





INTRODUCTION

TELE-FONIKA KABLE Sp. z o.o. S.K.A. is the biggest cable producer in Central and Eastern Europe. In terms of sales, it is Europe's fourth biggest cable manufacturer and is noted as one of the world's largest suppliers of high voltage cables and systems.

The company was founded in 1992 and is presently one of the biggest private enterprises operating in Poland.



The present position of the company is the result of dynamic development supported by the realization of investment projects in 1994-2003, including the purchase of Krakowska Fabryka Kabli SA (1998) and Elektrim Kable SA (2002).

TELE-FONIKA KABLE Sp. z o.o. S.K.A. offers design, delivery, execution and tests of complete High Voltage Cable Systems. Our high position has been built thanks to continuous research and development as well as state-of-the-art production machinery and top quality materials. We cooperate with the best suppliers of HV cable accessories so that we can assure operational reliability of power supply. Our product, deliveries and solidity of installation present the highest quality standards that fulfil the most demanding needs of our customers. Our systems have a strong support from our engineering staff from the High Voltage Cable System Department.

A Research and development program in the range of preparation and testing of cable systems was initiated in 1988, when the first CCV line of Nokia-Mailleffer was



installed in our Bydgoszcz factory. After achieving positive results from the testing of the system according to IEC 60840 at Power Institute in Warsaw, the first line of 110 kV was built for Power Plant in Warsaw Area in 1992.

In the next stage, the production range was extended to include EHV cables up to 400 kV and conductor cross-section up to 2000 mm².

The last investment was realized in 2003, when the completely new MV & HV Department was built in Bydgoszcz factory. It was equipped with state-of-the-art XLPE insulation line as well as screening and jacketing lines.

QUALITY MANAGEMENT SYSTEM

TELE-FONIKA KABLE Sp. z o.o. S.K.A. has established, documented and implemented the Quality Management Sys-

tem according to the ISO 9001:2000 standard as well as the Environmental Protection System according to the ISO 14001:2004 standard.

The management system covers the entire organisational structure of the Company, supporting the division of tasks, responsibilities and competences, and the breakdown of processes and resources, making it possible to maintain effective quality and environmental management.

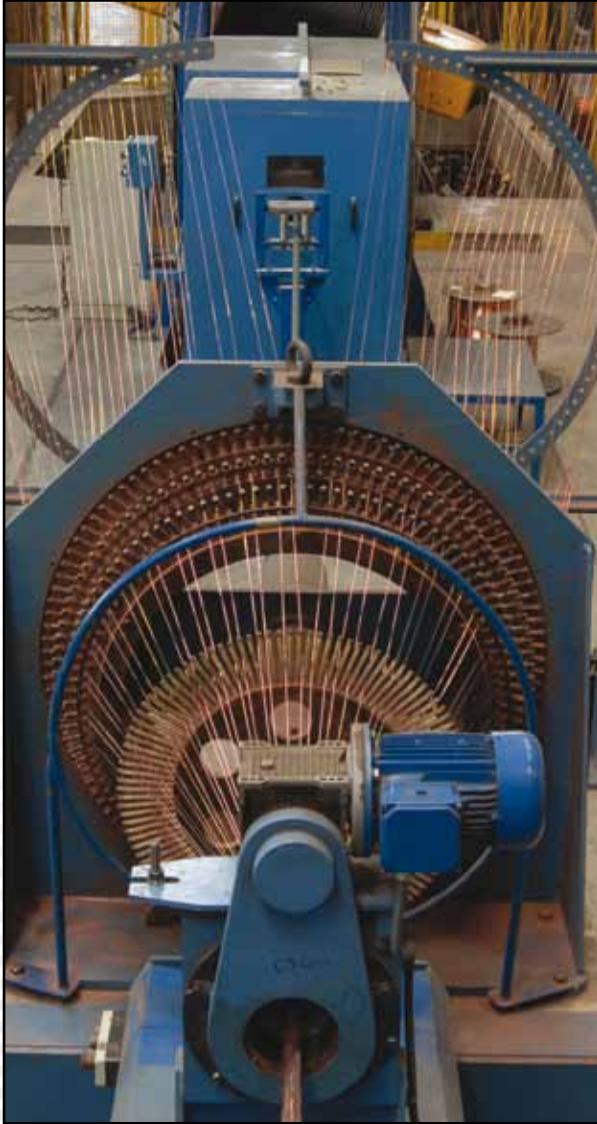
Customer requirements are studied and care is taken to ensure that they are fulfilled through the provision of products that are in accordance with previously agreed specifications, of the highest quality, safe to use, reliable and delivered on time.

Operational control in the integrated management system allows the Company to function in an environmentally safe way. It also ensures realisation of the environmental policy and the execution of accepted objectives and tasks.

We constantly strive to improve our activities and processes having in mind the highest quality of our products,







customer satisfaction, professionalism and environmentally friendly operations.

PRODUCTION PROCESS

THE CONDUCTOR

Round, stranded copper or aluminium conductor designed to achieve specific cross-section, resistance and outer diameter, optionally with longitudinal water barrier.

Conductors with cross-section $>1200 \text{ mm}^2$ are produced as segmented conductors.

INSULATING OF PHASE CONDUCTOR

In the insulation process polyethylene is delivered to extruders from the specially prepared clean room, in which air circulation takes place by means of special filters that ensure the level of air cleanliness. The transportation of semi-conductive and insulating materials is by means of separated tracks. Additionally the insulating polyethylene dosing system is completed by a device that removes dust, non-dimensional granules, etc.

MATERIAL HANDLING SYSTEM

System of feeding the materials to clean the PE insulating components to production of high-voltage cables. The cleaning of XLPE granules by means of an air separator unit, consisting of magnetic separator, ionizer and cascade-air sorter. A magnetic separator shows a strong magnetic field; in addition all metallic impurities, when they are present in plastic, stick very strongly to it.

During the pneumatic transport granules are loaded electrostatically so that no dust adheres to their surface. Ionizer effectively reduces accumulated load so that dust cannot be blown. The removing of dust is additionally aided mechanically by repeated padding granules in the cascade-air sorter.

Triple extrusion process of insulation material (semi-conductive inner screen, insulation, semi-conductive outer screen) over a phase conductor is realized in one operation with continuous on-line control of the important parameters of each layer as thickness, centricity and ovality.

EXTRA HEAT TREATMENT

To avoid "the leakage of insulation" effect, that may appear during the production of high-voltage cables with high diameter coefficient (outer diameter of insulation/diameter of phase conductor) and to ensure the ovality and centricity of cables, the EHT system is used on CCV lines. The solution relies on injection of inert gas directly

behind the crosshead that extrudes three layers of insulation. It causes the reduction of stickiness of the outer layer of insulation and consequently reduces "the leakage of insulation". Cross-linking and cooling the polyethylene takes place in a nitrogen atmosphere.

RELAXATION SYSTEM DURING ROL PRODUCTION

Specific volumes of plastics are reduced by a decrease in temperature. This dependence on temperature causes uneven mechanical tensions inside insulation of cable. During the cooling process of the insulating system of cables there are tensions resulting from the uneven crystallization of material. A direct relaxation method is used on lines to minimize mechanical tensions in XLPE insulation and to reduce its longitudinal return shrinkage. The system is based on an additional heating zone in the central cooling section of the continuous vulcanization line.

DEGASSING OF CABLE INSULATION FROM THE DERIVATIVES OF CROSS-LINKING PROCESS

To ensure the controlled conditions of degassing of high-voltage cable insulation, the heating chambers are used. The result of cross-linking process is decomposition of cross-linking factor (peroxide) that generates by-products like aceto-phenone, methane, methyl styrene, etc. In thermally controlled conditions the insulated conductors are subjected to slow degassing process. The time of keeping insulated conductors in degassing chambers is a function of temperature and thickness of insulation. The degree of degassing of insulation is controlled on measurement area.

SCREENING

Applying on insulated conductor:

- semi-conductive tape (with the function of humidity blockade in water-blocked cables)

- metallic screen of Cu wires and separate Cu tape
- separating tape (with the function of humidity blockade in water-blocked cables)

EXTRUSION OF OUTER SHEATH

Extrusion – on cable core – outer PVC, PE or LSOH sheath. In case of cables sealed radially – additionally Al/ Cu tape covered with copolymer is applied longitudinally on a cable core. As a result of the extrusion of the sheath there is a durable bonding of tape with the outer sheath

HV LABORATORY

To ensure the possibility of testing HV and EHV cables and cable accessories, a HV laboratory was built and equipped with state-of-the-art devices. The range of equipment in our HV laboratory enable us to perform the routine as well as type tests up to 400kV.

