will also commission and maintain HV cables (old and new) and install HV cables and all accessories. In addition, the company vision is that it will be accepted as a leading expert in HV systems (design of the system, providing add-ons such as DTS, etc.) The wholly owned company Aberdare Engineering fulfills the role as enabler of the HV Strategy.

As a cable manufacturer for over 76 years, we know that quality and reliability of cable systems and risk mitigation are of primary importance to our customers. For this reason, Aberdare's plan to enter the HV market was carefully considered, so as to uphold these standards and principals.

At Aberdare, we are people-centric and believe that our people are our greatest asset. We understand that an engaged workforce, delivers on our strategic goals and helps us achieve the impossible. We also understand what motivates our staff and we reciprocate with challenging but rewarding work; a wide range of opportunities for continuous individual learning and growth through robust incentive programmes, including career succession and progression. We know that our duty extends further to the greater population and we take pride in being an active agent of social change and transformation which is evident in our BEE Level 1 rating. Our ongoing socio-economic development initiatives have been commended by the Presidency and we are continuously working hard to make a difference in the communities in which we operate.

At Aberdare, education, training and development are seen as a foundation for economic productivity and as crucial tools to build empowered and dedicated employees. In this regard, our company actively promotes and follows a number of educational programmes, including adult education, apprentices, trainees, learnerships and formal education assistance.

Socio- Economic Development demonstrates the 'heart' of our company and through our efforts we strive to make a difference in the communities in which we operate. We believe that this can change the world one step at a time. We have always been an active supporter and pillar of strength for the communities in which we operate. Contributing to the national Socio-Economic Transformation agenda is also amongst our top priorities. Our company is therefore championing a number of social investment initiatives across our country.

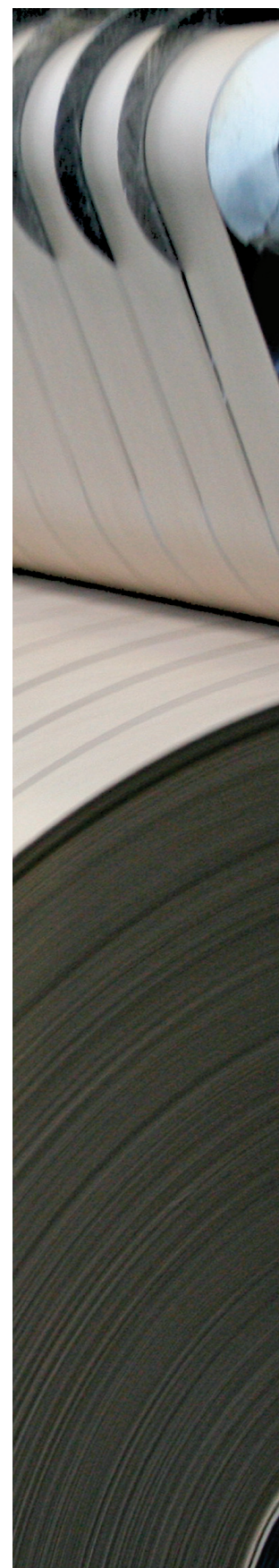
We have recently launched AberSchool, which is a program that aims to raise the level of Maths and Science amongst some of the high schools in Pietermaritzburg. The project is aimed at partnering with the Department of Education to offer extra tuition to Grade 9, 10 and 11 pupils in English, Mathematics & Science.

The programme is geared towards developing future engineers and technically oriented individuals not only for the Aberdare workforce, but the greater country in general.

We provide an ongoing supply of equipment to the AberCare Centre, an organization based in Pietermaritzburg that provides a sense of self-sufficiency and pride to mentally and physically disabled people. The primary focus is to provide the physically challenged individuals with a workplace. The daily tasks they do are simple but they receive stimulation and therapy and contribute to the economy. Aberdare has been assisting the facility annually with the donation of appliances or any of their operational needs, as well as sponsoring annual Christmas events for the residents.

In addition, in 2021, Aberdare engaged the Mathematics Foundation of South Africa and initiated the My Maths Buddy project at the Fundokuhle High School in PMB. The purpose of the project was to get learners to understand that Maths is part of their lives and a much-needed subject for their future and to show learners that Maths is a language which has its own terminology. This is a unique approach that the My Maths Buddy project applies, which helps learners acquire a new approach to learning Maths. A maths dictionary containing important terminology is provided to each learner and assists them with understanding the subject if read and applied. Aberdare believes that Mathematics is a critical subject for future engineers and those pursuing technical degrees and will assist in developing and growing learners in these fields, and in turn create a talent pool of future employees in our company.

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Overview

Paper Insulated Cables

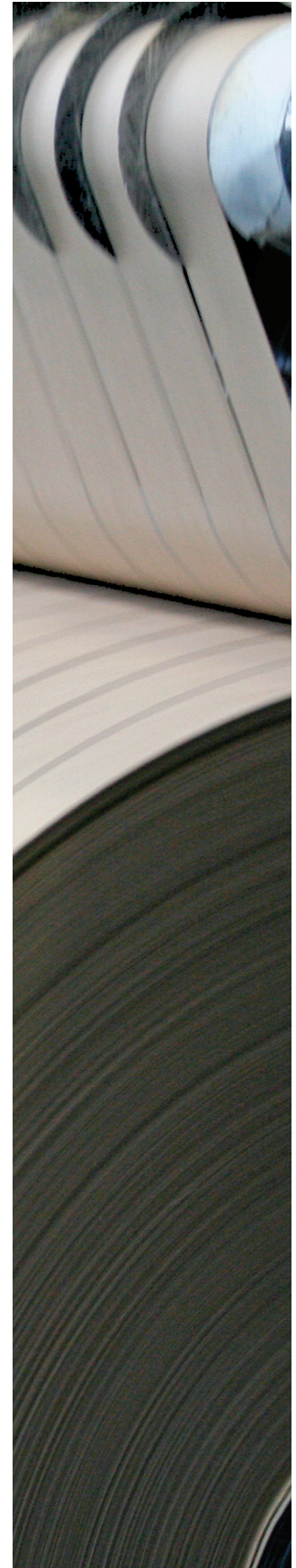
Paper insulated cables have been in use longer than any other type of cable insulation and, due to the reputation built up over the years, are still today a great favourite with engineers. When properly selected and correctly installed, this product can be relied upon to provide a satisfactory and trouble-free performance for many years.

Aberdare Cables started making paper insulated cables in South Africa in 1948. Our association with one of Europe's largest and oldest cable manufacturers placed at our disposal the technical expertise and research facilities which paved the way for an intensive expansion programme which still continues today.

Application

Paper insulated lead covered cables can be used in many electrical distribution and reticulation applications. Special constructions are also available for use in specialised applications including:-

- Electrical distribution in the petrochemical industry.
- Mining - a special construction for shaft installation is available with water blocking as well as flame retardancy.
- Fire and explosion hazardous areas.
- Submarine cables.



Manufacture of Paper Cables

Paper Insulated Cables



Paper insulated cable manufacture is carried out in accordance with SANS 97. The paper insulation is made up of layers of long-fibred paper tapes made from high-grade wood-pulp, the texture and quality of which have been carefully controlled to ensure no imperfections. These paper tapes are lapped helically around the conductors to form a complete compact and smooth covering, with the radial thickness required according to the voltage of the cable. The outer layer is generally numbered to enable positive core identification. (The laid-up cores are bound with further layers of helically applied paper tapes for belted-type cables, or copper woven tapes for screened cable.)

As paper itself is a hygroscopic, fibrous material, its electrical properties are rather poor. It therefore requires to be dried thoroughly under vacuum and impregnated with a stable electrical grade non-draining compound. This non-draining compound has a drop point of greater than 80°C which means that the impregnant does not migrate under normal operating conditions, or when installed on gradients.

To protect the impregnated paper insulation from contact with water during its intended life, an extruded seamless sheath of lead or lead alloy is applied by means of a lead extruder. (Ductility and durability are essential features of the sheathing.) Although ductile, pure lead is liable to fail by cracking when exposed to mechanical vibration such as may occur on bridge crossings or near railway tracks, and in these circumstances lead alloy 'E' is preferred. This has a considerably higher tensile strength than pure lead, particularly under alternative mechanical stress.

As the lead sheath requires protection, a bedding of bitumen-impregnated paper and fibrous material or an extruded plastic layer is applied to prevent the lead from being deformed by the armouring. An armouring of steel wire or double steel tape is then applied to give the cable full mechanical protection.

The final stage calls for an outer serving of bitumised fibrous material applied over the armour. An extruded plastic serving may also be used. The paper insulated cable is now complete and moves to the testing stage.

The SANS specification allows for heavy duty cables which are generally used in mines or other onerous conditions. Such cables are manufactured with thicker insulations, lead sheaths, armouring and sheathing.

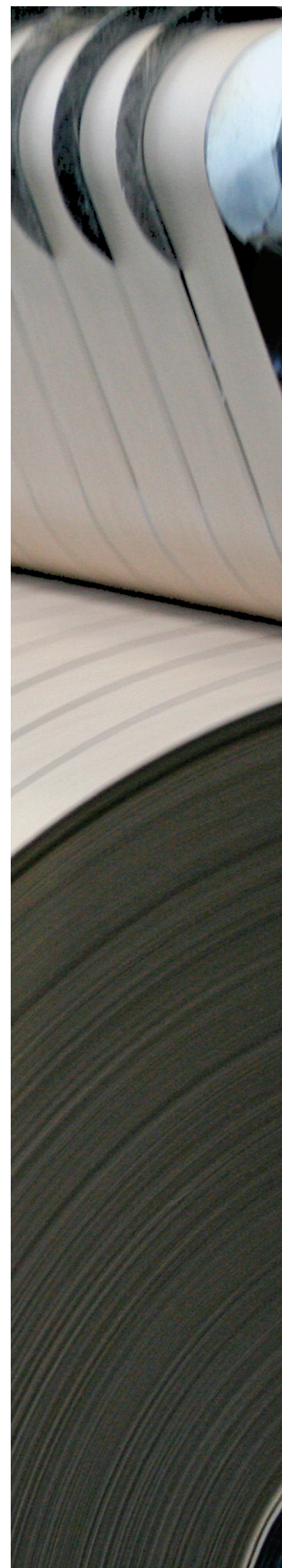
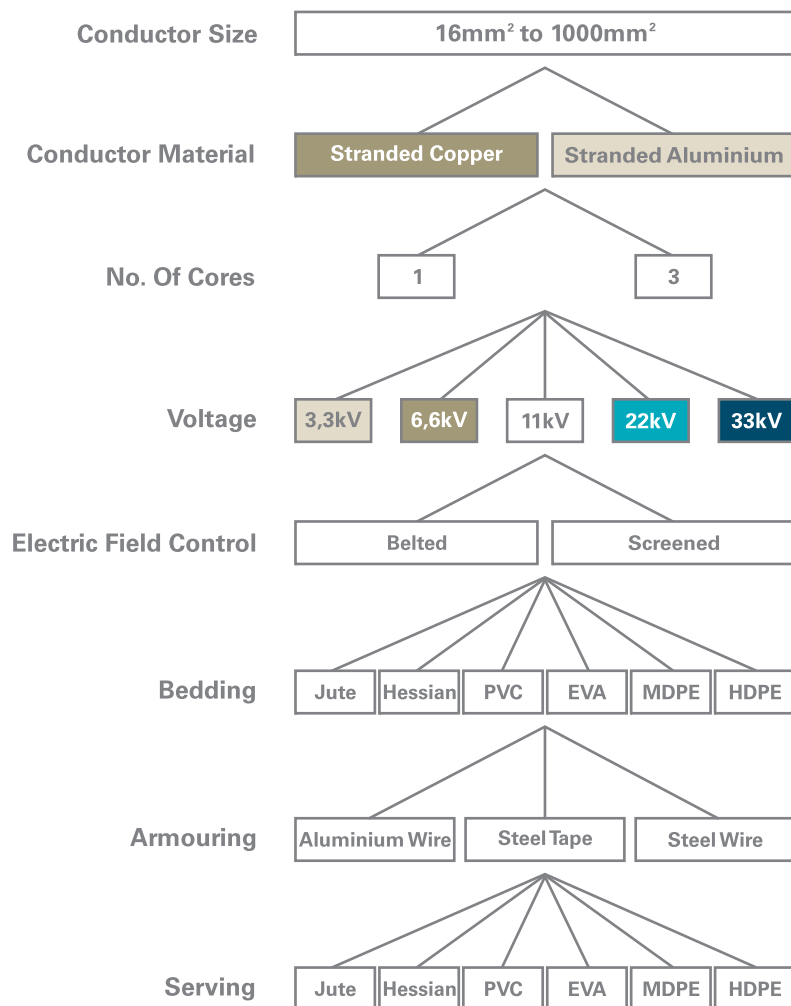
Aberdare cables provides a comprehensive backup service for our products including:-

- Technical seminars throughout the country.
- Technical support on all aspects of cable and accessory selection.
- Training schools for jointing and terminating.
- Cable design service.
- Supervision of cable installation and commissioning.

Quality Assurance, Quality Control and Testing

As electric power cables are manufactured to provide many years of service, it is necessary that the raw materials used are of the highest quality and conform to the rigid specifications laid down by South African Bureau of Standards. This also means that the production process has to be carefully controlled, particularly in areas where heating, drying or cooling cycles can be critical to the overall characteristics and electrical properties of the cable. Chemical, physical and electrical tests are carried out at various stages of manufacture. Final tests are all in accordance with SANS 97. Quality assurance systems are in compliance with SABS ISO 9000 series.

