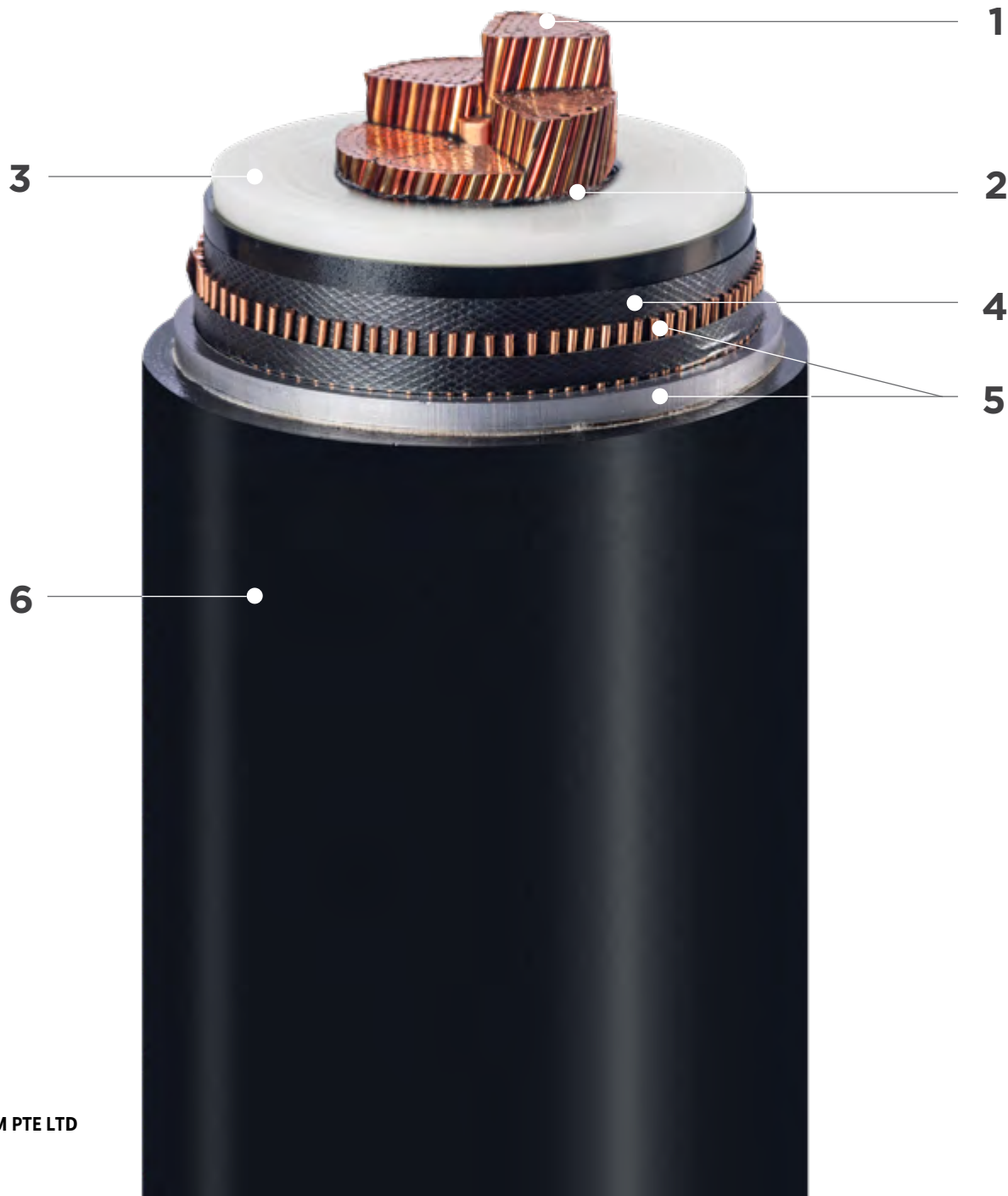


HIGH AND EXTRA
HIGH VOLTAGE
CABLES

Rated Voltages above
30 kV (36 kV) to 220 kV (245 kV).



