

OUTPUT PRODUCT CATALOGUE



limited liability company
TOMSKCABLE

OUTPUT AND REALIZATION OF CABLES AND CONDUCTORS

Коммунальный мост



WE ARE GLAD
TO COOPERATE WITH YOU!

limited liability company
TOMSKCABLE

на Новосибирск

на Аэропорт



Dear Gentlemen!

LLC "Tomsk Cable Plant" is one of the leading producers of cabling and wiring production in Russia, the courageous and progressive enterprise which has made considerable breakthrough in its development: on the basis of the old plant the modern hi-tech enterprise has been created, which corresponds to the level of the world standards.

In 2000 "Tomsk cable plant" has been created practically from scratch, having only buildings and rooms in assets, and at that time production basis allowed to produce only limited nomenclature. The first lot of final production was wires for overhead power transmission lines. Two years later the enterprise mastered production of cables in insulation: it organized production of power group of cables, control cables, communication wires of and cords of different purposes – total of more than 500 label sizes.

Year by year thanks to harmonious work of all collective the enterprise managed to make a lot of things. We installed the modern hi-tech equipment from England, Germany, Italy. We put the new production capacities into operation. We expanded the list of produced nomenclature and mastered new one. Mastering of production of alarm and blocking cables, assembly cables, power flexible cables became achievements of the last years. Serial production of cables with low toxicity of combustion products in "ng(A) - LSLTx" and "ng(A) - FRLSLTx" embodiments for voltage of 0,66 and 1 kV has been begun in 2013.

Now LLC "Tomskcable" manufactured the most demanded cable nomenclature. They are: screened cables for the enterprises of oil and gas industry; nonflammable and nontoxic cables applied in nuclear branch and at constructing objects of social value, since they correspond to high requirements of fire safety; as well as other production demanding hi-tech approach at manufacturing. Wide assortment row of the cables manufactured by the plant is our large advantage. Complex deliveries of different nomenclature from one producer are highly appreciated by such large Russian companies, as Sibur, Gazprom, Rosneft.

Modern requirements of the market oblige producers to develop and introduce new technologies in production. Development of high technologies is priority direction for LLC "Tomskcable", therefore the enterprise constantly improves the operating processes and introduces the latest technologies. The modern equipment and the automated system of work allows to plant to manufacture production for the sum more than 500 million rubles monthly in minimum terms and with optimum number of personnel.

Each stage of manufacturing technology of final product is automated and under rigid control: from the moment of raw material selection to shipping on a warehouse. The controlled production cycle of each production phase gives opportunity to provide consumers with high quality product being worthy to the competition. Also large achievement of automation of a full cycle of production and technological processes is opportunity to start daily in production backlogs of orders for cabling and wiring production.

Since 2006 the enterprise quality management system has been certified and really helped us in organization of manufacturing processes and quality control of production. After introduction of the quality system quantity of consumer claims has been reduced. In December, 2009 LLC "Tomskcable" passed assessment from the side of the authorized organization CJSC "Bureau Veritas Certification Rus" for compliance with the requirements of ISO 9001:2008 standard, and also to requirements of Russian Certification Standard (RSS) R ISO 9001-2008.

In Russia practically no branch of industry can do without "Tomsk cable plant" production. Cooperation with LLC "Tomskcable" has been appreciated by the Ural metallurgists, Tomsk, and Tyumen oil industry workers and gas workers, Kuzbass coal miners, Altai and Krasnoyarsk builders, Irkutsk gold miners, Far East industrialists, partners from Mongolia and Kazakhstan. Enterprise "Tomskcable" is accredited as the supplier of cabling and wiring production to the companies of OJSC "Rosneft", has the valid license for the right to produce and delivery of production for nuclear branch. In 2014 LLC "Tomskcable" passed accreditation on delivery of cables and wires for needs of the companies of OJSC Gazprom.

The modernized production and highly professional approach to work allow to optimize expenses of plant that influences product cost and formation of price policy. Possible options of individual cooperation with clients take into account transaction factors: fixation of the price on the coordinated period, formation of warehouse presence, ensuring timely manufacturing and shipment of the production, selection of a convenient logistic scheme of delivery, including one with own motor transport. "Tomsk cable plant" constantly works on improvement of schemes of cooperation with clients, that to provide the best offer from production plant.

Offers for long term work with use of accumulation of discounts system, continuous replenishment of warehouse presence of the client, joint promotion of production under brand of "Tomskcable" in the market of sales are valid for long term partners.

The plant has huge plans. Work for accreditation on delivery of cable production for the enterprises of Russian Railways is begun. Commissioning of office room with area more than 3 000 sq.m is ending; construction of new shop with area more than 10 000 sq.m for production of high-voltage cables from cross linked polyethylene for voltage from 6 to 220 kV is carried out. Prospects of production development include mastering of manufacturing of mine and excavator and ship cables.

We invite partners of the enterprise and simply interested persons to visit plant and to get personally acquainted with the existing industry.

**LLC "Tomskcable" General Director
Chulovsky Sergey Ivanovich**

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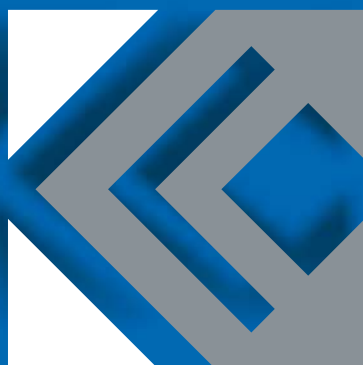
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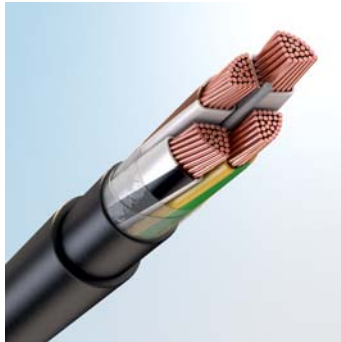


**POWER CABLES FOR THE
VOLTAGE 0,66; 1; 3 kV**

limited liability company
TOMSKCABLE

PVC-Compound Insulated Power Cables of Stationary Laying, Voltage 0,66; 1; 3 kV; TU 3500-020-59680332-2010

Power cables without protective coverages, voltage 0,66, 1 kV



VVG, AVVG

Power cables: copper or aluminium conductors, PVC-compound insulation and sheath

VVGng(A), AVVGng(A)

Power cables: copper or aluminium conductors, PVC-compound insulation, flame-retardant PVC-compound sheath

VVGng(A)-HL, AVVGng(A)-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation, cold-resistant, flame-retardant PVC-compound sheath

VVG-HL, AVVG-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and sheath

VVGng(A)-LS, AVVGng(A)-LS

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and sheath

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems (according to classifier of fire safety OPB 88/97 (PNAE G-01-011)).

The cables with insulation and outer PVC-compound sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with PVC-compound insulation and outer flame-retardant PVC-compound sheath are designed for laying in cable works of outdoor (open) electrical installations that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with low-smoke PVC-compound insulation and outer sheath are designed for bunched laying in cable works in rooms of indoor (closed) electrical installations inclusive facilities of using nuclear energy as well as for use in building constructions.

The "ng(A)-HL"-type cables with cold-resistant, flame-retardant PVC-compound insulation and outer cold-resistant, flame-retardant PVC-compound sheath are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with cold-resistant PVC-compound insulation and outer sheath are designed for single laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

OKP (Russian national product classifier) codes

352100 the cable with copper conductors for nominal voltage 0,66 kV
 353300 the cable with copper conductors for nominal voltage 1 kV
 352200 the cable with aluminium conductors for nominal voltage 0,66 kV
 353700 the cable with aluminium conductors for nominal voltage 1 kV

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to Russian Standard System (GOST) 22483.

2. Insulation: For the cables of AVVG, VVG, AVVGng(A) and VVGng(A) types: PVC-compound. For the cables of AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL and VVG-HL types: cold-resistant PVC-compound. For the cables of AVVGng(A)-LS and VVGng(A)-LS types: low-smoke PVC-compound. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: insulated conductors of two, three, four and five-core cables are stranded; two-, three and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections or one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.

4. Inner sheath: for the cables of AVVG and VVG types: PVC-compound. For the cables of the AVVGng(A) and VVGng(A) types: flame-retardant PVC-compound. For the cables of the AVVGng(A)-HL and VVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of the AVVG-HL and VVG-HL types: cold-resistant PVC-compound. For the cables of the AVVGng(A)-LS and VVGng(A)-LS types: low-smoke PVC-compound.

Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable the form being close to circular one. The cables with core's cross-section up to 16 mm² inclusive can be manufactured without inner sheath. Filling intervals between conductors is performed with outer sheath. Nominal thickness of inner sheath is specified in the Appendix on page 123.

5. Outer sheath: for the cables of AVVG and VVG types: PVC-compound. For the cables of AVVGng(A) and VVGng(A) types: flame-retardant PVC-compound. For the cables of AVVGng(A)-HL and VVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVVG-HL and VVG-HL types: cold-resistant PVC-compound. For the cables of AVVGng(A)-LS and VVGng(A)-LS types: low-smoke PVC-compound. Nominal thickness of sheaths is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables AVVG and VVGUHL and T, placement categories 1 and 5
 For the cables AVVGng(A) and VVGng(A)UHL, placement categories 1 and 5
 For the cables AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL, VVG-HLHL, placement categories 1 and 5
 For the cables AVVGng(A)-LS and VVGng(A)-LSUHL and V, placement categories 5

Operating temperature range:

For the cables AVVG, VVG, AVVGng(A), VVGng(A), AVVGng(A)-LS and VVGng(A)-LSfrom -50 °C to +50 °C
 For the cables AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL and VVG-HLfrom -60 °C to +50 °C
 Relative air humidity at max +35 °Cmax 98%
 Cable conductor continuous operating heating temperature max70 °C

Laying and installation of cables without preheating is performed at temperature not less than:

For the cables AVVG, VVG, AVVGng(A), VVGng(A), AVVGng(A)-LS, VVGng(A)-LS-15 °C
 For the cables AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL and VVG-HL-30 °C

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV3 kV
 for the voltage 1 kV3,5 kV
 Nominal frequency50 Hz

Minimal bending radius at laying and installation:

for single-core cables10 outer cable diameters
 for multi-core cables7,5 outer cable diameters

Max allowed pulling force during cable tracing

for the cables with copper conductors50 N/mm²
 for the cables with aluminium conductors30 N/mm²

Construction length with the main core's cross-section

up to 16 mm²450 m
 up to 25 to 70 mm²300 m
 up to 95 mm² and more200 m
 Guarantee use period5 years from date of input of the cable into operation
 Service life30 years

The cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of sections, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for the voltage 1 kV, kg				
	0,66 kV	1 kV	VVG	VVGng(A)	VVGng(A)-HL	VVG-HL	VVGng(A)-LS	VVG	VVGng(A)	VVGng(A)-HL	VVG-HL	VVGng(A)-LS
1 x 1,5 sr	5,4	5,8	42	44	44	40	50	47	49	48	45	55
1 x 2,5 sr	5,8	6,2	54	56	56	52	63	59	61	61	57	69
1 x 4 sr	6,4	7,0	73	76	76	71	84	82	85	84	79	94
1 x 6 sr	6,9	7,5	95	98	97	93	106	104	107	107	101	118
1 x 10 sr	8,1	8,3	143	146	145	139	157	146	149	149	143	162
1 x 16 sr	9,3	9,5	209	213	212	205	227	212	217	216	208	232
1 x 16 mr	9,7	9,9	215	220	219	211	235	220	224	223	215	240
1 x 25 sr	10,8	11,0	305	310	309	300	328	310	315	314	305	334
1 x 25 mr	11,1	11,3	314	319	318	309	339	319	324	323	314	345
1 x 35 mr	12,1	12,3	406	411	410	400	433	411	416	415	405	439
1 x 50 mr	13,8	14,0	582	588	586	575	615	588	594	592	580	622
1 x 70 mr	-	15,6	-	-	-	-	-	759	767	764	751	799
1 x 95 mr	-	17,7	-	-	-	-	-	1017	1025	1022	1006	1065
1 x 120 mr	-	19,5	-	-	-	-	-	1277	1288	1284	1265	1334
1 x 150 mr	-	21,3	-	-	-	-	-	1560	1572	1567	1546	1627
1 x 185 mr	-	23,3	-	-	-	-	-	1923	1936	1930	1907	2000
1 x 240 mr	-	26,4	-	-	-	-	-	2464	2484	2473	2443	2560
2 x 1,5 sr	8,7	9,5	107	113	112	102	129	123	130	129	117	149
2 x 2,5 sr	9,5	10,3	138	145	144	132	163	155	163	162	149	185
2 x 4 sr	10,8	12,0	189	198	197	182	221	220	229	228	211	259
2 x 6 sr	11,8	13,0	244	253	253	235	281	277	288	287	266	322
2 x 10 sr	14,2	14,6	369	382	381	357	421	382	396	394	369	437
2 x 16 sr	16,1	16,5	523	539	538	508	587	537	554	552	521	605
2 x 16 mr	17,0	17,4	551	569	567	535	622	566	585	583	549	641
2 x 25 sr	21,1	21,5	911	890	888	835	994	932	910	907	853	1018
2 x 25 mr	21,8	22,2	950	927	924	868	1038	972	947	945	887	1063
2 x 35 mr	24,0	24,4	1206	1178	1175	1109	1310	1230	1201	1198	1129	1338
2 x 50 mr	27,4	27,8	1682	1641	1637	1553	1812	1709	1667	1663	1576	1844
3 x 1,5 sr	9,1	10,0	125	130	130	120	147	142	149	148	136	170
3 x 2,5 sr	10,0	10,8	165	171	171	159	191	184	192	191	177	215
3 x 4 sr	11,4	12,7	231	239	238	223	264	264	273	272	255	305
3 x 6 sr	12,5	13,7	302	312	311	294	341	339	350	348	328	386
3 x 10 sr	15,0	15,4	464	477	475	452	518	478	491	489	466	535
3 x 16 sr	17,0	17,5	670	685	683	655	736	686	702	699	670	756
3 x 16 mr	18,0	18,4	700	716	714	683	772	717	734	731	670	793
3 x 25 sr	22,3	22,7	1137	1121	1117	1066	1226	1159	1142	1138	1086	1253
3 x 25 mr	23,0	23,4	1180	1162	1158	1105	1274	1204	1185	1181	1125	1302
3 x 35 mr	25,4	25,8	1514	1492	1488	1424	1624	1540	1517	1512	1447	1655
3 x 50 mr	29,0	29,5	2139	2107	2101	2202	2278	2168	2136	2129	2048	2312
4 x 1,5 sr	9,8	10,7	148	154	153	142	173	168	175	174	162	199
4 x 2,5 sr	10,7	11,7	198	205	204	192	227	221	229	228	213	255
4 x 4 sr	12,3	13,8	280	289	288	272	317	320	330	328	309	366
4 x 6 sr	13,5	15,0	372	382	380	363	415	415	426	424	403	468
4 x 10 sr	16,4	16,9	576	590	587	563	636	592	607	604	579	657
4 x 16 sr	18,7	19,1	840	856	853	824	913	859	876	872	842	936
4 x 16 mr	19,7	20,2	874	892	888	856	954	894	913	909	875	979
4 x 25 sr	24,5	25,0	1432	1417	1412	1357	1538	1458	1442	1437	1380	1569
4 x 25 mr	25,3	25,8	1484	1466	1461	1403	1595	1511	1493	1488	1427	1628
4 x 35 mr	27,7	28,2	1893	1873	1867	1800	2021	1924	1901	1896	1826	2057
4 x 50 mr	32,2	32,7	2728	2694	2686	2598	2893	2763	2728	2719	2629	2934
5 x 1,5 sr	10,5	11,6	177	183	182	171	205	201	208	207	193	235
5 x 2,5 sr	11,6	12,7	238	246	245	231	271	265	273	272	256	304
5 x 4 sr	13,4	15,0	340	350	348	331	383	386	397	395	375	439
5 x 6 sr	14,7	16,3	459	469	467	448	508	509	521	518	495	570
5 x 10 sr	17,9	18,5	707	721	718	692	776	726	741	738	711	800
5 x 16 sr	20,5	21,0	1030	1048	1044	1012	1115	1052	1071	1066	1033	1142
5 x 16 mr	21,7	22,2	1070	1089	1085	1050	1162	1094	1113	1109	1072	1192
5 x 25 sr	26,7	27,3	1729	1714	1708	1647	1851	1760	1744	1737	1675	1888
5 x 25 mr	27,7	28,2	1789	1772	1766	1702	1918	1822	1804	1797	1731	1957
5 x 35 mr	30,4	31,3	2303	2281	2274	2200	2451	2373	2346	2338	2259	2531
5 x 50 mr	35,8	36,3	3559	3326	3316	3216	3560	3401	3366	3355	3253	3610
3x25 sr + 1x16 sr	24,5	25,0	1374	1355	1351	1292	1481	1400	1381	1376	1315	1512
3x25 mr + 1x16mr	25,3	25,8	1421	1401	1397	1335	1534	1449	1428	1423	1359	1567
3x35 mr + 1x16mr	26,8	27,3	1704	1683	1678	1612	1825	1732	1710	1704	1637	1858
3x50 mr + 1x25mr	30,7	31,6	2421	2391	2384	2303	2573	2487	2453	2445	2358	2650

The cables with copper conductors, sector

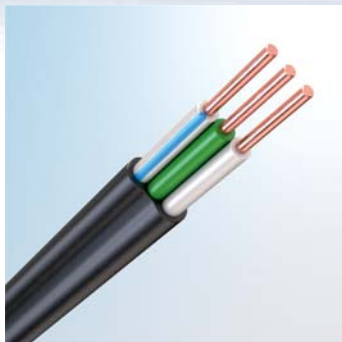
Number and nominal cross-section of cores, mm ²	Nominal outer diameter of sections, mm	Weight of 1 km of the cable for the voltage 0,66 kV, kg				
		VVG	VVGng(A)	VVGng(A)-HL	VVG-HL	VVGng(A)-LS
2x70 ms	26,5	1761	1758	1766	1717	1900
2x95 ms	28,5	2304	2300	2308	2254	2463
2x120 ms	32,9	2882	2872	2880	2813	3067
2x150 ms	35,3	3521	3513	3520	3443	3739
2x185 ms	37,8	4286	4277	4282	4200	4532
2x240 ms	43,7	5491	5473	5476	5373	5791
3x70 ms	30,5	2485	2481	2489	2432	2655
3x95 ms	35,3	3389	3380	3388	3312	3607
3x120 ms	38,3	4146	4137	4144	4061	4384
3x150 ms	42,7	5112	5095	5101	5001	5395
3x185 ms	47,1	6312	6296	6300	6184	6650
3x240 ms	51,1	7948	7929	7930	7800	8341
4x70 ms	35,3	3316	3308	3317	3241	3537
4x95 ms	39,3	4396	4386	4393	4308	4655
4x120 ms	42,7	5446	5429	5436	5336	5737
4x150 ms	47,1	6678	6661	6666	6550	7025
4x185 ms	52,1	8219	8200	8202	8072	8623
4x240 ms	56,9	10473	10446	10445	10288	10963
5x70 ms	38,3	4071	4061	4071	3987	4326
5x95 ms	43,7	5481	5462	5470	5367	5793
5x120 ms	49,1	6795	6777	6785	6663	7154
5x150 ms	53,5	8346	8318	8323	8182	8769
5x185 ms	58,9	10321	10294	10295	10131	10827
5x240 ms	62,9	12959	12929	12925	12749	13538
3x70 ms+1x35 mr	35,3	2978	2970	2977	2901	3187
3x95 ms+1x50 ms	39,3	3980	3971	3976	3890	4231
3x120 ms+1x70 ms	42,7	4961	4944	4952	4852	5243
3x150 ms+1x70 ms	47,1	5916	5900	5906	5790	6248
3x185 ms+1x95 ms	52,1	7350	7331	7335	7205	7736
3x240ms +1x120ms	56,9	9329	9303	9304	9146	9792

The cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of sections, mm	Weight of 1 km of the cable for the voltage 0,66 kV, kg				
		AVVG	AVVGng(A)	AVVGng(A) HL	AVVG-HL	AVVGng(A)-LS
2x70 ms	26,5	915	912	920	871	1054
2x95 ms	28,5	1156	1152	1159	1106	1315
2x120 ms	32,9	1414	1404	1411	1344	1598
2x150 ms	35,3	1694	1686	1692	1616	1912
2x185 ms	37,8	2022	2012	2017	1935	2267
2x240 ms	43,7	2580	2561	2565	2462	2880
3x70 ms	30,5	1216	1211	1220	1162	1385
3x95 ms	35,3	1667	1658	1666	1590	1885
3x120 ms	38,3	1943	1934	1941	1858	2181
3x150 ms	42,7	2372	2354	2360	2260	2655
3x185 ms	47,1	2916	2899	2903	2787	3254
3x240 ms	51,1	3581	3562	3563	3433	3974
4x70 ms	35,3	1624	1616	1625	1549	1844
4x95 ms	39,3	2100	2090	2097	2011	2359
4x120 ms	42,7	2509	2491	2499	2399	2799
4x150 ms	47,1	3023	3007	3012	2896	3370
4x185 ms	52,1	3690	3671	3673	3544	4095
4x240ms	56,9	4650	4624	4623	4465	5141
5x70ms	38,3	1955	1946	1955	1872	2210
5x95 ms	43,7	2610	2592	2600	2497	2922
5x120 ms	49,1	3123	3105	3113	2991	3482
5x150 ms	53,5	3779	3751	3755	3614	4201
5x185 ms	58,9	4660	4633	4634	4471	5167
5x240 ms	62,9	5681	5651	5647	5471	6261
3x70ms + 1x35mr	35,3	1500	1492	1499	1423	1709
3x95 ms+1x50 ms	39,3	1942	1933	1940	1855	2193
3x120ms+1x70ms	42,7	2335	2318	2326	2226	2617
3x150ms+1x70 ms	47,1	2753	2736	2743	2626	3084
3x185ms+1x95ms	52,1	3379	3361	3364	3234	3765
3x240ms+1x20ms	56,9	4227	4201	4203	4045	4691

The cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for the voltage 1 kV, kg				
	0,66 kV	1 kV	AVVG	AVVGng(A)	AVVGng(A)-HL	AVVG-HL	AVVGng(A)-LS	AVVG	AVVGng(A)	AVVGng(A)-HL	AVVG-HL	AVVGng(A)-LS
1x2,5sr	5,8	6,2	39	41	41	37	48	44	46	46	42	54
1x4sr	6,4	7,0	49	52	52	47	60	58	61	60	55	70
1x6sr	6,9	7,5	59	62	61	57	71	68	71	71	65	82
1x10sr	8,1	8,3	83	86	86	80	98	86	90	89	83	102
1x16sr	9,3	9,5	112	116	116	108	130	116	120	120	112	135
1x16mr	9,7	9,9	118	122	122	114	138	122	127	126	118	143
1x25sr	10,8	11,0	156	160	159	151	179	160	165	164	155	184
1x25mr	11,1	11,3	162	167	166	157	186	167	172	171	161	194
1x35mr	12,1	12,3	198	204	202	192	225	204	209	208	197	232
1x50mr	13,8	14,0	268	274	272	260	301	274	280	278	266	309
1x70mr	-	15,6	-	-	-	-	-	336	343	340	327	375
1x95mr	-	17,7	-	-	-	-	-	442	450	447	431	490
1x120mr	-	19,5	-	-	-	-	-	539	550	546	527	597
1x150mr	-	21,3	-	-	-	-	-	649	661	656	635	716
1x185mr	-	23,3	-	-	-	-	-	787	800	794	771	864
1x240mr	-	26,4	-	-	-	-	-	1004	1020	1013	984	1101
2x2,5sr	9,5	10,3	108	114	114	102	133	125	133	132	118	155
2x4sr	10,8	12,0	141	149	149	134	173	171	181	180	162	211
2x6sr	11,8	13,0	172	181	180	163	209	204	215	214	194	250
2x10sr	14,2	14,6	250	263	261	238	301	262	276	274	250	317
2x16sr	16,1	16,5	329	345	344	314	394	343	360	358	328	411
2x16mr	17,0	17,4	355	373	371	339	427	371	389	387	353	446
2x25sr	21,1	21,5	610	589	586	534	693	630	608	606	551	717
2x25mr	21,8	22,2	643	620	617	561	731	665	640	638	580	756
2x35mr	24,0	24,4	789	761	758	691	893	813	783	780	711	921
2x50mr	27,4	27,8	1050	1009	1005	921	1180	1077	1035	1031	944	1212
3x2,5sr	10,0	10,8	119	126	125	113	146	139	146	145	132	170
3x4sr	11,4	12,7	158	166	165	151	191	191	201	199	182	233
3x6sr	12,5	13,7	194	203	202	185	232	230	241	239	220	277
3x10sr	15,0	15,4	285	297	295	273	338	299	312	309	286	356
3x16sr	17,0	17,5	379	395	392	365	445	395	411	409	380	465
3x16mr	18,0	18,4	406	423	421	390	479	423	441	438	406	500
3x25sr	22,3	22,7	685	669	665	614	774	707	690	686	634	800
3x25mr	23,0	23,4	719	702	698	644	814	743	724	720	665	842
3x35mr	25,4	25,8	888	866	862	798	999	914	891	886	821	1029
3x50mr	29,0	29,5	1190	1159	1153	1074	1329	1220	1187	1181	1100	1364
4x2,5sr	10,7	11,7	138	145	144	131	167	160	168	167	152	195
4x4sr	12,3	13,8	184	193	191	176	221	223	233	231	213	270
4x6sr	13,5	15,0	227	237	236	218	270	270	281	279	258	323
4x10sr	16,4	16,9	337	350	347	323	396	353	367	364	339	417
4x16sr	18,7	19,1	453	469	466	436	525	471	488	485	454	549
4x16mr	19,7	20,2	483	501	497	465	563	503	521	518	484	588
4x25sr	24,5	25,0	829	814	809	754	935	855	839	839	777	966
4x25mr	25,3	25,8	869	852	847	789	981	897	879	879	813	1014
4x35mr	27,7	28,2	1059	1038	1032	965	1186	1090	1067	1061	992	1222
4x50mr	32,2	32,7	1464	1429	1421	1334	1628	1499	1463	1455	1365	1670
5x2,5sr	11,6	12,7	163	170	169	155	196	189	197	196	180	228
5x4sr	13,4	15,0	220	229	227	210	262	266	276	274	254	319
5x6sr	14,7	16,3	278	288	286	267	327	328	340	337	314	389
5x10sr	17,9	18,5	407	422	419	393	477	427	442	438	411	501
5x16sr	20,5	21,0	546	564	560	528	630	568	586	582	549	657
5x16mr	21,7	22,2	581	600	596	561	673	605	624	620	584	703
5x25sr	26,7	27,3	976	960	954	894	1098	1007	990	984	921	1134
5x25mr	27,7	28,2	1022	1004	998	934	1151	1054	1039	1029	963	1189
5x35mr	30,4	31,3	1260	1238	1230	1157	1407	1329	1302	1294	1215	1488
5x50mr	35,8	36,3	1779	1746	1735	1636	1980	1821	1786	1775	1673	2029
3x25sr+1x16sr	24,5	25,0	825	806	802	743	932	851	832	827	766	963
3x25mr+1x16mr	25,3	25,8	863	843	838	776	976	891	870	864	801	1009
3x35mr+1x16mr	26,8	27,3	980	959	954	888	1101	1008	986	980	913	1134
3x50mr+1x25mr	30,7	31,6	1319	1289	1282	1201	1471	1385	1351	1343	1256	1548



VVG-P, AVVG-P

Power cables: copper or aluminium conductors, PVC-compound insulation and sheath, flat embodiment

VVG-Png(A), AVVG-Png(A)

Power cables: copper or aluminium conductors, PVC-compound insulation, flame-retardant PVC-compound sheath, flat embodiment

VVG-Png(A)-LS, AVVG-Png(A)-LS

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and sheath, flat embodiment

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with insulation and outer PVC-compound sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with PVC-compound insulation and outer flame-retardant PVC-compound sheath are designed for laying in cable works of outdoor (open) electrical installations that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with low-smoke PVC-compound insulation and outer sheath are designed for bunched laying in cable works in rooms of indoor (closed) electrical installations inclusive facilities of using nuclear energy as well as for use in building constructions.

OKP CODES

352100 the cable with copper conductors for nominal voltage 0,66 kV
353300 the cable with copper conductors for nominal voltage 1 kV
352200 the cable with aluminium conductors for nominal voltage 0,66 kV
353700 the cable with aluminium conductors for nominal voltage 1 kV

DESIGN

1. Conductor: copper or aluminum, solid or stranded, round, 1st or 2nd class according to GOST 22483.

2. Insulation: for the cables of AVVG-P, VVG-P, AVVG-Png(A), VVG-Png(A) types: PVC-compound. For the cables of AVVG-Png(A)-LS and VVG-Png(A)-LS types: low-smoke PVC-compound. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Insulated conductors are laid in one plane.

4. Outer sheath: for the cables of AVVG-P and VVG-P types: PVC-compound. For the cables of AVVG-Png(A) and VVG-Png(A) types: flame-retardant PVC-compound. For the cables of AVVG-Png(A)-LS and VVG-Png(A)-LS types: low-smoke PVC-compound.

Outer sheath for the cables of AVVG-Png(A)-LS and VVG-Png(A)-LS types fills intervals between insulated conductors.

For other cable types a sheath is applied without filling of intervals between insulated conductors.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cable AVVG-P and VVG-P.....UHL and T, placement categories 1 and 5
For the cable AVVG-Png(A) and VVG-Png(A).....UHL, placement categories 1 and 5
For the cable AVVG-Png(A)-LS and VVG-Png(A)-LS.....UHL and V, placement category 5
Operating temperature range.....from -50 °C to +50 °C
Relative air humidity at temperature at max +35 °C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than -15 °C

Cable conductor continuous operating heating temperature max70 °C

Test AC voltage with frequency of 50 Hz:

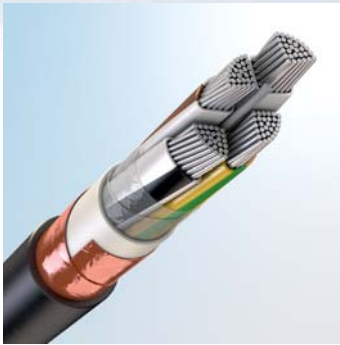
for voltage 0,66 kV.....3 kV
for voltage 1 kV.....3,5 kV
Nominal frequency50 Hz

Minimal bending radius at laying and installation.....7,5 outer cable diameters

Max allowed pulling force during cable tracing

for the cables with copper conductors.....50 N/mm²
for the cables with aluminium conductors.....30 N/mm²
Construction cable length.....450 m
Guarantee use period.....5 year from date of input of the cable into operation
Service life.....30 years

Number and nominal cross-section of cores, mm ²	Nominal outer dimensions of the cable, mm		Weight of 1 km of the cable, kg 0,66 kV						Weight of 1 km of the cable, kg 1 kV					
	0,66 kV	1 kV	VVG-P	VVG-Png(A)	VVG-Png(A)-LS	AVVG-P	AVVG-Png(A)	AVVG-Png(A)LS	VVG-P	VVG-Png(A)	VVG-Png(A)-LS	AVVG-P	AVVG-Png(A)	AVVG-Png(A)-LS
2x1,5sr	6,2x8,7	6,6x9,5	86	90	102	-	-	-	97	101	116	-	-	-
2x2,5sr	6,6x9,5	7,0x10,3	112	116	130	82	86	100	123	128	144	93	98	114
2x4,0sr	7,2x10,8	7,8x12,0	153	158	175	105	110	127	172	178	198	124	130	151
2x6,0sr	7,7x11,8	8,3x13,0	198	204	223	126	132	151	218	225	248	147	153	176
2x10,0sr	8,9x14,2	9,1x14,6	298	305	330	179	186	211	305	313	340	186	194	221
2x16,0sr	9,9x16,1	10,1x16,5	426	435	465	234	242	272	435	444	476	242	251	283
3x1,5sr	6,2x11,3	6,6x12,5	119	125	141	-	-	-	135	141	160	-	-	-
3x2,5sr	6,6x12,5	7,0x13,7	157	163	182	112	118	136	174	181	202	129	136	157
3x4,0sr	7,2x14,5	7,8x16,3	218	225	248	146	154	176	247	255	284	175	183	212
3x6,0sr	7,7x16,0	8,3x17,8	286	294	320	178	186	212	317	326	358	209	218	250
3x10,0sr	8,9x19,5	9,1x20,1	436	446	482	257	267	303	447	458	496	269	279	318
3x16,0sr	9,9x22,4	10,1x23,0	629	641	684	340	352	395	642	654	700	353	366	411



VVGE, AVVGE

Screened power cables: copper or aluminium conductors, PVC-compound insulation and sheath

VVGE(A), AVVGE(A)

Screened power cables: copper or aluminium conductors, PVC-compound insulation, flame-retardant PVC-compound sheath

VVGE(A)-HL, AVVGE(A)-HL

Screened power cables: copper or aluminium conductors, cold-resistant, flame-retardant PVC-compound insulation, cold-resistant, flame-retardant PVC-compound sheath

VVGE-HL, AVVGE-HL

Screened power cables: copper or aluminium conductors, cold-resistant PVC compound insulation and sheath

VVGE(A)-LS, AVVGE(A)-LS

Screened power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and sheath

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with PVC-compound insulation and outer sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with PVC-compound insulation and outer flame-retardant PVC-compound sheath are designed for laying in cable works of outdoor (open) electrical installations that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with insulation and outer low-smoke PVC-compound sheath are designed for bunched laying in cable works in rooms of indoor (closed) electrical installations inclusive facilities of using nuclear energy as well as for use in building constructions.

The "ng(A)-HL"-type cables with cold-resistant, flame-retardant PVC-compound insulation and outer cold-resistant, flame-retardant PVC-compound sheath are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with insulation and outer cold-resistant sheath are designed for single laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

DESIGN

1. Conductor: copper or aluminum, solid or stranded, round of sector, 1st or 2nd class according to GOST 22483.

2. Insulation: for the cables of AVVGE, VVGE, AVVGE(A) and VVGE(A) types: PVC-compound. For the cables of AVVGE(A)-HL, VVGE(A)-HL, AVVGE-HL and VVGE-HL types: cold-resistant PVC-compound. For the cables of AVVGE(A)-LS and VVGE(A)-LS types: low-smoke PVC-compound. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: insulated conductors of two, three, four and five-core cables are stranded; two-, three- and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.

4. Inner sheath: for the multi-core cables of AVVGE and VVGE types: PVC-compound. For the cables of AVVGE(A) and VVGE(A) types: flame-retardant PVC-compound. For the cables of AVVGE(A)-HL and VVGE(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVVGE-HL and VVGE-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVVGE-HL and VVGE-HL types: cold-resistant PVC-compound. For the cables of AVVGE(A)-LS and VVGE(A)-LS types: low-smoke PVC-compound. Nominal thickness of inner sheath is specified in the Appendix on page 123

Inner sheath fills intervals between insulated conductors of multi-core cable giving to the cable form close to circular one.

Bedding: for single-core cables: tapping of insulated conductors with polymeric band.

5. Screen: tapping with copper band with thickness not less than 0,06 mm with overlapping. Cross-section of copper screen is specified in the Appendix on page 123.

6. Outer sheath: for the cables of AVVGE and VVGE types: PVC-compound. For the cables of AVVGE(A) and VVGE(A) types: flame-retardant PVC-compound. For the cables of AVVGE(A)-HL and VVGE(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVVGE-HL and VVGE-HL types: cold-resistant PVC-compound. For the cables of AVVGE(A)-LS and VVGE(A)-LS types: low-smoke PVC-compound. Nominal thickness of sheath is specified in the Appendix on page 123.

OKP CODES

- 352100 the cable with copper conductors for nominal voltage 0,66 kV
- 353300 the cable with copper conductors for nominal voltage 1 kV
- 352200 the cable with aluminium conductors for nominal voltage 0,66 kV
- 353700 the cable with aluminium conductors for nominal voltage 1 kV

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

- For the cables AVVGE and VVGE.....UHL and T, placement categories 1 and 5
- For the cables AVVGE(A) and VVGE(A).....UHL, placement categories 1 и 5
- For the cables AVVGE(A)-HL, VVGE(A)-HL, AVVGE-HL and VVGE-HL.....HL, placement categories 1
- For the cables AVVGE(A)-LS and VVGE(A)-LS.....UHL and V, placement categories 5

Operating temperature range:

- For the cables AVVGE, VVGE, AVVGE(A), VVGE(A), AVVGE(A)-LS and VVGE(A)-LS.....from -50 °C to +50 °C
- For the cables AVVGE(A)-HL, VVGE(A)-HL, AVVGE-HL and VVGE-HL.....from -60 °C to +50 °C
- Relative air humidity at temperature max +35 °C.....max 98%
- Cable conductor continuous operating heating temperature max.....70 °C

Laying and installation of the cables without preheating is performed at temperature not less than :

- For the cables AVVGE, VVGE, AVVGE(A), VVGE(A), AVVGE(A)-LS and VVGE(A)-LS.....-15 °C
- For the cables AVVGE(A)-HL, VVGE(A)-HL, AVVGE-HL and VVGE-HL.....-30 °C

Test AC voltage with frequency of 50 Hz:

- for the voltage 0,66 kV.....3 kV
- for the voltage 1 kV.....3,5 kV
- Nominal frequency.....50 Hz

Minimal bending radius at laying and installation of:

- single-core cables10 outer cable diameters
- multi-core cables7,5 outer cable diameters

Max allowed pulling force during cable tracing

- for the cables with copper conductors.....50 N/mm²
- for the cables with aluminium conductors30 N/mm²

Construction length with the main core's cross-section:

- up to 16 mm² 450 m
- from 25 to 70 mm² 300 m
- from 95 mm² and more200 m
- Guarantee use period.....5 years from date of input of the cable into operation
- Service life30 years

The cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 1 kV, kg				
		VVGE	VVEng(A)	VVEng(A)HL	VVGE-HL	VVEng(A)-LS
2x70ms	26,7	1816	1813	1822	1773	1957
2x95ms	28,7	2364	2360	2369	2315	2525
2x120ms	33,1	2953	2943	2952	2884	3139
2x150ms	35,5	3596	3588	3596	3520	3817
2x185ms	38,0	4367	4358	4364	4282	4615
2x240ms	43,9	5586	5568	5573	5470	5889
3x70ms	30,7	2550	2546	2555	2497	2721
3x95ms	35,5	3464	3456	3465	3388	3684
3x120ms	38,5	4229	4220	4228	4145	4469
3x150ms	42,9	5205	5188	5195	5095	5490
3x185ms	47,3	6415	6399	6404	6287	6755
3x240ms	52,3	8063	8044	8046	7916	8458
4x70ms	35,5	3392	3384	3394	3318	3614
4x95ms	39,5	4481	4471	4479	4394	4742
4x120ms	42,9	5539	5522	5531	5430	5832
4x150ms	47,3	6780	6764	6770	6654	7130
4x185ms	52,3	8334	8315	8318	8188	8740
4x240ms	57,1	10598	10572	10572	10414	11091
5x70ms	38,5	4153	4144	4154	4071	4410
5x95ms	43,9	5576	5558	5567	5464	5890
5x120ms	49,3	6902	6885	6894	6772	7263
5x150ms	53,7	8465	8437	8442	8301	8889
5x185ms	59,1	10451	10424	10426	10263	10960
5x240ms	63,1	13099	13069	13066	12890	13680
3x70ms+1x35mr	35,5	3053	3045	3054	2978	3265
3x95ms+1x50ms	39,5	4065	4055	4065	3979	4318
3x120ms+1x70ms	42,9	5054	5037	5046	4946	5338
3x150ms+1x70ms	47,3	6019	6003	6011	5894	6353
3x185ms+1x95ms	52,3	7465	7446	7451	7321	7852
3x240ms+1x120ms	57,1	9454	9428	9430	9273	9920

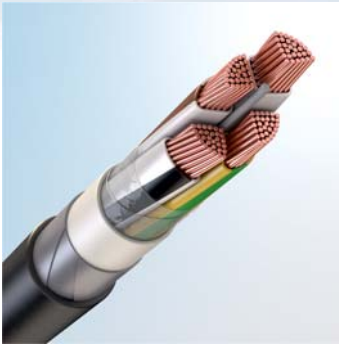
The cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of cable for the voltage 1kV, kg				
		AVVGE	AVVEng(A)	AVVEng(A) - HL	AVVGE-HL	AVVEng(A)-LS
2x70ms	26,7	970	967	976	927	1111
2x95ms	28,7	1216	1212	1221	1167	1377
2x120ms	33,1	1484	1474	1483	1416	1671
2x150ms	35,5	1769	1761	1769	1693	1989
2x185ms	38,0	2103	2094	2100	2018	2351
2x240ms	43,9	2675	2657	2661	2559	2978
3x70ms	30,7	1280	1276	1285	1228	1452
3x95ms	35,5	1742	1734	1743	1666	1962
3x120ms	38,5	2026	2017	2025	1942	2266
3x150ms	42,9	2465	2447	2454	2354	2750
3x185ms	47,3	3019	3002	3007	2891	3359
3x240ms	52,3	3696	3677	3679	3549	4091
4x70ms	35,5	1699	1691	1701	1625	1922
4x95ms	39,5	2185	2175	2183	2097	2446
4x120ms	42,9	2602	2584	2593	2493	2894
4x150ms	47,3	3126	3110	3116	3000	3475
4x185ms	52,3	3805	3746	3789	3659	4211
4x240ms	57,1	4776	4750	4750	4592	5268
5x70ms	38,5	2038	2028	2039	1955	2295
5x95ms	43,9	2706	2688	2696	2594	3020
5x120ms	49,3	3230	3213	3222	3100	3591
5x150ms	53,7	3897	3869	3875	3733	4321
5x185ms	59,1	4791	4763	4766	4602	5299
5x240ms	63,1	5821	5791	5788	5612	6403
3x70ms+1x35mr	35,5	1575	1567	1576	1499	1787
3x95ms+1x50ms	39,5	2027	2018	2026	1941	2280
3x120ms+1x70ms	42,9	2428	2411	2420	2320	2712
3x150ms+1x70ms	47,3	2855	2839	2847	2730	3189
3x185ms+1x95ms	52,3	3494	3475	3480	3350	3882
3x240ms+1x120ms	57,1	4353	4327	4329	4172	4819

The cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of cable for the voltage 0,66 kV, kg					Weight of 1 km of cable for the voltage 1 kV, kg				
	0,66 kV	1 kV	AVVGE	AVVGE(A)	AVVGE(A)-HL	AVVGE-HL	AVVGE(A)-LS	AVVGE	AVVGE(A)	AVVGE(A)-HL	AVVGE-HL	AVVGE(A)-LS
1x2,5sr	6,7	7,1	60	63	63	58	71	67	70	70	64	78
1x4sr	7,4	8,0	74	76	76	71	85	84	88	87	81	98
1x6sr	7,9	8,5	85	88	88	82	98	97	100	100	93	112
1x10sr	9,3	9,5	118	122	121	114	135	122	126	126	118	140
1x16sr	10,2	10,4	147	152	151	143	167	152	157	156	148	173
1x16mr	10,7	10,9	155	160	159	150	176	160	165	164	155	182
1x25sr	11,7	11,9	197	202	201	191	222	202	208	206	196	228
1x25mr	12,1	12,3	205	210	209	199	231	210	216	214	204	237
1x35mr	13,1	13,3	245	251	249	239	274	251	257	255	244	281
1x50mr	14,8	15,0	321	328	326	314	356	328	335	333	320	365
1x70mr	-	16,6	-	-	-	-	-	396	404	401	387	438
1x95mr	-	19,1	-	-	-	-	-	527	537	534	515	582
1x120mr	-	20,5	-	-	-	-	-	615	626	622	602	674
1x150mr	-	22,3	-	-	-	-	-	732	744	739	717	800
1x185mr	-	24,7	-	-	-	-	-	900	914	909	881	984
1x240mr	-	27,4	-	-	-	-	-	1107	1123	1116	1086	1206
2x2,5sr	12,8	12,8	225	221	221	197	262	223	220	219	197	260
2x4sr	13,0	14,2	235	231	231	208	272	277	272	271	244	321
2x6sr	14,0	15,2	275	270	270	244	317	320	313	312	282	369
2x10sr	16,4	16,8	378	369	368	334	432	395	385	384	348	452
2x16sr	18,3	18,7	478	465	464	423	543	497	483	482	439	565
2x16mr	19,2	19,6	515	500	498	454	585	535	519	517	471	608
2x25sr	21,3	21,7	653	632	630	577	737	675	653	650	596	762
2x25mr	22,0	22,4	688	665	663	607	777	711	687	684	626	803
2x35mr	24,2	24,6	839	811	808	741	944	864	835	831	762	972
2x50mr	27,6	28,0	1108	1068	1064	979	1239	1136	1094	1090	1003	1271
3x2,5sr	12,8	13,0	225	222	221	200	261	230	228	227	206	268
3x4sr	13,6	14,9	254	252	251	228	294	300	296	295	268	348
3x6sr	14,6	15,9	300	297	296	270	345	349	344	342	313	402
3x10sr	17,2	17,6	416	409	407	374	475	434	427	425	390	496
3x16sr	19,2	19,6	532	522	520	480	601	552	541	539	498	625
3x16mr	20,2	20,6	569	557	555	512	644	591	578	575	531	669
3x25sr	22,4	22,9	731	715	712	661	821	755	738	734	681	848
3x25mr	23,2	23,8	768	750	746	692	862	803	785	781	724	905
3x35mr	25,5	26,0	941	920	915	852	1052	968	946	941	875	1084
3x50mr	29,2	29,6	1253	1221	1215	1136	1392	1283	1251	1244	1163	1428
4x2,5sr	12,9	13,9	227	226	225	204	263	258	256	255	232	300
4x4sr	14,5	16,0	288	285	284	259	332	340	337	335	306	394
4x6sr	15,7	17,2	342	339	337	309	392	398	394	391	360	458
4x10sr	18,6	19,0	479	472	470	434	544	500	493	490	453	569
4x16sr	20,8	21,3	617	608	605	562	695	641	631	627	583	723
4x16mr	21,9	22,4	659	647	644	598	743	684	672	668	621	773
4x25sr	24,7	25,1	880	865	861	805	986	908	892	887	829	1019
4x25mr	25,5	26,0	922	906	901	842	1035	951	934	928	868	1069
4x35mr	27,9	28,4	1118	1097	1091	1024	1246	1150	1128	1121	1052	1283
4x50mr	32,4	32,9	1533	1499	1491	1404	1698	1570	1535	1526	1436	1741
5x2,5sr	13,8	14,9	259	257	256	234	300	295	293	291	266	342
5x4sr	15,6	17,2	332	329	328	301	382	393	389	386	355	454
5x6sr	16,9	18,5	402	399	397	367	460	467	462	459	425	537
5x10sr	20,1	20,6	562	555	552	513	638	587	579	576	535	667
5x16sr	22,7	23,2	726	716	712	666	815	753	742	738	690	848
5x16mr	24,1	24,6	784	773	768	717	884	813	801	797	743	919
5x25sr	26,9	27,4	1032	1017	1011	950	1155	1064	1048	1042	979	1192
5x25mr	27,9	28,4	1081	1064	1057	993	1210	1114	1096	1089	1024	1250
5x35mr	30,6	32,5	1325	1303	1296	1222	1473	1397	1370	1362	1283	1556
5x50mr	35,9	36,5	1857	1823	1813	1713	2058	1899	1865	1854	1752	2109
3x25sr+1x16sr	24,7	25,1	876	857	853	794	983	904	884	879	818	1016
3x25mr+1x16mr	25,5	26,0	916	896	892	829	1030	945	924	919	855	1064
3x35mr+1x16mr	27,0	27,5	1037	1016	1011	945	1158	1066	1044	1038	971	1193
3x50mr+1x25mr	30,9	31,8	1385	1356	1348	1267	1538	1454	1419	1411	1325	1617

Armoured Cables for the Voltage 0,66; 1 kV



VBSHv, AVBSHv

Power cables: copper or aluminium conductors, PVC-compound insulation, inner PVC-compound sheath, armour of steel galvanized bands, PVC-compound protection hose

VBaSHv, AVBaSHv

Power cables: copper or aluminium conductors, PVC-compound insulation and inner sheath, armour of aluminium or aluminium alloy bands, PVC-compound protection hose

VBSHvng(A), AVBSHvng(A)

Power cables: copper or aluminium conductors, PVC-compound insulation, inner flame-retardant PVC-compound sheath, armour of steel galvanized bands, flame-retardant PVC-compound protection hose

VBaSHvng(A), AVBaSHvng(A)

Power cables: copper or aluminium conductors, PVC-compound insulation, inner flame-retardant PVC-compound sheath, armour of aluminium or aluminium alloy bands, flame-retardant PVC-compound protection hose

VBSHvng(A)-HL, AVBSHvng(A)-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation, inner flame-retardant PVC-compound sheath, armour of steel galvanized bands, cold-resistant, flame-retardant protection hose

VBaSHvng(A)-HL, AVBaSHvng(A)-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation, inner flame-retardant PVC-compound sheath, armour of aluminium or aluminium alloy bands, cold-resistant, flame-retardant protection hose

VBSHv-HL, AVBSHv-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and inner sheath, armour of steel galvanized bands, cold-resistant PVC-compound protection hose

VBaSHv-HL, AVBaSHv-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and inner sheath, armour of aluminium or aluminium alloy bands, cold-resistant PVC-compound protection hose

VBSHvng(A)-LS, AVBSHvng(A)-LS

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and inner sheath, armour of steel galvanized bands, low-smoke PVC-compound protection hose

VBaSHvng(A)-LS, AVBaSHvng(A)-LS

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and inner sheath, armour of aluminium or aluminium alloy bands, low-smoke PVC-compound protection hose

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities.

The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with PVC-compound insulation and protection hose are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with PVC-compound insulation and flame-retardant PVC-compound protection hose are designed for laying in cable works of outdoor (open) electric installations, that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with low-smoke PVC-compound insulation and protection hose are designed for bunched laying in cable works and rooms of indoor (closed) electric installations incl. facilities of nuclear energy using as well as for use in building constructions.

The "ng(A)-HL"-type cables with cold-resistant, flame-retardant PVC-compound insulation and cold-resistant, flame-retardant PVC-compound protection hose are designed for bunched laying in cable works and rooms of indoor (open) electrical installations, incl. used in climatic conditions with temperature decreased to -60°C.

The "HL"-type cables with cold-resistant PVC-compound insulation and protection hose are designed for single laying in cable works and rooms of outdoor (open) electric installations, incl. ones used in climatic conditions with temperature decreased to -60°C.

OKP CODES

352100 the cable with copper conductors for nominal voltage 0,66 kV

353300 the cable with copper conductors for nominal voltage 1 kV

352200 the cable with aluminium conductors for nominal voltage 0,66 kV

353700 the cable with aluminium conductors for nominal voltage 1 kV

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: for the cables of AVBSHv, VBSHv, AVBaSHv, VBaSHv, AVBSHvng(A), VBSHvng(A), AVBaSHvng(A) and VBaSHvng(A) types: PVC-compound. For the cables of AVBSHvng(A)-LS, VBSHvng(A)-LS, AVBaSHvng(A)-LS and VBaSHvng(A)-LS types: low-smoke PVC-compound. For the cables of AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBaSHvng(A)-HL, VBaSHvng(A)-HL, AVBSHv-HL, VBSHv-HL, AVBaSHv-HL and VBaSHv-HL types: cold-resistant PVC-compound. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: insulated conductors of two, three, four and five-core cables are stranded; two-, three- and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.

4. Inner sheath: for the cables of AVBSHv, VBSHv, AVBaSHv and VBaSHv types: PVC-compound. For the cables of AVBSHvng(A), VBSHvng(A), AVBaSHvng(A) and VBaSHvng(A) types: flame-retardant PVC-compound. For the cables of AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBaSHvng(A)-HL and VBaSHvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVBSHv-HL, VBSHv-HL, AVBaSHv-HL and VBaSHv-HL types: cold-resistant PVC-compound. For the cables of AVBSHvng(A)-LS, VBSHvng(A)-LS, AVBaSHvng(A)-LS and VBaSHvng(A)-LS types: low-smoke PVC-compound.

Inner sheath fills interval between insulated conductors of multi-core cable giving to the cable form being close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123

5. Armour: for multi-core cables is made of two steel galvanized bands, for single-core cables is made of aluminium or aluminium alloy bands laid in such a way that upper band should overlap gaps between coils of lower band. bands are laid so that the upper band overlaps the gaps between the coils of the lower band. Gaps between coils of each band should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.

6. Protection hose: for the cables of AVBSHv, VBSHv, AVBaSHv and VBaSHv types: PVC-compound. For the cables of AVBSHvng(A), VBSHvng(A), AVBaSHvng(A) and VBaSHvng(A) types: flame-retardant PVC-compound. For the cables of AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBaSHvng(A)-HL and VBaSHvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVBSHv-HL, VBSHv-HL, AVBaSHv-HL and VBaSHv-HL types: cold-resistant PVC-compound. For the cables of AVBSHvng(A)-LS, VBSHvng(A)-LS, AVBaSHvng(A)-LS and VBaSHvng(A)-LS types: low-smoke PVC-compound. Thickness of the protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables AVBSHv and VBSHv.....UHL and T, placement categories 1 and 5
 For the cables AVBSHvng(A) and VBSHvng(A).....UHL, placement categories 1 and 5
 For the cables AVBSHvng(A)-HL, VBSHvng(A)-HL,
 AVBSHv-HL and VBSHv-HL..... HL, placement category 1
 For the cables AVBSHvng(A)-LS and
 VBSHvng(A)-LS.....UHL and V, placement category 5

Operation temperature range:

for the cables AVBSHv, VBSHv, AVBSHvng(A), VBSHvng(A),
 AVBSHvng(A)-LS and VBSHvng(A)-LS.....from -50 °C to +50 °C
 for the cables AVBSHvng(A)-HL, VBSHvng(A)-HL,
 AVBSHv-HL and VBSHv-HL.....from -60 °C to +50 °C
 Relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than:

for the cables AVBSHv, VBSHv, AVBSHvng(A), VBSHvng(A),
 AVBSHvng(A)-LS and VBSHvng(A)-LS.....-15 °C
 for the cables AVBSHvng(A)-HL, VBSHvng(A)-HL,
 AVBSHv-HL and VBSHv-HL.....-30 °C

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV.....3 kV
 for the voltage 1 kV.....3,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
 for multi-core cables.....7,5 outer cable diameters

Cable conductor continuous operating heating temperature max..... 70 °C

Max allowed pulling force during cable tracing
 for the cables with copper conductors.....50 N/mm²
 for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm²450 m
 from 25 to 70 mm²300 m
 from 95 mm² and more200 m
 Guarantee use period.....5 years from the date of input of the cable into operation
 Service life.....30 years

Technical standards of single-core cables armoured with aluminium alloy bands correspond to technical standards of multi-core cables armoured with steel bands.

The single-core cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for the voltage 1 kV, kg				
	0,66 kV	1 kV	VBaSHv	VBaSHvng(A)	VBaSHvng(A)-HL	VBaSHv-HL	VBaSHvng(A)-LS	VBaSHv	VBaSHvng(A)	VBaSHvng(A)-HL	VBaSHv-HL	VBaSHvng(A)-LS
1x1,5sr	14,6	14,6	313	304	304	274	355	311	303	302	273	353
1x2,5sr	14,6	14,6	318	310	310	281	360	317	309	309	280	359
1x4sr	14,6	14,6	326	319	319	290	368	323	316	316	289	365
1x6sr	14,6	14,6	338	332	331	304	379	334	329	328	302	376
1x10sr	14,6	14,6	359	355	354	329	399	357	354	353	328	398
1x16sr	14,6	14,6	396	394	393	370	435	394	393	392	370	433
1x16mr	14,6	14,6	389	389	388	366	428	387	388	387	366	426
1x25sr	15,4	15,6	481	482	481	458	523	489	489	488	465	532
1x25mr	15,7	15,9	496	496	495	472	539	503	504	502	479	548
1x35mr	16,7	16,9	602	602	600	575	649	610	610	608	583	659
1x50mr	18,4	18,6	803	803	801	772	849	812	812	809	781	869
1x70mr	-	20,2	-	-	-	-	-	1002	1001	999	967	1066
1x95mr	-	22,3	-	-	-	-	-	1290	1289	1285	1249	1365
1x120mr	-	23,7	-	-	-	-	-	1554	1552	1548	1510	1635
1x150mr	-	25,5	-	-	-	-	-	1862	1859	1855	1813	1953
1x185mr	-	27,9	-	-	-	-	-	2276	2275	2269	2220	2386
1x240mr	-	30,6	-	-	-	-	-	2833	2831	2824	2769	2960

The cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for the voltage 1 kV, kg				
	0,66 kV	1 kV	VBSHv	VBSHvng(A)	VBSHvng(A)-HL	VBSHv-HL	VBSHvng(A)-LS	VBSHv	VBSHvng(A)	VBSHvng(A)-HL	VBSHv-HL	VBSHvng(A)-LS
2x1,5sr	13,8	13,8	336	331	331	306	375	334	331	330	306	373
2x2,5sr	13,8	13,8	349	346	345	321	388	347	345	344	320	386
2x4sr	14,0	15,2	379	376	375	351	418	432	427	426	398	478
2x6sr	15,0	16,2	452	448	447	420	496	508	502	501	470	559
2x10sr	17,4	17,8	623	615	614	579	680	644	635	633	597	704
2x16sr	19,3	19,7	806	794	792	750	873	828	815	813	770	898
2x16mr	20,2	20,6	852	838	836	790	924	875	860	858	811	951
2x25sr	22,3	22,7	1113	1093	1091	1037	1199	1138	1117	1115	1059	1228
2x25mr	23,0	23,4	1160	1138	1135	1078	1251	1186	1163	1160	1100	1280
2x35mr	25,4	25,8	1450	1423	1421	1351	1560	1478	1450	1447	1375	1592
2x50mr	28,8	29,2	1963	1925	1921	1833	2100	1995	1955	1951	1861	2136
3x1,5sr	13,8	13,8	344	341	340	316	383	341	339	339	316	381
3x2,5sr	13,8	14,0	364	362	361	338	402	371	370	369	346	411
3x4sr	14,6	15,9	427	426	425	401	469	484	481	480	452	534
3x6sr	15,7	16,9	519	516	515	488	566	579	575	573	542	635
3x10sr	18,2	18,6	720	714	712	678	781	742	736	733	698	806
3x16sr	20,2	20,7	964	955	953	912	1036	988	978	975	933	1063
3x16mr	21,2	21,6	1012	1001	998	954	1089	1037	1025	1023	977	1118
3x25sr	23,5	23,9	1352	1336	1333	1281	1444	1379	1363	1359	1305	1475
3x25mr	24,2	24,6	1403	1386	1382	1327	1500	1431	1413	1409	1352	1532
3x35mr	26,8	27,2	1773	1753	1748	1681	1889	1803	1782	1777	1709	1925
3x50mr	30,4	30,9	2438	2409	2403	2320	2584	2473	2442	2435	2351	2623
4x1,5sr	13,8	13,9	350	349	348	325	389	352	352	351	329	392
4x2,5sr	13,9	14,9	382	382	381	359	421	422	421	420	396	466
4x4sr	15,5	17,0	493	491	480	464	540	559	556	554	524	614
4x6sr	16,7	18,2	607	604	602	573	659	668	663	661	628	730
4x10sr	19,6	20,1	855	849	846	809	923	880	873	870	832	952
4x16sr	21,9	22,3	1160	1151	1148	1104	1240	1188	1178	1175	1129	1272
4x16mr	22,9	23,4	1214	1204	1200	1153	1301	1243	1232	1228	1179	1334
4x25sr	25,9	26,4	1680	1667	1663	1604	1792	1712	1698	1693	1633	1829
4x25mr	26,7	27,2	1741	1726	1721	1659	1859	1774	1759	1753	1690	1898
4x35mr	29,1	29,6	2179	2160	2154	2083	2312	2215	2194	2188	2116	2354
4x50mr	33,6	34,1	3063	3031	3023	2932	3235	3104	3071	3062	2969	3282
5x1,5sr	13,8	14,8	360	360	359	338	399	399	399	398	374	444
5x2,5sr	14,8	15,9	437	436	435	412	480	483	481	480	454	532
5x4sr	16,6	18,2	571	569	567	540	623	638	635	632	600	701
5x6sr	17,9	19,5	706	703	701	670	765	784	780	777	741	856
5x10sr	21,1	21,7	1011	1005	1001	962	1089	1040	1033	1029	988	1123
5x16sr	23,7	24,2	1381	1371	1367	1320	1473	1413	1402	1398	1349	1509
5x16mr	25,3	25,8	1465	1456	1451	1397	1571	1499	1489	1484	1428	1610
5x25sr	28,1	28,7	2003	1989	1984	1920	2131	2040	2025	2019	1953	2174
5x25mr	29,1	29,6	2074	2058	2052	1985	2209	2112	2096	2089	2020	2254
5x35mr	31,8	32,7	2618	2597	2590	2513	2772	2698	2673	2665	2582	2863
5x50mr	37,2	37,7	3731	3700	3690	3586	3940	3779	3746	3735	3629	3995
3x25sr+1x16sr	25,9	26,4	1622	1606	1601	1539	1735	1654	1637	1632	1568	1772
3x25mr+1x16mr	26,7	27,2	1680	1661	1657	1591	1799	1713	1694	1688	1621	1837
3x35mr+1x16mr	28,2	28,7	1979	1960	1954	1886	2106	2012	1992	1986	1916	2144
3x50mr+1x25mr	32,1	33,0	2740	2712	2705	2620	2899	2816	2783	2775	2685	2985

The cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of cable for the voltage 1 kV, kg				
		VBSHv	VBSHvng(A)	VBSHvng(A)HL	VBSHv-HL	VBSHvng(A)-LS
2x70ms	27,9	2028	2026	2040	1987	2180
2x95ms	29,9	2593	2591	2604	2547	2765
2x120ms	34,3	3220	3212	3225	3155	3419
2x150ms	36,7	3883	3877	3889	3809	4116
2x185ms	39,2	4675	4668	4679	4593	4936
2x240ms	45,1	5946	5930	5939	5832	6263
3x70ms	31,9	2796	2794	2807	2747	2980
3x95ms	36,7	3750	3744	3757	3677	3983
3x120ms	39,7	4541	4534	4547	4460	4795
3x150ms	44,1	5557	5541	5553	5449	5856
3x185ms	48,5	6803	6789	6798	6677	7157
3x240ms	54,3	8848	8833	8843	8706	9266
4x70ms	36,7	3678	3672	3687	3606	3913
4x95ms	40,7	4802	4795	4807	4717	5077
4x120ms	44,1	5891	5875	5889	5784	6197
4x150ms	48,5	7168	7154	7165	7044	7532
4x185ms	54,3	9119	9104	9115	8978	9548
4x240ms	59,1	11455	11433	11441	11276	11971
5x70ms	39,7	4466	4459	4474	4386	4736
5x95ms	45,1	5936	5920	5933	5826	6264
5x120ms	50,5	7307	7293	7306	7179	7683
5x150ms	55,7	9272	9248	9262	9114	9719
5x185ms	61,1	11341	11317	11327	11157	11873
5x240ms	65,1	14052	14026	14031	13848	14658
3x70ms+1x35mr	36,7	3339	3333	3347	3266	3564
3x95ms+1x50ms	40,7	4387	4379	4393	4303	4653
3x120ms+1x70ms	44,1	5406	5390	5404	5300	5703
3x150ms+1x70ms	48,5	6407	6393	6405	6284	6755
3x185ms+1x95ms	54,3	8250	8235	8247	8111	8660
3x240ms+1x120ms	59,1	10311	10289	10299	10135	10801

The cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 1 kV, kg				
		AVBSHv	AVBSHvng(A)	AVBSHvng(A)HL	AVBSHv-HL	AVBSHvng(A)-LS
2x70ms	27,9	1181	1180	1193	1141	1334
2x95ms	29,9	1445	1443	1456	1399	1617
2x120ms	34,3	1751	1744	1757	1686	1951
2x150ms	36,7	2055	2049	2062	1982	2289
2x185ms	39,2	2411	2404	2415	2328	2672
2x240ms	45,1	3035	3019	3028	2921	3352
3x70ms	31,9	1527	1524	1538	1477	1710
3x95ms	36,7	2028	2022	2035	1955	2261
3x120ms	39,7	2338	2331	2344	2257	2592
3x150ms	44,1	2816	2801	2812	2708	3115
3x185ms	48,5	3406	3392	3402	3281	3761
3x240ms	54,3	4481	4466	4476	4340	4899
4x70ms	36,7	1985	1979	1994	1914	2221
4x95ms	40,7	2506	2498	2511	2421	2781
4x120ms	44,1	2953	2938	2951	2847	3259
4x150ms	48,5	3513	3500	3511	3389	3877
4x185ms	54,3	4590	4575	4586	4450	5019
4x240ms	59,1	5633	5611	5618	5454	6149
5x70ms	39,7	2350	2343	2358	2270	2621
5x95ms	45,1	3066	3050	3063	2956	3394
5x120ms	50,5	3635	3621	3634	3507	4012
5x150ms	55,7	4704	4680	4694	4546	5151
5x185ms	61,1	5680	5656	5666	5496	6212
5x240ms	65,1	6774	6748	6753	6570	7380
3x70ms+1x35mr	36,7	1861	1855	1868	1788	2086
3x95ms+1x50ms	40,7	2349	2341	2354	2265	2615
3x120ms+1x70ms	44,1	2779	2764	2778	2674	3077
3x150ms+1x70ms	48,5	3243	3229	3241	3120	3591
3x185ms+1x95ms	54,3	4279	4264	4277	4140	4690
3x240ms+1x120ms	59,1	5210	5188	5198	5034	5700

Cables without Protection Covering for the Voltage 3kV



VVG, AVVG

Power cables: copper or aluminium conductors, PVC-compound insulation and sheath

VVGng(A), AVVGng(A)

Power cables: copper or aluminium conductors, PVC-compound insulation, flame-retardant PVC-compound sheath

VVGng(A)-HL, AVVGng(A)-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation, cold-resistant, flame-retardant PVC-compound sheath

VVG-HL, AVVG-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and sheath

VVGng(A)-LS, AVVGng(A)-LS

Power cables: copper or aluminium strands, low-smoke PVC-compound insulation and sheath

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 3 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS" cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with PVC-compound insulation and outer sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with PVC-compound insulation and outer flame-retardant PVC-compound sheath are designed for laying in cable works of outdoor (open) electrical installations, that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with low-smoke PVC-compound insulation and outer sheath are designed for bunched laying in cable works and rooms of indoor (closed) electrical installations, incl. facilities of nuclear energy using as well as for use in building constructions.

The "ng(A)-HL"-type cables with cold-resistant, flame-retardant PVC-compound insulation and outer cold-resistant, flame-retardant PVC-compound sheath are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with cold-resistant PVC-compound insulation and outer sheath are designed for single laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

OKP CODES

353300 the cable with copper conductors for nominal voltage 3 kV
353700 the cable with aluminium conductors for nominal voltage 3 kV

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: for the cables of AVVG, VVG, AVVGng(A) and VVGng(A) types: PVC-compound. For the cables of AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL and VVG-HL types: cold-resistant PVC-compound. For the cables of AVVGng(A)-LS and VVGng(A)-LS types: low-smoke PVC-compound. Insulated conductors of multi-core cables are of different colours. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: three-core cables have cores of identical cross-section.

4. Inner sheath (for three-core cables): for the cables of AVVG and VVG types: PVC-compound. For the cables of AVVGng(A) and VVGng(A) types: flame-retardant PVC-compound. For the cables of AVVGng(A)-HL and VVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVVG-HL and VVG-HL types: cold-resistant PVC-compound. For the cables of AVVGng(A)-LS and VVGng(A)-LS types: low-smoke PVC-compound. Inner sheath fills interval between insulated conductors of multi-core cable giving to the cable form close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

Bedding (for single-core cables): tapping with polymer bands compatible with insulation materials.

5. Screen: tapping with copper band with thickness not less than 0.06 mm with overlapping.

6. Outer sheath: for the cables of AVVG and VVG types: PVC compound. For the cables of AVVGng(A) and VVGng(A) types: flame-retardant PVC-compound. For the cables of AVVGng(A)-HL and VVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVVG-HL and VVG-HL types: cold-resistant PVC-compound. For the cables of AVVGng(A)-LS and VVGng(A)-LS types: low-smoke PVC-compound. Nominal thickness of sheath is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables AVVG and VVG.....UHL and T, placement categories 1 and 5
For the cables AVVGng(A) and VVGng(A).....UHL, placement categories 3 and 5
For the cables AVVGng(A)-HL, VVGng(A)-HL,
AVVG-HL and VVG-HL.....HL, placement category 1
For the cables AVVGng(A)-LS and VVGng(A)-LS.....UHL and V, placement category 5

Operation temperature range:

for the cables AVVG, VVG, AVVGng(A), VVGng(A),
AVVGng(A)-LS and VVGng(A)-LS.....from -50 °C to +50 °C
for the cables AVVGng(A)-HL, VVGng(A)-HL,
AVVG-HL and VVG-HL.....from -60 °C to +50 °C
Relative air humidity at max +35 °C.....max 98%
Cable conductor continuous operating heating temperature max.....70 °C

Laying and installation of cables without preheating is performed at temperature not less than:

for the cables AVVG, VVG, AVVGng(A), VVGng(A),
AVVGng(A)-LS and VVGng(A)-LS.....-15 °C
for the cables AVVGng(A)-HL, VVGng(A)-HL,
AVVG-HL and VVG-HL.....-30 °C

Nominal frequency50 Hz
Test AC voltage with frequency of 50 Hz.....9.5 kV

Minimal bending radius at laying and installation:

for single-core cables10 outer cable diameters
for multi-core cables.....7.5 outer cable diameters

Max allowed pulling force during cable tracing

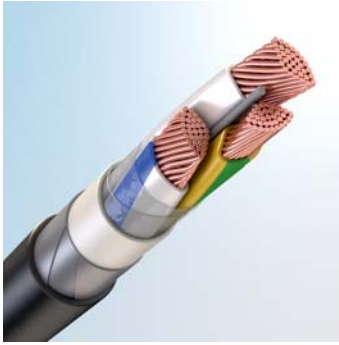
for the cables with copper conductors.....50 N/mm²
for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm²450 m
from 25 to 70 mm²300 m
from 95 mm² and more200 m
Guarantee use period.....5 years from the date of input of the cable into operation
Service life.....30 years

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage, kg									
		VVG	VVGng(A)	VVGng(A)-HL	VVG-HL	VVGng(A)-LS	AVVG	AVVGng(A)	AVVGng(A)-HL	AVVG-HL	AVVGng(A)-LS
1x10sr	11,8	232	237	235	225	261	172	178	176	166	202
1x16sr	12,8	302	308	306	295	335	206	212	210	199	239
1x16mr	13,2	320	326	323	312	357	223	229	226	215	260
1x25sr	13,9	400	406	403	392	437	250	256	254	242	287
1x25mr	14,2	420	426	423	411	460	267	274	271	259	308
1x35mr	15,2	512	519	516	503	555	305	312	309	296	348
1x50mr	16,5	687	695	691	677	735	373	381	377	363	421
1x70mr	18,5	885	895	890	872	943	461	471	467	449	519
1x95mr	20,2	1140	1151	1146	1126	1205	565	576	571	551	630
1x120mr	21,6	1393	1405	1399	1378	1464	655	667	661	640	726
1x150mr	23,0	1666	1679	1673	1650	1743	755	768	762	739	832
1x185mr	25,0	2039	2054	2048	2020	2128	903	918	912	884	992
1x240mr	27,3	2546	2562	2555	2525	2644	1086	1103	1096	1065	1185
3x10sr	22,7	821	905	899	804	971	641	725	719	624	791
3x16sr	24,9	1076	1176	1169	1056	1253	786	885	878	766	963
3x16mr	25,9	1147	1254	1246	1125	1341	853	961	952	832	1048
3x25sr	27,3	1411	1530	1522	1389	1618	959	1078	1069	937	1165
3x25mr	28,1	1485	1610	1601	1461	1708	1025	1150	1140	1001	1247
3x35mr	30,2	1807	1951	1941	1781	2053	1181	1325	1315	1155	1427
3x50ms	31,9	2211	2317	2304	2193	2439	1263	1369	1356	1245	1491
3x70ms	35,3	2810	2930	2916	2788	3075	1541	1661	1646	1519	1806
3x95ms	37,3	3584	3712	3696	3560	3872	1862	1990	1974	1838	2150
3x120ms	40,3	4356	4496	4477	4330	4671	2153	2293	2274	2127	2468
3x150ms	43,7	5260	5428	5408	5231	5621	2519	2687	2667	2490	2880
3x185ms	48,1	6416	6605	6582	6381	6828	3020	3209	3186	2985	3432
3x240ms	52,1	7972	8179	8153	7934	8428	3606	3812	3786	3567	4061

Armoured Cables for the Voltage 3 kV



VBShv, AVBShv

Power cables: copper or aluminium conductors, PVC-compound insulation and inner sheath, armour of steel galvanized bands, PVC-compound protection hose

VBaShv, AVBaShv

Power cables: copper or aluminium conductors, PVC-compound insulation and inner sheath, armored with aluminium or aluminium alloy bands, PVC-compound protection hose

VBShvng(A), AVBShvng(A)

Power cables: copper or aluminium conductors, PVC-compound insulation and inner flame-retardant PVC-compound sheath, armour of steel galvanized bands, flame-retardant PVC-compound protection hose

VBaShvng(A), AVBaShvng(A)

Power cables: copper or aluminium conductors, PVC-compound insulation, inner flame-retardant PVC-compound sheath, armour of aluminium or aluminium alloy bands, flame-retardant PVC-compound protection hose

VBShvng(A)-HL, AVBShvng(A)-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation, inner flame-retardant PVC-compound sheath, armour of steel galvanized bands, cold-resistant, flame-retardant PVC-compound protection hose

VBaShvng(A)-HL, AVBaShvng(A)-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation, inner flame-retardant PVC-compound sheath, armour of aluminium or aluminium alloy bands, cold-resistant, flame-retardant PVC-compound protection hose

VBShv-HL, AVBShv-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and inner sheath, armour of steel galvanized bands, cold-resistant protection hose.

VBaShv-HL, AVBaShv-HL

Power cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and inner sheath, armour of aluminium or aluminium alloy bands, cold-resistant PVC-compound protection hose

VBShvng(A)-LS, AVBShvng(A)-LS

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and inner sheath, armour of steel galvanized bands, low-smoke PVC-compound protection hose

VBaShvng(A)-LS, AVBaShvng(A)-LS

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and inner sheath, armour of aluminium or aluminium alloy bands, low-smoke PVC-compound protection hose

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 3 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities.

The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with PVC-compound insulation and outer sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with PVC-compound insulation and flame-retardant PVC-compound protection hose are designed for laying in cable works of outdoor (open) electrical installations, that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with low-smoke PVC-compound insulation and protection hose are designed for bunched laying in cable works and rooms of indoor (closed) electrical installations incl. facilities of nuclear energy using as well as for use in building constructions.

The "ng(A)-HL"-type cables with cold-resistant, flame-retardant PVC-compound insulation and cold-resistant, flame-retardant PVC-compound protection hose are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with cold-resistant PVC-compound insulation and protection hose are designed for single laying in cable works and rooms of outdoor (open) electrical installations, incl. one used in climatic conditions with temperature decreased to -60 °C.

OKP CODES

353300 the cable with copper conductors for nominal voltage 3 kV
353700 the cable with aluminium conductors for nominal voltage 3 kV

DESIGN

- 1. Conductor:** copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.
- 2. Insulation:** for the cables of AVBSHv, VBSHv, AVBaSHv, VBaSHv, AVBSHvng(A), VBSHvng(A), AVBaSHvng(A) and VBaSHvng(A) types: PVC-compound. For the cables of AVBSHvng(A)-LS, VBSHvng(A)-LS, AVBaSHvng(A)-LS and VBaSHvng(A)-LS types: low-smoke PVC-compound. For the cables of AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBaSHvng(A)-HL, VBaSHvng(A)-HL, AVBSHv-HL, VBSHv-HL, AVBaSHv-HL and VBaSHv-HL types: cold-resistant PVC-compound. Insulated conductors of multi-core cables are of different colours. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.
- 3. Stranding:** three-core cables have cores of identical cross-section.
- 4. Inner sheath:** for the cables of AVBSHv, VBSHv, AVBaSHv and VBaSHv types: PVC-compound. For the cables of AVBSHvng(A), VBSHvng(A), AVBaSHvng(A) and VBaSHvng(A) types: flame-retardant PVC-compound. For the cables of AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBaSHvng(A)-HL and VBaSHvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVBSHv-HL, VBSHv-HL, AVBaSHv-HL and VBaSHv-HL types: cold-resistant PVC-compound. For the cables of AVBSHvng(A)-LS, VBSHvng(A)-LS, AVBaSHvng(A)-LS and VBaSHvng(A)-LS types: low-smoke PVC-compound. Inner sheath fills interval between insulated conductors of multi-core cable giving to the cable form close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.
- 5. Armour:** for multi-core cables is made of two steel galvanized bands, for single-core cables is made of aluminium or aluminium alloy bands. Bands are laid so that the upper band overlaps the gaps between the coils of the lower band. Gaps between coils of each band should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.
- 6. Protection hose:** for the cables of AVBSHv, VBSHv, AVBaSHv and VBaSHv types: PVC-compound. For the cables of AVBSHvng(A), VBSHvng(A), AVBaSHvng(A) and VBaSHvng(A) types: flame-retardant PVC-compound. For the cables of AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBaSHvng(A)-HL and VBaSHvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVBSHv-HL and VBSHv-HL types: cold-resistant PVC-compound. For the cables of AVBSHvng(A)-LS and VBSHvng(A)-LS types: low-smoke PVC-compound. Nominal thickness of protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables AVBSHv and VBSHv.....UHL and T, placement categories 1 and 5
For the cables AVBSHvng(A) and VBSHvng(A).....UHL, placement categories 3 and 5
For the cables AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBSHv-HL and VBSHv-HL.....HL, placement categories 1
For the cables AVBSHvng(A)-LS and VBSHvng(A)-LS.....UHL and V, placement categories 5

Operating temperature range:

for the cables AVBSHv, VBSHv, AVBSHvng(A), VBSHvng(A), AVBSHvng(A)-LS and VBSHvng(A)-LS.....from -50 °C to +50 °C
for the cables AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBSHv-HL and VBSHv-HL.....from -60°C to +50°C
Relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than:

for the cables AVBSHv, VBSHv, AVBSHvng(A), VBSHvng(A), AVBSHvng(A)-LS and VBSHvng(A)-LS.....-15 °C
for the cables AVBSHvng(A)-HL, VBSHvng(A)-HL, AVBSHv-HL and VBSHv-HL.....-30 °C
Nominal frequency.....50 Hz
Test AC voltage with frequency 50 Hz.....9,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
for multi-core cables.....7,5 outer cable diameters

Cable conductor continuous operating heating temperature max..... 70 °C

Max allowed pulling force during cable tracing

for the cables with copper conductors.....50 N/mm²
for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm².....450 m
from 25 to 70 mm².....300 m
from 95 mm² and more200 m
Guarantee use period.....5 years from date of input of the cable into operation
Service life.....30 years

Technical standards of single-core cables, armoured with aluminium alloy bands, correspond to technical standards of multi-core cables, armoured with steel bands.