Manufacturing Range



1. All data is approximate or nominal.
2. Dimensions are to SANS 97.
3. Drums sizes : Dimensions for steel wire armoured cables have been used for calculation of drum sizes. Drums for double steel tape armoured cables will be slightly smaller and cables with PVC sheaths will have marginally larger drums.
4. Despatch masses includes drum lagging.
5. For sustained current ratings, the latest version of SANS 10198: "The selection, handling and installation of electric power cables of rating not exceeding 33kV" must be consulted where applicable.

Maximum sustained conductor temperature for cables laid direct in ground or in single-way ducts		
Cable type	Rated voltage kV	Maximum sustained conductor Temp °C
Belted cables	≤ 6,6	80
Belted cables	11	70
Screened cables	≤ 33	70

Standard installation conditions	
Ground temperature	25°C
Ambient air temperature	30°C
Thermal resistivity of soil	1,2K.m/W
Depth of laying to top surface of cable or single way duct in ground	0,8m

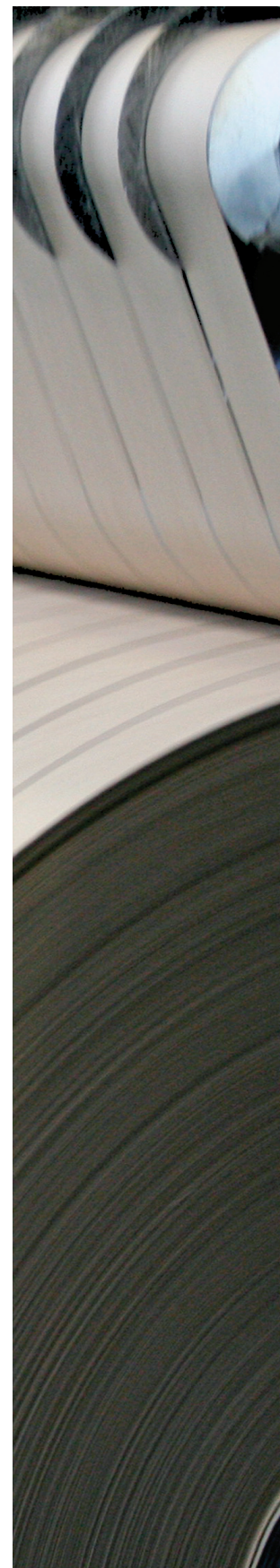
Single-core cables : touching, solid bonded at both ends Air ratings refer to shaded cables

6. Supplementary Notes

Relative values of mass and capacitance of drained cables will be marginally less than those indicated in the relevant tables which follow.

- C_o = equivalent star capacitance of each core to neutral
 = $1,2C_1$ approx (Capacitance varies according to relative permittivity and geometry)
- C_1 = approximate capacitance of one core, the others earthed to lead sheath. C_1 is the normal test value
- X_L = inductive Resistance of each conductor of multicore armoured cable or single core cable at 50Hz.
- R_{ac} = equivalent AC resistance of each conductor at 70°C and 50 Hz, inclusive of skin and proximity effects and losses due to sheath and armour related to the conductor.
- Z = impedance per conductors derived from X_L and R_{ac}

$$Z = \sqrt{X_L^2 + R_{ac}^2} \Omega /km$$



3,8 / 6,6 kV Single Core General Purpose Cables

Fully impregnated served or armoured and served to SANS 97

Table 9

Dimensional Data

	Conductor Size	mm ²	150	185	240	300	400	500	630	800	1000
			mm	mm	mm	mm	mm	mm	mm	mm	mm
Diameter	Over Lead Sheath	mm	23.47	25.18	28.01	30.95	34.02	36.23	43.07	47.84	52.59
	Unarmoured served	mm	26.97	28.68	31.51	34.45	37.82	40.03	47.07	52.04	57.19
Drum Dimensions	Armoured served	mm	35.19	36.9	39.93	42.87	48.00	50.41	57.45	62.42	69.59
	Unarmoured served	mm	1150	1150	1250	1350	1530	1680	1880	2080	2280
	Armoured served	mm	1350	1530	1680	1680	1880	2080	2280	2280	2480
	Unarmoured served	mm	950	950	1050	1050	1070	1070	1070	980	1100
Cable mass	Armoured served	mm	1050	1070	980	1070	980	1100	1100	1250	1250
	Unarmoured served	kg/km	3030	3480	4300	5210	6510	7470	9830	12240	14940
	Armoured served	kg/km	3780	4280	5180	6170	7800	8860	11430	14010	17290
	Unarmoured served	kg/km	2080	2310	2790	3310	3980	4450	5760	6970	8330
Despatch mass	Armoured served	kg/km	2830	3105	3670	4270	5270	5840	7350	8740	10680
	Unarmoured served	kg/300 m	1070	1200	1480	1770	2240	2560	3340	4200	5100
	Armoured served	kg/300 m	1340	1570	1880	2180	2740	3190	4050	4820	5900
	Unarmoured served	kg/300 m	780	850	1030	1200	1480	1660	2120	2620	3120
Armoured served	kg/300 m	1050	1220	1430	1610	1980	2280	2280	2820	3240	3910

Electrical Data

	Conductor Size	mm ²	150	185	240	300	400	500	630	800	1000	
			nF/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km
Capacitance C _i	Reactance X _L	ohms/km	0.116	0.1237	0.109	0.106	0.104	0.102	0.098	0.096	0.095	
	Copper conductors	ohms/km	0.1542	0.1237	0.0949	0.0766	0.061	0.0491	0.04	0.0336	0.0291	
A.C. Resistance	Aluminium conductors	ohms/km	0.2564	0.2044	0.1563	0.1256	0.0984	0.0775	0.0615	0.0498	0.0414	
	Copper conductors	ohms/km	0.1932	0.1677	0.1446	0.1308	0.1206	0.1133	0.106	0.102	0.0995	
Impedance	Aluminium conductors	ohms/km	0.2816	0.2366	0.1906	0.1644	0.1432	0.1282	0.1159	0.1085	0.1037	
	Copper conductors	ohms/km	355	400	460	520	480	590	520	660	565	680
Maximum Sustained Current Rating	Ground	Tref	355	400	465	525	485	595	525	665	570	755
	Duct	Flat	275	310	360	410	390	465	430	530	475	605
		Tref	275	315	365	410	390	470	435	540	480	615
	Air	Flat	315	355	410	385	460	425	520	455	580	495
Tref		320	360	415	390	465	430	525	460	590	500	
Maximum Sustained Current Rating	Duct	Flat	245	275	320	310	360	345	410	380	465	415
		Tref	245	280	325	310	365	345	415	380	470	420
	Air	Flat	430	490	585	570	645	645	785	720	895	795
		Tref	405	410	465	470	545	620	745	690	855	765
Maximum Sustained Current Rating	Air	Flat	330	340	385	390	455	530	520	620	665	715
		Tref	315	325	360	370	435	505	590	570	685	640
Maximum Sustained Current Rating	Air	Flat	315	360	435	435	505	590	570	685	640	820
		Tref	315	360	435	435	505	590	570	685	640	820

6,35 / 11 kV Single Core General Purpose Cables

Fully impregnated served or armoured and served to SANS 97

Table 10

Dimensional Data

Conductor Size		mm ²	150	185	240	300	400	500	630	800	1000
Diameter	Over Lead Sheath	mm	27.06	28.77	31.58	34.32	37.39	39.8	46.66	51.41	56.18
	Unarmoured served	mm	30.56	32.27	35.08	37.82	41.19	43.8	50.86	55.81	60.78
Drum Dimensions	Armoured served	mm	38.78	40.69	43.7	48.3	51.57	54.18	61.24	66.19	73.48
	Unarmoured served	mm	1250	1250	1350	1530	1680	1680	2080	2280	2280
Cable mass	Armoured served	mm	1530	1680	1680	1880	2080	2080	2280	2480	2680
	Unarmoured served	mm	1050	1050	1050	1070	1070	1070	1100	1100	1250
Despatch mass	Armoured served	mm	1070	1070	1070	980	1100	1100	1250	1100	1250
	Unarmoured served	kg/km	3500	3970	4820	5640	6980	8130	10580	13060	15790
A.C. Resistance	Armoured served	kg/km	4340	4880	5830	6960	8410	9650	12380	14950	18310
	Unarmoured served	kg/km	2550	2800	3310	3740	4450	5110	6510	7790	9180
Impedance	Armoured served	kg/km	3390	3710	4320	5060	5880	6630	8310	9680	11700
	Unarmoured served	kg/300 m	1240	1380	1650	1980	2420	2760	3700	4540	5350
Maximum Sustained Current Rating	Armoured served	kg/300 m	1590	1790	2070	2480	3050	3430	4330	5170	6270
	Unarmoured served	kg/300 m	950	1030	1200	1410	1660	1860	2480	2960	3370
Electrical Data	Armoured served	kg/300 m	1300	1440	1620	1910	2300	2520	3110	3590	4290

12,7 / 22 kV Single Core General Purpose Cables

Fully impregnated served or armoured and served to SANS 97

Table 11

Dimensional Data

	Conductor Size	mm ²	150	185	240	300	400	500	630	800	1000
			mm	mm	mm	mm	mm	mm	mm	mm	mm
Diameter	Over Lead Sheath	mm	31.68	33.39	36.22	39.16	42.23	44.44	51.28	56.05	61.02
	Unarmoured served	mm	35.18	36.89	40.02	43.16	46.23	49.04	56.08	61.35	66.52
Drum Dimensions	Over Servicing	mm	43.8	47.37	50.4	53.34	56.61	59.02	68.28	73.35	78.52
	Flange	mm	1680	1680	1880	1880	2080	2080	2280	2480	2680
	Width	mm	1880	2080	2280	2280	2280	2480	2480	2680	2680
	Armoured served	mm	980	980	1070	1070	1100	1100	1100	1250	1250
Cable mass	Copper conductors	kg/km	4170	4660	5590	6630	8010	9110	11680	14280	17360
	Aluminium conductors	kg/km	5170	5960	6990	8090	9590	10710	13840	16570	19840
	Unarmoured served	kg/km	3220	3490	4080	4730	5480	6090	6900	7580	8980
	Armoured served	kg/km	4220	4790	5480	6190	7060	7680	8600	9740	11270
Despatch mass	Copper conductors	kg/300 m	1580	1720	2060	2370	2940	3270	4130	5000	5990
	Aluminium conductors	kg/300 m	1930	2320	2720	3050	3500	3910	4930	5750	6730
	Unarmoured served	kg/300 m	1290	1370	1600	1800	2180	2360	2900	3410	3990
	Armoured served	kg/300 m	1650	1970	2260	2480	2740	3000	3700	4160	4740

Electrical Data

	Conductor Size	mm ²	150	185	240	300	400	500	630	800	1000	
			nF/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km
A.C. Resistance	Capacitance C ₁	nF/km	376	408	458	510	563	605	729	813	898	
	Reactance X _L	ohms/km	0.133	0.129	0.124	0.121	0.117	0.115	0.109	0.107	0.105	
Impedance	Copper conductors	ohms/km	0.1492	0.1196	0.0917	0.0738	0.0587	0.047	0.0382	0.0318	0.0274	
	Aluminium conductors	ohms/km	0.248	0.1977	0.1511	0.1213	0.095	0.0747	0.0591	0.0477	0.0395	
	Unarmoured served	ohms/km	0.2002	0.1761	0.1546	0.1413	0.1308	0.1243	0.1159	0.1115	0.1083	
Maximum Sustained Current Rating	Aluminium conductors	ohms/km	0.2816	0.2362	0.1957	0.171	0.1507	0.1372	0.1244	0.1171	0.112	
	Ground	Copper conductors	Flat	A 320	310	360	340	420	385	470	425	535
		Tref	A 325	310	365	420	390	420	390	475	430	540
	Duct	Aluminium conductors	Flat	A 250	245	280	270	325	310	370	345	420
		Tref	A 250	245	285	275	330	315	375	350	425	395
	Air	Copper conductors	Flat	A 285	275	320	300	370	340	415	370	470
		Tref	A 290	275	325	305	375	340	420	375	475	415
	Duct	Aluminium conductors	Flat	A 220	215	250	240	290	275	325	305	370
		Tref	A 225	220	255	245	295	275	330	310	375	345
	Air	Copper conductors	Flat	A 385	380	440	430	520	495	600	560	695
		Tref	A 365	365	420	415	500	480	610	540	665	610
	Duct	Aluminium conductors	Flat	A 300	300	340	340	405	400	470	455	550
Tref		A 285	290	330	330	390	385	440	440	525	505	
Air	Copper conductors	Flat	A 440	440	500	490	580	565	680	645	800	
	Tref	A 420	420	480	475	560	545	660	625	750	710	
Duct	Aluminium conductors	Flat	A 340	340	390	385	460	445	530	515	610	
	Tref	A 320	320	370	365	440	425	510	495	580	550	
Air	Copper conductors	Flat	A 500	500	570	560	660	645	780	745	910	
	Tref	A 480	480	550	545	640	625	740	705	840	790	
Duct	Aluminium conductors	Flat	A 400	400	460	455	540	525	620	605	710	
	Tref	A 380	380	440	435	520	505	590	575	670	640	
Air	Copper conductors	Flat	A 560	560	640	630	740	725	860	825	1000	
	Tref	A 540	540	620	615	720	705	820	785	930	880	
Duct	Aluminium conductors	Flat	A 460	460	530	525	620	605	710	695	810	
	Tref	A 440	440	510	505	590	575	670	655	760	730	