CONSTRUCTION DETAILS:

1. Conductor:

Compacted round stranded or segmental stranded “Milliken” Copper or Aluminium conductors as per IEC 60228 – class 2. Milliken conductors are consisting of a maximum of seven identical segments with or without center core. This design is preferred for large cross sections generally from 1000 mm². Segments are insulated from each other by using swelling tapes. For Copper conductors with large cross-sections (exceeding 1600 mm²), segments may comprise Copper wires with enamelled Copper wires, with a ratio of two-thirds enamelled wires to one-third Copper wires. Enamelled wires are used to reduce skin effect and proximity effect as each wire is insulated from the others. Swelling tapes applied in and over the conductor to achieve water tightness.

2. Conductor Screen:

An extruded layer of semi-conducting compound applied over the conductor surface to reduce stress points caused by the electric field generated by the conductor.

3. Insulation:

An extruded layer of Cross Linked Polyethylene (XLPE) with maximum operating temperature 90 °C.

4. Insulation Screen:

An extruded layer of semi-conducting compound over the insulation, it’s used for the same purpose of conductor screen. Conductor screen, XLPE insulation and insulation screen are applied at the same time using triple head extruder.

5. Metallic Screen:

Types of metallic screen:

- An extruded layer of lead alloy
- Copper wires
- Aluminium sheath

Metallic screen also can be a combination of two materials (e.g. Copper wires with lead sheath or Aluminium foil bonded to PE jacket) to withstand the desired short circuit current for a specified period.

6. Sheath:

An extruded layer of PE (LLDPE, MDPE or HDPE) or PVC is applied to provide mechanical protection as well as prevent moisture.

- Semi-conductive layer is applied over outer jacket for electrical test on outer jacket of the cable, it shall be graphite coating or an extruded semi-conducting layer.

Applicable Standards:

High voltage power cables are tested as per IEC 60840 & extra high voltage power cables are tested as per IEC 62067 standard.

Applications:

High voltage cables are used in power transmission system to connect generating station to substation.

HIGH AND EXTRA
HIGH VOLTAGE
CABLES

38/66 (72.5) kV Cables With Copper Conductor

Nominal CSA	Conductor Diameter	Thickness of Insulation	Max. DC Conductor Resistance at 20 ° C	Capacitance	Copper Wires/AL Sheath			Lead Sheath		
					CSA	Overall Diameter	Approx. Weight	CSA	Overall Diameter	Approx. Weight
mm²	mm	mm	Ω/km	µF/km	mm²	mm	kg/km	mm²	mm	kg/km
185 R	15.8	12	0.0991	0.17	90	58	4540	501	59	9190
240 R	18.2	12	0.0754	0.18	90	61	5180	490	61	9700
300 R	20.4	12	0.0601	0.19	90	63	5840	493	63	10390
400 R	23.2	12	0.0470	0.21	90	66	6785	500	66	11395
500 R	27.5	12	0.0366	0.24	90	69	7865	498	70	12545
630 R	30.5	12	0.0283	0.25	90	73	9380	501	72	13980
800 R	34.5	12	0.0221	0.28	90	77	11260	488	76	15705
1000 S	39	12	0.0176	0.31	90	83	13625	531	82	18600
1200 S	42.5	12	0.0151	0.33	90	86	15270	557	86	20520
1600 S	49.1	12	0.0113	0.37	90	93	19265	631	93	25350



CURRENT CARRYING CAPACITY (A)

Nominal CSA	Earthing Conditions	Trefoil Formation				Earthing Conditions	Flat Formation			
		Direct Burial 1.2 m & 20 °C		Free Air			Direct Burial 1.2 m & 20 °C		Free Air	
		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C
185 R	Both Ends Bonded (With Circulating Currents)	454	424	572	487	Cross or Single Point Bonded (Without Circulating Currents)	490	458	652	557
240 R		523	487	669	569		569	531	769	657
300 R		586	546	761	647		643	600	882	753
400 R		661	615	874	742		734	684	1023	873
500 R		747	693	1010	858		841	782	1200	1023
630 R	Cross or Single Point Bonded (Without Circulating Currents)	875	813	1190	1010		954	887	1383	1179
800 R		974	903	1349	1145		1074	997	1586	1351
1000 S		1122	1039	1586	1345		1227	1139	1842	1570
1200 S		1197	1109	1718	1457		1319	1223	2007	1710
1600 S		1333	1233	1966	1667		1492	1382	2329	1984