The single-core cables with copper and aluminium conductors, round

Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with copper conductor, kg					Weight of 1 km of the cable with aluminium conductors kV, kg				
		VBaSHv	VBaSHvng(A)	VBaSHvng(A)-HL	VBaSHv-HL	VBaSHvng(A)-LS	AVBaSHv	AVBaSHvng(A)	AVBaSHvng(A)-HL	AVBaSHv-HL	AVBaSHvng(A) - LS
1x10sr	15,5	353	375	374	344	407	293	316	314	284	348
1x16sr	16,5	432	457	454	422	492	336	360	358	326	396
1x16mr	16,9	454	480	477	443	518	357	383	380	346	421
1x25sr	17,6	539	566	564	528	605	389	417	414	379	456
1x25mr	17,9	562	590	587	551	633	410	438	435	398	480
1x35mr	18,9	664	694	691	652	738	456	487	483	444	531
1x50mr	20,2	868	908	904	855	957	554	594	590	541	643
1x70mr	21,8	1067	1111	1106	1052	1165	643	687	683	628	742
1x95mr	23,5	1338	1386	1382	1322	1447	763	811	807	747	872
1x120mr	25,3	1626	1680	1675	1607	1750	888	942	937	869	1012
1x150mr	26,7	1914	1972	1966	1894	2047	1003	1061	1055	983	1136
1x185mr	28,3	2281	2344	2337	2260	2425	1145	1208	1201	1124	1289
1x240mr	30,6	2810	2879	2871	2786	2968	1350	1419	1412	1327	1508

The three-core cables with copper and aluminium conductors

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with copper conductors, kg					Weight of 1 km of the cable with aluminium conductors kV, kg				
		VBSHv	VBSHvng(A)	VBSHvng(A)-HL	VBSHv-HL	VBSHvng(A) - LS	AVBSHv	AVBSHvng(A)	AVBSHvng(A) - HL	AVBSHv-HL	AVBSHvng(A)-LS
3x10sr	24,2	1015	1101	1095	996	1173	835	921	915	816	993
3x16sr	26,2	1277	1379	1372	1256	1460	987	1088	1081	965	1170
3x16mr	27,2	1356	1465	1457	1333	1557	1063	1172	1164	1040	1263
3x25sr	28,6	1633	1753	1745	1609	1846	1181	1301	1293	1157	1394
3x25mr	29,3	1714	1841	1831	1688	1943	1254	1380	1371	1228	1482
3x35mr	31,5	2054	2200	2190	2027	2307	1428	1574	1564	1401	1681
3x50mr	33,2	2471	2581	2569	2440	2708	1523	1633	1621	1492	1760
3x70ms	36,6	3098	3222	3208	3061	3372	1829	1953	1938	1792	2103
3x95ms	38,6	3890	4022	4005	3850	4188	2168	2300	2283	2128	2465
3x120ms	41,6	4688	4832	4814	4644	5013	2485	2629	2610	2441	2810
3x150ms	45,4	5662	5839	5818	5612	6046	2922	3098	3078	2871	3305
3x185ms	49,4	6814	7008	6985	6758	7238	3418	3611	3588	3362	3841
3x240ms	54,2	8760	8974	8948	8698	9232	4394	4607	4581	4331	4865



VEBSHv, AVEBSHv

Screened power cables: copper or aluminium conductors, PVC-compound insulation and inner sheath, copper foil screen, armour of steel galvanized bands, PVC-compound protection hose

VEBaSHv, AVEBaSHv

Power cables: copper or aluminium conductors, PVC-compound insulation and inner sheath, armour of aluminium or aluminium alloy bands, PVC-compound protection hose

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 3 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS" cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with PVC-compound insulation and protection hose are designed for single laying in cable works and production rooms.

Bunched laying of these cables is allowed only in outdoor electric installations and production rooms where only periodical presence of operating personnel is possible. At that it is necessary to use passive fire protection.

OKP CODES

353300 the cable with copper conductors for nominal voltage 3 kV
353700 the cable with aluminium conductors for nominal voltage 3 kV

Design

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: PVC-compound.

Insulated conductors of multi-core cables are of different colours. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: three-core cables have cores of identical cross-sections

4. Inner sheath (of three-core cables): in the PVC-compound cables.

Inner sheath fills intervals between insulated conductors, giving to cable form being close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

5. Screen: tapping with copper band with thickness not less than 0,06 mm with overlapping.

6. Bedding: PVC-compound.

7. Armour: for multi-core cables is made of two steel galvanized bands, for single-core cables is made of aluminium or aluminium alloy bands; bands are laid so that the upper band overlaps the gaps between the coils of the lower band. Gaps between coils of each band should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.

8. Protection hose: PVC-compound. Nominal thickness of protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69.....UHL and T, placement categories 1 and 5
Operation temperature rangefrom -50 °C to +50 °C
Relative air humidity at max +35°C.....max 98%
Laying and installation of cables without preheating is performed at temperature not less than-15 °C
Nominal frequency50 Hz
Test AC voltage with frequency 50 Hz.....9,5 kV
Cable conductor continuous operating heating temperature max.....70 °C

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
for multi-core cables.....7,5 outer cable diameters

Max allowed pulling force during cable tracing

for the cables with copper conductors.....50 N/mm²
for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm².....450 m
from 25 to 70 mm².....300 m
from 95 mm² and more.....200 m
Guarantee use period.....5 years from date of input of the cable into operation
Service life.....30 years

Technical standards of single-core cables, armoured with aluminium alloy bands, correspond to technical standards of multi-core cables, armoured with steel bands.

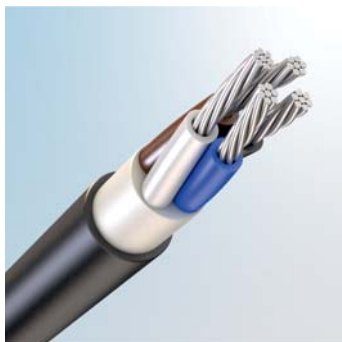
The single-core cables with copper and aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with conductors, kg	
		VEBaSHv	AVEBaSHv
1x10sr	17,6	460	400
1x16sr	18,6	546	450
1x16mr	19,0	571	474
1x25sr	19,7	661	511
1x25mr	20,0	687	534
1x35mr	21,0	795	588
1x50mr	22,3	1009	695
1x70mr	24,3	1240	917
1x95mr	26,0	1525	950
1x120mr	27,4	1803	1065
1x150mr	28,8	2100	1189
1x185mr	30,4	2479	1344
1x240mr	32,7	3025	1565

The three-core cables with copper and aluminium conductors

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with conductors, kg	
		VEBSHv	AVEBSHv
3x10sr	26,3	1203	1023
3x16sr	28,3	1480	1190
3x16mr	29,3	1567	1273
3x25sr	30,7	1854	1402
3x25mr	31,5	1940	1480
3x35mr	34,4	2364	1738
3x50mr	35,9	2794	1846
3x70ms	38,9	3416	2147
3x95ms	40,9	4225	2503
3x120ms	44,3	5095	2892
3x150ms	48,1	6104	3363
3x185ms	52,9	7640	4244
3x240ms	57,7	9412	5045

Power Cables with Plastic Insulation with Low Toxicity of Combustion Products for the Voltage 0,66 and 1kV TU 3500-025-59680332-2012



VVGng(A)-LSLTx, AVVGng(A)-LSLTx

Power cables: copper or aluminium conductors, flame-retardant PVC-compound insulation, flame-retardant PVC-compound inner and outer sheaths, low fume and gas emission, low toxicity of combustion products, without protection coverage.

VVGEng(A)-LSLTx, AVVGEng(A)-LSLTx

Screened power cables: copper or aluminium conductors, low-smoke PVC-compound insulation, low-smoke PVC-compound inner and outer sheaths with low fume and gas emission and low toxicity of combustion products.

VBShvng(A)-LSLTx, AVBShvng(A)-LSLTx

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation, inner and outer sheaths with low fume and gas emission and low toxicity of combustion products, armour of steel galvanized bands, low-smoke PVC-compound protection hose with low fume and gas emission and low toxicity of combustion products.

VBaSHvng(A)-LSLTx, AVBaSHvng(A)-LSLTx

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and inner sheath with low fume and gas emission and low toxicity of combustion products, armour of aluminium and aluminium alloy bands, low-smoke PVC-compound protection hose with low fume and gas emission and with low toxicity of combustion products.

VVGng(A)-FRLSLTx

Power cables: copper or aluminium conductors, low-smoke PVC-compound insulation, inner and outer sheaths with low fume and gas emission and low toxicity of combustion products, with thermal barrier along current-carrying conductor, without protection coverage.

VVGEng(A)-FRLSLTx

Screened power cables: copper or aluminium conductors, low-smoke PVC-compound insulation and inner and outer sheaths, with low fume and gas emission, with low toxicity of combustion products, with thermal barrier along current-carrying conductor,

VBShvng(A)-FRLSLTx

Power cables: copper conductors, low-smoke PVC-compound insulation and inner sheath with low fume and gas emission and low toxicity of combustion products, thermal barrier along current-carrying conductor, armour of steel galvanized bands, low-smoke PVC-compound protection hose with low fume and gas emission and low toxicity of combustion products.

VBaSHvng(A)-FRLSLTx

Power cables: copper conductors, low-smoke PVC-compound insulation and inner sheath with low fume and gas emission and low toxicity of combustion products, with thermal barrier along current-carrying conductor, armour of aluminium and aluminium alloy bands, low-smoke PVC-compound protection hose with low fume and gas emission and low toxicity of combustion products.

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables can be used in nuclear stations outside containment area in the systems of NS of 2nd, 3rd and 4th class according to classifier OPB 88/97 (PNAE G-01-011) and in explosion-hazard areas of 0th, 1st and 2nd classes according to GOST R 51330.13

The "ng(A)-LSLTx"-type cables are designed for laying in buildings of kindergartens, specialized homes for the elderly and disabled people, hospitals, bed-room blocks of boarding educational institutions and child care centers.

The "ng(A)-FRLSLTx"-type cables are designed for laying in the fire protection systems, as well as in other systems, which must ensure safe operation in fire conditions, in buildings of kindergartens, specialized homes for the elderly and disabled people, hospitals and bed-room blocks of boarding educational institutions and child care centers.

It is allowed to use the cables in explosion-hazard areas in accordance with stated requirements of GOST R 51330.13:

- armoured ones: by open and under-plaster way of laying for 0th, 1st and 2nd classes;
- unarmoured ones: in steel pipes suitable for water and gas by open and under-plaster way of laying for 0th, 1st and 2nd classes and in the absence of mechanical and chemical actions by open way for 2nd class;

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

Conductors of fireproof cables must be made only of copper.

2. Thermal barrier: conductors of the "ng(A)-FRLSLTx"-type cables must be tapped with two layer of micaceous band. Width of micaceous band must be not less than 0,12 mm

3. Insulation: low-smoke PVC-compound with low fume and gas emission and low toxicity of combustion products. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow.

4. Stranding: insulated conductors of two-, three-, four- and five-core cables are stranded; two-, three- and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.

5. Inner sheath: low-smoke PVC-compound with low fume and gas emission and low toxicity of combustion products.

Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form close to circular one.

6. Metal screen: for screened cables it is tapping with two copper bands with thickness not less than 0,06 mm with overlapping.

7. Armour: for multi-core cables it is made of two steel galvanized bands, for single-core cables it is made of aluminium or aluminium alloy bands; bands are laid so that the upper band overlaps the gaps

between the coils of the lower band. Gaps between coils of each tape should not exceed 50% of the width of the band.

8. Outer sheath: for unarmoured cables: low-smoke PVC-compound with low fume and gas emission and low toxicity of combustion products.

9. Protection hose for armoured cables: low-smoke PVC-compound with low fume and gas emission and low toxicity of combustion products.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69 UHL.....	placement categories 1 and 5
Operating temperature range	from -50 °C to +50 °C
Relative air humidity at max +35 °C.....	max 98%
Laying and installation of cables without preheating is performed at temperature not less than.....	-15 °C
Nominal frequency.....	50 Hz

Test AC voltage with frequency 50 Hz:

for the voltage 0,66 kV.....	3 kV
for the voltage 1 kV.....	3,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....	10 outer cable diameters
for multi-core cables.....	7,5 outer cable diameters
Cable conductor continuous operating heating temperature max	70 °C

Max allowed pulling force during cable tracing

for the cables with copper conductors.....	50 N/mm ²
for the cables with aluminium conductors.....	30 N/mm ²

Construction length with the main core's cross-section:

up to 16 mm ²	250 m
from 25 to 70 mm ²	200 m
from 95 mm ² and more	100 m
Guarantee use period.....	5 years from date of input of the cable into operation
Service life.....	30 years
Fire resistance of the cables with FR index, not less than	180 min
Reducing of light permeability in test chamber, not more than	50 %
Value of equivalent index of toxicity of combustion products, more than.....	120 g/m ³

VVGng(A)-LSLTx, AVVGng(A)-LSLTx

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VVGng(A)-LSLTx – 0,66 kV	VVGng(A)-LSLTx – 1 kV			AVVGng(A)-LSLTx – 0,66 kV	AVVGng(A)-LSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
1x1,5 sr	5,4	5,8	49	55	-	-	-	-
1x2,5 sr	5,8	6,2	62	69	5,8	6,2	47	54
1x4 sr	6,4	7,0	84	95	6,4	7,0	60	71
1x6 sr	6,9	7,5	107	118	6,9	7,5	71	82
1x10 sr	8,1	8,3	158	162	8,1	8,3	98	103
1x16 sr	9,3	9,5	227	232	9,3	9,5	131	136
1x16 mr	9,7	9,9	236	241	9,7	9,9	139	144
1x25 sr	10,8	11,0	330	336	10,8	11,0	180	186
1x25 mr	11,1	11,3	340	347	11,1	11,3	188	194
1x35 mr	12,1	12,3	437	444	12,1	12,3	225	232
1x50 mr	13,8	14,0	620	627	13,8	14,0	302	310
1x70 mr	-	15,6	-	804	-	15,6	-	380
1x95 mr	-	17,7	-	1072	-	17,7	-	497
1x120 mr	-	19,5	-	1342	-	19,5	-	604
1x150 mr	-	21,3	-	1636	-	21,3	-	725
1x185 mr	-	23,3	-	2012	-	23,3	-	876
1x240 mr	-	26,4	-	2576	-	26,4	-	1116
2x1,5 sr	7,9	8,7	109	127	-	-	-	-
2x2,5 sr	8,7	9,7	141	167	8,7	9,7	111	137
2x4 sr	10,2	11,4	202	239	10,2	11,4	154	190
2x6 sr	11,2	12,4	260	300	11,2	12,4	188	227
2x10 sr	13,6	14,0	397	412	13,6	14,0	277	292
2x16 sr	15,5	15,9	559	576	15,5	15,9	365	383
2x16 mr	16,4	16,8	593	612	16,4	16,8	397	416
2x25 sr	20,9	21,3	997	1022	20,9	21,3	696	721
2x25 mr	21,6	22,0	1042	1068	21,6	22,0	735	762
2x35 mr	24,0	24,4	1334	1363	24,0	24,4	908	937
2x50 mr	27,4	27,8	1842	1875	27,4	27,8	1202	1235
2x70 ms	-	26,7	-	1921	-	26,7	-	1075
2x95 ms	-	28,7	-	2491	-	28,7	-	1343
2x120 ms	-	33,1	-	3100	-	33,1	-	1631
2x150 ms	-	35,5	-	3780	-	35,5	-	1953
2x185 ms	-	38,0	-	4581	-	38,0	-	2317
2x240 ms	-	43,9	-	5857	-	43,9	-	2946
3x1,5 sr	8,3	9,4	127	153	-	-	-	-
3x2,5 sr	9,4	10,2	174	197	9,4	10,2	129	152
3x4 sr	10,8	12,1	245	285	10,8	12,1	172	213
3x6 sr	11,9	13,1	320	364	11,9	13,1	211	256
3x10 sr	14,4	14,8	494	511	14,4	14,8	314	331
3x16 sr	16,4	16,9	708	728	16,4	16,9	418	437
3x16 mr	17,4	17,8	744	765	17,4	17,8	450	471
3x25 sr	22,1	22,5	1230	1258	22,1	22,5	778	805
3x25 mr	22,8	23,2	1279	1308	22,8	23,2	819	848
3x35 mr	25,4	25,8	1652	1684	25,4	25,8	1013	1045
3x50 mr	29,0	29,5	2310	2347	29,0	29,5	1351	1387
3x70 ms	-	30,7	-	2683	-	30,7	-	1413
3x95 ms	-	35,5	-	3645	-	35,5	-	1923
3x120 ms	-	38,5	-	4427	-	38,5	-	2224
3x150 ms	-	42,9	-	5451	-	42,9	-	2711
3x185 ms	-	47,3	-	6719	-	47,3	-	3322
3x240 ms	-	52,3	-	8426	-	52,3	-	4059
4x1,5 sr	9,8	10,7	173	199	-	-	-	-
4x2,5 sr	10,7	11,7	227	256	10,7	11,7	167	196
4x4 sr	12,3	13,8	318	368	12,3	13,8	221	272
4x6 sr	13,5	15,0	415	470	13,5	15,0	271	325
4x10 sr	16,4	16,9	638	660	16,4	16,9	399	420
4x16 sr	18,7	19,1	916	940	18,7	19,1	528	552
4x16 mr	19,7	20,2	959	985	19,7	20,2	567	593
4x25 sr	24,5	25,0	1558	1591	24,5	25,0	955	988
4x25 mr	25,3	25,8	1617	1652	25,3	25,8	1004	1039
4x35 mr	27,7	28,2	2056	2094	27,7	28,2	1203	1241
4x50 mr	32,2	32,7	2935	2979	32,2	32,7	1655	1699

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, km		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VVGng(A)-LSLTx – 0,66 kV	VVGng(A)-LSLTx – 1 kV			AVVGng(A)-LSLTx – 0,66 kV	AVVGng(A)-LSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
4x70 ms	-	35,5	-	3576	-	35,5	-	1883
4x95 ms	-	39,5	-	4706	-	39,5	-	2410
4x120 ms	-	42,9	-	5795	-	42,9	-	2858
4x150 ms	-	47,3	-	7096	-	47,3	-	3442
4x185 ms	-	52,3	-	8712	-	52,3	-	4184
4x240 ms	-	57,1	-	11076	-	57,1	-	5253
5x1,5 sr	10,5	11,6	206	273	-	-	-	-
5x2,5 sr	11,6	12,7	272	306	11,6	12,7	196	230
5x4 sr	13,4	15,0	384	443	13,4	15,0	264	323
5x6 sr	14,7	16,3	511	575	14,7	16,3	330	394
5x10 sr	17,9	18,5	781	806	17,9	18,5	481	506
5x16 sr	20,5	21,0	1120	1149	20,5	21,0	636	664
5x16 mr	21,7	22,2	1170	1201	21,7	22,2	680	711
5x25 sr	26,7	27,3	1877	1915	26,7	27,3	1123	1162
5x25 mr	27,7	28,2	1946	1987	27,7	28,2	1179	1220
5x35 mr	30,4	31,3	2495	2579	30,4	31,3	1429	1513
5x50 mr	35,8	36,3	3613	3666	35,8	36,3	2013	2066
5x70 ms	-	38,5	-	4376	-	38,5	-	2260
5x95 ms	-	43,9	-	5860	-	43,9	-	2989
5x120 ms	-	49,3	-	7227	-	49,3	-	3555
5x150 ms	-	53,7	-	8863	-	53,7	-	4295
5x185 ms	-	59,1	-	10944	-	59,1	-	5283
5x240 ms	-	63,1	-	13681	-	63,1	-	6403
3x25 sr+1x16sr	24,5	25,0	1501	1535	24,5	25,0	952	986
3x25 mr+1x16mr	25,3	25,8	1557	1592	25,3	25,8	999	1034
3x35 mr+1x16mr	26,8	27,3	1856	1891	26,8	27,3	1118	1154
3x50 mr+1x25mr	30,7	31,6	2611	2691	30,7	31,6	1497	1578
3x70 ms+1x35mr	-	35,5	-	3224	-	35,5	-	1742
3x95 ms+1x50ms	-	39,5	-	4278	-	39,5	-	2240
3x120 ms+1x70ms	-	42,9	-	5298	-	42,9	-	2671
3x150 ms+1x70ms	-	47,3	-	6312	-	47,3	-	3148
3x185 ms+1x95ms	-	52,3	-	7816	-	52,3	-	3846
3x240 ms+1x120ms	-	57,1	-	9893	-	57,1	-	4792

VBaSHvng(A)-LSLTx, AVBaSHvng(A)-LSLTx

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VBaSHvng(A)-LSLTx – 0,66 kV	VBaSHvng(A)-LSLTx – 1 kV			AVBaSHvng(A)-LSLTx – 0,66 kV	AVBaSHvng(A)-LSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
1x1,5 sr	-	-	-	-	-	-	-	-
1x2,5 sr	-	-	-	-	14,6	14,6	312	312
1x4 sr	14,6	14,6	337	336	14,6	14,6	313	312
1x6 sr	14,6	14,6	350	350	14,6	14,6	314	314
1x10 sr	14,6	14,6	376	376	14,6	14,6	316	316
1x16 sr	14,6	14,6	417	416	14,6	14,6	320	320
1x16 mr	14,6	14,6	413	412	14,6	14,6	315	315
1x25 sr	15,4	15,6	509	517	15,4	15,6	359	368
1x25 mr	15,7	15,9	524	533	15,7	15,9	372	381
1x35 mr	16,7	16,9	635	644	16,7	16,9	423	433
1x50 mr	18,4	18,6	842	852	18,4	18,6	524	535
1x70 mr	-	20,2	-	1046	-	20,2	-	622
1x95 mr	-	22,3	-	1343	-	22,3	-	768
1x120 mr	-	23,7	-	1612	-	23,7	-	874
1x150 mr	-	25,5	-	1929	-	25,5	-	1018
1x185 mr	-	27,9	-	2361	-	27,9	-	1225
1x240 mr	-	30,6	-	2933	-	30,6	-	1474

VBShvng(A)-LSLTx, AVBShvng(A)-LSLTx

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VBShvng(A)-LSLTx – 0,66 kV	VBShvng(A)-LSLTx – 1 kV			AVBShvng(A)-LSLTx – 0,66 kV	AVBShvng(A)-LSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
2x1,5 sr	13,8	13,8	378	377	-	-	-	-
2x2,5 sr	13,8	13,8	391	389	13,8	13,8	360	359
2x4 sr	14,0	15,2	421	483	14,0	15,2	373	435
2x6 sr	15,0	16,2	500	565	15,0	16,2	428	493
2x10 sr	17,4	17,8	687	711	17,4	17,8	567	591

Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable, for the voltage, kg	
			VBSHvng(A)-LSLTx – 0,66 kV	VBSHvng(A)-LSLTx – 1 kV			AVBSHvng(A)-LSLTx – 0,66 kV	AVBSHvng(A)-LSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
2x16 sr	19,3	19,7	882	908	19,3	19,7	689	715
2x16 mr	20,2	20,6	936	963	20,2	20,6	740	767
2x25 sr	22,3	22,7	1214	1244	22,3	22,7	913	942
2x25 mr	23,0	23,4	1267	1297	23,0	23,4	960	991
2x35 mr	25,4	25,8	1583	1617	25,4	25,8	1157	1190
2x50 mr	28,8	29,2	2129	2167	28,8	29,2	1489	1527
2x70 ms	-	28,1	-	2201	-	28,1	-	1354
2x95 ms	-	30,1	-	2793	-	30,1	-	1645
2x120 ms	-	34,5	-	3451	-	34,5	-	1983
2x150 ms	-	36,9	-	4156	-	36,9	-	2329
2x185 ms	-	39,4	-	4985	-	39,4	-	2721
2x240 ms	-	45,3	-	6328	-	45,3	-	3416
3x1,5 sr	13,8	13,8	386	384	-	-	-	-
3x2,5 sr	13,8	14,0	405	414	13,8	14,0	360	369
3x4 sr	14,6	15,9	473	540	14,6	15,9	401	468
3x6 sr	15,7	16,9	571	642	15,7	16,9	462	533
3x10 sr	18,2	18,6	789	815	18,2	18,6	609	635
3x16 sr	20,2	20,7	1046	1074	20,2	20,7	755	784
3x16 mr	21,2	21,6	1102	1132	21,2	21,6	808	838
3x25 sr	23,5	23,9	1460	1492	23,5	23,9	1008	1040
3x25 mr	24,2	24,6	1518	1552	24,2	24,6	1058	1092
3x35 mr	26,8	27,2	1916	1953	26,8	27,2	1277	1314
3x50 mr	30,4	30,9	2616	2658	30,4	30,9	1656	1698
3x70 ms	-	32,1	-	3007	-	32,1	-	1738
3x95 ms	-	36,9	-	4021	-	36,9	-	2299
3x120 ms	-	39,9	-	4837	-	39,9	-	2634
3x150 ms	-	44,3	-	5911	-	44,3	-	3170
3x185 ms	-	48,7	-	7225	-	48,7	-	3828
3x240 ms	-	54,5	-	9349	-	54,5	-	4982
4x1,5 sr	13,8	13,9	392	396	-	-	-	-
4x2,5 sr	13,9	14,9	424	471	13,9	14,9	363	410
4x4 sr	15,5	17,0	544	622	15,5	17,0	448	525
4x6 sr	16,7	18,2	664	738	16,7	18,2	519	593
4x10 sr	19,6	20,1	932	962	19,6	20,1	693	723
4x16 sr	21,9	22,3	1253	1286	21,9	22,3	865	898
4x16 mr	22,9	23,4	1316	1351	22,9	23,4	924	959
4x25 sr	25,9	26,4	1812	1851	25,9	26,4	1209	1248
4x25 mr	26,7	27,2	1881	1921	26,7	27,2	1268	1308
4x35 mr	29,1	29,6	2347	2390	29,1	29,6	1494	1537
4x50 mr	33,6	34,1	3277	3326	33,6	34,1	1997	2047
4x70 ms	-	36,9	-	3952	-	36,9	-	2259
4x95 ms	-	40,9	-	5127	-	40,9	-	2831
4x120 ms	-	44,3	-	6255	-	44,3	-	3317
4x150 ms	-	48,7	-	7602	-	48,7	-	3948
4x185 ms	-	54,5	-	9635	-	54,5	-	5107
4x240 ms	-	59,3	-	12083	-	59,3	-	6260
5x1,5 sr	13,7	14,8	398	449	-	-	-	-
5x2,5 sr	14,8	15,9	484	538	14,8	15,9	408	462
5x4 sr	16,6	18,2	629	711	16,6	18,2	509	590
5x6 sr	17,9	19,5	773	867	17,9	19,5	592	686
5x10 sr	21,1	21,7	1102	1137	21,1	21,7	802	837
5x16 sr	23,7	24,2	1489	1527	23,7	24,2	1004	1043
5x16 mr	25,3	25,8	1590	1631	25,3	25,8	1100	1141
5x25 sr	28,1	28,7	2156	2201	28,1	28,7	1403	1447
5x25 mr	29,1	29,6	2236	2283	29,1	29,6	1469	1516
5x35 mr	31,8	32,7	2816	2911	31,8	32,7	1750	1845
5x50 mr	37,2	37,7	3992	4050	37,2	37,7	2392	2451
5x70 ms	-	39,9	-	4785	-	39,9	-	2670
5x95 ms	-	45,3	-	6330	-	45,3	-	3460
5x120 ms	-	50,7	-	7755	-	50,7	-	4083
5x150 ms	-	55,9	-	9812	-	55,9	-	5244
5x185 ms	-	61,3	-	11988	-	61,3	-	6327
5x240 ms	-	65,3	-	14799	-	65,3	-	7521
3x25 sr+1x16sr	25,9	26,4	1756	1794	25,9	26,4	1207	1245

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VBSHvng(A)-LSLTx – 0,66 kV	VBSHvng(A)-LSLTx – 1 kV			AVBSHvng(A) LSLTx – 0,66 kV	AVBSHvng(A) LSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
3x25 mr+1x16mr	26,7	27,2	1821	1861	26,7	27,2	1263	1303
3x35 mr+1x16mr	28,2	28,7	2137	2177	28,2	28,7	1399	1439
3x50 mr+1x25mr	32,1	33,0	2936	3026	32,1	33,0	1822	1912
3x70 ms+1x35mr	-	36,9	-	3600	-	36,9	-	2118
3x95 ms+1x50ms	-	40,9	-	4699	-	40,9	-	2661
3x120 ms+1x70ms	-	44,3	-	5757	-	44,3	-	3131
3x150 ms+1x70ms	-	48,7	-	6818	-	48,7	-	3655
3x185 ms+1x95ms	-	54,5	-	8739	-	54,5	-	4769
3x240 ms+1x120ms	-	59,3	-	10900	-	59,3	-	5798

VVEng(A)-LSLTx, AVVEng(A)-LSLTx

Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VVEng(A)-LSLTx – 0,66 kV	VVEng(A)-LSLTx – 1 kV			AVVEng(A)-LSLTx – 0,66 kV	AVVEng(A)-LSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
1x1,5 sr	-	-	-	-	-	-	-	-
1x2,5 sr	-	-	-	-	6,7	7,1	69	77
1x4 sr	-	-	-	-	7,4	8,0	84	97
1x6 sr	7,9	8,5	133	147	7,9	8,5	97	111
1x10 sr	9,3	9,5	194	199	9,3	9,5	134	140
1x16 sr	10,2	10,4	263	268	10,2	10,4	166	172
1x16 mr	10,7	10,9	273	279	10,7	10,9	176	182
1x25 sr	11,7	11,9	371	378	11,7	11,9	221	228
1x25 mr	12,1	12,3	383	390	12,1	12,3	231	238
1x35 mr	13,1	13,3	483	491	13,1	13,3	272	279
1x50 mr	14,8	15,0	673	682	14,8	15,0	355	364
1x70 mr	-	16,6	-	864	-	16,6	-	440
1x95 mr	-	19,1	-	1161	-	19,1	-	586
1x120 mr	-	20,5	-	1417	-	20,5	-	679
1x150 mr	-	22,3	-	1719	-	22,3	-	808
1x185 mr	-	24,7	-	2129	-	24,7	-	994
1x240 mr	-	27,4	-	2678	-	27,4	-	1219
2x1,5 sr	12,2	12,2	261	260	-	-	-	-
2x2,5 sr	12,2	12,2	274	273	12,2	12,2	244	242
2x4 sr	12,4	13,6	302	351	12,4	13,6	254	303
2x6 sr	13,4	14,6	370	423	13,4	14,6	298	350
2x10 sr	15,8	16,2	532	552	15,8	16,2	412	432
2x16 sr	17,7	18,5	716	759	17,7	18,5	522	565
2x16 mr	19,0	19,4	782	805	19,0	19,4	586	609
2x25 sr	21,1	21,5	1041	1067	21,1	21,5	740	766
2x25 mr	21,8	22,2	1087	1115	21,8	22,2	781	808
2x35 mr	24,2	24,6	1385	1415	24,2	24,6	958	988
2x50 mr	27,6	28,0	1900	1935	27,6	28,0	1261	1295
2x70 ms	-	26,9	-	1978	-	26,9	-	1132
2x95 ms	-	28,9	-	2553	-	28,9	-	1405
2x120 ms	-	33,3	-	3172	-	33,3	-	1703
2x150 ms	-	35,7	-	3857	-	35,7	-	2030
2x185 ms	-	38,2	-	4664	-	38,2	-	2400
2x240 ms	-	44,1	-	6041	-	44,1	-	3043
3x1,5 sr	12,2	12,2	269	267	-	-	-	-
3x2,5 sr	12,2	12,4	288	295	12,2	12,4	243	250
3x4 sr	13,0	14,3	348	401	13,0	14,3	276	329
3x6 sr	14,0	15,3	434	491	14,0	15,3	325	383
3x10 sr	16,6	17,0	634	656	16,6	17,0	454	476
3x16 sr	19,0	19,4	891	916	19,0	19,4	601	625
3x16 mr	20,0	20,4	939	965	20,0	20,4	645	671
3x25 sr	22,2	22,7	1277	1305	22,2	22,7	824	853
3x25 mr	23,0	23,8	1328	1385	23,0	23,8	868	925
3x35 mr	25,5	26,0	1706	1739	25,5	26,0	1066	1100
3x50 mr	29,2	29,6	2373	2411	29,2	29,6	1413	1451
3x70 ms	-	30,9	-	2749	-	30,9	-	1480

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage	
			VVGng(A)-LSLTx – 0,66 kV	VVGng(A)-LSLTx – 1 kV			AVVGng(A)-LSLTx – 0,66 kV	AVVGng(A)-LSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
3x95 ms	-	35,7	-	3723	-	35,7	-	2001
3x120 ms	-	38,7	-	4512	-	38,7	-	2309
3x150 ms	-	43,1	-	5546	-	43,1	-	2806
3x185 ms	-	47,5	-	6823	-	47,5	-	3427
3x240 ms	-	52,5	-	8543	-	52,5	-	4176
4x1,5 sr	12,8	12,9	297	299	-	-	-	-
4x2,5 sr	12,9	13,9	327	365	12,9	13,9	266	305
4x4 sr	14,5	16,0	433	498	14,5	16,0	337	401
4x6 sr	15,7	17,2	542	612	15,7	17,2	398	467
4x10 sr	18,6	19,0	794	820	18,6	19,0	554	581
4x16 sr	20,8	21,3	1095	1124	20,8	21,3	708	737
4x16 mr	21,9	22,4	1150	1181	21,9	22,4	758	789
4x25 sr	24,7	25,1	1610	1644	24,7	25,1	1007	1041
4x25 mr	25,5	26,0	1671	1707	25,5	26,0	1057	1093
4x35 mr	27,9	28,4	2115	2154	27,9	28,4	1262	1302
4x50 mr	32,4	32,9	3005	3051	32,4	32,9	1725	1771
4x70 ms	-	35,7	-	3653	-	35,7	-	1961
4x95 ms	-	39,7	-	4793	-	39,7	-	2497
4x120 ms	-	43,1	-	5890	-	43,1	-	2953
4x150 ms	-	47,5	-	7201	-	47,5	-	3547
4x185 ms	-	52,5	-	8829	-	52,5	-	4300
4x240 ms	-	57,3	-	11203	-	57,3	-	5381
5x1,5 sr	12,7	13,8	303	344	-	-	-	-
5x2,5 sr	13,8	14,9	380	424	13,8	14,9	304	348
5x4 sr	15,6	17,2	509	584	15,6	17,2	389	463
5x6 sr	16,9	18,5	649	729	16,9	18,5	468	548
5x10 sr	20,1	20,6	951	981	20,1	20,6	651	682
5x16 sr	22,7	23,2	1316	1350	22,7	23,2	832	866
5x16 mr	24,1	24,6	1392	1429	24,1	24,6	902	939
5x25 sr	26,9	27,4	1934	1974	26,9	27,4	1180	1220
5x25 mr	27,9	28,4	2005	2047	27,9	28,4	1238	1281
5x35 mr	30,6	31,5	2561	2647	30,6	31,5	1495	1581
5x50 mr	35,9	36,5	3691	3745	35,9	36,5	2091	2145
5x70 ms	-	38,7	-	4460	-	38,7	-	2344
5x95 ms	-	44,1	-	5957	-	44,1	-	3087
5x120 ms	-	49,5	-	7336	-	49,5	-	3664
5x150 ms	-	53,9	-	8983	-	53,9	-	4416
5x185 ms	-	59,3	-	11076	-	59,3	-	5415
5x240 ms	-	63,3	-	13823	-	63,3	-	6545
3x25 sr+1x16sr	24,7	25,1	1553	1587	24,7	25,1	1004	1038
3x25 mr+1x16mr	25,5	26,0	1611	1647	25,5	26,0	1053	1089
3x35 mr+1x16mr	27,0	27,5	1913	1950	27,0	27,5	1176	1212
3x50 mr+1x25mr	30,9	31,8	2677	2760	30,9	31,8	1564	1646
3x70 ms+1x35mr	-	35,7	-	3302	-	35,7	-	1819
3x95 ms+1x50ms	-	39,7	-	4365	-	39,7	-	2327
3x120 ms+1x70ms	-	43,1	-	5393	-	43,1	-	2767
3x150 ms+1x70ms	-	47,5	-	6417	-	47,5	-	3253
3x185 ms+1x95ms	-	52,5	-	7933	-	52,5	-	3962
3x240 ms+1x120ms	-	57,3	-	10020	-	57,3	-	4919

VVGng(A)-FRLSLTx, VBaSHvng(A)-FRLSLTx

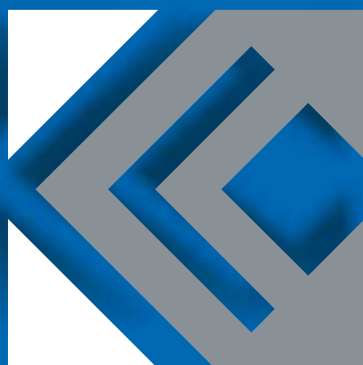
Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VVGng(A)-FRLSLTx – 0,66 kV	VVGng(A)-FRLSLTx – 1 kV			VBaSHvng(A)-FRLSLTx – 0,66 kV	VBaSHvng(A)-FRLSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
1x2,5 sr	9,0	9,4	130	140	-	-	-	-
1x4 sr	9,7	10,3	157	174	14,6	14,6	358	355
1x6 sr	10,2	10,8	185	202	14,6	14,6	368	365
1x10 sr	11,4	11,6	247	254	14,6	14,6	387	386
1x16 sr	12,3	12,5	321	328	14,6	14,8	419	428
1x16 mr	12,8	13,0	332	339	15,0	15,2	434	443

Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VVGng(A)-FRLSLTx – 0,66 kV	VVGng(A)-FRLSLTx – 1 kV			VBaSHvng(A)-FRLSLTx – 0,66 kV	VBaSHvng(A)-FRLSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
1x25 sr	13,8	14,0	437	445	16,1	16,3	547	557
1x25 mr	14,2	14,4	449	457	16,4	16,6	561	571
1x35 mr	15,2	15,4	554	562	17,4	17,6	674	684
1x50 mr	16,9	17,1	751	761	19,1	19,3	880	891
1x70 mr	-	19,1	-	971	-	20,9	-	1092
1x95 mr	-	21,2	-	1260	-	23,0	-	1393
1x120 mr	-	22,6	-	1522	-	24,4	-	1664
1x150 mr	-	24,8	-	1859	-	26,6	-	2014
1x185 mr	-	26,8	-	2254	-	28,6	-	2422
1x240 mr	-	29,5	-	2816	-	31,3	-	3000
1x300 mr	-	34,5	-	3621	-	-	-	-

VVGng(A)-FRLSLTx and VBSHvng(A)-FRLSLTx

Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VVGng(A)-FRLSLTx – 0,66 kV	VVGng(A)-FRLSLTx – 1 kV			VBSHvng(A) – FRLSLTx – 0,66 kV	VBSHvng(A) – FRLSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
2x1,5 sr	12,4	12,7	245	257	13,8	14,2	374	391
2x2,5 sr	12,7	13,5	271	302	14,2	15,0	405	445
2x4 sr	14,0	15,2	344	396	15,5	16,7	493	560
2x6 sr	15,0	16,2	414	470	16,5	17,7	576	646
2x10 sr	17,4	17,8	582	603	18,8	19,2	764	790
2x16 sr	19,7	20,1	793	816	20,7	21,1	974	1002
2x16 mr	20,6	21,0	838	862	21,6	22,0	1029	1058
2x25 sr	22,7	23,1	1105	1132	23,7	24,1	1318	1349
2x25 mr	23,4	24,2	1150	1205	24,4	25,2	1370	1430
2x35 mr	25,8	26,2	1453	1484	26,8	27,2	1695	1730
2x50 mr	29,2	29,6	1975	2010	30,2	30,6	2253	2292
2x70 ms	-	29,6	-	2036	-	30,6	-	2318
2x95 ms	-	32,0	-	2664	-	33,0	-	2970
2x120 ms	-	36,4	-	3275	-	37,4	-	3624
2x150 ms	-	38,4	-	3925	-	39,4	-	4295
2x185 ms	-	40,9	-	4734	-	41,9	-	5130
2x240 ms	-	47,2	-	6080	-	48,2	-	6539
3x1,5 sr	12,4	13,3	253	286	13,9	14,7	383	426
3x2,5 sr	13,3	14,1	306	341	14,7	15,6	446	491
3x4 sr	14,7	16,0	394	452	16,1	17,4	551	625
3x6 sr	15,8	17,1	483	545	17,2	18,5	653	722
3x10 sr	18,7	19,1	711	735	19,7	20,2	882	910
3x16 sr	20,7	21,2	955	981	21,8	22,2	1147	1178
3x16 mr	21,7	22,1	1001	1029	22,8	23,2	1204	1236
3x25 sr	24,4	24,8	1376	1407	25,4	25,8	1604	1639
3x25 mr	25,1	25,6	1425	1457	26,2	26,6	1660	1696
3x35 mr	27,3	27,7	1782	1816	28,3	28,7	2039	2078
3x50 mr	30,9	31,8	2457	2536	32,0	32,8	2753	2840
3x70 ms	-	36,4	-	2961	-	37,4	-	3310
3x95 ms	-	41,4	-	3874	-	42,4	-	4276
3x120 ms	-	43,8	-	4711	-	44,8	-	5137
3x150 ms	-	48,2	-	5739	-	49,2	-	6208
3x185 ms	-	52,2	-	6970	-	54,0	-	7838
3x240 ms	-	58,0	-	8853	-	59,8	-	9817
4x1,5 sr	13,9	14,8	314	353	14,7	15,7	431	480
4x2,5 sr	14,8	15,8	381	422	15,7	16,6	508	559
4x4 sr	16,4	17,9	491	561	17,3	18,7	634	711
4x6 sr	17,6	19,1	604	678	18,5	19,9	751	841
4x10 sr	20,5	21,0	864	893	21,3	21,8	1040	1073
4x16 sr	22,8	23,2	1172	1203	23,6	24,1	1371	1407
4x16 mr	24,0	24,5	1239	1272	24,7	25,6	1434	1501
4x25 sr	26,6	27,1	1699	1736	27,6	28,1	1950	1991
4x25 mr	27,4	27,9	1756	1794	28,5	28,9	2015	2058
4x35 mr	29,8	30,3	2207	2247	30,9	31,3	2491	2536
4x50 mr	34,7	35,2	3147	3194	35,8	36,2	3479	3531
4x70 ms	-	40,4	-	3793	-	41,4	-	4183
4x95 ms	-	45,2	-	5061	-	46,2	-	5499

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg		Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage, kg	
			VVGng(A)-FRLSLTx – 0,66 kV	VVGng(A)-FRLSLTx – 1 kV			VBSHvng(A)-FRLSLTx – 0,66 kV	VBSHvng(A)-FRLSLTx – 1 kV
	0,66 kV	1 kV			0,66 kV	1 kV		
4x120 ms	-	48,2	-	6100	-	49,2	-	6569
4x150 ms	-	52,2	-	7368	-	54,0	-	8236
4x185 ms	-	58,0	-	9158	-	59,8	-	10123
4x240 ms	-	62,0	-	11397	-	63,8	-	12432
5x1,5 sr	14,8	15,9	362	408	15,7	16,7	489	546
5x2,5 sr	15,9	17,0	442	491	16,7	17,8	580	632
5x4 sr	17,7	19,3	577	658	18,5	20,1	725	823
5x6 sr	19,0	20,6	721	808	19,9	21,5	883	986
5x10 sr	22,2	22,8	1034	1067	23,1	23,6	1227	1266
5x16 sr	25,0	25,5	1422	1458	26,0	26,6	1655	1698
5x16 mr	26,2	26,7	1483	1522	27,2	27,8	1729	1773
5x25 sr	29,0	29,6	2041	2083	30,1	30,6	2316	2365
5x25 mr	30,0	30,5	2107	2151	31,0	31,6	2392	2442
5x35 mr	33,1	33,6	2711	2759	34,1	34,7	3029	3083
5x50 mr	38,1	38,6	3816	3872	39,1	39,6	4183	4244
5x70 ms	-	43,8	-	4685	-	44,8	-	5112
5x95 ms	-	49,2	-	6181	-	50,2	-	6661
5x120 ms	-	54,6	-	7600	-	56,4	-	8510
5x150 ms	-	59,0	-	9241	-	60,8	-	10224
5x185 ms	-	64,0	-	11281	-	65,8	-	12351
5x240 ms	-	69,0	-	14237	-	70,8	-	15383
3x25 sr+1x16sr	26,6	27,1	1642	1679	27,6	28,1	1893	1934
3x25 mr+1x16mr	27,4	27,9	1696	1734	28,5	28,9	1955	1998
3x35 mr+1x16mr	28,8	29,3	1996	2033	29,9	30,3	2270	2312
3x50 mr+1x25mr	33,2	33,6	2810	2853	34,2	34,7	3129	3177
3x70 ms+1x35mr	-	40,4	-	3438	-	41,4	-	3828
3x95 ms+1x50ms	-	45,2	-	4627	-	46,2	-	5065
3x120 ms+1x70ms	-	48,2	-	5597	-	49,2	-	6066
3x150 ms+1x70ms	-	52,2	-	6575	-	54,0	-	7443
3x185 ms+1x95ms	-	58,0	-	8253	-	59,8	-	9218
3x240 ms+1x120ms	-	62,0	-	10203	-	63,8	-	11238

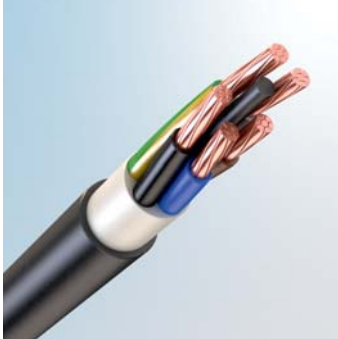


**XLPE INSULATED
POWER CABLES
OF STATIONARY LAYING,
VOLTAGE 0,66; 1; 3 kV**

limited liability company
TOMSKCABLE

XLPE Insulated Power Cables of Stationary Laying, Voltage 0,66; 1; 3 kV TU 3500-020-59680332-2010

Cables without protective covering for the voltage 0,66 and 1 kV



PvVG, APvVG

Power cables: copper or aluminium conductors, XLPE insulation, PVC-compound sheath

PvVGng(A), APvVGng(A)

Power cables: copper or aluminium conductors, XLPE insulation, flame-retardant PVC-compound sheath

PvVGng(A)-HL, APvVGng(A)-HL

Power cables: copper or aluminium conductors, XLPE insulation, cold-resistant, flame-retardant PVC-compound sheath

PvVG-HL, APvVG-HL

Power cables: copper or aluminium conductors, XLPE insulation, cold-resistant PVC-compound sheath

PvVGng(A)-LS, APvVGng(A)-LS

Power cables: copper or aluminium conductors, XLPE insulation, low-smoke PVC-compound sheath

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities.

The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with XLPE insulation and outer PVC-compound sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electric installations and production rooms where only periodic presence of operative personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with XLPE insulation and outer flame-retardant PVC-compound sheath are designed for laying in cable works of outdoor (open) electric installations that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with low-smoke PVC-compound insulation and outer sheath are designed for bunched laying in cable works in rooms of indoor (closed) electrical installations inclusive facilities of using nuclear energy as well as for use in building constructions.

The "ng(A)-HL"-type cables with XLPE insulation and outer cold-resistant, flame-retardant PVC-compound sheath are intended for bunched laying in cable works and rooms of outdoor (open) electric installations, incl. ones used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with XLPE insulation from and outer cold-resistant sheath are designed for single laying in cable works and rooms of outdoor (open) electric installations, incl. ones used in climatic conditions with temperature decreased to -60 °C.

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: XLPE. Insulated conductors of multi-core cables have distinction coloring. Insulation of neutral conductors (N) is blue. Insulation of ground conductors (PE) is of two color: green and yellow. Nominal thickness of insulation and color of multi-core cables are specified in Appendix in p. 123.

3. Stranding: insulated conductors of two-, three-, four- and five-core cables are stranded; two-, three- and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.

4. Inner sheath: for the cables of APvVG and PvVG types: PVC-compound. For the cables of APvVGng(A) and PvVGng(A), types: flame-retardant PVC-compound. For the cables of APvVGng(A)-HL and PvVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvVG-HL and PvVG-HL types: cold-resistant PVC-compound. For the cables of APvVGng(A)-LS and PvVGng(A)-LS types: low-smoke PVC-compound.

Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one. It is allowed to manufacture the cables with cross-sections of conductors up to 16 mm² inclusively without inner sheath. Filling of intervals between conductors is performed with outer sheath. nominal thickness of inner sheath is specified in the Appendix on page 123.

5. Outer sheath: for the cables of APvVG and PvVG types: PVC-compound. For the cables of APvVGng(A) and PvVGng(A) types: flame-retardant PVC-compound. For the cables of APvVGng(A)-HL and PvVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvVG-HL and PvVG-HL types: cold-resistant PVC-compound. For the cables of APvVGng(A)-LS and PvVGng(A)-LS types: low-smoke PVC-compound. Nominal thickness of sheaths is specified in the Appendix on page 123.

OKP CODES

352100 the cable with copper conductors for nominal voltage 0,66 kV

353300 the cable with copper conductors for nominal voltage 1 kV

352200 the cable with aluminium conductors for nominal voltage 0,66 kV

353700 the cable with aluminium conductors for nominal voltage 1 kV

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables APvVG and PvVG.....UHL and T, placement categories 1 and 5

For the cables APvVGng(A) and PvVGng(A).....UHL, placement categories 1 and 5

For the cables APvVGng(A)-HL,

PvVGng(A)-HL, APvVG-HL, PvVG-HLHL, placement category 1

For the cables APvVGng(A)-LS and PvVGng(A)-LS.....UHL and V, placement category 5

Operating temperature range:

For the cables APvVG, PvVG, APvVGng(A),

PvVGng(A), APvVGng(A)-LS and PvVGng(A)-LS.....from -50 °C to +50 °C

For the cables APvVGng(A)-HL, PvVGng(A)-HL,

APvVG-HL and PvVG-HL.....from -60 °C to +50 °C

Relative air humidity at max +35 °C.....max 98%

Laying and installation of the cables without preheating is performed at temperature

not less than:

For the cables

APvVG, PvVG, APvVGng(A), PvVGng(A), APvVGng(A)-LS and PvVGng(A)-LS-15 °C

For the cables

APvVGng(A)-HL, PvVGng(A)-HL, APvVG-HL and PvVG-HL-30 °C

Nominal frequency.....50 Hz

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV.....3 kV

for the voltage 1 kV.....3,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters

for multi-core cables.....7,5 outer cable diameters

Cable conductor continuous operating heating temperature max.....90 °C

Max allowed pulling force during cable tracing

for the cables with copper conductors.....50 N/mm²

for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm².....450 m

from 25 to 70 mm².....300 m

from 95 mm² and more200 m

Guarantee use period.....5 years from date of input of the cable into operation

Service life.....30 years

The cables with copper conductors, round

Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for the voltage 1 kV, kg				
			0,66 kV	1 kV	PvVG	PvVGng(A)	PvVGng(A)-HL	PvVG-HL	PvVGng(A)-LS	PvVG	PvVGng(A)	PvVGng(A)-HL
	1x4sr	6,2	6,4	69	71	71	67	77	71	74	74	69
1x6sr	6,7	6,9	90	93	93	88	99	93	95	95	90	102
1x10sr	7,5	7,7	130	113	133	128	140	133	136	136	130	143
1x16sr	8,5	8,7	190	194	194	188	202	193	197	197	190	205
1x16mr	9,1	9,3	200	204	204	197	214	204	208	208	201	218
1x25sr	10,2	10,4	287	291	291	283	302	290	295	295	287	306
1x25mr	10,5	10,7	296	301	301	292	312	300	305	305	296	316
1x35mr	11,5	11,7	385	390	390	381	403	389	395	395	385	408
1x50mr	13,0	13,2	552	558	558	547	573	557	563	563	552	578
1x70mr	-	15,0	-	-	-	-	-	730	737	737	724	754
1x95mr	-	16,7	-	-	-	-	-	968	976	976	962	996
1x120mr	-	18,7	-	-	-	-	-	1230	1240	1240	1222	1265
1x150mr	-	20,5	-	-	-	-	-	1506	1517	1517	1497	1544
1x185mr	-	22,5	-	-	-	-	-	1861	1873	1873	1851	1903
1x240mr	-	25,5	-	-	-	-	-	2380	2396	2396	2368	2433
2x4sr	10,4	10,8	177	184	184	170	203	185	193	193	178	213
2x6sr	11,4	11,8	229	238	238	222	260	239	248	248	231	272
2x10sr	13,0	13,4	328	340	340	319	367	339	351	351	329	380
2x16sr	14,9	15,3	476	490	490	464	525	488	502	502	476	539
2x16mr	15,8	16,2	502	517	517	489	556	515	531	531	501	572
2x25sr	19,9	20,3	840	823	823	775	905	858	840	840	790	925
2x25mr	20,6	21,0	878	859	859	808	946	897	877	877	824	967
2x35mr	22,6	23,0	1117	1091	1091	1032	1195	1138	1111	1111	1050	1218
2x50mr	25,8	26,2	1563	1529	1529	1453	1661	1587	1551	1551	1473	1687
3x4sr	11,0	11,4	215	222	222	209	241	224	232	232	217	252
3x6sr	12,0	12,5	285	293	293	278	315	295	304	304	287	327
3x10sr	13,7	14,1	417	428	428	408	454	428	439	439	419	467
3x16sr	15,7	16,2	615	629	629	604	662	628	642	642	617	677
3x16mr	16,7	17,1	643	657	657	631	694	657	672	672	644	710
3x25sr	21,0	21,4	1056	1042	1042	996	1120	1074	1060	1060	1012	1140
3x25mr	21,7	22,2	1098	1083	1083	1034	1165	1118	1103	1103	1052	1188
3x35mr	24,1	24,5	1423	1404	1404	1346	1503	1445	1426	1426	1366	1528
3x50mr	27,3	27,7	2004	1977	1977	1905	2100	2029	2001	2001	1928	2127
4x4sr	11,8	12,3	261	269	269	254	289	272	280	280	265	301
4x6sr	13,0	13,5	350	360	360	343	382	362	372	372	354	396
4x10sr	14,9	15,4	519	531	531	510	559	532	544	544	522	574
4x16sr	17,2	17,7	774	788	788	762	823	789	803	803	776	840
4x16mr	18,3	18,8	805	821	821	792	859	822	838	838	809	878
4x25sr	22,8	23,3	1323	1310	1310	1261	1394	1345	1331	1331	1280	1418
4x25mr	23,9	24,4	1384	1370	1370	1317	1462	1408	1393	1393	1338	1501
4x35mr	26,3	26,8	1785	1767	1767	1705	1873	1811	1792	1792	1728	2000
4x50mr	29,9	30,4	2531	2505	2505	2430	2637	2561	2534	2534	2456	3000
5x4sr	12,8	13,4	317	326	326	310	348	329	339	339	322	363
5x6sr	14,2	14,7	432	443	443	424	469	446	456	456	437	485
5x10sr	16,3	16,8	639	652	652	629	684	654	667	667	643	701
5x16sr	18,9	19,4	952	967	967	939	1007	969	985	985	956	1027
5x16mr	20,1	20,6	988	1005	1005	974	1049	1007	1025	1025	993	1071
5x25sr	25,1	25,6	1613	1600	1600	1545	1696	1638	1624	1624	1568	1723
5x25mr	26,1	26,6	1673	1658	1658	1600	1759	1700	1685	1685	1625	1789
5x35mr	28,8	29,3	2174	2155	2155	2088	2274	2204	2184	2184	2115	2306
5x50mr	33,2	33,7	3134	3103	3103	3016	3258	3168	3136	3136	3047	3295
3x25sr+1x16sr	22,1	22,6	1223	1211	1211	1164	1291	1243	1230	1230	1181	1313
3x25mr+1x16mr	23,9	24,4	1324	1307	1307	1250	1404	1348	1330	1330	1271	1430
3x35mr+1x16mr	25,4	25,9	1604	1586	1586	1525	1690	1628	1609	1609	1547	1716
3x50mr+1x25mr	28,9	29,4	2271	2246	2246	2173	2373	2298	2272	2272	2197	2402

The cables with copper conductors, sector

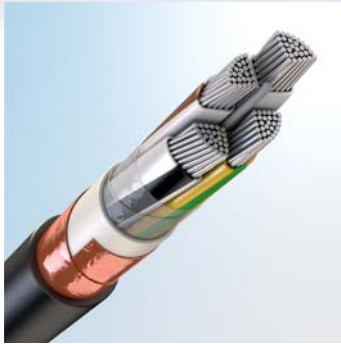
Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 1 kV, kg				
		PvVG	PvVGng(A)	PvVGng(A)-HL	PvVG-HL	PvVGng(A)-LS
2x70ms	26,0	1698	1694	1694	1646	1786
2x95ms	28,0	2204	2200	2200	2148	2301
2x120ms	32,4	2783	2773	2773	2707	2899
2x150ms	34,8	3402	3393	3393	3319	3537
2x185ms	37,3	4135	4126	4126	4045	4281
2x240ms	43,2	5292	5273	5273	5172	5469
3x70ms	30,0	2390	2385	2385	2329	2489
3x95ms	34,8	3238	3230	3230	3155	3367
3x120ms	37,8	3997	3988	3988	3906	4138
3x150ms	42,2	4933	4916	4916	4817	5097
3x185ms	46,6	6086	6070	6070	5955	6278
3x240ms	51,6	7649	7630	7630	7502	7863
4x70ms	34,8	3189	3181	3181	3106	3318
4x95ms	38,8	4195	4186	4186	4101	4340
4x120ms	42,2	5247	5230	5230	5131	5411
4x150ms	46,6	6438	6422	6422	6307	6630
4x185ms	51,6	7918	7899	7899	7770	8131
4x240ms	56,4	10074	10048	10048	9892	10329
5x70ms	37,8	3911	3902	3902	3820	4055
5x95ms	43,2	5230	5212	5212	5111	5400
5x120ms	48,6	6546	6528	6528	6408	6748
5x150ms	53,0	8048	8020	8020	7880	8278
5x185ms	58,4	9944	9917	9917	9755	10214
5x240ms	62,4	12461	12431	12431	12257	12749
3x70ms+1x35mr	34,8	2865	2857	2857	2782	2994
3x95ms+1x50ms	38,8	3799	3789	3789	3705	3944
3x120ms+1x70ms	42,2	4780	4763	4763	4664	4944
3x150ms+1x70ms	46,6	5705	5689	5689	5574	5897
3x185ms+1x95ms	51,6	7074	7055	7055	6927	7287
3x240ms+1x120ms	56,4	8980	8954	8954	8798	9235

The cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of of 1 km of the cable for the voltage 1 kV, kg				
		APvVG	APvVGng(A)	APvVGng(A)-HL	APvVG-HL	APvVGng(A)-LS
2x70ms	26,0	851	848	848	800	940
2x95ms	28,0	1056	1052	1052	1000	1153
2x120ms	32,4	1314	1304	1304	1238	1431
2x150ms	34,8	1575	1566	1566	1491	1710
2x185ms	37,3	1871	1862	1862	1781	2016
2x240ms	43,2	2380	2362	2362	2261	2558
3x70ms	30,0	1120	1116	1116	1059	1219
3x95ms	34,8	1516	1508	1508	1433	1645
3x120ms	37,8	1794	1785	1785	1703	1935
3x150ms	42,2	2192	2175	2175	2076	2356
3x185ms	46,6	2690	2673	2673	2558	2882
3x240ms	51,6	3283	3264	3264	3135	3497
4x70ms	34,8	1496	1488	1488	1413	1625
4x95ms	38,8	1899	1890	1890	1805	2044
4x120ms	42,2	2310	2292	2292	2194	2473
4x150ms	46,6	2784	2768	2768	2653	2976
4x185ms	51,6	3389	3370	3370	3242	3603
4x240ms	56,4	4252	4226	4226	4070	4507
5x70ms	37,8	1796	1786	1786	1704	1939
5x95ms	43,2	2360	2342	2342	2241	2530
5x120ms	48,6	2874	2857	2857	2736	3077
5x150ms	53,0	3480	3452	3452	3312	3710
5x185ms	58,4	4284	4256	4256	4095	4553
5x240ms	62,4	5183	5153	5153	4979	5471
3x70ms+1x35mr	34,8	1387	1378	1378	1304	1515
3x95ms+1x50ms	38,8	1761	1751	1751	1667	1905
3x120ms+1x70ms	42,2	2154	2136	2136	2038	2317
3x150ms+1x70ms	46,6	2541	2525	2525	2410	2733
3x185ms+1x95ms	51,6	3103	3084	3084	2956	3317
3x240ms+1x120ms	56,4	3879	3853	3853	3697	4134

The cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for the voltage of 1 kV, kg				
	0,66 kV	1 kV	APvVG	APvBGng(A)	APvVGng(A)-HL	APvVG-HL	APvVGng(A)-LS	APvVG	APvVGng(A)	APvVGng(A)-HL	APvVG-HL	APvVGng(A)-LS
1x4sr	6,2	6,4	45	47	47	43	53	47	50	50	45	56
1x6sr	6,7	6,9	54	57	57	52	63	57	59	59	54	66
1x10sr	7,5	7,7	71	74	74	68	81	73	76	76	71	84
1x16sr	8,5	8,7	94	98	98	91	106	97	101	101	94	109
1x16mr	9,1	9,3	103	107	107	100	117	107	111	111	103	121
1x25sr	10,2	10,4	137	142	142	134	153	141	145	145	137	157
1x25mr	10,5	10,7	144	148	148	140	160	148	152	152	144	164
1x35mr	11,5	11,7	178	183	183	174	196	182	188	188	178	201
1x50mr	13,0	13,2	238	244	244	233	259	243	249	249	238	264
1x70mr	-	15,0	-	-	-	-	-	306	313	313	300	330
1x95mr	-	16,7	-	-	-	-	-	393	401	401	387	421
1x120mr	-	18,7	-	-	-	-	-	492	502	502	484	527
1x150mr	-	20,5	-	-	-	-	-	595	606	606	586	633
1x185mr	-	22,5	-	-	-	-	-	725	737	737	714	767
1x240mr	-	25,5	-	-	-	-	-	921	936	936	908	974
2x4sr	10,4	10,8	128	136	136	122	155	137	145	145	130	165
2x6sr	11,4	11,8	157	166	166	150	188	166	176	176	159	199
2x10sr	13,0	13,4	209	220	220	199	247	219	231	231	209	260
2x16sr	14,9	15,3	282	296	296	270	331	294	309	309	282	345
2x16mr	15,8	16,2	306	322	322	293	360	319	336	336	306	376
2x25sr	19,9	20,3	539	521	521	473	603	557	538	538	489	623
2x25mr	20,6	21,0	571	552	552	501	639	590	570	570	517	660
2x35mr	22,6	23,0	699	674	674	614	777	720	694	694	632	801
2x50mr	25,8	26,2	931	897	897	821	1029	955	919	919	841	1055
3x4sr	11,0	11,4	142	150	150	136	168	152	160	160	145	179
3x6sr	12,0	12,5	176	185	185	169	206	186	195	195	179	218
3x10sr	13,7	14,1	237	248	248	228	274	248	260	260	239	287
3x16sr	15,7	16,2	325	338	338	314	371	337	351	351	326	386
3x16mr	16,7	17,1	349	364	364	337	401	364	379	379	351	417
3x25sr	21,0	21,4	603	590	590	544	668	622	608	608	560	688
3x25mr	21,7	22,2	638	622	622	574	705	658	642	642	592	727
3x35mr	24,1	24,5	797	778	778	720	877	819	800	800	740	902
3x50mr	27,3	27,7	1055	1029	1029	957	1151	1081	1053	1053	980	1179
4x4sr	11,8	12,3	165	173	173	158	192	175	184	184	168	205
4x6sr	13,0	13,5	205	215	215	198	238	217	227	227	209	251
4x10sr	14,9	15,4	279	291	291	270	319	292	304	304	283	334
4x16sr	17,2	17,7	386	400	400	374	435	401	416	416	389	452
4x16mr	18,3	18,8	414	430	430	401	468	431	447	447	417	487
4x25sr	22,8	23,3	720	707	707	658	791	742	728	728	677	815
4x25mr	23,9	24,4	770	756	756	703	848	794	779	779	724	873
4x35mr	26,3	26,8	950	932	932	870	1038	976	957	957	893	1066
4x50mr	29,9	30,4	1267	1241	1241	1166	1372	1296	1269	1269	1192	1404
5x4sr	12,8	13,4	196	205	205	189	228	209	218	218	201	242
5x6sr	14,2	14,7	251	262	262	243	288	265	275	275	256	304
5x10sr	16,3	16,8	339	352	352	329	384	354	368	368	344	402
5x16sr	18,9	19,4	467	483	483	454	523	484	500	500	471	542
5x16mr	20,1	20,6	499	516	516	485	560	518	536	536	504	581
5x25sr	25,1	25,6	860	847	847	792	942	885	871	871	814	970
5x25mr	26,1	26,6	905	791	791	833	992	933	917	917	857	1022
5x35mr	28,8	29,3	1131	1112	1112	1044	1231	1161	1141	1141	1071	1263
5x50mr	33,2	33,7	1553	1522	1522	1436	1678	1588	1556	1556	1467	1715
3x25sr+1x16sr	22,1	22,6	674	662	662	615	742	694	681	681	632	764
3x25mr+1x16mr	23,9	24,4	766	748	748	692	846	790	772	772	713	872
3x35mr+1x16mr	25,4	25,9	880	862	862	801	966	904	885	885	823	992
3x50mr+1x25mr	28,9	29,4	1170	1144	1144	1071	1272	1196	1170	1170	1095	1301



PvVGE, APvVGE

Screened power cables: copper or aluminium conductors, XLPE insulation, PVC-compound sheath

PvVGE(A), APvVGE(A)

Screened power cables: copper or aluminium conductors, XLPE insulation, flame-retardant PVC-compound sheath

PvVGE(A)-HL, APvVGE(A)-HL

Screened power cables: copper or aluminium conductors, XLPE insulation, cold-resistant, flame-retardant PVC-compound sheath

PvVGE(A)-LS, APvVGE(A)-LS

Screened power cables: copper or aluminium conductors, XLPE insulation, low-smoke PVC-compound sheath

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with XLPE insulation and outer PVC-compound sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installations and production rooms where only periodical presence of operating personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with XLPE insulation and outer flame-retardant PVC-compound sheath are designed for laying in cable works of outdoor (open) electrical installations that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with XLPE insulation and outer low-smoke PVC-compound sheath are designed for bunched laying in cable works and rooms of indoor (close) electrical installations incl. objects of use of nuclear energy as well as for use in building constructions.

The "ng(A)-HL"-type cables with XLPE insulation and outer cold-resistant, flame-retardant PVC-compound sheath are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. ones used in climatic conditions with temperature decreased to -60 °C.

OKP CODES

352100 the cable with copper conductors for nominal voltage 0,66 kV
353300 the cable with copper conductors for nominal voltage 1 kV
352200 the cable with aluminium conductors for nominal voltage 0,66 kV
353700 the cable with aluminium conductors for nominal voltage 1 kV

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: XLPE. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: insulated conductors of two-, three-, four- and five-core cables are stranded; two-, three- and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.

4. Inner sheath: for the cables of APvVGE and PvVGE types: PVC-compound. For the cables of APvVGE(A) and PvVGE(A) types: flame-retardant PVC-compound. For the cables of APvVGE(A)-HL and PvVGE(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvVGE(A)-LS and PvVGE(A)-LS types: low-smoke PVC-compound.

Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

Bedding: for single-core cables it is tapping of insulated conductor with polymer bands.

5. Screen: tapping with copper band with width not less than 0,06 mm with overlapping, cross-section of copper screen is specified in the Appendix on page 123.

6. Outer sheath: for the cables of APvVGE and PvVGE types: PVC-compound. For the cables of APvVGE(A) and PvVGE(A) types: flame-retardant PVC-compound. For the cables of APvVGE(A)-HL and PvVGE(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvVGE(A)-LS and PvVGE(A)-LS types: low-smoke PVC-compound. Nominal thickness of sheaths is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables APvVGE and PvVGE.....UHL and T, placement categories 1 and 5
For the cables APvVGE(A) and PvVGE(A).....UHL, placement categories 1 and 5
For the cables APvVGE(A)-HL,
PvVGE(A)-HL, APvVGE-HL, PvVGE-HLHL, placement category 1
For the cables
APvVGE(A)-LS and PvVGE(A)-LS.....UHL and V, placement category 5

Operation temperature range:

For the cables APvVGE, PvVGE, APvVGE(A),
PvVGE(A), APvVGE(A)-LS and PvVGE(A)-LS.....from -50 °C to +50 °C
For the cables APvVGE(A)-HL, PvVGE(A)-HL,
APvVGE-HL and PvVGE-HL.....from -60 °C to +50 °C
Relative air humidity at max +35 °C.....max 98%
Cable conductor continuous operating heating temperature max.....90 °C

Laying and installation of cables without preheating is performed at temperature not less than:

For the cables APvVGE, PvVGE,
APvVGE(A), PvVGE(A), APvVGE(A)-LS and PvVGE(A)-LS.....-15 °C
For the cables APvVGE(A)-HL,
PvVGE(A)-HL and PvVGE-HL.....-30 °C

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV.....3 kV
for the voltage 1 kV.....3,5 kV
Nominal frequency50 Hz

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
for multi-core cables.....7,5 outer cable diameters

Max allowed pulling force during cable tracing

for the cables with copper conductors.....50 N/mm²
for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm²450 m
from 25 to 70 mm²300 m
from 95 mm² and more200 m
Guarantee use period.....5 from date of input of the cable into operation
Service life.....30 years

The cables with copper conductors, round

Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg				Weight of 1 km of the cable for the voltage 1 kV, kg			
	0,66 kV	1 kV	PvVGE	PvVEng(A)	PvVEng(A)-HL	PvVEng(A)-LS	PvVGE	PvVEng(A)	PvVEng(A)-HL	PvVEng(A)-LS
1x4sr	6,6	6,8	80	83	83	89	83	85	85	92
1x6sr	7,1	7,3	102	105	105	112	105	108	108	115
1x10sr	7,9	8,1	144	148	148	155	148	151	151	159
1x16sr	8,8	9,2	211	215	215	224	214	218	218	228
1x16mr	9,5	9,7	218	222	222	232	222	226	226	237
1x25sr	10,5	10,7	307	312	312	323	311	316	316	328
1x25mr	10,9	11,1	317	322	322	334	322	327	327	339
1x35mr	11,9	12,1	409	414	414	427	413	419	419	432
1x50mr	13,4	13,6	579	585	585	600	584	591	591	606
1x70mr	-	15,4	-	-	-	-	761	769	769	786
1x95mr	-	17,1	-	-	-	-	1004	1012	1012	1032
1x120mr	-	19,1	-	-	-	-	1270	1281	1281	1306
1x150mr	-	20,9	-	-	-	-	1551	1562	1562	1590
1x185mr	-	22,9	-	-	-	-	1910	1922	1922	1953
1x240mr	-	25,8	-	-	-	-	2436	2451	2451	2490
2x4sr	12,6	13,0	266	263	263	298	278	275	275	312
2x6sr	13,6	14,0	329	325	325	365	342	338	338	380
2x10sr	15,2	15,6	444	437	437	486	459	451	451	503
2x16sr	17,1	17,5	612	601	601	662	628	617	617	681
2x16mr	18,0	18,4	648	636	636	703	665	652	652	722
2x25sr	20,1	20,5	881	863	863	946	900	881	881	967
2x25mr	20,8	21,2	920	901	901	989	941	920	920	1011
2x35mr	22,8	23,2	1164	1139	1139	1242	1186	1159	1159	1266
2x50mr	26,0	26,4	1618	1583	1583	1716	1643	1607	1607	1743
3x4sr	13,1	13,6	307	305	305	340	320	318	318	355
3x6sr	14,2	14,6	387	384	384	424	401	398	398	440
3x10sr	15,9	16,3	535	530	530	578	551	545	545	596
3x16sr	17,9	18,4	754	746	746	805	771	763	763	824
3x16mr	18,9	19,3	792	782	782	847	810	800	800	867
3x25sr	21,2	21,6	1099	1085	1085	1163	1119	1104	1104	1185
3x25mr	21,9	22,3	1143	1128	1128	1211	1165	1149	1149	1234
3x35mr	24,3	24,7	1473	1455	1455	1554	1497	1477	1477	1579
3x50mr	27,5	27,9	2062	2035	2035	2158	2088	2060	2060	2187
4x4sr	14,0	14,5	360	358	358	395	375	373	373	412
4x6sr	15,2	15,7	460	458	458	500	477	473	473	518
4x10sr	17,1	17,6	647	642	642	693	665	659	659	713
4x16sr	19,4	19,9	924	916	916	979	944	935	935	1001
4x16mr	20,5	21,0	966	957	957	1026	988	978	978	1049
4x25sr	23,0	23,5	1371	1358	1358	1442	1394	1380	1380	1467
4x25mr	24,1	24,5	1434	1420	1420	1512	1459	1444	1444	1539
4x35mr	26,5	26,9	1840	1822	1822	1929	1868	1848	1848	1958
4x50mr	30,1	30,6	2596	2570	2570	2701	2626	2599	2599	2734
5x4sr	15,0	15,6	424	422	422	464	441	439	439	483
5x6sr	16,4	16,9	552	549	549	597	570	567	567	617
5x10sr	18,5	19,0	778	773	773	831	799	793	793	853
5x16sr	21,0	21,6	1116	1107	1107	1177	1138	1129	1129	1202
5x16mr	22,3	22,8	1164	1154	1154	1230	1189	1178	1178	1257
5x25sr	25,3	25,8	1666	1653	1653	1749	1692	1679	1679	1778
5x25mr	26,2	26,8	1728	1713	1713	1815	1757	1741	1741	1846
5x35mr	28,9	29,5	2236	2217	2217	2336	2267	2247	2247	2370
5x50mr	33,4	34,3	3206	3175	3175	3331	3273	3243	3243	3409
3x25sr+1x16sr	22,3	22,8	1269	1257	1257	1338	1290	1277	1277	1360
3x25mr+1x16sr	24,1	24,5	1374	1357	1357	1454	1399	1381	1381	1482
3x35mr+1x16sr	25,6	26,1	1658	1639	1639	1744	1683	1664	1664	1771
3x50mr+1x25sr	29,1	29,5	2333	2308	2308	2436	2361	2335	2335	2466

The cables with copper conductors, sector

Number and nominal cross-section of cores mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 1 kv, kg			
		PvVGE	PvVGE(A)	PvVGE(A)-HL	PvVGE(A)-LS
2x70	26,2	1753	1749	1749	1842
2x95	28,2	2264	2260	2260	2361
2x120	32,6	2853	2843	2843	2970
2x150	35,0	3477	3469	3469	3613
2x185	37,5	4217	4208	4208	4363
2x240	43,4	5387	5369	5369	5566
3x70	30,2	2454	2450	2450	2554
3x95	35,0	3314	3306	3306	3443
3x120	38,0	4080	4070	4070	4221
3x150	42,4	5026	5009	5009	5191
3x185	46,8	6189	6173	6173	6382
3x240	51,8	7764	7745	7745	7979
4x70	35,0	3264	3256	3256	3394
4x95	39,0	4280	4271	4271	4426
4x120	42,4	5340	5323	5323	5504
4x150	46,8	6541	6525	6525	6734
4x185	51,8	8032	8014	8014	8247
4x240	56,6	10200	10174	10174	10455
5x70	38,0	3994	3985	3985	4138
5x95	43,4	5325	5307	5307	5496
5x120	48,8	6653	6636	6636	6857
5x150	53,2	8166	8138	8138	8397
5x185	58,6	10075	10048	10048	10345
5x240	62,6	12600	12571	12571	12890
3x70+1x35	35,0	2940	2932	2932	3070
3x95+1x50	39,0	3884	3874	3874	4029
3x120+1x70	42,4	4873	4856	4856	5037
3x150+1x70	48,6	5808	5792	5792	6001
3x185+1x95	51,8	7189	7170	7170	7403
3x240+1x120	56,6	9105	9080	9080	9361

The cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 1 kv, kg			
		APvVGE	APvVGE(A)	APvVGE(A)-HL	APvVGE(A)-LS
2x70	26,2	906	903	903	996
2x95	28,2	1116	1112	1112	1213
2x120	32,6	1385	1375	1375	1502
2x150	35,0	1650	1642	1642	1786
2x185	37,5	1952	1943	1943	2098
2x240	43,4	2476	2458	2458	2654
3x70	30,2	1185	1181	1181	1285
3x95	35,0	1592	1584	1584	1721
3x120	38,0	1876	1867	1867	2018
3x150	42,4	2285	2268	2268	2450
3x185	46,8	2793	2776	2776	2985
3x240	51,8	3397	3379	3379	3612
4x70	35,0	1572	1563	1563	1701
4x95	39,0	1984	1975	1975	2129
4x120	42,4	2403	2385	2385	2567
4x150	46,8	2887	2871	2871	3080
4x185	51,8	3504	3485	3485	3718
4x240	56,6	4377	4351	4351	4633
5x70	38,0	1878	1869	1869	2022
5x95	43,4	2455	2437	2437	2626
5x120	48,8	2982	2964	2964	3185
5x150	53,2	3598	3570	3570	3829
5x185	58,6	4414	4387	4387	4684
5x240	62,6	5323	5293	5293	5612
3x70+1x35	35,0	1462	1454	1454	1592
3x95+1x50	39,0	1846	1836	1836	1991
3x120+1x70	42,4	2247	2230	2230	2411
3x150+1x70	48,6	2644	2628	2628	2837
3x185+1x95	51,8	3218	3199	3199	3432
3x240+1x120	56,6	4004	3978	3978	4260

The cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg				Weight of 1 km of the cable for the voltage 1 kV, kg			
	0,66 kV	1 kV	APvVGE	APvVEng(A)	APvVEng(A)-HL	APvVEng(A)-LS	APvVGE	APvVEng(A)	APvVEng(A)-HL	APvVEng(A)-LS
1x4sr	6,6	6,8	62	65	65	71	65	68	68	74
1x6sr	7,1	7,3	73	76	76	83	77	80	80	87
1x10sr	7,9	8,1	93	96	96	104	96	100	100	108
1x16sr	8,8	9,2	120	124	124	133	128	132	132	142
1x16mr	9,5	9,7	131	136	136	146	136	140	140	150
1x25sr	10,5	10,7	170	174	174	186	174	179	179	190
1x25mr	10,9	11,1	177	182	182	194	182	187	187	199
1x35mr	11,9	12,1	216	221	221	234	221	226	226	240
1x50mr	13,4	13,6	282	288	288	303	287	294	294	309
1x70mr	-	15,4	-	-	-	-	358	365	365	382
1x95mr	-	17,1	-	-	-	-	452	460	460	480
1x120mr	-	19,1	-	-	-	-	558	568	568	593
1x150mr	-	20,9	-	-	-	-	668	679	679	707
1x185mr	-	22,9	-	-	-	-	805	818	818	848
1x240mr	-	25,8	-	-	-	-	1011	1027	1027	1065
2x4sr	12,6	13,0	218	215	215	250	230	227	227	264
2x6sr	13,6	14,0	256	252	252	293	270	265	265	308
2x10sr	15,2	15,6	324	317	317	366	339	331	331	383
2x16sr	17,1	17,5	418	408	408	469	434	423	423	487
2x16mr	18,0	18,4	452	440	440	507	470	457	457	527
2x25sr	20,1	20,5	579	562	562	644	598	580	580	665
2x25mr	20,8	21,2	613	594	594	682	634	613	613	704
2x35mr	22,8	23,2	746	721	721	825	768	742	742	849
2x50mr	26,0	26,4	986	951	951	1084	1010	975	975	1111
3x4sr	13,1	13,6	235	233	233	267	248	245	245	282
3x6sr	14,2	14,6	278	275	275	315	293	289	289	331
3x10sr	15,9	16,3	356	351	351	399	371	365	365	416
3x16sr	17,9	18,4	464	456	456	515	481	472	472	534
3x16mr	18,9	19,3	498	489	489	553	517	507	507	574
3x25sr	21,2	21,6	647	633	633	711	667	652	652	733
3x25mr	21,9	22,3	683	668	668	750	704	688	688	774
3x35mr	24,3	24,7	847	829	829	928	871	851	851	953
3x50mr	27,5	27,9	1113	1087	1087	1210	1140	1112	1112	1238
4x4sr	14,0	14,5	264	262	262	299	279	276	276	316
4x6sr	15,2	15,7	316	313	313	355	332	328	328	373
4x10sr	17,1	17,6	407	402	402	454	425	420	420	473
4x16sr	19,4	19,9	537	529	529	591	556	548	548	613
4x16mr	20,5	21,0	575	566	566	634	597	587	587	658
4x25sr	23,0	23,5	768	755	755	839	791	777	777	864
4x25mr	24,1	24,5	820	806	806	898	845	830	830	925
4x35mr	26,5	26,9	1006	988	988	1094	1033	1014	1014	1124
4x50mr	30,1	30,6	1331	1306	1306	1437	1362	1335	1335	1470
5x4sr	15,0	15,6	304	302	302	343	321	318	318	362
5x6sr	16,4	16,9	371	368	368	416	389	386	386	436
5x10sr	18,5	19,0	479	473	473	531	499	493	493	553
5x16sr	21,0	21,6	631	623	623	693	654	645	645	718
5x16mr	22,3	22,8	675	665	665	741	700	689	689	768
5x25sr	25,3	25,8	912	899	899	995	939	925	925	1024
5x25mr	26,2	26,8	960	946	946	1047	989	974	974	1078
5x35mr	28,9	29,5	1192	1173	1173	1293	1224	1204	1204	1326
5x50mr	33,4	34,3	1625	1595	1595	1751	1692	1663	1663	1828
3x25sr+1x16sr	22,3	22,8	720	708	708	789	741	728	728	811
3x25mr+1x16sr	24,1	24,5	816	798	798	896	841	823	823	924
3x35mr+1x16sr	25,6	26,1	934	916	916	1020	959	940	940	1047
3x50mr+1x25sr	29,1	29,5	1231	1206	1206	1334	1259	1233	1233	1364



PvBShv, APvBShv

Power cables: copper or aluminium conductors, XLPE insulation, inner PVC-compound sheath, armour of steel galvanized bands, PVC-compound protection hose

PvBaShv, APvBaShv

Power cables: copper or aluminium conductors, XLPE insulation, inner PVC-compound sheath, armour of aluminium or aluminium alloy bands, PVC-compound protection hose

PvBShvng(A), APvBShvng(A)

Power cables: copper or aluminium conductors, XLPE insulation, inner flame-retardant PVC-compound sheath, armour of steel galvanized bands, flame-retardant PVC-compound protection hose

PvBaShvng(A), APvBaShvng(A)

Power cables: copper or aluminium conductors, XLPE insulation, inner flame-retardant PVC-compound sheath, armour of aluminium or aluminium alloy bands, flame-retardant PVC-compound protection hose

PvBShvng(A)-HL, APvBShvng(A)-HL

Power cables: copper or aluminium conductors, XLPE insulation, inner flame-retardant PVC-compound sheath, armour of steel galvanized bands, cold-resistant, flame-retardant PVC-compound protection hose

PvBaShvng(A)-HL, APvBaShvng(A)-HL

Power cables: copper or aluminium conductors, XLPE insulation, inner flame-retardant PVC-compound sheath, armour of aluminium or aluminium alloy bands, cold-resistant, flame-retardant PVC-compound protection hose

PvBShvng(A)-LS, APvBShvng(A)-LS

Power cables: copper or aluminium conductors, XLPE insulation, inner low-smoke PVC-compound sheath, armour of steel galvanized bands, low-smoke PVC-compound protection hose

PvBaShvng(A)-LS, APvBaShvng(A)-LS

Power cables: copper or aluminium conductors, XLPE insulation, inner low-smoke PVC-compound sheath, armour of aluminium or aluminium alloy bands, low-smoke PVC-compound protection hose

PvBShp, APvBShp

Power cables: copper or aluminium conductors, XLPE insulation, inner PVC-compound sheath, armour of steel galvanized bands, polyethylene protection hose

PvBaShp, APvBaShp

Power cables: copper or aluminium conductors, XLPE insulation, inner PVC-compound sheath, armour of aluminium or aluminium alloy bands, polyethylene protection hose

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS"-type cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with XLPE insulation and PVC-compound protection hose are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installations and production rooms where only periodical presence of operating personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with XLPE insulation and flame-retardant PVC-compound protection hose are designed for laying in cable works of outdoor (open) electrical installations that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with XLPE insulation and low-smoke PVC-compound protection hose are designed for bunched laying in cable works and rooms of inner (close) electrical installations incl. objects of use of nuclear energy as well as for use in building constructions.