19 / 33 kV Single Core General Purpose Cables

Fully impregnated served or armoured and served to SANS 97

Table 12

Dimensional Data

	Conductor Size	mm ²	150	185	240	300	400	500	630	800	1000
			mm	mm	mm	mm	mm	mm	mm	mm	mm
Diameter	Over Lead Sheath	mm	33.76	35.47	38.28	41.02	44.09	46.5	53.36	58.11	62.64
	Unarmoured served	mm	37.56	39.27	42.28	45.22	48.49	50.9	57.96	62.91	68.18
Drum Dimensions	Armoured served	mm	47.74	49.65	52.46	55.4	58.67	61.28	70.36	75.61	80.58
	Unarmoured served	mm	1680	1880	1880	2080	2080	2280	2480	2680	2680
	Armoured served	mm	2080	2080	2280	2280	2480	2480	2680	2680	2880
	Unarmoured served	mm	980	1070	1070	1100	1100	1100	1100	1255	1100
Cable mass	Armoured served	mm	1100	1100	1100	1250	1250	1250	1105	1100	1340
	Unarmoured served	kg/km	4570	5080	6045	6945	8380	9585	12210	14825	17735
	Armoured served	kg/km	5860	6455	7475	8470	10005	11315	14600	17430	20485
	Unarmoured served	kg/km	3620	3905	4531	5040	5850	6560	8135	9555	11120
Despatch mass	Armoured served	kg/km	4910	5280	5960	6570	7475	8290	10525	12160	13870
	Unarmoured served	kg/300 m	1700	1905	2190	2615	3045	3490	4355	5225	6100
	Armoured served	kg/300 m	2290	2470	2860	3165	3695	4110	5160	5985	7160
	Unarmoured served	kg/300 m	1410	1550	1735	2045	2290	2585	3135	3645	4115
Armoured served	kg/300 m	2005	2115	2405	2595	2935	3205	3935	4405	5175	

Electrical Data

	Conductor Size	mm ²	150	185	240	300	400	500	630	800	1000
			nF/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km
Capacitance C ₁	Reactance X _L	ohms/km	0.123	0.133	0.128	0.123	0.12	0.018	0.012	0.109	0.106
	Copper conductors	ohms/km	0.1491	0.1196	0.0916	0.0737	0.0586	0.0469	0.038	0.0317	0.0273
A.C. Resistance	Aluminium conductors	ohms/km	0.248	0.1977	0.151	0.1213	0.095	0.0746	0.0591	0.0476	0.0394
	Copper conductors	ohms/km	0.1932	0.1791	0.1574	0.1438	0.1335	0.1265	0.1178	0.113	0.1098
Impedance	Aluminium conductors	ohms/km	0.2767	0.2384	0.1979	0.1731	0.153	0.1392	0.1262	0.1185	0.1134
	Copper conductors	ohms/km	315	360	415	465	525	590	665	730	785
Ground	Tref	A	320	360	420	470	535	600	675	740	795
	Aluminium conductors	A	245	280	325	365	420	475	540	605	665
Maximum Sustained Current Rating	Tref	A	250	280	325	370	420	480	550	615	675
	Aluminium conductors	A	280	315	365	410	460	515	575	625	690
Duct	Tref	A	285	320	370	415	465	525	585	635	700
	Aluminium conductors	A	220	245	285	320	365	415	470	520	585
Air	Tref	A	220	250	290	325	370	420	475	530	595
	Aluminium conductors	A	380	435	515	555	685	780	915	1030	1135
Air	Tref	A	365	420	495	520	660	755	885	995	1100
	Aluminium conductors	A	295	340	405	465	545	625	745	855	960
Air	Tref	A	285	290	325	330	390	435	500	560	600
	Aluminium conductors	A	Unarm	arm	Unarm	arm	Unarm	arm	Unarm	arm	Unarm
Air	Tref	A	Unarm	arm	Unarm	arm	Unarm	arm	Unarm	arm	Unarm
	Aluminium conductors	A	Unarm	arm	Unarm	arm	Unarm	arm	Unarm	arm	Unarm

3,8 / 6,6 kV Single Core Cables



Table
13

Fully impregnated (heavy duty) or drained (general purpose) served or armoured and served to SANS 97

Dimensional Data

		Conductor Size											
		mm ²	150	185	240	300	400	500	630	800	1000		
Diameter	Over Lead Sheath	mm	24.89	26.6	29.41	32.15	35.22	37.63	44.49	49.24	54.01		
	Unarmoured served	mm	28.39	30.1	32.91	36.15	39.22	41.83	48.69	53.44	58.61		
Drum Dimensions	Armoured served	mm	36.61	38.52	42.49	46.13	49.40	52.01	59.57	64.52	71.31		
	Unarmoured served	mm	1150	1250	1250	1350	1530	1680	1880	2080	2280		
Cable mass	Armoured served	mm	1530	1530	1680	1880	1880	2080	2280	2480	2680		
	Unarmoured served	mm	950	950	1050	1050	1070	1070	980	1105	1105		
Despatch mass	Armoured served	mm	1070	1070	1070	980	980	1105	1255	1105	1255		
	Unarmoured served	kg/km	3255	3725	4560	5400	6700	7835	10230	12645	15385		
A.C. Resistance	Armoured served	kg/km	4030	4570	5625	6620	8030	9250	11970	14575	17820		
	Unarmoured served	kg/km	2305	2550	3045	3500	4170	4810	6155	7375	8770		
Impedance	Armoured served	kg/km	3080	3395	4115	4720	5500	6225	7895	9305	11205		
	Unarmoured served	kg/300 m	1135	1300	1555	1820	2295	2670	3460	4315	5225		
Maximum Sustained Current Rating	Armoured served	kg/300 m	1490	1655	2010	2380	2800	3300	4205	5060	6125		
	Unarmoured served	kg/300 m	850	945	1100	1250	1535	1765	2240	2735	3240		
Electrical Data	Armoured served	kg/300 m	1210	1300	1555	1810	2040	2390	2980	3475	4140		

6,35 / 11 kV Single Core Cables



Fully impregnated (heavy duty) or drained (general purpose) served or armoured and served to SANS 97

Table 14

Dimensional Data

	Conductor Size	mm ²	150	185	240	300	400	500	630	800	1000
			mm	mm	mm	mm	mm	mm	mm	mm	mm
Diameter	Over Lead Sheath	mm	29.48	31.39	34.22	36.96	40.01	42.44	49.28	54.05	58.80
	Unarmoured served	mm	32.98	34.89	38.22	40.96	44.21	46.64	53.48	58.45	63.80
Drum Dimensions	Over Servicing	mm	41.40	43.51	47.80	51.14	54.39	57.02	64.06	70.55	76.30
	Flange	mm	1250	1350	1530	1680	1880	1880	2080	2280	2480
	Armoured served	mm	1680	1680	1880	2080	2080	2280	2480	2480	2680
	Width	mm	1050	1050	1070	1070	980	980	980	1105	1105
Cable mass	Armoured served	mm	1070	1070	980	1105	1105	1105	1105	1255	1105
	Copper conductors	kg/km	3785	4395	5325	6170	7535	8710	11190	13235	16560
	Armoured served	kg/km	4710	5395	6550	7555	9030	10315	13035	16085	19205
	Aluminium conductors	kg/km	2835	3220	3810	4270	5005	5685	7290	8465	9945
Despatch mass	Armoured served	kg/km	3760	4220	5035	5650	6500	7290	8965	10815	12590
	Copper conductors	kg/300 m	1320	1520	1880	2170	2655	3005	3880	4735	5655
	Armoured served	kg/300 m	1735	1940	2360	2795	3240	3210	4595	5530	6525
	Aluminium conductors	kg/300 m	1040	1170	1430	1600	1895	2100	2100	2660	3155
	Armoured served	kg/300 m	1450	1585	1905	2225	2480	2805	3375	3950	4540

Electrical Data

	Conductor Size	mm ²	150	185	240	300	400	500	630	800	1000
			nF/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km
Capacitance C ₁	Reactance X _L	ohms/km	0.129	0.126	0.121	0.117	0.114	0.112	0.106	0.104	0.102
	Copper conductors	ohms/km	0.1492	0.1197	0.0917	0.0739	0.0588	0.0472	0.0384	0.0321	0.0277
A.C. Resistance	Aluminium conductors	ohms/km	0.2480	0.1977	0.1511	0.1214	0.0951	0.0748	0.0593	0.0479	0.0397
	Copper conductors	ohms/km	0.1974	0.1736	0.1522	0.1385	0.1283	0.1214	0.1131	0.1089	0.1056
Impedance	Aluminium conductors	ohms/km	0.2797	0.2343	0.1939	0.1687	0.1485	0.1346	0.1218	0.1143	0.1094
	Copper conductors	ohms/km	320	310	365	345	420	390	475	430	535
Maximum Sustained Current Rating	Ground	Flat	320	310	365	345	420	390	475	430	535
	Duct	Tref	325	315	365	350	425	390	480	430	545
		Flat	250	245	285	275	330	315	370	350	425
	Air	Tref	250	250	285	280	330	315	375	355	430
Flat		285	275	325	305	375	340	420	375	470	
Ground	Copper conductors	Tref	290	280	325	310	375	345	425	380	480
		Flat	225	220	250	245	290	275	330	305	375
	Aluminium conductors	Tref	225	220	250	245	290	275	330	305	375
		Flat	225	220	250	245	290	275	330	305	375
Duct	Copper conductors	Tref	385	385	440	435	525	500	605	565	695
		Flat	365	370	420	415	500	485	575	545	670
	Aluminium conductors	Tref	300	300	345	345	410	405	470	455	550
		Flat	285	290	330	330	390	390	450	440	530
Air	Copper conductors	Tref	285	290	330	330	390	390	450	440	530
		Flat	285	290	330	330	390	390	450	440	530
	Aluminium conductors	Tref	285	290	330	330	390	390	450	440	530
		Flat	285	290	330	330	390	390	450	440	530

3,8 / 6,6 kV 3 Core General Purpose Belted Cables

Fully impregnated armoured and served to SANS 97

Table
15

Dimensional Data

	Conductor Size		mm ²	16	25	35	50	70	95	120	150	185	240	300	400*
	Over Serving	Over Lead Sheath		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
Diameter	Over	Steel tape armoured served	mm	24.19	25.14	26.77	29.1	32.13	34.95	37.36	39.97	43.05	48.19	54.41	58.04
	Serving	Steel tape armoured served	mm	36.90	37.85	39.48	42.61	45.64	48.46	50.87	53.48	56.56	61.70	65.70	71.55
		Single wire armoured served	mm	37.70	38.65	40.28	43.61	46.64	49.46	51.87	54.48	58.86	64.00	68.00	73.85
Drum Dimensions	Flange		mm	1250	1250	1250	1530	1530	1530	1680	1680	1880	2080	2080	2180
	Width		mm	950	950	1050	980	1070	1070	980	1070	1070	1005	1105	1250
Cable mass	Copper conductors	Steel tape armoured served	kg/km	3465	3800	4330	5270	6280	7385	8515	9955	11500	13865	16740	19890
		Single wire armoured served	kg/km	3575	3925	4405	5595	6660	7805	9015	10350	12490	14905	15170	18265
	Aluminium conductors	Steel tape armoured served	kg/km	3160	3340	3685	4330	4995	5650	6325	7195	8125	9505	11300	12510
		Single wire armoured served	kg/km	3270	3470	3760	4655	5375	6070	6825	7590	8420	9115	10810	12825
Despatch mass	Copper conductors		kg/300 m	1235	1340	1500	1945	2275	2620	3015	3420	4130	4980	5910	6935
	Aluminium conductors		kg/300 m	1140	1200	1305	1660	1890	2095	2360	2595	3120	3670	4275	4720

Electrical Data

	Conductor Size		mm ²	16	25	35	50	70	95	120	150	185	240	300	400*
	Capacitance C _i	Reactance X _i		nF/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km
A.C. Resistance	Copper conductors	Capacitance C _i	243	271	302	344	383	428	467	514	552	613	671	763	
		Reactance X _i	0.117	0.106	0.101	0.096	0.093	0.087	0.085	0.083	0.083	0.081	0.079	0.077	0.076
	Aluminium conductors	Capacitance C _i	1.4213	0.8986	0.6478	0.4786	0.3317	0.2392	0.1900	0.1544	0.1239	0.0951	0.0768	0.0596	
		Reactance X _i	2.3719	1.4902	1.0780	0.7962	0.5504	0.3978	0.3147	0.2565	0.2045	0.1564	0.1257	0.0955	
Impedance	Copper conductors	Capacitance C _i	1.4261	0.9048	0.6556	0.4882	0.3444	0.2545	0.2081	0.1752	0.1483	0.1235	0.1090	0.0963	
		Reactance X _i	2.3748	1.4940	1.0827	0.8020	0.5582	0.4071	0.3259	0.2695	0.2201	0.1751	0.1475	0.1218	
	Aluminium conductors	Capacitance C _i	90	120	145	170	210	250	285	320	360	415	465	490	
		Reactance X _i	70	95	115	135	165	195	225	250	285	325	365	390	
Maximum Sustained Current	Ground	Capacitance C _i	75	105	125	145	180	215	245	270	305	350	400	420	
		Reactance X _i	60	80	95	115	140	165	190	215	240	275	315	335	
Rating	Air	Capacitance C _i	85	120	145	175	220	265	305	345	395	460	530	550	
		Reactance X _i	65	95	115	135	170	205	235	270	310	360	410	440	