HIGH AND EXTRA
HIGH VOLTAGE
CABLES

38/66 (72.5) kV Cables With Aluminium Conductor

Nominal CSA	Conductor Diameter	Thickness of Insulation	Max. DC Conductor Resistance at 20 °C	Capacitance	Copper Wires/AL Sheath			Lead Sheath		
					CSA	Overall Diameter	Approx. Weight	CSA	Overall Diameter	Approx. Weight
mm²	mm	mm	Ω/km	µF/km	mm²	mm	kg/km	mm²	mm	kg/km
185 R	15.8	12	0.164	0.17	90	58	3430	501	59	8080
240 R	18.2	12	0.125	0.18	90	61	3720	490	61	8240
300 R	20.4	12	0.100	0.19	90	63	3995	493	63	8540
400 R	23.2	12	0.0778	0.21	90	66	4385	500	66	9000
500 R	27.5	12	0.0605	0.24	90	69	4835	498	70	9515
630 R	30.5	12	0.0469	0.25	90	73	5515	501	72	10115
800 R	34.5	12	0.0367	0.28	90	77	6230	488	76	10680
1000 S	39	12	0.0291	0.31	90	83	7350	531	82	12325
1200 S	42.5	12	0.0247	0.33	90	86	8080	557	86	13335
1600 S	49.1	12	0.0186	0.37	90	93	9585	631	93	15670

CURRENT CARRYING CAPACITY (A)

Nominal CSA	Trefoil Formation					Flat Formation				
	Earthing Conditions	Direct Burial 1.2 m & 20 °C		Free Air		Earthing Conditions	Direct Burial 1.2 m & 20 °C		Free Air	
		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C
185 R	Both Ends Bonded (With Circulating Currents)	355	332	446	380	Cross or Single Point Bonded (Without Circulating Currents)	381	356	507	433
240 R		411	383	524	445		442	413	598	511
300 R		462	430	598	508		500	467	686	585
400 R		526	490	693	588		574	535	800	683
500 R		601	558	810	687		661	615	944	805
630 R	Cross or Single Point Bonded (Without Circulating Currents)	702	652	954	810		756	703	1096	934
800 R		794	737	1099	932		860	799	1270	1083
1000 S		924	856	1303	1106		999	927	1499	1278
1200 S		1008	934	1444	1224		1095	1016	1667	1420
1600 S		1168	1081	1719	1457		1281	1187	1999	1703



HIGH AND EXTRA HIGH VOLTAGE CABLES

64/110 (123) kV Cables With Copper Conductor

Nominal CSA	Conductor Diameter	Thickness of Insulation	Max. DC Conductor Resistance at 20 ° C	Capacitance	Copper Wires/AL Sheath			Lead Sheath		
					CSA	Overall Diameter	Approx. Weight	CSA	Overall Diameter	Approx. Weight
mm ²	mm	mm	Ω/km	μF/km	mm ²	mm	kg/km	mm ²	mm	kg/km
240 R	18.2	14	0.0754	0.16	90	66	5625	795	69	13595
300 R	20.4	14	0.0601	0.17	90	68	6305	805	71	14385
400 R	23.2	14	0.0470	0.19	90	71	7265	800	73	15290
500 R	27.5	14	0.0366	0.21	90	75	8465	810	77	16625
630 R	30.5	14	0.0283	0.23	90	78	9915	800	80	17940
800 R	34.5	14	0.0221	0.25	90	82	11825	800	83	19815
1000 S	39	14	0.0176	0.28	90	88	14230	790	89	22145
1200 S	42.5	14	0.0151	0.29	90	91	15900	800	93	23900
1600 S	49.1	14	0.0113	0.33	90	98	19945	830	99	28325



CURRENT CARRYING CAPACITY (A)