The "ng(A)-HL"-type cables with XLPE insulation and outer cold-resistant, flame-retardant PVC-compound sheath are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. ones used in climatic conditions with temperature decreased to -60 °C.

The cables with XLPE insulation and polyethylene protection hose are designed for laying in ground (trench) independently on corrosion activity of ground and ground waters. It is allowed to use cables with armor from steel galvanized bands for laying through unnavigable rivers and water bodies at condition of bite.

OKP CODES

352100 the cable with copper conductors for nominal voltage 0,66 kV

353300 the cable with copper conductors for nominal voltage 1 kV

352200 the cable with aluminium conductors for nominal voltage 0,66 kV

353700 the cable with aluminium conductors for nominal voltage 1 kV

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables
 APvBShV, PvBShV, APvBShp and PvBShp.....UHL and T, placement categories 1 and 5
 For the cables APvBShVng(A) and VpVShVng(A).....UHL, placement categories 1 and 5
 For the cables APvBShVng(A)-HL, PvBShVng(A)-HL.....HL, placement category 1
 For the cables APvBShVng(A)-LS and PvBShVng(A)-LS.....UHL and V, placement category 5

Operating temperature range:

For the cables APvBShV, PvBShV, APvBShp, PvBShp, APvBShVng(A),
 PvBShVng(A), APvBShVng(A)-LS and PvBShVng(A)-LS.....from -50 °C to +50 °C
 For the cables
 APvBShVng(A)-HL and PvBShVng(A)-HL.....from -60 °C to +50 °C
 Relative air humidity at max +35 °C.....max 98%
 Cable conductor continuous operating heating temperature max.....90 °C

Laying and installation of cables without preheating are performed at temperature not less than:

for the cables APvBShV, PvBShV, APvBShp, PvBShp,
 APvBShVng(A), PvBShVng(A), APvBShVng(A)-LS and PvBShVng(A)-LS.....-15 °C
 for the cables APvBShVng(A)-HL, PvBShVng(A)-HL and APvBShV-HL.....-30 °C
 Nominal frequency50 Hz

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV.....3 kV
 for the voltage 1 kV.....3,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
 for multi-core cables.....7,5 outer cable diameters

Max allowed pulling force during cable tracing

for the cables with copper conductors.....50 N/mm²
 for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm²450 m
 from 25 to 70 mm²300 m
 from 95 mm² and more200 m
 Guarantee use period.....5 years from data of input of the cable into operation
 Service life30 years

Technical standards of single-core cables armoured with bands from aluminium alloy correspond to technical standards of multi-core cables armoured with steel bands.

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: XLPE. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal thickness of insulation and color of multi-core cables are specified in the Appendix on page 96.

3. Stranding: insulated conductors of two-, three-, four- and five-core cables are stranded; two-, three- and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.

4. Inner sheath: for the cables of APvBShV, PvVBSHV, APvBaShV, PvVBSHV, APvBShp, PvVBSHp, APvBaShp and PvVBSHp types: PVC-compound. For the cables of APvBShVng(A), PvBShVng(A), APvBaShVng(A) and PvBaShVng(A) types: flame-retardant PVC-compound. For the cables of APvBShVng(A)-HL, PvBShVng(A)-HL, APvBaShVng(A)-HL and PvBaShVng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvBShVng(A)-LS, PvBShVng(A)-LS, APvBaShVng(A)-LS and PvBaShVng(A)-LS types: low-smoke PVC-compound.

Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

5. Armour: for multi-core cables it is from two steel galvanized bands, for single-core cables it is from aluminium or aluminium alloy bands applied by such way that upper band should overlap gap between coils of lower band. At that gap between coils of each band must not exceed 50 % of band width. Nominal thickness of armor bands is specified in the Appendix on page 123.

6. Protection hose: for the cables of APvBShV, PvVBSHV, APvBaShV and PvBaShV types: PVC-compound. For the cables of APvBShVng(A), PvBShVng(A), APvBaShVng(A) and PvBaShVng(A) types: flame-retardant PVC-compound. For the cables of APvBShVng(A)-HL, PvBShVng(A)-HL, APvBaShVng(A)-HL and PvBaShVng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvBShVng(A)-LS, PvBShVng(A)-LS, APvBaShVng(A)-LS and PvBaShVng(A)-LS types: low-smoke PVC-compound. For the cables of APvBShp, PvVBSHp, APvBaShp and PvVBSHp types: polyethylene. Nominal thickness of protection hose is specified in the Appendix on page 123.

The single-core cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for the voltage 1 kV, kg				
	0,66 kV	1 kV	PvBaShV	PvBaShVng(A)	PvBaShVng(A)-HL	PvBaShVng(A)-LS	PvBaShp	PvBaShV	PvBaShVng(A)	PvBaShVng(A)-HL	PvBaShVng(A)-LS	PvBaShp
1x4sr	14,6	14,6	297	293	293	335	266	296	293	293	334	265
1x6sr	14,6	14,6	310	307	307	347	279	310	306	306	346	278
1x10sr	14,6	14,6	337	334	334	373	306	336	334	334	371	304
1x16sr	14,6	14,6	378	377	377	412	347	376	376	376	411	345
1x16mr	14,6	14,6	374	374	374	408	343	373	374	374	406	342
1x25sr	14,8	15,0	441	443	443	473	409	447	449	449	480	415
1x25mr	15,1	15,3	455	457	457	488	422	461	463	463	495	428
1x35mr	16,1	16,3	557	559	559	593	522	564	566	566	600	529
1x50mr	17,6	17,8	744	746	746	784	705	751	753	753	792	712
1x70mr	-	19,6	-	-	-	-	-	943	945	945	988	899
1x95mr	-	21,3	-	-	-	-	-	1203	1205	1205	1253	1156
1x120mr	-	22,9	-	-	-	-	-	1470	1472	1472	1524	1418
1x150mr	-	24,7	-	-	-	-	-	1767	1769	1769	1827	1712
1x185mr	-	27,1	-	-	-	-	-	2169	2173	2173	2241	2085
1x240mr	-	29,6	-	-	-	-	-	2699	2703	2703	2778	2607

The cables with copper conductors, round

Number and nominal section of conductors, MM ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for voltage of 1 kV, kg				
	0,66 kV	1 kV	PvBShv	PvBShvng(A)	PvBShvng(A)-HL	PvBShvng(A)-LS	PvBShp	PvBShv	PvBShvng(A)	PvBShvng(A)-HL	PvBShvng(A)-LS	PvBShp
2x4sr	13,6	14,0	358	356	356	393	328	374	372	372	410	343
2x6sr	14,6	15,0	430	426	426	468	398	447	443	443	487	413
2x10sr	16,2	16,6	559	553	553	604	523	577	570	570	624	540
2x16sr	18,1	18,5	736	726	726	789	694	755	745	745	810	713
2x16mr	19,0	19,4	779	768	768	836	736	800	788	788	859	756
2x25sr	21,1	21,5	1030	1013	1013	1097	981	1052	1034	1034	1121	1002
2x25mr	21,8	22,2	1075	1057	1057	1146	1025	1099	1079	1079	1171	1047
2x35mr	23,8	24,2	1335	1311	1311	1416	1280	1360	1335	1335	1443	1304
2x50mr	27,2	27,6	1827	1794	1794	1931	1739	1855	1821	1821	1962	1766
3x4sr	14,2	14,6	404	402	402	439	372	421	419	419	457	388
3x6sr	15,2	15,7	493	491	491	532	459	511	509	509	552	476
3x10sr	16,9	17,3	657	652	652	702	619	676	671	671	723	637
3x16sr	18,9	19,4	885	878	878	939	842	906	898	898	961	862
3x16mr	19,9	20,3	931	922	922	988	885	953	943	943	1012	906
3x25sr	22,2	22,6	1257	1244	1244	1323	1205	1280	1266	1266	1349	1228
3x25mr	22,9	23,4	1307	1293	1293	1377	1254	1332	1317	1317	1404	1278
3x35mr	25,5	25,9	1667	1650	1650	1753	1585	1695	1676	1676	1783	1611
3x50mr	28,7	29,1	2284	2259	2259	2386	2191	2314	2288	2288	2419	2220
4x4sr	15,0	15,5	465	464	464	502	431	484	483	483	523	450
4x6sr	16,2	16,7	576	574	574	618	539	596	594	594	640	559
4x10sr	18,1	18,6	771	767	767	820	730	793	788	788	843	750
4x16sr	20,4	20,9	1067	1060	1060	1124	1020	1091	1083	1083	1150	1043
4x16mr	21,5	22,0	1119	1110	1110	1180	1069	1144	1135	1135	1207	1093
4x25sr	24,0	24,5	1544	1532	1532	1618	1488	1571	1558	1558	1646	1513
4x25mr	25,3	25,8	1626	1614	1614	1710	1545	1655	1642	1642	1741	1573
4x35mr	27,7	28,2	2054	2037	2037	2148	1964	2085	2068	2068	2182	1994
4x50mr	31,3	31,8	2841	2817	2817	2953	2739	2875	2850	2850	2990	2772
5x4sr	16,0	16,6	538	536	536	579	502	560	558	558	603	522
5x6sr	17,4	18,0	678	675	675	725	638	693	690	690	742	652
5x10sr	19,5	20,0	914	909	909	969	869	939	933	933	995	893
5x16sr	22,1	22,6	1272	1265	1265	1337	1221	1299	1291	1291	1366	1247
5x16mr	23,3	23,8	1331	1322	1322	1400	1277	1360	1350	1350	1431	1304
5x25sr	26,5	27,0	1869	1858	1858	1958	1784	1900	1888	1888	1991	1813
5x25mr	27,5	28,0	1939	1926	1926	2032	1851	1973	1959	1959	2068	1882
5x35mr	30,2	30,7	2471	2453	2453	2577	2373	2507	2489	2489	2616	2407
5x50mr	34,6	35,1	3480	3451	3451	3612	3367	3520	3490	3490	3655	3406
3x25sr+1x16sr	23,3	23,8	1436	1425	1425	1507	1382	1461	1449	1449	1534	1405
3x25mr+1x16sr	25,3	25,8	1566	1550	1550	1652	1485	1595	1579	1579	1684	1513
3x35mr+1x16sr	26,8	27,3	1864	1847	1847	1955	1777	1893	1875	1875	1987	1805
3x50mr+1x25sr	30,3	30,8	2570	2546	2546	2678	2471	2602	2577	2577	2712	2502

The cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 1 kV, kg				
		PvBShv	PvBShvng(A)	PvBShvng(A)-HL	PvBShvng(A)-LS	PvBShp
2x70	27,4	1964	1962	1962	2060	1875
2x95	29,4	2493	2491	2491	2598	2397
2x120	33,8	3121	3113	3113	3246	3010
2x150	36,2	3763	3757	3757	3908	3647
2x185	38,7	4525	4518	4518	4680	4400
2x240	44,6	5747	5731	5731	5935	5602
3x70	31,4	2701	2698	2698	2808	2598
3x95	36,2	3600	3594	3594	3738	3483
3x120	39,2	4392	4385	4385	4542	4265
3x150	43,6	5377	5362	5362	5552	5236
3x185	48,0	6577	6563	6563	6780	6423
3x240	53,8	8549	8534	8534	8779	8376
4x70	36,2	3550	3544	3544	3689	3434
4x95	40,2	4602	4594	4594	4756	4472
4x120	43,6	5692	5676	5676	5865	5550
4x150	48,0	6929	6915	6915	7132	6775
4x185	53,8	8817	8802	8802	9047	8644
4x240	58,6	11057	11035	11035	11328	10834
5x70	39,2	4306	4299	4299	4459	4180
5x95	44,6	5686	5670	5670	5866	5540
5x120	50,0	7058	7044	7044	7272	6898
5x150	55,2	8973	8949	8949	9219	8795
5x185	60,6	10964	10941	10940	11250	10733
5x240	64,6	13553	13528	13528	13859	13307
3x70+1x35	36,2	3226	3220	3220	3364	3110
3x95+1x50	40,2	4205	4198	4198	4360	4075
3x120+1x70	43,6	5225	5209	5209	5398	5083
3x150+1x70	48,0	6195	6182	6182	6399	6042
3x185+1x95	53,8	7974	7959	7959	8203	7801
3x240+1x120	58,6	9963	9940	9940	10234	9740

The cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 1 kV, kg				
		APvBShv	APvBShvng(A)	APvBShvng(A)-HL	APvBShvng(A)-LS	APvBShp
2x70	27,4	1118	1116	1116	1214	1029
2x95	29,4	1345	1343	1343	1450	1249
2x120	33,8	1652	1644	1644	1777	1542
2x150	36,2	1936	1930	1930	2081	1820
2x185	38,7	2260	2254	2254	2416	2136
2x240	44,6	2836	2820	2820	3024	2691
3x70	31,4	1431	1429	1429	1539	1329
3x95	36,2	1878	1872	1872	2016	1761
3x120	39,2	2189	2182	2182	2339	2062
3x150	43,6	2636	2622	2622	2811	2495
3x185	48,0	3180	3166	3166	3383	3026
3x240	53,8	4183	4167	4167	4412	4009
4x70	36,2	1858	1852	1852	1996	1741
4x95	40,2	2305	2298	2298	2460	2175
4x120	43,6	2754	2739	2739	2928	2612
4x150	48,0	3274	3261	3261	3477	3121
4x185	53,8	4289	4274	4274	4517	4116
4x240	58,6	5234	5212	5212	5506	5011
5x70	39,2	2191	2184	2184	2344	2064
5x95	44,6	2815	2800	2800	2996	2670
5x120	50,0	3387	3372	3372	3601	3226
5x150	55,2	4405	4381	4381	4651	4227
5x185	60,6	5303	5280	5280	5589	5072
5x240	64,6	6275	6250	6250	6581	6029
3x70+1x35	36,2	1748	1742	1742	1886	1632
3x95+1x50	40,2	2167	2160	2160	2322	2037
3x120+1x70	43,6	2598	2583	2583	2772	2457
3x150+1x70	48,0	3032	3018	3018	3235	2878
3x185+1x95	53,8	4003	3988	3988	4232	3830
3x240+1x120	58,6	4862	4839	4839	5133	4639

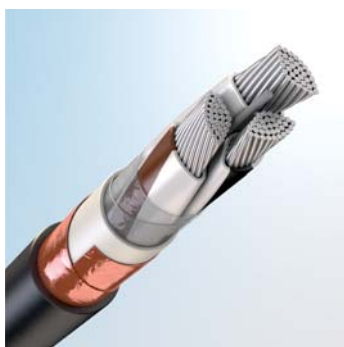
The single-core cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for the voltage 1 kV, kg				
	0,66 kV	1 kV	APvBaSHv	APvBaSHvng(A)	APvBaSHvng(A)-HL	APvBaSHvng(A)-LS	APvBaSHp	APvBaSHv	APvBaSHvng(A)	APvBaSHvng(A)-HL	APvBaSHvng(A)-LS	APvBaSHp
1x4sr	14,6	14,6	297	293	293	335	242	296	293	293	334	241
1x6sr	14,6	14,6	311	307	307	347	243	310	306	306	346	242
1x10sr	14,6	14,6	337	334	334	373	246	336	334	334	371	245
1x16sr	14,6	14,6	378	377	377	412	251	376	376	376	411	249
1x16mr	14,6	14,6	374	374	374	408	245	373	374	374	406	245
1x25sr	14,8	15,0	441	443	443	473	260	447	449	449	480	265
1x25mr	15,1	15,3	455	457	457	488	270	461	464	464	495	276
1x35mr	16,1	16,3	557	559	559	593	315	564	566	566	600	321
1x50mr	17,6	17,8	744	746	746	784	391	751	753	753	792	398
1x70mr	-	19,6	-	-	-	-	-	943	945	945	988	476
1x95mr	-	21,3	-	-	-	-	-	1203	1205	1205	1254	581
1x120mr	-	22,9	-	-	-	-	-	1470	1472	1472	1524	681
1x150mr	-	24,7	-	-	-	-	-	1768	1769	1769	1727	801
1x185mr	-	27,1	-	-	-	-	-	2170	2173	2173	2241	949
1x240mr	-	29,6	-	-	-	-	-	2699	2703	2703	2778	1147

The cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of the cable for the voltage 0,66 kV, kg					Weight of 1 km of the cable for voltage of 1km, kg				
	0,66 kV	1 kV	APvBShv	APvBShvng(A)	APvBShvng(A)-HL	APvBShvng(A)-LS	APvBShp	APvBShv	APvBaSHvng(A)	APvBShvng(A)-HL	APvBShvng(A)-LS	APvBShp
2x4sr	13,6	14,0	310	308	308	344	280	326	323	323	362	295
2x6sr	14,6	15,0	358	354	354	396	325	375	370	370	415	341
2x10sr	16,2	16,6	439	433	433	484	403	457	451	451	504	420
2x16sr	18,1	18,5	542	532	532	595	501	562	551	551	616	519
2x16mr	19,0	19,4	584	572	572	641	540	605	592	592	663	560
2x25sr	21,1	21,5	728	712	712	795	680	751	733	733	820	701
2x25mr	21,8	22,2	768	750	750	839	718	792	772	772	864	740
2x35mr	23,8	24,2	918	893	893	999	862	943	917	917	1026	887
2x50mr	27,2	27,6	1195	1162	1162	1299	1107	1223	1189	1189	1330	1134
3x4sr	14,2	14,6	331	330	330	366	300	348	347	347	385	316
3x6sr	15,2	15,7	385	382	382	424	351	403	400	400	443	368
3x10sr	16,9	17,3	477	473	473	522	439	496	491	491	543	457
3x16sr	18,9	19,4	595	587	587	648	551	615	607	607	670	571
3x16mr	19,9	20,3	637	629	629	695	592	660	650	650	719	613
3x25sr	22,2	22,6	805	792	792	871	753	828	814	814	897	775
3x25mr	22,9	23,4	847	832	832	917	793	872	856	856	944	817
3x35mr	25,5	25,9	1041	1024	1024	1127	959	1069	1051	1051	1157	985
3x50mr	28,7	29,1	1336	1311	1311	1438	1243	1366	1340	1340	1470	1272
4x4sr	15,0	15,5	368	367	367	406	335	388	386	386	427	353
4x6sr	16,2	16,7	431	429	429	473	395	451	449	449	495	414
4x10sr	18,1	18,6	531	527	527	580	490	553	548	548	604	511
4x16sr	20,4	20,9	680	673	673	737	633	703	696	696	762	655
4x16mr	21,5	22,0	727	719	719	789	678	753	744	744	816	702
4x25sr	24,0	24,5	941	929	929	1015	885	968	955	955	1044	911
4x25mr	25,3	25,8	1012	1000	1000	1096	931	1041	1028	1028	1127	959
4x35mr	27,7	28,2	1219	1203	1203	1314	1130	1251	1233	1233	1347	1160
4x50mr	31,3	31,8	1576	1553	1553	1689	1475	1611	1586	1586	1726	1508
5x4sr	16,0	16,6	417	416	416	459	381	439	437	437	483	402
5x6sr	17,4	18,0	497	494	494	544	457	512	509	509	561	471
5x10sr	19,5	20,0	614	610	610	669	569	639	634	634	696	593
5x16sr	22,1	22,6	788	780	780	852	737	815	807	807	881	762
5x16mr	23,3	23,8	842	833	833	911	788	871	861	861	942	816
5x25sr	26,5	27,0	1115	1104	1104	1204	1030	1147	1134	1134	1238	1059
5x25mr	27,5	28,0	1172	1159	1159	1264	1083	1205	1192	1192	1300	1115
5x35mr	30,2	30,7	1427	1410	1410	1534	1330	1463	1445	1445	1572	1364
5x50mr	34,6	35,1	1900	1871	1871	2031	1786	1940	1910	1910	2075	1825
3x25sr+1x16sr	23,3	23,8	887	876	876	958	833	912	900	900	985	856
3x25mr+1x16sr	25,3	25,8	1008	992	992	1094	927	1037	1021	1021	1126	954
3x35mr+1x16sr	26,8	27,3	1140	1123	1123	1232	1053	1169	1152	1152	1263	1081
3x50mr+1x25sr	30,3	30,8	1468	1445	1445	1576	1370	1500	1476	1476	1611	1400

Cables without Protective Coverage for the Voltage 3 kV



PvVG, APvVG

Power cables: copper or aluminium conductors, XLPE insulation, PVC-compound sheath

PvVGng(A), APvVGng(A)

Power cables: copper or aluminium conductors, XLPE insulation, flame-retardant PVC-compound sheath

PvVGng(A)-HL, APvVGng(A)-HL

Power cables: copper or aluminium conductors, XLPE insulation, cold-resistant, flame-retardant PVC-compound sheath

PvVG-HL, APvVG-HL

Power cables: copper or aluminium conductors, XLPE insulation, cold-resistant PVC-compound sheath

PvVGng(A)-LS, APvVGng(A)-LS

Power cables: copper or aluminium conductors, XLPE insulation, low-smoke PVC-compound sheath

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 3 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities.

The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with XLPE insulation and outer PVC-compound sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installations and production rooms where only periodical presence of operating personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with XLPE insulation and outer flame-retardant PVC-compound sheath are designed for laying in cable works of outdoor (open) electrical installations that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with XLPE insulation and outer low-smoke PVC-compound sheath are designed for bunched laying in cable works and rooms of inner (close) electrical installations incl. objects of use of nuclear energy as well as for use in building constructions.

The "ng(A)-HL"-type cables with XLPE insulation and outer cold-resistant, flame-retardant PVC-compound sheath are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. ones used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with XLPE insulation and outer cold-resistant PVC-compound sheath are designed for single laying in cable works and rooms of outdoor (open) electrical installations incl. ones used in climatic conditions with temperature decreased to -60 °C.

OKP CODES

353300 the cable with copper conductors for nominal voltage 3 kV

353700 the cable with aluminium conductors for nominal voltage 3 kV

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, of 1st or 2nd class according to GOST 22483.

2. Insulation: XLPE. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: three-core cables have conductors of identical cross-section.

4. Inner sheath (for three-core cable); for the cables of APvVG and PvVG types: PVC-compound. For the cables of APvVGng(A) and PvVGng(A) types: flame-retardant PVC-compound. For the cables of APvVGng(A)-HL and PvVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound, for the cables of APvVG-HL and PvVG-HL types: cold-resistant PVC-compound. For the cables of APvVGng(A)-LS and PvVGng(A)-LS types: low-smoke PVC-compound.

Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

Separation layer (for single-core cables):tapping with PUF-coating compatible with insulation materials.

5. Screen: tapping with copper band with thickness not less than 0,06 mm with overlapping.

6. Outer sheath: for the cables of APvVG and PvVG types: PVC-compound. For the cables of APvVGng(A) and PvVGng(A) types: flame-retardant PVC-compound. For the cables of APvVGng(A)-HL and PvVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvVG-HL and PvVG-HL types: cold-resistant PVC-compound. For the cables of APvVGng(A)-LS and PvVGng(A)-LS types: low-smoke PVC-compound. Nominal thickness of sheaths is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables APvVG and PvVG.....UHL and T, placement categories 1 and 5

For the cables APvVGng(A) and PvVGng(A).....UHL, placement categories 1 and 5

For the cables APvVGng(A)-HL, PvVGng(A)-HL,

APvVG-HL and PvVG-HL.....HL, placement category 1

For cables APvVGng(A)-LS and PvVGng(A)-LS.....UHL and V, placement category 5

Operating temperature range:

For the cables APvVG, PvVG, APvVGng(A),

PvVGng(A), APvVGng(A)-LS and PvVGng(A)-LS.....from -50 °C to +50 °C

For the cables

APvVGng(A)-HL, PvVGng(A)-HL, APvVG-HL and PvVG-HL.....from -60 °C to +50 °C

Relative air humidity at max +35 °C.....max 98%

Cable conductor continuous operating heating temperature max.....90 °C

Laying and installation of cables without preheating is performed at temperature not less than:

For the cables

APvVG, PvVG, APvVGng(A), PvVGng(A), APvVGng(A)-LS, PvVGng(A)-LS.....-15 °C

For the cables

APvVGng(A)-HL, PvVGng(A)-HL, APvVG-HL, PvVG-HL.....-30 °C

Nominal frequency50 Hz

Test AC voltage with frequency of 50 Hz.....9,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters

for multi-core cables.....7,5 outer cable diameters

Max allowed pulling force during cable tracing:

for the cables with copper conductors.....50 N/mm²

for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm²450 m

from 25 to 70 mm²300 m

from 95 mm² and more200 m

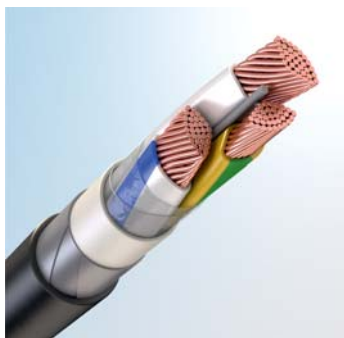
Guarantee use period.....5 years from the date of input of the cable into operation

Service life30 years

The cables with copper and aluminium conductors

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 3 kV, kg									
		PvVG	PvVGng(A)	PvVGng(A)-HL	PvVG-HL	PvVGng(A)-LS	APvVG	APvVGng(A)	APvVGng(A)-HL	APvVG-HL	APvVGng(A)-LS
1x10sr	11,4	210	215	215	206	228	150	155	155	146	168
1x16sr	12,4	277	283	283	273	297	181	187	187	177	201
1x16mr	12,8	291	297	297	286	311	194	200	200	189	214
1x25sr	13,5	372	378	378	366	393	222	228	228	217	243
1x25mr	13,8	387	394	394	382	409	235	241	241	230	257
1x35mr	14,8	479	486	486	473	503	272	279	279	266	295
1x50mr	16,1	650	657	657	644	676	336	343	343	330	352
1x70mr	17,7	827	835	835	820	856	403	412	412	396	432
1x95mk	19,8	1092	1103	1103	1084	1129	517	528	528	509	554
1x120mr	21,2	1341	1352	1352	1332	1381	603	615	615	594	643
1x150mr	22,6	1610	1622	1622	1600	1652	699	711	711	689	741
1x185mr	24,6	1977	1992	1992	1965	2029	842	856	856	829	893
1x240mr	26,9	2477	2494	2494	2464	2534	1018	1034	1034	1004	1074
3x10sr	21,8	743	820	820	732	852	563	641	641	552	672
3x16sr	24,1	988	1081	1081	975	1118	697	790	790	685	827
3x16mr	25,1	1045	1145	1145	1032	1184	751	852	852	738	891
3x25sr	26,5	1311	1423	1423	1297	1464	859	971	971	845	1012
3x25mr	27,2	1372	1490	1490	1358	1532	911	1029	1029	897	1072
3x35mr	29,4	1689	1825	1825	1674	1871	1063	1199	1199	1048	1245
3x50mr	31,9	2099	2205	2205	2094	2256	1151	1257	1257	1146	1308
3x70ms	35,3	2680	2801	2801	2673	2863	1411	1531	1531	1404	1593
3x95ms	37,3	3438	3566	3566	3430	3633	1716	1844	1844	1708	1910
3x120ms	40,3	4195	4334	4334	4187	4407	1992	2131	2131	1984	2204
3x150ms	43,7	5082	5250	5250	5073	5329	2341	2509	2509	2332	2589
3x185ms	48,1	6216	6405	6405	6204	6500	2820	3009	3009	2807	3104
3x240ms	52,1	7746	7953	7953	7733	8056	3380	3586	3586	3367	3690

Armoured Cables for the Voltage 3 kV



PvBShv, APvBShv

Power cables: copper or aluminium conductors, XLPE insulation, inner PVC-compound sheath, armour of steel galvanized bands, PVC-compound protection hose

PvBaShv, APvBaShv

Power cables: copper or aluminium conductors, XLPE insulation, inner PVC-compound sheath, armour of aluminium or aluminium alloy bands, PVC-compound protection hose

PvBShvng(A), APvBShvng(A)

Power cables: copper or aluminium conductors, XLPE insulation, inner flame-retardant PVC-compound sheath, armour of steel galvanized bands, flame-retardant PVC-compound protection hose

PvBaShvng(A), APvBaShvng(A)

Power cables: copper or aluminium conductors, XLPE insulation, inner flame-retardant PVC-compound sheath, armour of aluminium or aluminium alloy bands, flame-retardant PVC-compound protection hose

PvBShvng(A)-HL, APvBShvng(A)-HL

Power cables: copper or aluminium conductor, XLPE insulation, inner flame-retardant PVC-compound sheath, armoured of steel galvanized bands, cold-resistant, flame-retardant PVC-compound protective hose

PvBaShvng(A)-HL, APvBaShvng(A)-HL

Power cables: copper or aluminium conductors, XLPE insulation, inner flame-retardant PVC-compound sheath, armour of aluminium or aluminium alloy bands, cold-resistant, flame-retardant PVC-compound protection hose

PvBShvng(A)-LS, APvBShvng(A)-LS

Power cables: copper or aluminium conductors, XLPE insulation, inner low-smoke PVC-compound sheath, armour of steel galvanized bands, low-smoke PVC-compound protection hose

PvBaShvng(A)-LS, APvBaShvng(A)-LS

Power cables: copper or aluminium conductors, XLPE insulation, inner low-smoke PVC-compound sheath, armour of aluminium or aluminium alloy bands, low-smoke PVC-compound protection hose

PvBShp, APvBShp

Power cables: copper or aluminium conductors, XLPE insulation, inner PVC-compound sheath, armour of steel galvanized bands, polyethylene protection hose

PvBaShp, APvBaShp

Power cables: copper or aluminium conductors, XLPE insulation, inner PVC-compound sheath, armour of aluminium or aluminium alloy bands, polyethylene protection hose

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 3 kV and nominal frequency of 50 Hz.

The cables are intended for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems (according to classifier of fire safety OPB 88/97 (PNAE G-01-011)).

The cables with XLPE insulation and PVC-compound protection hose are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installations and production rooms where only periodical presence of operating personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with XLPE insulation and flame-retardant PVC-compound protection hose are designed for laying in cable works of outdoor (open) electrical installations that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with XLPE insulation and low-smoke PVC-compound protection hose are designed for bunched laying in cable works and rooms of inner (close) electrical installations incl. objects of use of nuclear energy as well as for use in building constructions.

The "ng(A)-HL"-type cables with XLPE insulation and cold-resistant, flame-retardant PVC-compound protection hose are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. ones used in climatic conditions with temperature decreased to -60 °C.

The cables with XLPE insulation and polyethylene protection hose are designed for laying in ground (trenches) independently on corrosion activity of ground and ground waters. It is allowed to use the cables with armor from steel galvanized bands to lay through unnavigable rivers and water bodies upon condition of bite.

OKP CODES

353300 the cable with copper conductors for nominal voltage 3 kV

353700 the cable with aluminium conductors for nominal voltage 3 kV

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, of 1st or 2nd class according to GOST 22483.

2. Insulation: XLPE. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: three-core cables have conductors of identical cross-section.

4. Inner sheath: for the cables of APvBShv, PvBShv, APvBaShv, PvBaShv, APvBShp, PvBShp, APvBaShp and PvBaShp types: PVC-compound. For the cables of APvBShvng(A), PvBShvng(A), APvBaShvng(A) and PvBaShvng(A) types: flame-retardant PVC-compound. For the cables of APvBShvng(A)-HL, PvBShvng(A)-HL, APvBaShvng(A)-HL and PvBaShvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvBShvng(A)-LS, PvBShvng(A)-LS, APvBaShvng(A)-LS and PvBaShvng(A)-LS types: low-smoke PVC-compound.

Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

5. Armour: for multi-core cables: two steel galvanized bands or for single-core cables: aluminium or aluminium alloy bands applied by so way that upper band should overlap gaps between coils of lower band. At that a gap between coils of each bands must not exceed 50 % of band width. Nominal width of bands for armoring is specified in the Appendix on page 123.

6. Protection hose: for the cables of APvBShv, PvBShv, APvBaShv and PvBaShv types: PVC-compound. For the cables of APvBShvng(A), PvBShvng(A), APvBaShvng(A) and PvBaShvng(A) types: flame-retardant PVC-compound. For the cables of APvBShvng(A)-HL, PvBShvng(A)-HL, APvBaShvng(A)-HL and PvBaShvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvBShvng(A)-LS, PvBShvng(A)-LS, APvBaShvng(A)-LS and PvBaShvng(A)-LS types: low-smoke PVC-compound. For the cables of APvBShp, PvBShp, APvBaShp and PvBaShp types: polyethylene. Nominal thickness of protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables APvBShV, PvBShV, APvBShP, PvBShP.....UHL and T, placement categories 1 and 5
 For the cables APvBShVng(A) and VPvShVng(A).....UHL, placement categories 1 and 5
 For the cables of APvBShVng(A)-HL and PvBShVng(A)-HL.....HL, placement categories 1
 For the cables of APvBShVng(A)-LS, PvBShVng(A)-LS.....UHL and V, placement categories 5

Operating temperature range:

For the cables APvBShV, PvBShV, APvBShP, PvBShP, APvBShVng(A),
 PvBShVng(A), APvBShVng(A)-LS, PvBShVng(A)-LS.....from -50°C to +50 °C
 for the cables APvBShVng(A)-HL and PvBShVng(A)-HL.....from -60°C to +50°C
 Relative air humidity at max +35°C.....max 98%
 Cable conductor continuous operating heating temperature max.....90 °C

Laying and installation of the cables without preheating is performed at temperature not less than:

For the cables APvBShV, PvBShV, APvBShP, PvBShP, APvBShVng(A), , PvBShVng(A),
 APvBShVng(A)-LS, PvBShVng(A)-LS.....-15 °C
 For the cables APvBShVng(A)-HL, PvBShVng (A)-HL and APvBShV-HL.....-30 °C
 Nominal frequency.....50 Hz
 Test AC voltage with frequency 50 Hz.....9,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
 for multi-core cables.....7,5 outer cable diameters

Max allowed pulling force during cable tracing

for the cables with copper conductors.....50 N/mm²
 for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm².....450 m
 from 25 to 70 mm².....300 m
 from 95 mm² and more200 m
 Guarantee use period5 years from the date of input of the cable into operation
 Service life30 years

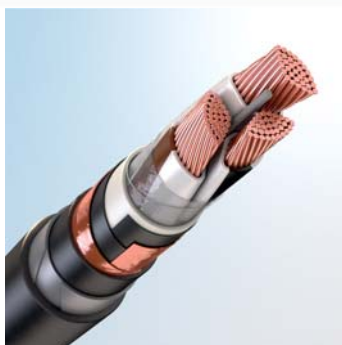
Technical standards of single-core cables, armoured with aluminium alloy bands, corresponds to technical standards of multi-core cables armoured with steel bands.

The single-core cables with copper and aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with copper conductors, kg					Weight of 1 km of the cable with aluminium conductors, kg				
		PvBaSHv	PvBaSHvng(A)	PvBaSHvng(A)-HL	PvBaSHvng(A)-LS	PvBaSHp	APvBaSHv	APvBaSHvng(A)	APvBaSHvng(A)-HL	APvBaSHvng(A)-LS	APvBaSHp
1x10sr	15,1	327	349	349	369	295	268	290	290	310	235
1x16sr	16,1	403	427	427	449	369	307	331	331	353	273
1x16mr	16,5	421	446	446	469	386	324	349	349	372	288
1x25ok	17,2	507	534	534	557	470	358	384	384	408	320
1x25mr	17,5	526	554	554	577	488	374	401	401	425	336
1x35mr	18,5	627	656	656	682	586	420	449	449	475	379
1x50mr	19,8	827	865	865	893	783	513	552	552	579	469
1x70mr	21,4	1020	1063	1063	1093	973	597	640	640	670	549
1x95mr	23,1	1286	1334	1334	1367	1235	711	759	759	792	660
1x120mr	24,9	1570	1623	1623	1662	1493	832	885	885	924	755
1x150mr	26,3	1853	1910	1910	1951	1772	942	999	999	1040	861
1x185mr	37,9	2216	2277	2277	2321	2129	1080	1141	1141	1185	993
1x240mr	30,2	2737	2805	2805	2853	2643	1278	1346	1346	1393	1184

The three-core cables with copper and aluminium conductors

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1km of the cable with copper conductors, kg					Weight of 1 km of the cable with aluminium conductors, kg				
		PvBShV	PvBShVng(A)	PvBShVng(A)-HL	PvBShVng(A)-LS	PvBShp	APvBShV	APvBShVng(A)	APvBShVng(A)-HL	APvBShVng(A)-LS	APvBShp
3x10sr	22,9	907	986	986	1019	854	727	806	806	839	674
3x16sr	25,4	1181	1276	1276	1317	1100	890	985	985	1026	809
3x16mr	26,3	1247	1349	1349	1392	1162	954	1056	1056	1099	869
3x25sr	27,7	1526	1639	1639	1684	1436	1073	1187	1187	1232	984
3x25mr	28,5	1593	1712	1712	1759	1501	1132	1252	1252	1299	1040
3x35mr	30,6	1929	2067	2067	2118	1830	1303	1441	1441	1492	1204
3x50mr	33,2	2359	2469	2469	2525	2252	1411	1521	1521	1577	1303
3x70ms	36,6	2968	3093	3093	3160	2851	1699	1823	1823	1891	1582
3x95ms	38,6	3743	3876	3876	3948	3620	2021	2154	2154	2226	1898
3x120ms	41,6	4527	4671	4671	4749	4393	2324	2468	2468	2545	2190
3x150ms	45,4	5484	5661	5661	5754	5340	2744	2920	2920	3013	2600
3x185ms	49,4	6614	6808	6808	6909	6457	3218	3411	3411	3513	3060
3x240ms	54,2	8534	8748	8748	8860	8360	4167	4381	4381	4493	3994



PvEBSHv, APvEBSHv

Power cables: copper or aluminum conductors, XLPE insulation, inner PVC-compound sheath, foil copper screen, armour of steel galvanized band, PVC-compound protection hose

PvEBaSHv, APvEBaSHv

Power cables: copper or aluminum conductors, XLPE insulation, inner PVC-compound sheath, foil copper screen, armour of aluminium or aluminium alloy bands, PVC-compound protection hose

PvEBSHp, APvEBSHp

Power cables: copper or aluminum conductors, XLPE insulation, inner PVC-compound sheath, foil copper screen, armour of steel galvanized band, polyethylene protection hose

PvEBaSHp, APvEBaSHp

Power cables: copper or aluminum conductors, XLPE insulation, inner PVC-compound sheath, foil copper screen, armour of aluminium or aluminium alloy bands, polyethylene protection hose

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 3 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities.

The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with PVC-compound insulation and protection hose are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The cables with XLPE insulation and polyethylene protection hose are designed for below ground laying (trenches) apart from corrosive activity of ground and ground water. Application of cables with steel galvanized band armour is allowed for laying through unnavigable rivers and waters upon bite condition.

OKP CODES

353300 cable with copper conductors for nominal voltage 3 kV

353700 cable with aluminium conductors for nominal voltage 3 kV

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: XLPE. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: three-core cables have the cores of identical cross-section.

4. Inner sheath (three-core cables): PVC-compound.

Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form being close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

5. Screen: tapping with copper tape with thickness not less than 0,06 mm with overlapping. Cross-section of copper screen is specified in the Appendix on page 123.

6. Bedding: PVC-compound. Nominal bedding thickness is specified in the Appendix on page 123.

7. Armour: for multi-core cables: two steel galvanized bands; for single-core cables: aluminium or aluminium alloy bands; tapes are laid so that the upper tape overlaps the gaps between the coils of the lower tape. Gaps between coils of each tape should not exceed 50% of the width of the tape. Nominal thickness of the armouring tape is specified in the Appendix on page 123.

8. Protection hose: for the cables of PvEBSHv, APvEBSHv, PvEBaSHv, APvEBaSHv types: PVC-compound. For the cables of PvEBSHp, APvEBSHp, PvEBaSHp, APvEBaSHp types: polyethylene. Nominal thickness of the protection hose is specified in the Appendix on page 123

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69.....UHL and T, placement category 1 and 5

Operating temperature range.....from -50°C to +50°C

Relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than.....-15°C

Nominal frequency.....50 Hz

Test AC voltage with frequency of 50 Hz.....9,5 kV

Cable conductor continuous operating heating temperature max90°C

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters

for multi-core cables.....7,5 outer cable diameters

Max allowed pulling force during cable tracing

For the cables with copper conductors.....50 N/mm²

For the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

up to 16 mm²450 m

from 25 to 70 mm²300 m

from 95 mm² and more.....200 m

Guarantee use period.....5 years from date of input of the cable into operation

Service life.....30 years

Technical standards of single-core cables, armoured with aluminium alloy bands, correspond to technical standards of multi-core cables, armoured with steel bands.

The single-core cables with copper and aluminum conductors, round

Number and nominal core's cross-section, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with copper conductors, kg		Weight of 1 km of the cable with aluminum conductors, kg	
		PvEBaSHv	PvEBaSHp	APvEBaSHv	APvEBaSHp
1x10sr	17,2	432	394	372	335
1x16sr	18,2	515	475	418	379
1x16mr	18,6	536	495	439	398
1x25sr	19,3	627	584	477	434
1x25mr	19,6	648	605	496	452
1x35mr	20,6	756	710	549	503
1x50mr	21,9	965	916	651	602
1x70mr	23,5	1170	1117	747	694
1x95mr	25,6	1471	1391	896	817
1x120mr	27,0	1744	1660	1006	922
1x150mr	28,4	2037	1949	1126	1038
1x185mr	30,0	2411	2318	1275	1182
1x240mr	32,3	2950	2848	1490	1389

The three-core cables with copper and aluminum conductors

Number and nominal core's cross-section, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with copper conductors, kg		Weight of 1 km of the cable with aluminum conductors, kg	
		PvEBSHv	PvEBSHp	APvEBSHv	APvEBSHp
3x10sr	25,4	1110	1044	930	864
3x16sr	27,5	1378	1289	1087	999
3x16mr	28,5	1451	1359	1157	1065
3x25sr	29,9	1740	1643	1288	1191
3x25mr	30,6	1813	1713	1352	1253
3x35mr	33,2	2201	2092	1575	1466
3x50mr	35,9	2682	2567	1734	1619
3x70ms	38,9	3287	3161	2017	1892
3x95ms	40,9	4078	3946	2356	2224
3x120ms	44,3	4934	4790	2731	2587
3x150ms	48,1	5926	5772	3185	3031
3x185ms	52,9	7440	7270	4044	3874
3x240ms	57,7	9186	8966	4819	4600

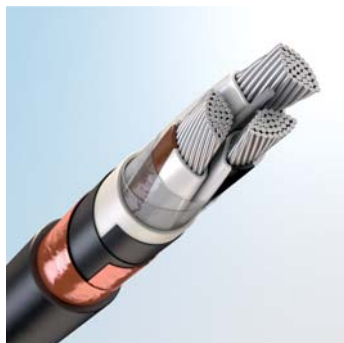


**POWER CABLES FOR
THE VOLTAGE 6 kV**

limited liability company
TOMSKCABLE

Power Cables for the Voltage 6 kV TU 3530-023-59680332-201

Cables without protection coverage for the voltage 6 kV



VVG, AVVG

Power cables: copper or aluminium conductors, PVC-compound insulation, inner and outer sheath

VVGng(A), AVVGng(A)

Power cables: copper or aluminum conductors, PVC-compound insulation, inner low-smoke PVC-compound sheath, outer fire-retardant PVC-compound sheath

VVGng(A)-HL, AVVGng(A)-HL

Power cables: copper or aluminum conductors, cold-resistant PVC-compound insulation, inner low-smoke PVC-compound sheath, outer cold-resistant, fire-retardant PVC-compound sheath

VVG-HL, AVVG-HL

Power cables: copper or aluminum conductors, cold-resistant PVC-compound insulation, inner and outer sheaths

VVGng(A)-LS, AVVGng(A)-LS

Power cables: copper and aluminum conductors, low-smoke PVC-compound insulation, inner and outer sheaths

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 6 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities.

The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with inner and outer PVC-compound insulation are designed for single laying in cable works and production rooms.

Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with PVC-compound insulation, outer flame-retardant PVC-compound sheath are designed for laying in cable structures of open (outdoor) electrical installation, that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with low-smoke PVC-compound insulation and outer sheath are designed for bunched laying in cable works in rooms of indoor (closed) electrical installations inclusive facilities of using nuclear energy as well as for use in building constructions

The "ng(A)-HL"-type cables with cold-resistant, flame-retardant PVC-compound insulation and outer cold-resistant, flame-retardant PVC-compound sheath are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with insulation and outer cold-resistant sheath are designed for single laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

OKP CODE

35 3000

DESIGN

1. Conductor: copper or aluminum, solid or stranded, round of sector, 1st or 2nd class according to GOST 22483.

2. Insulation: for the cables of AVVG, VVG, AVVGng(A), VVGng(A) types: PVC-compound. For the cables of AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL, VVG-HL types: cold-resistant PVC-compound. For the cables of AVVGng(A)-LS, VVGng(A)-LS types: cold-resistant, low-smoke PVC-compound. Insulated conductors of multi-core cables are of different colours. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: cables have cores of identical cross-section.

4. Inner sheath: for the cables of AVVG, VVG types: PVC-compound. For the cables of AVVGng(A), VVGng(A), AVVGng(A)-HL, VVGng(A)-HL, AVVGng(A)-LS, VVGng(A)-LS types: low-smoke PVC-compound. For the cables of AVVG-HL, VVG-HL types: cold-resistant PVC-compound. Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

5. Screen: applied by winding with a gap from two bands of electro conductive cable paper with nominal thickness not less than 0,12 mm.

6. Metal screen: tapping with two copper bands with thickness not less than 0,06 mm with overlapping.

7. Bedding: tapping of insulated conductors with polypropylene tapewind for the cables of AVVG, VVG, AVVG-HL, VVG-HL types, tapping of insulated conductors with glass-fabric tapewind for the cables of AVVGng(A), VVGng(A), AVVGng(A)-HL, VVGng(A)-HL, AVVGng(A)-LS, VVGng(A)-LS types.

8. Outer sheath: for the cables of AVVG, VVG types: PVC-compound. For the cables of AVVGng(A), VVGng(A) types: flame-retardant PVC-compound. For the cables of AVVGng(A)-HL, VVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AVVG-HL, VVG-HL types:

cold-resistant PVC-compound. For the cables of AVVGng(A)-LS, VVGng(A)-LS types: low-smoke PVC-compound. Nominal thickness of sheath is specified in Appendix on the page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables AVVG, VVG UHL, placement categories 1 and 5
 For the cables AVVGng(A), VVGng(A) UHL, placement categories 1 and 5
 For the cables AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL, VVG-HL HL, placement categories 1
 For the cables AVVGng(A)-LS, VVGng(A)-LS UHL and V, placement categories 5

Operating temperature range:

For the cables
 AVVG, VVG, AVVGng(A), VVGng(A), AVVGng(A)-LS, VVGng(A)-LS from -50° C to +50° C
 For the cables
 AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL, VVG-HL from -60° C to +50° C
 Relative air humidity at max +35° C max 98%

Laying and installation of the cables without preheating is performed at temperature not less than :

For the cables
 AVVG, VVG, AVVGng(A), VVGng(A), AVVGng(A)-LS, VVGng(A)-LS -15° C

For the cables
 AVVGng(A)-HL, VVGng(A)-HL, AVVG-HL, VVG-HL -30° C
 Nominal frequency 50 Hz
 Test AC voltage with frequency of 50 Hz 15 kV
 Minimal bending radius at laying and installation 7,5 outer cable diameters
 Cable conductor continuous operating heating temperature max 70° C

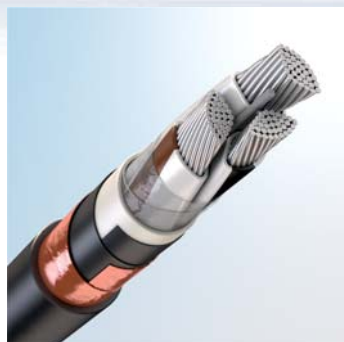
Max allowed pulling force during cable tracing

for the cables with copper conductors 50 N/mm²
 for the cables with aluminium conductors 30 N/mm²

Construction length with the main core's cross-section:

from 25 to 70 mm² 450 m
 from 95 mm² to 120 mm² 400 m
 from 150 mm² and more 350 m
 Guarantee use period 5 years from date of input of the cable into operation
 Service life 30 years

Number and nominal core's cross-section, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 6kV, kg									
		VVG	VVGng(A)	VVGng(A)-HL	VVG-HL	VVGng(A)-LS	AVVG	AVVGng(A)	AVVGng(A)-HL	AVVG-HL	AVVGng(A)-LS
3x25sr	34,6	1887	2084	2025	1869	2226	1436	1632	1573	1417	1773
3x25mr	35,3	1995	2200	2138	1974	2357	1535	1740	1677	1514	1896
3x35mr	37,5	2334	2563	2497	2312	2725	1708	1937	1871	1686	2099
3x50mr	38,6	2652	2801	2729	2625	2990	1704	1853	1781	1677	2042
3x70ms	40,6	3241	3399	3322	3211	3611	1972	2130	2052	1942	2341
3x95ms	44,0	4120	4308	4223	4087	4544	2398	2586	2501	2364	2821
3x120ms	47,4	4969	5175	5077	4930	5439	2766	2972	2874	2727	3236
3x150ms	50,4	5862	6083	5977	5819	6371	3121	3342	3236	3079	3630
3x185ms	55,2	7088	7404	7281	7041	7733	3692	4008	3884	3645	4337
3x240ms	58,2	8729	9012	8879	8673	9375	4363	4645	4512	4307	5008



PvVG, APvVG

Power cables: copper or aluminum conductors, XLPE insulation, inner and outer PVC-compound sheath

PvVGng(A), APvVGng(A)

Power cables: copper or aluminum conductors, XLPE insulation, inner low-smoke PVC-compound sheath, outer flame-retardant PVC-compound sheath

PvVGng(A)-HL, APvVGng(A)-HL

Power cables: copper or aluminum conductors, XLPE insulation, inner low-smoke PVC-compound sheath, outer cold-resistant, flame-retardant PVC-compound sheath

PvVG-HL, APvVG-HL

Power cables: copper or aluminum conductors, XLPE insulation, inner and outer cold-resistant PVC-compound sheaths

PvVGng(A)-LS, APvVGng(A)-LS

Power cables: copper or aluminum conductors, XLPE insulation, inner and outer cold-resistant, low-smoke PVC-compound sheath

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 6 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities.

The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables with XLPE insulation and outer PVC-compound sheath are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with XLPE insulation and outer flame-retardant PVC-compound sheath are designed for laying in cable works of outdoor (open) electrical installations, that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with XLPE insulation and outer low-smoke PVC-compound sheath are designed for bunched laying in cable works and rooms of indoor (closed) electrical installations incl. facilities of nuclear energy using as well as for use in building constructions.

The "ng(A)-HL"-type cables with XLPE insulation and outer cold-resistant, flame-retardant PVC-compound sheath are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with XLPE insulation and outer cold-resistant PVC-compound sheath are designed for single laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

OKP CODE

35 3000

DESIGN

1. **Conductor:** copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. **Insulation:** XLPE. Insulated conductors of multi-core cables are of different colours. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. **Stranding:** three-core cables have the identical cross-section.

4. **Inner sheath** (three-core cables): for the cables of APvVG, PvVG types: PVC-compound. For the cables of APvVGng(A), PvVGng(A) types: low-smoke PVC-compound. For the cables of APvVGng(A)-HL, PvVGng(A)-HL types: low-smoke, cold-resistant PVC-compound. For the cables of APvVG-HL, PvVG-HL types: cold-resistant PVC-compound. For the cables of APvVGng(A)-LS, PvVGng(A)-LS types: low-smoke PVC-compound.

Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one. Nominal thickness of inner sheath is specified in the Appendix on page 123.

5. **Screen:** applied by winding with a gap from two bands of electro conductive cable paper with nominal thickness not less than 0,12 mm.

6. **Metal screen:** tapping with two copper tapes with thickness not less than 0,06 mm with overlapping.

7. **Bedding:** a tapping insulated conductors with polypropylene tapewind for the cables of APvVG, PvVG, APvVG-HL, PvVG-HL types, a tapping of insulated conductors with glass-fabric tapewind for cables of APvVGng(A), PvVGng(A), APvVGng(A)-HL, PvVGng(A)-HL, APvVGng(A)-LS, PvVGng(A)-LS types.

8. **Outer sheath:** for the cables of APvVG, PvVG types: PVC-compound. For the cables of APvVGng(A), PvVGng(A) types: flame-retardant PVC-compound. For the cables of APvVGng(A)-HL, PvVGng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvVG-HL, PvVG-HL types: cold-resistant PVC-compound. For the cables of APvVGng(A)-LS, PvVGng(A)-LS types: low-smoke PVC-compound.

Nominal sheath thickness is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables PvVG, APvVG.....UHL and T, placement category 1 and 5

For the cables APvVGng(A), PvVGng(A).....UHL, placement category 1 and 5

For the cables APvVGng(A)-HL, PvVGng(A)-HL, APvVG-HL, PvVG-HL.....placement category 1

For the cables APvVGng(A)-LS, PvVGng(A)-LS.....UHL and V, placement category 5

Operating temperature range:

For the cables APvVG, PvVG, APvVGng(A) PvVGng(A), APvVGng(A)-LS, PvVGng(A)-LS.....from -50°C to +50°C

For the cables APvVGng(A)-HL, PvVGng(A)-HL.....from -60°C to +50°C

Relative air humidity at max +35°C.....max 98%

Cable conductor continuous operating heating temperature max90°C

Laying and installation of cables without preheating is performed at temperature not lower than:

For the cables APvVG, PvVG, APvVGng(A) PvVGng(A), APvVGng(A)-LS, PvVGng(A)-LS.....-15°C

For the cables APvVGng(A)-HL, PvVGng(A)-HL, APvVG-HL, PvVG-HL.....-30°C

Nominal frequency.....50 Hz

Test AC voltage with frequency of 50 Hz.....15 kV

Minimal bending radius at wiring and installation.....7,5 outer cable diameters

Max allowed pulling force during cable tracing:

for the cables with copper conductors.....50 N/mm²

for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section:

from 25 to 70 mm²450 m

from 95 mm² to 120 mm²400 m

from 150 mm² and more.....350 m

Guarantee use period.....5 years from date of input of the cable into operation

Service life.....30 years

The cables with copper and aluminum conductors

Number and nominal core's cross-section, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable for the voltage 6kV, kg									
		PvVG	PvVGng(A)	PvVGng(A)-HL	PvVG-HL	PvVGng(A)-LS	APvVG	APvVGng(A)	APvVGng(A)-HL	APvVG-HL	APvVGng(A)-LS
3x25sr	32,5	1650	1825	1825	1633	1876	1197	1373	1373	1180	1422
3x25mr	33,2	1731	1915	1915	1714	1967	1271	1454	1454	1253	1504
3x35mr	35,8	2095	2304	2304	2074	2366	1469	1678	1678	1448	1737
3x50mr	36,6	2400	2541	2541	2379	2605	1452	1593	1593	1431	1657
3x70ms	39,6	2982	3136	3136	2960	3206	1713	1867	1867	1690	1937
3x95ms	41,6	3762	3924	3924	3737	3998	2039	2202	2202	2015	2276
3x120ms	45,4	4633	4829	4829	4604	4918	2429	2626	2626	2401	2715
3x150ms	48,4	5498	5710	5710	5468	5805	2758	2969	2969	2727	3065
3x185ms	52,4	6625	6856	6856	6591	6959	3229	3459	3459	3195	3563
3x240ms	56,2	8282	8554	8554	8243	8675	3915	4187	4187	3876	4308

Armored Cables for the Voltage 6kV



VBSHv, AVBSHv

Power cables: copper or aluminum conductors, PVC-compound insulation, inner sheath and bedding, armour of steel galvanized band, PVC-compound protection hose

VBSHvng(A), AVBSHvng(A)

Power cables: copper or aluminum conductors, PVC-compound insulation, inner low-smoke PVC-compound sheath, flame-retardant PVC-compound bedding, armour of steel galvanized band, flame-retardant PVC-compound protection hose.

VBSHvng (A)-HL, AVBSHvng (A)-HL

Power cables: copper or aluminum conductors, cold-resistant PVC-compound insulation, inner low-smoke PVC-compound sheath, flame-retardant PVC-compound bedding, armour of steel galvanized band, cold-resistant, flame-retardant PVC-compound protection hose.

VBSHv - HL, AVBSHv - HL

Power cables: copper or aluminum conductors, cold-resistant PVC-compound insulation, inner sheath and bedding, armour of steel galvanized band, cold-resistant PVC-compound protection hose.

VBSHvng (A)-LS, AVBSHvng (A)-LS

Power cables: copper and aluminum conductors, cold-resistant, low smoke PVC-compound insulation, inner sheath and bedding, armour of steel galvanized band, low-smoke PVC-compound protection hose.

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 6kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems (according to classifier of fire safety OPB 88/97 (PNAE G-01-011)).

The cables with PVC-compound insulation and protection hose are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with PVC-compound insulation and flame-retardant PVC-compound protection hose are designed for laying in cable works of outdoor (open) electrical installations, that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with low-smoke PVC-compound insulation and protection hose are designed for bunched laying in cable works and rooms of indoor (closed) electrical installations incl. facilities of nuclear energy using as well as for use in building constructions.

The "ng(A)-HL"-type cables with cold-resistant, flame-retardant PVC-compound insulation and cold-resistant, flame-retardant PVC-compound protection hose are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

The "HL"-type cables with cold-resistant PVC-compound insulation and protection hose are designed for single laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

OKP CODE

35 3000

DESIGN

- Conductor:** copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.
- Insulation:** for the cables of VBSHv, AVBSHv, VBSHvng(A), AVBSHvng(A) types: PVC-compound. For the cables of VBSHvng(A)-LS, AVBSHvng(A)-LS types: low-smoke PVC-compound. For the cables of VBSHvng(A)-HL, AVBSHvng(A)-HL, VBSHv - HL, AVBSHv - HL types: cold-resistant PVC-compound. Insulated conductors of multi-core cables are of different colours. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.
- Stranding:** three-core cables have the identical cross-section.
- Inner sheath:** for the cables of VBSHv, AVBSHv types: PVC-compound. For the cables of VBSHvng(A), AVBSHvng(A), VBSHvng(A)-HL, AVBSHvng(A)-HL, VBSHvng(A)-LS, AVBSHvng(A)-LS types: low-smoke PVC-compound. For the cables of VBSHv - HL, AVBSHv - HL types: cold-resistant PVC-compound. Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form being close to circular one. Nominal inner sheath thickness is introduced in Appendix on the page 123.
- Screen:** a tapping with two bands of electro conductive cable paper with nominal thickness of not less than 0,12 mm
- Metal screen:** tapping with two copper bands with thickness not less than 0,06 mm with overlapping.
- Bedding:** for the cables of VBSHv, AVBSHv, VBSHv - HL, AVBSHv - HL types: tapping with polypropylene tape, for the cables of VBSHvng(A), AVBSHvng(A), VBSHvng(A)-HL, AVBSHvng(A)-HL, VBSHvng(A)-LS, AVBSHvng(A)-LS types: tapping with glass-fabric tape.
- Bedding:** for the cables of VBSHv, AVBSHv types: PVC-compound. For the cables of VBSHvng(A), AVBSHvng(A), VBSHvng(A)-HL, AVBSHvng(A)-HL types: flame-retardant PVC-compound. For the cables of VBSHv - HL, AVBSHv - HL types: cold-resistant PVC-compound. For the cables of VBSHvng(A)-LS, AVBSHvng(A)-LS types: low-smoke PVC-compound.
- Armour:** two steel galvanized bands; tapes are laid so that the upper tape overlaps the gaps between the coils of the lower tape. Gaps between coils of each tape should not exceed 50% of the width of the tape. Nominal thickness of the armouring tape is specified in the Appendix on page 123.
- Protection hose:** for the cables of VBSHv, AVBSHv types: PVC-compound. For cables of VBSHvng(A), AVBSHvng(A) types: flame-retardant PVC-compound. For the cables of VBSHvng(A)-HL, AVBSHvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of VBSHv - HL, AVBSHv - HL: cold-resistant PVC-compound. For the cables of VBSHvng(A)-LS, AVBSHvng(A)-LS types: low-smoke PVC-compound. Nominal protection hose thickness is specified in the Appendix on page 123

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables VBSHv, AVBSHv.....UHL and T, placement categories 1 and 5
For the cables the VBSHvng(A), AVBSHvng(A).....UHL, placement categories 3 and 5

For the cables VBSHv (A)-HL, AVBSHvng (A)-HL, VBSHv-HL, AVBSHv-HL.....HL, placement category 1
For the cables VBSHvng (A)-LS, AVBSHvng (A)-LS.....UHL and V, placement categories 5

Operating temperature range:

for the cables VBSHv, AVBSHv, VBSHvng(A), AVBSHvng(A), VBSHvng (A)-LS, AVBSHvng (A)-LS.....from -50°C to +50°C
for the cables VBSHvng (A)-HL, AVBSHvng (A)-HL, VBSHv - HL, AVBSHv - HL.....from -60°C to +50°C
Relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than:

for the cables VBSHv, AVBSHv, VBSHvng(A), AVBSHvng(A), VBSHvng (A)-LS, AVBSHvng (A)-LS -15°C
for the cables VBSHvng (A)-HL, AVBSHvng (A)-HL, VBSHv - HL, AVBSHv - HL -30°C
Nominal frequency.....50 Hz
Test AC voltage with frequency of 50 Hz.....15 kV
Minimal bending radius at laying and installation.....7,5 outer cable diameters
Cable conductor continuous operating heating temperature max.....70°C

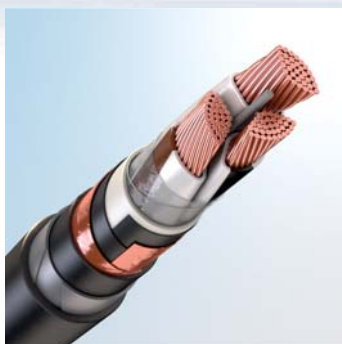
Max allowed pulling force during cable tracing:

for the cables with copper conductors.....50 N/mm²
for the cables with aluminium conductors.....30 N/mm²

Construction length with the main core's cross-section

from 25 to 70 mm²450 m
from 95 mm² to 120mm²400 m
from 150 mm² and more.....350 m
Guarantee use period.....5 years from date of input of the cable into operation
Service life.....30 years

Number and nominal core's cross-section, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with copper conductors, kg					Weight of 1 km of the cable with aluminum conductors, kg				
		VBSHv	VBSHvng(A)	VBSHvng(A)-HL	VBSHv-HL	VBSHvng(A)-LS	AVBSHv	AVBSHvng(A)	AVBSHvng(A)-HL	AVBSHv-HL	AVBSHvng(A)-LS
3x25sr	38,4	2482	2701	2635	2444	2889	2030	2249	2183	1992	2437
3x25mr	39,1	2602	2830	2760	2562	3035	2142	2370	2300	2101	2574
3x35mr	41,3	2978	3231	3157	2935	3444	2352	2605	2531	2309	2818
3x50ms	42,4	3311	3489	3410	3263	3730	2363	2541	2462	2315	2782
3x70ms	45,2	3982	4218	4126	3929	4500	2712	2948	2856	2660	3230
3x95ms	48,6	4965	5194	5093	4905	5505	3243	3472	3371	3183	3783
3x120ms	52,4	6169	6418	6309	6104	6757	3966	4215	4106	3901	4554
3x150ms	56,2	7249	7523	7399	7175	7910	4508	4782	4658	4434	5169
3x185ms	60,6	8595	8914	8778	8514	9340	5199	5517	5381	5117	5943
3x240ms	63,6	10266	10602	10456	10177	11067	5899	6236	6090	5810	6700



PvBShv, APvBShv

Power cables: copper or aluminum conductors, XLPE insulation, inner PVC-compound sheath, PVC-compound bedding, armour of steel galvanized band, PVC-compound protection hose.

PvBShvng(A), APvBShvng(A)

Power cables: copper or aluminum conductors, XLPE insulation, inner low-smoke PVC-compound sheath, flame-retardant PVC-compound bedding, armour of steel galvanized band, flame-retardant PVC-compound protection hose.

PvBShvng(A)-HL, APvBShvng(A)-HL

Power cables: copper or aluminum conductors, XLPE insulation, inner low-smoke PVC-compound sheath, flame-retardant bedding, armour of steel galvanized band, cold-resistant, flame-retardant PVC-compound protection hose.

PvBShv - HL, APvBShv - HL

Power cables: copper or aluminum conductors, XLPE insulation, inner cold-resistant PVC-compound sheath, cold-resistant PVC-compound bedding, armour of steel galvanized band, PVC-compound protection hose.

PvBShvng(A)-LS, PvBShvng(A)-LS

Power cables: copper or aluminum conductors, XLPE insulation, inner low-smoke PVC-compound sheath, low-smoke PVC-compound bedding, armour of steel galvanized band, low-smoke PVC-compound protection hose.

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 6 kV and nominal frequency of 50 Hz.

The cables are designed for needs of the national economy and used in industrial and power facilities. The "ng(A)-LS"-type cables can be used at nuclear plants in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

Cables with XLPE insulation and PVC-compound protection hose are designed for single laying in cable works and production rooms. Bunched laying of these cables is allowed only in outdoor electrical installation and production rooms where only periodical presence of operational personnel is possible. At that it is necessary to use passive fire protection.

The "ng(A)"-type cables with XLPE insulation and flame-retardant PVC-compound protection hose are designed for laying in cable works of outdoor (open) electrical installations, that is in rail bridges and cable galleries.

The "ng(A)-LS"-type cables with XLPE insulation and low-smoke PVC-compound protection hose are designed for bunched laying in cable works and rooms of indoor (closed) electrical installations incl. facilities of nuclear energy using as well as for use in building constructions.

The "ng(A)-HL"-type cables with XLPE insulation and cold-resistant, flame-retardant protection hose are designed for bunched laying in cable works and rooms of outdoor (open) electrical installations incl. one used in climatic conditions with temperature decreased to -60 °C.

OKP CODE

35 3000

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: XLPE. Insulated conductors of multi-core cables are of different colours. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: three-core cables with the identical cross-section.

4. Inner sheath: for the cables of APvBShv, PvBShv types: PVC-compound. For the cables of APvBShvng(A), PvBShvng(A), APvBShvng(A)-HL, PvBShvng(A)-HL, APvBShvng(A)-LS, PvBShvng(A)-LS types: low-smoke PVC-compound. For the cables of APvBShv-HL, PvBShv-HL types: cold-resistant PVC-compound.

Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one. Nominal inner sheath thickness is specified in the Appendix on page 123.

5. Screen: a tapping with two tapes of electro conductive cable paper with nominal thickness not less than 0,12 mm

6. Metal screen: a tapping with two copper bands with thickness not less than 0,06 mm with overlapping.

7. Bedding: for the cables of APvBShv, PvBShv, APvBShv-HL, PvBShv-HL types: a tapping with polypropylene band. For the cables of APvBShvng(A), PvBShvng(A), APvBShvng(A)-HL, PvBShvng(A)-HL, APvBShvng(A)-LS, PvBShvng(A)-LS types: a tapping with glass-fabric band.

8. Bedding: for the cables of APvBShv, PvBShv types: PVC-compound. For the cables of APvBShvng(A), PvBShvng(A), APvBShvng(A)-HL, PvBShvng(A)-HL types: flame-retardant PVC-compound. For the cables of APvBShv-HL, PvBShv-HL types: cold-resistant PVC-compound. For the cables of APvBShvng(A)-LS, PvBShvng(A)-LS types: low-smoke PVC-compound.

9. Armour: two steel galvanized bands, tapes are laid so that the upper tape overlaps the gaps between the coils of the lower tape. Gaps between coils of each tape should not exceed 50% of the width of the

tape. Nominal thickness of the armouring tape is specified in the Appendix on page 123.

10. Protection hose: For the cables of APvBShv, PvBShv types: PVC-compound. For the cables of APvBShvng(A), PvBShvng(A) types: flame-retardant PVC-compound. For the cables of APvBShvng(A)-HL, PvBShvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of APvBShv-HL, PvBShv-HL types: cold-resistant PVC-compound. For the cables of APvBShvng(A)-LS, PvBShvng(A)-LS types: low-smoke PVC-compound. Nominal thickness of protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

For the cables APvBShv, PvBShv.....UHL and T, placement categories 1 and 5

For the cables APvBShvng(A), PvBShvng(A).....UHL, placement categories 1 and 5

For the cables APvBShvng(A)-HL, PvBShvng(A)-HL,

APvBShv-HL, PvBShv-HL.....HL, placement category 1

For the cables APvBShvng(A)-LS, PvBShvng(A)-LS.....UHL and B, location categories 5

Operating temperature range:

For the cables APvBShv, PvBShv, APvBShvng(A),

PvBShvng(A), APvBShvng(A)-LS, PvBShvng(A)-LS.....from -50°C to +50°C

For the cables APvBShvng(A)-HL, PvBShvng(A)-HL,

APvBShv-HL, PvBShv-HLfrom -60°C to +50°C

Relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed

at temperature not less than:

For the cables APvBShv, PvBShv, APvBShvng(A),

PvBShvng(A), APvBShvng(A)-LS, PvBShvng(A)-LS-15°C

For the cables APvBShvng(A)-HL, PvBShvng(A)-HL, APvBShv-HL, PvBShv-HL-30°C

Nominal frequency.....50 Hz

Test AC voltage with frequency of 50 Hz.....15 kV

Minimal bending radius

at laying and installation:.....7,5 outer cable diameters

Cable conductor continuous operating heating temperature max90°C

Max allowed pulling force during cable tracing

for the cables with copper conductors.....50N/mm²

for the cables with aluminium conductors.....30N/mm²

Construction length with the main core's cross-section

from 25 to 70mm²450 m

from 95 mm² to 120 mm²400 m

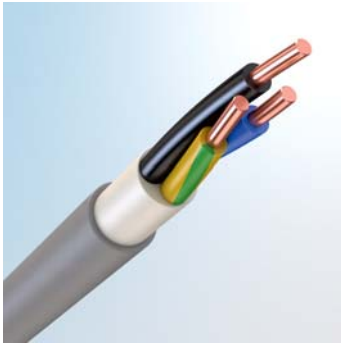
from 150 mm² and more.....350 m

Guarantee use period.....5 years from from date of input of the cable into operation

Service life.....30 years

Number and nominal core's cross-section, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of the cable with copper conductors, kg					Weight of 1 km of the cable with aluminum conductors, kg				
		PvBShv	PvBShvng(A)	PvBShvng(A)-HL	PvBShv-HL	PvBShvng(A)-LS	APvBShv	APvBShvng(A)	APvBShvng(A)-HL	APvBShv-HL	APvBShvng(A)-LS
3x25sr	36,7	2243	2444	2444	2221	2545	1791	1991	1991	1769	2093
3x25mr	37,4	2338	2547	2547	2316	2651	1878	2087	2087	1855	2191
3x35mr	39,6	2709	2942	2942	2685	3052	2083	2316	2316	2059	2426
3x50ms	40,4	3025	3194	3194	3001	3307	2077	2246	2246	2052	2359
3x70ms	43,8	3659	3892	3892	3632	4023	2389	2622	2622	2363	2754
3x95ms	46,2	4561	4762	4762	4531	4909	2839	3040	3040	2809	3187
3x120ms	49,6	5457	5690	5690	5424	5849	3253	3487	3487	3220	3646
3x150ms	53,4	6724	6979	6979	6689	7150	3984	4238	4238	3948	4409
3x185ms	58,2	8066	8352	8352	8024	8558	4670	4955	4955	4628	5162
3x240ms	61,6	9765	10090	10090	9721	10310	5399	5723	5723	5354	5943

NUM-j, NUM-o for 0,66 kV under TU 3521-004-59680332-04 Power cables with copper conductors and PVC insulation in PVC sheath



DESIGN

- 1. Conductor:** copper, round, 1st or 2nd class according to GOST 22483-77.
- 2. Insulation:** PVC-compound. Insulated conductors have plain color according to the colors in table to the left. Insulation thickness is specified in the Appendix on page 123.
- 3. Stranding:** insulated conductors of two-, three-, four-, five-core cables are stranded and have the identical cross-section.
- 4. Inner sheath:** unvulcanized rubber compound, one-core conductors of NUM types are made without inner sheath. Inner sheath is put in order to fill in the spaces between insulated cores.
- 5. Sheath:** PVC-compound of grey color, nonsupportive to burning. Insulation thickness is specified in the Appendix on page 123.

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 6 kV and frequency of 50 Hz. For laying in dry and wet industrial facilities, special cable tray systems, blocks, in manufacturing and living buildings and facilities. For power supplying of electric installations, demanding cable gland during input. Cables of NUM-o and NUM-j types do not spread burning in case of single laying.

TECHNICAL STANDARDS

Ambient class UHL, T, placement categories 1 and 5 according to GOST 15150-69:
 Operating temperature range:.....from -50°C to +50°C
 Relative air humidity at max +35°C.....max 98%
 Laying and installation of cables without preheating is performed at temperature not less than:.....-15°C
 Nominal frequency.....50 Hz
 Test AC voltage with frequency of 50 Hz for voltage 0,66 kV:3 kV
 Bending radius at laying and installation:.....7,5 outer cable diameters
 Cable conductor continuous operating heating temperature max70°C
 Max allowed pulling force during cable tracing:.....50 N/mm²
 Construction length with the main core's cross-section up to 16 mm²450 m
 from 25 mm² to 70 mm²300 m
 Guarantee use period.....5 years from date of input of the cable into operation
 Service life.....30 years

Core number	Conductors with earth core of green-yellow color of NUM-J type	NUM-O conductors
1	green-yellow	black
2	-	black, blue
3	green-yellow, black, blue	black, blue, brown
4	green-yellow, black, blue, brown	black, blue, brown, black
5	green-yellow, black, blue, brown, black	-

The NUM-j, NUM-o cables

Number and nominal core cross-section, mm ²	Nominal outer diameter of conductor, mm	1 km cable weight, kg
1 x 1,5	5,4	46
1 x 2,5	6,0	61
1 x 4	6,6	81
1 x 6	7,1	103
1 x 10 sw	8,3	153
1 x 16	9,7	223
3 x 1,5	9,1	142
3 x 2,5	10,4	196
3 x 4	11,8	269
3 x 6	13,3	361
3 x 10 sw	16,2	561
3 x 16	19,6	849
3 x 25	23,0	1241
3 x 35	25,6	1605
4 x 1,5	9,8	166
4 x 2,5	11,2	232
4 x 4	13,2	336
4 x 6	14,8	453
4 x 10 sw	17,7	680
4 x 16	21,4	1035
4 x 25	25,6	1555
4 x 35	28,0	1979

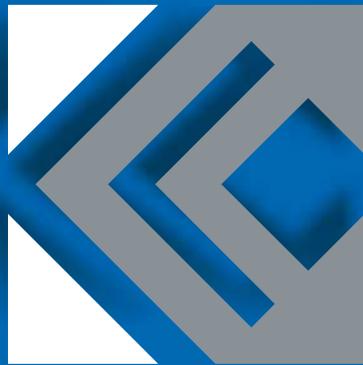
The NUM-o cables

Number and nominal core's cross-section, mm ²	Nominal outer diameter of conductor, mm	1 km cable weight, kg
2 x 1,5	8,7	125
2 x 2,5	9,9	170
2 x 4	11,2	229
2 x 6	12,6	303
2 x 10 sw	15,4	467
2 x 16	18,2	679
2 x 25	21,4	991
2 x 35	24,2	1301

The NUM-j cables

Number and nominal core's cross-section, mm ²	Nominal outer diameter of conductor, mm	1 km cable weight, kg
5 x 1,5	10,5	191
5 x 2,5	12,1	271
5 x 4	14,7	412
5 x 6	16,1	534
5 x 10 sw	19,3	808
5 x 16	23,8	1257
5 x 25	28,0	1858
5 x 35*	30,7	2373

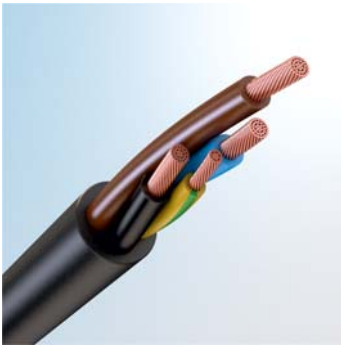
*Cables have to be made by the customer's request



**POWER FLEXIBLE
CABLES**

limited liability company
TOMSKCABLE

Power Flexible Cables for Nonstationary Laying TU 3544-024-59680332-2012



KG Power flexible cables: copper conductors

KG-HL Power flexible cable: copper conductors, cold-resistant design.