*Not covered by SANS 97

6,6 / 6,6 kV 3 Core General Purpose Belted Cables

Fully impregnated armoured and served to SANS 97

Table
16

Dimensional Data

Diameter	Conductor Size		mm ²	16	25	35	50	70	95	120	150	185	240	300	400*
	Over Serving	Over Lead Sheath		mm	25	35	50	70	95	120	150	185	240	300	400*
Drum Dimensions	Steel tape armoured served	Over Lead Sheath	mm	26.41	27.56	28.99	31.54	34.55	37.39	39.79	42.41	45.47	50.41	54.63	60.46
	Single wire armoured served	Steel tape armoured served	mm	39.12	40.27	42.50	45.05	48.06	50.90	53.29	55.92	58.98	63.92	68.14	73.97
	Flange	Single wire armoured served	mm	39.92	41.07	43.50	46.05	49.06	51.90	54.29	58.22	61.28	66.22	70.44	78.03
Cable mass	Copper conductors	Width	mm	1250	1250	1530	1530	1530	1680	1680	1680	1880	2080	2080	2180
		Steel tape armoured served	kg/km	1050	1050	980	980	1070	1070	980	1070	1070	1070	1010	1110
	Aluminium conductors	Single wire armoured served	kg/km	3805	4220	4915	5730	6760	7935	9365	10410	11905	14315	16920	20680
		Steel tape armoured served	kg/km	3930	4380	5240	6120	7195	8365	9575	11570	13120	15710	18450	22430
Despatch mass	Copper conductors	Single wire armoured served	kg/km	3260	3755	4275	4815	5470	6180	6865	7620	8485	9885	11395	13300
		Steel tape armoured served	kg/300 m	3600	3915	4606	5205	5905	6610	7360	8780	9750	11280	12925	15050
Aluminium conductors	Aluminium conductors	Single wire armoured served	kg/300 m	1355	1490	1840	2115	2435	2820	3190	3855	4335	5145	5965	7230
		Steel tape armoured served	kg/300 m	1255	1350	1645	1840	2050	2295	2525	3020	3310	3815	4310	5015

Electrical Data

Diameter	Conductor Size		mm ²	16	25	35	50	70	95	120	150	185	240	300	400*
	Over Serving	Over Lead Sheath		nF/km	25	35	50	70	95	120	150	185	240	300	400*
A.C. Resistance	Copper conductors	Capacitance C ₁	ohms/km	0.117	0.106	0.101	0.097	0.093	0.087	0.085	0.083	0.081	0.079	0.077	0.076
		Reactance X ₁	ohms/km	1.4213	0.8986	0.6478	0.4786	0.3317	0.2392	0.1900	0.1544	0.1239	0.0951	0.0768	0.0596
Impedance	Copper conductors	Capacitance C ₂	ohms/km	2.3719	1.4902	1.0780	0.7962	0.5504	0.3978	0.3147	0.2565	0.2045	0.1564	0.1257	0.0955
		Reactance X ₂	ohms/km	1.4261	0.9048	0.6556	0.4882	0.3444	0.2545	0.2081	0.1752	0.1482	0.1235	0.1090	0.0963
Maximum Sustained Current Rating	Aluminium conductors	Capacitance C ₃	ohms/km	2.3748	1.4940	1.0827	0.8020	0.5582	0.4071	0.3259	0.2695	0.2201	0.1751	0.1475	0.1218
		Reactance X ₃	A	85	115	140	165	205	245	275	315	355	400	450	480
Ground	Aluminium conductors	Capacitance C ₄	A	65	90	110	130	160	190	220	245	280	320	365	380
		Reactance X ₄	A	75	100	120	145	175	210	235	270	305	345	390	415
Duct	Aluminium conductors	Capacitance C ₅	A	60	80	95	110	135	165	185	210	240	280	315	330
		Reactance X ₅	A	85	115	140	170	210	255	290	340	385	440	500	535
Air	Aluminium conductors	Capacitance C ₆	A	65	90	110	130	165	200	230	265	305	355	405	425
		Reactance X ₆	A	75	100	120	145	175	210	235	270	305	345	390	415

*Not covered by SANS 97

6,35 / 11 kV 3 Core General Purpose Belted Cables

Fully impregnated armoured and served to SANS 97

Table
17

Dimensional Data

Conductor Size		mm ²	25	35	50	70	95	120	150	185	240	300	400*
Diameter	Over Lead Sheath	mm	31.38	33.64	33.49	36.50	39.33	41.73	44.36	47.42	52.14	56.15	61.99
	Steel tape armoured served	mm	44.09	47.15	47.00	50.01	52.84	55.24	57.87	60.93	65.65	69.66	75.50
	Single wire armoured served	mm	44.89	48.15	48.00	51.01	53.84	56.24	60.17	63.23	67.95	74.52	80.36
Drum Dimensions	Flange	mm	1530	1530	1530	1680	1680	1680	1880	1880	2080	2080	2180
	Width	mm	980	1070	1070	980	1070	1070	1070	1070	1100	1100	1705
Cable mass	Copper conductors	kg/km	4890	5710	6020	7080	8260	9440	10770	12290	14480	16940	20650
	Single wire armoured served	kg/km	5110	6120	6440	7530	8760	9960	12000	13570	15960	18980	22895
	Steel tape armoured served	kg/km	4415	5055	5195	5790	6505	7225	7980	8870	10050	11415	13270
	Single wire armoured served	kg/km	4630	5465	5525	6240	7005	7745	9210	10150	11530	13455	15515
Despatch mass	Copper conductors	kg/300 m	1800	2115	2210	2570	2945	3305	3915	4500	5220	6240	7370
	Aluminium conductors	kg/300 m	1755	1915	1935	2185	2420	2646	3150	3475	3890	4585	5155

Electrical Data

Conductor Size		mm ²	25	35	50	70	95	120	150	185	240	300	400*
Capacitance C _i	Capacitance C _i	nF/km	259	285	308	343	380	412	446	481	531	578	617
	Reactance X _i	ohms/km	0.117	0.112	0.105	0.101	0.094	0.091	0.089	0.087	0.084	0.082	0.081
A.C. Resistance	Copper conductors	ohms/km	0.8700	0.6272	0.4633	0.3211	0.2316	0.1839	0.1494	0.1200	0.0921	0.0743	0.0593
	Aluminium conductors	ohms/km	1.4419	1.0430	0.7703	0.5325	0.3849	0.3045	0.2481	0.1979	0.1513	0.1216	0.0954
	Copper conductors	ohms/km	0.8779	0.6371	0.4751	0.3365	0.2499	0.2053	0.1739	0.1481	0.1245	0.1106	0.1001
Impedance	Aluminium conductors	ohms/km	1.4421	1.0492	0.7777	0.5423	0.3972	0.3183	0.2640	0.2166	0.1734	0.1472	0.1249
	Copper conductors	A	105	130	160	195	235	265	295	335	380	425	495
Maximum Sustained Current	Aluminium conductors	A	80	100	125	155	185	210	235	265	305	340	395
	Copper conductors	A	90	110	135	165	200	225	250	280	325	365	425
Rating	Aluminium conductors	A	70	85	105	130	155	175	200	225	260	290	340
	Copper conductors	A	105	125	165	200	245	280	315	360	415	470	570
	Aluminium conductors	A	80	100	130	160	190	220	250	285	330	380	455

*Not covered by SANS 97

11 / 11kV 3 Core General Purpose Belted Cables

Fully impregnated armoured and served to SANS 97

Table 18

Dimensional Data

		Conductor Size											mm ²
		25	35	50	70	95	120	150	185	240	300	400*	
Diameter	Over Lead Sheath	35.14	37.60	37.67	40.68	43.51	45.71	48.32	51.40	56.54	60.53	66.39	
	Steel tape armoured served	48.65	51.11	51.18	54.19	57.02	59.22	61.83	64.91	70.05	74.04	79.90	
	Single wire armoured served	49.65	52.11	52.18	55.19	59.32	61.52	64.13	67.21	74.91	78.90	84.76	
Drum Dimensions	Flange	1530	1680	1680	1680	1680	1880	1880	2080	2080	2280	2180	
	Width	1070	980	980	1070	1070	1070	1070	1000	1100	1100	1705	
Cable mass	Copper conductors	5880	6520	6995	8125	9365	10360	11750	13325	16070	18570	22430	
	Single wire armoured served	6205	6980	7495	8640	10520	11625	13065	14745	18090	20815	24790	
	Steel tape armoured served	5400	5865	6080	6835	7610	8145	8960	9905	11640	13045	15050	
	Single wire armoured served	5725	6325	6580	7350	8765	9410	10270	11325	13660	15290	17410	
Despatch mass	Copper conductors	2140	2410	2565	2910	3540	3875	4350	4855	5975	6920	7940	
	Aluminium conductors	1995	2215	2290	2520	3015	3210	3510	3830	4645	5265	5725	

Electrical Data

		25	35	50	70	95	120	150	185	240	300	400*
Capacitance C ₁	Capacitance C ₁	232	254	274	303	334	361	390	420	461	501	537
	Reactance X ₁	0.117	0.112	0.105	0.101	0.094	0.091	0.089	0.087	0.084	0.082	0.081
A.C. Resistance	Copper conductors	0.8700	0.6272	0.4633	0.3211	0.2316	0.1839	0.1494	0.1200	0.0921	0.0743	0.0593
	Aluminium conductors	1.4419	1.0430	0.7703	0.5325	0.3849	0.3045	0.2481	0.1979	0.1513	0.1216	0.0954
	Copper conductors	0.8779	0.6371	0.4751	0.3365	0.2499	0.2053	0.1739	0.1481	0.1245	0.1106	0.1001
Impedance	Aluminium conductors	1.4468	1.0492	0.7777	0.5423	0.3965	0.3183	0.2640	0.2166	0.1734	0.1472	0.1249
	Copper conductors	100	120	150	185	220	250	280	320	365	410	475
Maximum Sustained Current	Ground	80	95	120	145	175	200	225	255	295	335	380
	Duct	90	105	130	160	190	215	245	275	320	355	415
Rating	Aluminium conductors	70	85	105	125	150	170	195	220	260	290	330
	Copper conductors	100	120	150	190	225	260	295	335	395	445	535
	Aluminium conductors	75	95	120	150	180	210	240	270	320	365	425

*Not covered by SANS 97

6,35 / 11kV 3 Core General Purpose Screened Cables

Fully impregnated armoured and served to SANS 97

Table 19

Dimensional Data

Diameter	Conductor Size		mm ²	25	35	50	70	95	120	150	185	240	300	400*
	Over Serving	Over Lead Sheath		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
Drum Dimensions	Over Serving	Steel tape armoured served	mm	45.50	48.56	51.24	51.71	54.53	56.72	59.35	62.41	66.86	71.57	76.26
		Single wire armoured served	mm	46.30	49.56	52.24	52.71	55.53	57.72	61.65	64.71	69.16	76.43	81.12
		Flange	mm	1530	1530	1680	1680	1680	1880	1880	1880	2080	2080	2280
Cable mass	Copper conductors	Width	mm	1070	1070	1070	1070	1070	1070	1070	1100	1100	1100	1705
		Steel tape armoured served	kg/km	5070	6015	6665	7455	8670	9680	11035	12300	12575	15080	17735
	Aluminium conductors	Single wire armoured served	kg/km	5315	6345	7165	7940	9175	10235	12300	13945	16580	19880	23495
		Steel tape armoured served	kg/km	4595	5360	5770	6155	6920	7455	8245	9155	10640	12215	14000
Despatch mass	Copper conductors		kg/300 m	1870	2180	2465	2700	3070	3455	4075	4615	5405	6510	7550
	Aluminium conductors		kg/300 m	1730	1985	2200	2310	2545	3065	3240	3590	4070	4855	5335

Electrical Data

Maximum Sustained Current Rating	Conductor Size		mm ²	25	35	50	70	95	120	150	185	240	300	400*
	Capacitance C _i	Reactance X _i		nF/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km	ohms/km
A.C. Resistance	Copper conductors	Copper conductors	ohms/km	0.8700	0.6272	0.4634	0.3211	0.2315	0.1839	0.1494	0.1199	0.092	0.0742	0.0592
		Aluminium conductors	ohms/km	1.4419	1.0430	0.7704	0.5325	0.3848	0.3045	0.2481	0.2481	0.1978	0.1513	0.1215
Impedance	Copper conductors	Copper conductors	ohms/km	0.8788	0.6382	0.4769	0.3381	0.2517	0.2073	0.176	0.1503	0.1267	0.1129	0.1017
		Aluminium conductors	ohms/km	1.4472	1.0497	0.7786	0.5429	0.3973	0.3191	0.2650	0.2650	0.2176	0.1746	0.1484
Ground	Copper conductors	Copper conductors	A	115	140	160	200	240	270	305	340	390	440	495
		Aluminium conductors	A	90	105	125	155	185	210	235	270	270	305	345
Duct	Copper conductors	Copper conductors	A	100	115	140	170	205	230	255	290	335	375	425
		Aluminium conductors	A	75	90	105	135	160	180	200	225	265	300	340
Air	Copper conductors	Copper conductors	A	115	140	165	210	255	290	330	375	430	495	565
		Aluminium conductors	A	90	110	130	165	195	225	255	290	335	390	450