QUALITY EVIDENCE

Every complete system is type tested under supervision of a representative of an independent laboratory and in cases of positive results, it receives confirmation of technical properties and can be used in power networks. Those tests ensure full compatibility of cables and accessories and guarantee high quality and a durability in operation without breakdown.

TYPE OF CABLES

**XRUHAKXS, XRUHKXS - NA2XS(FL)2Y, N2XS(FL)2Y, NRUHAKXS,
NRUHKXS - NA2XS(FL)H, N2XS(FL)H**



Legend to the figure 1.

- 1 – Aluminium or copper conductor.
- 2 – Semi-conductive screen extruded on the phase conductor.
- 3 – XLPE insulation.
- 4 – Semi-conductive screen extruded on insulation.
- 5 – Wrapping of semi-conductive water swelling tape
- 6 – Metallic screen.
- 7 – Wrapping of semi-conductive water swelling tape
- 8 – Longitudinally applied aluminium tape coated with PE copolymer.
- 9 – MDPE outer sheath.

For the special application Tele-Fonika Kable S.A. offered single-core a cable type

**YHAKXS, YHKXS - NA2XSY, N2XSY - XHAKXS, XHKXS - NA2XS2Y,
N2XS2Y, NHAKXS, NHKXS - NA2XSH, N2XSH**



Legend to the figure 2.

- 1 – Aluminium or copper conductor.
- 2 – Semi-conductive screen extruded on the phase conductor.
- 3 – XLPE insulation.
- 4 – Semi-conductive screen extruded on insulation.
- 5 – Semi-conductive tape wrap, non swelling under action of water.
- 6 – Metallic screen.
- 7 – Wrapping of polyester tape.
- 8 – Outer sheath: PVC, MDPE, LSF

XUHAKXS, XUHKXS - NA2XS(F)2Y, N2XS(F)2Y, NUHAKXS, NUHKXS - NA2XS(F)H, N2XS(F)H



Legend to the figure 3.

- 1 – Aluminium or copper conductor.
- 2 – Semi-conductive screen extruded on the phase conductor.
- 3 – XLPE insulation.
- 4 – Semi-conductive screen extruded on insulation.
- 5 – Wrapping of semi-conductive water swelling tape
- 6 – Metallic screen.
- 7 – Wrapping of non conductive water swelling tape
- 8 – Outer sheath: MDPE, LSF

CABLE SELECTION

High-voltage cables are manufactured on the basis of customers' specifications or factory standard.

Constructing of cables is mainly on the basis of IEC standards.

IEC 60287 – Electric cables - Calculation of the current rating. Current rating equations (100 % load factor) and calculation of losses

IEC 60853 – Calculation of the cyclic and emergency current rating of cables

IEC 61443 – Short-circuit temperature limits of electric cables with rated voltages above 30 kV ($U_m = 36$ kV)

IEC 60228 – Conductors of insulated cables

The aim of increase of efficiency of constructional works was prepared by computer program that enables not only calculations but also simulation of operating conditions of cable system.

CALCULATION BASIS:

IN GROUND – temperature 20°C , laying depth 1,0 m, soil thermal resistivity $K = 1,0$ Km/W, phase distance at flat formation = $2xD$ (D-cable diameter)

For cables installed in separate pipes the ampacity is reduced to 90% of values presented in tables on next pages.

IN AIR – temperature 35°C

LAYING CONDITION:

Minimum laying temperature: minus 20°C

Minimum bending radius: values in mm according to tables on next pages

Maximum pulling force by means of the conductor or a basket over an outer jacket: values in kN according to tables above Minimum inner diameter of pipe: min. $1.5 \times D$ (mm) , where D = outer cable diameter in mm.

The constructions detailed in this catalogue cover the most popular designs but please note that Tele-Fonika Kable has the capability to manufacture HV cables according to other standards as well as specific customer's requirements.

HIGH VOLTAGE XLPE CABLES 36/60 ÷ 69(72.5)kV

COPPER CONDUCTOR

- 2XS(FL)2Y acc. IEC 60840
- N2XS(FL)2Y acc. DIN VDE 0276-632
- XRUHKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 120RM	12.9 + 0.25	13	40.1	35	44.3	51.3	3080	6.0	1.01
1 x 150RM	14.5 + 0.30	12	39.7	35	43.9	50.9	3270	7.5	1.00
1 x 185RM	16.0 + 0.30	12	41.2	35	45.4	52.4	3670	9.3	1.03
1 x 240RM	18.5 + 0.30	11	41.7	35	45.9	53.1	4150	12.0	1.04
1 x 300RM	20.5 + 0.30	11	43.7	35	47.9	55.1	4780	15.0	1.09
1 x 400RM	23.5 + 0.30	11	47.1	35	51.7	59.3	5820	20.0	1.17
1 x 500RM	26.5 + 0.40	10	48.1	35	52.7	60.3	6770	25.0	1.19
1 x 630RM	30.3 + 0.40	10	52.2	35	56.8	64.5	8220	31.5	1.28
1 x 800RM	34.6 + 0.50	10	56.5	35	61.1	69.2	9990	40.0	1.38
1 x 1000RM	38.2 + 0.40	10	60.5	50	65.5	73.8	12210	50.0	1.47
1 x 1200RM	43.6 + 0.80	10	67.6	50	72.6	81.6	14610	60.0	1.63
1 x 1400RMS	46.6 + 1.00	10	70.6	50	75.6	84.8	16570	70.0	1.70
1 x 1600RMS	50.0 + 1.00	10	74.0	50	79.0	88.5	18570	80.0	1.77
1 x 1800RMS	53.3 + 1.00	9	77.3	50	82.3	92.0	20560	90.0	1.84
1 x 2000RMS	56.3 + 1.20	10	80.3	50	85.3	95.2	22600	100.0	1.91

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength that conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity		
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo ¹ Δ ²	in ground	in air
											SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		μF / km	mH / km	A		
1 x 120RM	0.1530	0.1956	0.542	0.670	5.17 / 1.82	17.5	7.4	0.122	0.649 0.465	388 / 364 370 / 367	467 / 449 414 / 411	
1 x 150RM	0.1240	0.1588	0.542	0.670	5.23 / 2.07	21.8	7.4	0.138	0.624 0.440	436 / 403 416 / 411	534 / 507 470 / 466	
1 x 185RM	0.0991	0.1273	0.542	0.670	5.07 / 2.12	26.9	7.4	0.146	0.611 0.426	493 / 447 469 / 462	610 / 572 535 / 529	
1 x 240RM	0.0754	0.0974	0.542	0.670	5.16 / 2.44	34.8	7.4	0.170	0.584 0.399	574 / 504 545 / 534	725 / 664 631 / 621	
1 x 300RM	0.0601	0.0783	0.542	0.670	5.02 / 2.49	43.5	7.4	0.183	0.571 0.386	648 / 553 614 / 599	831 / 744 721 / 707	
1 x 400RM	0.0470	0.0620	0.542	0.670	4.82 / 2.57	57.9	7.4	0.203	0.558 0.374	741 / 607 698 / 676	965 / 839 835 / 814	
1 x 500RM	0.0366	0.0491	0.542	0.670	5.05 / 2.95	72.2	7.4	0.238	0.538 0.353	845 / 663 791 / 760	1125 / 942 963 / 933	
1 x 630RM	0.0283	0.0389	0.542	0.670	4.90 / 3.02	90.9	7.4	0.264	0.525 0.340	974 / 707 894 / 850	1308 / 1051 1112 / 1067	
1 x 800RM	0.0221	0.0313	0.542	0.670	4.78 / 3.09	115.4	7.4	0.292	0.512 0.327	1082 / 765 998 / 938	1505 / 1155 1266 / 1204	
1 x 1000RM	0.0176	0.0260	0.379	0.468	4.69 / 3.14	144.1	10.5	0.318	0.505 0.320	1197 / 759 1082 / 994	1684 / 1189 1398 / 1306	
1 x 1200RMS	0.0151	0.0203	0.379	0.468	4.56 / 3.21	172.8	10.5	0.364	0.499 0.314	1385 / 802 1258 / 1127	1981 / 1303 1663 / 1552	
1 x 1400RMS	0.0129	0.0176	0.379	0.468	4.52 / 3.24	201.5	10.5	0.384	0.493 0.308	1496 / 824 1346 / 1189	2166 / 1360 1804 / 1632	
1 x 1600RMS	0.0113	0.0156	0.379	0.468	4.48 / 3.27	230.3	10.5	0.406	0.488 0.303	1596 / 841 1424 / 1242	2340 / 1411 1933 / 1730	
1 x 1800RMS	0.0101	0.0141	0.379	0.468	4.44 / 3.29	259.0	10.5	0.427	0.483 0.298	1685 / 855 1490 / 1286	2499 / 1456 2047 / 1816	
1 x 2000RMS	0.0090	0.0128	0.379	0.468	4.41 / 3.31	287.7	10.5	0.446	0.478 0.294	1775 / 868 1556 / 1329	2659 / 1497 2160 / 1898	

