

CABLE PRODUCTS

TS 3500-024-76960731-2012 KUSIL is a XPLE insulated power cable optimized for 10, 20, 35 kV voltages.

The product series include flame retardant “HF-LS”, and “HF-HF”, UV-resistant “YΦ”, armored and unarmored cables.

ООО «Donkabel» - quality management system certified according to ISO 9001

KUSIL cables are designed for transmission and distribution of electric power in stationary equipment with nominal AC voltages of 10, 20, 35 kV and nominal frequency of 50 Hz for networks with grounded or insulated neutral. Cables meet all the requirements of international standard IEC 60502-2.

The cables are designed both for group and single cable laying in cable structures, sewers, industrial premises (including wet and often flooded locations), as well as for laying in the ground (including excessively wet soils), and water (non-navigable water). “YΦ” marked cables are UV-resistant cables that can be installed outdoors without solar radiation protection. The cables can also be laid in cable raceways with no restrictions to level difference. The cables can be used in hazardous area zones regarding the requirements of IEC 60079-14-2008.

Cable design features, materials and types

TS 3500-024-76960731-2012 KUSIL cable product series include XLPE insulated single core and three core (Table 1) cables. Armor can be applied to three core cables only.

All conductors comply with Class 2 of GOST 22483-77 standard and may be of compacted stranded aluminum or stranded copper.

Single core cables with nominal conductor cross-section of 35-1000 mm² are optimized for rated voltages of 10 kV, and those with nominal conductor cross-section of 50-1000 mm² are optimized for rated voltages of 20 kV and 35 kV, according to Table 1.

Three core cables that feature round-shaped conductors with nominal conductor cross-section of 35-300 mm², and those with sector-shaped conductors and nominal cross-section of 120-300 mm² are optimized for rated voltages of 10 kV, according to Table 1. Three core cables, which are optimized for rated voltages of 20 kV and 35 kV, feature round-shaped conductors with nominal conductor cross-section of 50-300 mm².

At the customer's request a digit core marking can be printed on the three core cable conductor insulation screen surface.

All cables have a copper wire screen (Table 2) with a copper tape spirally applied over it.

Cables with longitudinal sealing («Г»), longitudinal and lateral sealing («2Г»), as well as those with conductor sealing («Ж»), can be applied for laying in the ground (excessively wet soils), and water (non-navigable water), as well as installed in wet and often flooded locations in case all the measures to prevent mechanical cable damage are followed. Reinforced cables («Y» - with longitudinal stiffeners) and armored cables («Б») are designed for laying in complex cable raceways that contain more than 4 turns at an angle of more than 30° or straight sections with more than four pipe transitions longer than 20m or more than two pipe transitions longer than 40m. Armored cable («Б») provides maximum conductor protection against external mechanical impacts due to galvanized steel tapes and additional sheath used in cable design.

The outer sheath of cables marked with «П» material index is made of polyethylene. These cables can be laid in the ground regardless of soil aggressiveness. The sheath of those cables marked with «Б» material index is made of PVC plastic, which allows laying them in dry soils (sandy-clay soil and normal soil with moisture level of no more than 14%).

Cables with «HF(A)-LS» or «HF(B)-LS» fire safety index have the outer sheath made of flame retardant and low smoke PVC. Cables marked with «HF(A)-HF» index have the outer sheath made of a halogen-free polymer composition, which means the cables do not emit corrosive gases when burning or smoldering. Cables with «HF(A)-LS», «HF(B)-LS», and «HF(A)-HF» indexes can be used for group laying.