*Not covered by SANS 97

12,7 / 22 kV 3 Core General Purpose Screened Cables

Fully impregnated armoured and served to SANS 97

Table
20

Dimensional Data

		Conductor Size									
		mm ²	50	70	95	120	150	185	240	300	
Diameter	Over Lead Sheath	mm	49.17	52.92	58.01	56.29	58.9	61.98	65.75	69.76	
	Over Serving	mm	62.68	66.43	71.52	69.80	72.41	75.49	79.26	83.27	
	Single wire armoured served	mm	64.98	68.73	73.82	72.1	75.51	78.59	82.36	86.37	
Drum Dimensions	Flange	mm	2280	2280	2480	2480	2480	2480	2680	2880	
	Width	mm	1100	1100	1250	1100	1250	1250	1250	1340	
Cable mass	Copper conductors	kg/km	9430	10940	12815	13295	14800	16500	19015	21620	
	Single wire armoured served	kg/km	10815	12435	14385	14770	16795	18615	21290	24060	
	Aluminium conductors	kg/km	8535	9565	10960	11070	12010	13080	14590	16100	
	Single wire armoured served	kg/km	9925	11060	12530	12550	14000	15195	16855	18540	
Despatch mass	Copper conductors	kg/300 m	3850	4340	5005	5115	5725	6275	7150	8225	
	Aluminium conductors	kg/300 m	3585	3930	4450	4450	4890	5245	5815	6570	

Electrical Data

		Conductor Size									
		mm ²	50	70	95	120	150	185	240	300	
Capacitance C _i	Capacitance C _i	nF/km	260	293	328	339	373	396	437	485	
	Reactance X _i	ohms/km	0.133	0.126	0.119	0.112	0.108	0.105	0.1	0.097	
A.C. Resistance	Copper conductors	ohms/km	0.4633	0.3211	0.2315	0.1837	0.1492	0.1197	0.0917	0.0738	
	Aluminium conductors	ohms/km	0.7703	0.5325	0.3848	0.3044	0.248	0.1977	0.1511	0.1213	
	Copper conductors	ohms/km	0.482	0.3448	0.2601	0.2151	0.184	0.1592	0.136	0.1218	
Impedance	Aluminium conductors	ohms/km	0.7817	0.5471	0.4027	0.3241	0.2704	0.2236	0.1811	0.1552	
	Copper conductors	A	160	195	235	270	305	340	390	440	
Maximum Sustained Current	Aluminium conductors	A	125	155	185	215	240	270	310	345	
	Copper conductors	A	140	170	205	235	265	295	340	380	
Rating	Aluminium conductors	A	110	135	160	185	205	230	265	300	
	Copper conductors	A	170	210	255	300	340	380	445	505	
	Aluminium conductors	A	130	160	195	235	265	300	350	400	

19 / 33 kV 3 Core General Purpose Screened Cables

Fully impregnated armoured and served to SANS 97

Table
21

Dimensional Data

		Conductor Size		mm ²	95	120	150	185	240	300
Diameter	Over Lead Sheath			mm	62.97	65.28	67.38	72.17	78.92	84.34
	Over Serving	Steel tape armoured served		mm	76.48	78.79	80.89	81.68	92.43	95.85
		Single wire armoured served		mm	79.58	81.89	83.99	88.78	95.53	100.95
Drum Dimensions	Flange		mm	2680	2480	2680	2680	2680	2880	2880
	Width		mm	1100	1100	1250	1250	1250	1340	1340
Cable mass	Copper conductors	Steel tape armoured served	kg/km	14660	16045	17030	19340	19340	22975	25961
		Single wire armoured served	kg/km	16560	17930	19560	21930	25345	25345	29060
	Aluminium conductors	Steel tape armoured served	kg/km	13305	13705	14105	15430	18305	18305	20095
		Single wire armoured served	kg/km	14705	15590	16635	18300	20675	20675	23190
Despatch mass	Copper conductors		kg/300 m	5730	6140	6630	7585	7905	7905	9560
	Aluminium conductors		kg/300 m	5170	5440	5750	5490	6505	6505	7040

Electrical Data

		Conductor Size		mm ²	95	120	150	185	240	300
Capacitance C _i			nF/km	283	313	339	367	410	410	456
	Reactance X _i		ohms/km	0.126	0.121	0.116	0.113	0.107	0.107	0.103
A.C. Resistance	Copper conductors		ohms/km	0.2315	0.1838	0.1493	0.1198	0.0919	0.0919	0.0742
	Aluminium conductors		ohms/km	0.3848	0.3044	0.2481	0.1978	0.1512	0.1512	0.1215
Impedance	Copper conductors		ohms/km	0.2636	0.2198	0.1893	0.1644	0.1412	0.1412	0.1271
	Aluminium conductors		ohms/km	0.4046	0.3274	0.2742	0.2277	0.1856	0.1856	0.1596
Maximum Sustained Current	Ground	Copper conductors	A	230	260	290	325	375	375	415
		Aluminium conductors	A	180	205	230	255	295	295	335
Rating	Duct	Copper conductors	A	200	225	255	280	325	325	360
		Aluminium conductors	A	160	180	200	225	260	260	290
Rating	Air	Copper conductors	A	245	280	315	355	425	425	475
		Aluminium conductors	A	195	225	250	285	335	335	380

3,3 / 3,3kV 3 Core Belted Cables

Fully impregnated (heavy duty) or drained (general purpose) armoured and served to SANS 97

Table
22

Dimensional Data

		Conductor Size												mm ²
		16	25	35	50	70	95	120	150	185	240	300	400*	
Diameter	Over Lead Sheath	23.12	24.24	25.67	28.20	31.25	34.07	36.48	39.09	42.15	47.07	51.29	57.14	
	Steel tape armoured served	35.83	36.95	38.38	41.71	44.76	47.58	49.99	52.60	55.66	60.58	64.8	70.65	
	Single wire armoured served	36.63	37.75	39.18	42.71	45.76	48.58	50.99	53.60	57.96	62.88	67.1	72.95	
Drum Dimensions	Flange	1250	1250	1250	1530	1530	1530	1680	1680	1880	2080	2080	2180	
	Width	950	950	1050	980	980	1070	980	1070	1070	1000	1100	1105	
Cable mass	Copper conductors	3150	4000	4460	5145	6150	7280	8380	9680	11175	13495	16040	19880	
	Single wire armoured served	3370	3800	4250	5460	6525	7710	8830	10185	12330	14780	17465	21295	
	Steel tape armoured served	2840	3535	3810	4220	4865	5530	6155	6890	7755	9070	10520	12500	
	Single wire armoured served	3060	3335	3600	4535	5240	5960	6605	7395	8910	10355	11945	13915	
Despatch mass	Copper conductors	1175	1300	1450	1905	2225	2590	2960	3370	4085	4865	5670	6890	
	Aluminium conductors	1080	1160	1255	1625	1840	2065	2295	2535	3060	3535	4015	4675	

Electrical Data

		Conductor Size												mm ²
		16	25	35	50	70	95	120	150	185	240	300	400*	
Capacitance C _i	Capacitance C _i	262	294	328	371	419	469	513	560	610	678	743	856	
	Reactance X _i	0.109	0.099	0.095	0.091	0.088	0.083	0.0813	0.079	0.078	0.076	0.075	0.073	
A.C. Resistance	Copper conductors	1.4213	0.8986	0.6478	0.4786	0.3317	0.2392	0.1900	0.1545	0.1240	0.0952	0.0769	0.0597	
	Aluminium conductors	2.3719	1.4903	1.0780	0.7962	0.5504	0.3978	0.3148	0.2565	0.2046	0.1565	0.1258	0.0956	
	Copper conductors	1.4255	0.9040	0.6547	0.4872	0.3432	0.2531	0.2065	0.1737	0.1466	0.1217	0.1072	0.0944	
Impedance	Aluminium conductors	2.3744	1.4935	1.0822	0.8014	0.5574	0.4063	0.3250	0.2685	0.2190	0.1739	0.1463	0.1204	
	Copper conductors	A	115	140	170	205	245	280	315	355	405	455	480	
	Aluminium conductors	A	90	110	130	160	195	220	250	280	325	365	385	
Maximum Sustained Current	Copper conductors	A	100	120	145	175	210	240	265	300	345	385	415	
	Aluminium conductors	A	60	80	95	110	135	190	210	240	280	320	330	
Rating	Copper conductors	A	85	115	140	170	210	255	335	380	445	505	535	
	Aluminium conductors	A	65	90	110	135	165	200	265	305	360	410	425	

*Not covered by SANS 97

3,8 / 6,6 kV 3 Core Belted Cables

Fully impregnated (heavy duty) or drained (general purpose) armoured and served to SANS 97

Table
23

Dimensional Data

		Conductor Size												mm ²
		16	25	35	50	70	95	120	150	185	240	300	400*	
Diameter	Over Lead Sheath	26.35	27.34	28.77	31.32	34.33	37.17	39.56	42.19	45.25	50.20	54.19	60.05	
	Steel tape armoured served	39.06	40.05	41.48	44.83	47.84	50.68	53.07	55.70	58.76	63.71	67.70	73.56	
	Over Serving	39.86	40.85	42.28	45.83	48.84	51.68	54.07	58.00	60.06	66.01	70.00	75.86	
Drum Dimensions	Flange	1250	1250	1530	1530	1530	1680	1680	1880	1880	2080	2080	2180	
	Width	1050	1050	980	980	1070	1070	1070	1070	1070	1100	1100	1340	
Cable mass	Copper conductors	3830	4185	4600	5680	6710	7890	9030	10335	11860	14230	16655	20370	
	Aluminium conductors	3980	4340	4170	6035	7130	8350	9500	11480	13060	15620	18140	21995	
	Steel tape armoured served	3520	3720	3950	4750	5410	6140	6810	7565	8440	9790	11135	12990	
	Single wire armoured served	3670	3875	4120	5110	5830	6600	7280	8690	9640	11180	12620	14615	
Despatch mass	Copper conductors	1370	1480	1700	2075	2415	2820	3165	3830	4300	5115	5870	7100	
	Aluminium conductors	1275	1340	1500	1800	2025	2295	2500	2990	3775	3785	4215	4885	

Electrical Data

		Conductor Size												mm ²
		16	25	35	50	70	95	120	150	185	240	300	400*	
Capacitance C _i	Capacitance C _i	224	250	277	311	349	389	423	459	498	551	602	676	
	Reactance X _i	0.121	0.109	0.104	0.100	0.096	0.089	0.087	0.085	0.083	0.080	0.079	0.077	
A.C. Resistance	Copper conductors	1.4213	0.8986	0.6478	0.4786	0.3317	0.2392	0.1899	0.1543	0.1239	0.0951	0.0767	0.0600	
	Aluminium conductors	2.3719	1.4090	1.0780	0.7962	0.5504	0.3978	0.3147	0.2565	0.2045	0.1564	0.1257	0.0960	
	Copper conductors	1.4264	0.9052	0.6561	0.4888	0.3451	0.2553	0.2089	0.1762	0.1493	0.1245	0.1100	0.0970	
Impedance	Aluminium conductors	2.3750	1.4942	1.0830	0.8024	0.5586	0.4077	0.3265	0.2702	0.2208	0.1759	0.1484	0.1230	
	Copper conductors	90	120	145	175	210	255	290	325	365	420	470	485	
Maximum Sustained Current	Aluminium conductors	70	95	115	135	165	195	225	255	290	330	370	390	
	Copper conductors	75	105	125	150	180	215	245	275	310	365	405	420	
Rating	Aluminium conductors	60	80	95	115	140	170	190	215	245	285	320	335	
	Copper conductors	85	120	145	180	220	265	310	355	405	470	535	550	
	Aluminium conductors	65	95	115	140	170	210	240	275	315	370	420	440	

*Not covered by SANS 97

6,6 / 6,6 kV 3 Core Belted Cables

Fully impregnated (heavy duty) or drained (general purpose) armoured and served to SANS 97

Table
24

Dimensional Data

		Conductor Size												mm ²	Conductor Size													
Diameter	Over Serving	Over Lead Sheath	16	25	35	50	70	95	120	150	185	240	300	400*	mm	Over Serving	16	25	35	50	70	95	120	150	185	240	300	400*
		Steel tape armoured served	28.53	29.75	31.37	33.90	36.93	39.75	42.16	44.57	47.63	52.78	56.79	62.63		mm	Steel tape armoured served	41.24	42.43	44.08	47.41	50.44	53.26	55.67	58.08	61.14	66.29	80.3
Drum Dimensions		Single wire armoured served	42.04	43.23	45.88	48.41	51.44	54.26	57.97	60.89	63.95	68.59	75.16	81.00	mm	Flange	1250	1530	1530	1530	1680	1680	1680	1880	1880	2080	2080	2180
		Width	1050	980	980	1070	980	1070	1070	1070	1070	1100	1100	1100	mm	Width	4000	4535	5110	6220	7300	8450	9665	10820	12350	15005	17490	21240
Cable mass	Copper conductors	Steel tape armoured served	4280	4715	5710	6620	7780	9005	10825	12065	13710	16435	19615	23465	kg/km	Steel tape armoured served	4280	4715	5710	6620	7780	9005	10825	12065	13710	16435	19615	23465
	Aluminium conductors	Steel tape armoured served	3675	4075	4465	5295	6005	6695	7450	8025	8930	10575	11970	13860	kg/km	Steel tape armoured served	3675	4075	4465	5295	6005	6695	7450	8025	8930	10575	11970	13860
		Single wire armoured served	3955	4260	5070	5695	6495	7270	8605	9275	10290	12005	14095	16085	kg/km	Single wire armoured served	3955	4260	5070	5695	6495	7270	8605	9275	10290	12005	14095	16085
Despatch mass	Copper conductors		1545	1680	1980	2265	2645	3020	3635	4005	4585	5360	6430	7540	kg/300 m	Copper conductors	1545	1680	1980	2265	2645	3020	3635	4005	4585	5360	6430	7540
	Aluminium conductors		1450	1545	1785	1985	2260	2500	2965	3170	3515	4030	4775	5325	kg/300 m	Aluminium conductors	1450	1545	1785	1985	2260	2500	2965	3170	3515	4030	4775	5325