APPLICATION

Cables are designed for connection of mobile engines, mechanisms and equipment to power systems for nominal voltage 380 V, nominal frequency up to 50 Hz and 660 V, nominal frequency up to 400 Hz.

OKP CODE
354400

DESIGN

- 1. Conductor:** tinned copper wire, also, 5 class under GOST 22483-77. Number of conductors in cable is from 1 to 5.
- 2. Winding:** current-carrying conductor should be wound with PVC-E sheet.
Nominal insulation thickness should correspond to GOST 23286-78.
- 3. Insulation:** polymer high-elastic compound.
- 4. Stranding:** insulated conductors should be stranded into the cable. Cables with number of main cores 2 and 3 could be made with one ground core, or with one or two supplemental cores. In multi-core cables with identical core's cross-section one core could be used as neutral core.
- 5. Sheath:** polymer high-elastic compound.
Nominal sheath thickness should correspond to GOST 23286-78.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69.....	UHL, HL, placement categories 1, 2
Operating temperature range:	
KG.....	from -50°C to +50°C
KG-HL.....	from -60°C to +50°C
Relative air humidity at max+35°C.....	max 98%
Installation of cables without preheating is performed at temperature not less than:.....	-30°C
Electrical resistance of conductor during acceptance and delivery.....	GOST 22483-77
during operation and storage.....	up to 120% from normal value during acceptance and delivery
Electrical resistance of conductor insulation, calculated for 1 km length, not less than:	
during acceptance and delivery.....	100MΩ
during operation and storage.....	10MΩ
Test voltage under 50Hz frequency between cores in 5 min:	
during acceptance and delivery:	
For conductors of 380 V voltage.....	1500V
For conductors of 660 V voltage.....	2500V
during operation and storage:	
For conductors of 380 V voltage.....	1000V
For conductors of 660 V voltage.....	1500V
Conductors should be mechanically strong:	
- with nominal section of main cores 6mm ² and more.....	to multiple bends on +90° angle
- with nominal section up to 4mm ² incl.....	to multiple bends through roller system with not less than 45000 cycles.
Construction cable length, not less than	
- with nominal cross-section of main cores to 35 mm ² incl., not less than	150m
- with nominal cross-section of main cores from 50 mm ² to 240 mm ² incl.....	100m
Guarantee use period.....	6 months from date of input of the cable into operation
Service life.....	5 years

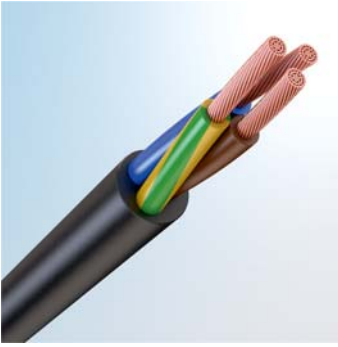
For the cable of voltage 660 V

Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km	Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km	Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km	Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km	Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km
1x0,75	5,0	31	2x0,75	7,4	66	3x0,75	7,8	76	4x0,75	8,4	91	5x0,75	9,5	113
1x1,00	5,2	34	2x1,00	7,8	75	3x1,00	8,2	88	4x1,00	9,2	113	5x1,00	10,0	132
1x1,50	5,5	41	2x1,50	8,4	91	3x1,50	9,2	116	4x1,50	9,9	139	5x1,50	10,8	168
1x2,50	6,4	58	2x2,50	10,5	146	3x2,50	11,1	175	4x2,50	12,1	212	5x2,50	13,6	269
1x4,00	7,0	79	2x4,00	11,8	199	3x4,00	12,5	244	4x4,00	14,0	310	5x4,00	15,3	379
1x6,00	7,5	96	2x6,00	12,8	245	3x6,00	13,9	314	4x6,00	15,2	386	5x6,00	16,6	475
1x10,00	9,4	159	2x10,00	16,2	406	3x10,00	17,1	507	4x10,00	19,4	651	5x10,00	21,2	799
1x16,00	10,5	220	2x16,00	18,3	559	3x16,00	20,0	733	4x16,00	22,0	912	5x16,00	26,1	1229
1x25,00	12,3	326	2x25,00	22,5	863	3x25,00	23,9	1099	4x25,00	28,4	1487	5x25,00	32,0	1891
1x35,00	14,0	440	2x35,00	27,1	1233	3x35,00	28,7	1561	4x35,00	32,4	2012	5x35,00	35,5	2474
1x50,00	15,7	579	2x50,00	30,6	1612	3x50,00	33,4	2120	4x50,00	36,6	2644	5x50,00	41,2	3361
1x70,00	17,4	765	2x70,00	35,0	2164	3x70,00	38,1	2845	4x70,00	41,8	3556	5x70,00	46,8	4499
1x95,00	20,3	1037	2x95,00	40,5	2914	3x95,00	43,0	3733	4x95,00	48,2	4780	5x95,00	53,9	6018
1x120,00	21,9	1275	2x120,00	44,8	3622	3x120,00	47,5	4651	4x120,00	53,2	5947	5x120,00	59,4	7469
1x150,00	26,0	1668	2x150,00	50,0	4512	3x150,00	53,0	5795	4x150,00	59,2	7396	5x150,00	66,0	9294
1x185,00	28,2	2019	2x185,00	54,5	5443	3x185,00	58,8	7135	4x185,00	65,6	9093	5x185,00	-	-
1x240,00	32,6	2705	2x240,00	63,1	7318	3x240,00	67,0	9432	4x240,00	73,6	11868	5x240,00	-	-

For the cable of voltage 380 V

Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km	Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km	Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km	Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km	Nominal core's cross-section, mm ²	Outer diameter of the cable, mm	Nominal weight, kg/km
1x0,75	4,6	27	2x0,75	6,8	57	3x0,75	7,1	67	4x0,75	7,7	80	5x0,75	8,3	93
1x1,00	4,8	30	2x1,00	7,2	66	3x1,00	7,5	78	4x1,00	8,2	94	5x1,00	9,3	118
1x1,50	5,1	36	2x1,50	7,8	82	3x1,50	8,2	98	4x1,50	9,3	126	5x1,50	10,0	153
1x2,50	5,8	50	2x2,50	9,5	126	3x2,50	10,0	152	4x2,50	10,9	185	5x2,50	11,9	227
1x4,00	6,4	70	2x4,00	10,8	176	3x4,00	11,4	217	4x4,00	12,5	268	5x4,00	14,0	342
1x6,00	6,9	87	2x6,00	11,8	219	3x6,00	12,5	274	4x6,00	14,0	351	5x6,00	15,3	431
1x10,00	8,4	141	2x10,00	15,2	373	3x10,00	16,1	470	4x10,00	17,6	585	5x10,00	19,8	739
1x16,00	9,9	207	2x16,00	17,3	522	3x16,00	18,8	682	4x16,00	20,6	853	5x16,00	22,6	1059
1x25,00	11,7	311	2x25,00	21,3	809	3x25,00	22,7	1038	4x25,00	25,4	1325	5x25,00	28,0	1645
1x35,00	13,4	423	2x35,00	24,3	1086	3x35,00	25,8	1402	4x35,00	28,5	1767	5x35,00	32,0	2238
1x50,00	15,1	560	2x50,00	27,8	1444	3x50,00	30,2	1908	4x50,00	33,3	2405	5x50,00	37,1	3022
1x70,00	16,8	743	2x70,00	31,8	1946	3x70,00	33,9	2532	4x70,00	37,8	3235	5x70,00	42,8	4110
1x95,00	19,5	1004	2x95,00	36,7	2615	3x95,00	39,1	3409	4x95,00	44,2	4407	5x95,00	49,8	5592
1x120,00	21,1	1238	2x120,00	41,0	3289	3x120,00	43,7	4291	4x120,00	49,2	5534	5x120,00	55,3	6998
1x150,00	23,2	1527	2x150,00	45,2	4046	3x150,00	49,2	5390	4x150,00	55,3	6933	5x150,00	63,0	8894
1x185,00	25,8	1886	2x185,00	50,7	5034	3x185,00	54,9	6685	4x185,00	62,6	8706	5x185,00	-	-
1x240,00	29,8	2526	2x240,00	60,3	6964	3x240,00	64,1	9047	4x240,00	70,7	11431	5x240,00	-	-

Flexible Cables with Plastic Insulation TU 3561-026-59680332-2013



KGVV: flexible, copper conductors, PVC-compound insulation and sheath

KGVV-HL: flexible, copper conductors, cold-resistant PVC-compound insulation and sheath

KGVVng(A): flexible, copper conductors, PVC-compound insulation, flame-retardant PVC-compound sheath

KGVVng(A)-LS: flexible, copper conductors, low-smoke PVC-compound insulation and, low fume and gas emission

KGVVng(A)-LSLTx: flexible, copper conductors, low-smoke PVC-compound insulation and sheath, low toxicity of combustion products

KGPPng(A)-HF: flexible, copper conductors, halogen-free polymer compound insulation and sheath,

KGVVng(A)-FRLS: flexible, copper conductors, low-smoke PVC-compound insulation and sheath, low fume and gas emission, with thermal barrier along current-carrying conductor and inner sheath

KGVVng(A)-FRLSLTx: flexible, copper conductors, low-smoke PVC-compound insulation and sheath, low toxicity of combustion products, with thermal barrier along current-carrying conductor and inner sheath

KGPPng(A)-FRHF: flexible, copper conductors, halogen-free polymer compound insulation and sheath, with thermal barrier along current-carrying conductor and inner sheath

KGVEV: flexible, copper conductors, PVC-compound insulation and sheath, screened

KGVEV-HL: flexible, copper conductors, cold-resistant PVC-compound insulation and sheath, screened

KGVEVng(A): flexible, copper conductors, PVC-compound insulation, flame-retardant PVC-compound sheath

KGVEVng(A)-LS: flexible, copper conductors, low-smoke PVC-compound insulation and sheath, with low fume and gas emission, screened

KGVEVng(A)-LSLTx: flexible, copper conductors, low-smoke PVC-compound insulation and sheath, with low toxicity of combustion products, screened

KGPEPng(A)-HF: flexible, copper conductors, halogen-free polymer compound insulation and sheath, screened

KGVEVng(A)-FRLS: flexible, copper conductors, cold-resistant, low-smoke PVC-compound insulation and sheath, low fume and gas emission, with thermal barrier along current-carrying conductor and inner sheath, screened

KGVEVng(A)-FRLSLTx: flexible, copper conductors, cold-resistant, low-smoke PVC-compound insulation and sheath, low fume and gas emission, with thermal barrier along current-carrying conductor and inner sheath, screened

KGPEPng(A)-FRHF: flexible, copper conductors, halogen-free polymer compound insulation and sheath, with thermal barrier along current-carrying conductor and inner sheath, screened

APPLICATION

The cables are designed for fixed installation of power and control circuits on machines and mechanisms at voltage of 660 and 1000 V AC frequency to 60 Hz or at 1000V and 1500V DC.

The cables are designed for the needs of the economy and used in industrial and energy facilities. The cables of "ng (A) -LS», «ng (A) -FRLS», «ng (A) -HF» and «ng (A) -FRHF»-types can be used in nuclear power plants outside containment area in systems class 2,3 and 4 according to classifier OPB 88/97 (PNAE G 01-011).

The cables with PVC-compound insulation and sheath, including cold-resistant ones, are designed for single laying in cable lines, and perform a circuit current collectors located on the premises.

The cables with low-smoke PVC-compound insulation and sheath with low fume and gas emission of "ng (A) -LS" and "ng (A) -FRLS" types are designed for bunched laying in cable lines in the office and industrial buildings, including underground structures in residential and public buildings.

The cables with halogen free polymer compound insulation and sheath of "ng (A) -HF" and "ng (A) -FRHF" types are designed for bunched laying in electrical wiring in public buildings, kindergartens, specialized nursing homes for the disabled people, hospitals and children's orphanages.

The cables of "ng (A) -LSLTx" type are designed for installation in buildings and kindergartens, specialized nursing homes, hospitals, sleeping buildings of educational institutions providing residential and childcare.

The cables of "ng (A) -FRLSLTx" type are designed for installation in fire protection systems, as well as in other systems, which must remain operative in the event of fire in buildings of kindergartens, specialized nursing homes, hospitals, sleeping buildings, educational and residential care institutions for children.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69 for the cables of

- "HL"-type.....HL, placement category 1
 - other types.....UHL, placement category 5

Operating temperature range for the cables of stationary laying of

- "HL"-type.....from -60°C to +50°C
 - other types.....from -50°C to +50°C

Operating temperature range for the cables of non-stationary laying.....from 0°C to +50°C

Relative air humidity at max +35°C.....max 98%

Cable conductor continuous operating heating temperature max70°C

Laying and installation of cables without

preheating is performed at temperature not less than:

for the "HL"-type cables.....-30°C

for the other types of cables.....-15°C

Nominal frequency.....50 Hz

Test AC voltage with frequency 50 Hz

for the voltage 0,66 kV.....2,5 kV

for the voltage 1 kV.....3,0 kV

Minimal bending radius at laying and installation:

for the cables of stationary laying.....5 nominal cable diameters

for the non-screeded cables of non-stationary laying.....10 outer cable diameters

for the screeded cables of non-stationary laying.....20 outer cable diameters

Construction length of the cables.....100 m

Guarantee use period

for the cables of stationary laying.....5 years

for the cables of non-stationary laying.....6 months

Service life

for the cables of stationary laying.....30 years

for the cables of non-stationary laying.....4 years

DESIGN

1. Conductor: copper, 3 or 4 class according to GOST 22483.

2. Thermal barrier: - current-carrying conductors for fireproof cables should be braided with two layers of mica-containing band. Thickness of mica-containing bands is not less than 0,12 mm.

3. Insulation: for the cables of KGVV, KGVVng (A), KGVEV, KGVEVng (A) types: PVC-compound.

For the cables of KGVV-HL, KGVEV-HL types: cold-resistant PVC-compound.

For the cables of KGVVng (A)-LS, KGVVng (A)-FRLS, KGVEVng (A)-LS, KGVEVng (A)-FRLS: low-smoke PVC-compound, with low fume and gas emission.

For the cables of KGVVng (A)-LSLTx, KGVVng (A)-FRLSLTx, KGVEVng (A)-LSLTx, KGVEVng (A)-FRLSLTx types: low-smoke PVC-compound, with low toxicity of combustion products.

For the cables of KGPPng(A)-HF, KGPPng(A)-FRHF, KGPEPng (A)-HF, KGPEPng (A)-FRHF types: halogen-free polymer compound.

Insulated conductors of multi-core cables with number of cores up to 5 (incl.) are of different colors, with number of cores 7 and more in each layer should have count core and conductor, differ in color from each other and from other layer cores. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow.

4. Stranding: three-core cables have the identical cross-section.

3 or 4 core cables with core's cross-section 4 mm² and more might have one core of smaller cross-section (ground conduction (PE) or neutral (N)).

5. Inner sheath: for the cables of KGVVng (A)-LS, KGVVng (A)-FRLS, KGVEVng (A)-LS, KGVEVng (A)-FRLS types: low-smoke PVC-compound, with low fume and gas emission.

For the cables of KGVVng (A)-LSLTx, KGVVng (A)-FRLSLTx, KGVEVng (A)-LSLTx, KGVEVng (A)-FRLSLTx types: low-smoke PVC-compound, with low toxicity of combustion products.

For the cables of KGPPng(A)-HF, KGPPng(A)-FRHF, KGPEPng (A)-HF, KGPEPng (A)-FRHF types: halogen-free polymer compound.

Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one.

6. Thermal barrier: for fireproof control cables, winding by one mica-containing band with overlapping not less than 30% of band width. Band thickness is not less than 0,12 mm.

7. Screen: for screened cables: from copper wire in the form of cable braid.

8. Outer sheath: for the cables of KGVV, KGVEV types: PVC-compound.

For the cables of KGVVng (A), KGVEVng (A) types: flame-retardant PVC-compound.

For the cables of KGVV-HL, KGVEV-HL types: cold-resistant PVC-compound.

For the cables of KGVVng (A)-LS, KGVVng (A)-FRLS, KGVEVng (A)-LS, KGVEVng (A)-FRLS types: low-smoke PVC-compound, with low fume and gas emission

For the cables of KGVVng (A)-LSLTx, KGVVng (A)-FRLSLTx, KGVEVng (A)-LSLTx, KGVEVng (A)-FRLSLTx types: low-smoke PVC-compound, with low toxicity of combustion products.

For the cables of KGPPng(A)-HF, KGPPng(A)-FRHF, KGPEPng (A)-HF, KGPEPng (A)-FRHF types: halogen-free polymer compound.

Cable type	Voltage, V	KGVV		KGVVng(A)		KGVV-HL		KGVVng(A)-LS		KGVVng(A)-LSLTx	
		Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg
1 x 1,0	660	5,2	36,1	5,2	37,8	5,2	34,5	5,2	43,2	5,2	43,3
1 x 1,5	660	5,5	42,6	5,5	44,4	5,5	40,9	5,5	50,3	5,5	50,5
1 x 2,5	660	6,0	55,1	6,0	57,0	6,0	53,1	6,0	63,8	6,0	64,0
1 x 4,0	660	6,8	77,8	6,8	80,1	6,8	75,4	6,8	88,5	6,8	89,1
1 x 6,0	660	7,3	95,5	7,3	98,0	7,3	92,8	7,3	107,3	7,3	107,9
1 x 10,0	1000	9,4	164,1	9,4	168,2	9,4	159,8	9,4	183,6	9,4	184,8
1 x 16,0	1000	10,5	225,3	10,5	230,0	10,5	220,4	10,5	247,8	10,5	249,3
1 x 25,0	1000	12,3	332,7	12,3	338,3	12,3	326,4	12,3	361,6	12,3	364,4
1 x 35,0	1000	13,6	436,8	13,6	443,0	13,6	429,6	13,6	469,5	13,6	472,8
1 x 50,0	1000	15,3	576,1	15,3	583,2	15,3	567,5	15,3	616,0	15,3	621,0
1 x 70,0	1000	17,0	761,9	17,0	769,9	17,0	752,2	17,0	807,2	17,0	813,1
1 x 95,0	1000	19,7	1027,1	19,7	1037,6	19,7	1014,3	19,7	1086,9	19,7	1094,8
1 x 120,0	1000	21,3	1263,7	21,3	1275,2	21,3	1249,6	21,3	1329,5	21,3	1338,4
1 x 150,0	1000	23,8	1573,3	23,8	1587,7	23,8	1555,7	23,8	1655,7	23,8	1666,8
1 x 185,0	1000	25,6	1892,8	25,6	1908,4	25,6	1873,6	25,6	1982,5	25,6	1994,8
1 x 240,0	1000	28,8	2486,6	28,8	2504,3	28,8	2464,4	28,8	2591,2	28,8	2606,6
1 x 300,0	1000	31,7	3117,7	31,7	3137,3	31,7	3092,5	31,7	3236,9	31,7	3255,6
2 x 1,0	660	8,0	67,6	8,0	70,5	8,0	64,6	8,0	104,8	8,0	104,5
2 x 1,5	660	9,2	92,8	9,2	96,9	9,2	88,8	9,2	140,2	9,2	139,5
2 x 2,5	660	10,1	119,3	10,1	124,0	10,1	114,7	10,1	178,9	10,1	178,1
2 x 4,0	660	11,8	167,7	11,8	173,3	11,8	162,0	11,8	252,3	11,8	251,4
2 x 6,0	660	12,8	204,8	12,8	210,9	12,8	198,5	12,8	305,4	12,8	304,4
2 x 10,0	1000	15,8	323,6	15,8	331,3	15,8	315,0	15,8	485,0	15,8	484,3
2 x 16,0	1000	17,9	447,4	17,9	456,2	17,9	437,4	17,9	659,0	17,9	657,9
2 x 25,0	1000	22,3	699,2	22,3	711,8	22,3	684,9	24,9	1253,5	24,9	1263,6
2 x 35,0	1000	25,3	936,1	25,3	952,0	25,3	918,3	27,5	1581,3	27,5	1593,8
2 x 50,0	1000	28,8	1226,1	28,8	1244,4	28,8	1204,7	31,4	2083,0	31,4	2101,2
2 x 70,0	1000	32,2	1609,5	32,2	1630,1	32,2	1585,1	35,2	2696,3	35,2	2717,7
2 x 95,0	1000	37,1	2154,9	37,1	2181,3	37,1	2123,5	39,7	3495,6	39,7	3525,2
2 x 120,0	1000	40,4	2640,5	40,4	2669,4	40,4	2605,9	43,4	4262,0	43,4	4297,1
2 x 150,0	1000	45,0	3274,5	45,0	3309,7	45,0	3231,8	48,0	5232,8	48,0	5276,3
2 x 185,0	1000	48,6	3927,8	48,6	3966,1	48,6	3881,4	51,7	6183,9	51,7	6233,7
2 x 240,0	1000	55,3	5191,0	55,3	5238,4	55,3	5133,8	58,7	8106,0	58,7	8168,9
3 x 1,0	660	9,0	97,1	9,0	101,1	9,0	92,9	9,0	135,0	9,0	135,0
3 x 1,5	660	9,6	116,3	9,6	120,7	9,6	111,7	9,6	160,1	9,6	160,1
3 x 2,5	660	10,7	153,3	10,7	158,2	10,7	148,1	10,7	207,6	10,7	207,7
3 x 4,0	660	12,5	221,0	12,5	228,9	12,5	214,5	12,5	297,1	12,5	297,7
3 x 6,0	660	13,5	273,8	13,5	280,3	13,5	266,5	13,5	363,6	13,5	364,2
3 x 10,0	1000	16,7	443,3	16,7	451,5	16,7	433,2	16,7	585,7	16,7	587,9
3 x 16,0	1000	19,4	640,3	19,4	651,2	19,4	627,4	19,4	830,2	19,4	832,2
3 x 25,0	1000	24,1	996,6	24,1	1011,7	24,1	978,1	26,3	1495,4	26,3	1508,8
3 x 35,0	1000	26,9	1311,1	26,9	1328,2	26,9	1290,1	29,1	1907,3	29,1	1923,5
3 x 50,0	1000	30,6	1732,3	30,6	1751,9	30,6	1706,7	33,2	2521,7	33,2	2545,1
3 x 70,0	1000	34,7	2325,2	34,7	2349,8	34,7	2294,0	37,3	3289,8	37,3	3316,9
3 x 95,0	1000	39,5	3079,8	39,5	3108,1	39,5	3041,9	42,6	4343,8	42,6	4381,6
3 x 120,0	1000	43,1	3793,8	43,1	3824,7	43,1	3752,0	46,5	5308,3	46,5	5350,4
3 x 150,0	1000	48,0	4709,1	48,0	4746,9	48,0	4657,5	51,0	6463,4	51,0	6517,1
3 x 185,0	1000	51,9	5672,0	51,9	5713,0	51,9	5615,8	55,7	7812,3	55,7	7872,5
3 x 240,0	1000	59,0	7515,6	59,0	7566,4	59,0	7446,5	62,5	10098,8	62,5	10174,4
4 x 1,0	660	9,7	117,3	9,7	121,8	9,7	112,5	9,7	157,6	9,7	158,1
4 x 1,5	660	10,4	142,1	10,4	146,9	10,4	136,8	10,4	188,4	10,4	189,0
4 x 2,5	660	11,6	189,9	11,6	195,3	11,6	183,9	11,6	247,1	11,6	247,9
4 x 4,0	660	13,6	277,6	13,6	284,1	13,6	270,0	13,6	357,4	13,6	359,0

Cable type	Voltage, V	KGVV		KGVVng(A)		KGVVHL		KGVVng(A)-LS		KGVVng(A)-LSLTx	
		Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg
4 x 6,0	660	14,8	346,5	14,8	353,6	14,8	338,0	14,8	440,2	14,8	442,0
4 x 10,0	1000	18,8	584,7	18,8	595,2	18,8	571,7	18,8	738,1	18,8	742,0
4 x 16,0	1000	21,4	823,2	21,4	835,2	21,4	807,9	21,4	1019,8	21,4	1024,4
4 x 25,0	1000	26,5	1283,0	26,5	1299,8	26,5	1261,1	28,8	1810,5	28,8	1828,0
4 x 35,0	1000	29,6	1696,9	29,6	1715,9	29,6	1672,0	32,2	2365,3	32,2	2386,6
4 x 50,0	1000	34,2	2282,1	34,2	2306,3	34,2	2249,4	36,8	3124,4	36,8	3153,2
4 x 70,0	1000	38,3	3027,3	38,3	3054,6	38,3	2990,1	41,0	4038,2	41,0	4072,7
4 x 95,0	1000	43,8	4023,0	43,8	4054,4	43,8	3977,6	47,2	5400,5	47,2	5447,0
4 x 120,0	1000	48,2	5010,8	48,2	5048,7	48,2	4957,8	51,2	6550,1	51,2	6603,1
4 x 150,0	1000	53,2	6168,2	53,2	6210,2	53,2	6106,2	57,0	8131,4	57,0	8198,4
4 x 185,0	1000	58,0	7495,4	58,0	7545,2	58,0	7424,3	61,4	9672,2	61,4	9747,5
4 x 240,0	1000	66,5	10023,1	66,5	10091,6	66,5	9930,3	70,4	12838,0	70,4	12928,7
5 x 1,0	660	10,5	147,8	10,5	152,7	10,5	142,4	10,5	193,5	10,5	194,4
5 x 1,5	660	11,3	178,2	11,3	183,5	11,3	172,2	11,3	230,4	11,3	231,5
5 x 2,5	660	12,6	236,9	12,6	242,9	12,6	230,0	12,6	301,0	12,6	302,4
5 x 4,0	660	14,9	352,3	14,9	359,5	14,9	343,5	14,9	442,0	14,9	444,5
5 x 6,0	660	16,2	437,3	16,2	445,3	16,2	427,6	16,2	542,1	16,2	545,0
5 x 10,0	1000	20,6	729,5	20,6	741,0	20,6	714,3	20,6	899,2	20,6	905,1
5 x 16,0	1000	23,9	1056,2	23,9	1071,2	23,9	1037,1	23,9	1280,6	23,9	1286,9
5 x 25,0	1000	29,2	1610,7	29,2	1629,3	29,2	1585,3	31,8	2231,8	31,8	2254,0
5 x 35,0	1000	32,7	2154,6	32,7	2175,6	32,7	2125,6	35,7	2934,3	35,7	2959,7
5 x 50,0	1000	37,8	2876,4	37,8	2903,3	37,8	2838,4	40,4	3804,2	40,4	3839,9
5 x 70,0	1000	42,4	3841,2	42,4	3871,6	42,4	3797,8	45,8	5066,9	45,8	5108,8
5 x 95,0	1000	48,9	5122,9	48,9	5161,4	48,9	5066,8	51,9	6593,2	51,9	6650,3
5 x 120,0	1000	53,4	6436,5	53,4	6478,7	53,4	6374,6	57,2	8281,9	57,2	8346,2
5 x 150,0	1000	59,4	7929,8	59,4	7980,9	59,4	7853,5	62,8	10045,2	62,8	10127,1
5 x 185,0	1000	64,3	9521,3	64,3	9576,9	64,3	9438,1	68,7	12115,3	68,7	12202,6
5 x 240,0	1000	73,8	12717,1	73,8	12793,4	73,8	12608,7	77,6	15813,1	77,6	15923,5
2 x 4,0 + 1 x 2,5	660	12,5	203,2	12,5	209,2	12,5	197,3	12,5	288,6	12,5	288,6
2 x 6,0 + 1 x 2,5	660	12,9	236,8	12,9	243,0	12,9	230,5	12,9	323,1	12,9	323,4
2 x 10,0 + 1 x 4,0	1000	15,8	373,5	15,8	381,2	15,8	365,0	15,8	505,5	15,8	506,9
2 x 16,0 + 1 x 6,0	1000	17,9	513,0	17,9	521,9	17,9	503,1	17,9	687,7	17,9	689,1
2 x 25,0 + 1 x 10,0	1000	22,3	815,3	22,3	827,9	22,3	801,0	24,9	1302,5	24,9	1314,1
2 x 35,0 + 1 x 16,0	1000	25,6	1111,4	25,6	1127,6	25,6	1093,5	27,8	1689,6	27,8	1704,1
2 x 50,0 + 1 x 16,0	1000	28,8	1398,5	28,8	1416,8	28,8	1377,1	31,4	2160,2	31,4	2180,0
2 x 70,0 + 1 x 25,0	1000	32,2	1880,6	32,2	1901,3	32,2	1856,3	35,2	2822,9	35,2	2846,7
2 x 95,0 + 1 x 35,0	1000	37,1	2525,3	37,1	2551,7	37,1	2493,9	39,7	3676,6	39,7	3708,6
2 x 120,0 + 1 x 35,0	1000	40,4	3010,9	40,4	3039,8	40,4	2976,3	43,4	4438,3	43,4	4475,8
2 x 150,0 + 1 x 50,0	1000	45,0	3777,3	45,0	3812,6	45,0	3734,7	48,0	5475,0	48,0	5521,8
2 x 185,0 + 1 x 50,0	1000	48,6	4430,7	48,6	4468,9	48,6	4384,2	51,7	6419,9	51,7	6472,9
2 x 240,0 + 1 x 70,0	1000	55,3	5875,0	55,3	5922,4	55,3	5817,8	58,7	8441,0	58,7	8507,0
2 x 4,0 + 1 x 2,5	660	12,5	203,2	12,5	209,2	12,5	197,3	12,5	288,6	12,5	288,6
2 x 6,0 + 1 x 4,0	660	13,5	259,7	13,5	266,2	13,5	253,1	13,5	355,9	13,5	356,3
2 x 10,0 + 1 x 6,0	1000	16,0	390,5	16,0	398,3	16,0	381,9	16,0	523,8	16,0	525,4
2 x 16,0 + 1 x 10,0	1000	19,4	588,6	19,4	599,4	19,4	577,0	19,4	799,5	19,4	800,7
2 x 25,0 + 1 x 16,0	1000	24,1	905,0	24,1	920,1	24,1	888,5	26,3	1449,5	26,3	1462,5
2 x 35,0 + 1 x 16,0	1000	25,6	1111,4	25,6	1127,6	25,6	1093,5	27,8	1689,6	27,8	1704,1
2 x 50,0 + 1 x 25,0	1000	29,1	1500,7	29,1	1519,3	29,1	1479,1	31,8	2250,4	31,8	2271,5
2 x 70,0 + 1 x 35,0	1000	32,6	1983,8	32,6	2004,8	32,6	1959,2	35,7	2930,3	35,7	2954,8
2 x 95,0 + 1 x 50,0	1000	37,6	2662,7	37,6	2689,5	37,6	2631,0	40,2	3811,0	40,2	3844,8
2 x 120,0 + 1 x 70,0	1000	40,9	3330,0	40,9	3359,3	40,9	3295,0	44,0	4696,5	44,0	4736,0
2 x 150,0 + 1 x 70,0	1000	45,6	3965,1	45,6	4000,9	45,6	3922,1	48,6	5678,4	48,6	5726,4
2 x 185,0 + 1 x 95,0	1000	49,3	4861,1	49,3	4899,9	49,3	4814,2	52,3	6777,5	52,3	6833,2
2 x 240,0 + 1 x 120,0	1000	56,0	6358,8	56,0	6406,9	56,0	6301,1	59,5	8864,5	59,5	8933,3

Cable type	Voltage, V	KGVV		KGVVng(A)		KGVVHL		KGVVng(A)-LS		KGVVng(A)-LSLTx	
		Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg
3 x 4,0 + 1 x 2,5	660	13,6	259,8	13,6	266,4	13,6	252,8	13,6	348,8	13,6	349,9
3 x 6,0 + 1 x 2,5	660	14,3	310,1	14,3	317,0	14,3	302,5	14,3	401,6	14,3	403,1
3 x 10,0 + 1 x 4,0	1000	17,2	496,8	17,2	505,3	17,2	486,4	17,2	621,2	17,2	625,1
3 x 16,0 + 1 x 6,0	1000	20,0	710,6	20,0	721,8	20,0	697,3	20,0	879,1	20,0	883,0
3 x 25,0 + 1 x 10,0	1000	24,8	1119,6	24,8	1135,2	24,8	1100,7	27,1	1582,7	27,1	1598,0
3 x 35,0 + 1 x 16,0	1000	28,5	1499,2	28,5	1517,4	28,5	1477,2	30,8	2116,7	30,8	2135,8
3 x 50,0 + 1 x 16,0	1000	31,6	1913,9	31,6	1934,1	31,6	1887,7	34,6	2701,0	34,6	2725,6
3 x 70,0 + 1 x 25,0	1000	35,8	2607,8	35,8	2633,3	35,8	2575,9	38,5	3495,2	38,5	3525,4
3 x 95,0 + 1 x 35,0	1000	40,8	3463,5	40,8	3492,7	40,8	3424,8	43,9	4627,9	43,9	4669,2
3 x 120,0 + 1 x 35,0	1000	44,9	4219,5	44,9	4254,7	44,9	4174,2	48,0	5608,1	48,0	5653,7
3 x 150,0 + 1 x 50,0	1000	49,6	5229,7	49,6	5268,8	49,6	5177,1	53,0	6921,7	53,0	6981,1
3 x 185,0 + 1 x 50,0	1000	53,6	6194,3	53,6	6236,7	53,6	6136,8	57,5	8226,1	57,5	8291,3
3 x 240,0 + 1 x 70,0	1000	61,0	8223,6	61,0	8276,2	61,0	8153,0	64,5	10658,5	64,5	10739,6
3 x 4,0 + 1 x 2,5	660	13,6	259,8	13,6	266,4	13,6	252,8	13,6	348,8	13,6	349,9
3 x 6,0 + 1 x 4,0	660	14,8	332,4	14,8	339,6	14,8	324,6	14,8	432,5	14,8	434,1
3 x 10,0 + 1 x 6,0	1000	17,8	515,9	17,8	524,7	17,8	505,4	17,8	657,0	17,8	660,8
3 x 16,0 + 1 x 10,0	1000	21,4	771,4	21,4	783,4	21,4	757,5	21,4	989,1	21,4	992,9
3 x 25,0 + 1 x 16,0	1000	26,5	1191,4	26,5	1208,2	26,5	1171,5	28,8	1764,6	28,8	1781,6
3 x 35,0 + 1 x 16,0	1000	28,5	1499,2	28,5	1517,4	28,5	1477,2	30,8	2116,7	30,8	2135,8
3 x 50,0 + 1 x 25,0	1000	32,6	2021,8	32,6	2042,7	32,6	1995,1	35,6	2864,0	35,6	2890,8
3 x 70,0 + 1 x 35,0	1000	36,9	2718,5	36,9	2744,8	36,9	2685,9	39,6	3694,3	39,6	3726,3
3 x 95,0 + 1 x 50,0	1000	42,1	3609,2	42,1	3639,4	42,1	3569,7	45,6	4937,1	45,6	4980,5
3 x 120,0 + 1 x 70,0	1000	46,4	4549,0	46,4	4585,4	46,4	4502,7	49,4	6013,5	49,4	6063,0
3 x 150,0 + 1 x 70,0	1000	51,2	5428,7	51,2	5469,1	51,2	5374,9	55,0	7370,5	55,0	7432,0
3 x 185,0 + 1 x 95,0	1000	55,8	6687,3	55,8	6735,1	55,8	6625,4	59,2	8799,6	59,2	8870,1
3 x 240,0 + 1 x 120,0	1000	63,0	8722,4	63,0	8776,8	63,0	8650,3	67,5	11550,8	67,5	11634,1
7 x 1,0	660	11,4	174,5	11,4	179,8	11,4	168,1	11,4	202,6	11,4	205,1
7 x 1,5	660	12,2	215,3	12,2	221,1	12,2	208,3	12,2	246,4	12,2	249,4
7 x 2,5	660	13,7	295,1	13,7	301,6	13,7	286,9	13,7	331,1	13,7	334,8
7 x 4,0	660	16,2	441,5	16,2	449,4	16,2	431,0	16,2	488,0	16,2	493,9
7 x 6,0	660	17,7	558,0	17,7	566,7	17,7	546,3	17,7	609,8	17,7	616,6
7 x 10,0	1000	22,6	953,2	22,6	966,0	22,6	934,9	22,6	1035,0	22,6	1047,6
10 x 1,0	660	14,2	239,4	14,2	246,3	14,2	230,9	14,2	276,9	14,2	280,8
10 x 1,5	660	15,3	297,3	15,3	304,7	15,3	287,9	15,3	338,8	15,3	343,4
10 x 2,5	660	17,3	410,2	17,3	418,7	17,3	399,3	17,3	458,6	17,3	464,2
10 x 4,0	660	21,0	636,7	21,0	648,5	21,0	621,3	21,0	704,8	21,0	713,0
10 x 6,0	660	23,0	803,9	23,0	816,9	23,0	786,8	23,0	879,8	23,0	889,3
14 x 1,0	660	15,3	308,5	15,3	315,9	15,3	298,3	15,3	353,6	15,3	359,8
14 x 1,5	660	16,6	387,1	16,6	395,2	16,6	375,8	16,6	437,3	16,6	444,5
14 x 2,5	660	19,1	558,5	19,1	569,1	19,1	544,2	19,1	621,9	19,1	630,2
14 x 4,0	660	22,8	845,6	22,8	858,5	22,8	827,0	22,8	928,5	22,8	941,3
14 x 6,0	660	25,4	1098,1	25,4	1114,1	25,4	1075,9	25,4	1196,9	25,4	1210,9
16 x 1,0	660	16,1	344,6	16,1	352,5	16,1	333,5	16,1	394,0	16,1	401,3
16 x 1,5	660	17,5	433,8	17,5	442,4	17,5	421,4	17,5	488,9	17,5	497,3
16 x 2,5	660	20,2	627,0	20,2	638,3	20,2	611,4	20,2	696,4	20,2	706,2
16 x 4,0	660	24,5	975,0	24,5	990,5	24,5	953,2	24,5	1072,1	24,5	1086,5
16 x 6,0	660	26,8	1238,3	26,8	1255,3	26,8	1214,0	26,8	1346,6	26,8	1363,1
19 x 1,0	660	17,0	396,2	17,0	404,6	17,0	383,9	17,0	451,4	17,0	460,4
19 x 1,5	660	18,8	517,9	18,8	528,3	18,8	503,0	18,8	584,0	18,8	594,0
19 x 2,5	660	21,2	726,1	21,2	738,1	21,2	708,8	21,2	803,4	21,2	815,6
19 x 4,0	660	25,8	1132,7	25,8	1149,0	25,8	1108,4	25,8	1241,1	25,8	1258,9
19 x 6,0	660	28,3	1442,9	28,3	1460,9	28,3	1415,8	28,3	1563,9	28,3	1584,3
24 x 1,0	660	20,5	523,9	20,5	535,4	20,5	507,5	20,8	602,4	20,8	613,4
24 x 1,5	660	22,3	658,3	22,3	670,9	22,3	640,1	22,5	745,5	22,5	758,2

Cable type	Voltage, V	KGVV		KGVVng(A)		KGVVHL		KGVVng(A)-LS		KGVVng(A)-LSLTx	
		Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg
24 x 2,5	660	25,6	945,1	25,6	961,2	25,6	922,3	25,8	1053,1	25,8	1068,1
24 x 4,0	660	30,6	1435,1	30,6	1454,7	30,6	1405,3	30,8	1576,0	30,8	1598,8
27 x 1,0	660	20,9	573,3	20,9	585,1	20,9	555,8	21,2	657,0	21,2	669,8
27 x 1,5	660	22,7	723,1	22,7	735,9	22,7	703,6	23,0	816,1	23,0	830,9
27 x 2,5	660	26,1	1040,9	26,1	1057,4	26,1	1016,6	26,3	1156,0	26,3	1173,4
27 x 4,0	660	31,3	1587,5	31,3	1607,5	31,3	1555,6	31,5	1738,2	31,5	1764,7
30 x 1,0	660	21,7	625,3	21,7	637,5	21,7	606,6	21,9	714,8	21,9	729,4
30 x 1,5	660	23,9	812,2	23,9	827,3	23,9	790,0	24,2	918,0	24,2	934,1
30 x 2,5	660	27,0	1140,4	27,0	1157,5	27,0	1114,4	27,3	1263,5	27,3	1283,3
37 x 1,0	660	23,3	746,3	23,3	759,5	23,3	724,8	23,9	876,7	23,9	894,7
37 x 1,5	660	25,7	971,2	25,7	987,5	25,7	945,7	26,0	1092,7	26,0	1113,4
37 x 2,5	660	29,1	1371,9	29,1	1390,4	29,1	1341,9	29,4	1513,7	29,4	1539,0
44 x 1,0	660	26,5	900,8	26,5	917,6	26,5	874,2	26,7	1026,7	26,7	1048,4
44 x 1,5	660	28,8	1142,0	28,8	1160,4	28,8	1112,4	29,1	1282,3	29,1	1307,4
52 x 1,0	660	27,6	1033,9	27,6	1051,5	27,6	1004,4	27,9	1173,8	27,9	1200,4
52 x 1,5	660	30,1	1316,2	30,1	1335,4	30,1	1283,2	30,3	1472,4	30,3	1502,9
61 x 1,0	660	29,3	1187,0	29,3	1205,7	29,3	1154,0	29,5	1343,6	29,5	1375,4
61 x 1,5	660	31,9	1515,8	31,9	1536,3	31,9	1478,8	32,1	1690,8	32,1	1727,4

Cable type	Voltage, v	KGVVng(A)-FRLS		KGVVng(A)-FRLSLTx		KGPPng(A)-HF		KGPPng(A)-FRHF	
		Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg
1 x 1,0	660	8,3	101,2	8,3	101,5	5,2	39,9	8,3	95,0
1 x 1,5	660	9,2	125,5	9,2	125,6	5,5	46,8	9,2	117,5
1 x 2,5	660	9,6	143,9	9,6	144,0	6,0	59,8	9,6	135,3
1 x 4,0	660	10,5	177,2	10,5	177,7	6,8	83,7	10,5	167,4
1 x 6,0	660	11,0	200,9	11,0	201,5	7,3	101,9	11,0	190,5
1 x 10,0	1000	12,5	277,6	12,5	279,4	9,4	174,8	12,5	264,9
1 x 16,0	1000	13,5	351,0	13,5	353,2	10,5	237,7	13,5	336,8
1 x 25,0	1000	15,4	480,6	15,4	484,3	12,3	348,9	15,4	463,4
1 x 35,0	1000	16,6	599,5	16,6	603,8	13,6	455,2	16,6	580,5
1 x 50,0	1000	18,8	781,7	18,8	787,5	15,3	598,8	18,8	757,3
1 x 70,0	1000	20,5	989,6	20,5	996,4	17,0	787,8	20,5	962,5
1 x 95,0	1000	22,7	1269,6	22,7	1279,1	19,7	1061,3	22,7	1237,8
1 x 120,0	1000	24,8	1553,9	24,8	1563,8	21,3	1301,4	24,8	1516,3
1 x 150,0	1000	26,9	1874,2	26,9	1887,2	23,8	1620,5	26,9	1831,7
1 x 185,0	1000	28,7	2216,6	28,7	2231,0	25,6	1944,2	28,7	2170,7
1 x 240,0	1000	32,2	2890,1	32,2	2908,4	28,8	2546,9	32,2	2836,6
1 x 300,0	1000	35,6	3604,1	35,6	3625,2	31,7	3186,7	35,6	3539,8
2 x 1,0	660	12,4	237,3	12,4	238,4	10,6	158,2	12,4	224,4
2 x 1,5	660	13,0	264,7	13,0	266,1	11,2	180,5	13,0	250,9
2 x 2,5	660	13,9	314,6	13,9	316,5	12,1	221,8	13,9	299,5

Cable type	Voltage, V	KGVVng(A)-FRLS		KGVVng(A)-FRLSLTx		KGPPng(A)-HF		KGPPng(A)-FRHF	
		Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg
2 x 4,0	660	15,6	407,8	15,6	410,8	13,8	299,4	15,6	389,9
2 x 6,0	660	16,6	472,6	16,6	476,1	14,8	354,7	16,6	453,2
2 x 10,0	1000	20,0	712,3	20,0	718,5	17,8	539,3	20,0	684,6
2 x 16,0	1000	22,1	915,7	22,1	923,4	20,3	737,0	22,1	883,9
2 x 25,0	1000	26,7	1384,8	26,7	1397,0	24,9	1144,0	26,7	1340,2
2 x 35,0	1000	29,3	1725,2	29,3	1740,0	27,5	1449,7	29,3	1674,7
2 x 50,0	1000	33,2	2246,5	33,2	2267,6	31,4	1911,0	33,2	2185,3
2 x 70,0	1000	37,0	2878,8	37,0	2903,4	35,2	2483,0	37,0	2804,3
2 x 95,0	1000	41,5	3700,4	41,5	3734,0	39,7	3226,8	41,5	3611,6
2 x 120,0	1000	45,6	4537,8	45,6	4576,2	43,4	3940,4	45,6	4432,3
2 x 150,0	1000	49,8	5479,0	49,8	5527,8	48,0	4842,9	49,8	5357,9
2 x 185,0	1000	53,9	6515,8	53,9	6572,2	51,7	5736,5	53,9	6381,0
2 x 240,0	1000	60,5	8405,3	60,5	8474,8	58,7	7530,0	60,5	8239,7
3 x 1,0	660	12,9	259,4	12,9	261,3	11,0	175,5	12,9	245,4
3 x 1,5	660	13,5	291,7	13,5	293,9	11,6	202,6	13,5	276,8
3 x 2,5	660	14,6	351,2	14,6	354,0	12,7	253,3	14,6	334,8
3 x 4,0	660	16,4	461,5	16,4	465,8	14,5	347,7	16,4	441,9
3 x 6,0	660	17,4	540,3	17,4	545,3	15,5	417,0	17,4	519,1
3 x 10,0	1000	21,0	826,1	21,0	834,6	19,1	665,5	21,0	795,5
3 x 16,0	1000	23,3	1078,4	23,3	1088,9	21,4	894,3	23,3	1043,4
3 x 25,0	1000	28,2	1637,8	28,2	1654,0	26,3	1391,5	28,2	1588,5
3 x 35,0	1000	31,0	2063,4	31,0	2082,6	29,1	1784,1	31,0	2007,8
3 x 50,0	1000	35,6	2740,1	35,6	2766,4	33,2	2361,5	35,6	2667,9
3 x 70,0	1000	39,2	3487,9	39,2	3519,2	37,3	3093,5	39,2	3405,9
3 x 95,0	1000	44,9	4620,4	44,9	4662,4	42,6	4090,5	44,9	4515,4
3 x 120,0	1000	48,4	5553,2	48,4	5601,1	46,5	5011,8	48,4	5437,3
3 x 150,0	1000	53,3	6798,3	53,3	6859,9	51,0	6112,5	53,3	6663,1
3 x 185,0	1000	57,6	8104,0	57,6	8171,7	55,7	7395,5	57,6	7948,9
3 x 240,0	1000	64,4	10424,3	64,4	10508,8	62,5	9588,9	64,4	10243,1
4 x 1,0	660	13,8	295,2	13,8	298,0	11,7	200,7	13,8	279,7
4 x 1,5	660	14,5	334,2	14,5	337,4	12,4	233,8	14,5	317,6
4 x 2,5	660	15,7	406,6	15,7	410,4	13,6	296,1	15,7	388,1
4 x 4,0	660	17,7	540,3	17,7	546,1	15,6	412,0	17,7	518,2
4 x 6,0	660	19,3	659,2	19,3	665,3	16,8	498,1	19,3	632,8
4 x 10,0	1000	22,9	984,1	22,9	995,4	20,8	803,0	22,9	949,3
4 x 16,0	1000	25,9	1327,0	25,9	1340,1	23,4	1090,0	25,9	1283,9
4 x 25,0	1000	30,8	1974,9	30,8	1996,0	28,8	1698,5	30,8	1918,6
4 x 35,0	1000	34,7	2588,3	34,7	2612,8	32,2	2226,5	34,7	2519,4
4 x 50,0	1000	38,9	3332,4	38,9	3366,2	36,8	2947,9	38,9	3249,7

Cable type	Voltage, V	KGVVng(A)-FRLS		KGVVng(A)-FRLSLTx		KGPPng(A)-HF		KGPPng(A)-FRHF	
		Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg
4 x 70,0	1000	43,5	4322,5	43,5	4363,2	41,0	3828,4	43,5	4227,3
4 x 95,0	1000	49,3	5663,9	49,3	5717,3	47,2	5124,3	49,3	5543,4
4 x 120,0	1000	53,7	6902,1	53,7	6963,4	51,2	6234,6	53,7	6767,6
4 x 150,0	1000	59,1	8447,6	59,1	8523,6	57,0	7740,0	59,1	8284,7
4 x 185,0	1000	63,5	10011,3	63,5	10096,2	61,4	9230,2	63,5	9833,2
4 x 240,0	1000	72,5	13225,4	72,5	13327,3	-	-	-	-
5 x 1,0	660	14,8	346,2	14,8	349,8	12,5	228,2	14,8	328,9
5 x 1,5	660	15,6	392,4	15,6	396,5	13,3	267,6	15,6	373,9
5 x 2,5	660	16,9	478,5	16,9	483,4	14,6	342,3	16,9	457,9
5 x 4,0	660	19,6	668,8	19,6	675,5	16,9	481,0	19,6	641,5
5 x 6,0	660	20,9	786,3	20,9	794,1	18,6	603,7	20,9	756,7
5 x 10,0	1000	25,4	1204,1	25,4	1217,6	22,6	949,5	25,4	1161,5
5 x 16,0	1000	28,2	1596,4	28,2	1612,8	25,9	1324,0	28,2	1547,6
5 x 25,0	1000	34,5	2464,2	34,5	2489,9	31,8	2057,1	34,5	2394,8
5 x 35,0	1000	38,0	3148,5	38,0	3178,8	35,7	2697,6	38,0	3070,3
3 x 6,0	660	17,4	540,3	17,4	545,3	15,5	417,0	17,4	519,1
3 x 10,0	1000	21,0	826,1	21,0	834,6	19,1	665,5	21,0	795,5
3 x 16,0	1000	23,3	1078,4	23,3	1088,9	21,4	894,3	23,3	1043,4
3 x 25,0	1000	28,2	1637,8	28,2	1654,0	26,3	1391,5	28,2	1588,5
3 x 35,0	1000	31,0	2063,4	31,0	2082,6	29,1	1784,1	31,0	2007,8
3 x 50,0	1000	35,6	2740,1	35,6	2766,4	33,2	2361,5	35,6	2667,9
3 x 70,0	1000	39,2	3487,9	39,2	3519,2	37,3	3093,5	39,2	3405,9
3 x 95,0	1000	44,9	4620,4	44,9	4662,4	42,6	4090,5	44,9	4515,4
3 x 120,0	1000	48,4	5553,2	48,4	5601,1	46,5	5011,8	48,4	5437,3
3 x 150,0	1000	53,3	6798,3	53,3	6859,9	51,0	6112,5	53,3	6663,1
3 x 185,0	1000	57,6	8104,0	57,6	8171,7	55,7	7395,5	57,6	7948,9
3 x 240,0	1000	64,4	10424,3	64,4	10508,8	62,5	9588,9	64,4	10243,1
4 x 1,0	660	13,8	295,2	13,8	298,0	11,7	200,7	13,8	279,7
4 x 1,5	660	14,5	334,2	14,5	337,4	12,4	233,8	14,5	317,6
4 x 2,5	660	15,7	406,6	15,7	410,4	13,6	296,1	15,7	388,1
4 x 4,0	660	17,7	540,3	17,7	546,1	15,6	412,0	17,7	518,2
4 x 6,0	660	19,3	659,2	19,3	665,3	16,8	498,1	19,3	632,8
4 x 10,0	1000	22,9	984,1	22,9	995,4	20,8	803,0	22,9	949,3
4 x 16,0	1000	25,9	1327,0	25,9	1340,1	23,4	1090,0	25,9	1283,9
4 x 25,0	1000	30,8	1974,9	30,8	1996,0	28,8	1698,5	30,8	1918,6
4 x 35,0	1000	34,7	2588,3	34,7	2612,8	32,2	2226,5	34,7	2519,4
4 x 50,0	1000	38,9	3332,4	38,9	3366,2	36,8	2947,9	38,9	3249,7
4 x 70,0	1000	43,5	4322,5	43,5	4363,2	41,0	3828,4	43,5	4227,3
4 x 95,0	1000	49,3	5663,9	49,3	5717,3	47,2	5124,3	49,3	5543,4

Cable type	Voltage, V	KGVVng(A)-FRLS		KGVVng(A)-FRLSLTx		KGPPng(A)-HF		KGPPng(A)-FRHF	
		Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg	Outer cable diameter, mm	Weight of 1 km of the cable, kg
Number and nominal core's cross-section, mm ²									
2 x 120,0 + 1 x 35,0	1000	45,6	4706,2	45,6	4747,0	43,4	4161,7	45,6	4600,1
2 x 150,0 + 1 x 50,0	1000	49,8	5712,2	49,8	5764,3	48,0	5144,5	49,8	5590,1
2 x 185,0 + 1 x 50,0	1000	53,9	6742,6	53,9	6802,1	51,7	6035,9	53,9	6606,9
2 x 240,0 + 1 x 70,0	1000	60,5	8729,7	60,5	8802,3	58,7	7948,0	60,5	8563,8
2 x 4,0 + 1 x 2,5	660	16,4	454,1	16,4	458,1	14,5	339,1	16,4	434,7
2 x 6,0 + 1 x 4,0	660	17,4	533,4	17,4	538,3	15,5	409,7	17,4	512,2
2 x 10,0 + 1 x 6,0	1000	20,2	748,9	20,2	756,1	18,0	583,3	20,2	720,3
2 x 16,0 + 1 x 10,0	1000	23,3	1049,9	23,3	1060,2	21,4	863,5	23,3	1014,8
2 x 25,0 + 1 x 16,0	1000	28,2	1592,7	28,2	1608,1	26,3	1340,7	28,2	1543,8
2 x 35,0 + 1 x 16,0	1000	29,6	1831,8	29,6	1848,7	27,8	1573,5	29,6	1779,8
2 x 50,0 + 1 x 25,0	1000	33,6	2411,6	33,6	2435,8	31,8	2102,3	33,6	2348,4
2 x 70,0 + 1 x 35,0	1000	37,5	3110,1	37,5	3137,9	35,7	2748,4	37,5	3033,6
2 x 95,0 + 1 x 50,0	1000	42,4	4066,1	42,4	4104,7	40,2	3585,3	42,4	3973,2
2 x 120,0 + 1 x 70,0	1000	46,2	4969,4	46,2	5012,1	44,0	4431,1	46,2	4861,2
2 x 150,0 + 1 x 70,0	1000	50,5	5921,4	50,5	5974,7	48,6	5345,2	50,5	5797,3
2 x 185,0 + 1 x 95,0	1000	54,5	7106,3	54,5	7168,5	52,3	6406,9	54,5	6968,1
2 x 240,0 + 1 x 120,0	1000	61,3	9159,5	61,3	9235,0	59,5	8382,7	61,3	8990,5
3 x 4,0 + 1 x 2,5	660	17,7	532,9	17,7	538,4	15,6	403,3	17,7	510,9
3 x 6,0 + 1 x 2,5	660	18,7	610,4	18,7	615,9	16,3	458,6	18,7	585,2
3 x 10,0 + 1 x 4,0	1000	22,2	903,1	22,2	913,1	19,6	706,0	22,2	870,1
3 x 16,0 + 1 x 6,0	1000	24,4	1157,5	24,4	1168,5	22,0	948,4	24,4	1118,1
3 x 25,0 + 1 x 10,0	1000	29,8	1800,6	29,8	1819,7	27,1	1485,4	29,8	1747,1
3 x 35,0 + 1 x 16,0	1000	33,2	2326,1	33,2	2349,1	30,8	1990,0	33,2	2264,7
3 x 50,0 + 1 x 16,0	1000	36,6	2882,2	36,6	2910,8	34,6	2544,2	36,6	2807,2
3 x 70,0 + 1 x 25,0	1000	40,4	3694,5	40,4	3729,2	38,5	3313,0	40,4	3609,0
3 x 95,0 + 1 x 35,0	1000	46,2	4907,4	46,2	4953,0	43,9	4392,7	46,2	4798,3
3 x 120,0 + 1 x 35,0	1000	49,9	5855,0	49,9	5906,5	48,0	5327,2	49,9	5734,6
3 x 150,0 + 1 x 50,0	1000	55,4	7257,5	55,4	7322,7	53,0	6583,4	55,4	7110,0
3 x 185,0 + 1 x 50,0	1000	59,5	8520,5	59,5	8593,3	57,5	7829,3	59,5	8359,1
3 x 240,0 + 1 x 70,0	1000	67,4	11180,3	67,4	11265,9	64,5	10175,3	67,4	10971,5
3 x 4,0 + 1 x 2,5	660	17,7	532,9	17,7	538,4	15,6	403,3	17,7	510,9
3 x 6,0 + 1 x 4,0	660	19,3	652,3	19,3	658,3	16,8	490,8	19,3	625,9
3 x 10,0 + 1 x 6,0	1000	22,2	911,7	22,2	921,7	20,2	742,9	22,2	878,7
3 x 16,0 + 1 x 10,0	1000	25,9	1298,5	25,9	1311,5	23,4	1059,2	25,9	1255,4
3 x 25,0 + 1 x 16,0	1000	30,8	1929,9	30,8	1950,1	28,8	1647,6	30,8	1873,9
3 x 35,0 + 1 x 16,0	1000	33,2	2326,1	33,2	2349,1	30,8	1990,0	33,2	2264,7
3 x 50,0 + 1 x 25,0	1000	37,6	3057,1	37,6	3088,0	35,6	2698,0	37,6	2978,6
3 x 70,0 + 1 x 35,0	1000	41,6	3907,3	41,6	3943,8	39,6	3496,6	41,6	3818,2
3 x 95,0 + 1 x 50,0	1000	47,6	5181,3	47,6	5230,4	45,6	4677,3	47,6	5066,9
3 x 120,0 + 1 x 70,0	1000	51,4	6276,6	51,4	6332,2	49,4	5719,9	51,4	6150,6

3	x	150,0	+	1	x	70,0	1000	57,1	7663,8	57,1	7732,7	55,0	6993,0	57,1	7509,9
3	x	185,0	+	1	x	95,0	1000	61,3	9113,6	61,3	9192,0	59,2	8381,0	61,3	8944,5
3	x	240,0	+	1	x	120,0	1000	69,5	11907,5	69,5	11999,7	-	-	-	-
7	x	1,0					660	15,9	385,0	15,9	390,2	13,4	268,3	15,9	365,5
7	x	1,5					660	16,8	440,1	16,8	445,9	14,2	316,7	16,8	419,2
7	x	2,5					660	18,6	564,8	18,6	571,1	15,7	408,9	18,6	539,2
7	x	4,0					660	21,1	756,6	21,1	765,8	18,6	597,4	21,1	725,8
7	x	6,0					660	22,6	899,0	22,6	909,4	20,1	728,1	22,6	865,6
7	x	10,0					1000	27,5	1395,7	27,5	1413,6	25,0	1177,9	27,5	1347,4
10	x	1,0					660	19,8	536,4	19,8	543,7	16,2	357,2	19,8	508,7
10	x	1,5					660	21,0	615,1	21,0	623,2	17,3	425,2	21,0	585,3
10	x	2,5					660	22,9	762,5	22,9	772,0	19,7	575,0	22,9	729,3
10	x	4,0					660	26,7	1062,6	26,7	1075,6	23,0	817,1	26,7	1019,0
10	x	6,0					660	28,6	1265,7	28,6	1280,3	25,4	1027,7	28,6	1218,2
14	x	1,0					660	21,2	652,6	21,2	663,4	17,3	438,6	21,2	620,5
14	x	1,5					660	22,5	756,2	22,5	768,2	19,0	548,2	22,5	721,7
14	x	2,5					660	25,1	980,5	25,1	994,0	21,1	723,7	25,1	938,8
14	x	4,0					660	28,8	1343,4	28,8	1362,7	25,2	1072,9	28,8	1292,3
14	x	6,0					660	30,9	1616,2	30,9	1637,9	27,4	1324,7	30,9	1560,5
16	x	1,0					660	22,3	716,3	22,3	728,9	18,5	501,6	22,3	681,7
16	x	1,5					660	24,0	860,4	24,0	873,8	19,9	604,6	24,0	820,1
16	x	2,5					660	26,3	1083,5	26,3	1099,1	22,2	802,7	26,3	1038,4
16	x	4,0					660	30,3	1492,5	30,3	1514,9	26,5	1195,0	30,3	1437,1
16	x	6,0					660	32,9	1851,8	32,9	1877,5	28,8	1480,0	32,9	1790,2
19	x	1,0					660	23,3	802,9	23,3	818,2	19,4	563,2	23,3	765,1
19	x	1,5					660	25,2	967,0	25,2	983,3	20,8	682,9	25,2	923,0
19	x	2,5					660	27,6	1226,3	27,6	1245,4	23,2	913,8	27,6	1177,1
19	x	4,0					660	32,2	1751,9	32,2	1779,6	27,8	1368,4	32,2	1689,8
19	x	6,0					660	35,0	2156,8	35,0	2186,9	30,3	1702,2	35,0	2084,7
24	x	1,0					660	27,8	1041,5	27,8	1060,3	22,8	711,1	27,8	992,0
24	x	1,5					660	29,6	1214,0	29,6	1235,0	24,9	887,8	29,6	1160,7
24	x	2,5					660	32,9	1591,8	32,9	1616,8	27,8	1182,5	32,9	1530,7
24	x	4,0					660	38,3	2244,1	38,3	2278,5	33,2	1769,3	38,3	2163,8
27	x	1,0					660	28,4	1119,3	28,4	1140,8	23,2	766,5	28,4	1067,1
27	x	1,5					660	30,1	1309,8	30,1	1333,7	25,4	959,8	30,1	1253,4
27	x	2,5					660	33,5	1723,4	33,5	1752,0	28,3	1286,3	33,5	1658,9
27	x	4,0					660	39,1	2441,4	39,1	2480,6	34,3	1968,3	39,1	2356,5
30	x	1,0					660	29,3	1205,1	29,3	1229,3	24,3	851,8	29,3	1149,7
30	x	1,5					660	31,1	1414,2	31,1	1441,1	26,2	1037,7	31,1	1354,4
30	x	2,5					660	35,0	1905,9	35,0	1937,0	29,3	1396,9	35,0	1833,0
37	x	1,0					660	31,7	1453,0	31,7	1484,2	25,9	993,8	31,7	1389,2
37	x	1,5					660	33,8	1708,8	33,8	1743,3	28,0	1218,5	33,8	1639,6
37	x	2,5					660	37,6	2239,0	37,6	2278,1	31,8	1695,1	37,6	2156,5
44	x	1,0					660	35,7	1728,7	35,7	1765,1	28,7	1155,8	35,7	1651,0
44	x	1,5					660	38,0	2033,4	38,0	2073,7	31,5	1462,0	38,0	1949,3
52	x	1,0					660	37,1	1940,8	37,1	1984,5	29,9	1305,2	37,1	1855,8
52	x	1,5					660	39,5	2293,8	39,5	2342,2	32,7	1656,2	39,5	2201,6
61	x	1,0					660	39,2	2190,2	39,2	2242,0	31,9	1521,1	39,2	2096,1
61	x	1,5					660	41,8	2598,3	41,8	2655,7	34,9	1917,9	41,8	2496,2

Cable type	Voltage, V	KGVEV		KGVEVng(A)		KGVEV-HL		KGVEVng(A)-LS		KGVEVng(A) LSLTx	
		Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg
1 x 1,0	660	5,7	52,1	5,7	53,9	5,7	50,3	5,7	59,8	5,7	59,8
1 x 1,5	660	5,9	59,8	5,9	61,7	5,9	57,9	5,9	68,1	5,9	68,2
1 x 2,5	660	6,4	74,2	6,4	76,4	6,4	72,1	6,4	83,6	6,4	83,7
1 x 4,0	660	7,3	100,5	7,3	103,0	7,3	97,9	7,3	111,9	7,3	112,3
1 x 6,0	660	7,8	120,1	7,8	122,9	7,8	117,4	7,8	132,6	7,8	133,2
1 x 10,0	1000	9,8	195,6	9,8	199,9	9,8	191,1	9,8	215,9	9,8	217,0
1 x 16,0	1000	10,9	261,3	10,9	266,2	10,9	256,2	10,9	284,6	10,9	286,0
1 x 25,0	1000	12,7	376,3	12,7	382,1	12,7	369,8	13,3	419,7	13,3	422,3
1 x 35,0	1000	14,0	485,7	14,0	492,2	14,0	478,4	14,6	533,9	14,6	537,0
1 x 50,0	1000	15,8	632,3	15,8	639,7	15,8	623,5	16,3	688,9	16,3	693,7
1 x 70,0	1000	17,5	825,2	17,5	833,5	17,5	815,3	18,4	908,8	18,4	914,1
1 x 95,0	1000	20,1	1100,3	20,1	1111,1	20,1	1087,2	20,7	1180,4	20,7	1188,0
1 x 120,0	1000	21,8	1343,8	21,8	1355,6	21,8	1329,5	22,3	1431,2	22,3	1439,8
1 x 150,0	1000	24,3	1662,5	24,3	1677,2	24,3	1644,7	24,8	1768,7	24,8	1779,5
1 x 185,0	1000	26,1	1989,6	26,1	2005,5	26,1	1970,2	26,6	2104,4	26,6	2116,5
1 x 240,0	1000	29,2	2596,5	29,2	2614,4	29,2	2574,0	-	-	-	-
2 x 1,0	660	9,0	107,2	9,0	111,2	9,0	103,4	11,0	206,7	11,0	207,3
2 x 1,5	660	9,6	123,6	9,6	127,9	9,6	119,4	11,6	233,6	11,6	234,4
2 x 2,5	660	10,6	154,1	10,6	159,0	10,6	149,4	12,5	282,8	12,5	284,0
2 x 4,0	660	12,3	209,5	12,3	215,3	12,3	203,8	14,2	374,8	14,2	377,0
2 x 6,0	660	13,2	250,6	13,2	256,9	13,2	244,3	15,2	438,8	15,2	441,5
2 x 10,0	1000	16,2	381,9	16,2	389,8	16,2	373,5	18,6	673,8	18,6	678,9
2 x 16,0	1000	18,8	531,5	18,8	541,9	18,8	520,6	20,7	875,3	20,7	881,9
2 x 25,0	1000	22,7	774,6	22,7	787,4	22,7	760,6	25,3	1337,4	25,3	1348,1
2 x 35,0	1000	25,7	1021,4	25,7	1037,6	25,7	1004,1	27,9	1675,6	27,9	1688,9
2 x 50,0	1000	29,2	1324,4	29,2	1343,0	29,2	1303,7	-	-	-	-
3 x 1,0	660	9,5	127,1	9,5	131,4	9,5	122,8	11,4	226,0	11,4	227,1
3 x 1,5	660	10,1	148,9	10,1	153,6	10,1	144,3	12,0	257,7	12,0	259,2
3 x 2,5	660	11,1	190,3	11,1	195,5	11,1	185,0	13,1	316,4	13,1	318,4
3 x 4,0	660	12,9	265,5	12,9	271,7	12,9	259,0	14,9	425,5	14,9	428,8
3 x 6,0	660	14,0	322,7	14,0	329,4	14,0	315,5	15,9	503,3	15,9	507,2
3 x 10,0	1000	17,2	505,6	17,2	514,1	17,2	495,8	19,5	783,4	19,5	790,7
3 x 16,0	1000	19,9	712,6	19,9	723,7	19,9	700,1	21,8	1033,6	21,8	1042,7
3 x 25,0	1000	24,5	1077,5	24,5	1092,9	24,5	1059,7	26,7	1584,9	26,7	1599,4
3 x 35,0	1000	27,3	1402,3	27,3	1419,6	27,3	1382,2	29,5	2008,0	29,5	2025,5
4 x 1,0	660	10,2	150,4	10,2	155,1	10,2	145,6	12,1	255,9	12,1	257,7
4 x 1,5	660	10,9	178,1	10,9	183,1	10,9	172,8	12,8	294,2	12,8	296,3
4 x 2,5	660	12,1	230,8	12,1	236,5	12,1	224,8	14,0	365,3	14,0	368,1
4 x 4,0	660	14,1	326,9	14,1	333,7	14,1	319,4	16,0	497,3	16,0	501,8
4 x 6,0	660	15,2	400,6	15,2	408,0	15,2	392,4	17,2	592,7	17,2	598,1

Cable type	Voltage, V	KGVEV		KGVEVng(A)		KGVEV-HL		KGVEVng(A)-LS		KGVEVng(A) LSLTx	
		Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg
4 x 10,0	1000	19,3	654,4	19,3	665,1	19,3	641,8	21,2	932,3	21,2	942,0
4 x 16,0	1000	21,8	903,5	21,8	915,8	21,8	888,9	24,2	1270,3	24,2	1281,7
4 x 25,0	1000	26,9	1372,9	26,9	1390,0	26,9	1352,0	29,2	1909,8	29,2	1928,8
5 x 1,0	660	11,0	184,3	11,0	189,4	11,0	178,9	12,9	300,1	12,9	302,5
5 x 1,5	660	11,8	217,9	11,8	223,4	11,8	211,9	13,7	345,3	13,7	348,2
5 x 2,5	660	13,1	282,1	13,1	288,4	13,1	275,3	15,0	429,7	15,0	433,4
5 x 4,0	660	15,4	406,9	15,4	414,4	15,4	398,4	17,3	595,1	17,3	600,9
5 x 6,0	660	16,7	497,4	16,7	505,6	16,7	488,0	19,0	731,0	19,0	737,3
5 x 10,0	1000	21,1	806,9	21,1	818,7	21,1	792,3	23,0	1112,6	23,0	1124,8
5 x 16,0	1000	24,4	1146,0	24,4	1161,3	24,4	1127,6	26,3	1527,7	26,3	1542,2
2 x 4,0 + 1 x 2,5	660	12,9	247,8	12,9	253,9	12,9	241,8	14,9	417,6	14,9	419,7
2 x 6,0 + 1 x 2,5	660	13,4	283,2	13,4	289,6	13,4	276,9	15,3	456,7	15,3	459,2
2 x 10,0 + 1 x 4,0	1000	16,2	431,9	16,2	439,8	16,2	423,4	18,6	691,9	18,6	696,5
2 x 16,0 + 1 x 6,0	1000	18,8	597,1	18,8	607,5	18,8	586,3	20,7	901,0	20,7	907,0
2 x 25,0 + 1 x 10,0	1000	22,7	890,7	22,7	903,5	22,7	876,8	25,3	1386,3	25,3	1395,9
2 x 35,0 + 1 x 16,0	1000	26,0	1197,9	26,0	1214,3	26,0	1180,4	28,2	1785,1	28,2	1797,2
2 x 50,0 + 1 x 16,0	1000	29,2	1496,8	29,2	1515,4	29,2	1476,1	-	-	-	-
2 x 4,0 + 1 x 2,5	660	12,9	247,8	12,9	253,9	12,9	241,8	14,9	417,6	14,9	419,7
2 x 6,0 + 1 x 4,0	660	14,0	308,6	14,0	315,3	14,0	302,0	15,9	496,1	15,9	498,6
2 x 10,0 + 1 x 6,0	1000	16,4	449,6	16,4	457,7	16,4	441,1	18,8	712,5	18,8	717,0
2 x 16,0 + 1 x 10,0	1000	19,9	660,9	19,9	672,0	19,9	649,5	21,8	1004,5	21,8	1010,8
2 x 25,0 + 1 x 16,0	1000	24,5	985,9	24,5	1001,3	24,5	969,8	26,7	1539,0	26,7	1549,4
2 x 35,0 + 1 x 16,0	1000	26,0	1197,9	26,0	1214,3	26,0	1180,4	28,2	1785,1	28,2	1797,2
3 x 4,0 + 1 x 2,5	660	14,1	309,1	14,1	315,9	14,1	302,1	16,0	489,4	16,0	492,8
3 x 6,0 + 1 x 2,5	660	14,8	362,3	14,8	369,4	14,8	354,8	16,7	549,2	16,7	553,0
3 x 10,0 + 1 x 4,0	1000	17,7	561,2	17,7	569,9	17,7	551,2	20,0	823,1	20,0	829,9
3 x 16,0 + 1 x 6,0	1000	20,5	785,4	20,5	796,8	20,5	772,5	22,4	1086,6	22,4	1095,2
3 x 25,0 + 1 x 10,0	1000	25,2	1203,3	25,2	1219,2	25,2	1185,0	27,5	1675,2	27,5	1688,9
3 x 35,0 + 1 x 16,0	1000	28,9	1596,7	28,9	1615,2	28,9	1575,6	-	-	-	-
3 x 4,0 + 1 x 2,5	660	14,1	309,1	14,1	315,9	14,1	302,1	16,0	489,4	16,0	492,8
3 x 6,0 + 1 x 4,0	660	15,2	386,6	15,2	394,0	15,2	378,9	17,2	585,5	17,2	589,4
3 x 10,0 + 1 x 6,0	1000	18,6	599,2	18,6	609,5	18,6	587,9	20,6	865,9	20,6	872,9
3 x 16,0 + 1 x 10,0	1000	21,8	851,8	21,8	864,1	21,8	838,3	24,2	1241,2	24,2	1249,8
3 x 25,0 + 1 x 16,0	1000	26,9	1281,3	26,9	1298,4	26,9	1262,1	29,2	1863,8	29,2	1878,7
3 x 35,0 + 1 x 16,0	1000	28,9	1596,7	28,9	1615,2	28,9	1575,6	-	-	-	-
7 x 1,0	660	11,8	214,4	11,8	220,0	11,8	208,1	13,8	334,6	13,8	338,3
7 x 1,5	660	12,7	258,9	12,7	265,0	12,7	252,0	14,6	389,1	14,6	393,4
7 x 2,5	660	14,2	344,7	14,2	351,5	14,2	336,7	16,1	491,3	16,1	496,6
7 x 4,0	660	16,7	501,7	16,7	509,8	16,7	491,5	19,0	700,6	19,0	708,2
7 x 6,0	660	18,5	640,8	18,5	651,1	18,5	628,6	20,5	841,7	20,5	850,4

Cable type	Voltage, V	KGVEV		KGVEVng(A)		KGVEV-HL		KGVEVng(A)-LS		KGVEVng(A) LSLTx	
		Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg
Number and nominal core's cross-section, mm ²											
7 x 10,0	1000	23,0	1038,6	23,0	1051,6	23,0	1021,2	25,4	1329,8	25,4	1345,4
10 x 1,0	660	14,6	291,0	14,6	298,1	14,6	282,8	16,6	442,9	16,6	448,4
10 x 1,5	660	15,8	353,7	15,8	361,4	15,8	344,6	17,7	518,9	17,7	525,3
10 x 2,5	660	17,7	474,7	17,7	483,5	17,7	464,2	20,1	685,0	20,1	692,4
10 x 4,0	660	21,5	715,7	21,5	727,8	21,5	700,9	23,8	979,2	23,8	989,8
10 x 6,0	660	23,8	912,4	23,8	927,4	23,8	894,6	25,8	1179,9	25,8	1192,1
14 x 1,0	660	15,8	364,9	15,8	372,5	15,8	355,1	17,7	533,5	17,7	541,7
14 x 1,5	660	17,1	448,8	17,1	457,2	17,1	438,0	19,4	654,9	19,4	663,9
14 x 2,5	660	19,6	629,5	19,6	640,4	19,6	615,8	21,5	845,8	21,5	856,9
14 x 4,0	660	23,3	932,1	23,3	945,3	23,3	914,5	25,6	1226,8	25,6	1242,7
14 x 6,0	660	25,8	1194,0	25,8	1210,3	25,8	1172,8	27,8	1494,5	27,8	1512,7
16 x 1,0	660	16,6	404,4	16,6	412,5	16,6	393,8	18,9	605,3	18,9	614,4
16 x 1,5	660	17,9	499,3	17,9	508,1	17,9	487,5	20,3	718,3	20,3	728,8
16 x 2,5	660	20,6	702,4	20,6	713,9	20,6	687,5	22,6	932,9	22,6	945,7
16 x 4,0	660	25,0	1067,3	25,0	1083,0	25,0	1046,6	26,9	1359,3	26,9	1377,8
16 x 6,0	660	27,2	1340,1	27,2	1357,4	27,2	1317,0	29,2	1661,4	29,2	1682,5
19 x 1,0	660	17,4	459,5	17,4	468,1	17,4	447,8	19,8	673,8	19,8	684,9
19 x 1,5	660	19,3	587,6	19,3	598,4	19,3	573,5	21,2	804,3	21,2	817,0
19 x 2,5	660	21,7	805,9	21,7	818,1	21,7	789,5	24,0	1080,5	24,0	1095,4
19 x 4,0	660	26,3	1230,5	26,3	1247,1	26,3	1207,6	28,2	1544,3	28,2	1566,7
19 x 6,0	660	28,7	1550,7	28,7	1569,0	28,7	1525,2	-	-	-	-
24 x 1,0	660	20,9	592,5	20,9	604,3	20,9	577,0	23,2	841,1	23,2	855,4
24 x 1,5	660	22,7	733,5	22,7	746,3	22,7	716,2	25,3	1039,4	25,3	1055,1
24 x 2,5	660	26,0	1031,4	26,0	1047,8	26,0	1009,9	28,2	1355,9	28,2	1375,1
27 x 1,0	660	21,3	643,5	21,3	655,5	21,3	627,0	24,0	933,3	24,0	948,9
27 x 1,5	660	23,1	800,0	23,1	813,1	23,1	781,7	25,8	1116,1	25,8	1134,2
27 x 2,5	660	26,5	1129,2	26,5	1146,0	26,5	1106,4	28,7	1465,3	28,7	1487,3
30 x 1,0	660	22,1	698,3	22,1	710,7	22,1	680,7	24,7	1000,7	24,7	1018,4
30 x 1,5	660	24,3	892,5	24,3	907,8	24,3	871,5	26,6	1201,0	26,6	1221,3
30 x 2,5	660	27,4	1232,2	27,4	1249,6	27,4	1207,7	-	-	-	-
37 x 1,0	660	24,1	847,1	24,1	862,3	24,1	825,5	26,3	1157,1	26,3	1179,4
37 x 1,5	660	26,1	1058,3	26,1	1074,8	26,1	1034,3	28,4	1397,7	28,4	1423,3
37 x 2,5	660	29,5	1471,5	29,5	1490,4	29,5	1443,5	-	-	-	-
44 x 1,0	660	26,9	990,7	26,9	1007,7	26,9	965,8	29,1	1340,9	29,1	1367,7
44 x 1,5	660	29,2	1240,6	29,2	1259,2	29,2	1212,9	-	-	-	-
52 x 1,0	660	28,0	1128,0	28,0	1145,9	28,0	1100,6	-	-	-	-

Cable type	Voltage, V	KGVEVng(A)-FRLS		KGVEVng(A)-FRLSLTx		KGPEPng(A)-HF		KGPEPng(A)-FRHF	
		Outer conductor diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg
Number and nominal core's cross-section, mm ²									
1 x 1,0	660	9,3	131,8	9,3	131,7	5,7	56,1	9,3	123,8
1 x 1,5	660	9,6	142,6	9,6	142,5	5,9	64,2	9,6	134,2
1 x 2,5	660	10,0	162,1	10,0	162,2	6,4	79,2	10,0	153,1
1 x 4,0	660	10,9	197,8	10,9	198,3	7,3	106,6	10,9	187,7
1 x 6,0	660	11,4	222,6	11,4	223,2	7,8	126,8	11,4	211,9
1 x 10,0	1000	12,9	303,6	12,9	305,2	9,8	206,5	12,9	290,5
1 x 16,0	1000	13,9	379,4	13,9	381,5	10,9	273,9	13,9	364,9
1 x 25,0	1000	15,8	513,9	15,8	517,5	13,3	405,7	15,8	496,4
1 x 35,0	1000	17,0	635,8	17,0	640,0	14,6	518,2	17,0	616,4
1 x 50,0	1000	19,2	823,2	19,2	828,9	16,3	670,2	19,2	798,4
1 x 70,0	1000	20,9	1035,1	20,9	1041,7	18,4	885,6	20,9	1007,5
1 x 95,0	1000	23,1	1320,9	23,1	1330,3	20,7	1152,8	23,1	1288,7
1 x 120,0	1000	25,2	1609,4	25,2	1619,3	22,3	1401,0	25,2	1571,5
1 x 150,0	1000	27,3	1935,3	27,3	1948,2	24,8	1731,0	27,3	1892,3
1 x 185,0	1000	29,1	2281,9	29,1	2296,3	26,6	2063,6	29,1	2235,6
2 x 1,0	660	12,8	265,1	12,8	266,2	11,0	185,6	12,8	251,9
2 x 1,5	660	13,4	293,9	13,4	295,2	11,6	210,3	13,4	279,8
2 x 2,5	660	14,3	346,1	14,3	347,9	12,5	255,7	14,3	330,6
2 x 4,0	660	16,0	444,2	16,0	447,1	14,2	340,1	16,0	425,9
2 x 6,0	660	17,0	511,3	17,0	514,7	15,2	399,5	17,0	491,4
2 x 10,0	1000	20,4	759,7	20,4	765,8	18,6	615,5	20,4	731,6
2 x 16,0	1000	22,5	968,0	22,5	975,6	20,7	803,8	22,5	935,8
2 x 25,0	1000	27,1	1449,8	27,1	1461,9	25,3	1229,1	27,1	1404,7
2 x 35,0	1000	-	-	-	-	27,9	1546,1	-	-
3 x 1,0	660	13,3	286,5	13,3	288,3	11,4	204,5	13,3	272,2
3 x 1,5	660	13,9	319,8	13,9	322,0	12,0	234,1	13,9	304,6
3 x 2,5	660	15,0	381,1	15,0	383,8	13,1	289,0	15,0	364,3
3 x 4,0	660	16,8	495,9	16,8	500,1	14,9	390,7	16,8	475,9
3 x 6,0	660	17,8	576,4	17,8	581,2	15,9	464,2	17,8	554,7
3 x 10,0	1000	21,4	869,9	21,4	878,3	19,5	726,0	21,4	838,9
3 x 16,0	1000	24,1	1153,5	24,1	1163,3	21,8	964,0	24,1	1115,1
3 x 25,0	1000	28,6	1696,5	28,6	1712,6	26,7	1479,7	28,6	1646,7
3 x 35,0	1000	-	-	-	-	29,5	1883,4	-	-
4 x 1,0	660	14,2	323,1	14,2	325,8	12,1	232,6	14,2	307,2
4 x 1,5	660	14,9	363,0	14,9	366,1	12,8	268,5	14,9	346,0
4 x 2,5	660	16,1	436,8	16,1	440,5	14,0	335,5	16,1	418,0
4 x 4,0	660	18,5	596,2	18,5	601,3	16,0	459,5	18,5	571,4

Cable type	Voltage, V	KGVEVng(A)-FRLS		KGVEVng(A)-FRLSLTx		KGPEPng(A)-HF		KGPEPng(A)-FRHF	
		Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg	Outer cable diameter, mm	Weight of 1 km cable, kg
Number and nominal core's cross-section, mm ²									
4 x 6,0	660	19,7	695,7	19,7	701,6	17,2	550,3	19,7	668,8
4 x 10,0	1000	23,3	1027,4	23,3	1038,6	21,2	870,0	23,3	992,2
4 x 16,0	1000	26,3	1373,8	26,3	1386,7	24,2	1192,1	26,3	1330,2
4 x 25,0	1000	-	-	-	-	29,2	1796,1	-	-
5 x 1,0	660	15,2	364,2	15,2	367,7	12,9	274,5	15,2	346,5
5 x 1,5	660	16,0	411,1	16,0	415,2	13,7	317,1	16,0	392,2
5 x 2,5	660	17,3	498,4	17,3	503,3	15,0	397,0	17,3	477,4
5 x 4,0	660	20,0	684,9	20,0	691,6	17,3	553,4	20,0	657,2
5 x 6,0	660	21,3	803,5	21,3	811,2	19,0	681,9	21,3	773,4
5 x 10,0	1000	25,8	1228,5	25,8	1241,9	23,0	1043,7	25,8	1185,4
5 x 16,0	1000	28,6	1611,9	28,6	1628,2	26,3	1441,3	28,6	1562,6
2 x 4,0 + 1 x 2,5	660	16,8	489,7	16,8	492,4	14,9	382,1	16,8	470,7
2 x 6,0 + 1 x 2,5	660	17,1	524,2	17,1	527,2	15,3	420,1	17,1	504,6
2 x 10,0 + 1 x 4,0	1000	20,6	783,4	20,6	788,8	18,6	639,5	20,6	755,6
2 x 16,0 + 1 x 6,0	1000	22,5	983,7	22,5	990,5	20,7	836,8	22,5	952,4
2 x 25,0 + 1 x 10,0	1000	27,4	1512,8	27,4	1523,7	25,3	1290,3	27,4	1468,4
2 x 35,0 + 1 x 16,0	1000	-	-	-	-	28,2	1667,8	-	-
2 x 4,0 + 1 x 2,5	660	16,8	489,7	16,8	492,4	14,9	382,1	16,8	470,7
2 x 6,0 + 1 x 4,0	660	17,8	570,3	17,8	573,5	15,9	456,9	17,8	549,9
2 x 10,0 + 1 x 6,0	1000	20,6	791,1	20,6	796,4	18,8	659,5	20,6	763,4
2 x 16,0 + 1 x 10,0	1000	24,1	1126,9	24,1	1133,5	21,8	933,2	24,1	1090,6
2 x 25,0 + 1 x 16,0	1000	28,6	1653,9	28,6	1665,6	26,7	1429,0	28,6	1607,1
2 x 35,0 + 1 x 16,0	1000	-	-	-	-	28,2	1667,8	-	-
3 x 4,0 + 1 x 2,5	660	18,5	589,9	18,5	593,6	16,0	450,9	18,5	566,1
3 x 6,0 + 1 x 2,5	660	19,1	646,6	19,1	650,7	16,7	508,9	19,1	621,7
3 x 10,0 + 1 x 4,0	1000	22,6	946,4	22,6	954,6	20,0	768,5	22,6	914,1
3 x 16,0 + 1 x 6,0	1000	24,8	1202,1	24,8	1211,1	22,4	1020,4	24,8	1163,4
3 x 25,0 + 1 x 10,0	1000	-	-	-	-	27,5	1576,4	-	-
3 x 4,0 + 1 x 2,5	660	18,5	589,9	18,5	593,6	16,0	450,9	18,5	566,1
3 x 6,0 + 1 x 4,0	660	19,7	689,6	19,7	693,9	17,2	543,0	19,7	663,9
3 x 10,0 + 1 x 6,0	1000	22,6	954,1	22,6	962,2	20,6	807,5	22,6	921,9
3 x 16,0 + 1 x 10,0	1000	26,3	1347,1	26,3	1356,9	24,2	1161,3	26,3	1305,7
3 x 25,0 + 1 x 16,0	1000	-	-	-	-	29,2	1745,4	-	-
7 x 1,0	660	16,3	412,7	16,3	417,8	13,8	307,0	16,3	392,7
7 x 1,5	660	17,2	467,9	17,2	473,6	14,6	359,0	17,2	446,6
7 x 2,5	660	19,0	593,1	19,0	599,3	16,1	457,1	19,0	567,1
7 x 4,0	660	21,5	788,5	21,5	797,6	19,0	656,2	21,5	757,3

Cable type	Voltage, V	KGVEVng(A)-FRLS		KGVEVng(A)-FRLSLTx		KGPEPng(A)-HF		KGPEPng(A)-FRHF	
		Outer cable diameter, mm	Weight of 1 km conductor, kg	Outer cable diameter, mm	Weight of 1 km conductor, kg	Outer cable diameter, mm	Weight of 1 km conductor, kg	Outer cable diameter, mm	Weight of 1 km cable, kg
7 x 6,0	660	23,0	930,8	23,0	941,1	20,5	792,8	23,0	897,0
7 x 10,0	1000	27,9	1432,7	27,9	1450,5	25,4	1261,3	27,9	1383,9
10 x 1,0	660	20,2	570,1	20,2	577,3	16,6	407,3	20,2	542,0
10 x 1,5	660	21,4	648,6	21,4	656,6	17,7	480,0	21,4	618,4
10 x 2,5	660	23,3	795,6	23,3	805,0	20,1	638,1	23,3	762,0
10 x 4,0	660	27,1	1100,3	27,1	1113,2	23,8	918,3	27,1	1056,2
10 x 6,0	660	29,0	1302,8	29,0	1317,3	25,8	1112,8	29,0	1254,8
14 x 1,0	660	21,6	680,6	21,6	691,3	17,7	493,3	21,6	648,1
14 x 1,5	660	22,9	782,5	22,9	794,4	19,4	608,5	22,9	747,5
14 x 2,5	660	25,5	1004,4	25,5	1017,8	21,5	792,7	25,5	962,2
14 x 4,0	660	29,2	1369,0	29,2	1388,2	25,6	1157,4	29,2	1317,4
14 x 6,0	660	31,3	1638,5	31,3	1660,1	27,8	1417,9	31,3	1582,4
16 x 1,0	660	22,7	742,6	22,7	755,1	18,9	560,1	22,7	707,6
16 x 1,5	660	24,4	884,8	24,4	898,1	20,3	668,6	24,4	844,1
16 x 2,5	660	26,7	1104,0	26,7	1119,6	22,6	875,9	26,7	1058,5
16 x 4,0	660	-	-	-	-	26,9	1284,7	-	-
16 x 6,0	660	-	-	-	-	29,2	1579,0	-	-
19 x 1,0	660	24,1	852,5	24,1	867,1	19,8	625,0	24,1	811,3
19 x 1,5	660	25,6	985,9	25,6	1002,1	21,2	750,7	25,6	941,5
19 x 2,5	660	28,0	1239,5	28,0	1258,4	24,0	1015,9	28,0	1189,7
19 x 4,0	660	-	-	-	-	28,2	1463,4	-	-
24 x 1,0	660	28,2	1066,1	28,2	1084,9	23,2	781,7	28,2	1016,2
24 x 1,5	660	-	-	-	-	25,3	971,0	-	-
24 x 2,5	660	-	-	-	-	28,2	1277,4	-	-
27 x 1,0	660	28,8	1137,4	28,8	1158,9	24,0	868,4	28,8	1084,8
27 x 1,5	660	-	-	-	-	25,8	1044,8	-	-
27 x 2,5	660	-	-	-	-	28,7	1383,4	-	-
30 x 1,0	660	-	-	-	-	24,7	932,5	-	-
30 x 1,5	660	-	-	-	-	26,6	1125,9	-	-
37 x 1,0	660	-	-	-	-	26,3	1081,2	-	-
37 x 1,5	660	-	-	-	-	28,4	1314,1	-	-
44 x 1,0	660	-	-	-	-	29,1	1254,5	-	-



**POWER CABLES
WITH PLASTIC INSULATION,
FLAME-RETARDANT
AND FIREPROOF
FOR VOLTAGE 0,66 AND 1 kV**

limited liability company
TOMSKCABLE

Plastic-Insulated Flame-Resistant and Fireproof Cables for the Voltage 0,66; 1 kV TU 3500-021-59680332-2011



VVGng (A)-FRLS

Power cables: copper conductors, low-smoke PVC-compound insulation, inner and outer sheath, low fume and gas emission, with thermal barrier along current-carrying conductor.