HIGH VOLTAGE XLPE CABLES 36/60 ÷ 69(72.5)kV

ALUMINIUM CONDUCTOR

- A2XS(FL)2Y acc. IEC 60840
- NA2XS(FL)2Y acc. DIN VDE 0276-632
- XRUHAKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 120RM	12.5 ^{+0.20}	13	39.7	35	43.9	50.9	2340	3.6	1.00
1 x 150RM	14.2 ^{+0.20}	12	39.4	35	43.6	50.6	2360	4.5	0.99
1 x 185RM	15.8 ^{+0.20}	12	41.0	35	45.2	52.2	2540	5.6	1.03
1 x 240RM	17.9 ^{+0.10}	11	41.1	35	45.3	52.3	2640	7.2	1.03
1 x 300RM	20.0 ^{+0.30}	11	43.2	35	47.4	54.6	2910	9.0	1.07
1 x 400RM	22.9 ^{+0.30}	11	46.5	35	51.1	58.5	3370	12.0	1.16
1 x 500RM	25.7 ^{+0.40}	10	47.3	35	51.9	59.5	3650	15.0	1.17
1 x 630RM	29.3 ^{+0.50}	10	51.2	35	55.8	63.5	4230	18.9	1.26
1 x 800RM	33.0 ^{+0.50}	10	54.9	35	59.5	67.4	4870	24.0	1.34
1 x 1000RM	38.0 ^{+0.50}	10	60.3	50	65.3	73.6	5960	30.0	1.47
1 x 1200RM	41.0 ^{+0.60}	10	63.3	50	68.3	76.8	6740	36.0	1.53
1 x 1200RMS	43.6 ^{+0.80}	10	67.6	50	72.6	81.6	7160	36.0	1.63
1 x 1400RMS	46.6 ^{+1.00}	10	70.6	50	75.6	84.8	7890	42.0	1.70
1 x 1600RMS	50.0 ^{+1.00}	10	74.0	50	79.0	88.5	8650	48.0	1.77
1 x 1800RMS	53.3 ^{+1.00}	10	77.3	50	82.3	92.0	9420	54.0	1.84
1 x 2000RMS	55.4 ^{+1.00}	10	79.4	50	84.4	94.3	10090	60.0	1.89

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength that conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity			
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo ¹	Δ^2	in ground	in air
												SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		$\mu F / km$	mH / km	A			
1 x 120RM	0.2530	0.3247	0.542	0.670	5.23 / 1.80	11.6	7.4	0.120	0.654 0.469	300 / 288 286 / 285	360 / 351 320 / 318		
1 x 150RM	0.2060	0.2645	0.542	0.670	5.27 / 2.06	14.5	7.4	0.136	0.627 0.443	338 / 321 322 / 319	412 / 399 363 / 361		
1 x 185RM	0.1640	0.2108	0.542	0.670	5.09 / 2.11	17.8	7.4	0.145	0.612 0.427	382 / 360 364 / 361	473 / 454 415 / 412		
1 x 240RM	0.1250	0.1610	0.542	0.670	5.21 / 2.42	23.1	7.4	0.167	0.588 0.403	444 / 410 422 / 417	560 / 529 488 / 483		
1 x 300RM	0.1000	0.1292	0.542	0.670	5.05 / 2.48	28.8	7.4	0.180	0.574 0.389	503 / 454 477 / 470	642 / 599 559 / 552		
1 x 400RM	0.0778	0.1011	0.542	0.670	4.85 / 2.56	38.3	7.4	0.199	0.561 0.376	578 / 508 547 / 536	750 / 686 652 / 642		
1 x 500RM	0.0605	0.0794	0.542	0.670	5.08 / 2.93	47.8	7.4	0.232	0.541 0.356	663 / 562 625 / 609	878 / 781 757 / 741		
1 x 630RM	0.0469	0.0624	0.542	0.670	4.93 / 3.00	60.2	7.4	0.258	0.528 0.343	761 / 619 714 / 690	1027 / 885 881 / 858		
1 x 800RM	0.0367	0.0497	0.542	0.670	4.82 / 3.06	76.4	7.4	0.282	0.516 0.332	865 / 672 806 / 774	1190 / 989 1015 / 982		
1 x 1000RM	0.0291	0.0402	0.379	0.468	4.69 / 3.14	95.3	10.5	0.317	0.506 0.321	975 / 691 898 / 845	1368 / 1060 1157 / 1102		
1 x 1200RM	0.0247	0.0347	0.379	0.468	4.64 / 3.17	114.3	10.5	0.336	0.499 0.314	1056 / 719 963 / 900	1501 / 1123 1259 / 1192		
1 x 1200RMS	0.0247	0.0322	0.379	0.468	4.56 / 3.21	114.3	10.5	0.364	0.499 0.314	1121 / 740 1034 / 957	1601 / 1173 1362 / 1281		
1 x 1400RMS	0.0212	0.0278	0.379	0.468	4.52 / 3.24	133.3	10.5	0.384	0.493 0.308	1218 / 767 1115 / 1021	1759 / 1238 1489 / 1387		
1 x 1600RMS	0.0186	0.0245	0.379	0.468	4.48 / 3.27	152.3	10.5	0.406	0.488 0.303	1310 / 789 1192 / 1079	1915 / 1297 1612 / 1488		
1 x 1800RMS	0.0165	0.0218	0.379	0.468	4.44 / 3.29	171.2	10.5	0.427	0.483 0.298	1397 / 808 1263 / 1131	2065 / 1350 1728 / 1581		
1 x 2000RMS	0.0149	0.0198	0.379	0.468	4.42 / 3.31	190.2	10.5	0.440	0.480 0.295	1473 / 824 1324 / 1174	2195 / 1390 1827 / 1658		

HIGH VOLTAGE XLPE CABLES 64/110 ÷ 115(123)kV

COPPER CONDUCTOR

- 2XS(FL)2Y acc. IEC 60840
- N2XS(FL)2Y acc. DIN VDE 0276-632
- XRUHKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 150RM	14.5 + 0.30	17	51.5	95	57.3	65.3	5080	7.5	1.29
1 x 185RM	16.0 + 0.30	17	52.4	95	58.2	66.2	5450	9.3	1.31
1 x 240RM	18.5 + 0.30	16	52.5	95	58.3	66.3	5890	12.0	1.31
1 x 300RM	20.5 + 0.30	15	52.5	95	58.3	66.3	6370	15.0	1.31
1 x 400RM	23.5 + 0.30	15	55.5	95	61.3	69.5	7380	20.0	1.38
1 x 500RM	26.5 + 0.40	15	58.5	95	64.3	72.7	8560	25.0	1.45
1 x 630RM	30.3 + 0.40	15	63.0	95	68.8	77.5	10160	31.5	1.55
1 x 800RM	34.6 + 0.50	15	67.3	95	73.1	82.0	11980	40.0	1.64
1 x 1000RM	38.2 + 0.40	15	70.9	95	76.7	85.8	14030	50.0	1.72
1 x 1200RMS	43.6 + 0.80	15	77.6	95	83.4	93.3	16520	60.0	1.87
1 x 1400RMS	46.6 + 1.00	15	80.6	95	86.4	96.5	18530	70.0	1.93
1 x 1600RMS	50.0 + 1.00	15	84.0	95	89.8	100.1	20580	80.0	2.01
1 x 1800RMS	53.3 + 1.00	15	87.3	95	93.1	103.6	22630	90.0	2.08
1 x 2000RMS	56.3 + 1.20	15	90.3	95	96.1	106.8	24720	100.0	2.15