Nominal CSA	Earthing Conditions	Trefoil Formation				Earthing Conditions	Flat Formation			
		Direct Burial 1.2 m & 20 °C		Free Air			Direct Burial 1.2 m & 20 °C		Free Air	
		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C
240 R	Both Ends Bonded (With Circulating Currents)	515	480	665	566	Cross or Single Point Bonded (Without Circulating Currents)	569	532	764	653
300 R		575	536	755	642		643	601	875	747
400 R		647	602	864	734		733	684	1014	866
500 R		726	674	994	844		840	782	1187	1013
630 R	Cross or Single Point Bonded (Without Circulating Currents)	871	810	1189	1010		953	887	1367	1166
800 R		970	900	1347	1144		1072	997	1566	1336
1000 S		1111	1031	1574	1337		1223	1136	1816	1549
1200 S		1186	1098	1703	1446		1313	1219	1977	1686
1600 S		1320	1221	1946	1651		1485	1377	1951	2289

HIGH AND EXTRA
HIGH VOLTAGE
CABLES

64/110 (123) kV Cables With Aluminium Conductor

Nominal CSA	Conductor Diameter	Thickness of Insulation	Max. DC Conductor Resistance at 20 °C	Capacitance	Copper Wires/AL Sheath			Lead Sheath		
					CSA	Overall Diameter	Approx. Weight	CSA	Overall Diameter	Approx. Weight
mm²	mm	mm	Ω/km	µF/km	mm²	mm	kg/km	mm²	mm	kg/km
240 R	18.2	14	0.125	0.16	90	66	4165	795	69	12135
300 R	20.4	14	0.100	0.17	90	68	4455	805	71	12535
400 R	23.2	14	0.0778	0.19	90	71	4870	800	73	12895
500 R	27.5	14	0.0605	0.21	90	75	5435	810	77	13595
630 R	30.5	14	0.0469	0.23	90	78	6050	800	80	14075
800 R	34.5	14	0.0367	0.25	90	82	6795	800	83	14790
1000 S	39	14	0.0291	0.28	90	88	7955	790	89	15870
1200 S	42.5	14	0.0247	0.29	90	91	8710	800	93	16710
1600 S	49.1	14	0.0186	0.33	90	98	10265	830	99	18645

CURRENT CARRYING CAPACITY (A)

Nominal CSA	Trefoil Formation					Flat Formation				
	Earthing Conditions	Direct Burial 1.2 m & 20 °C		Free Air		Earthing Conditions	Direct Burial 1.2 m & 20 °C		Free Air	
		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C
240 R	Both Ends Bonded (With Circulating Currents)	407	380	523	445	Cross or Single Point Bonded (Without Circulating Currents)	442	414	594	507
300 R		456	425	595	506		500	467	680	581
400 R		518	483	688	585		573	535	793	677
500 R		589	548	801	680		661	616	934	797
630 R		699	650	952	809		755	703	1083	924
800 R	Cross or Single Point Bonded (Without Circulating Currents)	790	734	1095	930		859	798	1254	1070
1000 S		916	850	1294	1099		996	926	1479	1262
1200 S		999	926	1432	1215		1091	1013	1642	1400
1600 S		1156	1070	1700	1443		1275	1183	1965	1675



HIGH AND EXTRA
HIGH VOLTAGE
CABLES

76/132 (145) kV Cables With Copper Conductor



Nominal CSA	Conductor Diameter	Thickness of Insulation	Max. DC Conductor Resistance at 20 ° C	Capacitance	Copper Wires/AL Sheath			Lead Sheath		
					CSA	Overall Diameter	Approx. Weight	CSA	Overall Diameter	Approx. Weight
mm²	mm	mm	Ω/km	µF/km	mm²	mm	kg/km	mm²	mm	kg/km
300 R	20.4	16	0.0601	0.21	90	74	6955	810	77	15110
400 R	23.2	16	0.0470	0.22	90	77	7945	800	79	15985
500 R	27.5	16	0.0366	0.25	90	81	9210	810	83	17280
630 R	30.5	16	0.0283	0.26	90	84	10670	790	86	18555
800 R	34.5	16	0.0221	0.29	90	88	12615	810	89	20685
1000 S	39	16	0.0176	0.31	90	93	14875	800	94	22930
1200 S	42.5	16	0.0151	0.33	90	96	16570	780	97	24365
1600 S	49.1	16	0.0113	0.36	90	103	20665	810	104	28780
2000 S	55.5	16	0.009	0.4	90	109	24950	800	110	32960

