

CABLE PRODUCTS

KUSIL TS 3500-013-76960731-2008 is a universal power cable designed to be used as power, control, installation, or lighting cable. The product series include flame retardant “НГ” “НГ-LS”, “НГ-HF”, fire-resistant “НГ-FR”, “НГ-FRLS” and “НГ-FRHF”, UV- resistant “УФ”, oil-petrol-resistant, steel-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, as well as for installation of power and control circuits, alarms, and lighting with nominal AC voltages of 0.66; 1 and 3 kV and nominal frequency of 50 Hz. Cables meet all the requirements of GOST R 53769-2010 "Power cables with plastic insulation for rated voltage of 0.66; 1 and 3 kV. OTU" and IEC 60502-1:2004 international standard for power cables.

The cables can be installed both indoors and outdoors, in channels, tunnels, underground (cable trenches), and places exposed to stray currents. “УФ” marked cables are UV-resistant cables that can be installed in the open air with no additional protection from solar radiation. The cables can be used in 0, 1, and 2 hazardous area zones (regarding the requirements of IEC 60079-14-2008) and plant safety systems.

Cable design features, materials and types

KUSIL cables are designed according to GOST 22483-77 (Table 3.4) and may include 1 or 2 class single or stranded conductor. All single-core cables and multi-core cables with nominal cross-section of up to 16 mm² (cables with cross-section of up to 50mm² may also be included) have round conductors. Double-core cables with cross-section of 25 mm² and more have segment-shaped conductors, while 3, 4 and 5-core cables have sector-shaped conductors. 4-core cables with a nominal cross-section of 6mm² or more may also have a smaller conductor (earth or neutral conductor) according to Table 5.

All conductors have numeral or color marking. The insulation color of multi-core cables is specified in Table 6. The insulation of single-core cables can be of any color. Earth conductors (PE) are green-yellow, neutral conductors (N) are blue (cyan). The cable comes with a black sheath in case you did not specify a different sheath color when ordering.

Cables that are marked with "B" material index are made of flexible PVC. “НГ” material index is put on cables made of flame-resistant PVC composition, while the “НГ-LS” material index means the cable has a flame-retardant low-smoke sheath. Cables marked with “П” material index are made of polymer compositions that do not contain halogens (“НГ-HF”). Those cable insulations marked with “Пс” material index are made of XLPE, letting the cable to withstand high load currents and have better insulation properties. Cables marked with “Т” material index have insulation and sheath made of thermoplastic elastomer, so these cables have an increased durability and extended range of operating temperature. We also manufacture fire resistant (“FR”) cables.

A shared screen made of copper tape and/or a copper wire braid for each separate core can be applied to any cable, or it may not be applied at all. A water swelling tape is applied over the cable core in order to prevent the longitudinal water propagation. Armored cables include galvanized steel strips (“Б”) or galvanized wires (“К”), which form an armor layer right under the cable's outer sheath.

All cables have a round cross-section and a substrate, which is obtained by extrusion, making them fully compatible with requirements of art.9.3.1 IEC 60079-14-2008 and applicable in explosion hazardous zones.

Fire-resistant cable (“НГ-FR”, “НГ-FRLS” and “НГ-FRHF” indexes)

Conductor insulation of fire-resistant cables (“НГ-FR”, “НГ-FRLS” and “НГ-FRHF” indexes) is covered with two additional layers of mica tape. Cable maintains working efficiency for at least 90 minutes even if being exposed to an open fire and a minimum temperature of +750° C. This feature will help to avoid the emergency power cut-off in case of a fire. Fire-resistant cable requirements for alarm, emergency lighting, and smoke exhaust systems, as well as for fire pumps and elevators circuits, etc. are described in GOST R 53315-2009 and "Technical Regulations for Fire Safety Requirements" of 22 July 2008. No. 123-F3.

Manufacture of custom cable

- with conductors of 3, 4 or 5 flexibility class, meeting the requirements of GOST 22483-77;
- any combination of conductor insulation colors;
- with colored outer sheath (red, yellow or any other color);
- composite cable;
- with tinned copper wire screen;
- fire-resistant cables that maintain their working efficiency for at least 180 minutes even if being exposed to an open fire and a temperature of up to +1100° C;
- combined cable - single cable simultaneously transmits electrical energy (through electric conductor) and optical signals (through optical fiber).