- Cables meet all the requirements of international standard IEC 60502-2
- Cables withstand high-frequency and short-circuit currents due to cross-linked polyethylene insulation
- Conductor cross-section varying from 35 mm² to 1000mm²
- Number of conductors: 1 or 3
- New materials are applied to provide the best fire safety characteristics (“HF-LS” and “HF-HF”)
- Cable marked with “YΦ” index is resistant to solar radiation
- Longitudinal, lateral, and conductor sealing technologies are applied to protect the cable against moisture ingress
- Wide range of applications in all hazardous areas



Figure 1 Example of cable design for
КУСИЛ 1х185/25-35 ПвП2r

- 1 – Round-shaped stranded compacted copper conductor with cross section of 185mm²
- 2 – Conductor screen made of conductive XLPE
- 3 – XLPE insulation
- 4 – Insulation screen made of conductive XLPE
- 5 – Conductive water swelling tape
- 6 – Copper wire screen with a cross-section of 25mm² bonded with copper tape
- 7 – Separation layer of water-blocking tape
- 8 – Polymer coated aluminum tape (lateral sealing)
- 9 – Polyethylene sheath

Table 1 Nominal conductor cross-section

Conductor	Nominal conductor cross-section, mm ²	
	Single core cable	Three core cable
Round-shaped	35; 50; 70; 95; 120; 150; 185; 240; 300; 400; 500; 630; 800; 1000	35; 50; 70; 95; 120; 150; 185; 240; 300
Sector-shaped	-	120; 150; 185; 240; 300

Table 2 Copper screen nominal cross-section: for single core cables; for three core cables with sector-shaped conductors; for three core cables with round-shaped conductors - total cross-section of copper screens applied to each insulated conductor

Nominal conductor cross-section, mm ²	Copper screen cross-section, mm ² at least
35-120	16
150-300	25
> 400	35

Cable characteristics

Table 3

Rated voltage	AC voltage of 10 kV, 25 kV, 35 kV, 50 Hz with grounded or insulated neutral	
Operating temperature	- from -60° to +50°C for polyethylene («П» material index) coated cables - from -50° to +50°C for PVC («В» material index) coated cables - from -60° to +50°C for «XL» cables	
Minimum cable installation temperature (without preheating)	- -20°C or higher for polyethylene («П») coated cables - -15°C or higher for PVC («В») coated cables	
Cable conductor continuous heating temperature	90°C	
Limiting temperature of	short-circuit conductor heating	250°C
	copper screen heating	350°C
	noncombustible short-circuit conductor heating	400°C (short-circuit current duration up to 5s)
Conductor continuous heating temperature for emergency overload conditions	< 130°C, can be exposed to overload conditions for no more than 8 hours a day and no more than 1000 hours during the entire service life	
DC conductor resistance	Meets the requirements of GOST 22483-77 standard	
Climatic category	“YXJT” and “Y” indexes, with the categories of placement 1 and 2 (according to GOST 15150-69 standard), including laying in the ground and water	
Cable bend radius (D –outside cable diameter)	- 15 D or more for single core cables (7,5 D is allowed if a specific template is applied) - 10 D or more for three core cables	
Guaranteed service life	5 years	
Cable service life	At least 30 years	

Table 4 Calculated capacitance values for cables with round-shaped conductors (for reference use)

Nominal conductor cross-section, mm ²	Cable capacitance for 1 km of cable, mF		
	Cable rated voltage, kV		
	10	20	35
35	0,22	-	-
50	0,25	0,17	0,14
70	0,29	0,19	0,16
95	0,32	0,21	0,18
120	0,35	0,23	0,19
150	0,38	0,26	0,20
185	0,42	0,27	0,22
240	0,46	0,29	0,24
300	0,51	0,32	0,26
400	0,57	0,35	0,29
500	0,63	0,39	0,32
630	0,70	0,43	0,35
800	0,77	0,49	0,40
1000	0,87	0,57	0,39

Cable admissible current

Table 5 Continuous admissible current for single core and three core cables with load factor of K=1.0 and ambient temperature of +25°C when laid in the air, and +15°C when laid in the ground