Electrical Data

		Conductor Size												mm ²	Conductor Size													
A.C. Resistance	Reactance X _L	Capacitance C ₁	16	25	35	50	70	95	120	150	185	240	300	400*	nF/km	Capacitance C ₁	16	25	35	50	70	95	120	150	185	240	300	400*
		ohms/km	0.122	0.110	0.105	0.096	0.096	0.090	0.088	0.086	0.084	0.081	0.079	0.077		ohms/km	0.122	0.110	0.105	0.096	0.096	0.090	0.088	0.086	0.084	0.081	0.079	0.077
Impedance	Ground	Copper conductors	1.4213	0.899	0.6480	0.3316	0.3316	0.2392	0.1899	0.1543	0.1239	0.0951	0.0767	0.0600	ohms/km	Aluminium conductors	2.3719	1.4902	1.0780	0.5504	0.5504	0.3978	0.3147	0.2565	0.2045	0.1564	0.1257	0.0996
		Copper conductors	1.4265	0.9053	0.6562	0.3453	0.3453	0.2555	0.2092	0.1762	0.1495	0.1248	0.1103	0.0974	ohms/km	Aluminium conductors	2.3750	1.4942	1.0830	0.5586	0.5586	0.4077	0.3265	0.2702	0.2208	0.1759	0.1484	0.1227
Maximum Sustained Current Rating	Duct	Copper conductors	A	85	115	140	200	200	240	275	310	400	445	475	A	Copper conductors	A	90	105	155	155	190	215	240	270	315	355	380
		Aluminium conductors	A	65	90	120	175	175	210	235	265	300	350	390	410	A	Aluminium conductors	A	75	100	120	175	175	210	235	265	300	350
Air	Air	Copper conductors	A	60	80	95	135	135	160	185	205	275	310	330	A	Aluminium conductors	A	60	80	95	135	135	160	185	205	235	275	310
		Aluminium conductors	A	85	115	140	210	210	255	290	330	375	440	500	530	A	Copper conductors	A	85	115	140	210	210	255	290	330	375	440
		Aluminium conductors	A	65	90	105	160	160	195	225	255	345	395	425	A	Aluminium conductors	A	65	90	105	160	160	195	225	255	345	395	425

*Not covered by SANS 97

6,35 / 11 kV 3 Core Belted Cables

Fully impregnated (heavy duty) or drained (general purpose) armoured and served to SANS 97

Table 25

Dimensional Data

		Conductor Size												mm ²
		25	35	50	70	95	120	150	185	240	300	400*		
Diameter	Over Lead Sheath	35.27	37.53	40.23	40.68	43.52	45.71	48.32	51.4	55.85	60.54	66.39		
	Over Serving	48.78	51.04	53.74	54.19	57.03	59.22	61.83	64.91	69.36	74.05	79.90		
	Single wire armoured served	49.78	52.04	54.74	55.19	59.33	61.52	64.13	67.21	74.22	78.91	84.76		
Drum Dimensions	Flange	1530	1680	1680	1680	1880	1880	2080	2080	2280	2480	2180		
	Width	1070	1070	1070	1070	1070	1070	1000	1100	1100	1100	1705		
Cable mass	Copper conductors	5990	6450	7320	8130	9360	10370	11760	13335	15970	18555	22410		
	Single wire armoured served	6310	6910	7810	8680	10570	11660	13100	14785	18015	20835	24805		
	Aluminium conductors	5515	5795	6425	6830	7610	8150	8970	9915	11530	13035	15030		
	Single wire armoured served	5835	6255	6915	7380	8220	9440	10310	11365	13575	15315	17425		
Despatch mass	Copper conductors	2170	2390	2660	2920	3555	3880	4360	4865	5950	6925	7945		
	Aluminium conductors	2025	2190	2390	2530	3030	3215	3520	3840	4620	5270	5730		

Electrical Data

		Conductor Size												mm ²
		25	35	50	70	95	120	150	185	240	300	400*		
Capacitance C ₁	Capacitance C ₁	218	238	260	283	312	336	362	389	426	462	515		
	Reactance X ₁	0.127	0.121	0.115	0.108	0.101	0.098	0.095	0.092	0.090	0.086	0.084		
A.C. Resistance	Copper conductors	0.8700	0.6272	0.4634	0.3211	0.2315	0.1838	0.1494	0.1198	0.0919	0.0741	0.0590		
	Aluminium conductors	1.4419	1.0430	0.7703	0.5325	0.3848	0.3044	0.2481	0.1978	0.1512	0.1215	0.0953		
	Copper conductors	0.8792	0.6387	0.4775	0.3877	0.2524	0.2081	0.1769	0.1513	0.1283	0.1139	0.1030		
Impedance	Aluminium conductors	1.4475	1.0500	0.7789	0.5433	0.3978	0.3197	0.2656	0.2183	0.1753	0.1491	0.1270		
	Copper conductors	105	125	150	200	240	270	305	340	395	440	490		
Maximum Sustained Current	Aluminium conductors	80	100	115	155	185	210	235	265	310	345	395		
	Copper conductors	95	1100	130	170	205	230	260	295	340	375	425		
Rating	Aluminium conductors	70	85	100	130	160	180	200	230	265	300	340		
	Copper conductors	105	125	150	205	250	290	380	375	440	495	565		
	Aluminium conductors	80	100	120	160	195	225	255	290	350	390	455		

*Not covered by SANS 97

11 / 11 kV 3 Core Belted Cables

Fully impregnated (heavy duty) or drained (general purpose) armoured and served to SANS 97

Table
26

Dimensional Data

		Conductor Size												mm ²						
		25	35	50	70	95	120	150	185	240	300	400*								
Diameter	Over Lead Sheath	39.71	42.19	44.87	45.34	48.16	50.57	53.18	56.26	61.18	65.20	71.30								
	Steel tape armoured served	53.22	55.70	58.38	58.85	61.67	64.08	66.69	69.77	74.69	78.71	84.54								
	Single wire armoured served	54.22	56.70	59.38	61.15	63.97	66.38	68.99	74.63	79.55	83.57	89.40								
Drum Dimensions	Flange	1680	1680	1880	1880	2080	2080	2080	2280	2480	2480	2680								
	Width	1070	1070	1070	1070	1000	1100	1100	1100	1100	1250	1250								
Cable mass	Copper conductors	6620	7470	8425	9145	10470	11715	13145	14885	17480	20025	23980								
	Single wire armoured served	7150	8025	9030	10415	11820	13110	14650	16970	19750	22425	26580								
	Steel tape armoured served	6145	6815	7530	7845	8720	9495	10355	11465	13040	14505	16600								
	Single wire armoured served	6675	7370	8135	9115	10070	10890	11860	13550	15310	16905	19200								
Despatch mass	Copper conductors	2460	2725	3095	3510	3975	4360	4825	5640	6600	7410	8480								
	Aluminium conductors	2320	2530	2825	3120	3450	3695	3990	4610	5270	5760	6260								

Electrical Data

		Conductor Size												mm ²						
		25	35	50	70	95	120	150	185	240	300	400*								
	Capacitance C _i	204	222	242	256	280	301	324	347	379	410	455								
	Reactance X _i	0.125	0.119	0.113	0.108	0.101	0.098	0.095	0.092	0.089	0.086	0.084								
A.C. Resistance	Copper conductors	0.8700	0.6272	0.4634	0.3211	0.2315	0.1838	0.1494	0.1198	0.0919	0.0741	0.0591								
	Aluminium conductors	1.4419	1.0430	0.7703	0.5325	0.3848	0.3044	0.2481	0.1978	0.1512	0.1215	0.0953								
	Copper conductors	0.8789	0.6383	0.4770	0.3387	0.2524	0.2081	0.1769	0.1513	0.1277	0.1139	0.1026								
Impedance	Aluminium conductors	1.4475	1.0500	0.7789	0.5433	0.3978	0.3197	0.2656	0.2183	0.1753	0.1491	0.1269								
	Copper conductors	100	120	145	185	225	255	285	325	370	420	470								
	Aluminium conductors	80	95	110	145	175	200	225	255	295	330	375								
Maximum Sustained Current	Copper conductors	90	105	125	160	195	225	250	285	325	365	410								
	Aluminium conductors	70	85	100	125	150	175	195	220	255	290	330								
Rating	Copper conductors	100	120	145	190	235	265	305	350	405	460	530								
	Aluminium conductors	75	95	110	150	180	210	235	275	320	365	420								

*Not covered by SANS 97

6,35 / 11 kV 3 Core Screened Cables

Fully impregnated (heavy duty) or drained (general purpose) armoured and served to SANS 97

Table
27

Dimensional Data

		Conductor Size												mm ²
		25	35	50	70	95	120	150	185	240	300	400*		
Diameter	Over Lead Sheath	36.65	38.91	41.61	41.58	44.99	47.19	49.80	52.88	57.33	62.01	66.72		
	Steel tape armoured served	50.16	52.42	55.12	55.09	58.50	60.70	63.31	66.39	70.84	75.52	80.23		
	Single wire armoured served	51.16	53.42	56.12	56.09	60.80	63.00	65.61	68.69	73.94	78.62	85.09		
Drum Dimensions	Flange	1680	1680	1680	1680	1880	2080	2080	2080	2280	2280	2180		
	Width	980	1070	1070	1070	1070	1000	1100	1100	1100	1255	1705		
Cable mass	Steel tape armoured served	6165	6630	7525	8260	9615	10585	12015	13585	16245	18890	22600		
	Single wire armoured served	6485	7130	8040	8780	10825	11875	13415	15030	18205	21035	24920		
	Aluminium conductors	5695	5985	6645	6960	7865	8365	9225	10165	11805	13370	15220		
	Single wire armoured served	6015	6485	7160	7480	9075	9655	10625	11610	13765	15515	17540		
Despatch mass	Copper conductors	2260	2455	2730	2950	3630	3990	4455	4940	6010	6920	7980		
	Aluminium conductors	2120	2260	2465	2560	3105	3325	3615	3910	4675	5265	5765		

Electrical Data

		25	35	50	70	95	120	150	185	240	300	400*
Capacitance C _i	nF/km	272	302	334	371	414	452	493	535	594	651	734
	Reactance X _i	0.132	0.126	0.12	0.112	0.104	0.101	0.098	0.095	0.091	0.089	0.086
A.C. Resistance	Copper conductors	0.8700	0.6272	0.4633	0.3211	0.2315	0.1838	0.1493	0.1198	0.0919	0.0741	0.059
	Aluminium conductors	1.4419	1.0430	0.7703	0.5325	0.3848	0.3044	0.2481	0.1978	0.1512	0.1215	0.0952
	Copper conductors	0.8800	0.6396	0.4785	0.3400	0.2539	0.2097	0.1786	0.1531	0.1296	0.1158	0.1044
Impedance	Aluminium conductors	1.1179	1.0506	0.7796	0.5441	0.3987	0.3207	0.2667	0.2196	0.1767	0.1506	0.1284
	Copper conductors	A	115	135	160	200	240	305	340	395	440	490
	Aluminium conductors	A	90	105	125	155	190	215	235	270	310	395
Maximum Sustained Current	Copper conductors	A	100	120	140	170	205	260	295	340	380	425
	Aluminium conductors	A	75	90	110	135	160	205	230	265	300	340
Rating	Copper conductors	A	115	140	165	210	260	330	375	440	500	565
	Aluminium conductors	A	90	110	130	165	200	260	295	345	395	450

*Not covered by SANS 97

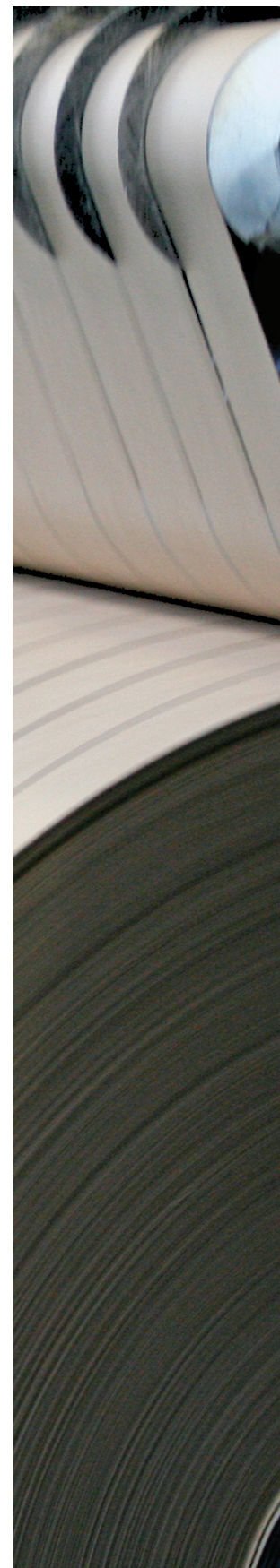
Derating Factors

For Installation Conditions other than Standard

Variations of depth of laying - single and multicore cables				
Depth of laying	Direct in ground		In single way ducts	
m	Up to 300mm ²	Above 300mm ²	Single core	Multicore
0,5	1,15	1,15	1,15	1,15
0,6	1,10	1,10	1,10	1,10
0,8	1,00	1,00	1,00	1,00
1,0	0,98	0,97	0,98	0,99
1,25	0,96	0,95	0,95	0,97
1,5	0,95	0,94	0,93	0,96
2,0	0,92	0,90	0,90	0,94