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength at conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity		
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo ¹ Δ ²	in ground	in air
											SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		μF / km	mH / km	A		
1 x 150RM	0.1240	0.1587	0.200	0.247	6.72 / 2.28	21.8	19.0	0.118	0.674 0.489	434 / 384 413 / 404	521 / 486 469 / 463	
1 x 185RM	0.0991	0.1272	0.200	0.247	6.60 / 2.32	26.9	19.0	0.122	0.657 0.473	490 / 422 465 / 453	595 / 546 534 / 524	
1 x 240RM	0.0754	0.0973	0.200	0.247	6.59 / 2.57	34.8	19.0	0.136	0.629 0.444	570 / 470 539 / 520	707 / 628 629 / 613	
1 x 300RM	0.0601	0.0781	0.200	0.247	6.66 / 2.86	43.5	19.0	0.151	0.608 0.423	644 / 510 607 / 580	811 / 699 717 / 694	
1 x 400RM	0.0470	0.0618	0.200	0.247	6.40 / 2.94	57.9	19.0	0.164	0.590 0.405	736 / 553 690 / 652	943 / 783 828 / 795	
1 x 500RM	0.0366	0.0489	0.200	0.247	6.20 / 3.02	72.2	19.0	0.178	0.575 0.390	838 / 595 780 / 728	1091 / 869 953 / 905	
1 x 630RM	0.0283	0.0387	0.200	0.247	5.95 / 3.12	90.9	19.0	0.198	0.561 0.377	946 / 641 880 / 808	1264 / 959 1095 / 1028	
1 x 800RM	0.0221	0.0312	0.200	0.247	5.77 / 3.20	115.4	19.0	0.216	0.546 0.361	1074 / 682 980 / 885	1452 / 1046 1244 / 1153	
1 x 1000RM	0.0176	0.0259	0.200	0.247	5.65 / 3.26	144.1	19.0	0.232	0.535 0.351	1185 / 701 1069 / 951	1628 / 1118 1380 / 1263	
1 x 1200RMS	0.0151	0.0202	0.200	0.247	5.46 / 3.35	172.8	19.0	0.261	0.526 0.341	1366 / 738 1232 / 1062	1910 / 1218 1625 / 1452	
1 x 1400RMS	0.0129	0.0175	0.200	0.247	5.39 / 3.39	201.5	19.0	0.274	0.519 0.334	1462 / 763 1316 / 1116	2085 / 1272 1759 / 1550	
1 x 1600RMS	0.0113	0.0155	0.200	0.247	5.32 / 3.42	230.3	19.0	0.289	0.512 0.327	1572 / 772 1389 / 1162	2250 / 1390 1882 / 1638	
1 x 1800RMS	0.0101	0.0140	0.200	0.247	5.26 / 3.46	259.0	19.0	0.303	0.506 0.321	1658 / 785 1452 / 1200	2400 / 1360 1990 / 1715	
1 x 2000RMS	0.0090	0.0127	0.200	0.247	5.22 / 3.48	287.7	19.0	0.316	0.501 0.317	1699 / 812 1513 / 1235	2552 / 1396 2097 / 1788	

HIGH VOLTAGE XLPE CABLES 64/110 ÷ 115(123)kV

ALUMINIUM CONDUCTOR

- A2XS(FL)2Y acc. IEC 60840
- NA2XS(FL)2Y acc. DIN VDE 0276-632
- XRUHAKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 150RM	14.2 ^{+0.20}	17	51.2	95	57.0	64.8	4150	4.5	1.29
1 x 185RM	15.8 ^{+0.20}	17	52.2	95	58.0	66.0	4320	5.6	1.31
1 x 240RM	17.9 ^{+0.10}	16	51.9	95	57.7	65.7	4390	7.2	1.30
1 x 300RM	20.0 ^{+0.30}	15	52.0	95	57.8	65.8	4500	9.0	1.30
1 x 400RM	22.9 ^{+0.30}	15	54.9	95	60.7	68.9	4940	12.0	1.37
1 x 500RM	25.7 ^{+0.40}	15	57.7	95	63.5	71.9	5420	15.0	1.43
1 x 630RM	29.3 ^{+0.50}	15	62.0	95	67.8	76.3	6120	18.9	1.52
1 x 800RM	33.0 ^{+0.50}	15	65.7	95	71.5	80.4	6860	24.0	1.60
1 x 1000RM	38.0 ^{+0.50}	15	70.7	95	76.5	85.6	7770	30.0	1.71
1 x 1200RM	41.0 ^{+0.60}	15	73.7	95	79.5	88.9	8590	36.0	1.78
1 x 1200RMS	43.6 ^{+0.80}	15	77.6	95	83.4	93.3	9070	36.0	1.87
1 x 1400RMS	46.6 ^{+1.00}	15	80.6	95	86.4	96.5	9850	42.0	1.93
1 x 1600RMS	50.0 ^{+1.00}	15	84.0	95	89.8	100.1	10660	48.0	2.01
1 x 1800RMS	53.3 ^{+1.00}	15	87.3	95	93.1	103.6	11490	54.0	2.08
1 x 2000RMS	55.4 ^{+1.00}	15	89.4	95	95.2	105.9	12200	60.0	2.13

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength at conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity		
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo ¹ Δ ²	in ground	in air
											SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		μF / km	mH / km	A		
1 x 150RM	0.2060	0.2645	0.200	0.247	6.77 / 2.27	14.5	19.0	0.117	0.677 0.492	336 / 311 320 / 316	403 / 385 363 / 360	
1 x 185RM	0.1640	0.2108	0.200	0.247	6.62 / 2.31	17.8	19.0	0.121	0.659 0.474	381 / 346 362 / 356	462 / 437 415 / 410	
1 x 240RM	0.1250	0.1609	0.200	0.247	6.66 / 2.55	23.1	19.0	0.133	0.633 0.449	442 / 390 420 / 410	546 / 506 487 / 479	
1 x 300RM	0.1000	0.1291	0.200	0.247	6.71 / 2.84	28.8	19.0	0.149	0.612 0.427	500 / 429 474 / 461	628 / 570 557 / 546	
1 x 400RM	0.0778	0.1009	0.200	0.247	6.45 / 2.93	38.3	19.0	0.162	0.594 0.409	575 / 474 542 / 523	733 / 649 648 / 631	
1 x 500RM	0.0605	0.0791	0.200	0.247	6.25 / 3.00	47.8	19.0	0.174	0.579 0.394	659 / 519 618 / 591	852 / 731 750 / 726	
1 x 630RM	0.0469	0.0621	0.200	0.247	6.00 / 3.10	60.2	19.0	0.193	0.565 0.380	755 / 565 704 / 666	994 / 821 870 / 835	
1 x 800RM	0.0367	0.0494	0.200	0.247	5.83 / 3.17	76.4	19.0	0.209	0.552 0.367	858 / 607 795 / 741	1148 / 909 999 / 949	
1 x 1000RM	0.0291	0.0400	0.200	0.247	5.65 / 3.25	95.3	19.0	0.231	0.536 0.351	975 / 691 888 / 817	1323 / 1001 1141 / 1071	
1 x 1200RM	0.0247	0.0346	0.200	0.247	5.56 / 3.30	114.3	19.0	0.244	0.528 0.344	1049 / 669 953 / 867	1449 / 1059 1240 / 1155	
1 x 1200RMS	0.0247	0.0321	0.200	0.247	5.46 / 3.35	114.3	19.0	0.261	0.526 0.341	1111 / 688 1018 / 915	1546 / 1103 1335 / 1233	
1 x 1400RMS	0.0212	0.0277	0.200	0.247	5.39 / 3.39	133.3	19.0	0.274	0.519 0.334	1195 / 716 1096 / 972	1696 / 1163 1456 / 1330	
1 x 1600RMS	0.0186	0.0244	0.200	0.247	5.32 / 3.42	152.3	19.0	0.289	0.512 0.327 ²	1306 / 788 1192 / 1075	1848 / 1286 1591 / 1473	
1 x 1800RMS	0.0165	0.0217	0.200	0.247	5.26 / 3.46	171.2	19.0	0.303	0.506 0.321	1380 / 748 1237 / 1069	1987 / 1267 1683 / 1506	
1 x 2000RMS	0.0149	0.0197	0.200	0.247	5.23 / 3.48	190.2	19.0	0.313	0.503 0.318	1455 / 761 1296 / 1107	2110 / 1303 1777 / 1575	

HIGH VOLTAGE XLPE CABLES 76/132 ÷ 138(145)kV

COPPER CONDUCTOR

- 2XS(FL)2Y acc. IEC 60840
- N2XS(FL)2Y acc. DIN VDE 0276-632
- XRUHKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 185RM	16.0 ^{+0.30}	17	52.4	95	58.2	66.2	5450	9.3	1.31
1 x 240RM	18.5 ^{+0.30}	16	52.5	95	58.3	66.3	5890	12.0	1.31
1 x 300RM	20.5 ^{+0.30}	15	52.5	95	58.3	66.3	6370	15.0	1.31
1 x 400RM	23.5 ^{+0.30}	15	55.5	95	61.3	69.5	7380	20.0	1.38
1 x 500RM	26.5 ^{+0.40}	15	58.5	95	64.3	72.7	8560	25.0	1.45
1 x 630RM	30.3 ^{+0.40}	15	63.0	95	68.8	77.5	10160	31.5	1.55
1 x 800RM	34.6 ^{+0.50}	15	67.3	95	73.1	82.0	11980	40.0	1.64
1 x 1000RM	38.2 ^{+0.40}	15	70.9	95	76.7	85.8	14030	50.0	1.72
1 x 1200RMS	43.6 ^{+0.80}	15	77.6	95	83.4	93.3	16520	60.0	1.87
1 x 1400RMS	46.6 ^{+1.00}	15	80.6	95	86.4	96.5	18530	70.0	1.93
1 x 1600RMS	50.0 ^{+1.00}	15	84.0	95	89.8	100.1	20580	80.0	2.01
1 x 1800RMS	53.3 ^{+1.00}	15	87.3	95	93.1	103.6	22630	90.0	2.08
1 x 2000RMS	56.3 ^{+1.20}	15	90.3	95	96.1	106.8	24720	100.0	2.15