Nominal conductor cross-section, mm ²	Current (A) values for 10 kV / 20kV and 35 kV cables when laid in the ground in the air					
	Single core cables				Three core cables	
	with copper conductor		with aluminum conductor		with copper conductors	with aluminum conductors
	flat formation	trefoil formation	flat formation	trefoil formation		
35	175 / - 217 / -	181 / - 192 / -	153 / - 189 / -	145 / - 150 / -	175 / - 173 / -	136 / - 134 / -
50	250 / 230 290 / 290	225 / 225 240 / 250	195 / 185 225 / 225	170 / 175 185 / 190	207 / 207 206 / 215	156 / 161 159 / 163
70	310 / 290 360 / 365	275 / 270 300 / 310	240 / 225 280 / 280	210 / 215 230 / 240	253 / 248 255 / 264	193 / 199 196 / 204
95	336 / 336 448 / 446	326 / 326 387 / 389	263 / 263 349 / 348	253 / 253 300 / 301	300 / 300 329 / 331	233 / 233 255 / 256
120	380 / 380 515 / 513	370 / 371 445 / 448	298 / 298 403 / 402	288 / 288 346 / 348	340 / 341 374 / 376	265 / 265 291 / 292
150	416 / 417 574 / 573	413 / 413 503 / 507	329 / 330 452 / 451	322 / 322 392 / 394	384 / 384 423 / 426	300 / 300 329 / 331
185	466 / 466 654 / 652	466 / 466 577 / 580	371 / 371 518 / 516	364 / 365 450 / 452	433 / 433 479 / 481	338 / 339 374 / 375
240	531 / 532 762 / 760	537 / 538 677 / 680	426 / 426 607 / 605	422 / 422 531 / 533	500 / 500 562 / 564	392 / 392 441 / 442
300	590 / 582 865 / 863	604 / 605 776 / 779	477 / 477 693 / 690	476 / 476 609 / 611	563 / 563 630 / 630	456 / 456 490 / 490
400	633 / 635 959 / 957	677 / 678 891 / 895	525 / 526 787 / 783	541 / 541 710 / 712		
500	697 / 700 1081 / 1081	759 / 762 1025 / 1027	287 / 588 900 / 897	614 / 615 822 / 824		
630	762 / 766 1213 / 1213	848 / 851 1166 / 1172	653 / 655 1026 / 1023	695 / 699 954 / 953		
800	825 / 830 1349 / 1351	933 / 942 1319 / 1325	719 / 722 1161 / 1159	780 / 782 1094 / 1096		
1000	900 / 906 1423 / 1430	1003 / 1007 1411 / 1415	800 / 805 1220 / 1230	845 / 850 1180 / 1186		

- Admissible overload currents are calculated as follows: when laid in the ground – multiply current values, represented in Table 5, by 1.17; when laid in the air multiply the values by 1.2
- Admissible currents for cables laid in pipes of more than 10m: for single core cables laid in separate pipes – multiply current values, represented in Table 5, by 0.94; for three single core cables laid in one pipe multiply the values by 0.9
- Admissible currents for several cables laid in the ground, including those laid in pipes, should be decreased through multiplying current values, represented in Table 5, by coefficients from Table 6
- Admissible one-second short-circuit currents in cable copper screens should not exceed the values represented in Table 7 and Table 8. For short-circuit current duration that differs from 1 second, please, multiply the value from the table by K coefficient that is to be calculated as follows: $K = \frac{1}{\sqrt{t}}$, where t is short-circuit current duration.

Table 6

Distance between cables, mm	Coefficients depending on cables quantity					
	1	2	3	4	5	6
100	1,0	0,90	0,85	0,80	0,78	0,75
200	1,0	0,92	0,87	0,84	0,82	0,81
300	1,0	0,93	0,90	0,87	0,86	0,85