Variations of thermal resistivity of soil - single and multicore cables								
Conductor Size	Direct in ground				In single way ducts			
	Soil resistivity, K.m/W				Soil resistivity, K.m/W			
mm ²	1,0	1,5	2,0	2,5	1,0	1,5	2,0	2,5
25	1,06	0,93	0,85	0,78	1,03	0,96	0,91	0,86
35	1,06	0,93	0,85	0,78	1,03	0,96	0,90	0,85
50	1,07	0,93	0,84	0,77	1,03	0,96	0,90	0,85
70	1,07	0,93	0,84	0,77	1,03	0,96	0,90	0,85
95	1,07	0,93	0,84	0,77	1,03	0,95	0,89	0,84
120	1,07	0,92	0,83	0,76	1,03	0,95	0,89	0,83
150	1,07	0,92	0,83	0,76	1,04	0,95	0,89	0,83
185	1,07	0,92	0,82	0,75	1,04	0,95	0,88	0,82
240	1,07	0,92	0,82	0,75	1,04	0,95	0,88	0,82
300	1,07	0,92	0,82	0,74	1,04	0,95	0,87	0,82
400	1,07	0,91	0,81	0,74	1,04	0,94	0,86	0,81
500	1,08	0,91	0,80	0,72	1,05	0,94	0,84	0,78
630	1,08	0,91	0,79	0,72	1,05	0,94	0,84	0,78
800	1,08	0,90	0,79	0,71	1,06	0,93	0,83	0,77
1000	1,08	0,90	0,79	0,71	1,06	0,93	0,83	0,76

Ground Temperature derating factors					
Maximum sustained conductor temperature °C	Ground Temperature °C				
	25	30	35	40	45
70	1,00	0,95	0,90	0,85	0,80
80	1,00	0,96	0,92	0,88	0,83

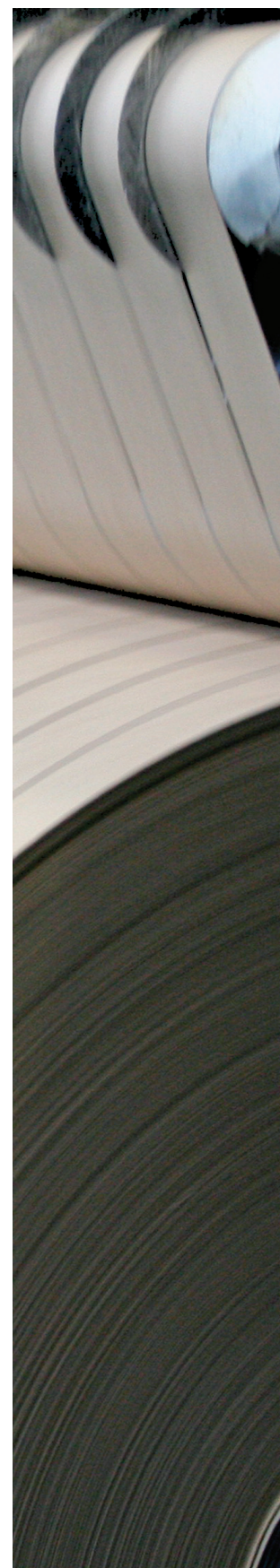


Derating Factors

For Installation Conditions other than Standard

Derating factors for grouping of multicore cables in horizontal formation in ground or ducts									
No. of cables in group	In ground - Axial spacing m					In ducts - Axial spacing m			
	Touching	0,15	0,30	0,45	0,60	Touching	0,30	0,45	0,60
2	0,80	0,85	0,89	0,90	0,92	0,88	0,91	0,93	0,94
3	0,69	0,75	0,80	0,84	0,86	0,80	0,84	0,87	0,89
4	0,63	0,70	0,77	0,80	0,84	0,75	0,81	0,84	0,87
5	0,57	0,66	0,73	0,78	0,81	0,71	0,77	0,82	0,85
6	0,55	0,63	0,71	0,76	0,80	0,69	0,75	0,80	0,84

Voltage Range	No. of circuits	Derating factors for Grouping of single core cables								
		Horizontal formation in single way ducts			Horizontal formation laid direct					
		Axial spacing m			Axial spacing of circuits m					
		Touching	0,45	0,60	Touching		0,15	0,30	0,45	0,60
Trefoil	Flat									
3,3 to 22kV	2	0,85	0,88	0,90	0,78	0,80	0,81	0,85	0,88	0,90
	3	0,75	0,80	0,93	0,66	0,69	0,71	0,76	0,80	0,83
	4	0,70	0,76	0,80	0,60	0,63	0,65	0,72	0,76	0,80
	5	0,67	0,73	0,77	0,55	0,58	0,61	0,68	0,73	0,77
	6	0,64	0,71	0,76	0,52	0,55	0,58	0,66	0,72	0,76
	7	0,62	0,70	0,75	0,49	0,52	0,55	0,63	0,70	0,74
	8	0,61	0,69	0,74	0,47	0,51	0,54	0,62	0,69	0,74
	9	0,59	0,68	0,73	0,45	0,49	0,52	0,61	0,68	0,73
	10	0,58	0,67	0,73	0,44	0,48	0,51	0,60	0,67	0,73
	11	0,58	0,66	0,72	0,43	0,46	0,49	0,59	0,67	0,72
	12	0,57	0,66	0,72	0,42	0,46	0,49	0,58	0,66	0,72
	33 kV	2	0,85	0,88	0,90	0,79	0,81	0,81	0,85	0,88
3		0,76	0,80	0,83	0,67	0,70	0,71	0,76	0,80	0,83
4		0,71	0,76	0,80	0,62	0,65	0,65	0,72	0,76	0,80
5		0,67	0,73	0,77	0,57	0,60	0,60	0,68	0,73	0,77
6		0,65	0,71	0,76	0,54	0,57	0,57	0,66	0,72	0,76
7		0,63	0,70	0,75	0,51	0,54	0,55	0,63	0,70	0,74
8		0,62	0,69	0,74	0,49	0,53	0,53	0,62	0,69	0,74
9		0,60	0,68	0,73	0,47	0,51	0,52	0,61	0,68	0,73
10		0,60	0,67	0,73	0,46	0,50	0,51	0,60	0,67	0,73
11		0,59	0,66	0,72	0,44	0,49	0,49	0,59	0,66	0,72
12		0,58	0,66	0,72	0,44	0,48	0,49	0,58	0,66	0,72



Grouping of cables in air

Paper Insulated Cables

Cables may be grouped in air without derating provided that:

1. Horizontal formation:

- i) The clearance is not less than 6 times the overall diameter of the cable or 150mm, whichever is the least.

2. Vertical formation:

- i) The clearance from a supporting wall is not less than 20mm, and;
- ii) The vertical clearance between cables is not less than 150mm, and;
- iii) If the number of cables exceeds four they are installed in a horizontal plane.

Derating factors for variations in ambient air temperature				
Max. Sustained conductor temperature °C	Air Temperature °C			
	30	35	40	45
70	1,00	0,94	0,87	0,79
80	1,00	0,95	0,89	0,79

Short Circuit Ratings of Cables

Short circuit conditions do not lend themselves readily to rigid treatment. The variables are known but their interaction is extremely complex. In the case of armoured, lead sheathed cables with conductors greater than 240mm² in particular, earth fault currents may increase the lead sheath temperatures to above tolerable limits. An absolute sheath temperature of 170°C (below the melting point of jointing metal) should not be exceeded. The maximum permissible conductor temperature is 160°C for conductors with soldered lugs and ferrules and 250°C for conductors with crimped or welded lugs and ferrules. In calculating the factors for short circuit ratings given for guidance in the table below, it was assumed that symmetrical 3 phase short circuit currents occur under full load conditions, and that adiabatic conditions prevail, i.e. no heat is lost from the conductors during the fault conditions.

Factors for determination of one second short circuit ratings of cables kA/mm ²					
Conductor Material	Sustained conductor inception temperature				
	160°C	70°C		80°C	
		Copper	Aluminium	Copper	Aluminium
Maximum Permissible Conductor Temperature	160°C	0,115	0,076	0,107	0,071
	250°C	0,154	0,101	0,148	0,098

Note

For times other than 1 second, divide the calculated 1 second short circuit current rating by the square root of the actual time in seconds for which the short circuit rating is required.

Example

120mm², 11kV screened 3 core copper conductor cable with soldered ferrules or lugs

(maximum permissible conductor temperature = 160°C).

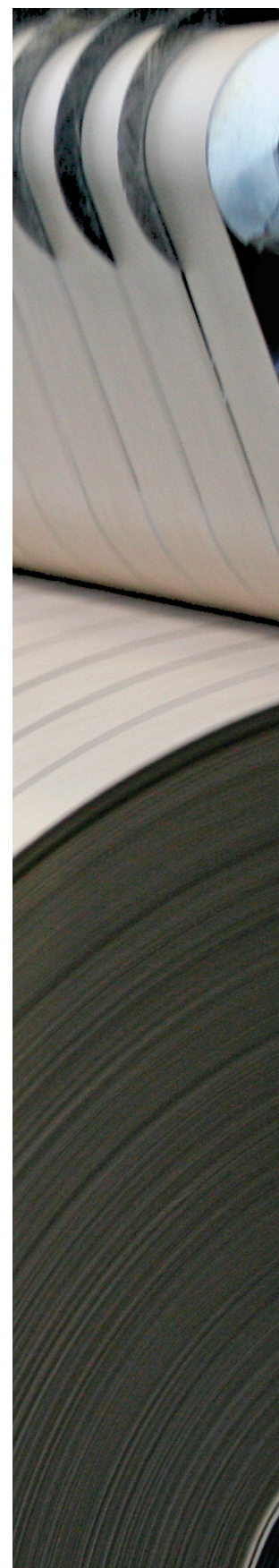
Temp. of conductors at inception of short circuit = 70°C

1 second short circuit current rating = 120mm² x 0,115 kA/mm²

= 13,80 kA

2 second short circuit current rating = $\frac{13,80 \text{ kA}}{\sqrt{2}}$

= 9,76 kA



Lead Sheathed Cables Subject to Vibration

Lead sheathed cables to be installed in positions subject to moderate vibration, viz. bridges, tunnels, factories, mine shafts etc, should have sheaths of Lead alloy E, and should preferably be armoured.

Corrosion of Lead Sheaths

Some installation conditions may be aggressive to lead sheaths which are protected only with conventional bitumen impregnated textile bedding and / or serving. This condition may occur in soils that are otherwise relatively inert. Heavy sporadic rain in a predominately dry area tends to accumulate in the disturbed terrain of a cable trench. Subsequent evaporation concentrates any dissolved salts and organic compounds, which together with differential aeration in contact with lead sheath, can supply the electrolyte and cause a galvanic corrosion of the lead. Presence of earth currents arising from local arc furnaces or DC traction may further complicate the process of corrosion.

When this condition is known to exist, as may be evidenced by relatively frequent replacement of metal water pipes in the area, it is recommended that the conventional bedding and / or serving be replaced by an extruded PVC sheath which is fully protective for most conditions of installation. Graphite coated PVC sheaths are available when it is intended to carry out regular (bi-annual) sheath integrity tests on the installed cables. When such graphite coated PVC sheathed cables are tested the leakage current flowing through the sheath during the application of 10 kV DC for one minute shall be typically less than 5 mA/km.

Some installation conditions may be aggressive to lead sheaths which are protected only with conventional bitumen impregnated textile bedding and / or serving. This condition may occur in soils that are otherwise relatively inert. Heavy sporadic rain in a predominately dry area tends to accumulate in the disturbed terrain of a cable trench. Subsequent evaporation concentrates any dissolved salts and organic compounds, which together with differential aeration in contact with lead sheath, can supply the electrolyte and cause a galvanic corrosion of the lead. Presence of earth currents arising from local arc furnaces or DC traction may further complicate the process of corrosion.

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Vertical Installations

The problem of drainage of impregnant from fully impregnated cables installed vertically or on steep gradients has been significantly reduced by the use of non-draining compounds. Non-draining impregnants are designed to remain solid at normal operating temperatures. Nevertheless, cables so installed which are likely to be subjected to repeated overloads, are recommended to be of the drained type. In this design a full impregnating cycle is applied which consists of a period of drying under heat and vacuum followed by full impregnation under heat and pressure. Before exposing the cable to the atmosphere, the surplus impregnant is withdrawn during a further period of heat and vacuum.