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength at conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity			
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo ¹	Δ ²	in ground	in air
												SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		μF / km	mH / km	A			
1 x 185RM	0.0991	0.1272	0.200	0.247	7.92 / 2.78	26.9	19.0	0.122	0.657 0.473	490 / 422 465 / 453	595 / 546 534 / 524		
1 x 240RM	0.0754	0.0973	0.200	0.247	7.91 / 3.09	34.8	19.0	0.136	0.629 0.444	570 / 470 539 / 520	707 / 628 629 / 613		
1 x 300RM	0.0601	0.0781	0.200	0.247	8.00 / 3.43	43.5	19.0	0.151	0.608 0.423	644 / 510 607 / 580	811 / 699 717 / 694		
1 x 400RM	0.0470	0.0618	0.200	0.247	7.69 / 3.53	57.9	19.0	0.164	0.590 0.405	736 / 553 690 / 652	943 / 783 828 / 795		
1 x 500RM	0.0366	0.0489	0.200	0.247	7.44 / 3.62	72.2	19.0	0.178	0.575 0.390	838 / 595 780 / 728	1091 / 869 953 / 905		
1 x 630RM	0.0283	0.0387	0.200	0.247	7.14 / 3.74	90.9	19.0	0.198	0.561 0.377	946 / 641 880 / 808	1264 / 959 1095 / 1028		
1 x 800RM	0.0221	0.0312	0.200	0.247	6.92 / 3.84	115.4	19.0	0.216	0.546 0.361	1074 / 682 980 / 885	1452 / 1046 1244 / 1153		
1 x 1000RM	0.0176	0.0259	0.200	0.247	6.77 / 3.91	144.1	19.0	0.232	0.535 0.351	1185 / 701 1069 / 951	1628 / 1118 1380 / 1263		
1 x 1200RMS	0.0151	0.0202	0.200	0.247	6.55 / 4.02	172.8	19.0	0.261	0.526 0.341	1366 / 738 1232 / 1062	1910 / 1218 1625 / 1452		
1 x 1400RMS	0.0129	0.0175	0.200	0.247	6.47 / 4.06	201.5	19.0	0.274	0.519 0.334	1462 / 763 1316 / 1116	2085 / 1272 1759 / 1550		
1 x 1600RMS	0.0113	0.0155	0.200	0.247	6.39 / 4.11	230.3	19.0	0.289	0.512 0.327	1572 / 772 1389 / 1162	2250 / 1319 1882 / 1638		
1 x 1800RMS	0.0101	0.0140	0.200	0.247	6.32 / 4.15	259.0	19.0	0.303	0.506 0.321	1658 / 785 1452 / 1200	2400 / 1360 1990 / 1715		
1 x 2000RMS	0.0090	0.0127	0.200	0.247	6.26 / 4.18	287.7	19.0	0.316	0.501 0.317	1699 / 812 1513 / 1235	2552 / 1396 2097 / 1788		

HIGH VOLTAGE XLPE CABLES 76/132 ÷ 138(145)kV

ALUMINIUM CONDUCTOR

- A2XS(FL)2Y acc. IEC 60840
- NA2XS(FL)2Y acc. DIN VDE 0276-632
- XRUHAKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 185RM	15.8 +0.20	17	52.2	95	58.0	66.0	4320	5.6	1.31
1 x 240RM	17.9 +0.10	16	51.9	95	57.7	65.7	4390	7.2	1.30
1 x 300RM	20.0 +0.30	15	52.0	95	57.8	65.8	4500	9.0	1.30
1 x 400RM	22.9 +0.30	15	54.9	95	60.7	68.9	4940	12.0	1.37
1 x 500RM	25.7 +0.40	15	57.7	95	63.5	71.9	5420	15.0	1.43
1 x 630RM	29.3 +0.50	15	62.0	95	67.8	76.3	6120	18.9	1.52
1 x 800RM	33.0 +0.50	15	65.7	95	71.5	80.4	6860	24.0	1.60
1 x 1000RM	38.0 +0.50	15	70.7	95	76.5	85.6	7770	30.0	1.71
1 x 1200RM	41.0 +0.60	15	73.7	95	79.5	88.9	8590	36.0	1.78
1 x 1200RMS	43.6 +0.80	15	77.6	95	83.4	93.3	9070	36.0	1.87
1 x 1400RMS	46.6 +1.00	15	80.6	95	86.4	96.5	9850	42.0	1.93
1 x 1600RMS	50.0 +1.00	15	84.0	95	89.8	100.1	10660	48.0	2.01
1 x 1800RMS	53.3 +1.00	15	87.3	95	93.1	103.6	11490	54.0	2.08
1 x 2000RMS	55.4 +1.00	15	89.4	95	95.2	105.9	12200	60.0	2.13

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength at conductor screen / insulation	Max. short circuit current		Capacitance	Inductance ooo ¹ Δ^2	Ampacity	
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			in ground	in air
mm ²	Ω / km				kV / mm	kA / 1 sec		$\mu F / km$	mH / km	A	
1 x 185RM	0.1640	0.2108	0.200	0.247	7.95 / 2.77	17.8	19.0	0.121	0.659 0.474	381 / 346 462 / 437	462 / 437 415 / 410
1 x 240RM	0.1250	0.1609	0.200	0.247	7.99 / 3.06	23.1	19.0	0.133	0.633 0.449	442 / 390 420 / 410	546 / 506 487 / 479
1 x 300RM	0.1000	0.1291	0.200	0.247	8.05 / 3.41	28.8	19.0	0.149	0.612 0.427	500 / 429 474 / 461	628 / 570 557 / 546
1 x 400RM	0.0778	0.1009	0.200	0.247	7.74 / 3.51	38.3	19.0	0.162	0.594 0.409	575 / 474 542 / 523	733 / 649 648 / 631
1 x 500RM	0.0605	0.0791	0.200	0.247	7.50 / 3.60	47.8	19.0	0.174	0.579 0.394	659 / 519 618 / 591	852 / 731 750 / 726
1 x 630RM	0.0469	0.0621	0.200	0.247	7.20 / 3.72	60.2	19.0	0.193	0.565 0.380	755 / 565 704 / 666	994 / 821 870 / 835
1 x 800RM	0.0367	0.0494	0.200	0.247	7.00 / 3.80	76.4	19.0	0.209	0.552 0.367	858 / 607 795 / 741	1148 / 909 999 / 949
1 x 1000RM	0.0291	0.0400	0.200	0.247	6.78 / 3.90	95.3	19.0	0.231	0.536 0.351	975 / 691 888 / 817	1323 / 1001 1141 / 1071
1 x 1200RM	0.0247	0.0346	0.200	0.247	6.67 / 3.96	114.3	19.0	0.244	0.528 0.344	1049 / 669 953 / 867	1449 / 1059 1240 / 1155
1 x 1200RMS	0.0247	0.0321	0.200	0.247	6.55 / 4.02	114.3	19.0	0.261	0.526 0.341	1111 / 688 1018 / 915	1546 / 1103 1335 / 1233
1 x 1400RMS	0.0212	0.0277	0.200	0.247	6.47 / 4.06	133.3	19.0	0.274	0.519 0.334	1195 / 716 1096 / 972	1696 / 1163 1456 / 1330
1 x 1600RMS	0.0186	0.0244	0.200	0.247	6.39 / 4.11	152.3	19.0	0.289	0.512 0.327	1306 / 788 1192 / 1075	1848 / 1286 1591 / 1473
1 x 1800RMS	0.0165	0.0217	0.200	0.247	6.32 / 4.15	171.2	19.0	0.303	0.506 0.321	1380 / 748 1237 / 1069	1987 / 1267 1683 / 1506
1 x 2000RMS	0.0149	0.0197	0.200	0.247	6.28 / 4.17	190.2	19.0	0.313	0.503 0.318	1455 / 761 1296 / 1107	2110 / 1303 1777 / 1575