VVEng (A)-FRLS

Power cables: copper conductors, low-smoke PVC-compound insulation, inner and outer sheath, low fume and gas emission, with thermal barrier along current-carrying conductor, screened.

VBShvng (A)-FRLS

Power cables: copper conductors, low-smoke PVC-compound insulation, inner sheath and protection hose, low fume and gas emission, with thermal barrier along current-carrying conductor, armour of steel galvanized tape

VBaShvng (A)-FRLS

Power cables: copper conductors, low-smoke PVC-compound insulation, inner sheath and protection hose, low fume and gas emission, with thermal barrier along current-carrying conductor, armour of aluminium or aluminium alloy band

(FR index in the grades of cables stands for their **Fire Resistance**, LS index in the grades stands for **Low Smoke**)

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables are designed for nuclear plant safety system power supply cable lines, fire safety system circuit wiring: fire-control circuits, power supply for fire water pumps, emergency exit lights, smoke exhaust and plenum ventilation system lights, as well as evacuation lifts lights. The cables are used for laying in surgical units at hospitals and in emergency power supply circuits which can operate in case of fire.

OKP Codes

352100 cables with copper conductors for the nominal voltage 0,66 kV
353300 cables with copper conductors for the nominal voltage 1 kV

DESIGN

- 1. Conductor:** copper, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.
- 2. Thermal barrier:** micaeous double-layer lapping, minimal band width is 0,12 mm.
- 3. Insulation:** low-smoke PVC-compound with low fume and gas emission. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.
- 4. Stranding:** insulated conductors of two-, three-, four- or five-core cables are stranded; two-, three and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.
- 5. Inner sheath:** low-smoke PVC-compound, with low fume and gas emission. Inner sheath fills intervals between insulated conductors of multiple conductor cable giving to the cable form close to circular one. Nominal thickness of the inner sheath is specified in the Appendix on page 123.
- 6. Metal screen:** for the cables of VVEng (A) -FRLS type: lapping with two copper tapes min 0,06 mm thick with overlapping.
- 7. Outer sheath:** for the unarmoured VVGng(A)-FRLS and VVEng(A)-FRLS type cables: low-smoke PVC-compound, with low fume gas emission. Nominal thickness of the outer sheath is specified in the Appendix on page 123.
- 8. Armour:** for multi-core VBShvng (A) -FRLS cables: two steel galvanized bands or for single-core VBaShvng (A)-FRLS cables: aluminium or aluminium alloy bands; bands are laid so that the upper tape overlaps the gaps between the coils of the lower tape. Gaps between coils of each tape should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.
- 9. Armoured cable protection hose:** for the cables of VBShvng(A)-FRLS and VBaShvng (A)-FRLS types: low-smoke PVC-compound, with low fume and gas emission. Thickness of the protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 1, 5 according to GOST 15150-69
Operating temperature range.....from -50°C to +50°C
Relative air humidity at max +35°C.....max 98%
Laying and installation of cables without preheating is performed at temperature not less than:.....-15°C
Nominal frequency.....50Hz

AC test voltage at 50Hz frequency:

for the voltage 0,66kV.....3kV
for the voltage 1kV.....3,5kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
for multi-core cables.....7,5 outer cable diameters
Cable conductor continuous operating heating temperature max.....70 °C
Max allowed pulling force during cable tracing.....50N/mm²

Construction cable length for the main core's cross-section:

up to 16 mm².....250m
from 25 mm² to 70 mm².....200m
more than 95mm².....100m
Guarantee use period..... 5 years from date of input of the cable into operation
Service life.....30 years

FIRE SAFETY PERFORMANCE

Cables are flame-retardant when laid as cable bunches and comply with the fire safety class according to GOST 53315-2009 - item 16.1.2.2.2
Cables are characterised by low chlorine hydride emission (max 140 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.
Fire tests proved cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 50%.
Cables are flame-retardant for min 180 minutes if exposed to open fire.

The VVGng(A)-FRLS cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of VVGng (A)-FRLS cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5 sr (single)	8,4	9,0	109	124
1x2,5sr	9,0	9,4	131	141
1x4sr	9,7	10,3	158	174
1x6sr	10,2	10,8	185	202
1x10sr	11,4	11,6	247	253
1x16sr	12,3	12,5	320	327
1x16mr (mult.)	12,8	13,0	331	338
1x25sr	13,8	14,0	435	443
1x25mr	14,2	14,4	447	455
1x35mr	15,2	15,4	550	558
1x50mr	16,9	17,1	747	756
1x70mr	-	19,1	-	967
1x95mr	-	21,2	-	1254
1x120mr	-	22,6	-	1515
1x150mr	-	24,8	-	1851
1x185mr	-	26,8	-	2243
1x240mr	-	29,5	-	2801
2x1,5sr	13,0	13,3	265	277
2x2,5sr	13,3	14,1	292	323
2x4sr	14,6	15,8	365	418
2x6sr	15,6	16,8	437	493
2x10sr	18,0	18,4	606	627
2x16sr	19,9	20,3	796	819
2x16mr	20,8	21,2	840	864
2x25sr	22,9	23,3	1106	1132
2x25mr	23,6	24,2	1150	1191
2x35mr	25,8	26,2	1433	1463
2x50mr	29,2	29,6	1952	1985
3x1,5sr	13,0	13,9	273	306
3x2,5sr	13,9	14,7	327	362
3x4sr	15,3	16,6	416	474
3x6sr	16,4	17,7	506	567
3x10sr	18,9	19,3	714	737
3x16sr	20,9	21,4	957	983
3x16mr	21,9	22,3	1002	1029
3x25sr	24,4	24,8	1362	1392
3x25mr	25,1	25,6	1410	1441
3x35mr	27,3	27,7	1758	1790
3x50mr	30,9	31,8	2429	2505
4x1,5sr	13,9	14,8	311	349
4x2,5sr	14,8	15,8	378	418
4x4sr	16,4	17,9	486	553
4x6sr	17,6	19,1	598	670
4x10sr r	20,5	21,0	855	882
4x16sr	22,8	23,2	1161	1190
4x16mr	24,0	24,5	1225	1256
4x25sr	26,6	27,1	1681	1715
4x25mr	27,4	27,9	1736	1772
4x35mr	29,8	30,3	2175	2213
4x50mr	34,7	35,2	3110	3155
5x1,5sr	14,8	15,9	359	403
5x2,5sr	15,9	17,0	438	484
5x4sr	17,7	19,3	570	648
5x6sr	19,0	20,6	713	796
5x10sr	22,2	22,8	1021	1053
5x16sr	25,0	25,5	1407	1442
5x16mr	26,2	26,7	1465	1502
5x25sr	29,0	29,3	2017	2057
5x25mr	30,0	30,5	2082	2123
5x35mr	33,1	33,6	2669	2715
5x50mr	38,1	38,6	3769	3821
3x25sr+1x16sr	26,6	27,1	1624	1658
3x25mr+1x16mr	27,4	27,9	1676	1712
3x35mr+1x16mr	28,8	29,3	1968	2003
3x50mr+1x25mr	33,2	33,6	2776	2817

The VVGng(A)-FRLS cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of VVGng(A)-FRLS cables,kg
2x70ms	29,6	2017
2x95ms	32,0	2638
2x120ms	36,4	3247
2x150ms	38,4	3889
2x185ms	40,9	4690
2x240ms	47,2	6022
3x70ms	36,4	2935
3x95ms	41,4	3840
3x120ms	43,8	4672
3x150ms	48,2	5691
3x185ms	52,2	6909
3x240ms	58,0	8775
4x70ms	40,4	3758
4x95ms	45,2	5014
4x120ms	48,2	6049
4x150ms	52,2	7303
4x185ms	58,0	9076
4x240ms	62,0	11294
5x70ms	43,8	4638
5x95ms	49,2	6122
5x120ms	54,6	7533
5x150ms	59,0	9157
5x185ms	64,0	11174
5x240ms	69,0	14110
3x70ms+1x35ms	40,4	3404
3x95ms+1x50ms	45,2	4584
3x120ms+1x70ms	48,2	5550
3x150ms+1x70ms	52,2	6518
3x185ms+1x95ms	58,0	8180
3x240ms+1x120ms	62,0	10112

The VVEng(A)-FRLS cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of VVEng(A)FRLS-cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5sr	8,6	9,2	124	140
1x2,5sr	9,2	9,6	147	158
1x4sr	9,9	10,5	175	193
1x6sr	10,4	11,0	204	222
1x10sr	11,6	11,8	269	275
1x16sr	12,5	12,7	344	351
1x16mr	13,0	13,2	356	364
1x25sr	14,0	14,2	463	471
1x25mr	14,4	14,6	476	484
1x35mr	15,4	15,6	580	585
1x50mr	17,1	17,3	782	791
1x70mr	-	19,3	-	1006
1x95mr	-	21,4	-	1298
1x120mr	-	22,8	-	1563
1x150mr	-	25,0	-	1903
1x185mr	-	27,0	-	2300
1x240mr	-	29,7	-	2864
2x1,5sr	13,1	13,5	289	303
2x2,5sr	13,5	14,3	317	350
2x4sr	14,8	16,0	394	449
2x6sr	15,8	17,0	468	527
2x10sr	18,2	18,6	643	665
2x16sr	20,1	20,5	837	861
2x16mr	21,0	21,4	883	908
2x25sr	23,1	23,5	1154	1182
2x25mr	24,0	24,4	1214	1242
2x35mr	26,0	26,4	1488	1519
2x50mr	29,4	29,8	2015	2049
3x1,5sr	13,2	14,1	298	332
3x2,5sr	14,1	14,9	354	390
3x4sr	15,5	16,8	446	507
3x6sr	16,5	17,8	538	603
3x10sr	19,1	19,5	753	777
3x16sr	21,1	21,6	1001	1027
3x16mr	22,1	22,5	1048	1076
3x25sr	24,6	25,0	1414	1444
3x25mr	25,3	25,7	1464	1495
3x35mr	27,5	27,9	1816	1850
3x50mr	31,1	31,9	2496	2574
4x1,5sr	14,0	15,0	338	378
4x2,5sr	15,0	16,0	406	449
4x4sr	16,6	18,0	519	589
4x6sr	17,8	19,3	634	709
4x10sr	20,6	21,1	898	926
4x16sr	22,9	23,4	1208	1239
4x16mr	24,2	24,7	1276	1308
4x25sr	26,8	27,2	1737	1773
4x25mr	27,6	28,1	1795	1832
4x35mr	30,0	30,5	2239	2279
4x50mr	34,9	35,4	3186	3232
5x1,5sr	15,0	16,1	388	434
5x2,5sr	16,1	17,2	469	519
5x4sr	17,9	19,5	606	688
5x6sr	19,2	20,8	752	839
5x10sr	22,4	22,9	1068	1101
5x16sr	25,2	25,7	1459	1496
5x16mr	26,4	26,9	1521	1559
5x25sr	29,2	29,7	1079	2121
5x25mr	30,2	30,7	2146	2189
5x35mr	33,3	33,8	2741	2788
5x50mr	38,2	38,8	3852	3906
3x25sr+1x16sr	26,8	27,2	1680	1716
3x25mr+1x16mr	27,6	28,1	1735	1772
3x35mr+1x16mr	29,0	29,5	2030	2067
3x50mr+1x25mr	33,4	34,2	2849	2930

The VVEng(A)-FRLS cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of VVEng(A)-FRLS-cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
2x70ms	29,7		2081	
2x95ms	32,1		2708	
2x120ms	36,5		3326	
2x150ms	38,5		3973	
2x185ms	41,0		4780	
2x240ms	47,3		6127	
3x70ms	36,5		3015	
3x95ms	41,5		3931	
3x120ms	43,9		4769	
3x150ms	48,3		5797	
3x185ms	52,3		7026	
3x240ms	58,1		8904	
4x70ms	40,5		3847	
4x95ms	45,3		5114	
4x120ms	48,3		6155	
4x150ms	52,3		7420	
4x185ms	58,1		9206	
4x240ms	62,1		11433	
5x70ms	43,9		4735	
5x95ms	49,3		6231	
5x120ms	55,1		7718	
5x150ms	59,1		9289	
5x185ms	64,1		11318	
5x240ms	69,1		14264	
3x70ms+1x35mr	40,5		3493	
3x95ms+1x50ms	45,3		4684	
3x120ms+1x70ms	48,3		5656	
3x150ms+1x70ms	52,3		6634	
3x185ms+1x95ms	58,1		8309	
3x240ms+1x120ms	62,1		10251	

The VBaSHvng(A)-FRLS cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of cables, mm		Weight of 1 km of VBaSHvng(A)-FRLS cables,kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5sr	14,6	14,6	349	347
1x2,5sr	14,6	14,6	354	352
1x4sr	14,6	14,6	360	356
1x6sr	14,6	14,6	370	366
1x10sr	14,6	14,6	388	386
1x16sr	14,6	14,8	419	428
1x16mr	15,0	15,2	434	442
1x25sr	16,1	16,3	546	556
1x25mr	16,4	16,6	561	570
1x35mr	17,4	17,6	671	681
1x50mr	19,1	19,3	876	887
1x70mr	-	20,9	-	1088
1x95mr	-	23,0	-	1388
1x120mr	-	24,4	-	1658
1x150mr	-	26,6	-	2006
1x185mr	-	28,6	-	2411
1x240mr	-	31,3	-	2986

The VBSHvng(A)-FRLS cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of VBSHvng(A)-FRLS cables,kg	
	0,66 kV	1 kV	0,66 kV	1kV
2x1,5sr	13,8	14,2	372	389
2x2,5sr	14,2	15,0	403	443
2x4sr	15,5	16,7	490	556
2x6sr	16,5	17,7	573	641
2x10sr	18,8	19,2	758	783
2x16sr	20,7	21,1	967	994
2x16mr	21,6	22,0	1019	1048
2x25sr	23,7	24,1	1306	1336
2x25mr	24,4	25,2	1357	1417
2x35mr	26,8	27,2	1676	1710
2x50mr	30,2	30,6	2230	2267
3x1,5sr	13,9	14,7	381	423
3x2,5sr	14,7	15,6	444	488
3x4sr	16,1	17,4	548	619
3x6sr	17,2	18,5	649	716
3x10sr	19,7	20,2	875	902
3x16sr	21,8	22,2	1138	1168
3x16mr	22,8	23,2	1193	1223
3x25sr	25,4	25,8	1590	1624
3x25mr	26,2	26,6	1646	1681
3x35mr	28,3	28,7	2016	2053
3x50mr	32,0	32,8	2725	2810
4x1,5sr	14,7	15,7	429	476
4x2,5sr	15,7	16,6	505	555
4x4sr	17,3	18,7	630	704
4x6sr	18,5	19,9	746	832
4x10sr	21,3	21,8	1031	1063
4x16sr	23,6	24,1	1359	1394
4x16mr	24,7	25,6	1421	1486
4x25sr	27,6	28,1	1931	1971
4x25mr	28,5	28,9	1996	2037
4x35mr	30,9	31,3	2460	2503
4x50mr	35,8	36,2	3443	3493
5x1,5sr	15,7	16,7	486	541
5x2,5sr	16,7	17,8	576	626
5x4sr	18,5	20,1	719	813
5x6sr	19,9	21,5	875	974
5x10sr	23,1	23,6	1215	1251
5x16sr	26,0	26,6	1641	1681
5x16mr	27,2	27,8	1712	1754
5x25sr	30,1	30,6	2293	2339
5x25mr	31,0	31,6	2368	2415
5x35mr	34,1	34,7	2988	3039
5x50mr	39,1	39,6	4137	4195
3x25sr+1x16sr	27,6	28,1	1875	1914
3x25mr+1x16mr	28,5	28,9	1936	1977
3x35mr+1x16mr	29,9	30,3	2242	2283
3x50mr+1x25mr	34,2	34,7	3096	3141

The VBSHvng(A)-FRLS cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of VBSHvng(A)-FRLS cables, kg
2x70ms	30,6	2299
2x95ms	33,0	2945
2x120ms	37,4	3597
2x150ms	39,4	4260
2x185ms	41,9	5087
2x240ms	48,2	6482
3x70ms	37,4	3285
3x95ms	42,4	4242
3x120ms	44,8	5099
3x150ms	49,2	6161
3x185ms	54,0	7778
3x240ms	59,8	9741
4x70ms	41,4	4149
4x95ms	46,2	5453
4x120ms	49,2	6519
4x150ms	54,0	8172
4x185ms	59,8	10042
4x240ms	63,8	12330
5x70ms	44,8	5065
5x95ms	50,2	6602
5x120ms	56,4	8444
5x150ms	60,8	10141
5x185ms	65,8	12246
5x240ms	70,8	15257
3x70ms+1x35mr	41,4	3796
3x95ms+1x50ms	46,2	5023
3x120ms+1x70ms	49,2	6020
3x150ms+1x70ms	54,0	7387
3x185ms+1x95ms	59,8	9146
3x240ms+1x120ms	63,8	11149



PvVGng(A)-FRLS

Power cables: copper conductors, XLPE insulation, low-smoke PVC-compound inner and outer sheath, low fume and gas emission, with thermal barrier along current-carrying conductor.

PvVGEng(A)-FRLS

Power cables: copper conductors, XLPE insulation, low-smoke PVC-compound inner and outer sheath, low fume and gas emission, with thermal barrier along current-carrying conductor, screened.

PvBSHvng(A)-FRLS

Power cables: copper conductors, XLPE insulation, low-smoke PVC-compound inner sheath and protection hose, low fume and gas emission, with thermal barrier along current-carrying conductor, armour of galvanized steel band

PvBaSHvng(A)-FRLS

Power cables: copper conductors, XLPE insulation, low smoke PVC-compound inner sheath and protection hose, low fume and gas emission, with thermal barrier along current-carrying conductor, armour of aluminium or aluminium alloy band

(FR index in the grades of cables stands for their **Fire Resistance**, LS index in the grades stands for **Low Smoke**)

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables are designed for nuclear plant safety system power supply cable lines, fire safety system circuit wiring: fire-control circuits, power supply for fire water pumps, emergency exit lights, smoke exhaust and plenum ventilation system lights, as well as evacuation lifts lights. The cables are used for laying in surgical units at hospitals and in emergency power supply circuits which can operate in case of fire.

OKP Codes

352100 cables with copper conductors for nominal voltage 0,66 kV

353300 cables with copper conductors for nominal voltage 1 kV

DESIGN

- 1. Conductor:** copper, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.
- 2. Thermal barrier:** micaceous double-layer lapping, minimal band width is 0,12 mm.
- 3. Insulation:** XLPE. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.
- 4. Stranding:** insulated conductors of two-, three-, four- or five-core cables are stranded; two-, three and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.
- 5. Inner sheath:** low-smoke PVC-compound, with low fume and gas emission. Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one. Nominal thickness of the inner sheath is specified in the Appendix on page 123.
- 6. Metal screen:** for the cables of PvVGEng(A)-FRLS types: lapping with two copper bands min 0,06 mm thick with overlapping.
- 7. Outer sheath:** for unarmoured PvVGng(A)-FRLS and VPvVGEng(A)-FRLS cables: low-smoke PVC-compound, low fume and gas emission. Nominal thickness of the outer sheath is specified in the Appendix on page 123.
- 8. Armour:** for multi-core PvBSHvng(A)-FRLS cables: two steel galvanized bands or for single-core PvBaSHvng(A)-FRLS cables: aluminium or aluminium alloy bands; bands are laid so that the upper band overlaps the gaps between the coils of the lower band. Gaps between coils of each band should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.
- 9. Armored cable protection hose:** for the cables of PvBSHvng(A)-FRLS and PvBaSHvng(A)-FRLS type: low-smoke PVC-compound, low fume and gas emission. Thickness of the protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class.....UHL, placement categories 1, 5 according to GOST 15150-69
 Operating temperature range.....from -50°C to +50°C
 Relative air humidity at max +35°C.....max 98%
 Laying and installation of cables without preheating
 is performed at temperature not less than.....-15°C
 Nominal frequency.....50Hz

AC test voltage at 50Hz frequency:

for the voltage 0,66kV3kV
 for the voltage 1kV.....3,5kV

Minimum bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
 for multi-core cables.....7.5 outer cable diameters

Cable conductor continuous operating heating temperature max.....90 °C
 Max allowed pulling force during cable tracing.....50N/mm²

Construction cable length, not less than:

up to 16 mm².....250m
 from 25 mm² to 70 mm².....200m
 more than 95mm².....100m
 Guarantee use period.....5 years date of input of the cable into operation
 Service life.....30 years

FIRE SAFETY PERFORMANCE

Cables are flame-retardant when laid as cable bunches and comply with the fire safety class according to GOST R 53315-2009 - item 16.1.2.2.2
 Cables are characterised by low chlorine hydride emission (max 140 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.
 Fire tests proved cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 50%.
 Cables are flame-retardant for min 180 minutes if exposed to open fire.

The PvVGng(A)-FRLS cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvVGng(A)-FRLS cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	9,5	9,7	148	152
1x6sr	10,0	10,2	174	179
1x10sr	10,8	11,0	223	228
1x16sr	11,7	11,9	293	298
1x16mr	12,2	12,4	304	310
1x25sr	13,2	13,4	401	407
1x25mr	13,6	13,8	414	420
1x35mr	14,6	14,8	514	520
1x50mr	16,1	16,3	696	703
1x70mr	-	18,5	-	915
1x95mr	-	20,2	-	1173
1x120mr	-	21,8	-	1437
1x150mr	-	24,0	-	1758
1x185mr	-	26,0	-	2136
1x240mr	-	28,5	-	2663
2x4sr	14,2	14,6	339	354
2x6sr	15,2	15,6	409	424
2x10sr	16,8	17,2	534	551
2x16sr	18,7	19,1	715	733
2x16mr	19,6	20,0	757	778
2x25sr	21,7	22,1	1005	1026
2x25mr	22,4	22,8	1050	1073
2x35mr	24,6	25,0	1323	1348
2x50mr	27,6	28,0	1790	1818
3x4sr	14,9	15,3	384	399
3x6sr	15,9	16,4	471	487
3x10sr	17,6	18,0	630	647
3x16sr	19,7	20,1	862	881
3x16mr	20,6	21,1	906	927
3x25sr	22,9	23,3	1227	1250
3x25mr	23,8	24,3	1291	1315
3x35mr	26,0	26,4	1627	1653
3x50mr	29,2	29,6	2239	2268
4x4sr	15,9	16,4	447	464
4x6sr	17,1	17,6	554	573
4x10sr	19,0	19,5	753	773
4x16sr	21,3	21,8	1045	1067
4x16mr	22,4	22,9	1095	1120
4x25sr	25,1	25,6	1532	1558
4x25mr	26,0	26,5	1591	1619
4x35mr	28,4	28,9	2015	2045
4x50mr	32,4	32,9	2837	2871
5x4sr	17,1	17,7	523	543
5x6sr	18,5	19,0	660	681
5x10sr	20,6	21,1	900	924
5x16sr	23,2	23,9	1255	1294
5x16mr	24,6	25,1	1326	1355
5x25sr	27,4	27,9	1839	1868
5x25mr	28,4	28,9	1908	1941
5x35mr	31,1	32,0	2438	2512
5x50mr	35,9	36,4	3488	3528
3x25sr+1x16sr	25,1	25,6	1479	1505
3x25mr+1x16mr	26,0	26,5	1535	1563
3x35mr+1x16mr	27,5	27,9	1822	1850
3x50mr+1x25mr	30,9	31,8	2522	2592

The PvVGng(A)-FRLS cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvVGng(A)-FRLS, cables, kg
2x70ms	29,6	1915
2x95ms	32,0	2487
2x120ms	36,4	3093
2x150ms	38,4	3701
2x185ms	40,9	4454
2x240ms	47,2	5717
3x70ms	36,4	2782
3x95ms	41,4	3614
3x120ms	43,8	4440
3x150ms	48,2	5409
3x185ms	52,2	6555
3x240ms	58,0	8316
4x70ms	40,4	3553
4x95ms	45,2	4713
4x120ms	48,2	5740
4x150ms	52,2	6928
4x185ms	58,0	8604
4x240ms	62,0	10682
5x70ms	43,8	4383
5x95ms	49,2	5744
5x120ms	54,6	7147
5x150ms	59,0	8688
5x185ms	64,0	10584
5x240ms	69,0	13345
3x70ms+1x35mr	40,4	3222
3x95ms+1x50ms	45,2	4310
3x120ms+1x70ms	48,2	5267
3x150ms+1x70ms	52,2	6185
3x185ms+1x95ms	58,0	7750
3x240ms+1x120ms	62,0	9576

The PvVGenG(A)-FRLS cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvVGenG(A)-FRLS cables, kg
2x70ms	29,7	1979
2x95ms	32,1	2557
2x120ms	36,5	3172
2x150ms	38,5	3785
2x185ms	41,0	4544
2x240ms	47,3	5821
3x70ms	36,5	2862
3x95ms	41,5	3705
3x120ms	43,9	4537
3x150ms	48,3	5516
3x185ms	52,3	6672
3x240ms	58,1	8446
4x70ms	40,5	3642
4x95ms	45,3	4812
4x120ms	48,3	5847
4x150ms	52,3	7044
4x185ms	58,1	8734
4x240ms	62,1	10821
5x70ms	43,9	4480
5x95ms	49,3	5854
5x120ms	55,1	7332
5x150ms	59,1	8820
5x185ms	64,1	10728
5x240ms	69,1	13499
3x70ms+1x35mr	40,5	3311
3x95ms+1x50ms	45,3	4410
3x120ms+1x70ms	48,3	5374
3x150ms+1x70ms	52,3	6302
3x185ms+1x95ms	58,1	7880
3x240ms+1x120ms	62,1	9715

The PvVEng(A)-FRLS cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvVEng(A)-FRLS cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	9,7	9,9	165	170
1x6sr	10,2	10,4	193	198
1x10sr	11,0	11,2	243	248
1x16sr	11,9	12,1	316	321
1x16mr	12,4	12,6	328	334
1x25sr	13,4	13,6	428	433
1x25mr	13,8	14,0	441	448
1x35mr	14,8	15,0	543	550
1x50mr	16,3	16,5	729	736
1x70mr	-	18,7	-	953
1x95mr	-	20,4	-	1215
1x120mr	-	22,0	-	1483
1x150mr	-	24,2	-	1809
1x185mr	-	26,2	-	2191
1x240mr	-	28,7	-	2724
2x4sr	14,4	14,8	367	383
2x6sr	15,4	15,8	439	455
2x10sr	17,0	17,4	568	586
2x16sr	18,9	19,3	753	773
2x16mr	19,8	20,2	798	819
2x25sr	21,9	22,3	1050	1073
2x25mr	22,6	23,0	1097	1121
2x35mr	24,8	25,2	1375	1401
2x50mr	27,8	28,2	1849	1878
3x4sr	15,0	15,5	413	429
3x6sr	16,1	16,5	502	520
3x10sr	17,8	18,2	665	684
3x16sr	19,8	20,3	902	923
3x16mr	20,8	21,2	949	971
3x25sr	23,1	23,5	1275	1299
3x25mr	24,0	24,4	1341	1366
3x35mr	26,2	26,6	1682	1709
3x50mr	29,4	29,8	2302	2332
4x4sr	16,1	16,6	478	497
4x6sr	17,3	17,8	589	609
4x10sr	19,2	19,7	792	813
4x16sr	21,5	22,0	1090	1113
4x16mr	22,6	23,1	1142	1168
4x25sr	25,3	25,8	1585	1612
4x25mr	26,2	26,6	1647	1676
4x35mr	28,6	29,0	2076	2107
4x50mr	32,6	33,1	2907	2943
5x4sr	17,3	17,9	557	578
5x6sr	18,7	19,2	698	720
5x10sr	20,8	21,3	943	968
5x16sr	23,3	24,1	1304	1344
5x16mr	24,8	25,3	1378	1408
5x25sr	27,6	28,1	1897	1928
5x25mr	28,5	29,1	1969	2003
5x35mr	31,2	32,2	2505	2581
5x50mr	36,1	36,6	3566	3607
3x25sr+1x16sr	25,3	25,8	1532	1560
3x25mr+1x16mr	26,2	26,6	1590	1619
3x35mr+1x16mr	27,6	28,1	1881	1910
3x50mr+1x25mr	31,1	32	2589	2661

The PvBaSHvng(A)-FRLS cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvBaSHvng(A)-FRLS cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	14,6	14,6	356	354
1x6sr	14,6	14,6	366	364
1x10sr	14,6	14,6	386	383
1x16sr	14,0	14,2	387	394
1x16mr	14,4	14,6	402	409
1x25sr	15,5	15,7	507	514
1x25mr	15,8	16,0	523	530
1x35mr	16,8	17,0	529	637
1x50mr	18,3	18,5	823	832
1x70mr	-	20,3	-	1031
1x95mr	-	22,0	-	1300
1x120mr	-	23,6	-	1574
1x150mr	-	25,4	-	1880
1x185mr	-	27,8	-	2299
1x240mr	-	30,3	-	2840

The PvBSHvng(A)-FRLS cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvBSHvng(A)-FRLS cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
2x4sr	15,1	15,5	460	479
2x6sr	16,1	16,5	540	560
2x10sr	17,6	18,0	682	695
2x16sr	19,5	19,9	873	896
2x16mr	20,4	20,8	925	949
2x25sr	22,5	22,9	1193	1219
2x25mr	23,2	23,6	1245	1272
2x35mr	25,6	26,0	1553	1582
2x50mr	28,6	29,0	2052	2084
3x4sr	15,7	16,1	511	531
3x6sr	16,8	17,2	609	630
3x10sr	18,5	18,9	778	800
3x16sr	20,5	20,9	1030	1054
3x16mr	21,5	21,9	1084	1109
3x25sr	23,7	24,2	1427	1454
3x25mr	24,5	25,3	1485	1542
3x35mr	27,0	27,5	1871	1902
3x50mr	30,2	30,7	2517	2551
4x4sr	16,8	17,3	585	608
4x6sr	18,0	18,5	698	721
4x10sr	19,9	20,3	915	940
4x16sr	22,2	22,6	1230	1257
4x16mr	23,2	23,7	1290	1320
4x25sr	26,2	26,6	1767	1798
4x25mr	27,0	27,5	1836	1869
4x35mr	29,4	29,9	2285	2320
4x50mr	33,4	33,9	3148	3188
5x4sr	18,0	18,5	666	691
5x6sr	19,3	19,9	817	843
5x10sr	21,4	22,0	1078	1106
5x16sr	24,0	24,5	1458	1488
5x16mr	25,6	26,2	1556	1590
5x25sr	28,4	29,0	2098	2133
5x25mr	29,4	29,9	2178	2216
5x35mr	32,1	33,0	2735	2819
5x50mr	36,9	37,5	3833	3879
3x25sr+1x16sr	26,2	26,6	1702	1746
3x25mr+1x16mr	27,0	27,5	1766	1813
3x35mr+1x16mr	29,4	29,0	2157	2115
3x50mr+1x25mr	33,4	32,8	2961	2897

The PvBShvng(A)-FRLS cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvBShvng(A)-FRLS cables, kg
2x70ms	30,6	2197
2x95ms	33,0	2794
2x120ms	37,4	3442
2x150ms	39,4	4072
2x185ms	41,9	4851
2x240ms	48,2	6176
3x70ms	37,4	3132
3x95ms	42,4	4016
3x120ms	44,8	4867
3x150ms	49,2	5879
3x185ms	54,0	7424
3x240ms	59,8	9282
4x70ms	41,4	3945
4x95ms	46,2	5151
4x120ms	49,2	6210
4x150ms	54,0	7797
4x185ms	59,8	9570
4x240ms	63,8	11719
5x70ms	44,8	4810
5x95ms	50,2	6225
5x120ms	56,4	8058
5x150ms	60,8	9672
5x185ms	65,8	11656
5x240ms	70,8	14492
3x70ms+1x35mr	41,4	3614
3x95ms+1x50ms	46,2	4749
3x120ms+1x70ms	49,2	5737
3x150ms+1x70ms	54,0	7054
3x185ms+1x95ms	59,8	8716
3x240ms+1x120ms	63,8	10613



PPGng(A)FRHF

Power cables: copper conductors, halogen free polymer compound insulation, inner and outer sheath, with thermal barrier along current-carrying conductor.

PPGEng(A)-FRHF

Power cables: copper conductors, halogen free polymer compound insulation, inner and outer sheath, with thermal barrier along current-carrying conductor, screened.

PBPng(A)-FRHF

Power cables: copper conductors, halogen free polymer compound insulation, inner sheath and protection hose, with thermal barrier along current-carrying conductor, armour of galvanized steel band.

PBaPng(A)-FRHF

Power cables: copper conductors, halogen free polymer compound insulation, inner sheath and protection hose, with thermal barrier along current-carrying conductor, armour of aluminium or aluminium alloy band.

(FR index in the grades of cables stands for their **Fire Resistance**; HF index in the grades of cables stands for **Halogen Free**).

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables are designed for nuclear plant safety system power supply cable lines, fire safety system circuit wiring: fire-control circuits, power supply for fire water pumps, emergency exit lights, smoke exhaust and plenum ventilation system lights, as well as evacuation lifts lights. The cables are used for laying in surgical units at hospitals and in emergency power supply circuits which can operate in case of fire.

OKP odes

352100 cables with copper conductors for nominal voltage 0,66 kV

353300 cables with copper conductors for nominal voltage 1 kV

DESIGN

1. **Conductor:** copper, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.
2. **Thermal barrier:** micaceous double-layer lapping, minimal band width is 0,12 mm.
3. **Insulation:** halogen free polymer compound. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.
4. **Stranding:** insulated conductors of two-, three-, four- or five-core cables are stranded; two-, three and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.
5. **Inner sheath:** halogen free polymer compound. Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one. Nominal thickness of the inner sheath is specified in the Appendix on page 123.
6. **Metal screen:** for the cables of PPGEng(A)-FRHF type: lapping with two copper bands min 0,06 mm thick with overlapping.
7. **Outer sheath:** for unarmoured PPGng(A)-FRHF and PPGEng(A)-FRHF cables: halogen free polymer compound. Nominal thickness of the outer sheath is specified in the Appendix on page 123.
8. **Armouring:** for multi-core PBPng(A)-FRHF cables: two steel galvanized bands or for single-core PBaPng(A)-FRHF cables: aluminium or aluminium alloy bands; bands are laid so that the upper band overlaps the gaps between the coils of the lower band. Gaps between coils of each band should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.
9. **Armoured cable protection hose:** for PBPng(A)-FRHF and PBaPng(A)-FRHF cables: halogen free polymer compound. Thickness of the protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 3, 5 according to GOST 15150-69
 Operating temperature range.....from -50°C to +50°C
 Relative air humidity at max +35°C.....max 98%
 Laying and installation of cables without preheating is performed at temperature not less than.....-15°C
 Nominal frequency.....50Hz

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV.....3 kV
 for the voltage 1 kV.....3,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
 for multi-core cables.....7,5 outer cable diameters
 Cable conductor continuous operating heating temperature max.....70 °C
 Max allowed pulling force during cable tracing.....50N/mm²

Construction length with the main core's cross-section:

up to 16 mm².....250m
 from 25 mm² to 70 mm².....200m
 more than 95mm².....100m
 Guarantee use period.....5 years from date of input of the cable into operation
 Service life.....40 years

FIRE SAFETY PERFORMANCE

Cables are flame-retardant when laid as cable bunches and comply with the fire safety class according to GOST R 53315-2009 - Item 16.1.1.2.1

Cables are characterised by low chlorine hydride emission (max 5 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.

Fire tests proved cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 40%.

Cables are flame-retardant for min 180 minutes if exposed to open fire.

The PPGng(A)-FRHF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PPVng(A)-FRHF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5sr	8,4	9,0	102	116
1x2,5sr	9,0	9,4	123	132
1x4sr	9,7	10,3	149	164
1x6sr	10,2	10,8	176	192
1x10sr	11,4	11,6	236	242
1x16sr	12,3	12,5	308	314
1x16mr	12,8	13,0	318	325
1x25sr	13,8	14,0	421	428
1x25mr	14,2	14,4	432	439
1x35mr	15,2	15,4	533	541
1x50mr	16,9	17,1	728	736
1x70mr	-	19,1	-	943
1x95mr	-	21,2	-	1225
1x120mr	-	22,6	-	1484
1x150mr	-	24,8	-	1813
1x185mr	-	26,8	-	2200
1x240mr	-	29,5	-	2752
2x1,5sr	13,0	13,3	262	250
2x2,5sr	13,3	14,1	306	276
2x4sr	14,6	15,8	397	347
2x6sr	15,6	16,8	471	417
2x10sr	18,0	18,4	602	582
2x16sr	19,9	20,3	790	768
2x16mr	20,8	21,2	834	811
2x25sr	22,9	23,3	1097	1072
2x25mr	23,6	24,2	1153	1114
2x35mr	25,8	26,2	1420	1392
2x50mr	29,2	29,6	1934	1902
3x1,5sr	13,0	13,9	258	289
3x2,5sr	13,9	14,7	310	343
3x4sr	15,3	16,6	397	451
3x6sr	16,4	17,7	485	543
3x10sr	18,9	19,3	688	710
3x16sr	20,9	21,4	927	951
3x16mr	21,9	22,3	970	995
3x25sr	24,4	24,8	1323	1351
3x25mr	25,1	25,6	1370	1398
3x35mr	27,3	27,7	1712	1744
3x50mr	30,9	31,8	2374	2447
4x1,5sr	13,9	14,8	295	330
4x2,5sr	14,8	15,8	359	397
4x4sr	16,4	17,9	465	528
4x6sr	17,6	19,1	574	642
4x10sr	20,5	21,0	825	851
4x16sr	22,8	23,2	1126	1155
4x16mr	24,0	24,5	1187	1217
4x25sr	26,6	27,1	1635	1668
4x25mr	27,4	27,9	1689	1723
4x35mr	29,8	30,3	2122	2159
4x50mr	34,7	35,2	3041	3083
5x1,5sr	14,8	15,9	340	381
5x2,5sr	15,9	17,0	417	461
5x4sr	17,7	19,3	546	619
5x6sr	19,0	20,6	686	764
5x10sr	22,2	22,8	987	1017
5x16sr	25,0	25,5	1366	1399
5x16mr	26,2	26,7	1422	1456
5x25sr	29,0	29,6	1964	2002
5x25mr	30,0	30,5	2027	2066
5x35mr	33,1	33,6	2607	2650
5x50mr	38,1	38,6	3687	3737
3x25sr+1x16sr	26,6	27,1	1579	1611
3x25mr+1x16mr	27,4	27,9	1630	1663
3x35mr+1x16mr	28,8	29,3	1918	1952
3x50mr+1x25mr	33,2	33,6	2714	2753

The PPGng(A)-FRHF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PPGng(A)-FRHF cables, kg
2x70ms	29,6	1967
2x95ms	32,0	2580
2x120ms	36,4	3177
2x150ms	38,4	3810
2x185ms	40,9	4602
2x240ms	47,2	5909
3x70ms	36,4	2867
3x95ms	41,4	3758
3x120ms	43,8	4583
3x150ms	48,2	5583
3x185ms	52,2	6786
3x240ms	58,0	8623
4x70ms	40,4	3677
4x95ms	45,2	4913
4x120ms	48,2	5939
4x150ms	52,2	7178
4x185ms	58,0	8922
4x240ms	62,0	11117
5x70ms	43,8	4544
5x95ms	49,2	6004
5x120ms	54,6	7401
5x150ms	59,0	9000
5x185ms	64,0	10992
5x240ms	69,0	13881
3x70ms+1x35mr	43,8	4544
3x95ms+1x50ms	49,2	6004
3x120ms+1x70ms	54,6	7401
3x150ms+1x70ms	59,0	9000
3x185ms+1x95ms	64,0	10992
3x240ms+1x120ms	69,0	13881

The PPGEng(A)-FRHF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PPGEng(A)-FRHF cables, kg
2x70ms	29,7	2031
2x95ms	32,1	2649
2x120ms	36,5	3256
2x150ms	38,5	3894
2x185ms	41,0	4691
2x240ms	47,3	6014
3x70ms	36,5	2946
3x95ms	41,5	3849
3x120ms	43,9	4680
3x150ms	48,3	5689
3x185ms	52,3	6902
3x240ms	58,1	8753
4x70ms	40,5	3766
4x95ms	45,3	5012
4x120ms	48,3	6046
4x150ms	52,3	7294
4x185ms	58,1	9051
4x240ms	62,1	11256
5x70ms	43,9	4641
5x95ms	49,3	6113
5x120ms	55,1	7580
5x150ms	59,1	9132
5x185ms	64,1	11136
5x240ms	69,1	14035
3x70ms+1x35mr	40,5	3415
3x95ms+1x50ms	45,3	4585
3x120ms+1x70ms	48,3	5549
3x150ms+1x70ms	52,3	6514
3x185ms+1x95ms	58,1	8161
3x240ms+1x120ms	62,1	10084

The PPGEng(A)-FRHF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PPGEng(A)-FRHF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5sr	8,6	9,2	117	131
1x2,5sr	9,2	9,6	139	149
1x4sr	9,9	10,5	166	183
1x6sr	10,4	11,0	194	212
1x10sr	11,6	11,8	258	264
1x16sr	12,5	12,7	332	339
1x16mr	13,0	13,2	343	350
1x25sr	14,0	14,2	448	456
1x25mr	14,4	14,6	460	468
1x35mr	15,4	15,6	564	572
1x50mr	17,1	17,3	762	771
1x70mr	-	19,3	-	982
1x95mr	-	21,4	-	1269
1x120mr	-	22,8	-	1532
1x150mr	-	25,0	-	1865
1x185mr	-	27,0	-	2257
1x240mr	-	29,7	-	2518
2x1,5sr	13,1	13,5	274	287
2x2,5sr	13,5	14,3	301	333
2x4sr	14,8	16,0	376	428
2x6sr	15,8	17,0	448	504
2x10sr	18,2	18,6	619	639
2x16sr	20,1	20,5	809	832
2x16mr	21,0	21,4	854	878
2x25sr	23,1	23,5	1120	1146
2x25mr	24,0	24,4	1176	1204
2x35mr	26,0	26,4	1446	1476
2x50mr	29,4	29,8	1965	1998
3x1,5sr	13,2	14,1	282	315
3x2,5sr	14,1	14,9	337	371
3x4sr	15,5	16,8	426	484
3x6sr	16,5	17,8	517	578
3x10sr	19,1	19,5	726	749
3x16sr	21,1	21,6	970	995
3x16mr	22,1	22,5	1016	1042
3x25sr	24,6	25,0	1374	1403
3x25mr	25,3	25,7	1423	1452
3x35mr	27,5	27,9	1771	1803
3x50mr	31,1	31,9	2441	2516
4x1,5sr	14,0	15,0	321	359
4x2,5sr	15,0	16,0	388	428
4x4sr	16,6	18,0	497	564
4x6sr	17,8	19,3	610	681
4x10sr	20,6	21,1	868	894
4x16sr	22,9	23,4	1174	1203
4x16mr	24,2	24,7	1238	1269
4x25sr	26,8	27,2	1692	1725
4x25mr	27,6	28,1	1748	1782
4x35mr	30,0	30,5	2187	2224
4x50mr	34,9	35,4	3116	3160
5x1,5sr	15,0	16,1	369	412
5x2,5sr	16,1	17,2	448	495
5x4sr	17,9	19,5	581	659
5x6sr	19,2	20,8	724	807
5x10sr	22,4	22,9	1033	1064
5x16sr	25,2	25,7	1418	1453
5x16mr	26,4	26,9	1477	1513
5x25sr	29,2	29,7	2027	2066
5x25mr	30,2	30,7	2092	2132
5x35mr	33,3	33,8	2679	2723
5x50mr	38,2	38,8	3771	3822
3x25sr+1x16sr	26,8	27,2	1635	16,69
3x25mr+1x16mr	27,6	28,1	1688	1723
3x35mr+1x16mr	29,0	29,5	1980	2015
3x50mr+1x25mr	33,4	34,2	2787	2861

The PBaPng(A)-FRHF cables with copper conductors, round

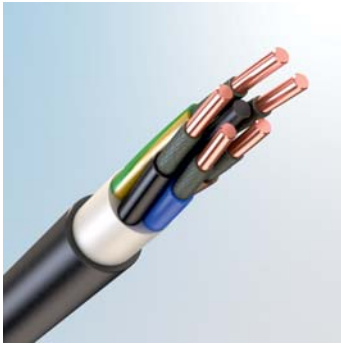
Number and nominal cross-section of cores, mm ²	Nominal outer diameter of cables, mm		Weight of 1 km of PBaPng(A)-FRHF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5sr	14,6	14,6	333	301
1x2,5sr	14,6	14,6	337	307
1x4sr	14,6	14,6	343	315
1x6sr	14,6	14,6	354	327
1x10sr	14,6	14,6	371	351
1x16sr	14,6	14,8	403	397
1x16mr	15	15,2	417	410
1x25sr	16,1	16,3	527	519
1x25mr	16,4	16,6	541	532
1x35mr	17,4	17,6	649	639
1x50mr	19,1	19,3	852	840
1x70mr	-	20,9	-	1036
1x95mr	-	23	-	1327
1x120mr	-	24,4	-	1592
1x150mr	-	26,6	-	1930
1x185mr	-	28,6	-	2327
1x240mr	-	31,3	-	2890

The PBPng(A)-FRHF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PBPng(A)-FRHF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
2x1,5sr	13,8	14,2	356	372
2x2,5sr	14,2	15,0	387	425
2x4sr	15,5	16,7	472	534
2x6sr	16,5	17,7	552	618
2x10sr	18,8	19,2	733	757
2x16sr	20,7	21,1	938	964
2x16mr	21,6	22,0	989	1016
2x25sr	23,7	24,1	1271	1300
2x25mr	24,4	25,2	1320	1376
2x35mr	26,8	27,2	1632	1664
2x50mr	30,2	30,6	2177	2213
3x1,5sr	13,9	14,7	365	405
3x2,5sr	14,7	15,6	427	468
3x4sr	16,1	17,4	528	596
3x6sr	17,2	18,5	627	690
3x10sr	19,7	20,2	848	874
3x16sr	21,8	22,2	1107	1135
3x16mr	22,8	23,2	1160	1189
3x25sr	25,4	25,8	1548	1581
3x25mr	26,2	26,6	1603	1636
3x35mr	28,3	28,7	1968	2003
3x50mr	32,0	32,8	2667	2749
4x1,5sr	14,7	15,7	411	456
4x2,5sr	15,7	16,6	485	533
4x4sr	17,3	18,7	607	678
4x6sr	18,5	19,9	722	804
4x10sr	21,3	21,8	1001	1031
4x16sr	23,6	24,1	1324	1357
4x16mr	24,7	25,6	1384	1444
4x25sr	27,6	28,1	1883	1921
4x25mr	28,5	28,9	1946	1985
4x35mr	30,9	31,3	2404	2446
4x50mr	35,8	36,2	3370	3418
5x1,5sr	15,7	16,7	466	519
5x2,5sr	16,7	17,8	555	602
5x4sr	18,5	20,1	694	783
5x6sr	19,9	21,5	847	941
5x10sr	23,1	23,6	1179	1214
5x16sr	26,0	26,6	1597	1636
5x16mr	27,2	27,8	1666	1706
5x25sr	30,1	30,6	2238	2282
5x25mr	31,0	31,6	2310	2355
5x35mr	34,1	34,7	2922	2971
5x50mr	39,1	39,6	4052	4107
3x25sr+1x16sr	27,6	28,1	1827	1864
3x25mr+1x16mr	28,5	28,9	1886	1925
3x35mr+1x16mr	29,9	30,3	2190	2228
3x50mr+1x25mr	34,2	34,7	3031	3074

The PBPng(A)-FRHF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PBPng(A)-FRHF cables, kg
2x70ms	30,6	2246
2x95ms	33,0	2883
2x120ms	37,4	3524
2x150ms	39,4	4177
2x185ms	41,9	4995
2x240ms	48,2	6365
3x70ms	37,4	32,14
3x95ms	42,4	4157
3x120ms	44,8	5006
3x150ms	49,2	6049
3x185ms	54,0	7649
3x240ms	59,8	9583
4x70ms	41,4	4065
4x95ms	46,2	5348
4x120ms	49,2	6405
4x150ms	54,0	8041
4x185ms	59,8	9882
4x240ms	63,8	12147
5x70ms	44,8	4967
5x95ms	50,2	6480
5x120ms	56,4	8307
5x150ms	60,8	9977
5x185ms	65,8	12057
5x240ms	70,8	15021
3x70ms+1x35mr	41,4	3714
3x95ms+1x50ms	46,2	4920
3x120ms+1x70ms	49,2	5909
3x150ms+1x70ms	54,0	7261
3x185ms+1x95ms	59,8	8991
3x240ms+1x120ms	63,8	10975



PvPGng(A)-FRHF,

Power cables: copper conductors, XLPE insulation, halogen free polymer compound inner and outer sheath, with thermal barrier along current-carrying conductor.

PvPGEg(A)-FRHF,

Power cables: copper conductors, XLPE insulation, halogen free polymer compounds inner and outer sheath, with thermal barrier along current-carrying conductor, screened.

PvBPng(A)-FRHF

Power cables: copper conductors, XLPE insulation, halogen free polymer compound inner sheath and protection hose, with thermal barrier along current-carrying conductor, armour of galvanized steel band.

PvBaPng(A)-FRHF

Power cables: copper conductors, XLPE insulation, halogen free polymer compound inner sheath and protection hose, with thermal barrier along current-carrying conductor, armour of aluminium or aluminium alloy band.

(FR index in the grades of cables stands for their **Fire Resistance**; HF index in the grades of cables stands for **Halogen Free**).

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The cables are designed for nuclear plant safety system power supply cable lines, fire safety system circuit wiring: fire-control circuits, power supply for fire water pumps, emergency exit lights, smoke exhaust and plenum ventilation system lights, as well as evacuation lifts lights. The cables are used for laying in surgical units at hospitals and in emergency power supply circuits which can operate in case of fire.

OKP Codes

352100 cables with copper conductors for nominal voltage 0,66 kV
353300 cables with copper conductors for nominal voltage 1 kV

DESIGN

1. **Conductor:** copper, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.
2. **Thermal barrier:** micaceous double-layer lapping, minimal band width is 0,12 mm.
3. **Insulation:** XLPE. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.
4. **Stranding:** insulated conductors of two-, three-, four- or five-core cables are stranded; two-, three and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.
5. **Inner sheath:** halogen free polymer compound. Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable shape being close to circular one. Nominal thickness of the inner sheath is specified in the Appendix on page 123.
6. **Metal screen:** for the cables of PPGEng(A)-FRHF types: lapping with two copper bands min 0,06 mm thick with overlapping.
7. **Outer sheath:** for unarmored PPgng(A)-FRHF and PPGEng(A)-FRHF cables: halogen free polymer compound. Nominal thickness of the outer sheath is specified in the Appendix on page 123.
8. **Armour:** for multi-core PBPng(A)-FRHF cables: two steel galvanized bands or for single-core PBaPng(A)-FRHF cables: aluminium or aluminium alloy bands; bands are laid so that the upper band overlaps the gaps between the coils of the lower band. Gaps between coils of each band should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.
9. **Armoured cable protection hose:** for the cables of PBPng(A)-FRHF and PBaPng(A)-FRHF types: halogen free polymer compound. Thickness of the protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 1, 5 according to GOST 15150-69
Operating temperature range.....from -50°C to +50°C
Relative air humidity at max +35°C.....max 98%
Laying and installation of cables without preheating is performed at temperature not less than:.....-15°C
Nominal frequency.....50Hz

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV.....3 kV
for the voltage 1 kV.....3,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
for multi-core cables.....7,5 outer cable diameters
Cable conductor continuous operating heating temperature max.....90 °C
Max allowed pulling force during cable tracing.....50N/mm²

Construction length with the main core's cross-section:

up to 16 mm².....250m
from 25 mm² to 70 mm².....200m
more than 95mm².....100m
Guarantee use period.....5 years from date of input of the cable into operation
Service life.....40 years

FIRE SAFETY PERFORMANCE

Cables are flame-retardant when laid as cable bunches and comply with the fire safety class according to GOST R 53315-2009 - item 16.1.1.2.1
Cables are characterised by low chlorine hydride emission (max 5 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.
Fire tests proved cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 40%.
Cables are flame-retardant for min 180 minutes if exposed to open fire.

The PvPGng(A)-FRHF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvPGng(A)-FRHF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	9,5	9,7	140	144
1x6sr	10,0	10,2	166	170
1x10sr	10,8	11,0	214	218
1x16sr	11,7	11,9	283	288
1x16mr	12,2	12,4	294	299
1x25sr	13,2	13,4	390	395
1x25mr	13,6	13,8	403	408
1x35mr	14,6	14,8	501	507
1x50mr	16,1	16,3	682	689
1x70mr	-	18,5	-	896
1x95mr	-	20,2	-	1153
1x120mr	-	21,8	-	1415
1x150mr	-	24,0	-	1732
1x185mr	-	26,0	-	2107
1x240mr	-	28,5	-	2630
2x4sr	14,2	14,6	324	338
2x6sr	15,2	15,6	392	407
2x10sr	16,8	17,2	515	531
2x16sr	18,7	19,1	692	711
2x16mr	19,6	20,0	734	753
2x25sr	21,7	22,1	978	999
2x25mr	22,4	22,8	1022	1044
2x35mr	24,6	25,0	1290	1314
2x50mr	27,6	28,0	1752	1779
3x4sr	14,9	15,3	368	383
3x6sr	15,9	16,4	453	469
3x10sr	17,6	18,0	610	627
3x16sr	19,7	20,1	839	858
3x16mr	20,6	21,1	882	902
3x25sr	22,9	23,3	1199	1221
3x25mr	23,8	24,3	1261	1284
3x35mr	26,0	26,4	1593	1619
3x50mr	29,2	29,6	2200	2228
4x4sr	15,9	16,4	429	446
4x6sr	17,1	17,6	535	553
4x10sr	19,0	19,5	731	751
4x16sr	21,3	21,8	1020	1042
4x16mr	22,4	22,9	1069	1093
4x25sr	25,1	25,6	1499	1524
4x25mr	26,0	26,5	1557	1585
4x35mr	28,4	28,9	1978	2007
4x50mr	32,4	32,9	2792	2826
5x4sr	17,1	17,7	503	523
5x6sr	18,5	19,0	638	659
5x10sr	20,6	21,1	876	898
5x16sr	23,2	23,9	1227	1264
5x16mr	24,6	25,1	1295	1323
5x25sr	27,4	27,9	1802	1831
5x25mr	28,4	28,9	1870	1902
5x35mr	31,1	32,0	2395	2467
5x50mr	35,9	36,4	3432	3471
3x25sr+1x16sr	25,1	25,6	1446	1472
3x25mr+1x16mr	26,0	26,5	1500	1528
3x35mr+1x16mr	27,5	27,9	1786	1813
3x50mr+1x25mr	30,9	31,8	2480	2548

The PvPGng(A)-FRHF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km PvPGng(A)-FRHF cables, kg
2x70ms	29,6	1878
2x95ms	32,0	2445
2x120ms	36,4	3041
2x150ms	38,4	3645
2x185ms	40,9	4394
2x240ms	47,2	5640
3x70ms	36,4	2733
3x95ms	41,4	3556
3x120ms	43,8	4378
3x150ms	48,2	5335
3x185ms	52,2	6475
3x240ms	58,0	8219
4x70ms	40,4	3497
4x95ms	45,2	4644
4x120ms	48,2	5666
4x150ms	52,2	6848
4x185ms	58,0	8507
4x240ms	62,0	10577
5x70ms	43,8	4320
5x95ms	49,2	5668
5x120ms	54,6	7060
5x150ms	59,0	8587
5x185ms	64,0	10474
5x240ms	69,0	13206
3x70ms+1x35mr	40,4	3166
3x95ms+1x50ms	45,2	4241
3x120ms+1x70ms	48,2	5193
3x150ms+1x70ms	52,2	6105
3x185ms+1x95ms	58,0	7653
3x240ms+1x120ms	62,0	9472

The PvPGEng(A)-FRHF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvPGEng(A)-FRHF cables, kg
2x70ms	29,7	1941
2x95ms	32,1	2515
2x120ms	36,5	3120
2x150ms	38,5	3729
2x185ms	41,0	4484
2x240ms	47,3	5744
3x70ms	36,5	2812
3x95ms	41,5	3648
3x120ms	43,9	4475
3x150ms	48,3	5442
3x185ms	52,3	6591
3x240ms	58,1	8348
4x70ms	40,5	3586
4x95ms	45,3	4743
4x120ms	48,3	5773
4x150ms	52,3	6964
4x185ms	58,1	8636
4x240ms	62,1	10716
5x70ms	43,9	4417
5x95ms	49,3	5777
5x120ms	54,7	7182
5x150ms	59,1	8719
5x185ms	64,1	10617
5x240ms	69,1	13360
3x70ms+1x35mr	40,5	3255
3x95ms+1x50ms	45,3	4341
3x120ms+1x70ms	48,3	5300
3x150ms+1x70ms	52,3	6221
3x185ms+1x95ms	58,1	7782
3x240ms+1x120ms	62,1	9610

The PvPGEEng(A)-FRHF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvPGEEng(A)-FRHF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	9,7	9,9	157	162
1x6sr	10,2	10,4	184	189
1x10sr	11,0	11,2	234	239
1x16sr	11,9	12,1	306	311
1x16mr	12,4	12,6	318	323
1x25sr	13,4	13,6	416	422
1x25mr	13,8	14,0	430	436
1x35mr	14,8	15,0	531	537
1x50mr	16,3	16,5	715	722
1x70mr	-	18,7	-	934
1x95mr	-	20,4	-	1195
1x120mr	-	22,0	-	1461
1x150mr	-	24,2	-	1782
1x185mr	-	26,2	-	2162
1x240mr	-	28,7	-	2691
2x4sr	14,4	14,8	351	366
2x6sr	15,4	15,8	421	437
2x10sr	17,0	17,4	548	566
2x16sr	18,9	19,3	730	750
2x16mr	19,8	20,2	774	795
2x25sr	21,9	22,3	1023	1045
2x25mr	22,6	23,0	1069	1092
2x35mr	24,8	25,2	1342	1367
2x50mr	27,8	28,2	1811	1839
3x4sr	15,0	15,5	396	412
3x6sr	16,1	16,5	484	501
3x10sr	17,8	18,2	645	663
3x16sr	19,8	20,3	879	899
3x16mr	20,8	21,2	924	946
3x25sr	23,1	23,5	1247	1270
3x25mr	24,0	24,4	1311	1335
3x35mr	26,2	26,6	1648	1675
3x50mr	29,4	29,8	2263	2292
4x4sr	16,1	16,6	460	478
4x6sr	17,3	17,8	570	589
4x10sr	19,2	19,7	770	791
4x16sr	21,5	22,0	1064	1087
4x16mr	22,6	23,1	1116	1141
4x25sr	25,3	25,8	1552	1578
4x25mr	26,2	26,6	1613	1641
4x35mr	28,6	29,0	2038	2069
4x50mr	32,6	33,1	2863	2897
5x4sr	17,3	17,9	537	558
5x6sr	18,7	19,2	676	698
5x10sr	20,8	21,3	918	942
5x16sr	23,3	24,1	1275	1314
5x16mr	24,8	25,3	1347	1376
5x25sr	27,6	28,1	1861	1891
5x25mr	28,5	29,1	1931	1964
5x35mr	31,2	32,2	2462	2536
5x50mr	36,1	36,6	3510	3550
3x25sr+1x16sr	25,3	25,8	1499	1526
3x25mr+1x16mr	26,2	26,6	1555	1584
3x35mr+1x16mr	27,6	28,1	1844	1872
3x50mr+1x25mr	31,1	32,0	2547	2617

The PvBaPng(A)-FRHF cables with copper conductors, round

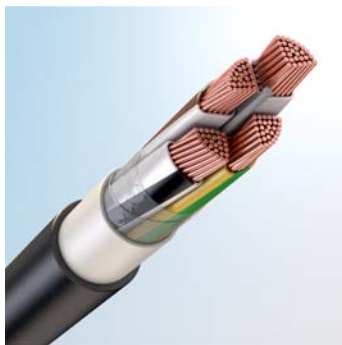
Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvBaPng(A)-FRHF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	14,6	14,6	341	311
1x6sr	14,6	14,6	350	323
1x10sr	14,6	14,6	371	346
1x16sr	14	14,2	373	366
1x16mr	14,4	14,6	387	380
1x25sr	15,5	15,7	491	482
1x25mr	15,8	16	506	497
1x35mr	16,8	17	612	602
1x50mr	18,3	18,5	804	791
1x70mr	-	20,3	-	986
1x95mr	-	22	-	1249
1x120mr	-	23,6	-	1518
1x150mr	-	25,4	-	1819
1x185mr	-	27,8	-	2229
1x240mr	-	30,3	-	2763

The PvBPng(A)-FRHF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvBPng(A)-FRHF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
2x4sr	15,1	15,5	444	462
2x6sr	16,1	16,5	522	542
2x10sr	17,6	18,0	661	674
2x16sr	19,5	19,9	850	872
2x16mr	20,4	20,8	900	924
2x25sr	22,5	22,9	1165	1190
2x25mr	23,2	23,6	1216	1242
2x35mr	25,6	26,0	1517	1546
2x50mr	28,6	29,0	2011	2042
3x4sr	15,7	16,1	494	514
3x6sr	16,8	17,2	591	611
3x10sr	18,5	18,9	757	778
3x16sr	20,5	20,9	1006	1029
3x16mr	21,5	21,9	1058	1083
3x25sr	23,7	24,2	1398	1425
3x25mr	24,5	25,3	1455	1508
3x35mr	27,0	27,5	1835	1865
3x50mr	30,2	30,7	2475	2508
4x4sr	16,8	17,3	567	589
4x6sr	18,0	18,5	678	700
4x10sr	19,9	20,3	892	917
4x16sr	22,2	22,6	1204	1230
4x16mr	23,2	23,7	1263	1292
4x25sr	26,2	26,6	1732	1762
4x25mr	27,0	27,5	1799	1831
4x35mr	29,4	29,9	2244	2279
4x50mr	33,4	33,9	3101	3139
5x4sr	18,0	18,5	646	670
5x6sr	19,3	19,9	794	820
5x10sr	21,4	22,0	1052	1080
5x16sr	24,0	24,5	1428	1459
5x16mr	25,6	26,2	1522	1556
5x25sr	28,4	29,0	2059	2093
5x25mr	29,4	29,9	2137	2174
5x35mr	32,1	33,0	2689	2771
5x50mr	36,9	37,5	3774	3818
3x25sr+1x16sr	26,2	26,6	1679	1710
3x25mr+1x16mr	27,0	27,5	1742	1775
3x35mr+1x16mr	28,5	29,0	2043	2075
3x50mr+1x25mr	32,0	32,8	2773	2850

The PvBPng(A)-FRHF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvBPng(A)-FRHF cables, kg
2x70ms	30,6	2157
2x95ms	33,0	2749
2x120ms	37,4	3387
2x150ms	39,4	4012
2x185ms	41,9	4787
2x240ms	48,2	6095
3x70ms	37,4	3079
3x95ms	42,4	3955
3x120ms	44,8	4802
3x150ms	49,2	5801
3x185ms	54,0	7338
3x240ms	59,8	9178
4x70ms	41,4	3885
4x95ms	46,2	5079
4x120ms	49,2	6132
4x150ms	54,0	7711
4x185ms	59,8	9467
4x240ms	63,8	11607
5x70ms	44,8	4743
5x95ms	50,2	6144
5x120ms	56,4	7966
5x150ms	60,8	9565
5x185ms	65,8	11539
5x240ms	70,8	14346
3x70ms+1x35mr	41,4	3554
3x95ms+1x50ms	46,2	4676
3x120ms+1x70ms	49,2	5659
3x150ms+1x70ms	54,0	6968
3x185ms+1x95ms	59,8	8613
3x240ms+1x120ms	63,8	10502



PPGng(A)-HF, APPGng(A)-HF

Power cables: copper or aluminium conductors, halogen free polymer compound insulation, inner and outer sheath.

PPGEng(A)-HF, APPGEng(A)-HF

Power cables: copper or aluminium conductors, halogen free polymer compound insulation, inner and outer sheath, screened.

PBPng(A)-HF, APBPng(A)-HF

Power cables: copper or aluminium conductors, halogen free polymer compound insulation, inner sheath and protection hose, armour of galvanized steel band.

PBaPng(A)-HF, APBaPng(A)-HF

Power cables: copper or aluminium conductors, halogen free polymer compound insulation, inner sheath and protection hose, armour of aluminium or aluminium alloy band.

(HF index in the grades of cables stands for Halogen Free)

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.
The cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).
The HF-type cables are designed for power supply cable lines in nuclear plant electrical facilities, laying in offices equipped with computers or microprocessors, in kindergartens, schools, hospitals, as well as for cable lines in entertainment and sport facilities.

OKP (Russian National Product Classifier) Codes
352100 cables with copper conductors for nominal voltage 0,66 kV
353300 cables with copper conductors for nominal voltage 1 kV

DESIGN

- 1. Conductor:** copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.
- 2. Insulation:** halogen free polymer compound. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.
- 3. Stranding:** insulated conductors of two-, three-, four- or five-core cables are stranded; two-, three and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.
- 4. Inner sheath:** halogen free polymer compound. Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one. Nominal thickness of the inner sheath is specified in the Appendix on page 123.
- 5. Metal screen:** for PPGEng(A)-HF, APPGEng(A)-HF cables: lapping with two copper bands min 0,06 mm thick with overlapping.
- 6. Outer sheath:** for unarmoured PPGng(A)-HF, APPGng(A)-HF, PPGEng(A)-HF and APPGEng(A)-HF cables: halogen free polymer compound. Nominal thickness of the outer sheath is specified in the Appendix on page 123.
- 7. Armour:** for multi-core PBPng(A)-HF, APBPng(A)-HF cables: two steel galvanized bands or for single-core PBaPng(A)-HF, APBaPng(A)-HF cables: aluminium or aluminium alloy bands; bands are laid so that the upper band overlaps the gaps between the coils of the lower band. Gaps between coils of each band should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.
- 8. Armoured cable protection hose:** for the cables of PBPng(A)-HF, APBPng(A)-HF, PBaPng(A)-HF and APBaPng(A)-HF types: halogen free polymer compound. Thickness of the protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 1, 5 according to GOST 15150-69
Operating temperature range.....from -50°C to +50°C
Relative air humidity at max +35°C.....max 98%
Laying and installation of cables without preheating
is performed at temperature not less than.....-15°C
Nominal frequency.....50Hz

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV.....3 kV
for the voltage 1 kV.....3,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
for multi-core cables.....7,5 outer cable diameters
Cable conductor continuous operating heating temperature max.....70 °C
Max allowed pulling force during cable tracing.....50N/mm²

Construction length with the main core's cross-section:

up to 16 mm².....250m
from 25 mm² to 70 mm².....200m
up to 95 mm² and more.....100m
Guarantee use period.....5 years from date of input of the cable into operation
Service life.....40 years

FIRE SAFETY PERFORMANCE

Cables are flame-retardant when laid as cable bunches and comply with the fire safety class according to GOST R 53315-2009 - item 16.8.1.2.1
Cables are characterised by low chlorine hydride emission (max 5 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.
Fire tests proved cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 40%.