CURRENT CARRYING CAPACITY (A)

Nominal CSA	Earthing Conditions	Trefoil Formation				Earthing Conditions	Flat Formation			
		Direct Burial 1.2 m & 20 °C		Free Air			Direct Burial 1.2 m & 20 °C		Free Air	
		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C
300 R	Both Ends Bonded (With Circulating Currents)	575	535	748	634	Cross or Single Point Bonded (Without Circulating Currents)	624	582	778	701
400 R		648	602	857	726		717	668	895	806
500 R		729	676	988	836		816	759	1037	934
630 R		863	800	1168	988		922	856	1182	1065
800 R		961	889	1324	1119		1038	962	1337	1204
1000 S	Cross or Single Point Bonded (Without Circulating Currents)	1096	1012	1540	1301		1188	1100	1551	1396
1200 S		1169	1079	1665	1407		1270	1174	1676	1507
1600 S		1301	1198	1903	1606		1430	1320	1906	1714
2000 S		1400	1288	2095	1768		1556	1434	2093	1882

HIGH AND EXTRA
HIGH VOLTAGE
CABLES

76/132 (145) kV Cables With Aluminium Conductor

Nominal CSA	Conductor Diameter	Thickness of Insulation	Max. DC Conductor Resistance at 20 °C	Capacitance	Copper Wires/AL Sheath			Lead Sheath		
					CSA	Overall Diameter	Approx. Weight	CSA	Overall Diameter	Approx. Weight
mm²	mm	mm	Ω/km	µF/km	mm²	mm	kg/km	mm²	mm	kg/km
300 R	20.4	16	0.1000	0.21	90	74	5110	810	77	13265
400 R	23.2	16	0.0778	0.22	90	77	5550	800	79	13585
500 R	27.5	16	0.0605	0.25	90	81	6130	810	83	14250
630 R	30.5	16	0.0469	0.26	90	84	6805	790	86	14690
800 R	34.5	16	0.0367	0.29	90	88	7585	810	89	15655
1000 S	39	16	0.0291	0.31	90	93	8600	800	94	16655
1200 S	42.5	16	0.0247	0.33	90	96	9380	780	97	17175
1600 S	49.1	16	0.0186	0.36	90	103	10985	810	104	19100
2000 S	55.5	16	0.0149	0.4	90	109	12240	800	110	20250

CURRENT CARRYING CAPACITY (A)

Nominal CSA	Trefoil Formation					Flat Formation				
	Earthing Conditions	Direct Burial 1.2 m & 20 °C		Free Air		Earthing Conditions	Direct Burial 1.2 m & 20 °C		Free Air	
		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C
300 R	Both Ends Bonded (With Circulating Currents)	455	423	588	499	Cross or Single Point Bonded (Without Circulating Currents)	486	453	607	547
400 R		517	481	680	576		561	522	704	634
500 R		589	564	792	670		642	597	823	741
630 R		692	641	933	790		731	678	948	854
800 R		781	723	1037	908		831	771	1089	980
1000 S	Cross or Single Point Bonded (Without Circulating Currents)	902	834	1264	1069		967	896	1280	1152
1200 S		983	908	1397	1180		1055	975	1413	1271
1600 S		1137	1047	1658	1399		1228	1133	1670	1501
2000 S		1271	1169	1897	1601		1383	1274	1904	1711