HIGH VOLTAGE XLPE CABLES 87/150 ÷ 161(170)kV

COPPER CONDUCTOR

- 2XS(FL)2Y acc. IEC 60840
- N2XS(FL)2Y acc. DIN VDE 0276-632
- XRUHKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 185RM	16.0 ^{+0.30}	23	64.8	95	70.6	79.4	6820	9.3	1.59
1 x 240RM	18.5 ^{+0.30}	22	64.5	95	70.3	79.1	7210	12.0	1.58
1 x 300RM	20.5 ^{+0.30}	21	64.5	95	70.3	79.1	7690	15.0	1.58
1 x 400RM	23.5 ^{+0.30}	20	65.5	95	71.3	80.1	8500	20.0	1.60
1 x 500RM	26.5 ^{+0.40}	19	66.5	95	72.3	81.3	9490	25.0	1.62
1 x 630RM	30.3 ^{+0.40}	19	71.0	95	76.8	85.9	11130	31.5	1.72
1 x 800RM	34.6 ^{+0.50}	19	75.3	95	81.1	90.7	13050	40.0	1.82
1 x 1000RM	38.2 ^{+0.40}	19	78.9	95	84.7	94.5	15140	50.0	1.90
1 x 1200RMS	43.6 ^{+0.80}	19	85.6	95	91.4	101.9	17720	60.0	2.04
1 x 1400RMS	46.6 ^{+1.00}	19	88.6	95	94.4	105.1	19760	70.0	2.11
1 x 1600RMS	50.0 ^{+1.00}	19	92.0	95	97.8	108.7	21860	80.0	2.18
1 x 1800RMS	53.3 ^{+1.00}	19	95.3	95	101.1	112.2	23950	90.0	2.26
1 x 2000RMS	56.3 ^{+1.20}	19	98.3	95	104.1	115.4	26080	100.0	2.32

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength at conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity			
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo'	Δ^2	in ground	in air
												SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		$\mu F / km$	mH / km	A			
1 x 185RM	0.0991	0.1271	0.200	0.247	7.45 / 2.16	26.9	19.0	0.103	0.694 0.509	488 / 423 463 / 452	582 / 540 531 / 522		
1 x 240RM	0.0754	0.0972	0.200	0.247	7.37 / 2.34	34.8	19.0	0.111	0.664 0.479	567 / 472 537 / 519	690 / 623 625 / 611		
1 x 300RM	0.0601	0.0780	0.200	0.247	7.31 / 2.55	43.5	19.0	0.121	0.643 0.459	641 / 513 605 / 580	791 / 695 712 / 692		
1 x 400RM	0.0470	0.0617	0.200	0.247	7.20 / 2.80	57.9	19.0	0.135	0.619 0.434	733 / 557 687 / 652	922 / 781 823 / 794		
1 x 500RM	0.0366	0.0488	0.200	0.247	7.17 / 3.07	72.2	19.0	0.151	0.598 0.413	835 / 599 779 / 728	1070 / 868 947 / 904		
1 x 630RM	0.0283	0.0386	0.200	0.247	6.85 / 3.18	90.9	19.0	0.167	0.582 0.397	945 / 644 879 / 810	1239 / 961 1089 / 1028		
1 x 800RM	0.0221	0.0311	0.200	0.247	6.61 / 3.27	115.4	19.0	0.182	0.566 0.381	1073 / 676 980 / 886	1422 / 1050 1238 / 1153		
1 x 1000RM	0.0176	0.0258	0.200	0.247	6.45 / 3.34	144.1	19.0	0.194	0.555 0.370	1184 / 705 1071 / 954	1594 / 1123 1374 / 1264		
1 x 1200RMS	0.0151	0.0202	0.200	0.247	6.20 / 3.45	172.8	19.0	0.218	0.543 0.358	1364 / 744 1230 / 1063	1869 / 1227 1613 / 1450		
1 x 1400RMS	0.0129	0.0175	0.200	0.247	6.11 / 3.49	201.5	19.0	0.228	0.536 0.351	1472 / 763 1316 / 1119	2040 / 1282 1746 / 1550		
1 x 1600RMS	0.0113	0.0155	0.200	0.247	6.02 / 3.53	230.3	19.0	0.240	0.529 0.344	1545 / 788 1389 / 1164	2201 / 1331 1868 / 1639		
1 x 1800RMS	0.0101	0.0140	0.200	0.247	5.94 / 3.57	259.0	19.0	0.251	0.522 0.337	1655 / 791 1452 / 1202	2348 / 1373 1976 / 1716		
1 x 2000RMS	0.0090	0.0127	0.200	0.247	5.88 / 3.61	287.7	19.0	0.261	0.517 0.332	1741 / 803 1516 / 1239	2496 / 1410 2084 / 1790		

HIGH VOLTAGE XLPE CABLES 87/150 ÷ 161(170)kV

ALUMINIUM CONDUCTOR

- A2XS(FL)2Y acc. IEC 60840
- NA2XS(FL)2Y acc. DIN VDE 0276-632
- XRUHAKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 185RM	15.8 + 0.20	23	64.6	95	70.4	79.2	5680	5.6	1.58
1 x 240RM	17.9 + 0.10	22	63.9	95	69.7	78.5	5690	7.2	1.57
1 x 300RM	20.0 + 0.30	21	64.0	95	69.8	78.6	5810	9.0	1.57
1 x 400RM	22.9 + 0.30	20	64.9	95	70.7	79.5	6050	12.0	1.59
1 x 500RM	25.7 + 0.40	19	65.7	95	71.5	80.5	6350	15.0	1.61
1 x 630RM	29.3 + 0.50	19	70.0	95	75.8	84.9	7100	18.9	1.70
1 x 800RM	33.0 + 0.50	19	73.7	95	79.5	88.9	7880	24.0	1.78
1 x 1000RM	38.0 + 0.50	19	78.7	95	84.5	94.3	8890	30.0	1.89
1 x 1200RM	41.0 + 0.60	19	81.7	95	87.5	97.5	9740	36.0	1.96
1 x 1200RMS	43.6 + 0.80	19	85.6	95	91.4	101.9	10260	36.0	2.04
1 x 1400RMS	46.6 + 1.00	19	88.6	95	94.4	105.1	11090	42.0	2.11
1 x 1600RMS	50.0 + 1.00	19	92.0	95	97.8	108.7	11940	48.0	2.18
1 x 1800RMS	53.3 + 1.00	19	95.3	95	101.1	112.2	12810	54.0	2.26
1 x 2000RMS	55.4 + 1.00	19	97.4	95	103.2	114.5	13550	60.0	2.30