The PPGng(A)-HF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PPGng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5sr	7,4	7,8	81	89
1x2,5sr	7,8	8,2	96	104
1x4sr	8,4	9,2	121	139
1x6sr	9,1	9,7	150	165
1x10sr	10,3	10,5	208	213
1x16sr	11,3	11,5	277	283
1x16mr	11,7	11,9	287	293
1x25sr	12,8	13,0	386	393
1x25mr	13,1	13,3	397	403
1x35mr	14,1	14,3	495	502
1x50mr	15,8	16,0	685	693
1x70mr	-	17,6	-	877
1x95mr	-	20,1	-	1172
1x120mr	-	21,5	-	1428
1x150mr	-	23,3	-	1727
1x185mr	-	25,7	-	2133
1x240mr	-	28,4	-	2678
2x1,5sr	12,6	12,6	243	241
2x2,5sr	12,6	12,6	256	254
2x4sr	12,8	14,0	283	328
2x6sr	13,8	15,0	349	397
2x10sr	16,2	16,6	503	521
2x16sr	18,1	18,5	681	701
2x16sr	19,0	19,4	719	740
2x25sr	21,1	21,5	971	994
2x25mr	21,8	22,2	1011	1035
2x35mr	24,0	24,4	1278	1305
2x50mr	27,4	27,8	1774	1804
3x1,5sr	12,6	12,6	251	248
3x2,5sr	12,6	12,8	270	276
3x4sr	13,4	14,7	327	376
3x6sr	14,5	15,7	411	463
3x10sr	17,0	17,4	602	622
3x16sr	19,0	19,5	832	854
3x16mr	20,0	20,4	870	893
3x25sr	22,3	22,7	1200	1226
3x25mr	23,0	23,4	1243	1270
3x35mr	25,4	25,8	1588	1617
3x50mr	29,0	29,5	2233	2267
4x1,5sr	12,6	12,7	257	258
4x2,5sr	12,7	13,7	287	320
4x4sr	14,3	15,8	386	442
4x6sr	15,5	17,0	489	550
4x10sr	18,4	18,9	726	749
4x16sr	20,7	21,1	1016	1042
4x16mr	21,7	22,2	1060	1087
4x25sr	24,5	25,0	1506	1537
4x25mr	25,3	25,8	1556	1587
4x35mr	27,7	28,2	1978	2012
4x50mr	32,2	32,7	2839	2879
5x1,5sr	12,6	13,6	267	299
5x2,5sr	13,6	14,7	335	373
5x4sr	15,4	17,0	455	521
5x6sr	16,7	18,3	588	658
5x10sr	19,9	20,5	873	900
5x16sr	22,5	23,0	1226	1256
5x16mr	23,9	24,4	1287	1319
5x25sr	26,7	27,3	1815	1851
5x25mr	27,7	28,2	1873	1910
5x35mr	30,4	31,3	2400	2478
5x50mr	35,8	36,3	3492	3539
3x25sr+1x16sr	24,5	25,0	1450	1480
3x25mr+1x16mr	25,3	25,8	1496	1528
3x35mr+1x16mr	26,8	27,3	1784	1815
3x50mr+1x25mr	30,7	31,6	2523	2597

The PPGng(A)-HF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PPGng(A)-HF cables, kg
2x70ms	26,2	1840
2x95ms	28,2	2395
2x120ms	32,6	2991
2x150ms	35,0	3649
2x185ms	37,5	4431
2x240ms	43,4	5671
3x70ms	30,2	2582
3x95ms	35,0	3516
3x120ms	38,0	4286
3x150ms	42,4	5281
3x185ms	46,8	6514
3x240ms	51,8	8184
4x70ms	35,0	3444
4x95ms	39,0	4547
4x120ms	42,4	5618
4x150ms	46,8	6883
4x185ms	51,8	8460
4x240ms	56,6	10767
5x70ms	38,0	4218
5x95ms	43,4	5665
5x120ms	48,8	7006
5x150ms	53,2	8599
5x185ms	58,6	10624
5x240ms	62,6	13306
3x70ms+1x35mr	35,0	3101
3x95ms+1x50ms	39,0	4127
3x120ms+1x70ms	42,4	5128
3x150ms+1x70ms	46,8	6113
3x185ms+1x95ms	51,8	7580
3x240ms+1x120ms	56,6	9607

The PPGEng(A)-HF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PPGEng(A)-HF cables, kg
2x70ms	26,4	1896
2x95ms	28,4	2456
2x120ms	32,8	3062
2x150ms	35,2	3725
2x185ms	37,7	4513
2x240ms	43,6	5767
3x70ms	30,4	2647
3x95ms	35,2	3592
3x120ms	38,2	4369
3x150ms	42,6	5375
3x185ms	47,0	6617
3x240ms	52,0	8299
4x70ms	35,2	3520
4x95ms	39,2	4633
4x120ms	42,6	5712
4x150ms	47,0	6986
4x185ms	52,0	8575
4x240ms	56,8	10893
5x70ms	38,2	4301
5x95ms	43,6	5761
5x120ms	49,0	7114
5x150ms	53,4	8718
5x185ms	58,8	10755
5x240ms	62,8	13447
3x70ms+1x35mr	35,2	3176
3x95ms+1x50ms	39,2	4212
3x120ms+1x70ms	42,6	5222
3x150ms+1x70ms	47,0	6216
3x185ms+1x95ms	52,0	7695
3x240ms+1x120ms	56,8	9733

PPGEng(A)-HF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PPGEng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5sr	7,5	7,9	94	102
1x2,5sr	7,9	8,3	110	119
1x4sr	8,6	9,4	135	155
1x6sr	9,3	9,9	167	183
1x10sr	10,5	10,7	227	233
1x16sr	11,4	11,6	299	305
1x16mr	11,9	12,1	309	315
1x25sr	12,9	13,1	411	418
1x25mr	13,3	13,5	423	430
1x35mr	14,3	14,5	524	531
1x50mr	16,0	16,2	718	726
1x70mr	-	17,8	-	914
1x95mr	-	20,3	-	1214
1x120mr	-	21,7	-	1473
1x150mr	-	23,9	-	1800
1x185mr	-	25,9	-	2188
1x240mr	-	28,6	-	2739
2x1,5sr	12,8	12,8	266	265
2x2,5sr	12,8	12,8	279	278
2x4sr	13,0	14,2	307	355
2x6sr	14,0	15,2	375	426
2x10sr	16,4	16,8	535	554
2x16sr	18,3	18,7	717	738
2x16mr	19,2	19,6	758	780
2x25sr	21,3	21,7	1015	1039
2x25mr	22,0	22,4	1056	1081
2x35mr	24,2	24,6	1329	1356
2x50mr	27,6	28,0	1832	1864
3x1,5sr	12,8	12,8	274	272
3x2,5sr	12,8	13,0	294	300
3x4sr	13,6	14,9	353	404
3x6sr	14,6	15,9	438	494
3x10sr	17,2	17,6	636	656
3x16sr	19,2	19,6	870	893
3x16mr	20,2	20,6	911	936
3x25sr	22,4	22,9	1247	1274
3x25mr	23,2	23,8	1291	1331
3x35mr	25,5	26,0	1642	1672
3x50mr	29,2	29,6	2296	2330
4x1,5sr	12,8	12,9	280	282
4x2,5sr	12,9	13,9	311	346
4x4sr	14,5	16,0	413	473
4x6sr	15,7	17,2	520	584
4x10sr	18,6	19,0	763	788
4x16sr	20,8	21,3	1059	1086
4x16mr	21,9	22,4	1105	1133
4x25sr	24,7	25,1	1558	1589
4x25mr	25,5	26,0	1610	1642
4x35mr	27,9	28,4	2037	2072
4x50mr	32,4	32,9	2909	2950
5x1,5sr	12,8	13,8	290	325
5x2,5sr	13,8	14,9	361	402
5x4sr	15,6	17,2	485	555
5x6sr	16,9	18,5	621	695
5x10sr	20,1	20,6	914	942
5x16sr	22,7	23,2	1273	1304
5x16mr	24,1	24,6	1337	1370
5x25sr	26,9	27,4	1872	1909
5x25mr	27,9	28,4	1932	1970
5x35mr	30,6	31,5	2465	2545
5x50mr	35,9	36,5	3570	3618
3x25sr+1x16sr	24,7	25,1	1501	1533
3x25mr+1x16mr	25,5	26,0	1550	1583
3x35mr+1x16mr	27,0	27,5	1841	1874
3x50mr+1x25mr	30,9	31,8	2590	2666

The PBaPng(A)-HF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PBaPng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x1,5sr	14,6	14,6	308	307
1x2,5sr	14,6	14,6	314	314
1x4sr	14,6	14,6	324	322
1x6sr	14,6	14,6	337	335
1x10sr	14,6	14,6	362	361
1x16sr	14,6	14,6	402	401
1x16mr	14,6	14,6	397	396
1x25sr	15,4	15,6	492	500
1x25mr	15,7	15,9	506	514
1x35mr	16,7	16,9	612	621
1x50mr	18,4	18,6	816	825
1x70mr	-	20,2	-	1017
1x95mr	-	22,3	-	1308
1x120mr	-	23,7	-	1573
1x150mr	-	25,5	-	1885
1x185mr	-	27,9	-	2306
1x240mr	-	30,6	-	2869

The PBPng(A)-HF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PBPng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
2x1,5sr	13,8	13,8	361	360
2x2,5sr	13,8	13,8	374	372
2x4sr	14,0	15,2	404	462
2x6sr	15,0	16,2	481	542
2x10sr	17,4	17,8	662	685
2x16sr	19,3	19,7	852	877
2x16mr	20,2	20,6	900	926
2x25sr	22,3	22,7	1175	1202
2x25mr	23,0	23,4	1222	1250
2x35mr	25,4	25,8	1525	1556
2x50mr	28,8	29,2	2059	2094
3x1,5sr	13,8	13,8	369	367
3x2,5sr	13,8	14,0	388	396
3x4sr	14,6	15,9	454	517
3x6sr	15,7	16,9	550	616
3x10sr	18,2	18,6	761	786
3x16sr	20,2	20,7	1013	1040
3x16mr	21,2	21,6	1062	1090
3x25sr	23,5	23,9	1417	1447
3x25mr	24,2	24,6	1467	1499
3x35mr	26,8	27,2	1850	1884
3x50mr	30,4	30,9	2536	2574
4x1,5sr	13,8	13,9	375	378
4x2,5sr	13,9	14,9	407	451
4x4sr	15,5	17,0	523	596
4x6sr	16,7	18,2	641	710
4x10sr	19,6	20,1	901	929
4x16sr	21,9	22,3	1215	1246
4x16mr	22,9	23,4	1270	1302
4x25sr	25,9	26,4	1758	1794
4x25mr	26,7	27,2	1817	1854
4x35mr	29,1	29,6	2266	2306
4x50mr	33,6	34,1	3178	3223
5x1,5sr	13,8	14,8	385	428
5x2,5sr	14,8	15,9	464	515
5x4sr	16,6	18,2	605	680
5x6sr	17,9	19,5	745	833
5x10sr	21,1	21,7	1064	1097
5x16sr	23,7	24,2	1444	1480
5x16mr	25,3	25,8	1532	1570
5x25sr	28,1	28,7	2092	2134
5x25mr	29,1	29,6	2161	2204
5x35mr	31,8	32,7	2718	2806
5x50mr	37,2	37,7	3868	3921
3x25sr+1x16sr	25,9	26,4	1701	1737
3x25mr+1x16mr	26,7	27,2	1758	1795
3x35mr+1x16mr	28,2	28,7	2062	2099
3x50mr+1x25mr	32,1	33,0	2845	2929

The PBPng(A)-HF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PBPng(A)-HF cables, kg
2x70ms	27,6	2111
2x95ms	29,6	2689
2x120ms	34,0	3334
2x150ms	36,4	4016
2x185ms	38,9	4826
2x240ms	44,8	6133
3x70ms	31,6	2898
3x95ms	36,4	3883
3x120ms	39,4	4687
3x150ms	43,8	5732
3x185ms	48,2	7011
3x240ms	54,0	9093
4x70ms	36,4	3811
4x95ms	40,4	4959
4x120ms	43,8	6069
4x150ms	48,2	7380
4x185ms	54,0	9369
4x240ms	58,8	11759
5x70ms	39,4	4619
5x95ms	44,8	6126
5x120ms	50,2	7525
5x150ms	55,4	9534
5x185ms	60,8	11653
5x240ms	64,8	14409
3x70ms+1x35mr	36,4	3468
3x95ms+1x50ms	40,4	4539
3x120ms+1x70ms	43,8	5579
3x150ms+1x70ms	48,2	6610
3x185ms+1x95ms	54,0	8489
3x240ms+1x120ms	58,8	10600

The APPGng(A)-HF cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of APPGng(A)-HF cables, kg
2x70ms	26,2	994
2x95ms	28,2	1247
2x120ms	32,6	1522
2x150ms	35,0	1822
2x185ms	37,5	2166
2x240ms	43,4	2760
3x70ms	30,2	1313
3x95ms	35,0	1794
3x120ms	38,0	2083
3x150ms	42,4	2541
3x185ms	46,8	3117
3x240ms	51,8	3817
4x70ms	35,0	1751
4x95ms	39,0	2251
4x120ms	42,4	2681
4x150ms	46,8	3229
4x185ms	51,8	3931
4x240ms	56,6	4945
5x70ms	38,0	2102
5x95ms	43,4	2794
5x120ms	48,8	3334
5x150ms	53,2	4031
5x185ms	58,6	4963
5x240ms	62,6	6028
3x70ms+1x35mr	35,0	1622
3x95ms+1x50ms	39,0	2089
3x120ms+1x70ms	42,4	2502
3x150ms+1x70ms	46,8	2949
3x185ms+1x95ms	51,8	3609
3x240ms+1x120ms	56,6	4506

The APPGng(A)-HF cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of APPGng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x2,5sr	7,8	8,2	81	89
1x4sr	8,4	9,2	97	115
1x6sr	9,1	9,7	115	129
1x10sr	10,3	10,5	148	153
1x16sr	11,3	11,5	181	187
1x16mr	11,7	11,9	189	195
1x25sr	12,8	13,0	237	243
1x25mr	13,1	13,3	244	251
1x35mr	14,1	14,3	288	295
1x50mr	15,8	16,0	372	379
1x70mr	-	17,6	-	454
1x95mr	-	20,1	-	597
1x120mr	-	21,5	-	690
1x150mr	-	23,3	-	816
1x185mr	-	25,7	-	997
1x240mr	-	28,4	-	1218
2x2,5sr	12,6	12,6	226	224
2x4sr	12,8	14,0	235	280
2x6sr	13,8	15,0	276	324
2x10sr	16,2	16,6	383	401
2x16sr	18,1	18,5	487	507
2x16mr	19,0	19,4	524	545
2x25sr	21,1	21,5	669	693
2x25mr	21,8	22,2	704	728
2x35mr	24,0	24,4	861	888
2x50mr	27,4	27,8	1142	1172
3x2,5sr	12,6	12,8	225	230
3x4sr	13,4	14,7	255	304
3x6sr	14,5	15,7	302	354
3x10sr	17,0	17,4	422	442
3x16sr	19,0	19,5	541	563
3x16mr	20,0	20,4	577	600
3x25sr	22,3	22,7	748	774
3x25mr	23,0	23,4	783	809
3x35mr	25,4	25,8	962	991
3x50mr	29,0	29,5	1285	1318
4x2,5sr	12,7	13,7	226	260
4x4sr	14,3	15,8	289	345
4x6sr	15,5	17,0	345	405
4x10sr	18,4	18,9	486	509
4x16sr	20,7	21,1	629	654
4x16mr	21,7	22,2	668	695
4x25sr	24,5	25,0	903	934
4x25mr	25,3	25,8	942	973
4x35mr	27,7	28,2	1143	1177
4x50mr	32,2	32,7	1575	1615
5x2,5sr	13,6	14,7	259	298
5x4sr	15,4	17,0	335	400
5x6sr	16,7	18,3	407	477
5x10sr	19,9	20,5	573	600
5x16sr	22,5	23,0	741	771
5x16mr	23,9	24,4	798	830
5x25sr	26,7	27,3	1062	1097
5x25mr	27,7	28,2	1106	1142
5x35mr	30,4	31,3	1357	1434
5x50mr	35,8	36,3	1912	1959
3x25sr+1x16sr	24,5	25,0	900	931
3x25mr+1x16mr	25,3	25,8	938	970
3x35mr+1x16mr	26,8	27,3	1060	1092
3x50mr+1x25mr	30,7	31,6	1421	1495

The APPGEng(A)-HF cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of APPGEng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x2,5sr	7,9	8,3	95	101
1x4sr	8,6	9,4	112	125
1x6sr	9,3	9,9	131	140
1x10sr	10,5	10,7	167	170
1x16sr	11,4	11,6	202	206
1x16mr	11,9	12,1	212	215
1x25sr	12,9	13,1	261	265
1x25mr	13,3	13,5	270	273
1x35mr	14,3	14,5	316	319
1x50mr	16,0	16,2	404	407
1x70mr	-	17,8	-	490
1x95mr	-	20,3	-	639
1x120mr	-	21,7	-	735
1x150mr	-	23,9	-	865
1x185mr	-	25,9	-	1052
1x240mr	-	28,6	-	1279
2x2,5sr	12,8	12,8	249	247
2x4sr	13,0	14,2	259	306
2x6sr	14,0	15,2	303	353
2x10sr	16,4	16,8	415	434
2x16sr	18,3	18,7	524	545
2x16mr	19,2	19,6	562	584
2x25sr	21,3	21,7	713	738
2x25mr	22,0	22,4	749	774
2x35mr	24,2	24,6	912	939
2x50mr	27,6	28,0	1200	1232
3x2,5sr	12,8	13,0	248	254
3x4sr	13,6	14,9	280	332
3x6sr	14,6	15,9	330	385
3x10sr	17,2	17,6	456	477
3x16sr	19,2	19,6	580	603
3x16mr	20,2	20,6	618	642
3x25sr	22,4	22,9	795	822
3x25mr	23,2	23,8	831	859
3x35mr	25,5	26,0	1016	1046
3x50mr	29,2	29,6	1348	1382
4x2,5sr	12,9	13,9	250	286
4x4sr	14,5	16,0	317	376
4x6sr	15,7	17,2	375	439
4x10sr	18,6	19,0	524	548
4x16sr	20,8	21,3	671	698
4x16mr	21,9	22,4	714	742
4x25sr	24,7	25,1	955	986
4x25mr	25,5	26,0	996	1028
4x35mr	27,9	28,4	1203	1238
4x50mr	32,4	32,9	1645	1686
5x2,5sr	13,8	14,9	285	326
5x4sr	15,6	17,2	365	434
5x6sr	16,9	18,5	440	515
5x10sr	20,1	20,6	614	642
5x16sr	22,7	23,2	788	819
5x16mr	24,1	24,6	848	881
5x25sr	26,9	27,4	1118	1155
5x25mr	27,9	28,4	1165	1203
5x35mr	30,6	31,5	1422	1502
5x50mr	35,9	36,5	1990	2038
3x25sr+1x16sr	24,7	25,1	952	984
3x25mr+1x16mr	25,5	26,0	992	1024
3x35mr+1x16mr	27,0	27,5	1117	1150
3x50mr+1x25mr	30,9	31,8	1488	1564

The APPGEng(A)-HF cables with aluminium cores, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of APPGEng(A)-HF cables, kg
2x70ms	26,4	1050
2x95ms	28,4	1308
2x120ms	32,8	1593
2x150ms	35,2	1898
2x185ms	37,7	2248
2x240ms	43,6	2856
3x70ms	30,4	1378
3x95ms	35,2	1870
3x120ms	38,2	2166
3x150ms	42,6	2634
3x185ms	47,0	3221
3x240ms	52,0	3933
4x70ms	35,2	1827
4x95ms	39,2	2337
4x120ms	42,6	2774
4x150ms	47,0	3332
4x185ms	52,0	4047
4x240ms	56,8	5071
5x70ms	38,2	2185
5x95ms	43,6	2890
5x120ms	49,0	3443
5x150ms	53,4	4150
5x185ms	58,8	5094
5x240ms	62,8	6169
3x70ms+1x35mr	35,2	1698
3x95ms+1x50ms	39,2	2174
3x120ms+1x70ms	42,6	2596
3x150ms+1x70ms	47,0	3052
3x185ms+1x95ms	52,0	3725
3x240ms+1x120ms	56,8	4632

The APBPng(A)-HF cables with aluminium conductors, sector

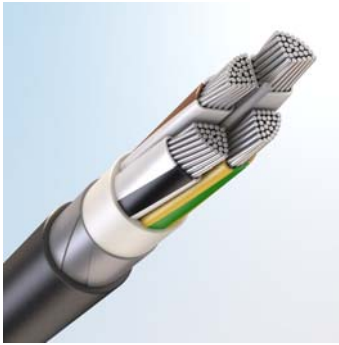
Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of APBPng(A)-HF cables, kg
2x70ms	27,6	1001
2x95ms	29,6	1256
2x120ms	34,0	1535
2x150ms	36,4	1801
2x185ms	38,9	2145
2x240ms	44,8	2738
3x70ms	31,6	1324
3x95ms	36,4	1772
3x120ms	39,4	2061
3x150ms	43,8	2519
3x185ms	48,2	3047
3x240ms	54,0	4087
4x70ms	36,4	1730
4x95ms	40,4	2230
4x120ms	43,8	2659
4x150ms	48,2	3158
4x185ms	54,0	4201
4x240ms	58,8	5183
5x70ms	39,4	2081
5x95ms	44,8	2772
5x120ms	50,2	3262
5x150ms	55,4	4310
5x185ms	60,8	5211
5x240ms	64,8	6297
3x70ms+1x35mr	36,4	1601
3x95ms+1x50ms	40,4	2067
3x120ms+1x70ms	43,8	2480
3x150ms+1x70ms	48,2	2879
3x185ms+1x95ms	54,0	3880
3x240ms+1x120ms	58,8	4745

The APBaPng(A)-HF cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of APBaPng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x2,5sr	14,6	14,6	299	298
1x4sr	14,6	14,6	300	298
1x6sr	14,6	14,6	301	299
1x10sr	14,6	14,6	302	301
1x16sr	14,6	14,6	306	305
1x16mr	14,6	14,5	299	294
1x25sr	15,4	15,6	342	351
1x25mr	15,7	15,9	353	361
1x35mr	16,7	16,9	402	411
1x50mr	18,4	18,6	499	509
1x70mr	-	20,2	-	593
1x95mr	-	22,3	-	733
1x120mr	-	23,7	-	835
1x150mr	-	25,5	-	973
1x185mr	-	27,9	-	1170
1x240mr	-	30,6	-	1409

The APBPng(A)-HF cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of APBP(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
2x2,5sr	13,8	13,8	232	231
2x4sr	14,0	15,2	242	289
2x6sr	15,0	16,2	286	336
2x10sr	17,4	17,8	397	416
2x16sr	19,3	19,7	496	517
2x16mr	20,2	20,6	534	556
2x25sr	22,3	22,7	683	707
2x25mr	23,0	23,4	718	743
2x35mr	25,4	25,8	866	893
2x50mr	28,8	29,2	1150	1181
3x2,5sr	13,8	14,0	231	237
3x4sr	14,6	15,9	263	314
3x6sr	15,7	16,9	312	367
3x10sr	18,2	18,6	429	450
3x16sr	20,2	20,7	551	574
3x16mr	21,2	21,6	589	612
3x25sr	23,5	23,9	763	790
3x25mr	24,2	24,6	799	826
3x35mr	26,8	27,2	968	998
3x50mr	30,4	30,9	1295	1328
4x2,5sr	13,9	14,9	233	268
4x4sr	15,5	17,0	299	358
4x6sr	16,7	18,2	357	413
4x10sr	19,6	20,1	496	520
4x16sr	21,9	22,3	641	668
4x16mr	22,9	23,4	683	710
4x25sr	25,9	26,4	909	940
4x25mr	26,7	27,2	948	980
4x35mr	29,1	29,6	1152	1186
4x50mr	33,6	34,1	1588	1628
5x2,5sr	14,8	15,9	268	308
5x4sr	16,6	18,2	347	407
5x6sr	17,9	19,5	414	487
5x10sr	21,1	21,7	585	612
5x16sr	23,7	24,2	756	787
5x16mr	25,3	25,8	803	835
5x25sr	28,1	28,7	1069	1105
5x25mr	29,1	29,6	1114	1151
5x35mr	31,8	32,7	1367	1446
5x50mr	37,2	37,7	1891	1938
3x25sr+1x16sr	25,9	26,4	906	937
3x25mr+1x16mr	26,7	27,2	944	976
3x35mr+1x16mr	28,2	28,7	1068	1100
3x50mr+1x25mr	32,1	33,0	1433	1507



PvPGng(A)-HF, APvPGng(A)-HF

Power cables: copper or aluminium conductors, XLPE insulation, halogen free polymer compound inner and outer sheath.

PvPGEg(A)-HF, APvPGEg(A)-HF

Power cables: copper or aluminium conductors, XLPE insulation, halogen free polymer compound inner and outer sheath, screened.

PvBPng(A)-HF, APvBPng(A)-HF

Power cables: copper or aluminium conductors, XLPE insulation, halogen free polymer compound inner sheath and protection hose, armour of galvanized steel band.

PvBaPng(A)-Hf, APvBaPng(A)-HF

Power cables: copper or aluminium conductors, XLPE insulation, halogen free polymer compound inner sheath and protection hose, armour of aluminium or aluminium alloy band.

(HF index in the grades of cables stands for **Halogen Free**)

APPLICATION

For transmission and distribution of electric power in fixed facilities with nominal alternating voltage of 0,66 and 1 kV and nominal frequency of 50 Hz.

The cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

The HF-type cables are designed for power supply cable lines in nuclear plant electrical facilities, wiring in offices equipped with computers or microprocessors, in kindergartens, schools, hospitals, as well as for cable lines in entertainment and sport facilities.

OKP Codes

352100 cables with copper conductors for nominal voltage 0,66 kV

353300 cables with copper conductors for nominal voltage 1 kV

DESIGN

1. Conductor: copper or aluminium, solid or stranded, round or sector, 1st or 2nd class according to GOST 22483.

2. Insulation: XLPE. Insulated conductors of multi-core cables are of different colours. Neutral conductors (N) are coloured blue; grounding conductors (PE) are coloured in two colours: green and yellow. Nominal insulation thickness, insulation colouring of multi-core cables are specified in the Appendix on page 123.

3. Stranding: insulated conductors of two-, three-, four- or five-core cables are stranded; two-, three and five-core cables have cores with identical core's cross-sections; four-core cables have all cores with identical core's cross-sections and one core with a smaller cross-section (grounding conductor (PE) or neutral conductor (N)). Nominal core's cross-sections of neutral conductors (with smaller core's cross-sections) and grounding conductors comply with the parameters specified in the Appendix on page 123.

4. Inner sheath: halogen free polymer compound. Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one. Nominal thickness of the inner sheath is specified in the Appendix on page 123.

5. Metal screen: for the cables of PvPGEg(A)-HF, APvPGEg(A)-HF types: lapping with two copper bands min 0,06 mm thick with overlapping.

6. Outer sheath: for unarmoured PvPGng(A)-HF, APvPGng(A)-HF, PvPGEg(A)-HF and APvPGEg(A)-HF cables: halogen free polymer compound. Nominal thickness of the outer sheath is specified in the Appendix on page 123.

7. Armour: for multi-core PvBPng(A)-HF, APvBPng(A)-HF cables: two steel galvanized bands or for single-core PvBaPng(A)-HF, APvBaPng(A)-HF cables: aluminium or aluminium alloy bands; bands are laid so that the upper band overlaps the gaps between the coils of the lower band. Gaps between coils of each band should not exceed 50% of the width of the band. Nominal thickness of the armouring band is specified in the Appendix on page 123.

8. Armored cable protection hose: for the cables of PvBPng(A)-HF, APvBP(A)-HF, PvBaPng(A)-HF and APvBaPng(A)-HF types: halogen free polymer compound. Thickness of the protection hose is specified in the Appendix on page 123.

TECHNICAL STANDARDS

Ambient class.....placement category 3, 5 according to GOST 15150-69
 Operating temperature range.....from -50°C to +50°C
 Relative air humidity at max +35°C.....max 98%
 Laying and installation of cables without preheating
 is performed at temperature not less than.....-15°C
 Nominal frequency.....50Hz

Test AC voltage with frequency of 50 Hz:

for the voltage 0,66 kV.....3 kV
 for the voltage 1 kV.....3,5 kV

Minimal bending radius at laying and installation:

for single-core cables.....10 outer cable diameters
 for multi-core cables.....7,5 outer cable diameters
 Cable conductor continuous operating heating temperature max.....90 °C
 Max allowed pulling force during cable tracing.....50N/mm²

Construction length with the main core's cross-section:

up to 16 mm².....250m
 from 25 mm² to 70 mm².....200m
 more than 95mm².....100m
 Guarantee use period.....5 years from date of input of the cable into operation
 Service life.....40 years

FIRE SAFETY PERFORMANCE

Cables are flame-retardant when wired as cable bunches and comply with the fire safety class according to GOST R 53315-2009 - item 16.8.1.2.1

Cables are characterised by low chlorine hydride emission (max 5 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.

Fire tests proved cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 40%.

The PvPGng(A)-HF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvPGng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	8,2	8,4	113	117
1x6sr	8,7	9,1	138	146
1x10sr	9,7	9,9	188	192
1x16sr	10,7	10,9	255	260
1x16mr	11,1	11,3	265	269
1x25sr	12,2	12,4	358	363
1x25mr	12,5	12,7	370	375
1x35mr	13,5	13,7	466	471
1x50mr	15,0	15,2	643	649
1x70mr	-	17,0	-	834
1x95mr	-	19,1	-	1103
1x120mr	-	20,7	-	1362
1x150mr	-	22,5	-	1650
1x185mr	-	24,9	-	2043
1x240mr	-	27,4	-	2560
2x4sr	12,4	12,8	263	276
2x6sr	13,4	13,8	326	340
2x10sr	15,0	15,4	442	457
2x16sr	16,9	17,3	612	628
2x16mr	17,8	18,2	649	667
2x25sr	19,9	20,3	884	904
2x25mr	20,6	21,0	925	946
2x35mr	22,6	23,0	1172	1194
2x50mr	25,8	26,2	1633	1659
3x4sr	13,0	13,4	303	316
3x6sr	14,0	14,5	383	397
3x10sr	15,7	16,1	532	548
3x16sr	17,7	18,2	752	769
3x16mr	18,7	19,1	789	808
3x25sr	21,0	21,4	1098	1119
3x25mr	21,7	22,2	1143	1165
3x35mr	24,1	24,5	1477	1501
3x50mr	27,3	27,7	2070	2097
4x4sr	13,8	14,3	355	371
4x6sr	15,0	15,5	456	472
4x10sr	16,9	17,4	643	660
4x16sr	19,2	19,7	920	940
4x16mr	20,3	20,8	963	985
4x25sr	22,8	23,3	1370	1393
4x25mr	23,9	24,4	1435	1460
4x35mr	26,3	26,8	1843	1871
4x50mr	29,9	30,4	2602	2633
5x4sr	14,8	15,4	420	437
5x6sr	16,2	16,7	548	566
5x10sr	18,3	18,8	774	795
5x16sr	20,9	21,4	1112	1135
5x16mr	22,1	22,6	1160	1185
5x25sr	25,1	25,6	1666	1693
5x25mr	26,1	26,6	1729	1758
5x35mr	28,8	29,3	2240	2271
5x50mr	33,2	33,7	3218	3254
3x25sr+1x16sr	22,1	22,6	1268	1289
3x25mr+1x16mr	23,9	24,4	1377	1403
3x35mr+1x16mr	25,4	25,9	1661	1687
3x50mr+1x25mr	28,9	29,4	2340	2369

The PvPGng(A)-HF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvPGng(A)-HF cables, kg
2x70ms	26,2	1755
2x95ms	28,2	2267
2x120ms	32,6	2861
2x150ms	35,0	3490
2x185ms	37,5	4231
2x240ms	43,4	5410
3x70ms	30,2	2455
3x95ms	35,0	3324
3x120ms	38,0	4090
3x150ms	42,4	5044
3x185ms	46,8	6214
3x240ms	51,8	7792
4x70ms	35,0	3274
4x95ms	39,0	4291
4x120ms	42,4	5357
4x150ms	46,8	6566
4x185ms	51,8	8060
4x240ms	56,6	10244
5x70ms	38,0	4006
5x95ms	43,4	5344
5x120ms	48,8	6680
5x150ms	53,2	8203
5x185ms	58,6	10123
5x240ms	62,6	12652
3x70ms+1x35mr	35,0	2950
3x95ms+1x50ms	39,0	3895
3x120ms+1x70ms	42,4	4890
3x150ms+1x70ms	46,8	5833
3x185ms+1x95ms	51,8	7216
3x240ms+1x120ms	56,6	9150

The PvPGEg(A)-HF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvPGEg(A)-HF cables, kg
2x70ms	26,4	1811
2x95ms	28,4	2328
2x120ms	32,8	2932
2x150ms	35,2	3566
2x185ms	37,7	4313
2x240ms	43,6	5506
3x70ms	30,4	2520
3x95ms	35,2	3400
3x120ms	38,2	4173
3x150ms	42,6	5137
3x185ms	47,0	6317
3x240ms	52,0	7907
4x70ms	35,2	3350
4x95ms	39,2	4377
4x120ms	42,6	5451
4x150ms	47,0	6669
4x185ms	52,0	8175
4x240ms	56,8	10370
5x70ms	38,2	4089
5x95ms	43,6	5440
5x120ms	49,0	6788
5x150ms	53,4	8321
5x185ms	58,8	10254
5x240ms	62,8	12793
3x70ms+1x35mr	35,2	3026
3x95ms+1x50ms	39,2	3980
3x120ms+1x70ms	42,6	4984
3x150ms+1x70ms	47,0	5936
3x185ms+1x95ms	52,0	7331
3x240ms+1x120ms	56,8	9276

The PvPGE_{ng}(A)-HF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvPGE _{ng} (A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	8,4	8,6	128	132
1x6sr	9,1	9,3	158	162
1x10sr	9,9	10,1	205	210
1x16sr	10,8	11,0	275	280
1x16mr	11,3	11,5	285	291
1x25sr	12,3	12,5	382	387
1x25mr	12,7	12,9	394	400
1x35mr	13,7	13,9	492	499
1x50mr	15,2	15,4	673	680
1x70mr	-	17,2	-	869
1x95mr	-	19,3	-	1143
1x120mr	-	20,9	-	1405
1x150mr	-	22,7	-	1698
1x185mr	-	25,1	-	2096
1x240mr	-	27,6	-	2619
2x4sr	12,8	13,0	292	300
2x6sr	13,6	14,0	352	366
2x10sr	15,2	15,6	471	487
2x16sr	17,1	17,5	645	663
2x16mr	18,0	18,4	685	704
2x25sr	20,1	20,5	925	946
2x25mr	20,8	21,2	967	989
2x35mr	22,8	23,2	1219	1243
2x50mr	26,0	26,4	1688	1714
3x4sr	13,1	13,6	327	341
3x6sr	14,2	14,6	410	425
3x10sr	15,9	16,3	563	579
3x16sr	17,9	18,4	787	806
3x16mr	18,9	19,3	828	848
3x25sr	21,2	21,6	1142	1163
3x25mr	21,9	22,3	1188	1211
3x35mr	24,3	24,7	1527	1552
3x50mr	27,5	27,9	2128	2156
4x4sr	14,0	14,5	382	398
4x6sr	15,2	15,7	485	502
4x10sr	17,1	17,6	676	695
4x16sr	19,4	19,9	959	980
4x16mr	20,5	21,0	1005	1028
4x25sr	23,0	23,5	1418	1442
4x25mr	24,1	24,5	1485	1511
4x35mr	26,5	26,9	1899	1928
4x50mr	30,1	30,6	2667	2699
5x4sr	15,0	15,6	448	467
5x6sr	16,4	16,9	580	599
5x10sr	18,5	19,0	811	833
5x16sr	21,0	21,6	1155	1179
5x16mr	22,3	22,8	1207	1233
5x25sr	25,3	25,8	1719	1747
5x25mr	26,2	26,8	1784	1815
5x35mr	28,9	29,5	2301	2334
5x50mr	33,4	34,3	3290	3363
3x25sr+1x16sr	22,3	22,8	1314	1336
3x25mr+1x16mr	24,1	24,5	1427	1454
3x35mr+1x16mr	25,6	26,1	1715	1741
3x50mr+1x25mr	29,1	29,5	2402	2432

The PvPGE(A)-HF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvPGE(A)-HF cables, kg
2x70ms	26,4	1811
2x95ms	28,4	2328
2x120ms	32,8	2932
2x150ms	35,2	3566
2x185ms	37,7	4313
2x240ms	43,6	5506
3x70ms	30,4	2520
3x95ms	35,2	3400
3x120ms	38,2	4173
3x150ms	42,6	5137
3x185ms	47,0	6317
3x240ms	52,0	7907
4x70ms	35,2	3350
4x95ms	39,2	4377
4x120ms	42,6	5451
4x150ms	47,0	6669
4x185ms	52,0	8175
4x240ms	56,8	10370
5x70ms	38,2	4089
5x95ms	43,6	5440
5x120ms	49,0	6788
5x150ms	53,4	8321
5x185ms	58,8	10254
5x240ms	62,8	12793
3x70ms+1x35mr	35,2	3026
3x95ms+1x50ms	39,2	3980
3x120ms+1x70ms	42,6	4984
3x150ms+1x70ms	47,0	5936
3x185ms+1x95ms	52,0	7331
3x240ms+1x120ms	56,8	9276

The PvBPng(A)-HF cables with copper conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvBPng(A)-HF cables, kg
2x70ms	27,6	2027
2x95ms	29,6	2561
2x120ms	34,0	3204
2x150ms	36,4	3857
2x185ms	38,9	4626
2x240ms	44,8	5871
3x70ms	31,6	2771
3x95ms	36,4	3691
3x120ms	39,4	4491
3x150ms	43,8	5494
3x185ms	48,2	6710
3x240ms	54,0	8701
4x70ms	36,4	3641
4x95ms	40,4	4703
4x120ms	43,8	5808
4x150ms	48,2	7063
4x185ms	54,0	8969
4x240ms	58,8	11236
5x70ms	39,4	4407
5x95ms	44,8	5806
5x120ms	50,2	7199
5x150ms	55,4	9138
5x185ms	60,8	11152
5x240ms	64,8	13755
3x70ms+1x35mr	36,4	3317
3x95ms+1x50ms	40,4	4307
3x120ms+1x70ms	43,8	5341
3x150ms+1x70ms	48,2	6329
3x185ms+1x95ms	54,0	8125
3x240ms+1x120ms	58,8	10142

The PvBaPng(A)-HF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvBaPng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	14,6	14,6	321	320
1x6sr	14,6	14,6	334	332
1x10sr	14,6	14,6	359	357
1x16sr	14,6	14,6	399	397
1x16mr	14,6	14,6	394	392
1x25sr	14,8	15	459	466
1x25mr	15,1	15,3	474	480
1x35mr	16,1	16,3	580	587
1x50mr	17,6	17,8	768	776
1x70mr	-	19,6	-	969
1x95mr	-	21,3	-	1233
1x120mr	-	22,9	-	1502
1x150mr	-	24,7	-	1802
1x185mr	-	27,1	-	2211
1x240mr	-	29,6	-	2745

The PvBPng(A)-HF cables with copper conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of PvBPng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
2x4sr	13,6	14,0	379	397
2x6sr	14,6	15,0	454	472
2x10sr	16,2	16,6	588	607
2x16sr	18,1	18,5	770	791
2x16mr	19,0	19,4	817	839
2x25sr	21,1	21,5	1075	1099
2x25mr	21,8	22,2	1123	1148
2x35mr	23,8	24,2	1391	1418
2x50mr	27,2	27,6	1900	1930
3x4sr	14,2	14,6	425	443
3x6sr	15,2	15,7	517	536
3x10sr	16,9	17,3	685	706
3x16sr	18,9	19,4	919	941
3x16mr	19,9	20,3	968	991
3x25sr	22,2	22,6	1301	1326
3x25mr	22,9	23,4	1354	1380
3x35mr	25,5	25,9	1724	1753
3x50mr	28,7	29,1	2353	2385
4x4sr	15,0	15,5	488	508
4x6sr	16,2	16,7	602	623
4x10sr	18,1	18,6	802	824
4x16sr	20,4	20,9	1104	1129
4x16mr	21,5	22,0	1158	1185
4x25sr	24,0	24,5	1592	1620
4x25mr	25,3	25,8	1680	1710
4x35mr	27,7	28,2	2115	2148
4x50mr	31,3	31,8	2915	2952
5x4sr	16,0	16,6	563	586
5x6sr	17,4	17,9	706	723
5x10sr	19,5	20,0	948	974
5x16sr	22,1	22,6	1313	1341
5x16mr	23,3	23,8	1375	1405
5x25sr	26,5	27,0	1925	1958
5x25mr	27,5	28,0	1998	2034
5x35mr	30,2	30,7	2539	2577
5x50mr	34,6	35,1	3567	3610
3x25sr+1x16sr	23,3	23,8	1482	1508
3x25mr+1x16mr	25,3	25,8	1622	1653
3x35mr+1x16mr	26,8	27,3	1924	1954
3x50mr+1x25mr	30,3	30,8	2642	2675

The APvPGng(A)-HF cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of APvPGng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	8,2	8,4	89	93
1x6sr	8,7	9,1	102	110
1x10sr	9,7	9,9	128	133
1x16sr	10,7	10,9	159	163
1x16mr	11,1	11,3	167	172
1x25sr	12,2	12,4	209	213
1x25mr	12,5	12,7	217	223
1x35mr	13,5	13,7	259	264
1x50mr	15,0	15,2	329	335
1x70mr	-	17,0	-	411
1x95mr	-	19,1	-	528
1x120mr	-	20,7	-	624
1x150mr	-	22,5	-	739
1x185mr	-	24,9	-	908
1x240mr	-	27,4	-	1101
2x4sr	12,4	12,8	215	228
2x6sr	13,4	13,8	254	268
2x10sr	15,0	15,4	322	338
2x16sr	16,9	17,3	418	435
2x16mr	17,8	18,2	453	471
2x25sr	19,9	20,3	583	602
2x25mr	20,6	21,0	618	639
2x35mr	22,6	23,0	754	777
2x50mr	25,8	26,2	1001	1027
3x4sr	13,0	13,4	231	244
3x6sr	14,0	14,5	275	289
3x10sr	15,7	16,1	352	368
3x16sr	17,7	18,2	461	478
3x16mr	18,7	19,1	496	515
3x25sr	21,0	21,4	646	666
3x25mr	21,7	22,2	683	705
3x35mr	24,1	24,5	851	875
3x50mr	27,3	27,7	1121	1149
4x4sr	13,8	14,3	259	274
4x6sr	15,0	15,5	311	327
4x10sr	16,9	17,4	403	421
4x16sr	19,2	19,7	533	552
4x16mr	20,3	20,8	572	593
4x25sr	22,8	23,3	767	790
4x25mr	23,9	24,4	821	846
4x35mr	26,3	26,8	1009	1036
4x50mr	29,9	30,4	1338	1369
5x4sr	14,8	15,4	299	316
5x6sr	16,2	16,7	367	385
5x10sr	18,3	18,8	475	495
5x16sr	20,9	21,4	627	650
5x16mr	22,1	22,6	672	697
5x25sr	25,1	25,6	913	940
5x25mr	26,1	26,6	961	991
5x35mr	28,8	29,3	1196	1228
5x50mr	33,2	33,7	1637	1674
3x25sr+1x16sr	22,1	22,6	719	740
3x25mr+1x16mr	23,9	24,4	819	845
3x35mr+1x16mr	25,4	25,9	937	963
3x50mr+1x25mr	28,9	29,4	1239	1267

The APvPGng(A)-HF cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of APvPGng(A)-HF cables, kg
2x70ms	26,2	909
2x95ms	28,2	1119
2x120ms	32,6	1392
2x150ms	35,0	1663
2x185ms	37,5	1966
2x240ms	43,4	2499
3x70ms	30,2	1186
3x95ms	35,0	1602
3x120ms	38,0	1887
3x150ms	42,4	2303
3x185ms	46,8	2817
3x240ms	51,8	3425
4x70ms	35,0	1582
4x95ms	39,0	1995
4x120ms	42,4	2420
4x150ms	46,8	2912
4x185ms	51,8	3531
4x240ms	56,6	4421
5x70ms	38,0	1890
5x95ms	43,4	2474
5x120ms	48,8	3008
5x150ms	53,2	3635
5x185ms	58,6	4462
5x240ms	62,6	5374
3x70ms+1x35mr	35,0	1472
3x95ms+1x50ms	39,0	1857
3x120ms+1x70ms	42,4	2264
3x150ms+1x70ms	46,8	2669
3x185ms+1x95ms	51,8	3245
3x240ms+1x120ms	56,6	4048

The APvPGEg(A)-HF cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of APvPGEg(A)-HF cables, kg
2x70ms	26,4	965
2x95ms	28,4	1180
2x120ms	32,8	1463
2x150ms	35,2	1739
2x185ms	37,7	2048
2x240ms	43,6	2595
3x70ms	30,4	1251
3x95ms	35,2	1677
3x120ms	38,2	1970
3x150ms	42,6	2396
3x185ms	47,0	2921
3x240ms	52,0	3540
4x70ms	35,2	1657
4x95ms	39,2	2080
4x120ms	42,6	2514
4x150ms	47,0	3015
4x185ms	52,0	3646
4x240ms	56,8	4548
5x70ms	38,2	1973
5x95ms	43,6	2570
5x120ms	49,0	3117
5x150ms	53,4	3754
5x185ms	58,8	4593
5x240ms	62,8	5515
3x70ms+1x35mr	35,2	1548
3x95ms+1x50ms	39,2	1942
3x120ms+1x70ms	42,6	2358
3x150ms+1x70ms	47,0	2772
3x185ms+1x95ms	52,0	3361
3x240ms+1x120ms	56,8	4175

The APvPGE(A)-HF cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of APvPGE(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	8,4	8,6	104	108
1x6sr	9,1	9,3	118	126
1x10sr	9,9	10,1	146	151
1x16sr	10,8	11,0	179	184
1x16mr	11,3	11,5	188	194
1x25sr	12,3	12,5	232	237
1x25mr	12,7	12,9	242	247
1x35mr	13,7	13,9	285	291
1x50mr	15,2	15,4	359	366
1x70mr	-	17,2	-	446
1x95mr	-	19,3	-	568
1x120mr	-	20,9	-	667
1x150mr	-	22,7	-	787
1x185mr	-	25,1	-	960
1x240mr	-	27,6	-	1159
2x4sr	12,8	13,0	238	252
2x6sr	13,6	14,0	279	294
2x10sr	15,2	15,6	352	368
2x16sr	17,1	17,5	452	469
2x16mr	18,0	18,4	489	508
2x25sr	20,1	20,5	624	644
2x25mr	20,8	21,2	661	682
2x35mr	22,8	23,2	802	825
2x50mr	26,0	26,4	1056	1082
3x4sr	13,1	13,6	255	269
3x6sr	14,2	14,6	301	317
3x10sr	15,9	16,3	383	400
3x16sr	17,9	18,4	497	515
3x16mr	18,9	19,3	534	554
3x25sr	21,2	21,6	690	711
3x25mr	21,9	22,3	728	751
3x35mr	24,3	24,7	901	927
3x50mr	27,5	27,9	1180	1208
4x4sr	14,0	14,5	285	302
4x6sr	15,2	15,7	340	358
4x10sr	17,1	17,6	437	456
4x16sr	19,4	19,9	572	593
4x16mr	20,5	21,0	614	636
4x25sr	23,0	23,5	815	839
4x25mr	24,1	24,5	871	897
4x35mr	26,5	26,9	1064	1093
4x50mr	30,1	30,6	1403	1435
5x4sr	15,0	15,6	328	346
5x6sr	16,4	16,9	399	418
5x10sr	18,5	19,0	512	533
5x16sr	21,0	21,6	671	695
5x16mr	22,3	22,8	718	744
5x25sr	25,3	25,8	966	994
5x25mr	26,2	26,8	1017	1047
5x35mr	28,9	29,5	1258	1291
5x50mr	33,4	34,3	1710	1747
3x25sr+1x16sr	22,3	22,8	765	787
3x25mr+1x16mr	24,1	24,5	869	896
3x35mr+1x16mr	25,6	26,1	991	1018
3x50mr+1x25mr	29,1	29,5	1301	1330

The APvBaPng(A)-HF cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of APvBaPng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
1x4sr	14,6	14,6	297	296
1x6sr	14,6	14,6	298	296
1x10sr	14,6	14,6	299	298
1x16sr	14,6	14,6	302	301
1x16mr	14,6	14,6	297	295
1x25sr	14,8	15	310	316
1x25mr	15,1	15,3	321	328
1x35mr	16,1	16,3	368	375
1x50mr	17,6	17,8	450	458
1x70mr	-	19,6	-	545
1x95mr	-	21,3	-	658
1x120mr	-	22,9	-	764
1x150mr	-	24,7	-	891
1x185mr	-	27,1	-	1075
1x240mr	-	29,6	-	1285

The APvBPng(A)-HF cables with aluminium conductors, round

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm		Weight of 1 km of APvBPng(A)-HF cables, kg	
	0,66 kV	1 kV	0,66 kV	1 kV
2x4sr	13,6	14,0	331	348
2x6sr	14,6	15,0	382	400
2x10sr	16,2	16,6	468	487
2x16sr	18,1	18,5	577	598
2x16mr	19,0	19,4	622	644
2x25sr	21,1	21,5	774	798
2x25mr	21,8	22,2	816	841
2x35mr	23,8	24,2	974	1001
2x50mr	27,2	27,6	1268	1298
3x4sr	14,2	14,6	353	371
3x6sr	15,2	15,7	409	428
3x10sr	16,9	17,3	505	526
3x16sr	18,9	19,4	629	651
3x16mr	19,9	20,3	674	698
3x25sr	22,2	22,6	849	873
3x25mr	22,9	23,4	893	920
3x35mr	25,5	25,9	1098	1127
3x50mr	28,7	29,1	1405	1437
4x4sr	15,0	15,5	391	412
4x6sr	16,2	16,7	457	478
4x10sr	18,1	18,6	562	585
4x16sr	20,4	20,9	716	741
4x16mr	21,5	22,0	767	794
4x25sr	24,0	24,5	989	1017
4x25mr	25,3	25,8	1066	1096
4x35mr	27,7	28,2	1281	1314
4x50mr	31,3	31,8	1651	1687
5x4sr	16,0	16,6	442	466
5x6sr	17,4	17,9	525	542
5x10sr	19,5	20,0	648	674
5x16sr	22,1	22,6	829	857
5x16mr	23,3	23,8	886	917
5x25sr	26,5	27,0	1172	1205
5x25mr	27,5	28,0	1231	1266
5x35mr	30,2	30,7	1496	1534
5x50mr	34,6	35,1	1987	2030
3x25sr+1x16sr	23,3	23,8	933	959
3x25mr+1x16mr	25,3	25,8	1064	1095
3x35mr+1x16mr	26,8	27,3	1200	1231
3x50mr+1x25mr	30,3	30,8	1540	1574

The APvBPng(A)-HF cables with aluminium conductors, sector

Number and nominal cross-section of cores, mm ²	Nominal outer diameter of the cable, mm	Weight of 1 km of PvBPng(A)-HF cables, kg
2x70ms	27,6	1180
2x95ms	29,6	1413
2x120ms	34,0	1735
2x150ms	36,4	2030
2x185ms	38,9	2362
2x240ms	44,8	2960
3x70ms	31,6	1502
3x95ms	36,4	1969
3x120ms	39,4	2288
3x150ms	43,8	2753
3x185ms	48,2	3314
3x240ms	54,0	4334
4x70ms	36,4	1949
4x95ms	40,4	2407
4x120ms	43,8	2870
4x150ms	48,2	3408
4x185ms	54,0	4440
4x240ms	58,8	5414
5x70ms	39,4	2291
5x95ms	44,8	2936
5x120ms	50,2	3528
5x150ms	55,4	4570
5x185ms	60,8	5492
5x240ms	64,8	6477
3x70ms+1x35mr	36,4	1839
3x95ms+1x50ms	40,4	2269
3x120ms+1x70ms	43,8	2714
3x150ms+1x70ms	48,2	3165
3x185ms+1x95ms	54,0	4154
3x240ms+1x120ms	58,8	5041

APPENDIX

1. Nominal thickness of insulation

1.1 Nominal thickness of power cables insulation (except NUM)

Nominal voltage kV	Nominal cross-section of cores, mm ²	Nominal thickness of insulation, mm	
		PVC-compound or polymer compound	XLPE
0,66	1,5 and 2,5	0,6	0,6
	4 and 6	0,7	
	10 and 16	0,9	
	25 and 35	1,1	0,8
	50	1,3	0,9
1,00	1,5 and 2,5	0,8	0,7
	4 – 16	1,0	
	25 and 35	1,2	0,9
	50	1,4	1,0
	70		1,1
	95	1,6	1,2
	120		1,4
	150	1,8	1,4
	185	2,0	1,6
240	2,2	1,7	
3,00	10 – 240	2,2	2,0
6,00	25-240	3,4	3,0

1.2. Nominal thickness of NUM-type cables insulation:

Nominal cross-section of cores, mm ²	Nominal thickness of insulation, mm
1,5	0,6
2,5	0,7
4 and 6	0,8
10 and 16	1,0
25 and 35	1,2

Maximum lower deviation from the insulation thickness is expressed as $(0,1+0,1 \delta_i)$ mm where δ_i is the nominal insulation thickness. Maximum higher deviation from the insulation thickness is not limited.

2. Nominal cross-sections of neutral smaller core conductors and grounding conductors

Conductor	Nominal cross-section of cores, mm ²								
	25	35	50	70	95	120	150	185	240
Main conductor									
Neutral or grounding conductor	16	16	25	35	50	70	70	95	120

3. Colouring of insulation

Number of conductors in the cable, ps.	Colouring of insulation				
	Sequence number of conductor				
	1	2	3	4	5
2	Grey *	Blue	—	—	—
3	Grey *	Brown	Black	—	—
	Grey *	Blue	Green and yellow	—	—
4	Grey *	Brown	Black	Blue	—
	Grey *	Brown	Black	Green and yellow**	—
5	Grey *	Brown	Black	Blue	Green and yellow

* - or original colour.
** - subject to agreement with customer.

Insulation of single-core cables can be made in any of the above indicated colours.

4. Nominal thickness of inner sheath

4.1 Nominal thickness of power cables inner sheath (except NUM)

Diameter over stranded insulated cores, D_{st} , mm	Nominal thickness of extruded inner sheath (of the bedding), mm
Up to 25 incl.	1,0
more than 25 « 35 «	1,2
« 35 « 45 «	1,4
« 45 « 60 «	1,6
« 60 « 80 «	1,8
« 80	2,0

Maximum lower deviation from the nominal thickness of the extruded inner sheath should be less than 50% of the values indicated in the above table.

4.2 Nominal thickness of inner sheath for NUM-type cables:

Number and nominal cross-section of cores, mm ²	Nominal thickness, mm
from 2x1,5 to 2x6,0	0,4
from 3x1,5 to 3x6,0	
from 4x1,5 to 4x4,0	
from 5x1,5 to 5x2,5	
2x25	0,8
from 3x16 to 3x25	
4x16	
5x10	

5 Nominal thickness of outer sheath

5.1 Nominal thickness of power cables outer sheath (except NUM)

Diameter of cable under the sheath, mm	Nominal thickness of outer sheath for cables, mm	
	single-core	multi-core
Up to 6 incl.	1,4	1,8
more than 6 « 15 «	1,5	
« 15 « 20 «	1,7	
« 20 « 30 «		1,9
« 30 « 40 «		2,1
« 40 « 50 «		2,3
« 50 « 60 «		2,5
« 60		3,0

5.2 Nominal thickness of outer sheath for NUM-type cables

Number and nominal cross-section of cores, mm ²	Nominal thickness, mm
from 1x1,5 to 1x16	1,4
from 2x1,5 to 2x6,0	1,4
from 2x10 to 2x25	1,6
2x35	1,8
from 3x1,5 to 3x4,0	1,4
from 3x6,0 to 3x16	1,6
3x25 and 3x35	1,8
4x1,5 and 4x2,5	1,4
from 4x4,0 to 4x16	1,6
4x25 and 4x35	1,8
from 5x1,5 to 5x2,5	1,4
from 5x4,0 to 4x10	1,6
from 5x16 to 5x35	1,8

Maximum lower deviation from the nominal outer sheath thickness is expressed as (0,1+0,15 δi) mm where δi is the nominal insulation thickness. Maximum higher deviation from the nominal outer sheath thickness is not limited.

6. Cross-section of the copper screen

Number and nominal cross-sections of main cores, mm ²	Voltage, kV	Cross-section of the copper screen, mm ²	Number and nominal cross-sections of main cores, mm ²	Voltage, kV	Cross-section of the copper screen, mm ²	Number and nominal cross-sections of main cores, mm ²	Voltage, kV	Cross-section of the copper screen, mm ²
1 x 1,5 sr	0,66	0,5	2 x 1,5 sr	0,66	1,4	3 x 1,5 sr	0,66	1,4
1 x 2,5 sr	0,66	0,6	2 x 2,5 sr	0,66	1,5	3 x 2,5 sr	0,66	1,6
1 x 4 sr	0,66	0,7	2 x 4 sr	0,66	1,8	3 x 4 sr	0,66	1,9
1 x 6 sr	0,66	0,8	2 x 6 sr	0,66	1,9	3 x 6 sr	0,66	2,1
1 x 10 sr	0,66	1,0	2 x 10 sr	0,66	2,4	3 x 10 sr	0,66	2,5
1 x 16 sr	0,66	1,2	2 x 16 sr	0,66	2,7	3 x 16 sr	0,66	2,9
1 x 16 mr	0,66	1,3	2 x 16 mr	0,66	2,9	3 x 16 mr	0,66	3,1
1 x 25 sr	0,66	1,5	2 x 25 sr	0,66	3,3	3 x 25 sr	0,66	3,5
1 x 25 mr	0,66	1,5	2 x 25 mr	0,66	3,4	3 x 25 mr	0,66	3,7
1 x 35 sr	0,66	1,7	2 x 35 sr	0,66	3,7	3 x 35 sr	0,66	4,0
1 x 35 mr	0,66	1,7	2 x 35 mr	0,66	3,8	3 x 35 mr	0,66	4,1
1 x 50 sr	0,66	2,0	2 x 50 sr	0,66	4,3	3 x 50 sr	0,66	4,6
1 x 50 mr	0,66	2,0	2 x 50 mr	0,66	4,5	3 x 50 mr	0,66	4,8
1 x 1,5 sr	1	0,6	2 x 1,5 sr	1	1,5	3 x 1,5 sr	1	1,6
1 x 2,5 sr	1	0,6	2 x 2,5 sr	1	1,7	3 x 2,5 sr	1	1,7
1 x 4 sr	1	0,8	2 x 4 sr	1	2,0	3 x 4 sr	1	2,1
1 x 6 sr	1	0,9	2 x 6 sr	1	2,2	3 x 6 sr	1	2,3
1 x 10 sr	1	1,0	2 x 10 sr	1	2,5	3 x 10 sr	1	2,6
1 x 16 sr	1	1,2	2 x 16 sr	1	2,8	3 x 16 sr	1	3,0
1 x 16 mr	1	1,3	2 x 16 mr	1	3,0	3 x 16 mr	1	3,2
1 x 25 sr	1	1,5	2 x 25 sr	1	3,4	3 x 25 sr	1	3,6
1 x 25 mr	1	1,6	2 x 25 mr	1	3,5	3 x 25 mr	1	3,8
1 x 35 sr	1	1,7	2 x 35 sr	1	3,8	3 x 35 sr	1	4,0
1 x 35 mr	1	1,8	2 x 35 mr	1	3,9	3 x 35 mr	1	4,2
1 x 50 sr	1	2,0	2 x 50 sr	1	4,4	3 x 50 sr	1	4,7
1 x 50 mr	1	2,1	2 x 50 mr	1	4,6	3 x 50 mr	1	4,8
1 x 70 mr	1	2,4	2 x 70 ms	1	4,0	3 x 70 ms	1	5,0
1 x 95 mr	1	2,8	2 x 95 ms	1	4,5	3 x 95 ms	1	5,8
1 x 120 mr	1	3,0	2 x 120 ms	1	4,8	3 x 120 ms	1	6,4
1 x 150 ms	1	3,4	2 x 150 ms	1	5,4	3 x 150 ms	1	7,2
1 x 185 mr	1	3,8	2 x 185 ms	1	5,9	3 x 185 ms	1	7,9
1 x 240 mr	1	4,3	2 x 240 ms	1	6,6	3 x 240 ms	1	8,9

Table continues

Number and nominal cross-sections of main cores, mm ²	Voltage, kV	Cross-section of the copper screen, mm ²	Number and nominal cross-sections of main cores, mm ²	Voltage, kV	Cross-section of the copper screen, mm ²
4 x 1,5 sr	0,66	1,6	5 x 1,5 sr	0,66	1,7
4 x 2,5 sr	0,66	1,7	5 x 2,5 sr	0,66	1,9
4 x 4 sr	0,66	2,0	5 x 4 sr	0,66	2,2
4 x 6 sr	0,66	2,3	5 x 6 sr	0,66	2,5
4 x 10 sr	0,66	2,8	5 x 10 sr	0,66	3,1
4 x 16 sr	0,66	3,2	5 x 16 sr	0,66	3,6
4 x 16 mr	0,66	3,4	5 x 16 mr	0,66	3,8
4 x 25 sr	0,66	3,9	5 x 25 sr	0,66	4,3
4 x 25 mr	0,66	4,1	5 x 25 mr	0,66	4,5
4 x 35 sr	0,66	4,4	5 x 35 sr	0,66	4,9
4 x 35 mr	0,66	4,5	5 x 35 mr	0,66	5,0
4 x 50 sr	0,66	5,2	5 x 50 sr	0,66	5,8
4 x 50 mr	0,66	5,4	5 x 50 mr	0,66	6,0
4 x 1,5 sr	1	1,7	5 x 1,5 sr	1	1,9
4 x 2,5 sr	1	1,9	5 x 2,5 sr	1	2,1
4 x 4 sr	1	2,3	5 x 4 sr	1	2,5
4 x 6 sr	1	2,5	5 x 6 sr	1	2,8
4 x 10 sr	1	2,9	5 x 10 sr	1	3,2
4 x 16 sr	1	3,3	5 x 16 sr	1	3,7
4 x 16 mr	1	3,5	5 x 16 mr	1	3,9
4 x 25 sr	1	4,0	5 x 25 sr	1	4,4
4 x 25 mr	1	4,2	5 x 25 mr	1	4,6
4 x 35 sr	1	4,5	5 x 35 sr	1	5,0
4 x 35 mr	1	4,6	5 x 35 mr	1	5,2
4 x 50 sr	1	5,3	5 x 50 sr	1	5,9
4 x 50 mr	1	5,5	5 x 50 mr	1	6,1
4 x 70 ms	1	5,8	5 x 70 ms	1	6,4
4 x 95 ms	1	6,5	5 x 95 ms	1	7,4
4 x 120 ms	1	7,2	5 x 120 ms	1	8,3
4 x 150 ms	1	7,9	5 x 150 ms	1	9,1
4 x 185 ms	1	8,9	5 x 185 ms	1	10,1
4 x 240 ms	1	9,7	5 x 240 ms	1	10,8

7. Nominal thickness of armouring bands

Nominal diameter of cable under the armouring, mm	Nominal thickness of galvanized steel band, mm
Up to 30 incl.	0,2 or 0,3
more than 30 « 45 «	0,3
more than 45 « 70 «	0,5
« 70	0,8

Nominal thickness of aluminium or aluminium alloy bands shall be 0,5 mm.

8. Nominal thickness of protection hose

Nominal diameter of cable under the armouring, mm	Nominal thickness of protection hose, mm	
	PVC-compound	PE
Up to 20 incl.	1,8	1,8
more than 20 « 30 «	2,0	1,8
« 30 « 40 «	2,2	2,1
« 40 « 50 «	2,4	2,4
« 50 « 60 «	2,6	2,5
« 60	3,1	2,8

9 Electrical ratings

9.1 Electric resistance of electrical conductors as calculated for 1 km of cable at the temperature of +20°C shall comply with GOST 22483

9.2 Electric resistance of PVC insulation of conductors as calculated for 1 km of cable at the temperature of +20°C, for all 0,66 and 1 kV cables, except for the HL-type cables, shall comply with data specified in the table.

Nominal cross-section of cores, mm ²	Electric resistance of insulation, MΩ, minimal				
	PVC-compound insulation, voltage: 0,66 and 1 kV	PVC-compound insulation, voltage: 3 kV	PVC-compound insulation, voltage: 6 kV	XPPE insulation	Polymer compound insulation, voltage: 0,66 and 1 kV
1,0 and 1,5	12	12	50	150	12
2,5 – 4,0	10	12	50	150	10
6,0	9	12	50	150	9
10,0 – 240,0	7	12	50	150	7

Electric resistance of PVC insulation of HL-type power cables as calculated for 1 km at the temperature of 20°C shall be min 2 MΩ.

9.3 Volumetric resistivity at the continuous heating temperature of conductors with PVC insulation should be min $1 \times 10^{10} \Omega \text{cm}$ and for electrical conductors with XLPE insulation should be min $1 \times 10^{12} \Omega \text{cm}$.

Constant of electrical insulation resistance (K_i) at the continuous heating temperature of conductors with PVC insulation should be min 0.037 MΩ/km and for electrical conductors with XLPE insulation it should be min 3.67MΩ/km.

10. Use guidelines

10.1 The cables are designed for AC power lines with grounded or insulated neutral which can be operated for max 8 hours in the single-phase-to-ground fault mode, and whose overall operation hours in the single-phase-to-ground fault mode is max 125 hours annually.

Maximum operating voltage for the Um-type cables shall be 1,2 U.

The cables may be used in DC power lines at the voltage of $2,4xU_0$ (where U_0 is the nominal voltage between the conductor and the screen, kV)

10.2 Continuous heating temperatures of electrical conductors when in service should not exceed the limits specified in the table.

Insulation type	Core heating temperature limit, °C			
	continuous heating temperature	over-load operation	short circuit extreme temperature	fire-resistency limit in case of short circuit
PVC-compound, low smoke PVC-compound, halogen free polymer compound	70	90	160	350
XPPE	90	130	250	400

10.3 Service carrying capacities of copper core cables and PVC-compound insulation shall comply with the parameters specified in the table.

Nominal cross-section of cores, mm ²	Power cables service carrying capacity, A					
	single-core				multi-core**	
	DC		AC*		DC	
	Outdoor	Ground	Outdoor	Ground	Outdoor	Ground
1,5	29	41	22	30	21	27
2,5	37	55	30	39	27	36
4,0	50	71	39	50	36	47
6,0	63	90	50	62	46	59
10,0	86	124	68	83	63	79
16,0	113	159	89	107	84	102
25,0	153	207	121	137	112	133
35,0	187	249	147	163	137	158
50,0	227	295	179	194	167	187
70,0	286	364	226	237	211	231
95,0	354	436	280	285	261	279
120,0	413	499	326	324	302	317
150,0	473	561	373	364	346	358
185,0	547	637	431	442	397	405
240,0	655	743	512	477	472	471

* If laid in trefoil formation side by side
 ** For rating of current loading for four-core cables with equal cores in four-wire networks in normal operating conditions in all cores; for five- core cables the parameters shall be multiplied by 0,93.

10.4 Service carrying capacities of copper cables with XLPE insulation shall comply with the parameters specified in the table:

Nominal cross-section of cores, mm ²	Power cables service carrying capacity, A					
	single-core				multi-core**	
	DC		AC*		DC	
	Outdoor	Ground	Outdoor	Ground	Outdoor	Ground
1,5	35	48	28	33	25	31
2,5	46	63	36	42	34	40
4,0	60	82	47	54	45	52
6,0	76	102	59	67	56	64
10,0	105	136	82	89	78	86
16,0	139	175	108	115	104	112
25,0	188	228	146	147	141	144
35,0	230	274	180	176	172	173
50,0	281	325	220	208	209	205
70,0	356	399	279	255	265	253
95,0	440	478	345	306	327	304
120,0	514	546	403	348	381	347
150,0	591	614	464	392	437	391
185,0	685	695	538	443	504	442
240,0	821	812	641	515	598	515

* If laid in trefoil formation side by side
 ** For rating of current loading for four-core cables with equal cores in four-wire networks in normal operating conditions in all cores; for five- core cables the parameters shall be multiplied by 0.93.

10.5 Service carrying capacities of aluminium core cables and PVC-compound insulation shall comply with the parameters specified in the table.

Nominal cross-section of cores, mm ²	Power cables service carrying capacity, A					
	single-core				multi-core**	
	DC		AC*		DC	
	Outdoor	Ground	Outdoor	Ground	Outdoor	Ground
2,5	30	32	22	30	21	28
4,0	40	41	30	39	29	37
6,0	51	52	37	48	37	44
10,0	69	68	50	63	50	59
16,0	93	83	68	82	67	77
25,0	117	159	92	106	87	102
35,0	143	192	113	127	106	123
50,0	176	229	139	150	126	143
70,0	223	282	176	184	161	178
95,0	275	339	217	221	197	214
120,0	320	388	253	252	229	244
150,0	366	434	290	283	261	274
185,0	425	494	336	321	302	312
240,0	508	576	401	374	359	363

* If laid in trefoil formation side by side.
 ** For rating of current loading for four-core cables with equal cores in four-wire networks in normal operating conditions in all cores; for five-core cables the parameters shall be multiplied by 0,93.

10.6 Service carrying capacities of aluminium core cables with XLPE insulation shall comply with the parameters specified in the table.

Nominal cross-section of cores, mm ²	Power cables service carrying capacity, A					
	single-core				multi-core**	
	DC		AC*		DC	
	Outdoor	Ground	Outdoor	Ground	Outdoor	Ground
2,5	35	36	26	34	24	32
4,0	46	46	35	44	34	42
6,0	59	59	43	54	43	50
10,0	80	77	58	71	58	67
16,0	108	94	79	93	78	87
25,0	144	176	112	114	108	112
35,0	176	211	138	136	134	135
50,0	217	251	171	161	158	157
70,0	276	309	216	198	203	195
95,0	340	371	267	237	248	233
120,0	399	423	313	271	290	267
150,0	457	474	360	304	330	299
185,0	531	539	419	346	382	341
240,0	636	629	501	403	453	397

* If laid in trefoil formation side by side.
 ** For rating of current loading for four-core cables with equal cores in four-wire networks in normal operating conditions in all cores; for five-core cables the parameters shall be multiplied by 0,93.

10.7 Cable service carrying capacities in over-load mode may be calculated by multiplying the parameters specified in tables 24, 26 by 1,13 for “ground” and by 1,16 for “outdoor”, and by multiplying the parameters specified in tables 25, 27 by 1,17 for “ground” and by 1,20 for “outdoor”.

10.8 Admissible currents of one second short circuit shall comply with the parameters specified in the table:

Nominal cross-section of cores, mm ²	Admissible current of one second short circuit in cables, kA, insulated			
	PVC-compound		XLPE	
	copper conductor	aluminium conductor	copper conductor	aluminium conductor
1,5	0,17	-	0,21	-
2,5	0,27	0,18	0,34	0,22
4,0	0,43	0,29	0,54	0,36
6,0	0,65	0,42	0,81	0,52
10,0	1,09	0,70	1,36	0,87
16,0	1,74	1,13	2,16	1,40
25,0	2,78	1,81	3,46	2,24
35,0	3,86	2,50	4,80	3,09
50,0	5,23	3,38	6,50	4,18
70,0	7,54	4,95	9,38	6,12
95,0	10,48	6,86	13,03	8,48
120,0	13,21	8,66	16,43	10,71
150,0	16,30	10,64	20,26	13,16
185,0	20,39	13,37	25,35	16,53
240,0	26,80	17,54	33,32	21,70

Should a short circuit period be different from 1 second, the short circuit currents specified in the above table shall be calculated as follows:

$$K = \frac{1}{\sqrt{\tau}}$$

where τ is the short circuit period, s.

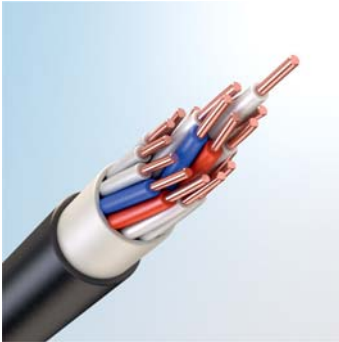
Maximum short circuit period shall not exceed 5 seconds.



**CONTROL CABLES
WITH PLASTIC
INSULATION**

limited liability company
TOMSKCABLE

Control Cables with Plastic Insulation TU 3563-018-59680332-2011



KVVG, AKVVG

Control cables: copper or aluminium conductors, PVC-compound insulation and sheath.

KVVGng(A), AKVVGng(A)

Control cables: copper or aluminium conductors, PVC-compound insulation and low-smoke PVC-compound sheath.

KVVGng(A)-HL, AKVVGng(A)-HL

Control cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and cold-resistant, low-smoke PVC-compound sheath.

VVG-HL, AKVVG-HL

Control cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and sheath.

KVVGng(A)-LS, AKVVGng(A)-LS

Control cables: copper or aluminium conductors, low smoke PVC-compound insulation and sheath.

LS index in the grades of cables stands for **Low Smoke**.

APPLICATION

The cables are designed for fixed connections to electric devices, apparatuses, terminal block of electric switchgear with nominal alternating voltage of 0,66 and frequency of up to 100 Hz or direct voltage of up to 1 kV.

The cables are designed for cable lines in buildings, canals, tunnels, for cable lines in aggressive environments, provided there is no physical impact on cables.

ng(A)-LS type cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems (according to classifier of fire safety OPB 88/97 (PNAEG-01-011)).

OKP Code

356300

DESIGN

- 1. Conductor:** copper or aluminium, solid, 1st class according to GOST 22483.
- 2. Insulation:** for the cables of AKVVG, KVVG, AKVVGng(A), KVVGng(A) types: PVC-compound. For the cables of AKVVGng(A)-HL, KVVGng(A)-HL, AKVVG-HL, KVVG-HL types: cold-resistant PVC-compound. For the cables of AKVVGng(A)-LS, KVVGng(A)-LS types: low-smoke PVC-compound.
- 3. Stranding:** insulated conductors are stranded; in each direction of stranding there is a marker pair whose insulated conductors differ in colour from each other and the other conductors.
- 4. Sheath:** for the cables of AKVVG, KVVG types: PVC-compound. For the cables of AKVVGng(A), KVVGng(A) types: low-smoke PVC-compound. For the cables of AKVVGng(A)-HL, KVVGng(A)-HL types: cold-resistant PVC-compound. For the cables of AKVVG-HL, KVVG-HL types: cold-resistant PVC-compound. For the cables of AKVVGng(A)-LS, KVVGng(A)-LS types: low-smoke PVC-compound.

FIRE SAFETY PERFORMANCE

Unmarked and HL-type cables with PVC-compound outer sheath or protection hose are flame-retardant when wired as single cables and comply with the fire safety class according to GOST 53315 item O1.8.2.3.4.

ng(A), ng(A)-LS and ng(A)-HL-type cables with PVC-compound outer sheath or protection hose are flame-retardant when wired as bunches and with the fire safety class according to GOST R 53315.

ng(A) and ng(A)-HL-type cables comply with the item 16.8.2.3.4

ng(A)-LS-type cables comply with the item 16.8.2.2.2 of the above GOST.

ng(A)-LS-type cables are low smoke in condition of burning or smouldering. Fire tests proved ng(A)-LS-type cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 50%.

TECHNICAL STANDARDS

Ambient class.....UHL, placement categories 1 or 5 according to GOST 15150-69

Operating temperature range:

for AKVVG, KVVG,

AKVVGng(A), KVVGng(A), AKVVGng(A)-LS, KVVGng(A)-LS cables.....from -50 °C to +50 °C

for AKVVGng(A)-HL, KVVGng(A)-HL, AKVVG-HL, VVG-HL cables.....from -60 °C to +50 °C

Relative air humidity at max +35°C.....max 98%

Nominal insulation thickness for conductors with the following cross-sections:

from 0,75 to 2,5 mm².....0,6 mm

from 4 to 6 mm².....0,7 mm

up to 10 mm².....0,9 mm

Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C with the following cross-sections:

from 0,75 to 1,5 mm², min.....10 MΩ

from 2,5 to 4 mm², min.....9 MΩ

from 6 to 10 mm², min.....6 MΩ

Cable conductor continuous operating heating temperature max.....+70 °C

The cables are resistant to installation bending

Minimal bending radius

laying and installation.....6 outer cable diameters

Construction cable length, min.....150 m

Service life.....min 15 years;

when wired in buildings, canals, tunnels :.....min 25 years

Guarantee use period.....3 years date of input of the cable into operation

Pulling force during laying or installation:

copper conductors.....4 kgf/mm²

aluminium conductors.....2 kgf/mm²

Number and nominal cross-section of cores, mm ²	Outer diameter of cable, mm	Weight of 1 km of AKVVG cable, kg	Weight of 1 km of AKVVGng(A) cable, kg	Weight of 1 km of AKVVGng(A)-HL cable, kg	Weight of 1 km of AKVVG-HL cable, kg	Weight of 1 km of AKVVGng(A)-LS cable, kg
4 x 2,5	9,5	96	100	100	92	139
5 x 2,5	10,3	117	121	122	112	165
7 x 2,5	11,2	141	146	146	136	181
10 x 2,5	14,0	194	200	200	187	246
14 x 2,5	15,2	248	254	254	240	308
19 x 2,5	16,9	317	324	323	307	388
27 x 2,5	20,7	454	464	459	440	550
37 x 2,5	23,5	610	624	616	592	734
4 x 4,0	11,1	131	135	135	126	189
5 x 4,0	12,1	162	167	167	156	227
7 x 4,0	13,2	197	203	202	191	247
10 x 4,0	16,8	276	283	280	267	340
14 x 4,0	18,6	374	383	379	363	456
19 x 4,0	20,7	480	490	485	466	577
27 x 4,0	25,2	676	691	683	657	810
4 x 6,0	12,3	164	169	169	158	235
5 x 6,0	13,5	209	215	215	203	285
7 x 6,0	14,7	252	259	258	245	309
10 x 6,0	19,2	372	381	378	360	451
14 x 6,0	20,8	482	493	488	469	576
19 x 6,0	23,6	644	657	651	627	764
4 x 10,0	14,9	241	248	248	234	344
5 x 10,0	16,4	290	311	311	296	418
7 x 10	18,3	396	406	404	385	478

Number and nominal cross-section of cores, mm ²	Outer diameter of cable, mm	Weight of 1 km of AKVVG cable, kg	Weight of 1 km of KVVGng(A) cable, kg	Weight of 1 km of KVVGng(A)-HL cable, kg	Weight of 1 km of KVVG-HL cable, kg	Weight of 1 km of KVVGng(A)-LS cable, kg
4 x 0,75	7,2	71	73	73	68	93
5 x 0,75	7,8	84	86	87	81	108
7 x 0,75	8,8	115	118	118	111	145
10 x 0,75	10,9	157	162	162	152	196
14 x 0,75	11,7	202	207	207	196	246
19 x 0,75	13,0	260	265	264	253	311
27 x 0,75	15,4	357	364	360	348	421
37 x 0,75	17,2	468	476	471	457	544
52 x 0,75	20,5	655	666	659	640	759
61 x 0,75	21,7	754	765	757	737	869
4 x 1,0	7,6	83	86	86	81	108
5 x 1,0	8,6	112	115	116	108	147
7 x 1,0	9,3	137	140	140	132	168
10 x 1,0	11,5	188	193	193	183	229
14 x 1,0	12,4	245	250	249	238	292
19 x 1,0	13,8	316	322	321	309	372
27 x 1,0	16,4	437	444	440	427	505
37 x 1,0	18,7	593	602	597	580	682
52 x 1,0	21,9	806	817	810	790	919
61 x 1,0	23,6	952	965	956	932	1084
4 x 1,5	8,1	104	107	108	101	133
5 x 1,5	9,2	138	142	142	134	177
7 x 1,5	10,0	172	177	177	168	207
10 x 1,5	12,4	239	244	244	233	284
14 x 1,5	13,4	314	320	320	307	367
19 x 1,5	14,9	409	416	415	401	471
27 x 1,5	18,2	584	593	589	573	667
37 x 1,5	20,3	772	782	776	758	871
52 x 1,5	24,2	1078	1092	1083	1058	1211
61 x 1,5	25,6	1245	1260	1250	1223	1393
4 x 2,5	9,5	156	160	161	152	199
5 x 2,5	10,3	193	197	198	189	241
7 x 2,5	11,2	247	252	252	242	287
10 x 2,5	14,0	345	351	351	338	398
14 x 2,5	15,2	460	467	466	452	521
19 x 2,5	16,9	605	612	611	595	676
27 x 2,5	20,7	863	873	868	849	959
37 x 2,5	23,5	1171	1184	1177	1153	1295
4 x 4,0	11,1	227	232	232	222	285
5 x 4,0	12,1	283	288	288	270	347
7 x 4,0	13,2	366	372	371	360	416
10 x 4,0	16,8	517	524	521	508	581
14 x 4,0	18,6	712	721	717	700	794
19 x 4,0	20,7	938	948	943	924	1035
27 x 4,0	25,2	1327	1342	1334	1308	1461
4 x 6,0	12,3	309	314	314	303	469
5 x 6,0	13,5	390	396	396	384	454
7 x 6,0	14,7	506	512	512	498	563
10 x 6,0	19,2	734	743	740	722	813
14 x 6,0	20,8	989	1000	995	976	1082
19 x 6,0	23,6	1332	1345	1339	1314	1452



KVVGz, AKVVGz

Control cables: copper or aluminium conductors, PVC-compound insulation and sheath laid with filling.