HIGH AND EXTRA
HIGH VOLTAGE
CABLES

127/220 (245) kV Cables With Copper Conductor

Nominal CSA	Conductor Diameter	Thickness of Insulation	Max. DC Conductor Resistance at 20 ° C	Capacitance	Copper Wires/AL Sheath			Lead Sheath		
					CSA	Overall Diameter	Approx. Weight	CSA	Overall Diameter	Approx. Weight
mm²	mm	mm	Ω/km	µF/km	mm²	mm	kg/km	mm²	mm	kg/km
400 R	23.2	22	0.0470	0.144	177	91	10265	1005	92	19750
500 R	27.5	22	0.0366	0.158	177	95	11610	1030	96	21375
630 R	30.5	22	0.0283	0.168	177	98	13120	1065	99	23295
800 R	34.5	22	0.0221	0.182	177	102	15140	1025	103	24840
1000 S	39	22	0.0176	0.197	177	107	17650	1045	108	27650
1200 S	42.5	22	0.0151	0.208	177	111	19415	1050	112	29480
1600 S	49.1	22	0.0113	0.23	177	117	23640	1125	118	34485
2000 S	55.5	22	0.009	0.25	177	124	28050	1230	125	40075
2500 S	62	22	0.0072	0.271	177	130	33510	1415	132	47645



CURRENT CARRYING CAPACITY (A)

Nominal CSA	Earthing Conditions	Trefoil Formation				Earthing Conditions	Flat Formation			
		Direct Burial 1.2 m & 20 °C		Free Air			Direct Burial 1.2 m & 20 °C		Free Air	
		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C
400 R	Both Ends Bonded (With Circulating Currents)	635	593	845	720	Cross or Single Point Bonded (Without Circulating Currents)	723	678	966	827
500 R		712	663	971	827		827	774	1129	966
630 R		860	802	1162	989		940	879	1300	1111
800 R		959	893	1317	1121		1058	988	1487	1271
1000 S	Cross or Single Point Bonded (Without Circulating Currents)	1090	1014	1525	1298		1203	1121	1716	1467
1200 S		1162	1080	1649	1403		1292	1204	1866	1595
1600 S		1293	1199	1881	1600		1460	1358	2156	1842
2000 S		1386	1283	2066	1756		1592	1479	2398	2048
2500 S		1464	1353	2237	1900		1718	1594	2637	2251

HIGH AND EXTRA
HIGH VOLTAGE
CABLES

127/220 (245) kV Cables With Aluminium Conductor

Nominal CSA	Conductor Diameter	Thickness of Insulation	Max. DC Conductor Resistance at 20 ° C	Capacitance	Copper Wires/AL Sheath			Lead Sheath		
					CSA	Overall Diameter	Approx. Weight	CSA	Overall Diameter	Approx. Weight
mm²	mm	mm	Ω/km	µF/km	mm²	mm	kg/km	mm²	mm	kg/km
400 R	23.2	22	0.0778	0.144	177	91	7870	1005	92	17350
500 R	27.5	22	0.0605	0.158	177	95	8580	1030	96	18345
630 R	30.5	22	0.0469	0.168	177	98	9255	1065	99	19430
800 R	34.5	22	0.0367	0.182	177	102	10115	1025	103	19815
1000 S	39	22	0.0291	0.197	177	107	11375	1045	108	21375
1200 S	42.5	22	0.0247	0.208	177	111	12225	1050	112	22285
1600 S	49.1	22	0.0186	0.23	177	117	13960	1125	118	24805
2000 S	55.5	22	0.0149	0.25	177	124	15340	1230	125	27365
2500 S	62	22	0.0127	0.271	177	130	17470	1415	132	31600

CURRENT CARRYING CAPACITY (A)

Nominal CSA	Trefoil Formation					Flat Formation				
	Earthing Conditions	Direct Burial 1.2 m & 20 °C		Free Air		Earthing Conditions	Direct Burial 1.2 m & 20 °C		Free Air	
		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C		1 °C. cm/W	1.2 °C. cm/W	30 °C	45 °C
400 R	Both Ends Bonded (With Circulating Currents)	510	476	672	573	Cross or Single Point Bonded (Without Circulating Currents)	565	530	756	647
500 R		579	539	781	665		651	609	888	760
630 R		689	643	928	790		745	696	1029	880
800 R		779	726	1066	907		847	791	1189	1017
1000 S		899	836	1252	1065		980	914	1397	1194
1200 S	Cross or Single Point Bonded (Without Circulating Currents)	979	910	1382	1176		1073	1000	1549	1324
1600 S		1130	1048	1637	1392		1253	1166	1849	1579
2000 S		1257	1165	1866	1586		1414	1314	2127	1816
2500 S		1350	1249	2054	1745		1544	1433	2365	2019