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

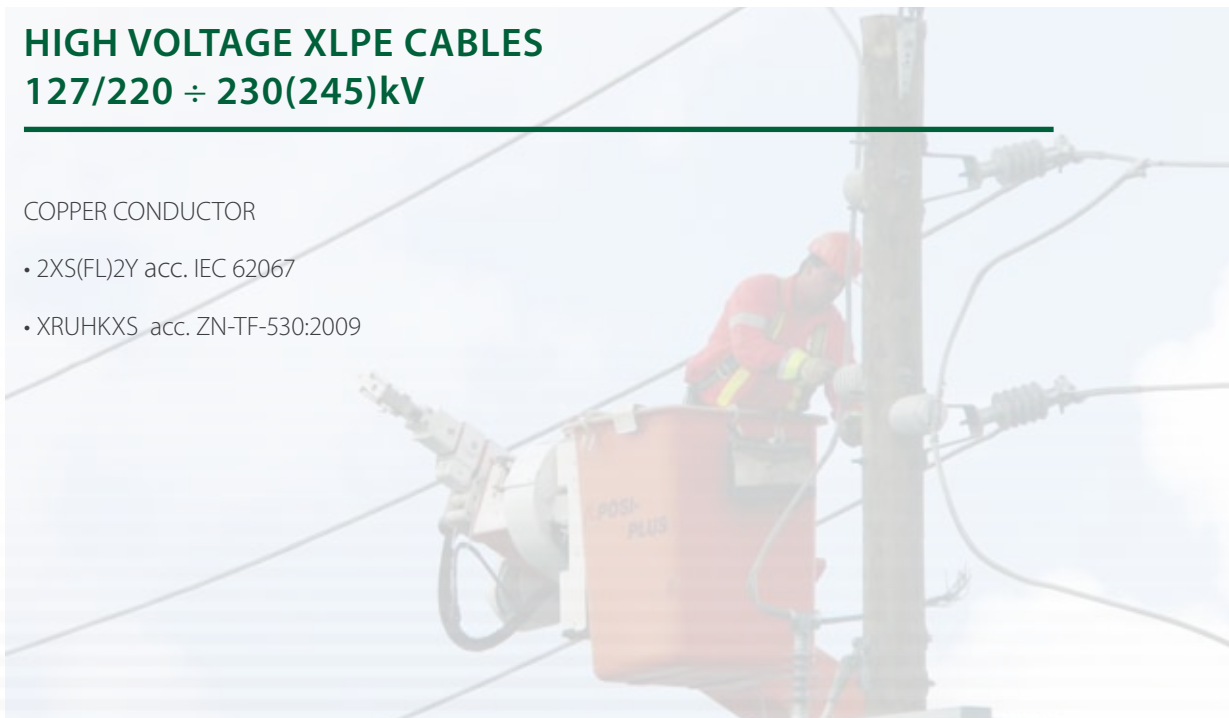
² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength at conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity			
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo ¹	Δ^2	in ground	in air
												SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		μF / km	mH / km	A			
1 x 185RM	0.1640	0.2107	0.200	0.247	7.48 / 2.15	17.8	19.0	0.103	0.696 0.511	379 / 346 412 / 408	451 / 430		
1 x 240RM	0.1250	0.1609	0.200	0.247	7.46 / 2.32	23.1	19.0	0.110	0.669 0.484	440 / 391 418 / 409	533 / 499 484 / 477		
1 x 300RM	0.1000	0.1290	0.200	0.247	7.37 / 2.53	28.8	19.0	0.120	0.647 0.462	498 / 430 471 / 459	612 / 563 553 / 543		
1 x 400RM	0.0778	0.1009	0.200	0.247	7.26 / 2.79	38.3	19.0	0.133	0.622 0.437	572 / 476 540 / 522	717 / 643 643 / 629		
1 x 500RM	0.0605	0.0790	0.200	0.247	7.24 / 3.05	47.8	19.0	0.148	0.602 0.417	656 / 521 616 / 590	836 / 727 745 / 723		
1 x 630RM	0.0469	0.0620	0.200	0.247	6.92 / 3.16	60.2	19.0	0.163	0.586 0.402	753 / 567 703 / 665	974 / 818 864 / 832		
1 x 800RM	0.0367	0.0493	0.200	0.247	6.69 / 3.24	76.4	19.0	0.176	0.572 0.387	856 / 610 793 / 741	1125 / 908 992 / 946		
1 x 1000RM	0.0291	0.0399	0.200	0.247	6.45 / 3.34	95.3	19.0	0.194	0.555 0.370	966 / 649 888 / 817	1295 / 1000 1132 / 1068		
1 x 1200RM	0.0247	0.0345	0.200	0.247	6.34 / 3.39	114.3	19.0	0.204	0.547 0.362	1046 / 674 954 / 869	1418 / 1060 1232 / 1152		
1 x 1200RMS	0.0247	0.0320	0.200	0.247	6.20 / 3.45	114.3	19.0	0.218	0.543 0.358	1108 / 692 1015 / 915	1512 / 1105 1322 / 1227		
1 x 1400RMS	0.0212	0.0276	0.200	0.247	6.11 / 3.49	133.3	19.0	0.228	0.536 0.351	1203 / 716 1095 / 973	1658 / 1167 1442 / 1325		
1 x 1600RMS	0.0186	0.0243	0.200	0.247	6.02 / 3.53	152.3	19.0	0.240	0.529 0.344	1303 / 790 1190 / 1074	1806 / 1283 1575 / 1464		
1 x 1800RMS	0.0165	0.0217	0.200	0.247	5.94 / 3.57	171.2	19.0	0.251	0.522 0.337	1377 / 753 1236 / 1070	1941 / 1273 1668 / 1501		
1 x 2000RMS	0.0149	0.0196	0.200	0.247	5.90 / 3.60	190.2	19.0	0.258	0.519 0.334	1452 / 767 1295 / 1108	2062 / 1311 1761 / 1571		

HIGH VOLTAGE XLPE CABLES 127/220 ÷ 230(245)kV

COPPER CONDUCTOR

- 2XS(FL)2Y acc. IEC 62067
- XRUHKXS acc. ZN-TF-530:2009



Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 300RM	20.5 ^{+0.30}	24	70.9	95	77.1	86.3	8550	15.0	1.73
1 x 400RM	23.5 ^{+0.30}	24	73.9	95	80.1	89.8	9690	20.0	1.79
1 x 500RM	26.5 ^{+0.40}	23	74.9	95	81.1	90.8	10680	25.0	1.82
1 x 630RM	30.3 ^{+0.40}	22	77.0	95	83.2	93.0	12050	31.5	1.86
1 x 800RM	34.6 ^{+0.50}	22	81.3	95	87.5	97.5	13980	40.0	1.96
1 x 1000RM	38.2 ^{+0.40}	22	84.9	95	91.1	101.3	16110	50.0	2.04
1 x 1200RMS	43.6 ^{+0.80}	22	91.6	95	97.8	108.7	18760	60.0	2.18
1 x 1400RMS	46.6 ^{+1.00}	22	94.6	95	100.8	111.9	20840	70.0	2.25
1 x 1600RMS	50.0 ^{+1.00}	22	98.0	95	104.2	115.5	22980	80.0	2.32
1 x 1800RMS	53.3 ^{+1.00}	22	101.3	95	107.5	119.0	25100	90.0	2.40
1 x 2000RMS	56.3 ^{+1.20}	22	104.3	95	110.5	122.2	27270	100.0	2.46

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

CB – Cross Bonded

BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength at conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity			
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo ¹	Δ^2	in ground	in air
												SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		$\mu F / km$	mH / km	A			
1 x 300RM	0.0601	0.0779	0.200	0.247	9.82 / 3.17	43.5	19.0	0.113	0.661 0.476	635 / 510 598 / 574	777 / 689 704 / 686		
1 x 400RM	0.0470	0.0616	0.200	0.247	9.35 / 3.28	57.9	19.0	0.122	0.642 0.457	725 / 554 680 / 645	901 / 774 813 / 786		
1 x 500RM	0.0366	0.0487	0.200	0.247	9.23 / 3.56	72.2	19.0	0.134	0.620 0.435	826 / 596 769 / 720	1045 / 863 935 / 895		
1 x 630RM	0.0283	0.0385	0.200	0.247	9.09 / 3.89	90.9	19.0	0.151	0.598 0.413	941 / 635 870 / 798	1215 / 951 1077 / 1016		
1 x 800RM	0.0221	0.0311	0.200	0.247	8.74 / 4.01	115.4	19.0	0.164	0.581 0.396	1059 / 673 968 / 877	1394 / 1047 1224 / 1144		
1 x 1000RM	0.0176	0.0258	0.200	0.247	8.51 / 4.10	144.1	19.0	0.175	0.569 0.384	1169 / 702 1058 / 944	1563 / 1121 1358 / 1255		
1 x 1200RMS	0.0151	0.0201	0.200	0.247	8.15 / 4.24	172.8	19.0	0.195	0.556 0.371	1345 / 739 1212 / 1049	1830 / 1227 1591 / 1438		
1 x 1400RMS	0.0129	0.0174	0.200	0.247	8.02 / 4.29	201.5	19.0	0.204	0.549 0.364	1452 / 738 1296 / 1104	1998 / 1282 1723 / 1537		
1 x 1600RMS	0.0113	0.0154	0.200	0.247	7.89 / 4.35	230.3	19.0	0.214	0.541 0.356	1548 / 773 1369 / 1150	2155 / 1332 1844 / 1627		
1 x 1800RMS	0.0101	0.0140	0.200	0.247	7.78 / 4.40	259.0	19.0	0.224	0.534 0.349	1612 / 792 1430 / 1186	2298 / 1374 1951 / 1704		
1 x 2000RMS	0.0090	0.0126	0.200	0.247	7.69 / 4.45	287.7	19.0	0.233	0.528 0.344	1717 / 797 1492 / 1222	2443 / 1414 2057 / 1778		

HIGH VOLTAGE XLPE CABLES 127/220 ÷ 230(245)kV

- ALUMINIUM CONDUCTOR
- A2XS(FL)2Y acc. IEC 62067
- XRUHAKXS acc. ZN-TF-530:2009

Cross-section of conductor	Diameter of conductor	Insulation		Copper screen		D _e Outer diameter of cable	Weight of cable	Max. pulling force	Min. bending radius
		Nominal thickness	Diameter over Insulation	cross-section	Diameter over screen				
mm ²	mm	mm	mm	mm ²	mm	mm	kg/km	kN	m
1 x 300RM	20.0 ^{+0.30}	24	70.4	95	76.6	85.8	6660	9.0	1.72
1 x 400RM	22.9 ^{+0.30}	24	73.3	95	79.5	89.0	7200	12.0	1.78
1 x 500RM	25.7 ^{+0.40}	23	74.1	95	80.3	90.0	7530	15.0	1.80
1 x 630RM	29.3 ^{+0.50}	22	76.0	95	82.2	91.8	7990	18.9	1.84
1 x 800RM	33.0 ^{+0.50}	22	79.7	95	85.9	95.9	8820	24.0	1.92
1 x 1000RM	38.0 ^{+0.50}	22	84.7	95	90.9	101.1	9860	30.0	2.03
1 x 1200RM	41.0 ^{+0.60}	22	87.7	95	93.9	104.3	10740	36.0	2.10
1 x 1200RMS	43.6 ^{+0.80}	22	91.6	95	97.8	108.7	11310	36.0	2.18
1 x 1400RMS	46.6 ^{+1.00}	22	94.6	95	100.8	111.9	12170	42.0	2.25
1 x 1600RMS	50.0 ^{+1.00}	22	98.0	95	104.2	115.5	13050	48.0	2.32
1 x 1800RMS	53.3 ^{+1.00}	22	101.3	95	107.5	119.0	13970	54.0	2.40
1 x 2000RMS	55.4 ^{+1.00}	22	103.4	95	109.6	121.3	14720	60.0	2.44