A drained type cable may be subjected to short circuit conditions, resulting in a maximum conductor temperature of 160°C without significant downward movement of the dielectric. Extra dielectric thickness is applied to minimize the dielectric stress in the drained installation.

Installation of Cables

a) Low Ambient Temperatures

Unless precautions have been taken to heat the cables above 10°C for at least 24 hours prior to installation, cables should not be installed at temperatures lower than this. In the field this may be achieved by the judicious use of heaters around the cable drums under a tarpaulin shield.

b) Handling of Drums

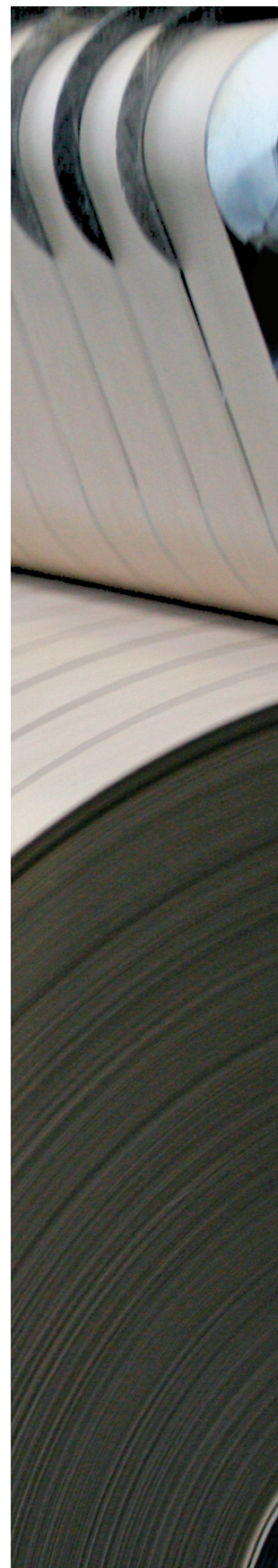
The drum of cable should be properly mounted on cable jacks or a cable trailer with a support bar of adequate strength relative to the drum width and mass and also to the distance between the bar supports. Collars must be worn to avoid axial creeping of the drum during drum rotation. If the inside end of the cable is protected by a metal covering, this and any securing ties must be removed before paying off the cable. The drum should not be allowed to overwind during withdrawal of the cable, since dangerous kinks may be formed and the creation of loose convolutions may cause the inner end to creep out of the cable drum hole. This creep must be allowed to take place.

c) Minimum Bending Radii

Cable bending should be done slowly and carefully, and precautions mentioned in (a) above should be followed when applicable. Electric cables should not be bent to radii less than those derived from the table below.

Rated Voltage	≤ 11kV	22/33kV
Single Core	20 x d	25 x d
Multi Core	12 x d	15 x d

d = overall diameter of cable (mm)



Handling and Installation of Cables

Refer to SANS 10198 "The selection, handling and installation of electric power cables of rating not exceeding 33kV" In particular, care must be taken in handling and transporting cables, since damage may seriously impair subsequent cable performance and life.

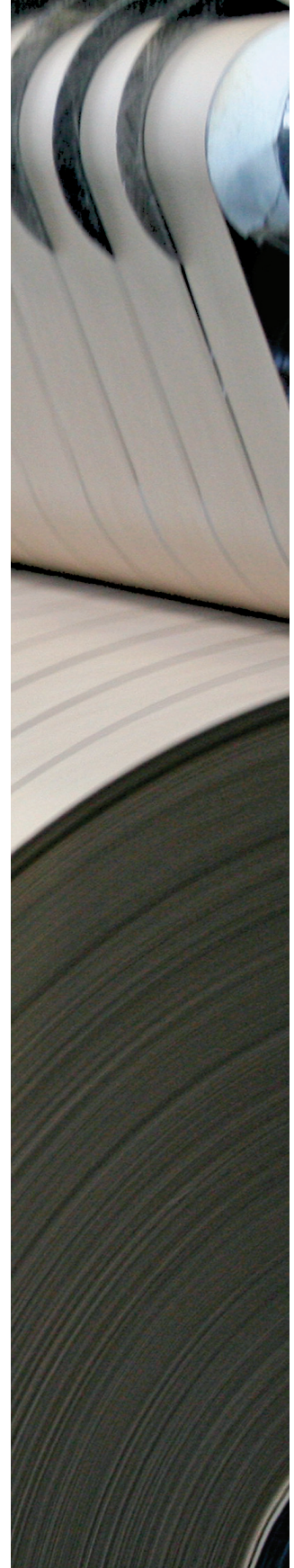
Transfer of Drums of Cable

Under no circumstances should a drum of cable be dropped during transport to or unloading on site. Rolling of a drum of cable must always be in the direction of the arrow marked on the flange, otherwise loose convolutions of the cable develop, which may result in damage to the cable during subsequent pay off.

Shaft Cables

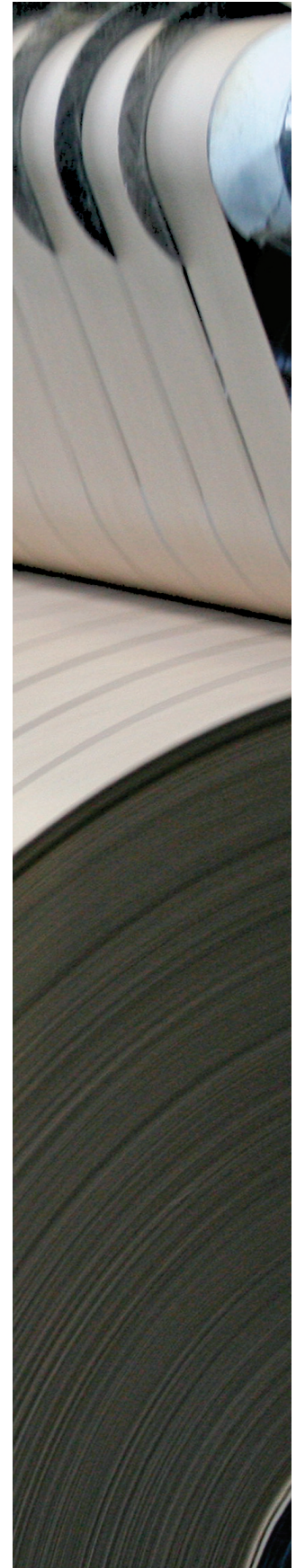
Shaft cables are often exposed to extreme conditions, being installed vertically, exposed to moist corrosive atmosphere, and susceptible to mechanical abuse. In order to enhance the cables performance under these conditions, special design measures are taken, these include:

1. Process changes to ensure impregnating compound cannot migrate. This provides the cable with improved drainage performance at operating temperature.
2. Employing a fully waterblocked, helically applied, galvanised steel wire armour layer over the lead. This provides mechanical protection against damage caused by rockfalls and the vibration caused by air buffeting from high speed skips passing in close proximity to the cables. A suitable water blocking compound encapsulates these wires to retard corrosion and stop free water being piped to joints, terminations or ancillary electrical equipment.
3. The whole cable is sheathed in a flame retardant, low halogen PVC sheath. This acts as an initial fire and mechanical barrier.



South African National Specifications:

SANS 97	Electric Cables Impregnated paper insulated metal-sheathed cables for rated voltages 3,3 kV to 19/33 kV.
SANS 182	Copper and Aluminium overhead conductors.
SANS 1339	Electric Cables Cross-linked polyethylene (XLPE) insulated cables for voltages from 3,8/6, 6 kV to 19/33 kV.
SANS 1418	Aerial bundled conductor systems.
SANS 1507	Electric Cables with extruded solid dielectric insulation for fixed installations, 300/500V to 1900/3300V.
SANS 1520	Flexible electric trailing cables for use on the mines, 640/1100V to 19/33 kV.
SANS 1574	Electric Cables Flexible cords and flexible cables to 600/1000V.
SANS 1576	Electric Cables single core arc welding cables.
SANS 1713	Electric Cables medium voltage aerial bundled conductors for voltages from 3,8/6,6kV to 19/33kV



Product Range

Our Services are Wide but Specialised



The Aberdare Group's product range and services are wide but specialised. Tried and tested and carrying South African Bureau of Standards (SABS) marks and complying with International Standards, we stand by our products.

Medium Voltage XLPE Cables (6.6 kV to 33 kV)

- Individually Screened
- Copper or Aluminium Conductors up to 300 mm² (3 core) & 1000 mm² (Single Core)

Paper Insulated Cables (6.6 kV to 33 kV)

- Screened or belted
- Fully impregnated, general purpose, heavy duty or drained
- Copper or Aluminium conductors up to 400 mm² (3 core) & 1000 mm² (single core)

High Voltage XLPE Insulated Cables (44 kV to 132 kV)

- Corrugated seamless Aluminium (CSA Sheath)
- Copper or aluminium conductors up to 1000 mm² (single core)

Elastomeric Cables (300/500 V to 19/33 kV)

- Flexible Cable (Types HO5 RN-F, HO7 RN-F)
- General Welding Cable
- Mining Trailing Cable (Up to 33 kV)

Overhead Aluminium Conductors

- AAC (All Aluminium Conductors)
- AAAC (All Aluminium Alloy Conductors)
- ACSR (Aluminium Conductor Steel Reinforced)
- Hard Drawn Copper

General Wire Insulated & Bare Copper Wire (300/500 V & 600/1000 V)

- Surfix Cable
- Flat Twin and Earth Cable
- Cabtyre Cable

- Submersible Pump Cable
- Audio cord (Ripcord)
- Welding cable
- Panel Flex Cable
- Illumination Cable
- PVC Nitrile Panel Cable
- Nitrile Trailing Cable
- Bare Copper
- Single Core PVC 1 kV Cable
- Single Core XLPE PVC 3.3 kV Cable

Low Voltage Armoured Cables (600/1000 V & 1.9/3.3 kV)

- Bells and Mains Cable
- Multicore Cable
- Single Core Cable

Electrodac Cables (600/1000 V)

- Aerial Bundle Conductor (ABC) (LV & MV)
- Airdac SNE Cable
- Airdac CNE Cable
- SaferDac CNE and SNE Cables

Intermediate Voltage Cables (1.9/3.3 kV)

- Armadac Cable
- Farmadac Cable

Specialised Cables

- Solar PV Cable (1.5/1.5 kV)

Theft Prevention Technology

- Unique Cable and Conductor Marking



NOTICE TO THE USER OF ELECTRIC CABLE PRODUCTS MANUFACTURED BY ABERDARE CABLES:

- **“WARNING: Electrical equipment (including cable) and installations which form part of a facility, whether fixed, mobile or moveable are by nature inherently dangerous when energized with electrical power as contact with un-insulated or damaged components of such a facility may result in injury, loss of life and damage to property. Only qualified persons should attend to the installation of such electrical equipment, the maintenance thereof, and the repair of any faulty facilities which have an electrical component.”**
- Selection and Installation of the product must be carried out as per the applicable compulsory specifications by appropriately qualified persons and certified by a competent person so authorized by law prior to being put into service. All fixed electrical Low Voltage installations must have a valid Certificate of Compliance (COC)
- Low voltage electrical installations up to 600/1000V must conform to the compulsory specification SANS 10142-1 “The Wiring of Premises Part 1: Low voltage installations”
- SA Legislation determines that the User or Lessor is responsible for the safety of the electrical installation.
- All Medium Voltage installations above 1 kV must conform to the specification SANS 10198 “The Selection, Handling and installation of electric power cables of rating not exceeding 33 kV”, and where applicable SABS 10142-2 “The wiring of premises Part 2: Medium voltage installations above 1 kV a.c. and not exceeding 22kV a.c. and up to and including 3 000 kW installed capacity”.
- The following **Compulsory Safety Standards** are applicable to Electric Cables manufactured, imported and used in South Africa and no product may be used which does not comply to the applicable standard:
 - (VC 8075) SANS 1507: Electric Cables with solid dielectric insulation for fixed installations (300/500V to 1900/3300V)
 - (VC 8077) SANS 1339: Electric Cables Cross linked Polyethylene (XLPE) insulated cables for rated voltages 3,8/6,6 kV to 19/33 kV
 - (VC 8077) SANS 97: Electric Cables Impregnated paper insulated metal sheathed cables for rated voltages 3,3/3,3 kV to 19/33 kV
 - (VC8006) SANS 1574: Electric Flexible Cables with solid dielectric insulation.
- All cables manufactured to a compulsory safety standard must be clearly marked with the applicable SANS standard number as well as the Manufacturer's name.
- Aberdare Cables manufactures all Electric Cables made to Compulsory standards under the SABS Mark scheme. Products manufactured under the SABS mark scheme carries the wording “SABS” to show that the manufacturer is a licensed Mark Holder. The SABS Mark gives the user the assurance that the South African Bureau of Standards monitors the quality of the products which carries this mark and verifies the quality system used by Aberdare Cables to manufacture these products, on an ongoing basis.
- Compulsory specifications (VC's) may be downloaded for free from the SABS website www.sabs.co.za.
- The user of electric cable products has the right to take up any issue of concern with the **National Regulator of Compulsory Specifications** at +27(0)12 428 5000

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POSSIBLE SPECIFICATION CHANGES:

Aberdare's policy of continuous product improvement may result in changes to the finished product, the parameters of which may differ from the published parameters in this brochure. Aberdare reserves the right to change product specifications for time to time to effect improvements and/or enhancements and accepts no liability arising from any differences between the published parameters of this brochure and the finished product, unless by prior written agreement.

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