APPLICATION

The cables are designed for fixed connections to electric devices, apparatuses, terminal block of electric switchgear with nominal alternating voltage of 0,66 and frequency of up to 100 Hz or direct voltage of up to 1 kV.

The cables with filling between the insulated conductors are designed for electric plants in which cable glanding is required at cable lead-ins.

OKP Code
356300

DESIGN

1. **Conductor:** copper or aluminium, solid 1st class according to GOST 22483.
2. **Insulation:** PVC-compound.
3. **Stranding:** insulated conductors are stranded; in each direction of stranding there is a marker pair whose insulated conductors differ in colour from each other and the other conductors.
4. **Sheath:** PVC-compound. The sheath fills intervals between insulated conductors of multi-core cable, giving to the cable the form being close to circular one.

FIRE SAFETY PERFORMANCE

Unmarked cables with PVC-compound outer sheath or protection hose are flame-retardant when laid as single cables and comply with the fire safety class according to GOST 53315 item O1.8.2.3.4.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 1 and 5 according to GOST 15150-69
Operating temperature range:.....from -50 °C to +50 °C
Relative air humidity at max +35°C.....max 98%

Nominal insulation thickness for conductors with the following cross-sections:

from 0,75 to 2,5 mm²0,6 mm
from 4 to 6 mm²0,7 mm
10 mm²0,9 mm

Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C with the following cross-sections:

from 0,75 to 1,5 mm², min.....10 MΩ
from 2,5 to 4 mm², min.....9 MΩ
from 6 to 10 mm², min.....6 MΩ
Cable conductor continuous operating heating temperature max.....+70 °C

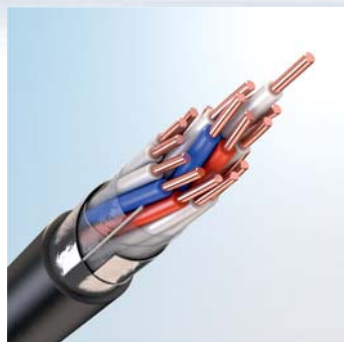
The cables are resistant to installation bending

Minimal bending radius at
laying and installation.....6 outer cable diameters
Construction cable length, min.....150 m
Service life.....min 15 years
when laid in buildings, canals, tunnels:.....min 25 years
Guarantee use period.....3 years from date of put of the cable into operation

Pulling force during laying or installation:

copper conductors.....4 kgf/mm²
aluminium conductors.....2 kgf/mm²

Number and nominal cross-section of cores, mm ²	Outer diameter of cable, mm	Weight of 1 km of KVVGz cable, kg	Weight of 1 km of AKVVGz cable, kg
4 x 0,75	7,2	79	-
5 x 0,75	7,8	93	-
4 x 1,0	7,6	93	-
5 x 1,0	8,7	122	-
4 x 1,5	8,2	116	-
5 x 1,5	9,3	151	-
4 x 2,5	9,5	172	112
5 x 2,5	10,4	210	129
4 x 4,0	11,1	250	154
5 x 4,0	12,1	307	307
4 x 6,0	12,3	339	194
5 x 6,0	13,5	422	422
4 x 10,0	14,9	528	416
5 x 10,0	16,4	653	353



KVVGE, AKVVGE

Control cables: copper or aluminium conductors, PVC-compound insulation and sheath, screened.

KVVEng(A), AKVVEng(A)

Control cables: copper or aluminium conductors, PVC-compound insulation, flame-retardant PVC-compound sheath, screened.

KVVEng(A)-HL, AKVVEng(A)-HL

Control cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and cold-resistant, low-smoke PVC-compound sheath, screened.

KVVGE-HL, AKVVGE-HL

Control cables: copper or aluminium conductors, cold-resistant PVC-compound insulation and sheath, screened.

KVVEng(A)-LS, AKVVEng(A)-LS

Control cables: copper or aluminium conductors, cold-resistant, low-smoke PVC-compound insulation and sheath, screened.

LS index in the grades of cables stands for Low Smoke.

APPLICATION

The cables are designed for fixed connections to electric devices, apparatuses, terminal block of electric switchgear with nominal alternating voltage of 0,66 and frequency of up to 100 Hz or direct voltage of up to 1 kV.

The cables are designed for cable lines in buildings, canals, tunnels, for cable lines in aggressive environments, provided there is no physical impact on cables.

ng(A)-LS type cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

OKP Code

356300

DESIGN

1. **Conductor:** copper or aluminium, solid, 1st class according to GOST 22483.
2. **Insulation:** for the cables of AKVVGE, KVVGE, AKVVEng(A), KVVEng(A) types: PVC-compound. For the cables of AKVVEng(A)-HL, KVVEng(A)-HL, AKVVGE-HL, KVVGE-HL types: cold-resistant PVC-compound. For the cables of AKVVEng(A)-LS, KVVEng(A)-LS types: low-smoke PVC-compound.
3. **Stranding:** insulated conductors are stranded; in each direction of stranding there is a marker pair whose insulated conductors differ in colour from each other and the other conductors.
4. **Bedding:** PVC-film, laid on stranded conductors.
5. **Screen:** alumoflex (aluminised PET), minimal nominal thickness is 0,04 mm. Alumoflex screen may be laid with laying under the screen or by overlapping providing the screen is solid at the allowed cable bend radiuses. Along the aluminium foil screen copper laying 0,04 mm in diameter is laid lengthwise.
6. **Sheath:** for the cables of AKVVGE, KVVGE types: PVC-compound. For the cables of AKVVEng(A), KVVEng(A) types: low-smoke PVC-compound. For the cables of AKVVEng(A)-HL, KVVEng(A)-HL types: cold-resistant PVC-compound. For the cables of AKVVGE-HL, KVVGE-HL types: cold-resistant PVC-compound. For the cables of AKVVEng(A)-LS, KVVEng(A)-LS types: low-smoke PVC-compound.

FIRE SAFETY PERFORMANCE

Unmarked and HL-type cables with PVC-compound outer sheath or protection hose are flame-retardant when wired as single cables and comply with the fire safety class according to GOST 53315 item O1.8.2.3.4.

ng(A), ng(A)-LS and ng(A)-HL-type cables with outer sheath and PVC-compound protection hose are flame-retardant when wired as bunches and with the fire safety class according to GOST R 53315.

ng(A) and ng(A)-HL-type cables comply with the item 16.8.2.3.4

ng(A)-LS-type cables comply with the item 16.8.2.2 of the above GOST.

ng(A)-LS-type cables are low smoke in condition of burning or smouldering. Fire tests proved ng(A)-LS-type cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 50%.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 1 and 5 according to GOST 15150-69

Operating temperature range:

for AKVVGE, KVVGE, AKVVEng(A), KVVEng(A), AKVVEng(A)-LS, KVVEng(A)-LS.....from -50 °C to +50 °C
for AKVVEng(A)-HL, KVVEng(A)-HL, AKVVGE-HL, VVGE-HL.....from -60 °C to +50 °C
Relative air humidity at max +35°C.....max 98%

Nominal insulation thickness for conductors with the following cross-sections:

from 0,75 to 2,5 mm²0,6 mm
from 4 to 6 mm²0,7 mm
10 mm²0,9 mm

Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C with the following cross-sections:

from 0,75 to 1,5 mm², min.....10 MΩ
from 2,5 to 4 mm², min.....9 MΩ
from 6 to 10 mm², min.....6 MΩ
Cable conductor continuous operating heating temperature max.....+70 °C

The cables are resistant to installation bending

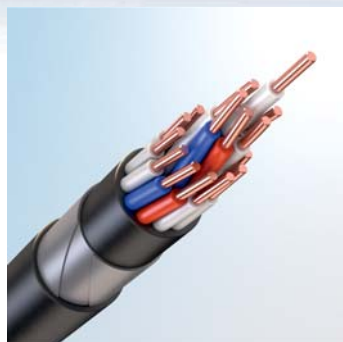
Minimal bending radius at laying and installation6 outer cable diameters
Construction cable length, min.....150 m
Service life.....min 15 years; when laid in buildings, canals, tunnels :.....min 25 years
Guarantee use period.....3 years from date of put of the cable into operation

Pulling force during laying or installation:

copper conductors4 kgf/mm²
aluminium conductors.....2 kgf/mm²

Number and nominal cross-section of cores, mm ²	Outer diameter of the cable, mm	Weight of 1 km of KVVGE cable, kg	Weight of 1 km of KVVGE(A) cable, kg	Weight of 1 km of KVVGE(A)-HL cable, kg	Weight of 1 km of KVVGE-HL cable, kg	Weight of 1 km of KVVGE(A)-LS cable, kg
4 x 0,75	7,5	90	94	93	87	105
5 x 0,75	8,1	104	108	107	100	120
7 x 0,75	9,3	132	137	136	128	153
10 x 0,75	11,4	179	184	182	172	205
14 x 0,75	12,3	225	231	230	219	257
19 x 0,75	13,5	285	292	290	277	323
27 x 0,75	16,0	388	396	392	378	436
37 x 0,75	17,7	503	512	507	491	562
52 x 0,75	21,0	698	710	703	681	779
61 x 0,75	22,3	798	811	803	779	889
4 x 1,0	7,9	104	108	107	101	120
5 x 1,0	9,2	138	143	142	133	160
7 x 1,0	9,8	155	160	159	150	177
10 x 1,0	12,1	211	217	215	205	240
14 x 1,0	13,0	269	275	273	261	302
19 x 1,0	14,3	343	350	347	334	383
27 x 1,0	17,0	468	477	473	457	520
37 x 1,0	19,3	631	642	637	616	700
52 x 1,0	22,4	850	864	856	832	938
61 x 1,0	24,1	1000	1016	1008	978	1106
4 x 1,5	9,1	140	145	144	135	161
5 x 1,5	9,8	167	172	172	162	191
7 x 1,5	10,5	193	197	195	186	217
10 x 1,5	13,0	263	269	268	256	294
14 x 1,5	14,0	340	347	345	332	377
19 x 1,5	15,4	439	447	444	430	484
27 x 1,5	18,8	622	633	628	609	685
37 x 1,5	20,9	814	827	820	798	861
4 x 2,5	10,0	189	195	194	183	213
5 x 2,5	10,9	228	234	233	222	256
7 x 2,5	11,7	269	274	273	263	296
10 x 2,5	14,6	372	381	377	364	408
14 x 2,5	15,7	490	498	495	481	533
19 x 2,5	17,4	637	646	642	626	689
27 x 2,5	21,2	906	918	913	888	979
37 x 2,5	24,1	1219	1235	1228	1199	1315
4 x 4,0	11,6	270	277	276	262	301
5 x 4,0	12,6	328	336	335	320	365
7 x 4,0	13,7	392	399	397	384	427
10 x 4,0	17,3	549	558	555	539	596
14 x 4,0	19,2	750	761	757	737	811
19 x 4,0	21,2	981	993	987	965	1055
4 x 6,0	12,8	360	369	368	352	398
5 x 6,0	14,0	446	454	453	436	489
7 x 6,0	15,2	536	543	541	527	576
10 x 6,0	19,7	772	784	780	759	831
14 x 6,0	21,4	1032	1044	1027	1017	1100
19 x 6,0	24,1	1380	1395	1377	1361	1472
4 x 10,0	15,4	556	567	565	544	607
5 x 10,0	16,9	682	695	692	669	742

Number and nominal cross-section of cores, mm ²	Outer diameter of the cable, mm	Weight of 1 km of AKVGE cable, kg	Weight of 1 km of AKVGE(A) cable, kg	Weight of 1 km of AKVGE(A)-HL cable, kg	Weight of 1 km of AKVGE-HL cable, kg	Weight of 1 km of AKVGE(A)-LS cable, kg
4 x 2,5	10,0	128	134	133	122	153
5 x 2,5	10,9	152	159	158	146	181
7 x 2,5	11,7	163	168	167	157	190
10 x 2,5	14,6	220	228	226	212	257
14 x 2,5	15,7	278	286	283	269	321
19 x 2,5	17,4	349	358	354	338	401
27 x 2,5	21,2	496	509	503	481	570
37 x 2,5	24,1	658	674	667	638	755
4 x 4,0	11,6	173	180	179	166	205
5 x 4,0	12,6	208	216	214	200	245
7 x 4,0	13,7	223	230	228	216	258
10 x 4,0	17,3	308	317	314	298	355
14 x 4,0	19,2	412	423	419	399	474
19 x 4,0	21,2	522	535	529	507	597
4 x 6,0	12,8	216	224	223	207	253
5 x 6,0	14,0	265	274	272	255	308
7 x 6,0	15,2	282	290	287	273	322
10 x 6,0	19,7	410	422	418	397	469
14 x 6,0	21,4	525	538	533	510	595
19 x 6,0	24,1	692	708	702	673	784
4 x 10	15,4	316	327	325	305	367
5 x 10	16,9	383	395	392	370	442
7 x 10	18,8	434	445	441	421	493



KVBbSHV, AKVBbSHV

Control cables: copper or aluminium conductors, PVC-compound insulation, inner sheath and protection hose, screened.

KVBbSHvng(A), AKVBbSHvng(A)

Control cables: copper or aluminium conductors, PVC-compound insulation and inner sheath, flame-retardant PVC-compound protection hose, screened.

KVBbSHvng(A)-HL, AKVBbSHvng(A)-HL

Control cables: copper or aluminium conductors, cold-resistant PVC- compound insulation, cold-resistant, flame-retardant PVC-compound inner sheath and protection hose, screened.

KVBbSHv-HL, AKVBbSHv-HL

Control cables: copper or aluminium conductors, cold-resistant PVC-compound insulation, inner sheath and protection hose, screened.

KVBbSHvng(A)-LS, AKVBbSHvng(A)-LS

Control cables: copper or aluminium conductors, cold-resistant, low-smoke PVC-compound insulation, inner sheath and protection hose, screened.

APPLICATION

The cables are designed for fixed connections to electric devices, apparatuses, terminal block of electric switchgear with nominal alternating voltage of 0,66 and frequency of up to 100 Hz or direct voltage of up to 1 kV.

The cables are designed for cable lines in buildings, canals, tunnels, for cable lines in aggressive and stray current environments, provided there is no physical impact on cables.

ng(A)-LS type cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

OKP Code

356300

DESIGN

1. **Conductor:** copper or aluminium, solid, 1st class according to GOST 22483.
2. **Insulation:** for the cables of AKVBbSHv, KVBbSHv, AKVBbSHvng(A), KVBbSHvng(A) types: PVC-compound. For the cables of AKVBbSHvng(A)-HL, KVBbSHvng(A)-HL, AKVBbSHv-HL, KVBbSHv-HL types: cold-resistant PVC-compound. For the cables of AKVBbSHvng(A)-LS, KVBbSHvng(A)-LS types: low-smoke PVC-compound.
3. **Stranding:** insulated conductors are stranded; in each direction of stranding there is a marker pair whose insulated conductors differ in colour from each other and the other conductors.
4. **Inner sheath:** for the cables of KVBbSHv, KVBbSHvng(A), AKVBbSHv, AKVBbSHvng(A) types: pressed-out PVC-compound. For the cables of KVBbSHv-HL, AKVBbSHv-HL types: cold-resistant PVC-compound. For the cables of KVBbSHvng(A)-HL, AKVBbSHvng(A)-HL types: flame-retardant PVC-compound. For the cables of KVBbSHvng(A)-LS, AKVBbSHvng(A)-LS types: low-smoke PVC-compound. For KVBbSHvng(A)-LS, AKVBbSHvng(A)-LS cables inner sheath should fill the gaps between the insulated conductors.
5. **Armour:** two galvanized steel bands; bands should be laid so that the upper band overlaps the gaps between the coils of the lower band. Nominal thickness of the galvanized steel band is 0,3 mm.
6. **Protection hose:** For the cables of AKVBbSHv, KVBbSHv types: PVC-compound. For the cables of AKVBbSHvng(A), KVBbSHvng(A) types: flame-retardant PVC-compound. For the cables of AKVBbSHvng(A)-HL, KVBbSHvng(A)-HL types: cold-resistant, flame-retardant PVC-compound. For the cables of AKVBbSHv-HL, KVBbSHv-HL types: cold-resistant PVC-compound. For the cables of AKVBbSHvng(A)-LS, KVBbSHvng(A)-LS types: low-smoke PVC-compound.

FIRE SAFETY PERFORMANCE

Unmarked and HL-type cables with outer sheath and PVC-compound protection hose are flame-retardant when laid as single cables and comply with the fire safety class according to GOST 53315 item O1.8.2.3.4.

ng(A), ng(A)-LS and ng(A)-HL-type cables with outer sheath and polyvinylchloride compound protection hose are flame-retardant when wired as bunches and with the fire safety class according to GOST R 53315.

ng(A) and ng(A)-HL-type cables comply with the item 16.8.2.3.4

ng(A)-LS-type cables comply with the item 16.8.2.2.2 of the above GOST.

ng(A)-LS-type cables are low smoke in condition of burning or smouldering. Fire tests proved ng(A)-LS-type cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 50%.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 1 and 5 according to GOST 15150-69

Operating temperature range:

for AKVBbSHv, KVBbSHv, AKVBbSHvng(A), KVBbSHvng(A), AKVBbSHvng(A)-LS, KVBbSHvng(A)-LS.....from -50 °C to +50 °C
 for AKVBbSHvng(A)-HL, KVBbSHvng(A)-HL, AKVBbSHv-HL, KVBbSHv-HL.....from -60 °C to +50 °C
 Relative air humidity at max +35°C.....max 98%

Nominal insulation thickness for conductors with the following cross-sections:

from 0,75 to 2,5 mm²0,6 mm
 from 4 to 6 mm²0,7 mm
 10 mm²0,9 mm

Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C with the following cross-sections:

from 0,75 to 1,5 mm², min.....10 MΩ
 from 2,5 to 4 mm², min.....9 MΩ
 from 6 to 10 mm², min.....6 MΩ
 Cable conductor continuous operating heating temperature max.....+70 °C

The cables are resistant to installation bending

Minimal bending radius at laying and installation.....10 outer cable diameters
 Minimal cable length.....150 m
 Service life.....min 15 years;
 when laid in buildings, canals, tunnels :.....min 25 years
 Guarantee use period.....3 years from date of put of the cable into operation
 Pulling force during laying or installation:
 copper conductors4 kgf/mm²
 aluminium conductors.....2 kgf/mm²

Number and nominal cross-section of cores, mm ²	Outer diameter of the cable, mm	Weight of 1 km of KVBbSHv cable, kg	Weight of 1 km of KVBbSHvng(A) cable, kg	Weight of 1 km of KVBbSHvng(A)-HL cable, kg	Weight of 1 km of KVBbSHv-HL cable, kg	Weight of 1 km of KVBbSHvng(A)-LS cable, kg
4 x 0,75	13,6	318	325	315	292	365
5 x 0,75	13,6	319	326	317	295	366
7 x 0,75	13,6	329	336	328	307	372
10 x 0,75	14,9	376	384	378	355	425
14 x 0,75	15,7	437	445	439	414	491
19 x 0,75	17,0	517	527	518	492	580
27 x 0,75	19,4	652	663	650	621	727
37 x 0,75	21,2	796	807	791	760	883
52 x 0,75	24,1	1017	1031	1011	974	1125
61 x 0,75	25,7	1160	1177	1154	1112	1286
4 x 1,0	13,6	323	330	321	299	371
5 x 1,0	13,6	330	338	329	308	380
7 x 1,0	13,6	339	333	339	320	381
10 x 1,0	15,5	419	427	421	397	470
14 x 1,0	16,4	492	501	494	468	551
19 x 1,0	17,8	581	591	582	553	648
27 x 1,0	20,4	750	761	747	716	829
37 x 1,0	22,3	924	936	919	885	1017
52 x 1,0	25,9	1215	1231	1209	1166	1338
61 x 1,0	27,2	1363	1380	1356	1311	1498
4 x 1,5	13,6	332	340	331	310	383
5 x 1,5	13,6	342	349	342	323	393
7 x 1,5	14,0	374	382	377	356	419
10 x 1,5	16,4	487	496	489	463	543
14 x 1,5	17,4	581	591	583	555	645
19 x 1,5	18,9	695	705	695	665	768
27 x 1,5	21,8	907	919	903	870	994
37 x 1,5	23,9	1131	1144	1125	1088	1234
52 x 1,5	27,8	1500	1517	1493	1447	1635
61 x 1,5	29,2	1692	1711	1684	1635	1841
4 x 2,5	13,6	354	361	355	336	408
5 x 2,5	14,3	401	409	404	382	462
7 x 2,5	15,2	472	480	474	450	522
10 x 2,5	18,0	615	625	617	588	679
14 x 2,5	19,2	751	762	752	721	823
19 x 2,5	20,9	927	938	927	892	1010
27 x 2,5	24,3	1228	1242	1223	1185	1328
37 x 2,5	27,1	1581	1598	1576	1531	1708
4 x 4,0	15,1	450	458	452	429	522
5 x 4,0	16,1	524	533	526	501	604
7 x 4,0	17,2	628	637	629	602	688
10 x 4,0	20,8	837	849	835	804	912
14 x 4,0	22,2	1041	1054	1038	1004	1128
19 x 4,0	24,3	1303	1317	1298	1260	1405
27 x 4,0	28,8	1766	1784	1648	1711	1901
4 x 6,0	16,3	554	563	556	531	640
5 x 6,0	17,5	657	667	660	632	753
7 x 6,0	18,7	787	797	788	758	855
10 x 6,0	22,8	1072	1085	1069	1035	1157
14 x 6,0	24,4	1356	1370	1260	1314	1454
19 x 6,0	27,2	1743	1761	1635	1694	1866
4 x 10,0	18,9	766	777	768	737	883
5 x 10,0	20,4	916	927	917	884	1049
7 x 10	21,9	1140	1152	1059	1103	1226

Number and nominal cross-section of cores, mm ²	Outer diameter of the cable, mm	Weight of 1 km of AKVBbSHv cable, kg	Weight of 1 km of AKVBbSHvng(A) cable, kg	Weight of 1 km of AKVBbSHvng(A)-HL cable, kg	Weight of 1 km of AKVBbSHv-HL cable, kg	Weight of 1 km of AKVBbSHvng(A)-LS cable, kg
4 x 2,5	13,6	293	300	294	275	348
5 x 2,5	14,3	326	333	328	306	386
7 x 2,5	15,2	366	374	368	344	416
10 x 2,5	18,0	463	473	465	436	527
14 x 2,5	19,2	539	550	540	509	611
19 x 2,5	20,9	639	650	639	604	722
27 x 2,5	24,3	818	832	813	776	919
37 x 2,5	27,1	1020	1037	1015	970	1147
4 x 4,0	15,1	353	361	355	332	426
5 x 4,0	16,1	404	412	406	381	483
7 x 4,0	17,2	459	468	460	433	520
10 x 4,0	20,8	596	607	594	562	671
14 x 4,0	22,2	703	716	700	666	790
19 x 4,0	24,3	845	859	840	802	946
27 x 4,0	28,8	1114	1133	1108	1060	1250
4 x 6,0	16,3	409	418	411	386	495
5 x 6,0	17,5	476	486	479	451	572
7 x 6,0	18,7	534	544	535	505	602
10 x 6,0	22,8	710	723	707	673	795
14 x 6,0	24,4	850	863	845	807	947
19 x 6,0	27,2	1056	1073	1051	1006	1178
4 x 10	18,9	527	537	528	498	648
5 x 10	20,4	616	628	617	584	749
7 x 10	21,9	720	732	720	684	807

Halogen Free Control Cables. TU 3563-018-59680332-2011



KPPGng(A)-HF, AKPPGng(A)-HF

Control cables: copper or aluminium conductors, halogen free polymer compound insulation, inner and outer sheath.

KPPGEng(A)-HF, AKPPGEng(A)-HF

Control cables: copper or aluminium conductors, halogen free polymer compound insulation, inner and outer sheath, screened.

KPBbPng(A)-HF, AKPBbPng(A)-HF

Control cables: copper or aluminium conductors, halogen free polymer compound insulation, inner and outer sheath, armoured.

APPLICATION

The cables are designed for fixed connections to electric devices, apparatuses, terminal block of electric switchgear with nominal alternating voltage of 0,66 and frequency of up to 100 Hz or direct voltage of up to 1 kV.

Non-screened and unarmoured cables are designed for cable lines in buildings, gutters, tunnels, for cable lines in aggressive environments, provided there is no physical impact on cables, and electric circuits should not be protected from external electric fields.

screened cables are designed for cable lines in buildings, gutters, tunnels, for cable lines in aggressive environments, provided there is no physical impact on cables, and electric circuits should not be protected from external electric fields.

Armoured cables are designed for cable lines in buildings, gutters, tunnels, for cable lines in aggressive environments, provided there is no physical impact on cables, and electric circuits should not be protected from external electric fields.

The cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

OKP Code
356300

DESIGN

- 1. Conductor:** copper or aluminium, solid, 1st class according to GOST 22483.
- 2. Insulation:** halogen free polymer compound.
- 3. Stranding:** insulated conductors are stranded; in each direction of stranding there is a marker pair whose insulated conductors differ in colour from each other and the other conductors.
- 4. Inner sheath:** halogen free polymer compound. Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable the form being close to circular one.
- 5. Screen:** lapping copper foil or copper band with nominal thickness of 0,06 mm for KPPGEng(A)-HF, KPPGng(A)-HF cables; the screen should be laid with overlapping providing the screen is solid at the allowed cable bend radiuses.
- 6. Outer sheath:** halogen free polymer compound. Outer sheath for KPPGEng(A)-HF, AKPPGEng(A)-HF cables should be laid over the metal screen. For KPPGng(A)-HF, AKPPGng(A)-HF cables.
- 7. Armor:** two galvanized steel bands; bands should be laid so that the upper band overlaps the gaps between the coils of the lower band. Nominal thickness of the galvanized steel band is 0,3 mm.
- 6. Protection hose:** halogen free polymer compound in KPBbPng(A)-HF, AKPBbPng(A)-HF cables.

FIRE SAFETY PERFORMANCE

Cables with halogen free polymer compound outer sheath or protection hose are flame-retardant when wired as cable bunches and comply with the fire safety class according to RSS P 53315 -item 16.8.1.2.1.

Cables should be low smoke under conditions of burning or smouldering while in use.

Fire tests proved cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 40%.

Cables are characterised by low chlorine hydride emission (max 5 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 1 and 5 according to GOST 15150-69
Operating temperature range.....from -50 °C to +50 °C
Relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than:

for unarmoured cables.....-15 °C
for armoured cables.....-7 °C

Minimal bending radius at laying and installation:

for unarmoured cables.....10 outer cable diameters
for armoured cables.....6 outer cable diameters

The cables are resistant to installation bending

Nominal insulation thickness for conductors with the following cross-sections:

from 0,75 to 2,5 mm²0,6 mm
from 4 to 6 mm²0,7 mm
10 mm²0,9 mm

Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C with the following cross-sections:

from 0,75 to 1,5 mm², min.....10 MΩ
from 2,5 to 4 mm², min.....9 MΩ
from 6 to 10 mm², min.....6 MΩ
Cable conductor continuous operating heating temperature max.....+70 °C
Construction cable length, min.....150 m
Service life.....30 years
Guarantee use period.....3 years from date of put of the cable into operation

Pulling force during laying or installation:

copper conductors4 kgf/mm²
aluminium conductors.....2 kgf/mm²

Number and nominal cross-section of cores, mm ²	Outer diameter of KPPGng(A)-HF cable, mm	Weight of 1 km of KPPGng(A)-HF cable, kg	Outer diameter of KPPGEng(A)-HF cable, mm	Weight of 1 km of KPPGEng(A)-HF cable, kg	Outer diameter of KPBBPng(A)-HF cable, mm	Weight of 1 km of KPBBPng(A)-HF cable, kg
4 x 0,75	12,0	220	12,2	243	13,8	357
5 x 0,75	12,0	220	12,2	243	13,8	357
7 x 0,75	12,0	236	12,2	256	13,8	370
10 x 0,75	13,7	283	13,9	335	15,5	467
14 x 0,75	14,6	341	14,7	370	16,4	530
19 x 0,75	15,9	416	16,0	448	17,7	624
27 x 0,75	19,1	572	19,3	611	20,5	834
37 x 0,75	21,0	713	21,2	757	22,4	1003
52 x 0,75	24,4	956	24,6	1007	25,8	1328
61 x 0,75	25,7	1078	25,9	1132	27,1	1472
4 x 1,0	12,0	226	12,2	249	13,8	363
5 x 1,0	12,0	233	12,2	256	13,8	370
7 x 1,0	12,0	242	12,2	266	13,8	381
10 x 1,0	14,3	321	14,5	349	16,1	519
14 x 1,0	15,3	391	15,5	422	17,1	595
19 x 1,0	16,7	482	16,8	516	18,5	697
27 x 1,0	20,3	678	20,3	706	21,5	949
37 x 1,0	22,3	851	22,3	883	23,5	1151
52 x 1,0	26,0	1143	26,0	1181	27,2	1533
61 x 1,0	27,4	1293	27,4	1333	28,6	1707
4 x 1,5	12,0	237	12,2	260	13,8	374
5 x 1,5	12,0	246	12,2	269	13,8	384
7 x 1,5	12,7	286	12,9	311	14,5	436
10 x 1,5	15,2	382	15,4	413	17,0	600
14 x 1,5	16,3	473	16,5	506	18,1	688
19 x 1,5	17,8	589	18,0	626	19,6	826
27 x 1,5	21,5	825	21,7	860	22,9	1132
37 x 1,5	24,1	1074	24,3	1112	25,5	1415
52 x 1,5	27,7	1419	27,9	1463	29,1	1863
61 x 1,5	29,2	1613	29,4	1660	30,6	2085
4 x 2,5	12,1	267	12,3	290	13,9	406
5 x 2,5	13,0	313	13,2	339	14,8	463
7 x 2,5	13,9	374	14,1	402	15,7	544
10 x 2,5	16,8	506	17,0	541	18,6	754
14 x 2,5	18,5	658	18,6	696	19,9	892
19 x 2,5	20,2	829	20,4	871	21,6	1086
27 x 2,5	24,4	1161	24,6	1200	25,8	1530
37 x 2,5	26,9	1492	27,1	1535	28,3	1901
4 x 4,0	13,7	362	13,9	389	15,5	522
5 x 4,0	14,8	430	15,0	460	16,6	603
7 x 4,0	15,9	516	16,0	549	17,7	721
10 x 4,0	20,3	746	20,5	778	21,7	1052
14 x 4,0	21,8	949	21,9	983	23,2	1258
19 x 4,0	24,3	1232	24,5	1271	25,7	1575
27 x 4,0	28,5	1664	28,6	1709	29,9	2145
4 x 6,0	14,9	464	15,1	494	16,7	639
5 x 6,0	16,1	560	16,3	593	17,9	743
7 x 6,0	17,4	673	17,5	709	19,2	897
10 x 6,0	22,3	971	22,5	1006	24,1	1358
14 x 6,0	24,4	1278	24,5	1317	25,8	1644
19 x 6,0	26,8	1640	27,0	1683	28,2	2043
4 x 10,0	17,8	695	18,0	732	19,6	898
5 x 10,0	19,7	859	19,9	900	21,1	1060
7 x 10	21,3	1041	21,5	1085	22,7	1260

Number and nominal cross-section of cores, mm ²	Outer diameter of AKPPGng(A)-HF cable, mm	Weight of 1 km of AKPPGng(A)-HF cable, kg	Outer diameter of AKPPGEng(A)-HF cable, mm	Weight of 1 km of AKPPGEng(A)-HF cable, kg	Outer diameter of AKPBbPng(A)-HF cable, mm	Weight of 1 km of AKPBbPng(A)-HF cable, kg
4 x 2,5	12,1	206	12,3	230	13,9	345
5 x 2,5	13,0	237	13,2	263	14,8	387
7 x 2,5	13,9	268	14,1	296	15,7	438
10 x 2,5	16,8	355	17,0	389	18,6	602
14 x 2,5	18,5	446	18,6	484	19,9	679
19 x 2,5	20,2	541	20,4	583	21,6	798
27 x 2,5	24,4	752	24,6	790	25,8	1121
37 x 2,5	26,9	931	27,1	974	28,3	1341
4 x 4,0	13,7	266	13,9	293	15,5	425
5 x 4,0	14,8	310	15,0	339	16,6	482
7 x 4,0	15,9	347	16,0	380	17,7	552
10 x 4,0	20,3	504	20,5	536	21,7	811
14 x 4,0	21,8	611	21,9	646	23,2	921
19 x 4,0	24,3	774	24,5	813	25,7	1117
27 x 4,0	28,5	1013	28,6	1058	29,9	1494
4 x 6,0	14,9	319	15,1	349	16,7	494
5 x 6,0	16,1	379	16,3	412	17,9	562
7 x 6,0	17,4	420	17,5	455	19,2	643
10 x 6,0	22,3	609	22,5	644	24,1	996
14 x 6,0	24,4	772	24,5	810	25,8	1137
19 x 6,0	26,8	952	27,0	995	28,2	1355
4 x 10	17,8	455	18,0	492	19,6	658
5 x 10	19,7	559	19,9	600	21,1	760
7 x 10	21,3	621	21,5	666	22,7	840

Fire-resistant Control Cables. TU 3563-018-59680332-2011



KVVGng(A)-FRLS,

Control cables: copper conductors, low-smoke PVC-compound insulation, inner and outer sheath, low fume and gas emission, with thermal barrier along current-carrying conductor.

KVVGEng(A)-FRLS,

Control cables: copper conductors, low-smoke PVC-compound insulation, inner and outer sheath, low fume and gas emission, with thermal barrier along current-carrying conductor, screened.

KVBbSHvng(A)-FRLS

Control cables: copper conductors, low-smoke PVC-compound insulation, inner sheath and protection hose, low fume and gas emission, with thermal barrier along current-carrying conductor, armour of galvanized steel band.

Control cables with copper conductors, fire-resistant, flame-retardant, low smoke.

(FR index in the grades of cables stands for their **Fire Resistance**, **LS** index in the grades stands for **Low Smoke**)

APPLICATION

The cables are designed for fixed connections to electric devices, apparatuses, terminal block of electric switchgear with nominal alternating voltage of 0,66 and frequency of up to 100 Hz or direct voltage of up to 1 kV.

The cables can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

OKP Code

356300

DESIGN

1. **Conductor:** copper, solid, 1st class according to GOST 22483.
2. **Thermal barrier:** micaceous double-layer lapping, minimal band width is 0,12 mm.
3. **Insulation:** low-smoke PVC-compound, low fume and gas emission.
4. **Stranding:** insulated conductors are stranded; in each direction of stranding there is a marker pair whose insulated conductors differ in colour from each other and the other conductors.
5. **Inner sheath:** low-smoke PVC compound, low gas emission. Inner sheath fills intervals between insulated conductors of multi-core cable, giving to the cable form being close to circular one.
6. **Metal screen:** for KVVGEng(A)-FRLS cables: lapping with a copper band min 0,06 mm thick with overlapping providing the screen is solid at the allowed cable bend radiuses.
7. **Outer sheath:** for unarmoured KVVGng(A)-FRLS and KVVGEng(A)-FRLS cables: low-smoke PVC-compound, low fume and gas emission.
8. **Protection covering for KVBbSHvng(A)-FRLS cables:**
 - armouring with two galvanized steel bands; bands are laid so that the upper band overlaps the gaps between the coils of the lower band;
 - low-smoke PVC-compound, low fume and gas emission protection hose

FIRE SAFETY PERFORMANCE

Cables are flame-retardant when wired as cable bunches and comply with the fire safety class according to GOST R 53315 item 16.3.2.2.2.

Cables should be low smoke under conditions of burning or smouldering while in use.

Fire tests proved cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 50%.

Cables are flame-resistant for min 120 minutes if exposed to open fire.

TECHNICAL STANDARDS

Ambient class.....UHL, placement category 1 and 5 according to GOST 15150-69
 Operating temperature range:.....from -50 °C to +50 °C
 Relative air humidity at max +35°C.....max 98%
 Laying and installation of cables without preheating is performed at temperature not less than:
 for unarmoured cables.....-15 °C
 for armoured cables.....-7 °C

Minimal bending radius at laying and installation:

for unarmoured cables.....10 outer cable diameters
 for armoured cables.....6 outer cable diameters

The cables are resistant to installation bending

Nominal insulation thickness for conductors with the following cross-sections:

from 0,75 to 2,5 mm²0,6 mm
 from 4 to 6 mm²0,7 mm
 10 mm²0,9 mm

Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C with the following cross-sections:

from 0,75 to 1,5 mm², min.....10 MΩ
 from 2,5 to 4 mm², min.....9 MΩ
 from 6 to 10 mm², min.....6 MΩ

Cable conductor continuous operating heating temperature max+70 °C

Construction cable length, min.....150 m

Guaranteed use period.....3 years from date of put of the cable into operation

Service life:

if laid in ground (trenches) and on overhead trays, min.....15 years

if laid in buildings, canals, tunnels, min.....25 years

Number and nominal cross-section of cores, mm ²	Outer diameter of KVVgng(A)-FRLS cable, mm	Weight of 1 km of KKVVgng(A)-FRLS cable, kg	Outer diameter of KVVgEng(A)-FRLS cable, mm	Weight of 1 km of KKVVgEng(A)-FRLS cable, kg	Outer diameter of KVBBshvng(A)-FRLS cable, mm	Weight of 1 km of KVBBshvng(A)-FRLS cable, kg
4 x 1,0	13,3	278	12,9	279	14,2	388
5 x 1,0	14,2	319	13,8	315	15,0	438
7 x 1,0	14,5	333	14,7	362	16,0	489
10 x 1,0	17,6	433	17,7	469	19,0	617
14 x 1,0	19,2	551	19,4	590	20,3	727
19 x 1,0	21,0	676	21,2	721	22,1	872
27 x 1,0	25,5	945	25,7	983	26,6	1185
37 x 1,0	28,1	1184	28,3	1227	29,2	1451
52 x 1,0	32,4	1551	32,6	1600	33,5	1863
61 x 1,0	34,6	1796	34,8	1848	35,7	2128
4 x 1,5	13,3	288	13,4	314	14,7	429
5 x 1,5	14,2	334	14,4	362	15,7	486
7 x 1,5	15,2	383	15,4	414	16,6	547
10 x 1,5	18,9	523	19,1	562	19,9	697
14 x 1,5	20,2	644	20,4	686	21,3	831
19 x 1,5	22,2	799	22,3	846	23,2	1007
27 x 1,5	26,9	1118	27,1	1176	28,0	1373
37 x 1,5	29,7	1415	29,9	1479	30,8	1699
52 x 1,5	34,7	1909	34,9	1984	35,8	2242
61 x 1,5	36,7	2167	36,9	2247	37,7	2520
4 x 2,5	14,2	352	14,4	381	15,7	505
5 x 2,5	15,3	411	15,5	442	16,7	576
7 x 2,5	16,4	478	16,6	512	17,8	649
10 x 2,5	20,5	658	20,7	701	21,5	849
14 x 2,5	22,0	825	22,2	871	23,0	1031
19 x 2,5	24,6	1066	24,7	1118	25,6	1296
27 x 2,5	29,4	1455	29,6	1519	30,4	1736
37 x 2,5	32,5	1866	32,7	1937	33,6	2179
4 x 4,0	15,8	458	16,0	491	17,3	630
5 x 4,0	17,1	540	17,3	576	18,5	719
7 x 4,0	18,8	654	19,0	693	19,8	826
10 x 4,0	24,1	930	24,3	980	24,8	1126
14 x 4,0	25,9	1173	26,1	1228	26,9	1416
19 x 4,0	28,5	1483	28,6	1544	29,5	1754
27 x 4,0	33,5	1998	33,6	2071	34,5	2320
4 x 6,0	17,0	568	17,2	559	18,5	746
5 x 6,0	18,8	702	19,0	695	19,9	875
7 x 6,0	20,3	822	20,5	853	21,3	1010
10 x 6,0	26,1	1170	26,3	1225	27,2	1416
14 x 6,0	28,1	1497	28,3	1557	29,1	1764
19 x 6,0	31,0	1914	31,1	1981	32,0	2210
4 x 10,0	20,3	843	20,4	814	21,3	1031
5 x 10,0	22,0	1008	22,2	1055	23,1	1215
7 x 10	24,2	1226	24,4	1277	25,3	1452



**BLOCK-SIGNALLING
CABLES**

limited liability company
TOMSKCABLE

Block and Signalling Cables with Polyethylene Insulation in Plastic Sheath GOST R 51312-99



SBVG

Block-signalling cable: copper conductors, polyethylene insulation, PVC-compound sheath.

SBVGng(A)

Block-signalling cable: copper conductors, polyethylene insulation, flame-retardant PVC-compound sheath.

SBPu

Block-signalling cable: copper conductors, polyethylene insulation, thickened polyethylene sheath.

SBZPu

Block-signalling cable: copper conductors, polyethylene insulation, PVC-compound sheath with water-blocking core filling.

SBVBbSHvng(A)

Block-signalling cable: copper conductors, polyethylene insulation, flame-retardant PVC compound sheath, armour of two steel bands, flame-retardant PVC-compound hose.

SBPBbSHv

Block-signalling cable: copper conductors, polyethylene insulation, polyethylene sheath, armour of two steel bands, PVC-compound hose.

SBZPBbSHv

Block-signalling cable: copper conductors, polyethylene insulation, polyethylene sheath, armour of two steel bands, PVC-compound hose, with water-blocking core filling.

SBPBbSHp

Block-signalling cable: copper conductors, polyethylene insulation, polyethylene sheath, armour of two steel bands, polyethylene hose

SBZPBbSHp

Block-signalling cable: copper conductors, polyethylene insulation, polyethylene sheath, armour of two steel bands, polyethylene hose, with water-blocking core filling.

DESIGN:

1. **Conductor:** soft copper wire with nominal diameter of 0,8, 0,9 or 1,0 mm.
2. **Insulation:** polyethylene .
3. **Twisted pair:** in twisted pair cables
4. **Core:** single and pair conductors are twisted into a core
5. **Filling:** water-blocking core filling in SBZPu, SBZPBbSHv, SBZPBbSHp cables.
6. **Belt insulation:** polyethylene theraphthalate band.
7. **Sheath:**
Polyethylene in SBPu, SBZPu cables;
PVC-compound in SBVG cables;
flame-retardant PVC-compound in SBVGng(A) cables.
8. **Inner cable sheath:** flame-retardant PVC-compound in SBVBbSHvng(A) cables; polyethylene in SBPBbSHp, SBZPBbSHp, SBZPBbSHv, SBPBbSHv cables.
9. **Armour:** two galvanized steel bands
10. **Protection hose:** flame-retardant PVC-compound in SBVBbSHvng(A) cables; PVC-compound in SBPBbSHv, SBZPBbSHv cables; polyethylene in SBPBbSHp, SBZPBbSHp cables.

OKP Codes

- 35 6555 01 for SBVG cables
- 35 6555 11 for SBVGng(A) cables
- 35 6555 13 for SBVBbSHvng(A) cables
- 35 6554 24 for SBPBbSHv cables
- 35 6555 23 for SBZPBbSHv cables
- 35 6554 04 for SBPBbSHp cables
- 35 6554 14 for SBZPBbSHp cables
- 35 6554 01 for SBPu cables
- 35 6554 17 for SBZPu cables

TECHNICAL STANDARDS

Ambient class:	UHL, T placement category 2, 3, 5 according to GOST 15150-69
Operating temperature range	from -50°C to +60°C
for SBPu, SBZPu, SBPBbSHp, SBZPBbSHp	from -15°C to +60°C
for SBVG, SBVGng(A), SBVBbSHvng(A), SBPBbSHv, SBZPBbSHv	from -10°C to +60°C
Relative air humidity at max +35°C	max 98%
Cables should be laid at the following temperatures:	
for SBVG, SBVGng(A), SBPu, SBZPu	from -15°C to +60°C
for SBVBbSHvng(A), SBPBbSHv, SBZPBbSHv, SBZPBbSHp, SBPBbSHp	from -10°C to +60°C
Relative air humidity at max +35°C	max 98%
Cables should be protected from direct solar irradiation.	
Maximum laying and installation bending radius:	
for SBVG, SBVGng(A), SBPu, SBZPu	7 max outer cable diameters
for SBVBbSHvng(A), SBPBbSHv, SBZPBbSHv, SBZPBbSHp, SBPBbSHp cables	2 max outer cable diameters
Max allowed pulling force:	50N/mm
Electrical resistance of electrical conductors as calculated for 1 km of cable and at the temperature of +20°C with the following cross-sections:	
0,8 mm conductor	36,6 Ω
0,9 mm conductor	28,8 Ω
1,0 mm conductor	23,3 Ω
Electrical resistance of conductor insulation as calculated for 1 km of cable and at the temperature of +20°C:	
cables without water-blocking core filling	5 000 MΩ
cables with water-blocking core filling	4 000 MΩ
Test AC voltage with frequency of 50 Hz between the conductors within 1 min.	2 500V
Operating capacity as calculated for 1 km of cable and at the AC current frequency of 800 or 1000 Hz, max:	
paired cables	100 nF
cores of single-core cables	150 nF
Damping coefficient for paired cables as calculated for 1 km of cable, at the temperature of +20°C and at the AC current frequency of 800 Hz, max:	
0,8 mm conductor	1,18 dB
0,9 mm conductor	1,04 dB
1,0 mm conductor	0,94 dB
Near-end cross talk between any pairs of paired cables within 300 m and at the AC current frequency of 800 Hz, min:	
for 100% parameters	60 dB
for 80% parameters	62 dB
Elongation in case of sheath or protection hose breakage, min	
Polyethylene	300%
PVC-compound	125%
Elongation in case of insulation blip, min	300%
Tensile strength in case of stretching of protection hose case, min	9 Mpa
Tensile strength in case of insulation stretching, min	9 Mpa
Construction cable length, min	300 m
Guarantee use period	4,5 years from date of input of the cable into operation
cables without water-blocking core filling	12 years
cables with water-blocking core filling	17 years

APPLICATION

The cables are designed for alarm electrical units, centralization and blocking, as well as fire alarms and automation facilities at the nominal voltage of 380 V and AC frequency of 50 Hz or at 700 V DC.

SBVG, SBVGng(A) cables are laid in buildings, dry canals and tunnels, in aggressive environments, provided there is no physical impact on cables.

SBVG cables are laid single; SBVGng(A) cables are laid in bunches.

SBPU cables are laid in plastic pipe-lines, in ground, in aggressive environments, provided there is no physical impact on cables.

SBZPU cables are laid in plastic pipe-lines, in ground, in aggressive environments, provided there is no physical impact on cables, and in high humidity conditions.

SBVBbSHvng(A) cables are laid in bunches in cable duct lines, tunnels, collectors, in aggressive environments including those physically impacting the cables and those in which minor tensile load is present.

SBPBbSHv cables are laid canals, tunnels, collectors, plastic pipe-lines, in ground, in aggressive environments, provided the cable is not affected by major tensile load. SBZPBbSHv cables are laid in canals, tunnels, collectors, plastic pipe-lines, in ground, in aggressive environments, provided the cable is not affected by major tensile load, and in high humidity conditions.

SBPBbSHp cables are laid in plastic pipe-lines, in ground, in aggressive environments, provided the cable is not affected by major tensile load.

SBZPBbSHp cables are laid in plastic pipe-lines, in ground, in aggressive environments, provided the cable is not affected by major tensile load, and in high humidity conditions.

Estimated weight and outer diameter of cables (for reference)

Number of pairs	SBVG		SBVGng(A)		SBPU		SBZPU		SBVBbSHvng(A)		SBPBbSHv		SBZPBbSHv		SBPBbSHp		SBZPBbSHp	
	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg
3x2x0,8	6,5	77	6,5	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4x2x0,8	7,0	92	7,0	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7x2x0,8	11,0	146	11,0	153	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10x2x0,8	12,5	192	12,5	201	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12x2x0,8	13,0	221	13,0	231	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1x2x0,9	8,0	42	8,0	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3x2x0,9	10,5	97	10,5	111	13,8	129	14,0	141	16,8	334	16,8	323	17,0	335	16,8	302	17,0	314
4x2x0,9	11,5	118	11,5	133	14,8	152	15,0	167	17,8	377	17,8	362	18,0	377	17,8	338	18,0	352
7x2x0,9	13,5	176	13,5	195	16,8	2144	17,0	234	18,8	468	18,8	450	19,0	470	19,8	428	20,0	448
10x2x0,9	16,0	236	16,0	256	19,3	280	19,5	316	22,8	566	22,8	548	23,0	584	22,3	519	23,0	555
12x2x0,9	17,0	274	17,0	295	20,3	318	20,5	264	23,8	627	23,8	605	24,5	648	23,3	571	24,5	614
1x2x1,0	8,5	53	8,5	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3x2x1,0	11,5	117	11,5	122	15,3	187	15,5	200	17,3	371	17,3	371	17,5	384	17,3	314	17,5	327
4x2x1,0	12,5	142	12,5	151	16,3	218	16,5	235	18,8	446	18,8	417	19,0	434	18,3	356	18,5	373
7x2x1,0	15,0	212	15,0	220	18,8	303	19,0	330	20,8	564	20,8	530	21,0	557	20,8	457	21,0	484
10x2x1,0	17,5	282	17,5	291	20,8	385	21,0	425	23,3	683	23,3	644	23,5	684	22,8	561	23,0	601
12x2x1,0	18,5	326	18,5	226	22,3	437	22,5	484	24,3	755	24,3	813	24,5	860	24,3	624	24,5	671

Number of cores	SBVG		SBVGng(A)		SBPU		SBZPU		SBVBbSHvng(A)		SBPBbSHv		SBZPBbSHv		SBPBbSHp		SBZPBbSHp	
	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg
3x0,8	6,5	47	6,5	53	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4x0,8	7,0	55	7,0	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5x0,8	7,5	64	7,5	71	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12x0,8	9,5	120	9,5	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3x0,9	7,5	61	7,5	65	11,3	86	11,5	90	14,3	251	14,3	242	14,5	246	13,8	218	14,0	222
4x0,9	8,0	72	8,0	77	11,8	98	12,0	102	14,8	272	14,8	263	15,0	267	14,3	237	14,5	241
5x0,9	9,0	84	9,0	89	12,3	110	12,5	115	15,3	297	15,3	284	15,5	289	15,3	268	15,5	273
7x0,9*	9,5	105	9,5	110	12,8	131	13,0	136	16,3	328	16,3	314	16,5	319	15,8	287	16,0	292
9x0,9*	11,0	138	11,0	146	14,8	157	15,0	167	17,8	369	17,8	354	18,0	365	17,3	334	17,5	345
12x0,9	12,0	169	12,0	177	15,3	188	15,5	200	18,8	425	18,8	407	19,0	419	18,3	377	18,5	389
3x1,0	8,5	65	8,5	69	12,8	120	13,0	124	14,8	273	14,8	258	15,0	262	14,3	230	14,5	234
4x1,0	9,0	78	9,0	82	13,3	136	13,5	140	15,3	297	15,3	281	15,5	286	14,8	249	15,0	254
5x1,0	9,5	90	9,5	95	13,8	152	14,0	158	15,8	322	15,8	305	16,0	311	15,8	272	16,0	278
7x1,0*	10,0	112	10,0	118	14,8	178	15,0	183	16,8	358	16,8	340	17,0	345	16,3	305	16,5	310
9x1,0*	12,0	149	12,0	156	16,3	213	16,5	225	18,3	415	18,3	395	18,5	407	17,8	356	18,0	368
12x1,0	13,0	183	13,0	191	16,8	251	17,0	264	19,3	468	19,3	446	19,5	459	18,8	405	19,0	418

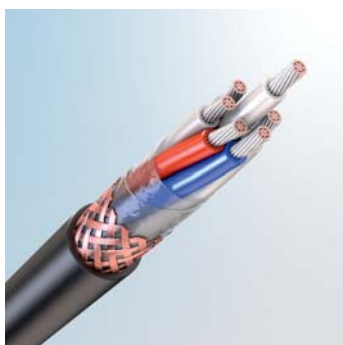
* Manufactured upon customer's request



**DATA MULTI-CORE CABLES
WITH PLASTIC INSULATION**

limited liability company
TOMSKCABLE

Data Multi-core Cables with Plastic Insulation GOST 10348-80



MKSH

Data cable: copper tinned conductors, PVC-compound insulation and sheath.

MKESH

Data cable: copper tinned conductors, PVC-compound insulation and sheath, screened.

MKSHM

Data cable: copper tinned conductors, PVC-compound insulation and sheath, screened.

DESIGN

- Conductor:** copper wire for 0,5 mm² cross-sections - 4th class according to GOST 22483-77, for 0,75 mm² cross-sections - 2nd or 3rd class according to the above GOST.
For MKSH and MKESH cables: copper tinned conductors.
- Insulation:** PVC-compound. Nominal insulation thickness is 0,5 mm.
- Stranding:** insulated conductors are stranded; in each direction of stranding there is a marker pair whose insulated conductors differ in colour from each other and the other conductors.
- Overlapping:** MKESH cables are wrapped with polyethylene T-E film.
- Screen:** MKESH cables are wrapped with copper wire, max diameter 0,20 mm.
- Sheath:** PVC-compound.
Nominal sheath thickness for 2, 3, 5 and 7-core cables:
non-screened cables: 1,0 mm
screened cables: 1,2 mm
for 10 and 14-core cables:
non-screened cables: 1,2 mm
screened cables: 1,4 mm

APPLICATION

Cables are designed for hardwiring of electrical appliances operating at the nominal AC voltage of max 500 V and at the frequency of max 400 Hz or at the DC voltage of max 750 V.

OKP Codes

- 35 4833 01 for MKSH cables
- 35 4833 02 for MKESH cables
- 35 4833 06 for MKSHM cables
- 35 4833 16 for MKSH-T cables
- 35 4833 17 for MKESH-T cables

TECHNICAL STANDARDS

Ambient class.....UHL and T, placement categories 2-5 according to GOST 15150-69
Operating temperature range:.....from -50 °C to +50 °C
 Relative air humidity at max +35°C.....max 98%
 Laying and installation of cables without preheating
 is performed at temperature not less than.....-15 °C
Electric conductor resistance is specified according to GOST 22483-77
Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C with the following cross-sections:
 acceptance and delivery.....10 MΩ
 use and storage.....0,1 MΩ
 at high air humidity and temperature of 35 °C.....1 MΩ
 at 70 °C.....0,1 MΩ
Test AC voltage with frequency of 50 Hz between the cores within 5 minutes:
 acceptance and delivery at 20 °C.....2 000V
 use and storage.....1 000V
 Cables proved to be tenacious:
 if affected by vibration load
 within the frequency range:.....from 1 to 5 000 Hz with acceleration of 392m/s²
 if affected by multiple
 accelerating blows.....1 471m/s², blow time from 1 to 3 ms
 if affected by single
 accelerating blows9 810 m/s² and linear load with acceleration of 4 905 m/s²
Construction cable length, not less than:
 screened cables.....60 m
 non-screened cables.....25 m
 Guarantee use period.....6 years from date of input of the cable into operation
 Service life.....15 years

Estimated weight and outer diameter of cables (for reference)

Number and nominal cross-section of cores, mm ²	MKSH		MKSHM		MKESH	
	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg	Diameter, mm	Weight, kg
2x0,5	6,0	37,8	5,9	37,5	7,2	66,4
3x0,5	6,3	46,7	6,2	46,4	7,5	76,9
5x0,5	7,3	66,9	7,3	66,4	8,6	102,6
7x0,5	7,9	84,8	7,9	84,2	9,2	123,5
10x0,5	10,3	125,9	10,3	125	11,6	175,8
14x0,5	11,1	160,7	11,1	159,5	12,4	214,8
2x0,75	6,4	45,7	6,4	45,4	7,7	76,7
3x0,75	6,8	57,7	6,7	57,3	8,0	90,4
5x0,75	8,0	84,2	7,9	83,6	9,2	123,1
7x0,75	8,6	108,2	8,6	107,4	9,9	150,5
10x0,75	11,2	159,9	11,2	158,6	12,5	214,6
14x0,75	12,2	206,9	12,1	205,1	13,4	266,1

Data Twisted-pair Cables. TU 3581-030-59680332-2013



MKSHv

copper tinned twisted-pair conductors, PVC-compound insulation and sheath.

MKKSHv, MKBSHv

copper tinned twisted-pair conductors, PVC-compound insulation and sheath, wire or band armouring

MKSHv-HL

copper tinned twisted-pair conductor, cold-resistant PVC-compound insulation and sheath

MKKSHv-HL, MKBSHv-HL

copper tinned twisted-pair conductor, cold-resistant PVC-compound insulation and sheath, wire or band armouring

MKSHvng(A)

copper tinned twisted-pair conductor, flame-retardant PVC-compound insulation and sheath

MKKSHvng(A), MKBSHvng(A)

copper tinned twisted-pair conductor, flame-retardant PVC-compound insulation and sheath, wire or band armouring

MKPsSHvng(A)

copper tinned twisted-pair conductor, XL-polyolefin insulation, flame-retardant PVC-compound sheath

MKPsKSHvng(A), MKPsBSHvng(A)

copper tinned twisted-pair conductor, XL-polyolefin insulation, flame-retardant PVC-compound sheath, wire or band armouring

MKSHvng(A)-HL

copper tinned twisted-pair conductor, cold-resistant, flame-retardant PVC-compound insulation and sheath

MKKSHvng(A)-HL, MKBSHvng(A)-HL

copper tinned twisted-pair conductor, cold-resistant, flame-retardant PVC-compound insulation and sheath, wire or band armouring

MKPsSHvng(A)-HL

copper tinned twisted-pair conductor, XL-polyolefin insulation, cold-resistant, flame-retardant PVC-compound sheath

MKPsKSHvng(A)-HL, MKPsBSHvng(A)-HL

copper tinned twisted-pair conductor, XL-polyolefin insulation, cold-resistant, flame-retardant PVC-compound sheath, wire or band armouring

MKSHvng(A)-LS

copper tinned twisted-pair conductor, low-smoke PVC-compound insulation and sheath, with low fume and gas emission

MKKSHvng(A)-LS, MKBSHvng(A)-LS

copper tinned twisted-pair conductor, low-smoke PVC-compound insulation and sheath with low fume and gas emission, wire or band armouring

MKPsSHvng(A)-LS

copper tinned twisted-pair conductor, XL-polyolefin insulation and cold-resistant low-smoke PVC-compound sheath, with low fume and gas emission

MKPsKSHvng(A)-LS, MKPsBSHvng(A)-LS

copper tinned twisted-pair conductor, XL-polyolefin insulation and cold-resistant low-smoke PVC-compound sheath, with low fume and gas emission, wire or band armouring

MKSHvng(A)-LS-HL

copper tinned twisted-pair conductor, cold-resistant, low-smoke PVC-compound insulation and sheath, with low fume and gas emission

MKKSHvng(A)-LS-HL, MKBSHvng(A)-LS-HL

copper tinned twisted-pair conductor, cold-resistant, low-smoke PVC-compound insulation and sheath, with low fume and gas emission, wire or band armouring

MKPsSHvng(A)-LS-HL

copper tinned twisted-pair conductor, XL-polyolefin insulation, cold-resistant, low-smoke PVC-compound sheath, with low fume and gas emission

MKPsKSHvng(A)-LS-HL, MKPsBSHvng(A)-LS-HL

copper tinned twisted-pair conductor, XL-polyolefin insulation, cold-resistant, low-smoke PVC-compound sheath, with low fume gas-emission, wire or band armouring

MKSHvng(A)-LSLTx

copper tinned twisted-pair conductor, low-smoke PVC-compound insulation and sheath, low fume and gas emission, low toxicity of combustion products

MKKSHvng(A)-LSLTx, MKBSHvng(A)-LSLTx

copper tinned twisted-pair conductor, low-smoke PVC-compound insulation and sheath, low toxicity of combustion products, wire or band armouring

MKSHvng(A)-FRLS

copper tinned twisted-pair conductor, low-smoke fire-resistant PVC-compound insulation and sheath, with low fume and gas emission

MKKSHvng(A)-FRLS, MKBSHvng(A)-FRLS

copper tinned twisted-pair conductor, low smoke fire-resistant PVC-compound insulation and sheath, with low fume and gas emission, wire or band armouring

MKPsSHvng(A)-FRLS

copper tinned twisted-pair conductor, XL-polyolefin insulation, low-smoke fire-resistant PVC-compound sheath, with low fume and gas emission, wire or band armouring

MKPsKSHvng(A)-FRLS, MKPsBSHvng(A)-FRLS

copper tinned twisted-pair conductor, XL-polyolefin insulation and low smoke PVC-compound sheath, wire or band armoring

MKSHvng(A)-FRLSLTx

copper tinned twisted-pair conductor, low-smoke, fire-resistant PVC-compound insulation and sheath, with low toxicity of combustion products

MKKSHvng(A)-FRLSLTx, MKBSHvng(A)-FRLSLTx

copper tinned twisted-pair conductor, low-smoke, fire-resistant PVC-compound insulation and sheath with low toxicity of combustion products, wire or band armoring

MKPng(A)-HF

copper tinned twisted-pair conductor, halogen free polymer compound insulation and sheath

MKKPng(A)-HF, MKBPng(A)-HF

copper tinned twisted-pair conductor, halogen free polymer compound insulation and sheath, wire or band armoring

MKPsPng(A)-HF

copper tinned twisted-pair conductor, XL-polyolefin insulation and halogen free polymer compound sheath

MKPsKPng(A)-HF, MKPsBPng(A)-HF

copper tinned twisted-pair conductor, XL-polyolefin insulation and halogen free polymer compound sheath, wire or band armoring

MKPng(A)-FRHF

copper tinned twisted-pair conductor, halogen free fire-resistant polymer compound insulation and sheath

MKKPng(A)-FRHF, MKBPng(A)-FRHF

copper tinned twisted-pair conductor, halogen free fire-resistant polymer compound insulation and sheath, wire or band armoring

MKPsPng(A)-FRHF

copper tinned twisted-pair conductor, XL-polyolefin insulation and halogen free fire-resistant polymer compound sheath

MKPsKPng(A)-FRHF, MKPsBPng(A)-FRHF

copper tinned twisted-pair conductor, XL-polyolefin insulation and halogen free fire-resistant polymer compound sheath, wire or band armoring

MKESHv

copper tinned twisted-pair conductor, PVC-compound insulation and sheath, screened twisted pair

MKEKSHv, MKEBSHv

copper tinned twisted-pair conductor, PVC-compound insulation and sheath, screened twisted pair, wire or band armoring

MKESHv-HL

copper tinned twisted-pair conductor, cold-resistant PVC-compound insulation and sheath, screened twisted pair

MKEKSHv-HL, MKEBSHv-HL

copper tinned twisted-pair conductor, cold-resistant PVC-compound insulation and sheath, screened twisted pair, wire or band armoring

MKESHvng(A)

copper tinned twisted-pair conductor, flame-retardant PVC-compound insulation and sheath, screened twisted pair

MKEKSHvng(A), MKEBSHvng(A)

copper tinned twisted-pair conductor, flame-retardant PVC-compound insulation and sheath, screened twisted pair, wire or band armoring

MKPsESHvng(A)

copper tinned twisted-pair conductor, XL-polyolefin insulation and flame-retardant PVC-compound sheath, screened twisted pair

MKPsEKSHvng(A), MKPsEBSHvng(A)

copper tinned twisted-pair conductor, XL-polyolefin insulation and flame-retardant PVC-compound sheath, screened twisted pair, wire or band armoring

MKSHvng(A)-HL

copper tinned twisted-pair conductor, cold-resistant flame-retardant PVC-compound insulation and sheath, screened twisted pair

MKKSHvng(A)-HL, MKEBSHvng(A)-HL

copper tinned twisted-pair conductor, cold-resistant flame-retardant PVC-compound insulation and sheath, screened twisted pair, wire or band armoring

MKPsSHvng(A)-HL

copper tinned twisted-pair conductor, XL-polyolefin insulation and cold-resistant flame-retardant PVC-compound sheath, screened twisted pair

MKPsKSHvng(A)-HL, MKPsBSHvng(A)-HL

copper tinned twisted-pair conductor, XL-polyolefin insulation and cold-resistant, flame-retardant PVC-compound sheath, screened twisted pair, wire or band armoring

MKESHvng(A)-LS

copper tinned twisted-pair conductor, low smoke PVC-compound insulation and sheath, screened twisted pair

MKEKSHvng(A)-LS, MKEBSHvng(A)-LS

copper tinned twisted-pair conductor, low smoke PVC-compound insulation and sheath, screened twisted pair, wire or band armoring

MKPsESHvng(A)-LS

copper tinned twisted-pair conductor, XL-polyolefin insulation and low smoke PVC-compound sheath, screened twisted pair, low fume and gas emission

MKPsEKSHvng(A)-LS, MKPsEBSHvng(A)-LS

copper tinned twisted-pair conductor, XL-polyolefin insulation and low smoke PVC-compound sheath, screened twisted pair, wire or band armoring

MKESHvng(A)-LS-HL

copper tinned twisted-pair conductor, cold-resistant, risk low-smoke PVC-compound insulation and sheath, with low fume and gas emission, screened twisted pair

MKEKSHvng(A)-LS-HL, MKEBSHvng(A)-LS-HL

copper tinned twisted-pair conductor, cold-resistant, low smoke PVC-compound insulation and sheath, screened twisted pair, wire or band armouring

DESIGN

Data twisted-pair cables can be screened or non-screened, with separate screened twisted pair cables, in a common screen and with screened twisted pairs in the common screen at the same time. The cables can be armoured and unarmoured.

- 1. Conductor:** copper tinned or copper (upon customer's request the grade of cable can be marked with "m"). Conductor class: min 3rd according to GOST 22483.
- 2. Thermal barrier:** electric conductors of fire-resistant cables shall be lapped with micaceous double-layer lapping, minimal band width is 0,12 mm.
- 3. Insulation:** PVC-compound for unmarked cables and flame-retardant cables (if laid in bunches) (ng(A)-type);
cold-resistant PVC-compound for HL-type cables;
XL-polyolefin for Ps-type cables;
low smoke PVC-compound for LS-type cables, incl. fire-resistant cables;
PVC-compound with low toxicity of combustion products for LSLTx-type cables, incl. fire-resistant cables;
halogen free polymer compound for HF-type cables, incl. fire-resistant cables.
- 4. Twisted pairs:** insulated conductors shall be twisted in pairs.
- 5. Twisted pair screen:** copper wires (at the end of a cable grade in parenthesis "e" stands for copper screen), or of tinned copper wires ("el"), as well as of copper bands or flexible materials made of copper foil ("em"), or of aluminium polymer bands ("ea")
- 6. Stranding into core:** screened or non-screened pairs shall be stranded into a core; in each direction of stranding there should be a marker pair and a directional pair.
- 7. Inner sheath:** low smoke PVC-compound for LS-type cables, incl. fire-resistant cables;
low-smoke PVC-compound with low toxicity of combustion products for LSLTx-type cables, incl. fire-resistant cables;
halogen free polymer compound for HF-type cables, incl. fire-resistant cables.
- 8. Common screen:** copper wires ("E"), or tinned copper wires ("El"), as well as of copper bands or flexible materials made of copper foil ("Em"), or of aluminium polymer bands ("Ea")
- 9. Bedding:** for all cables in round or band armouring.

- PVC-compound for unmarked cables and flame-retardant cables (if laid in bunches) (ng(A)-type);
cold-resistant PVC-compound for HL-type cables;
XL-polyolefin for Ps-type cables;
low-smoke PVC-compound for LS-type cables, incl. fire-resistant cables;
low-smoke PVC-compound with low toxicity of combustion products for LSLTx-type cables, incl. fire-resistant cables;
halogen free polymer compound for HF-type cables, incl. fire-resistant cables.
- 10. Armour:** made of galvanized steel wires ("K" shall be added to the grade of a cable) or galvanized steel bands ("B").
- 11. Outer sheath:** PVC-compound for unmarked cables and flame-retardant cables (if laid in bunches) (ng(A)-type);
cold-resistant PVC-compound for HL-type cables;
cold-resistant PVC-compound for all HL-type cables;
low smoke PVC-compound with low fume and gas emission for LS-type cables, incl. fire-resistant cables;
low-smoke PVC-compound with low toxicity of combustion products for LSLTx-type cables, incl. fire-resistant cables;
halogen free polymer compound for HF-type cables, incl. fire-resistant cables.

APPLICATION

The cables are designed for connections to fixed electrical appliances, apparatuses, and devices with the nominal AC voltage of max 500 V and current frequency of max 400 Hz or DC voltage of max 750 V.

Cables with insulation and sheath made of reduced fire risk low smoke PVC-compound or halogen free polymer compounds, incl. fire-retardant and low combustion products toxicity cables, can be used at nuclear plants outside containment area in class 2, 3 and 4 automated systems according to classifier of fire safety OPB 88/97 (PNAE G-01-011).

TECHNICAL STANDARDS

Ambient class according to GOST 15150

- for all cables, except for HL- and LS-HL type cables.....UHL, placement categories 2-5
- for UF-type cables.....UHL, placement category 1
- for HL and LS-HL-type cables.....HL, placement category 2

Cables may be used outdoor, provided they are protected from solar irradiation and thermal irradiation from various heating sources.

Operating temperature range for cables with fixed installation are as follows:

- HL-type cables.....from -60 °C to +70 °C
- all other types.....from -50 °C to +70 °C
- Relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than:

- HL-type cables.....-30°C
- all other types.....-15 °C
- Test AC voltage with frequency of 50 Hz.....2 000V

Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C during acceptance and delivery should be min,

- 10 MΩ for cables with PVC-compound or halogen free polymer compound insulation;
- 150 MΩ for cables with XL-polyolefin insulation;
- In use and storage: min 1 MΩ for all cables.

Operating capacity at the frequency of 0.8 or 1.0 kHz calculated for 1 km of cable shall be as follows:

- between two neighbouring conductors: max 150 nF (for cables with cross-sections of 0,5 и 0,75 mm²) and max 180 nF (for cables with cross-sections of 1,0; 1,5 и 2,5 mm²)
- between a conductor and a screen: max 300 nF.

Minimal bending radius at laying and installation:

- 6 outer cable diameters for all unarmoured cables,
- min 10 outer cable diameters for all cables in copper wiring,
- min 20 outer cable diameters for all cables in copper bands.

Conductor continuous heating temperature while in use:

- For all cables except XL-polyolefin insulation cables.....max 70 °C
- For XL-polyolefin insulation cables.....max 90 °C
- Cable construction length.....100 m
- Guarantee use period.....2 years from date of input of the cable into operation
- Service life.....15 years

Installation twisted-pair cables for fixed installation																				
Nominal outer diameter of sheath, mm. Nominal weight of 1 km cable, kg																				
Cross-sect, mm ²	MKESHV					MKESHvng(A)					MKESHvng(A)-LS					MKESHv-HL				
	0,5	0,75	1,0	1,5	2,5	0,5	0,75	1,0	1,5	2,5	0,5	0,75	1,0	1,5	2,5	0,5	0,75	1,0	1,5	2,5
1x2	7,2 67	7,7 77	8,1 86	9,3 114	10,2 144	7,2 69	7,7 80	8,1 89	9,3 118	10,2 148	9,8 148	10,2 163	10,6 177	11,2 198	12,2 237	7,2 64	7,7 74	8,1 83	9,3 110	10,2 139
2x2	11,8 136	12,7 158	13,5 178	14,6 210	16,6 271	11,8 142	12,7 164	13,5 184	14,6 217	16,6 279	13,7 243	14,6 274	15,4 300	16,6 343	18,9 443	11,8 131	12,7 153	13,5 172	14,6 204	16,6 263
4x2	12,4 159	13,4 187	14,2 213	15,5 256	17,5 338	12,4 164	13,4 194	14,2 220	15,5 263	17,5 347	14,3 272	15,3 310	16,1 343	17,4 398	19,9 522	12,4 153	13,4 181	14,2 206	15,5 249	17,5 329
5x2	13,4 186	14,5 222	15,5 254	16,9 308	19,6 430	13,4 192	14,5 229	15,5 262	16,9 316	19,6 441	15,3 309	16,5 356	17,4 397	19,2 486	21,5 616	13,4 179	14,5 215	15,5 246	16,9 300	19,6 419
7x2	14,5 214	15,8 257	16,9 296	18,8 379	21,4 509	14,5 221	15,8 265	16,9 305	18,8 390	21,4 521	16,5 349	17,7 404	19,2 475	20,8 558	23,4 713	14,5 207	15,8 250	16,9 288	18,8 369	21,4 497
8x2	15,7 243	17,1 294	18,7 356	20,4 435	23,4 588	15,7 250	17,1 302	18,7 367	20,4 447	23,4 601	17,7 389	19,5 476	20,6 534	22,4 630	25,7 841	15,7 235	17,1 285	18,7 346	20,4 423	23,4 574
10x2	15,7 259	17,1 315	18,7 383	20,4 472	23,4 645	15,7 266	17,1 324	18,7 394	20,4 484	23,4 658	17,7 407	19,5 500	20,6 563	22,4 670	25,7 901	15,7 250	17,1 306	18,7 373	20,4 460	23,4 631
12x2	16,9 287	18,9 369	20,1 428	22,1 528	25,7 747	16,9 296	18,9 379	20,1 439	22,1 541	25,7 763	19,3 469	20,8 550	22,1 622	24,4 770	27,6 1002	16,9 278	18,9 357	20,1 416	22,1 515	25,7 730
14x2	18,9 337	20,6 411	22,1 478	24,6 613	28,2 836	20,1 378	20,6 423	22,1 490	24,6 628	28,2 854	20,8 519	22,6 610	24,4 722	26,6 856	30,1 1117	18,9 326	20,6 399	22,1 465	24,6 597	28,2 817
16x2	20,1 367	21,9 449	23,9 544	26,2 671	30,1 917	20,7 417	21,9 461	23,9 559	26,2 687	30,1 937	22,0 561	24,3 689	25,8 780	28,2 931	32,5 1262	20,1 355	21,9 435	23,9 528	26,2 653	30,1 897
19x2	20,7 406	22,6 500	24,6 607	27,0 755	31,1 1043	21,8 464	22,6 513	24,6 623	27,0 772	31,1 1063	22,6 608	25,0 751	26,6 854	29,0 1027	33,4 1402	20,7 393	22,6 486	24,6 591	27,0 736	31,1 1021
20x2	21,8 452	24,2 581	25,9 680	28,5 849	32,8 1180	22,9 494	24,2 596	25,9 696	28,5 867	32,8 1201	24,6 719	26,7 852	28,4 971	31,0 1169	36,1 1639	21,8 438	24,2 564	25,9 662	28,5 829	32,8 1156
24x2	22,9 481	25,5 619	27,3 725	30,1 906	35,0 1292	22,9 510	25,5 635	27,3 742	30,1 925	35,0 1317	25,8 762	28,0 905	29,8 1032	32,9 1288	37,9 1804	22,9 466	25,5 601	27,3 706	30,1 884	35,0 1264
27x2	22,9 497	25,5 641	27,3 752	30,1 943	35,0 1349	24,5 596	25,5 657	27,3 770	30,1 962	35,0 1373	25,8 780	28,0 928	29,8 1061	32,9 1327	39,8 2030	22,9 482	25,5 623	27,3 733	30,1 921	35,0 1321
30x2	24,5 580	26,8 723	28,8 853	31,7 1074	36,9 1545	25,7 628	26,8 740	28,8 871	31,7 1095	36,9 1571	27,0 858	29,3 1029	31,3 1181	35,0 1524	41,7 2137	24,5 563	26,8 703	28,8 831	31,7 1050	36,9 1514
37x2	25,7 611	28,1 762	30,2 898	33,3 1132	38,8 1627	25,7 643	28,1 779	30,2 918	33,3 1153	38,8 1655	28,2 902	30,6 1082	33,1 1287	36,6 2197	41,7 2577	25,7 593	28,1 741	30,2 876	33,3 1107	38,8 1595
40x2	25,7 627	28,1 783	30,2 925	33,3 1169	38,8 1684	28,4 728	28,1 801	30,2 945	33,3 1190	38,8 1712	28,2 920	30,6 1106	33,1 1316	36,6 2604	47,0 2604	25,7 608	28,1 762	30,2 902	33,3 1143	38,8 1651
44x2	28,4 710	31,2 888	33,6 1050	37,5 1362	43,3 1915	29,0 783	31,2 908	33,6 1072	37,5 1389	43,3 1946	30,9 1034	34,5 1332	36,9 1527	40,4 1855	47,9 2808	28,4 689	31,2 864	33,6 1024	37,5 1331	43,3 1878



**WIRES AND CABLES FOR
ELECTRIC FACILITIES**

limited liability company
TOMSKCABLE

Wiring for Electric Facilities. TU 3500-022-59680332-2011



PuV

Installation wire: PVC- compound insulation, no sheath.

PuV-HL

Installation wire: cold-resistant PVC- compound insulation, no sheath.

PuVng(A)-LS

Installation wire: low-smoke PVC- compound insulation, no sheath.

PuPng(A)-HF

Installation wire: halogen free insulation, no sheath.

PuGV

Installation wire: extra-flexible core, PVC- compound insulation, no sheath.

PuGV-HL

Installation wire: extra-flexible core, cold-resistant PVC- compound insulation, no sheath.

PuGVng(A)-LS

Installation wire: extra-flexible core, low-smoke PVC- compound insulation, no sheath.

PuGPng(A)-HF

Installation wire: extra-flexible core, halogen free insulation, no sheath.

LS index in the grades of wires stands for **Low Smoke**.

HF index stands for **Halogen Free**.

APPLICATION

The wires are designed for electric installations, i.e. for fixed installations in illumination networks, as well as for installation of electrical equipment, machines, mechanisms and tools at the nominal AC voltage of 450/750 V and frequency of max 400 Hz or at 1000 V DC.

Wires with insulation made of PVC-compound and cold-resistant PVC-compound are laid single in cable lines and feed circuits of indoor power collectors.

Wires with insulation made of reduced fire risk low smoke PVC-compound of ng(A)-LS-type are laid in bunches in cable lines of indoor (closed) electric facilities, incl. electrical circuit laying in residential and public buildings.

Wires with insulation made of halogen free polymer compounds of ng(A)-HF-type are designed for electrical circuit laying in public buildings, pre-school educational institutions, senior and residential care housings, hospitals and children's residential care homes.

OKP Code

35 0000

DESIGN

1. Conductor: soft copper wire; wire may be tinned or non-tinned.

Regular flexibility electrical conductors shall comply with the following classes of RSS 22483:

- class 1: nominal cross-section of max 10 mm² incl.;

- class 2: nominal cross-section from 10 mm² and more.

Extra-flexible electrical conductors shall comply with class 5 of RSS 22483:

Cables and wires with electrical conductors made of copper tinned wire are marked with "T".

2. Insulation: PVC-compound for PuV, PuGV wires; cold-resistant PVC-compound for PuV-HL, PuGV-HL wires; reduced fire risk low smoke PVC- compound for PuVng(A)-LS, PuGVng(A)-LS wires; halogen free polymer compounds for PuPng(A)-HF, PuGPng(A)-HF wires.

Nominal insulation thickness is specified in the Appendix on page 158.