ELECTRICAL PARAMETERS

RM (RMC) – Round Multiwire Conductor (C- compacted) , Class 2

RMS (Milliken type) – Round Multiwire Segmented Conductor

SPB – Single Point Bonded

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BE – Both Ends

D_e – Cable diameter

¹ – Cables in flat formation, the distance between cables = $2 \times D_e$

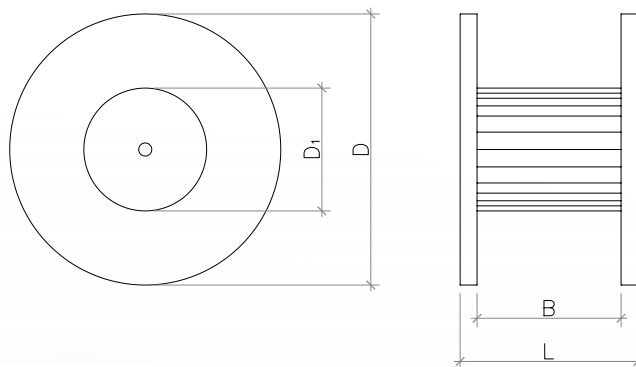
² – Cables in trefoil formation, the distance between cables = D_e

Cross-section of conductor	Conductor resistance		Copper screen resistance		Field strength that conductor screen / insulation	Max. short circuit current		Capacitance	Inductance	Ampacity			
	DC 20 °C	AC 90 °C	DC 20 °C	AC 90 °C		Conductor	Copper screen			ooo ¹	Δ^2	in ground	in air
												SPB, CB / BE	SPB, CB / BE
mm ²	Ω / km				kV / mm	kA / 1 sec		μF / km	mH / km	A			
1 x 300RM	0.1000	0.1290	0.200	0.247	9.90 / 3.15	28.8	19.0	0.112	0.665 0.480	493 / 427 466 / 454	601 / 557 547 / 538		
1 x 400RM	0.0778	0.1008	0.200	0.247	9.44 / 3.26	38.3	19.0	0.120	0.645 0.460	566 / 472 534 / 516	701 / 635 635 / 622		
1 x 500RM	0.0605	0.0789	0.200	0.247	9.32 / 3.54	47.8	19.0	0.132	0.624 0.439	649 / 517 609 / 583	816 / 718 735 / 715		
1 x 630RM	0.0469	0.0619	0.200	0.247	9.18 / 3.86	60.2	19.0	0.148	0.602 0.417	744 / 563 694 / 657	955 / 810 854 / 823		
1 x 800RM	0.0367	0.0492	0.200	0.247	8.86 / 3.97	76.4	19.0	0.159	0.587 0.402	846 / 605 784 / 732	1102 / 899 980 / 935		
1 x 1000RM	0.0291	0.0398	0.200	0.247	8.52 / 4.09	95.3	19.0	0.174	0.569 0.384	954 / 644 877 / 807	1269 / 992 1118 / 1056		
1 x 1200RM	0.0247	0.0344	0.200	0.247	8.35 / 4.16	114.3	19.0	0.183	0.560 0.375	1032 / 669 941 / 857	1389 / 1052 1216 / 1140		
1 x 1200RMS	0.0247	0.0320	0.200	0.247	8.15 / 4.24	114.3	19.0	0.195	0.556 0.371	1093 / 687 1000 / 901	1480 / 1098 1303 / 1213		
1 x 1400RMS	0.0212	0.0276	0.200	0.247	8.02 / 4.29	133.3	19.0	0.204	0.549 0.364	1186 / 710 1078 / 958	1623 / 1159 1421 / 1309		
1 x 1600RMS	0.0186	0.0243	0.200	0.247	7.89 / 4.35	152.3	19.0	0.214	0.541 0.356	1285 / 779 1172 / 1057	1767 / 1269 1551 / 1444		
1 x 1800RMS	0.0165	0.0216	0.200	0.247	7.78 / 4.40	171.2	19.0	0.224	0.534 0.349	1357 / 747 1216 / 1053	1899 / 1266 1643 / 1484		
1 x 2000RMS	0.0149	0.0196	0.200	0.247	7.72 / 4.43	190.2	19.0	0.231	0.530 0.345	1431 / 760 1275 / 1091	2016 / 1304 1736 / 1553		

CABLE DRUMS

Cable wooden drums are standardized. Also we offer special wooden drums with different dimensions on customer request.

Dimensions of wooden cable drums					
Type		28	30	32	34
Ø D	mm	2800	3000	3200	3400
Ø D ₁	mm	1800	2000	1700	2200
B	mm	1400	1700	1800	1800
L	mm	1675	1990	2095	2200
Weight	kg	1370	1798	1814	2500



Cable lengths (in metres) on standard wooden drums

Dia. [mm]	Type of wooden drums				Dia. [mm]	Type of wooden drums				Dia. [mm]	Type of wooden drums			
	28	30	32	34		28	30	32	34		28	30	32	34
57	1064	1424	2332	2341	82	401	556	1000	1132	107	220	306	662	597
58	891	1195	2343	2351	83	402	557	1003	1135	108	220	307	664	598
59	853	1154	2273	2278	84	403	528	1006	1138	109	221	307	529	600
60	855	1157	2023	2287	85	403	529	1009	1084	110	221	307	530	601
61	817	1115	1959	1946	86	377	530	962	901	111	221	308	531	602
62	819	1118	1968	1953	87	378	531	965	903	112	221	308	532	603
63	821	1121	1903	1887	88	379	502	968	905	113	222	287	534	564
64	823	1078	1911	1894	89	379	503	971	860	114	222	287	499	565
65	784	1081	1920	1900	90	380	504	922	862	115	222	287	500	566
66	786	1039	1622	1834	91	381	505	925	864	116	223	288	501	567
67	637	844	1628	1593	92	354	506	928	866	117	203	288	502	568
68	605	845	1634	1535	93	355	477	766	868	118	203	288	504	570
69	606	810	1575	1539	94	355	478	768	822	119	203	289	505	571
70	608	812	1581	1544	95	356	479	727	824	120	204	289	506	572
71	609	814	1521	1484	96	357	479	729	825	121	204	290	507	406
72	577	778	1527	1489	97	357	480	731	827	122	204	268	472	406
73	578	780	1320	1494	98	358	481	733	829	123	204	268	473	407
74	579	782	1267	1433	99	331	452	735	831	124	205	268	474	408
75	581	783	1272	1438	100	332	452	737	784	125	205	269	475	408
76	548	748	1276	1225	101	238	326	695	630	126	205	269	476	409
77	549	749	1281	1173	102	238	326	697	631	127	206	269	477	410
78	550	751	1227	1176	103	239	326	699	632	128	206	270	478	410
79	552	752	1231	1179	104	239	327	701	633	129	186	270	479	411
80	553	716	1235	1182	105	239	327	703	635	130	186	270	480	412
81	400	555	1180	1129	106	240	306	705	596	131	186	271	335	381

DELIVERY OF CABLE SYSTEMS

TELE-FONIKA KABLE Sp. z o.o. S.K.A. has a extensive experience in offering HV systems worldwide. Starting in 1992 with first installation of 110kV XLPE cable system in Poland so far Tele-Fonika has realize over 200 of HV system projects all over the world. The “turn key” solution includes design of the system, site surveys, cable-laying, installation and final test.

TELE-FONIKA KABLE Sp. z o.o. S.K.A. offer high voltage cable systems more than 220kV on individual request.

CABLE AND ACCESSORIES SELECTION

TELE-FONIKA KABLE Sp. z o.o. S.K.A. offers selection of cables and equipment adequate to required technical-operational parameters of designed cable systems, in cooperation with design offices and investors.

- selection of nominal cross-section of cable conductor, based on required load capacity of cable line and performance conditions
- selection of nominal cross-section metallic screen, based on short-circuit loads of energy system and time of their duration.
- area of cable laying: ground, air, ducts, flyover
 - number of cable lines and distances between them
 - method of cable laying (flat or triangular)
 - depth of laying under ground with respect to thermal resistance of soil
 - designed culverts and their length
- selection of types and quantities of cable accessories, based on atmospheric pollution level and available cable sections offered by the producer.