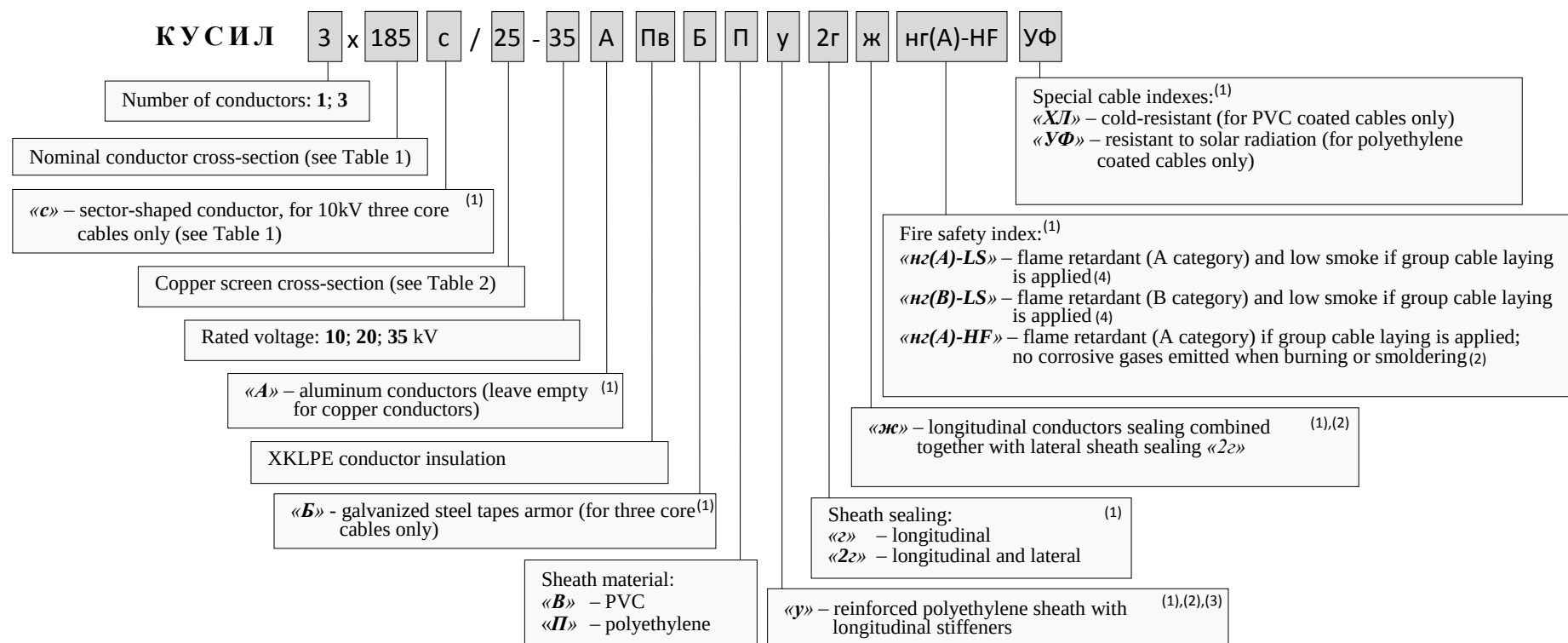
Table 8 Admissible one-second short-circuit currents in cable copper screens

Copper screen nominal cross-section, mm ²	One-second short-circuit current, kA, max
16	3,1
25	4,8
35	6,7
50	9,6
70	13,4

Table 7 Admissible one-second short-circuit currents (conductor temperature before short-circuiting: 90°C, max short-circuit conductor temperature: 250°C)

Nominal conductor cross-section, mm ²	Admissible one-second short-circuit current, kA	
	with copper conductor	with aluminum conductor
35	5,0	3,3
50	7,15	4,7
70	10,0	6,6
95	13,6	8,9
120	17,2	11,2
150	21,5	14,2
185	26,5	17,5
240	34,3	22,7
300	42,9	28,2
400	57,2	37,6
500	71,5	47,0
630	90,1	59,2
800	114,4	75,2
1000	142,9	94,5

Cable marking when ordering:



- ¹ – optional field
- ² – for polyethylene (П) coated cables only
- ³ – for unarmored cables only
- ⁴ – for PVC (Б) coated cables only

An example of cable marking when ordering

35 kV power cable featuring longitudinal sealing of three round-shaped copper conductors with cross-section of 150 mm², including reinforced polyethylene sheath with longitudinal and later sealing and copper screen with cross-section of 25 mm²:

«Кабель КУСИЛ 3х150/25-35 ПвПу2гж 3500-024-76960731-2012»