FIRE SAFETY PERFORMANCE

Unmarked and HL-type wires are flame-retardant when laid single and comply with the fire safety class according to GOST 53315 item O1.8.2.3.4.

ng(A)-LS and ng(A)-HF-type wires are flame-retardant when laid in bunches and comply with the following safety classes according to the above GOST:

ng(A)-LS: fire safety class item 16.8.2.2.2;

ng(A)-HF: fire safety class 16.8.1.2.1;

Fire tests proved ng(A)-LS-type cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 50%.

Fire tests proved ng(A)-HF-type cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 40%.

ng(A)-HF-type cables are characterised by low chlorine hydride emission (max 5 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

for unmarked wires:.....UHL and T, placement category 2

for HL-, ng(A)-LS, ng(A)-HF:.....UHL, placement category 2

Wires are resistant to ambient temperature within the range:.....from -50 °C to +65 °C

HL-type wires are resistant to ambient temperature within the range:.....from -60 °C to +65 °C

Wires are resistant to ambient relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than:

all wires except HL-type wire.....-15 °C

HL-type wires.....-30 °C

Minimal bending radius at laying and installation:

extra-flexible wires.....5 wire diameters

regular wires.....10 wire diameter

Electrical resistance of conductors insulation calculated for 1 km of cable and at the

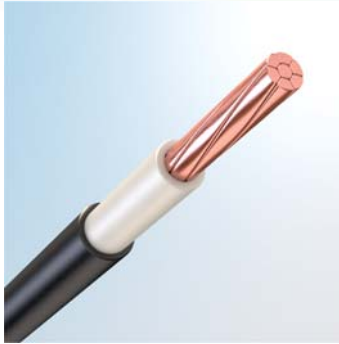
temperature of +20 °C min.....5MΩ

Conductor continuous operating heating temperature max.....+70 °C

Wire length.....100 m

Guarantee use period.....2 years from date of input of the cable into operation

Service life of wires, min.....15 years



PuVV

Installation wire: PVC- compound insulation and sheath.

PuVV-HL

Installation wire: cold-resistant PVC- compound insulation and sheath.

PuVVng(A)-LS

Installation wire: low smoke PVC- compound insulation and sheath.

PuPPng(A)-HF

Installation wire: halogen free polymer compound insulation and sheath.

PuGVV

Installation wire: extra-flexible core, PVC- compound insulation and sheath.

PuGVV-HL

Installation wire: extra-flexible core, cold-resistant PVC-compound insulation and sheath.

PuGVVng(A)-LS

Installation wire: extra-flexible core, low smoke PVC-compound insulation and sheath.

PuGPPng(A)-HF

Installation wire: extra-flexible core, halogen free polymer compound insulation and sheath.

LS index in the grades of wires stands for **Low Smoke**.

HF index stands for **Halogen Free**.

APPLICATION

The wires are designed for electric installations, i.e. for fixed installations in illumination networks, as well as for installation of electrical equipment, machines, mechanisms and tools at the nominal AC voltage of 450/750 V and frequency of max 400 Hz or at 1000 VDC.

Wires with insulation made of PVC-compound and cold-resistant PVC-compound are laid single in cable lines and feed circuits of indoor power collectors.

Wires with insulation made of reduced fire risk low smoke PVC-compound of ng(A)-LS-type are laid in bunches in cable lines of indoor (closed) electric facilities, incl. electrical circuit wiring in residential and public buildings.

Wires with insulation made of halogen free polymer compounds of ng(A)-HF-type are designed for electrical circuit wiring in public buildings, pre-school educational institutions, senior and residential care housings, hospitals and children's residential care homes.

OKP Code

35 0000

DESIGN

1. Conductor: soft copper wire; wire may be tinned or non-tinned.

Regular flexibility electrical conductors shall comply with the following classes of GOST 22483:

- class 1: nominal cross-section of max 10 mm² incl.;

- class 2: nominal cross-section from 10 mm² and more.

Extra-flexible electrical conductors shall comply with class 5 of GOST 22483:

Cables and wires with electrical conductors made of copper tinned wire are marked with "T".

2. Insulation: PVC-compound for PuVV, PuGVV wires; cold-resistant PVC-compound for PuVV-HL, PuGVV-HL wires; low smoke PVC-compound for PuVVng(A)-LS, PuGVVng(A)-LS wires; halogen free polymer compounds for PuPPng(A)-HF, PuGPPng(A)-HF wires.

Nominal insulation thickness is specified in the Appendix on page 158.

3. Insulated conductors of multiple core cables shall be laid in flat formation.

4. Outer sheath: PVC-compound for PuVV, PuGVV wires; cold-resistant PVC- compound for PuVV-HL, PuGVV-HL wires; low smoke PVC-compound for PuVVng(A)-LS, PuGVVng(A)-LS wires; halogen free polymer compounds for PuPPng(A)-HF, PuGPPng(A)-HF wires.

FIRE SAFETY PERFORMANCE

Unmarked and HL-type wires are flame-retardant when laid single and comply with the fire safety class according to GOST 53315 item O1.8.2.3.4.

ng(A)-LS and ng(A)-HF-type wires are flame-retardant when laid in bunches and comply with the following safety classes according to the above GOST:

ng(A)-LS: fire safety class item 16.8.2.2.2;

ng(A)-HF: fire safety class 16.8.1.2.1;

Fire tests proved ng(A)-LS-type cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 50%.

Fire tests proved ng(A)-HF-type cables to be low smoke under conditions of burning or smouldering: the transparency in the test cell lowered max 40%.

ng(A)-HF-type cables are characterised by low chlorine hydride emission (max 5 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

for unmarked wires.....UHL and T, placement category 2

for HL-, ng(A)-LS, ng(A)-HF.....UHL, placement category 2

Wires are resistant to ambient temperature within the range:.....from -50 °C to +65 °C

HL-type wires are resistant to ambient temperature within the range:.....from -60 °C to +65 °C

Wires are resistant to ambient relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than:

all wires except HL-type wire.....-15 °C

HL-type wires.....-30 °C

Minimal installation bending radius:

extra-flexible wires.....5 wire diameters

regular wires.....10 wire diameters

Electrical resistance of conductors insulation calculated for 1 km of cable and at the temperature of +20 °C min.....5MΩ

Conductor continuous operating heating temperature max.....+70 °C

Construction wire length, min.....100 m

Guarantee use period.....2 years from date of input of the cable into operation

Service life of wires, min.....15 years

The installation sheathed wires, round

Number and nominal cross-section of cores, mm ²	Outer diameter of cable, mm	Weight of 1 km of PuVV wire, kg	Weight of 1 km of PuVV-HL wire, kg	Weight of 1 km of PuVng(A)-LS wire, kg	Weight of 1 km of PuPng(A)-HF wire, kg
1 x 0,50	4,0	21	20	25	23
1 x 0,75	4,2	24	23	29	26
1 x 1,0	4,5	30	28	35	32
1 x 1,5	4,8	35	34	41	38
1 x 2,5	5,2	47	45	53	50
1 x 4,0	5,8	65	64	73	69
1 x 6,0	6,3	86	85	95	91
1 x 10	7,5	132	130	144	137
1 x 16	8,9	200	197	215	208
1 x 25	10,3	297	293	316	308
1 x 35	11,3	387	382	408	398
1 x 50	13,4	572	466	602	589
1 x 70	15,0	742	735	777	761
1 x 95	17,1	997	988	1040	1021
1 x 120	19,1	1264	1253	1318	1293
1 x 150	20,9	1547	1534	1609	1581
1 x 185	22,9	1909	1894	1981	1950
1 x 240	26,0	2448	2429	2540	2500

The installation sheathed wires, flat

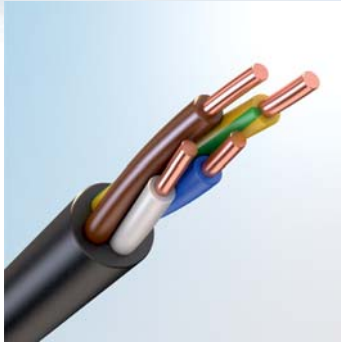
Number and nominal cross-section of cores, mm ²	Outer parameters of wire (height x width), mm	Weight of 1 km of PuVV wire, kg	Weight of 1 km of PuVV-HL wire, kg	Weight of 1 km of PuVng(A)-LS wire, kg	Weight of 1 km of PuPng(A)-HF wire, kg
2 x 0,50	4,0x6,0	36	35	43	39
2 x 0,75	4,2x6,3	43	41	51	47
2 x 1,0	4,5x7,1	54	52	63	58
2 x 1,5	4,8x7,5	65	63	75	70
2 x 2,5	5,2x8,3	89	86	100	94
2 x 4,0	5,8x9,6	126	123	141	133
3 x 0,50	4,0x8,0	51	49	61	55
3 x 0,75	4,2x8,5	61	59	72	66
3 x 1,0	4,5x9,6	77	74	90	83
3 x 1,5	4,8x10,3	94	81	108	101
3 x 2,5	5,2x11,5	129	126	146	137
3 x 4,0	5,8x13,5	186	181	207	196

The installation sheathed wires, round

Number and nominal cross-section of cores, mm ²	Outer diameter of cable, mm	Weight of 1 km of PuGVV wire, kg	Weight of 1 km of PuGVV-HL wire, kg	Weight of 1 km of PuGVng(A)-LS wire, kg	Weight of 1 km of PuGPPng(A)-HF wire, kg
1 x 0,50	4,2	22	21	27	24
1 x 0,75	4,4	26	25	31	28
1 x 1,0	4,8	32	31	38	35
1 x 1,5	5,1	38	37	45	41
1 x 2,5	5,6	50	48	57	54
1 x 4,0	6,4	72	70	81	77
1 x 6,0	6,9	89	87	100	94
1 x 10	8,4	145	142	159	152
1 x 16	9,5	204	200	220	213
1 x 25	11,3	307	303	329	320
1 x 35	13,0	420	414	448	435
1 x 50	14,7	557	550	529	576
1 x 70	16,4	741	732	780	763
1 x 95	19,3	1011	999	1066	1041
1 x 120	20,9	1246	1233	1307	1280
1 x 150	23,4	1554	1538	1631	1596
1 x 185	25,6	1895	1877	1985	1945
1 x 240	29,0	2503	2481	2610	2564

The installation sheathed wires, flat

Number and nominal cross-section of cores, mm ²	Outer parameters of wire (height x width), mm	Weight of 1 km of PuGVV wire, kg	Weight of 1 km of PuGVV-HL wire, kg	Weight of 1 km of PuGVng(A)-LS wire, kg	Weight of 1 km of PuGPPng(A)-HF wire, kg
2 x 0,50	4,2x6,3	39	37	47	43
2 x 0,75	4,4x6,8	47	45	55	51
2 x 1,0	4,8x7,6	58	56	69	63
2 x 1,5	5,1x8,2	71	68	82	76
2 x 2,5	5,6x9,1	95	92	109	102
2 x 4,0	6,4x10,8	140	137	158	149
3 x 0,50	4,2x8,5	55	53	66	60
3 x 0,75	4,4x9,2	67	64	79	72
3 x 1,0	4,8x10,4	84	81	99	91
3 x 1,5	5,1x11,2	103	99	119	111
3 x 2,5	5,6x12,7	140	135	159	149
3 x 4,0	6,4x15,2	208	202	233	220



KuVV

Installation wire: PVC- compound insulation and sheath.

KuVV-HL

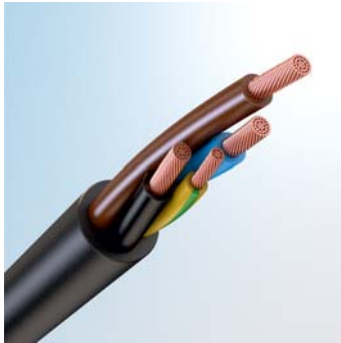
Installation wire: cold-resistant PVC- compound insulation and sheath.

KuVVng(A)-LS

Installation wire: low smoke PVC- compound insulation and sheath.

KuPPng(A)-HF

Installation wire: halogen free polymer compound insulation and sheath.



KuGVV

Installation wire: extra-flexible core, PVC- compound insulation and sheath.

KuGVV-HL

Installation wire: extra-flexible core, cold-resistant PVC- compound insulation and sheath.

KuGVVng(A)-LS

Installation wire: extra-flexible core, low smoke PVC- compound insulation and sheath, with low fume and gas emission.

KuGPPng(A)-HF

Installation wire: extra-flexible core, halogen free polymer compound insulation and sheath.

LS index in the grades of wires stands for **Low Smoke**.
HF index stands for **Halogen Free**.

APPLICATION

The wires are designed for electric installations, i.e. for fixed installations in illumination networks, as well as for installation of electrical equipment, machines, mechanisms and tools at the nominal AC voltage of 300/500 V and frequency of max 400 Hz.

Wires with insulation made of PVC-compound and cold-resistant PVC-compound are laid single in cable lines and feed circuits of indoor power collectors.

Wires with insulation made of low smoke PVC-compound of ng(A)-LS-type are laid in bunches in cable lines of indoor (closed) electric facilities, incl. electrical circuit wiring in residential and public buildings.

Wires with insulation made of halogen free polymer compounds of ng(A)-HF-type are designed for electrical circuit wiring in public buildings, pre-school educational institutions, senior and residential care housings, hospitals and children's residential care homes.

OKP Code
35 0000

DESIGN

1. Conductor: soft copper wire; wire may be tinned or non-tinned.

Regular flexibility electrical conductors shall comply with the following classes of GOST 22483:

- class 1: nominal cross-section of max 10 mm² incl.;
- class 2: nominal cross-section from 10 mm² and more.

Extra-flexible electrical conductors shall comply with class 5 of GOST 22483:

Cables and wires with electrical conductors made of copper tinned wire are marked with "L".

2. Insulation: PVC-compound for KuVV, KuGVV wires; cold-resistant PVC-compound for KuVV-HL, KuGVV-HL wires; low-smoke PVC-compound with low fume and gas emission for KuVVng(A)-LS, KuGVVng(A)-LS wires; halogen free polymer compounds for KuPPng(A)-HF, KuGPPng(A)-HF wires. Nominal insulation thickness is specified in the Appendix on page 158.

3. Stranding: insulated conductors of two-, three-, four- and five-core cables are stranded. The colouring of stranding is specified in the Appendix on page 158.

4. Outer sheath: PVC- compound for KuVV, KuGVV wires; cold-resistant PVC-compound for KuVV-HL, KuGVV-HL wires; low-smoke PVC-compound with low gas emission for KuVVng(A)-LS, KuGVVng(A)-LS wires; halogen free polymer compounds for KuPPng(A)-HF, KuGPPng(A)-HF wires.

FIRE SAFETY PERFORMANCE

Unmarked and HL-type wires are flame-retardant when laid single and comply with the fire safety class according to GOST 53315 item O1.8.2.3.4.

ng(A)-LS and ng(A)-HF-type wires are flame-retardant when laid in bunches and comply with the following safety classes according to the above GOST:

ng(A)-LS: fire safety class item 16.8.2.2.2;

ng(A)-HF: fire safety class 16.8.1.2.1;

Fire tests proved ng(A)-LS-type cables to be low smoke under conditions of burning or smouldering; the transparency in the test cell lowered max 50%.

Fire tests proved ng(A)-HF-type cables to be low smoke under conditions of burning or smouldering; the transparency in the test cell lowered max 40%.

ng(A)-HF-type cables are characterised by low chlorine hydride emission (max 5 mg/g) under conditions of burning or smouldering of the insulation, cable sheath or protection hose.

TECHNICAL STANDARDS

Ambient class according to GOST 15150-69:

for unmarked wires..... UHL and T, placement category 2

for HL-, ng(A)-LS, ng(A)-HF.....UHL, placement category 2

Wires are resistant to ambient temperature within the range:..... from -50 °C to +65 °C

HL-type wires are resistant to ambient temperature within the range..... from -60 °C to +65 °C

Wires are resistant to ambient relative air humidity at max +35°C.....max 98%

Laying and installation of cables without preheating is performed at temperature not less than:

all wires except HL-type wire.....-15 °C

HL-type wires.....-30 °C

Minimal bending radius at laying and installation:

extra-flexible wires.....5 wire diameters

regular wires.....10 wire diameters

Electrical resistance of conductors insulation calculated for 1 km of cable and at the

temperature of +20 °C min.....5MΩ

Continuous heating temperatures of electrical conductors, max.....+70 °C

Cable construction length, no less than

from 1,5 to 16 mm²250 m

from 25 mm² and more..... 200 m

Guarantee use period.....2 years from date of input of the cable into operation

Service life.....15 years

Number and nominal cross-section of cores, mm ²	Outer diameter of the cable, mm	Weight of 1 km of KuGVV wire, kg	Weight of 1 km of KuGVV-HL wire, kg	Weight of 1 km of KuGVVng(A)-LS wire, kg	Weight of 1 km of KuGPPng(A)-HF wire, kg
2 x 0,75	6,8	62	59	75	68
2 x 1,0	7,6	78	75	94	85
2 x 1,5	8,2	95	91	113	103
2 x 2,5	9,7	139	133	165	150
2 x 4,0	11,4	201	193	235	216
2 x 6,0	12,4	248	239	287	264
2 x 10	15,0	388	375	443	412
2 x 16	17,1	541	525	611	571
2 x 25	21,1	839	815	945	885
2 x 35	24,1	1126	1095	1260	1183
2 x 50	27,6	1497	1458	1671	1572
3 x 0,75	7,1	72	69	85	78
3 x 1,0	8,0	91	87	108	99
3 x 1,5	9,2	124	119	146	134
3 x 2,5	10,2	166	160	192	178
3 x 4,0	12,0	244	236	279	260
3 x 6,0	13,1	304	294	344	322
3 x 10	15,9	484	471	540	510
3 x 16	18,6	702	685	776	735
3 x 25	22,5	1066	1043	1172	1115
3 x 35	25,6	1439	1409	1572	1500
3 x 50	29,4	1921	1883	2093	2001
4 x 0,75	7,7	85	82	100	92
4 x 1,0	9,2	121	116	143	131
4 x 1,5	9,9	148	142	173	159
4 x 2,5	11,1	200	193	230	214
4 x 4,0	13,1	297	288	336	316
4 x 6,0	14,3	373	363	417	393
4 x 10	17,4	600	586	663	630
4 x 16	20,4	874	856	957	913
4 x 25	25,2	1358	1331	1481	1417
4 x 35	28,3	1807	1774	1954	1876
4 x 50	32,5	2418	2376	2608	2509
5 x 0,75	8,3	99	95	116	107
5 x 1,0	10,0	141	135	165	152
5 x 1,5	10,8	173	167	201	186
5 x 2,5	12,1	236	229	269	252
5 x 4,0	14,4	354	344	398	375
5 x 6,0	15,7	445	434	496	470
5 x 10	19,6	739	723	815	776
5 x 16	22,4	1055	1034	1148	1100
5 x 25	27,8	1642	1611	1781	1710
5 x 35	31,2	2191	2154	2356	2271
5 x 50	36,3	2969	2920	3192	3078
2x25+1x16	21,4	953	931	1051	998
2x35+1x16	24,1	1226	1198	1348	1281
2x50+1x25	28,0	1680	1643	1841	1753
3x25+1x16	24,3	1248	1222	1364	1303
3x35+1x16	26,4	1566	1537	1695	1627
3x50+1x25	31,3	2183	2143	2364	2269
4x25+1x16	27,8	1582	1549	1727	1651
4x35+1x16	31,2	2063	2024	2241	2147
4x50+1x25	36,3	2820	2767	3058	2933

Number and nominal cross-section of cores, mm ²	Outer diameter of the cable, mm	Weight of 1 km of KuGVV wire, kg	Weight of 1 km of KuGVV-HL wire, kg	Weight of 1 km of KuVvng(A)-LS wire, kg	Weight of 1 km of KuPPng(A)-HF wire, kg
2 x 0,75	6,3	56	53	67	61
2 x 1,0	7,1	71	68	85	77
2 x 1,5	7,5	85	81	101	92
2 x 2,5	8,3	114	110	132	122
2 x 4,0	10,2	175	169	203	187
2 x 6,0	11,2	228	221	261	242
2 x 10	13,2	339	329	383	358
2 x 16	16,0	515	501	577	542
2 x 25	19,2	778	758	867	816
2 x 35	21,2	1001	977	1106	1046
2 x 50	25,0	1457	1424	1602	1519
3 x 0,75	6,6	65	63	77	71
3 x 1,0	7,4	83	80	98	90
3 x 1,5	7,9	102	98	118	109
3 x 2,5	9,4	152	147	175	162
3 x 4,0	10,8	216	209	245	229
3 x 6,0	11,9	286	279	320	301
3 x 10	14,0	432	422	477	452
3 x 16	17,0	662	648	724	690
3 x 25	20,4	1007	987	1097	1048
3 x 35	22,5	1308	1285	1413	1356
3 x 50	26,6	1917	1885	2062	1984
4 x 0,75	7,1	78	75	91	84
4 x 1,0	8,0	99	96	116	107
4 x 1,5	9,2	135	130	156	145
4 x 2,5	10,1	184	179	209	196
4 x 4,0	11,7	264	257	297	279
4 x 6,0	12,9	354	346	392	372
4 x 10	15,3	540	528	590	563
4 x 16	19,1	849	832	922	883
4 x 25	22,4	1271	1249	1370	1318
4 x 35	25,2	1680	1653	1802	1738
4 x 50	29,3	2436	2401	2596	2513
5 x 0,75	7,7	91	87	106	98
5 x 1,0	9,3	129	124	151	139
5 x 1,5	9,9	158	153	182	169
5 x 2,5	11,0	218	212	247	231
5 x 4,0	12,8	316	307	352	333
5 x 6,0	14,1	426	416	468	446
5 x 10	16,8	652	639	708	679
5 x 16	21,0	1027	1009	1110	1067
5 x 25	25,1	1567	1541	1685	1624
5 x 35	27,8	2044	2014	2181	2110
5 x 50	32,4	2973	2934	3154	3062
2x25+1x16	20,4	940	919	1034	982
2x35+1x16	21,5	1122	1100	1221	1167
2x50+1x25	25,3	1649	1618	1785	1711
3x25+1x16	22,4	1204	1118	1307	1252
3x35+1x16	24,4	1497	1471	1614	1552
3x50+1x25	28,3	2174	2140	2326	2246
4x25+1x16	25,1	1500	1472	1622	1557
4x35+1x16	27,8	1911	1879	2057	1980
4x50+1x25	32,4	2780	2737	2972	2871

APPENDIX

1. Nominal insulation thickness

Nominal cross-section of cores, mm ²	Nominal insulation thickness, mm	
	wires	cables
0,50	0,6	-
0,75	0,6	0,5
1,00	0,7	0,6
1,50	0,7	0,6
2,50	0,7	0,6
4,00	0,8	0,7
6,00	0,8	0,7
10,00	1,0	0,8
16,00	1,0	0,8
25,00	1,2	1,0
35,00	1,2	1,0
50,00	1,4	1,2
70,00	1,4	-
95,00	1,6	-
120,00	1,6	-
150,00	1,8	-
185,00	2,0	-
240,00	2,2	-

2. Colouring of insulation

Insulated conductors of multiple core shall be of different colours. Colouring shall be solid. Recommended conductor colours are specified in the table below:

Number of conductors in the cable	Insulation colouring				
	conductor sequence number				
	1	2	3	4	5
2	Brown	Blue			
3	Brown	Black	Grey*	—	—
	Brown	Blue	Green and yellow	—	—
4	Brown	Black	Grey*	Blue	—
	Brown	Black	Grey*	Green and yellow	—
5	Brown	Black	Grey*	Black	Blue
	Brown	Black	Grey*	Blue	Green and yellow

*- or original colour

It is not recommended to use red and white colours for electric conductors colouring.

Main conductors may be coloured differently upon agreement with the customer.

Insulation of single-core cables can be made in any colour specified in the table or in any different colour upon agreement with the customer.

Insulation of neutral conductor (N) shall be blue.

Insulation of grounding conductor (PE) shall be made in two colours (green and yellow); one colour should cover min 30% and max 70% of the insulation; the other colour shall cover the rest.

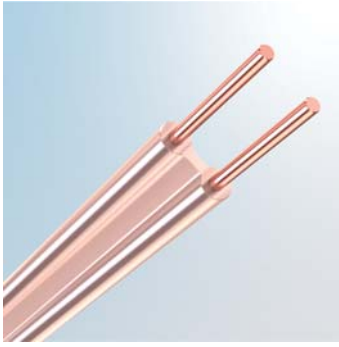
Conductors may be coloured by coating.



**COMMUNICATION
WIRES**

limited liability company
TOMSKCABLE

Communication Wires



TRP under TU 16.K04.005-89

Telephone conductor: distributive, single pair with copper solid conductors, insulated with polyethylene, distributive foundation.

TRV under TU 16.K04.005-89

Telephone conductor: distributive, single pair with copper solid conductors, PVC insulated with polyethylene, distributive foundation.

APPLICATION

Conductors are designed for stationary concealed or open drop distribution of telephone distribution network indoor and on the external building walls.

OKP CODES

35751101 conductor TRP

35751201 conductor TRV

DESIGN

1. **Conductors:** copper solid conductors, diameter 0,4 or 0,5 mm.

2. **Insulation:** polyethylene, thickness 0,7 mm, applied on current-carrying conductors, laid in parallel in plane, with separate foundation 0,9 x 2,0 mm.

TECHNICAL STANDARDS

Ambient class

for TRP UHL and T: placement category 1 according to GOST 15150-69

for TRV UHL: placement category 3.1 according to GOST 15150-69

Relative air humidity at max +35°C.....max 98%

High ambient air temperature.....+65°C

Low ambient air temperature in the context of hardwiring:

for TRP.....-60°C

for TRV.....-40°C

Electric resistance of current-carrying conductor:

diameter 0,4 mm, max.....148 Ω/km

diameter 0,5 mm, max.....94 Ω/km

Electric resistance of insulation, scaled on 1 km of length and 20°C temperature, min:

for TRP500 MΩ

for TRV.....30 MΩ

AC test voltage during 2 min. after 5 min period.....1000V

Breaking wire stress, not less than:

with current-carrying conductors of 0,4mm diameter.....48N

with current-carrying conductors of 0,5mm diameter.....73,5N

Laying and installation of cables without preheating is performed at temperature not less than:

for TRP.....-30°C

for TRV.....-15°C

Bending radius not less than tenfold value of minimal outer size

Construction length, not less than.....400m

Guarantee use period.....5 years date of input of the cable into operation

Minimal service life:

For outer laying.....12 years

For inner laying.....25 years

Type, number of cores, conductor diameter, mm	Nominal outer conductor size, mm	Reference weight of 1 km cond., kg	
		TRP	TRV
TRV, TRP 2 x 0,4	2,2 x 6,4	8,6	11,2
TRV, TRP 2 x 0,5	2,3 x 6,6	10,6	13,1



PRPPM under TU 16-705.450-87

Single pair conductors: copper solid conductors, polyethylene insulation/protective cover for telephonic communication and broadcast networks

PRPVM under TU 16-705.450-87

Single pair conductors: copper solid conductors, polyethylene insulation, PVC plastic cover for telephonic communication and broadcast networks.

APPLICATION

Conductors are designed for exploitation under voltage up to 380 V, frequency up to 10 kHz on telephone lines and distribution networks.

OKP CODES

357711

DESIGN

1. **Conductors:** copper, diameter 0,9 or 1,2 mm.
2. **Insulation/protective cover:** applied on current-carrying conductors, laid in parallel in one plane. Thickness of insulation/protective cover on wires of 0,9-1,2 mm diameter, on wires of 1,2-1,4 mm diameter.

TECHNICAL STANDARDS

Ambient class:
 for PRPPM: UHL and T, placement category 1 according to GOST 15150-69
 for PRPVM: U, UHL, placement categories 1 and 4 according to GOST 15150-69
 Relative air humidity at max +35°C.....max 98%
 High ambient air temperature
 for PRPPM.....+50°C
 for PRPVM.....+60°C
 Low ambient air temperature in the context of hardwiring:
 for PRPPM.....-40°C
 for PRPVM.....-60°C
 Electric resistance of current-carrying conductor:
 diameter 0,9 mm, max.....28,4 Ω/km
 diameter 1,2 mm, max.....16,0 Ω/km
 Service capacity:
 with current-carrying conductors of 0,9mm diameter, max...50 nF/km (PRPPM), 87 nF/km (PRPVM)
 with current-carrying conductors of 1,2mm diameter,max.....6,0 nF/km (PRPPM), 88 nF/km (PRPVM)
 Laying and installation of cables is performed at temperature not less than:.....-10°C
 Bending radius not less than tenfold value of minimal outer size
 Construction length, min.....500m

Type, number of cores, conductor diameter, mm	Nominal outer conductor size, mm	Reference weight of 1 km cond., kg	
		PRPPM	PRPVM
PRPPM 2 x 0,9	3,3 x 6,6	26,9	31,7
PRPPM 2 x 1,2	4,0 x 8,0	42,7	50,1



APPLICATION

Wires are designed for temporary inclusions in crosses of telephone stations under constant voltage up to 120 V.

OKPP CODES

35786202 – PKSV wires

PKSV under TU 16.K71-8-90

Jumper office wires: two, three or four solid copper conductors, insulated with PVC-compound

DESIGN

- 1. **Conductors:** solid copper conductor, diameter 0,4 and 0.5 mm.
- 2. **Insulation:** PVC-compound with 0,25 mm thickness.
- 3. **Stranding:** two, three or four insulated cores stranded into wire with strand pitch up to 15 diameters of stranding.

TECHNICAL STANDARDS

Ambient class: UHL placement category 4, 5 and T placement categories 2, 3, 4 according to GOST15150-69

High ambient air temperature.....+50°C
 Low ambient air temperature.....-10°C
 Relative humidity..... up to 80%
 High relative humidity tropicalized +35°C..... up to 98%

Electric resistance of current-carrying conductor:
 diameter 0,4 mm, max.....148 Ω/km
 diameter 0,5 mm, max.....94 Ω/km

Electric resistance of insulation, scaled on 1 km of length and 20°C temperature:
 under temperature +20°C and normal relative humidity, min.....100 MΩ
 under temperature +35°C and 98% relative humidity (T performance), min.....60 MΩ

Breaking wire stress of insulated current-carrying conductor:
 0,4mm diameter, min.....31,5N
 0,5mm diameter, min.....49,0N

Laying and installation is performed at temperature not less than:.....-5°C
 Bending radius not less thantenfold value of minimal outer wire size
 Construction wire length, not less than.....100m
 Guarantee use period.....3 years
 Service life, not less than.....5 years

Label size	Conductor color	Maximal outer diameter, mm	Reference weight of 1 km wire, kg
PKSV 2x0,4	white, blue	2,3	3,8
PKSV 3x0,4	white, blue, red	2,5	5,6
PKSV 4x0,4	white, blue, red, green	2,9	7,5
PKSV 2x0,5	white, blue	2,8	5,3
PKSV 3x0,5	white, blue, red	3,0	7,8
PKSV 4x0,5	white, blue, red, green	3,4	10,5



APPLICATION

Wires P-274M are designed for field communication: burial laying is allowed, ground laying, staking suspension or ground features, temporary laying through water barriers.

OKPP CODES

35764160 – P-274M wires

P-274M under TU 16-505.221-78

Wire: conductors made of copper and steel galvanized wires, polyethylene insulation of low pressure

- 1. **Conductors:** stranded from 3 steel wires of 0,3mm diameter and 4 copper wires of 0,3mm diameter.
- 2. **Insulation:** light-stabilized polyethylene of high density with 0,5 mm thickness.
- 3. **Two insulated cores:** with maximal diameter 2,3 mm strained in pair with strand pitch 80-100 mm.

TECHNICAL STANDARDS

Ambient class.....UHL placement category 1-5 under GOST 15150-69

High ambient air temperature.....+65°C
 Low ambient air temperature.....-50°C
 Relative air humidity at max 35°C.....max98%

Conductor resistance difference at 1 km length, max.....3,00 Ω
 CCC resistance, max.....65 Ω/km
 Insulation resistance after 1 hour of presence in water under 20°C, min.....1000 MΩ/km
 Breaking stress of insulated conductor min.....392N
 Construction wire length, min.....500+-10m
 Wire mass, max.....15 kg/km
 Minimal service life.....15 years



**WIRES FOR OVERHEAD
TRANSMISSION LINES**

limited liability company
TOMSKCABLE

Wires for Overhead Transmission Lines A, AKP under GOST 839-80



Non-insulated conductors, stranded from aluminum wires

DESIGN

Mark A: wires consist of aluminum wires, stranded with regular stranding, with stranding direction of neighbor layers in opposite sides, outer layer has right stranding direction.
Mark AKP: mark A wire, but inter-wire space of the whole wire, except outer surface, is filled with neutral lubricant with high thermal resistance.

APPLICATION

Non-insulated mark A wires are designed for electrical power transmission in overhead transmission lines, in air atmosphere of I and II types under the condition of keep in atmosphere of sulfur gas up to 150 mg/m² per night (1.5 mg/m³) on shore of all macroclimatic regions under GOST15150 UHL performance, except TV and TS.
Non-insulated mark A wires are designed for electrical power transmission on the seashores, salt-water lakes, in industrial areas and saline sands, and adjacent areas with air atmosphere of I and II types on shore and sea of all macroclimatic regions under GOST15150 UHL performance.

OKP CODES: 351141

Number of wires in conductor, their nominal diameter, number of layers and construction length of A and AKP wires are introduced in table (parameter value for A and AKP wires)

TECHNICAL STANDARDS

Cable conductor continuous operating heating temperature max.....+90°C
Guarantee use period:4 years from date of input of the cable into operation
Service life:

Wires of A type, min.....45years
Wires of AKP type, min.....25years

Calculated design and technical parameters of A and AKP wires are introduced in table (parameter value for A and AKP wires)

Nominal core cross-section, mm ²	Number of cores	Nominal wire diameter, mm	Number of cores	Nominal wire diameter, mm
16	7	1,70	1	4500
25	7	2,13	1	4000
35	7	2,50	1	4000
50	7	3,00	1	3500
70	7	3,55	1	2500
95	7	4,10	1	2000
120	19	2,80	2	1500
150	19	3,15	2	1250
185	19	3,50	2	1000
240	19	4,00	2	1000
300	37	3,15	2	1000
350	37	3,45	3	1000
400	37	3,66	3	1000
450	37	3,90	3	1000
500	37	4,15	3	1000

Nominal core cross-section, mm ²	Cross-section, mm ²	Wire diameter, mm	Electrical resistance to constant current of 1 km wire under 20°C, Ohm, up to	Breaking wire stress, N, not less than	1 km wire weight (no lubricant), kg	Lubricant mass for 1 km wire of AKP, kg
16	15,9	5,10	1,8007	3021	43,0	0,5
25	24,9	6,40	1,1498	4500	68,0	0,5
35	34,3	7,50	0,8347	5913	94,0	0,5
50	49,5	9,00	0,5784	8198	135,0	0,5
70	69,3	10,70	0,4131	11288	189,0	1,0
95	92,4	12,30	0,3114	14784	252,0	1,0
120	117,0	14,00	0,2459	19890	321,0	16
150	148,0	15,80	0,1944	24420	406,0	20
185	182,8	17,50	0,1574	29832	502,0	25
240	238,7	20,00	0,1205	38192	655,0	33
300	288,3	22,10	0,1000	47569	794,0	54
350	345,8	24,20	0,0833	57057	952,0	65
400	389,2	25,60	0,0740	63420	1072,0	73
450	449,1	27,30	0,0642	71856	1206,0	84
500	500,4	29,10	0,0576	80000	1378,0	94



AS, ASKS, ASKP, ASK GOST 839-80

Non-insulated conductor, consisting of steel core and aluminum wires.

DESIGN

AS mark:

Conductors consist of steel core and aluminum wires, stranded with regular stranding with stranding direction of neighbor layers in opposite sides, outer layer has right stranding direction.

ASKS and ASKP mark:

AS mark wires, but inter-sire space of steel core, including its outer surface, is filled with neutral lubricant with high thermal resistance.

ASK mark:

AS mark wires, but steel core is insulated with two bands of mylar reflective film sheet. Bunched steel core under mylar reflective film sheets is to be covered with thermal resistance lubricant.

TECHNICAL STANDARDS

Cable conductor continuous operating heating temperature max.....max 90°C
 Guarantee use period.....4 years from date of input of the cable into operation
 Service life of AS, min.....45 years
 Service life of ASKS, min.....25 years
 Service life of ASKP, ASK min.....10 years

APPLICATION

Non-insulated AS mark wires are designed for electrical power transmission in overhead transmission lines, in air atmosphere of I and II types under the condition of keep in atmosphere of sulfur gas up to 150 mg/m² per night (1.5 mg/m³) on shore of all macroclimatic regions under GOST 15150 UHL performance, except TV and TS.

Non-insulated ASKS mark wires are designed for electrical power transmission on the seashores, salt-water lakes, in industrial areas and saline sands, and adjacent areas with air atmosphere of I and III types under the condition of keep in atmosphere of sulfur gas up to 150 mg/m² per night (1.5 mg/m³) and chloride salts up to 200 mg/m² on shore and sea of all macroclimatic regions under GOST15150 UHL performance, except TV.

Non-insulated AS mark wires are designed for electrical power transmission in overhead transmission lines, in air atmosphere of I and II types under the condition of keep in atmosphere of sulfur gas up to 150 mg/m² per night (1.5 mg/m³) on shore of all macroclimatic regions under GOST 15150 UHL performance, except TV and TS.

Non-insulated ASKS mark wires are intended for electrical power transmission on the seashores, salt-water lakes, in industrial areas and saline sands, and adjacent areas with air atmosphere of I and III types under the condition of keep in atmosphere of sulfur gas up to 150 mg/m² per night (1.5 mg/m³) and chloride salts up to 200 mg/m² on shore and sea of all macroclimatic regions under GOST15150 UHL performance, except TV.

OKP CODE

351151

Calculated design and technical parameters of AS, ASKS, ASKP, ASK wires are introduced in table:

Nominal corss-section (aluminum/steel, mm ²)	Diameter, mm		Electrical resistance to constant current of 1 km wire under 20C, Ω, up to	Breaking wire stress, N, not less than
	Conductors	Steel core		
16/2,69	5,6	1,9	1,7818	6220
24,9/4,115	6,9	2,3	1,1521	9296
36,9/6,15	8,4	2,8	0,7774	13524
40/6,7	8,74	2,91	0,7172	14400
48,2/8,04	9,6	3,2	0,5951	17112
63/10,5	10,97	3,66	0,4553	21630
95,4/15,9	13,5	4,5	0,3007	33369
100/16,7	13,82	4,61	0,2868	34333
118/18,8	15,2	5,6	0,2440	41521
114/26,6	15,4	6,6	0,2531	49465
148/18,8	16,8	5,6	0,2046	46307
149/24,2	17,1	6,3	0,2039	52279
147/34,3	17,5	7,5	0,2061	62643
187/24,2	18,9	6,3	0,1540	58075
181/29	18,8	6,9	0,1591	62055
185/43,1	19,6	8,4	0,1559	77767
244/31,7	21,6	7,2	0,1182	75050
236/38,6	21,6	8,0	0,1222	80895
301/38,6	24,0	8,0	0,0958	90574
295/47,8	24,1	8,9	0,0978	100623

Number of wires in conductor, their nominal diameter, number of layers and construction length of AS wires is introduced in table:

Nominal core cross-section, mm ²	Aluminum part of the wire		Steel core		Number of layers		Proportion of aluminum part section to steel core cross-section	Construction length, m, not less than	Weight of km wire, kg					
	Number of wires	Nomin. wire diameter, mm	Number of wires	Nomin. wire diameter, mm	Alumin. wires	Steel wires			Aluminum part	Steel core	Wires without lubricant	Lubricant for wire of types		Lubricants/sheets for ASK wires
												ASKS	ASPKP	
16/2,7	6	1,85	1	18,5	1	-	6,00	3000	44,0	20,9	64,9	1,0	1,0	-/0,56
25/4,2	6	2,30	1	23,0	1	-	6,00	3000	67,9	32,4	100,3	1,5	1,5	-/0,56
35/6,2	6	2,80	1	28,0	1	-	6,00	3000	100,0	48,0	148,0	2,5	2,5	-/0,84
40/6,7	6	2,91	1	29,1	1	-	6,00	3000	-	-	161,3	-	-	-
50/8,0	6	3,20	1	32,0	1	-	6,00	3000	132,0	63,0	195,0	3,0	3,0	-/0,84
70/11	6	3,80	1	38,0	1	-	6,00	2000	188,0	88,0	276,0	4,5	4,5	1/1,12
95/16	6	4,50	1	45,0	1	-	6,00	1500	261,0	124,0	385,0	6,0	6,0	-/1,4
100/16,7	6	4,61	1	46,1	1	-	6,00	1500	-	-	403,2	-	-	-
120/19	26	2,40	7	18,5	2	1	6,25	2000	324,0	147,0	471,0	11,0	35,0	9/2
120/27	30	2,20	7	22,0	2	1	4,29	2000	320,0	209,0	528,0	14,0	37,0	12/2
150/19	24	2,80	7	18,5	2	1	7,85	2000	407,0	147,0	554,0	12,0	42,0	9,2
150/24	26	2,70	7	21,0	2	1	6,14	2000	409,0	190,0	599,0	14,0	44,0	11/2
150/34	30	2,50	7	25,0	2	1	4,29	2000	406,0	269,0	675,0	18,0	48,0	15/2
185/24	24	3,15	7	21,0	2	1	7,71	2000	500,0	190,0	705,0	14,0	53,0	11/2
185/29	26	2,98	7	23,0	2	1	6,24	2000	509,0	228,0	728,0	16,0	52,0	13/2
185/43	30	2,80	7	28,0	2	1	4,29	2000	517,0	337,0	846,0	23,0	61,0	18/2
240/32	24	3,60	7	2,40	2	1	7,71	2000	673,0	248,0	921,0	17,0	74,0	14/2
240/39	26	3,40	7	2,65	2	1	6,11	2000	650,0	302,0	952,0	22,0	74,0	16/2
240/56	30	3,20	7	3,20	2	1	-	2000	664,0	441,0	1105,1	30,0	78,0	22/3
300/39	24	4,00	7	2,65	2	1	7,81	2000	650,0	302,0	1132,0	22,0	76,0	16/2
300/48	26	3,80	7	2,95	2	1	6,16	2000	830,0	302,0	1186,0	27,0	87,0	19/3



M GOST 839-80

Non-insulated conductor from one or stranded from some copper wires

DESIGN

Conductors consist of one or some copper wires, stranded with regular stranding with stranding direction of neighbor layers in opposite sides, outer layer has right stranding direction.

APPLICATION

Non-insulated M mark wires are designed for electrical power transmission in overhead transmission lines, in air atmosphere of II and III types on shore and sea of all macroclimatic regions under GOST15150 UHL performance.

OKP CODES:
351111

TECHNICAL STANDARDS

Number of wires in conductor, their nominal diameter, number of layers and construction length of M wires are introduced in table (parameter value for M wires)

Nominal core cross-section, mm ²	Number of wires	Nominal diameter of the wires, mm	Number of wires	Construction length, m
4	1	2,24	-	2200
6	1	2,76	-	1500
10	1	3,57	-	900
16	7	1,70	1	4000
25	7	2,13	1	3000
35	7	2,60	1	2500
50	7	3,00	1	2000
70	19	2,13	2	1500
95	19	2,50	2	1200
120	19	2,80	2	1000
150	19	3,15	2	800
185	37	2,50	2	800
240	37	2,84	3	800
300	37	3,15	3	600
400	37	3,66	3	600

Calculated design and technical parameters of M wires are introduced in table (parameter value for M wires)

Nominal core cross-section, mm ²	Cross-section, mm ²	Wire diameter, mm	Electrical resistance to constant current of 1 km wire under 20C, Oh, up to	Breaking wire stress, N, not less than	1 km wire weight (no lubricant), kg
4	3,94	2,2	4,6009	1161	35
6	5,85	2,8	3,0701	2467	52
10	9,89	3,6	1,8197	3881	88
16	15,9	5,1	1,1573	6031	142
25	24,9	6,4	0,7336	9463	224
35	34,61	7,5	0,5238	13141	311
50	49,4	9	0,3688	17455	444
70	67,7	10,7	0,2723	27115	612
95	94	12,6	0,1944	37637	850
120	117	14	0,1560	46845	1058
150	148	15,8	0,1238	55151	1338
185	183	17,6	0,1001	73303	1659
240	234	19,9	0,0789	93837	2124
300	288	22,1	0,0637	107422	2614
400	389	25,5	0,0471	144988	3528

Self-Supporting Insulated Wires

SIP under TU 3533-016-59680332-2010



SIP-1: self-supporting conductor, compact aluminum cores, light-stabilized XLPE insulation, nominal non-insulated carrying core from aluminum alloy.

SIP-2: the same, light-stabilized cross linked PE insulation, nominal non-insulated carrying core from aluminum alloy.

SIP-3: single-core wire, self-supporting, protected with compact carrying core from aluminum alloy, light-stabilized XLPE insulation.

SIP-4: self-supporting insulated conductor without structural element, aluminum current-carrying cores, light-stabilized XLPE insulation. Core's cross-section: from 16 to 25 mm².

SIP-5: self-supporting insulated conductor without structural element, with aluminum current-carrying cores, light-stabilized XLPE insulation. Core's cross-section: from 16 to 240 mm².

APPLICATION

SIP-1 – for overhead transmission lines (OTL) trunks and line derivations from OTL in air atmosphere of I and II types under GOST 15150-69.

SIP-2 – for overhead transmission lines (OTL) trunks and line derivations from OTL in air atmosphere of I and II types under GOST 15150-69, including sea shores, salt-water lakes, in industrial areas and saline sands.

SIP-3 – for OTL with nominal voltage 10-35 kV in air atmosphere of I and II types under GOST 15150-69, including sea shores, salt-water lakes, in industrial areas and saline sands.

SIP-4, SIP-5 – for OTL derivations to input and laying along building and engineering DESIGN walls in air atmosphere of I and II types under GOST 15150-69.

OKP CODES

355301 – for SIP-1, SIP-2 conductors

355302 - for SIP-3 conductors

355303 - for SIP-4 conductors

355304 - for SIP-5 conductors

DESIGN

1.Main and secondary conductors: aluminum stranded, round, compact. For SIP-5 conduct cores with 16 and 25 mm² section – single-wire. Number of wires, outer diameter, electrical resistant of current-carrying cores are listed in table.

Nominal cross-section of main current-carrying core, mm ²	Number of wires in core, pcs	Outer diameter of current-carrying core, mm		Electrical resistant of 1 km core to current, Ω, up to
		Min.	Max.	
16	7	4,6	5,1	1,910
25	7	5,7	6,1	1,200
35	7	6,7	7,1	0,868
50	7	7,85	8,35	0,641
70	7	9,45	9,95	0,443
95	7	11,1	11,7	0,320
120	19	12,5	13,1	0,253
150	19	14,0	14,5	0,206
185	19	15,45	16,15	0,164
240	19	17,75	18,45	0,125

2.Nominal carrying core and current-carrying core of protected wires: aluminum alloy, stranded, round, compact (for SIP-1, SIP-2 wires, for protected SIP-3 wires). Number of wires, outer diameter, electrical resistant of current-carrying cores, strength are listed in table.

Nominal cross-section of main current-carrying core, mm ²	Number of wires in core, pcs	Outer diameter of current-carrying core, mm		Outer diameter of current-carrying core, mm	Core tensile strength, kN, not less than
		Min.	Min.		
25	7	5,7	6,1	1,380	7,4
35	7	6,7	7,1	0,986	10,3
50	7	7,85	8,35	0,720	14,2
54,6	7	9,2	9,6	0,630	16,6
70	7	9,45	9,95	0,493	20,6
95	7	11,1	11,7	0,363	27,9
120	19	12,2	12,9	0,288	35,2
150	19	13,9	14,5	0,236	43,4
185	19	15,45	16,15	0,188	53,5
240	19	17,75	18,45	0,145	69,5

3.Insulation: light-stabilized XLPE. Main insulated cores are to have differential indications – color warp stripes with width not less than 1 mm. Color should be contrast to black. Insulation of protected conductors, nominal carrying cores and secondary cores – black color. In SIP-1 wire nominal carrying core is not insulated. Thickness is mentioned in table:

Wire mark	Nominal insulation thickness, mm, for cores with nominal cross- section, mm ²										
	16	25	35	50	54,6	70	95	120	150	185	240
SIP-1	1,3	1,3	1,3	1,5	1,5	1,7	1,7	1,7	1,7	1,9	1,9
SIP-1	1,3	1,3	1,3	1,5	1,5	1,7	1,7	1,7	1,7	1,9	1,9
SIP-3 20kV						2,3					
SIP-3 35 kV						3,5					
SIP-4	1,3	1,3									
SIP-5	1,3	1,3	1,3	1,5	-	1,7	1,7	1,7			

4.Stranding: insulated and secondary cores have to be stranded around nominal core. Insulated cores of wires without carrying cores need to be stranded between each other. Core stranding has right direction. Production of customized SIP-1 and SIP-2 wires with additional core with 16 or 25 mm² section is allowed for light circuit connection.

TECHNICAL STANDARDS

Ambient class: UHL, placement categories 1, 2 and 3 according to GOST 15150-69
 Operating temperature range.....from -60°C to +50°C
 Relative air humidity at max+35°C.....max 98%
 Laying and installation of cables without preheating is performed at temperature not less than:.....-20°C
 Minimal bending radius under montage.....10 outer cable diameters
 Nominal frequency.....50Hz
 Wires after water storage under temperature (20+-10C) not less than 10 minutes pass the alternating voltage test with 50Hz frequency during 5 minutes, with the value:
 For wires SIP-1, SIP-2, SIP-4, SIP-5.....4 kV
 For wires SIP-3 for 20 kV voltage.....6 kV
 For wires SIP-3 for 35 kV voltage.....10 kV
 Admissible power core heat during exploitation should not exceed the following values:
 Normal condition.....+90°C
 In case of short-circuit.....+250°C
 DESIGN length:
 For wires SIP-1, SIP-2, SIP-5.....500 m
 For wires SIP-3.....1000 m
 For wires SIP-4.....300 m
 Guarantee use period.....3 years from date of put of the cable into operation
 Service life.....40 years
 Admissible current wire load, calculated for air temperature +25°C, wind speed 0.6 m/s and solar intensity 1000 W/m², and admissible second short-circuit currents:

Nominal main core cross-section, mm ²	Admissible load current, A, up to			Admissible second short-circuit current	
	Self-supporting insulated wire	Protected wires		Self-supporting insulated wire	Protected wires
		20 kV	35 kV		
16	100	-	-	1,5	-
25	130	-	-	2,3	-
35	160	200	220	3,2	3,0
50	195	245	270	4,6	4,3
70	240	310	340	6,5	6,0
95	300	370	400	8,8	8,2
120	340	430	460	10,9	10,3
150	380	485	520	13,2	12,9
185	436	560	600	16,5	15,9
240	515	600	670	22,0	20,6

Number and nominal cross-section of main, nominal carrier and supplemental cores, mm ²	Outer wire diameter, mm	Estimated weight of 1 km wire
SIP-1 wire		
1 x 16 + 1 x 25	13,4	137
3 x 16 + 1 x 25	20,9	276
3 x 25 + 1 x 35	23,9	387
3 x 35 + 1 x 50	27,2	520
3 x 50 + 1 x 50	30,6	690
3 x 50 + 1 x 70	32,2	732
3 x 70 + 1 x 70	36,2	908
3 x 70 + 1 x 95	37,9	979
3 x 95 + 1 x 70	39,6	1149
3 x 95 + 1 x 95	41,3	1219
3 x 120 + 1 x 95	44,1	1430
3 x 150 + 1 x 95	46,9	1672
3 x 185 + 1 x 95	50,9	2023
3 x 240 + 1 x 95	55,5	2476
4 x 16 + 1 x 25	20,9	345
4 x 25 + 1 x 35	23,9	485
4 x 35 + 1 x 50	27,2	648
4 x 50 + 1 x 50	30,6	875
4 x 50 + 1 x 70	32,2	917
4 x 70 + 1 x 35	33,3	1066
4 x 70 + 1 x 70	36,2	1152
4 x 70 + 1 x 95	37,9	1222
4 x 95 + 1 x 70	39,6	1472
4 x 95 + 1 x 95	41,3	1542
4 x 120 + 1 x 95	44,1	1824

Number and nominal cross-section of main, nominal carrier and supplemental cores, mm ²	Outer wire diameter, mm	Estimated weight of 1 km wire
4 x 150 + 1 x 95	46,9	2147
4 x 185 + 1 x 95	50,9	2615
4 x 240 + 1 x 95	55,5	3218
3 x 50 + 1 x 70 + 1 x 25	32,2	830
3 x 50 + 1 x 54,6 + 1 x 16	31,8	773
3 x 70 + 1 x 95 + 1 x 16	37,9	1048
3 x 95 + 1 x 95 + 1 x 16	41,3	1288
SIP-2 wire		
1 x 16 + 1 x 25	16,0	168
2 x 16 + 1 x 25	23,5	237
3 x 16 + 1 x 25	23,5	307
3 x 16 + 1 x 54,6	27,4	413
4 x 16 + 1 x 35	24,5	406
4 x 16 + 1 x 25	23,5	377
1 x 25 + 1 x 25	17,0	197
2 x 25 + 1 x 35	18,3	324
3 x 25 + 1 x 25	25,5	393
3 x 25 + 1 x 35	26,5	423
3 x 25 + 1 x 54,6	29,4	399
4 x 25 + 1 x 35	26,5	521
2 x 35 + 1 x 35	20,4	384
3 x 35 + 1 x 35	28,5	512
3 x 35 + 1 x 50	30,2	568
3 x 35 + 1 x 54,5	31,4	588
4 x 35 + 1 x 50	20,2	696
3 x 50 + 1 x 50	33,6	739

Number and nominal cross-section of main, neutral carrier and supplemental cores, mm ²	Outer wire diameter, mm	Estimated weight of 1 km wire
3 x 50 + 1 x 54,6	34,8	758
3 x 50 + 1 x 70	35,6	797
4 x 50 + 1 x 25	30,9	738
4 x 50 + 1 x 50	33,6	923
4 x 50 + 1 x 54,6	34,8	943
3 x 70 + 1 x 54,6	38,8	934
4 x 70 + 1 x 54,6	38,8	1178
3 x 70 + 1 x 70	39,6	974
3 x 70 + 1 x 95	41,3	1054
3 x 95 + 1 x 70	43,0	1214
4 x 95 + 1 x 70	43,0	1537
3 x 95 + 1 x 95	44,7	1294
3 x 120 + 1 x 95	47,5	1505
3 x 120 + 1 x 70	45,8	1425
3 x 150 + 1 x 95	50,3	1747
3 x 185 + 1 x 95	54,3	2098
3 x 240 + 1 x 95	58,9	2551
3 x 16 + 1 x 25 + 1 x 16	23,5	377
3 x 25 + 1 x 35 + 1 x 16	26,5	492
3 x 25 + 1 x 35 + 1 x 25	26,5	521
3 x 25 + 1 x 54,6 + 1 x 16	29,4	568
3 x 25 + 1 x 54,6 + 2 x 16	29,4	638
3 x 35 + 1 x 50 + 1 x 16	30,2	638
3 x 35 + 1 x 35 + 1 x 16	28,5	581
3 x 35 + 1 x 35 + 2 x 16	28,5	651
3 x 35 + 1 x 35 + 1 x 25	28,5	610
3 x 35 + 1 x 50 + 1 x 25	30,2	667
3 x 35 + 1 x 54,6 + 2 x 16	31,4	727
3 x 35 + 1 x 50 + 2 x 16	30,2	707
3 x 35 + 1 x 54,6 + 1 x 25	31,4	686
3 x 35 + 1 x 54,6 + 2 x 25	31,4	784
3 x 35 + 1 x 95 + 1 x 16	33,9	777
3 x 35 + 1 x 54,6 + 1 x 16	31,4	657
3 x 50 + 1 x 50 + 1 x 16	33,6	808
3 x 50 + 1 x 50 + 2 x 16	33,6	878
3 x 50 + 1 x 50 + 1 x 25	33,6	837
3 x 50 + 1 x 50 + 2 x 25	33,6	935
3 x 50 + 1 x 54,6 + 1 x 16	34,8	828
3 x 50 + 1 x 54,6 + 2 x 16	34,8	897
3 x 50 + 1 x 54,6 + 1 x 25	34,8	856
3 x 50 + 1 x 70 + 1 x 16	35,6	867
3 x 50 + 1 x 70 + 1 x 25	35,6	896
3 x 50 + 1 x 70 + 2 x 25	35,6	994
3 x 50 + 1 x 70 + 1 x 35	35,6	925
3 x 70 + 1 x 54,6 + 1 x 16	38,8	1004
3 x 70 + 1 x 54,6 + 2 x 16	38,8	1074
3 x 70 + 1 x 54,6 + 1 x 25	38,8	1033
3 x 70 + 1 x 70 + 1 x 16	39,6	1043
3 x 70 + 1 x 70 + 2 x 16	39,6	1113

Number and nominal cross-section of main, neutral carrier and supplemental cores, mm ²	Outer wire diameter, mm	Estimated weight of 1 km wire
3 x 70 + 1 x 70 + 1 x 25	39,6	1072
3 x 70 + 1 x 70 + 2 x 25	39,6	1170
3 x 70 + 1 x 70 + 1 x 35	39,6	1101
3 x 70 + 1 x 95 + 1 x 16	41,3	1123
3 x 70 + 1 x 95 + 1 x 25	41,3	1152
3 x 70 + 1 x 95 + 2 x 25	41,3	1250
3 x 70 + 1 x 95 + 1 x 35	41,3	1182
3 x 70 + 1 x 95 + 2 x 35	41,3	1309
3 x 95 + 1 x 70 + 1 x 16	43,0	1283
3 x 95 + 1 x 70 + 2 x 16	43,0	1353
3 x 95 + 1 x 70 + 2 x 35	43,0	1469
3 x 95 + 1 x 70 + 1 x 25	43,0	1312
3 x 95 + 1 x 95 + 1 x 16	44,7	1363
3 x 95 + 1 x 95 + 2 x 16	44,7	1433
3 x 95 + 1 x 95 + 2 x 25	44,7	1490
3 x 95 + 1 x 95 + 1 x 25	44,7	1392
3 x 95 + 1 x 95 + 1 x 35	44,7	1422
3 x 120 + 1 x 70 + 1 x 16	45,8	1495
3 x 120 + 1 x 95 + 1 x 16	47,5	1575
3 x 120 + 1 x 95 + 2 x 16	47,5	1644
3 x 120 + 1 x 95 + 2 x 25	47,5	1701
3 x 120 + 1 x 95 + 1 x 25	47,5	1603
3 x 150 + 1 x 95 + 1 x 16	50,3	1817
3 x 150 + 1 x 95 + 2 x 16	50,3	1886
SIP-3 wire 20kV		
1 x 35	11,5	162
1 x 50	12,8	215
1 x 70	14,4	269
1 x 95	16,1	352
1 x 120	17,5	425
1 x 150	18,9	508
1 x 185	20,5	614
1 x 240	22,8	767
SIP-3 wire 35kV		
1 x 35	13,9	212
1 x 50	15,2	271
1 x 70	16,8	331
1 x 95	18,5	421
1 x 120	19,9	499
1 x 150	21,3	588
1 x 185	22,9	700
1 x 240	25,2	862
SIP-4 wire		
2 x 16	15,0	139
4 x 16	18,1	278
2 x 25	17,0	197
4 x 25	20,5	393

Number and nominal cross-section of main, neutral carrier and supplemental cores, mm ²	Outer wire diameter, mm	Estimated weight of 1 km wire
SIP-5 wire		
2 x 16 sw	14,1	130
2 x 25 sw	16,3	186
2 x 35	19	256
2 x 50	22,4	369
2 x 70	26,4	487
2 x 95	29,8	647
2 x 120	32,6	788
4 x 16 sw	16,9	260
4 x 25 sw	19,6	371
4 x 35	22,8	512
4 x 50	26,9	739
4 x 70	31,8	974
4 x 95	35,9	1294
4 x 120	39,2	1575
4 x 150	42,6	1898
4 x 185	47,4	2366
4 x 240	53,0	2970
4 x 16sw + 1 x 16	21,6	330
4 x 25sw + 1 x 16	23,8	441
4 x 35 + 1 x 16	26,5	581
4 x 50 + 1 x 16	29,9	808
4 x 70 + 1 x 16	33,9	1043
4 x 70 + 1 x 25	24,9	1072
4 x 95 + 1 x 16	37,3	1363
4 x 95 + 1 x 25	38,3	1392
3 x 150 + 1 x 95 + 1 x 25	50,3	1846
3 x 95 + 1 x 54,6 + 1 x 16	42,2	1244
3 x 150 + 1 x 70 + 1 x 16	48,6	1737



**WIRES AND CORDS
OF DIFFERENT
PURPOSE**

limited liability company
TOMSKCABLE

WIRES AND CORDS OF DIFFERENT PURPOSE



PVS under GOST 7399-97

Wire: stranded copper cores, PVC insulation, PVC sheath, flexible, for voltage up to 380 V for 380/660 V systems

DESIGN

1. **Conductor:** copper, round, bunched, 5 class under GOST 22483.
2. **Insulation:** PVC-compound. Colors of core insulation in wires are specified in the Appendix on page 177.
3. **Stranding:** insulated cores are stranded without filling. Insulated cores of five-core wires should be stranded around strand.
4. **Sheath:** PVC-compound. Sheath in wire is applied with filling of spaces between cores, giving them round shape.

APPLICATION

For connection of electrical appliances and electrical tools for homecare and its repair, washing machines, fridges, labor saving devices for gardening and vegetable culturing and other similar machines and appliances, and for extension wire production for voltage up to 380 V for 380/660 V systems

OKP CODES:

355513

TECHNICAL STANDARDS

Ambient class according to GOST 15150

U – placement category 1, 2, 3

T - placement category 4

UHL - Placement category 4

U performance wires are designed for exploitation under

air temperature from -40°C to +40°C

Other wire performances from -25°C to +40°C

Cable conductor operating heating temperature max +70°C

Wires after water storage under temperature (20+-5C) during.....1h

should pass the alternating current 20000V test with 50Hz frequency

during.....15 minutes

Conductors do not spread burning in case of single laying. Nominal current load are

specified in the Appendix on page 177.

Conductor resource, expressed in endurance to alternating bend strain under nominal

voltage, min.....30000 (60000) cycles (movements)

Nominal tensile strength and diameter correspond to specified values in the Appendix on

page 177.

Specified no-failure operating time, not less than.....5000h

Specified no-failure operating time for wires, applied in stationary electrical appliances,

not less than.....12000 h

Construction length, min:50 m

Guarantee use period.....2 years from date of put of the cable into operation

Service life:.....6 years

Number and nominal core's cross-section, mm ²	Nominal thickness, mm		Outer measurement for PVSn wires, mm		Outer measurement for PVS wires, mm		Estimated weight for 1 km wire, kg
	Insulation	Sheath	min	max	min	max	
2 x 0,75	0,6	0,8	5,7	7,2	6,0	6,6	52
2 x 1,00	0,6	0,8	5,9	7,5	6,4	7,0	60
2 x 1,5	0,7	0,8	6,8	8,6	7,4	8,2	80
2 x 2,5	0,8	1,0			8,4	10,6	123
3 x 0,75	0,6	0,8	6,0	7,6	6,4	7,0	61
3 x 1,0	0,6	0,8	6,3	8,0	6,8	7,6	71
3 x 1,5	0,7	0,9	7,4	8,4	8,0	8,8	99
3 x 2,5	0,8	1,1			9,2	11,4	154
4 x 0,75	0,6	0,8			6,6	8,3	74
4 x 1,0	0,6	0,9			7,1	9,0	89
4 x 1,5	0,7	1,0			8,4	10,5	125
4 x 2,5	0,8	1,1			10,1	12,5	188
5 x 0,75	0,6	0,9			7,4	9,3	91
5 x 1,0	0,6	0,9			7,8	9,8	107
5 x 1,5	0,7	1,1			9,3	11,6	153
5 x 2,5	0,8	1,2			11,2	13,9	229

Note: difference between any two values of outer wire diameter, not intended for armoring with non-dismountable armature, on the same section (out-of-roundness) should not exceed 15% of maximal outer diameter; but the out-of-roundness of the wires, intended for armoring with non-dismountable armature, should not exceed 5% of maximal outer size.



SHVVP under GOST 7399-97

Cord: parallel copper cores, PVC-compound insulation, PVC-compound sheath, flexible, for voltage up to 380 V for 380/660 V systems

SHVVPn

the same cord without the possibility of armoring with indecomposable armour

DESIGN

1. **Conductor:** copper or tinned copper (on customer's demand, in case of the order letter "L" is adding to the type), round, bunched class 5 according to GOST 22483.
2. **Insulation:** PVC-compound. Colors of core insulation in wires are specified in the Appendix on page 177.
3. **Cores location:** insulated cores are located parallel.
4. **Sheath:** PVC-compound. Colors of wire sheath are specified in the Appendix on page 177.

APPLICATION

SHVVP cords are designed for connection of personal care and microclimate appliances, electric soldering irons, lamps, kitchen electromechanical instruments, communications-electronics equipment, washing machines, fridges, labor saving devices for gardening and vegetable culturing and other similar machines and appliances, and for extension wire production for voltage up to 380 V for 380/660 V systems.

OKP CODES:
355353

TECHNICAL STANDARDS

Ambient class according to GOST 15150

U – placement category 1, 2, 3

T - placement category 4

UHL - placement category 4

U performance wires are intended for exploitation under air

temperaturefrom -40°C to +40°C

Other wire performances from -25°C to +40°C

Maximal current conductor exploitation temperature+70°C

Wires after water storage under temperature (20+-5C) during.....1h

should pass the alternating current 20000V test with 50Hz frequency

during15 minutes

Conductors do not spread burning in case of single laying.

Nominal current load are specified in the Appendix on page 133.

Conductor resource, expressed in endurance to alternating bend strain under nominal voltage, not less than.....30000 (60000) cycles (movements)

Nominal tensile strength and diameter correspond to specified values in the Appendix on page 177.

Specified no-failure operating time, not less than.....5000h

Specified no-failure operating time for wires, applied in stationary electrical appliances, not less than.....12000 h

Construction length, not less than.....50 m

Guarantee use period.....2 years from date of put of the cable into operation

Service life of wire, applies in stationary appliances, not less than.....10 years

Number and nominal cores cross-section, mm ²	Nominal thickness, mm		Outer measurement for SVVPn wires, mm		Outer measurement for SVVP wires, mm		Estimated weight for 1 km wire, kg
	Insulation	Sheath	min	max	min	max	
2 x 0,50	0,5	0,6	3,0 x 4,9	3,7 x 5,9	3,0 x 4,9	3,7 x 5,4	25
2 x 0,75	0,5	0,6	3,2 x 5,2	3,8 x 6,3	3,2 x 5,2	3,6 x 5,8	31
3 x 0,50	0,5	0,6	3,0 x 6,8	3,7 x 6,8	3,0 x 6,8	3,3 x 7,4	36
3 x 0,75	0,5	0,6	3,2 x 7,2	3,8 x 8,7	3,2 x 7,2	3,6 x 8,2	45

Motor wires with PVC-compound insulation

under TU 3552-001 -596800332-2004



PVA: wire with copper flexible core single-wire, PVC insulation, heatproof
PVAM: wire with copper core with ease flexibility, PVC insulation, single-wire, heatproof
PGVA: wire with copper flexible core, PVC insulation

DESIGN

- 1. Conductor:** copper, round, bunched.
- 2. Insulation:** PVC-compound. Wire insulation has plane and combined color, specified during the order placement. Combined color is performed by combination of parallel stripes of two colors, one of them – major. Supplemental color consists of two stripes. Major and supplemental colors correspond to specified in the Appendix on page 177. Total stripe width of supplemental color is smaller than total stripe width of major color. Indication of combined color includes indication of major and supplemental colors, moreover indication of major color goes first. In case of absence of indication of specific colors in the order, the delivery of any color wires is possible.

APPLICATION

Motor wires with copper cores with PVC insulation are designed for connection of motor equipment and appliances with nominal voltage up to 48 V, produced for cars, oriented for exploitation in moderate and tropical climate conditions. PVA, PVAM wire is used for connection, demanding ease flexibility, of electrical equipment and appliance, working under high temperature.

OKP CODES:
355353

TECHNICAL STANDARDS

Ambient class according to GOST 15150, placement categories 1, 2
 for PVA, PVAM..... U, T performance
 for PGVA..... U, T, HL performance
 Operation temperature range
 PVA, PVAM..... from -40°C to +105°C
 PGVA..... from -50°C (for HL – from -60°C)
 (for T – from -45°C to +105°C)
 Wires are resistant to fuel, oil, gasoline impact
 Wires are resistant to crack formations
 Wires with T performance are resistant to affect of mold fungus
 Wires do not spread burning in case of single laying
 PGVA wires in HL performance are resistant to multiple strokes with precipitation
 1470 m/m² by stroke duration 1-5 mm under the
 temperature..... -60°C
 PVA, PVAM wires are resistant to pressing-through under the temperature +110C
 during..... 8 hours
 PGVA wires in HL performance are resistant to impact of montage and exploitation
 bends with bending radius not less than ten maximal outer wire diameters under
 the temperature not lower than -60°C
 PGVA wires in T and U performance, PVA, PVAM in U performance under the
 temperature not lower than -30°C
 Wire flexibility coefficient of PGVA wires in HL performance in case of temperature
 change from +60 to (25+10)C, up to 10
 Construction length:
 for cross-sections from 0,5 to 25 mm² 100m
 for cross-sections from 35 to 95 mm² 50m
 Minimal operating time of wires in regimes and conditions, admissible technical
 conditions, not less than:
 For PVA, PVAM wires under 105°C..... 500h
 For PVA, PVAM wires under 90°C..... 10000h
 For PVA, PVAM wires under 70°C..... 20000h
 For PGVA wires under 70°C..... 20000h
 Guarantee use period..... 3 years from date of put of the cable into operation
 Service life, within which the operating time is performed:..... 10 years

Nominal CCC cross-section, mm ²	Nominal wire diameter in cords, up to, mm		Electrical resistance of current-conduction core by acceptance and delivery of cords, up to, mm	Nominal insulation thickness, mm		Outer diameter, up to, mm			Estimated weight for 1 km wire (reference), kg		
	PVA, PVAM	PGVA		PVA, PGVA	PVAM	PVA	PVAM	PGVA	PVA	PVAM	PGVA
0,5	0,21	0,20	39	0,6	0,30	2,3	1,7	2,3	10	7	10
0,75	0,21	0,20	26	0,6	0,30	2,6	1,9	2,6	13	9	12
1,0	0,27	0,20	19,5	0,6	0,30	2,7	2,10	2,7	15	12	15
1,5	0,33	0,25	13,3	0,6	0,30	3,10	2,4	3,1	21	17	21
2,5	0,25	0,25	7,98	0,7	0,35	3,7	3,0	3,8	32	27	31
4,0	0,30	0,30	4,95	0,8	0,40	4,6	3,8	4,6	52	43	51
6,0	0,30	0,30	3,30	0,8	0,40	5,3	4,4	5,3	73	63	72
10	0,40	0,40	1,91	1,0	-	6,7	-	6,7	120	-	119
16	0,40	0,40	1,21	1,0	-	8,5	-	8,5	200	-	182
25	0,44	0,40	0,78	1,2	-	10,5	-	10,5	283	-	280
35	-	0,40	0,554	1,2	-	11,6	-	11,6	372	-	369
50	-	0,40	0,386	1,4	-	-	-	14,1	-	-	548
70	-	0,50	0,272	1,4	-	-	-	15,7	-	-	704
95	-	0,50	0,206	1,6	-	-	-	16,2	-	-	953

Wires for Commercial Blasting under GOST 6285-74



VP: wires with copper cores and polyethylene insulation

APPLICATION

VP wires are specified for commercial blasting. Wires with current-conduction core diameter 0,5 mm are applied as inlet cables of electrical igniters, with diameter 0,8 mm and two-core wires with diameter 0,7 mm – for main lines. Wires are intended for short term exploitation under voltage 380 V and immediate – under alternative voltage 660 V or constant voltage up to 3000 V.

OKP CODES:

355612 for VP wires

DESIGN

1. Conductor: copper, single wire, round, diameter 0,5 or 0,8 and 0,7 mm.

2. Insulation: polyethylene, insulation cores colors of two-core wire should differ from each other.

3. Stranding: insulated cores of two-core wire are stranded with pitch up to 20 stranding diameters

TECHNICAL STANDARDS

Ambient class O and T, placement categories 1-5 according to GOST 15150

Electrical resistance of current-carrying core to constant current, calculated for 20C temperature and 1 km length is:

for wire with core diameter 0,5 mm, up to.....93Ω

for wire with core diameter 0,8 mm, up to.....36Ω

for wire with core diameter 0,7 mm, up to.....50Ω

Wire and insulated cores pass the test with AC voltage with not less than 50 Hz frequency:

for wire with core diameter 0,5 mm.....3000V

for wire with core diameter 0,8 and 0,7 mm.....5000V

Construction length:

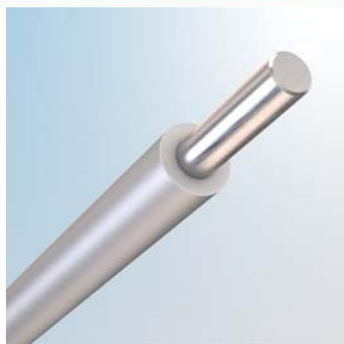
for wire with core diameter 0,5 mm.....1500m

for wire with core diameter 0,8 and 0,7 mm.....500m

Guarantee use period.....1 year from the date of production

Nominal core diameter, mm	Core number	Nominal insulation thickness, mm	Maximal outer diameter, mm	Estimated weight for 1 km wire, kg
0,5	1	0,35	1,4	2,7
0,8	1	0,60	2,3	7,0
0,7	2	0,60	4,4	11,8

Heating wire



APPLICATION

It is designed for heating of monolithic concrete or reinforced concrete, also for floor heaters.

OKP CODES:

355813

PNSV under TU 16.K71 -013-88

Heating wire: steel core, PVC compound or polyethylene insulation

DESIGN

1. Conductor: steel wire

2. Insulation: PVC-compound or polyethylene. Nominal insulation thickness is 0,8 mm.

TECHNICAL STANDARDS

Ambient class UHL wires according to GOST 15150-69

Operating temperature range.....from -60°C to +50°C

Cable laying without pre-heating is made

at minimal temperature of.....-15°C

Minimal bending radius at installation.....5 outer cable diameters

AC test voltage during 1 minute in water without storage in it.....2,0 kV

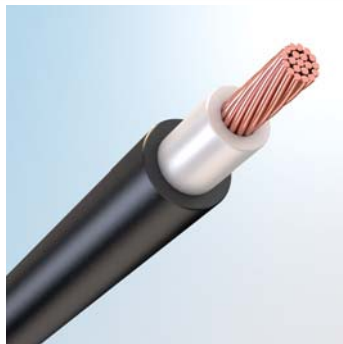
Maximal admissible exploitation temperature.....80°C

Guarantee use period.....2 years from date of put of the cable into operation

Service life:.....16 years

Nominal wire diameter, mm	Nominal value of electrical resistance of current-carrying cores, Ohm/m	Wire specific capacity, Wt/m	Heating section length under work voltage 220V and air temperature 20°C	Nominal wire outer diameter, mm	Construction length, mm or fold to it	Estimated weight for 1 km wire, kg
1,0	0,22	20	80	2,6	80	18,0
1,1	0,18	20	95	2,7	95	18,5
1,2	0,15	20	110	2,8	110	19,0
1,3	0,13	20	125	2,9	125	19,5
1,4	0,11	20	140	3,0	140	20,0

Installation wires for submersible motors



VPV under TU 16-705.077-79

Installation wire for submersible motors: polyethylene insulation, PVC sheath, for voltage 380 and 660 V

VPP under TU 16-705.077-79

Installation wire for submersible motors: polyethylene insulation, PVC sheath, for voltage 380 and 660 V

APPLICATION

It is designed for connection to power supply networks for nominal voltage 380 and 660 V of alternative current with 50 Hz frequency for exploitation in fixed position during sustained work of submersible motors in water wells.

OKP CODES:

355112

DESIGN

1. Conductor: copper, bunched, round, 2 class under GOST 22483-77

2. Insulation: polyethylene.

3. Sheath: PVC-compound for VPV wire, polyethylene for VPP wire.

TECHNICAL STANDARDS

Ambient class: UHL wires according to GOST 15150-69

Wires are resistant to high pressure..... 6.86x10(6) Pa

Operating temperature range

for VPP wire from -40°C to +80°C

for VPV wire from -40°C to +65°C

Montage and laying without preheating is performed under temperature not lower than

for VPP wire -40°C.

for VPV wire -15°C

Minimal bending radius at installation..... 10 outer cable diameters

AC test voltage 50 Hz frequency 5 minutes after 3 hour of storage in water

during acceptance to delivery:

Wires for nominal voltage 380V2,0 kV

Wires for nominal voltage 660V12,5 kV

during exploitation and storage:

Wires for nominal voltage 380V1,0 kV

Wires for nominal voltage 660V2,5 kV

Wire mean lifetime:

for VPP and VPP wires under 50 C temperature32000 h.

for VPP and VPP wires under 65 C temperature20000 h.

Guarantee use period.....2,5 years from date of put of the cable into operation

Service life:.....6 years

Nominal current carrying cores cross-section, mm ²	Nominal thickness, mm				Maximal wire outer diameter, mm		Estimated weight for 1 km wire, kg		Construction length, m
	380 V		660 V						
	Insulation	Sheath	Insulation	Sheath	330 V	660 V	330 V	660 V	
1,5	0,6	1,2	0,7	1,2	5,6	5,8	31,1	32,7	90
2,5	0,6	1,2	0,7	1,2	6,1	6,3	42,2	43,9	110
4,0	0,7	1,2	0,8	1,2	6,9	7,1	62,4	64,5	360
6,0	0,7	1,2	0,8	1,2	7,5	7,7	84,9	87,1	142
10	0,8	1,2	1,0	1,2	8,6	9,8	128,6	142,0	190
16	0,8	1,5	1,0	1,5	10,4	10,8	197,1	203,3	100
25	1,0	1,5	1,2	1,5	12,5	12,9	295,3	302,6	113
35	1,0	1,5	1,2	1,5	13,4	13,8	389,2	397,1	77
50	1,2	1,5	1,4	1,5	15,1	15,5	541,7	550,9	375
70	1,2	1,5	1,4	1,5	16,9	17,3	725,6	735,6	600

APPENDIX

1. Main and supplemental colors of PVA and PGVA wires correspond to the following table:

Color name	Color indication
white (without paint)	Б
yellow	Ж
orange	О
red	К
pink	Р
blue	Г
green	З
brown	КЧ
grey	С
black	Ч
purple	Ф

2. Core insulation colors in PVS wires and SVVP cords are specified in table:

Core number	Color (core color)	
	cord or wire with earth core	cord or wire without earth core
2	-	blue, brown
3	green and yellow, blue, brown	blue, black, brown
4	green and yellow, blue, black, brown, red	blue, black, brown, red
5	green and yellow, blue, black, brown, red	blue, black, brown, red, yellow

Purple color is not allowed for PVA, PVAM wires. In T performance wires white or natural colors are not used.

3. Nominal extension strain and rollers diameter correspond to specified in the table values:

Mark	Insulated cores number	Nominal core cross-section, mm ²	Nominal extension strain, N	Nominal rollers diameter, mm
SHVVP	2 or 3	for all cross-sections	9,8	80
PVS	from 2 to 5	0,75; 1,0	9,8	80
PVS	from 2 to 5	1,5; 2,5	14,7	120

3. Nominal extension strain and for the PVS and SHVVP-type conductors correspond to specified in the table values:

Nominal core cross-section, mm ²	Nominal current load, A, up to
0,50	2,5
0,75	6,0
1,0	10,0
1,5	16,0
2,5	25,0
4,0	32,0

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