- Cables meet all the requirements of IEC 60502-1:2004 international standard and GOST R 53769-2010 "Power cables with plastic insulation for rated voltage of 0.66; 1 and 3 kV. OTU"
- “Пс” XLPE cable withstands high-frequency current and short-circuit current of long duration
- Cable conductors with individual and collective screen
- Cables have round cross-section
- Cross-section varying from 1,0 mm² to 500mm², and a number of conductors varying from 1 to 61
- Cable marked with «FR» index is a fire-resistant cable
- New materials are applied to provide the best fire safety characteristics for “НГ-LS” and “НГ-HF” cable
- Cable marked with special “М” index is resistant to oil-and-petrol
- Cable marked with “УФ” index is resistant to solar radiation
- Cable moisture protection technology is applied
- Wide range of applications, including all hazardous areas
- Wide operating temperature range varying from -60° to +200°C
- Combined cable option - copper wires and optical fibers put together in a single cable

Table 1 Insulation and sheath material, cable fire safety rating

Insulation and sheath material	Fire safety rating	Cable type (according to GOST R 53315-2009 Fire Safety Requirements)	Marking example
B	(without index)	flame retardant cable if single cable laying is applicable	КУСИЛ 3х25ок В – 0,66
	нг	flame retardant cable if group cable laying is applicable	КУСИЛ нг 3х120мс+1х70мс(Н) ВБ – 1
	нг-LS	flame retardant and low smoke cable if group cable laying is applicable	КУСИЛ нг-LS 5х10ок ВБ – 0,66
	нг-FRLS	flame retardant, fire-resistant and low smoke cable if group cable laying is applicable	КУСИЛ нг-FRLS 4х70мс В – 1
II	нг-HF	flame retardant and halogen-free cable if group cable laying is applicable (no corrosive gaseous products are emitted under combustion or smoldering)	КУСИЛ нг-HF 4х50мс II-УФ – 1
	нг-FRHF	flame retardant, fire-resistant and halogen-free cable if group cable laying is applicable (no corrosive gaseous products are emitted under combustion or smoldering)	КУСИЛ нг-FRHF 5х95мс II – 1
IIc	нг-LS	flame retardant and low smoke cable if group cable laying is applicable	КУСИЛ нг-LS 4х70мс IIc – 1
	нг-FRLS	flame retardant, fire-resistant and low smoke cable if group cable laying is applicable	КУСИЛ нг-FRLS 5х95мс IIc – 1
	нг-HF	flame retardant and halogen-free cable if group cable laying is applicable (no corrosive gaseous products are emitted under combustion or smoldering)	КУСИЛ нг-HF 4х185мс IIc-УФ – 1
	нг-FRHF	flame retardant, fire-resistant and halogen-free cable if group cable laying is applicable (no corrosive gaseous products are emitted under combustion or smoldering)	КУСИЛ нг-FRHF 5х95мс IIc – 1
T	нг	flame retardant cable if group cable laying is applicable	КУСИЛ нг 5х2,5ок ТЭ – 0,66
	нг-FR	flame retardant and fire-resistant cable if group cable laying is applicable	КУСИЛ нг-FR 4х70мс Т – Т – 1

Cable characteristics

Table 2

Operating temperature	- from –50° to +70°C - from –60° to +70°C for cables marked with “XL” index - from –60° to +125°C for cables marked with “T” material index - from –40° to +200°C for cables marked with “T-T” material index
Minimum cable installation temperature	- equal to or higher than –15°C - equal to or higher than –30°C for cables marked with «XL» and «T» index
Rated voltage	AC with a frequency of up to 50 Hz 0,66 kV; 1 kV; 3 kV
DC resistance of conductors	Meets the requirements of GOST 22483-77 standard
Insulation resistance during operation, t = +20°C	- 10 MΩ·km or more for cables marked with “PVC”, and “P” material index - 50 MΩ·km or more for cables marked with “T” material index - 150 MΩ·km or more for cables marked with “XLPS” material index
Climatic category	CR and PVC, with the categories of placement 1 and 5 (according to GOST 15150-69 standard). The cables can be used in any climatic region, including tropics.
Resistance to longitudinal water propagation under the cable sheath	Water and moisture is completely blocked
Cable bend radius (D –outside diameter of cable)	- 10 D or more for single-core cables - 7,5 D or more for multi-core cables
Resistance to mold	Mold resistance factor – up to 2
Fire-resistance (for “FR” cables)	can be exposed to an open fire and a temperature of +750° C and higher for at least 90 minutes
Cable service life	- no less than 30 years - no less than 25 years for cables marked with “T” material index

Nominal conductor cross-section

Table 3 Nominal cross-section of conductor depending on the number of cable conductors and cable rated voltage

Number of conductors	Rated voltage, кВ		
	0,66	1	3
	Nominal conductor cross-section, mm ²		
1	1,0 – 50	1,0 - 500	10 - 500
2 - 5		1,0 - 240	10 - 240
4 - 61	1,0 – 6	-	-

Table 4 Nominal cross-section of conductor depending on the conductor size and type

Conductor type	Nominal conductor cross-section, mm ²	
	round-shaped	sector-shaped
Solid	1,0-50	-
Stranded	1,0-500	25-240

Table 5 Nominal cross-section of neutral conductor (N) and earth conductor (PE) for four-conductor cable

Conductor	Nominal conductor cross-section area, mm ²										
Main	10	16	25	35	50	70	95	120	150	185	240
Neutral (N) or Earth (PE)	6	10	16	16	25	35	50	70	70	95	120

Table 6 Conductor insulation color for stranded conductor cable

Number of conductors, pcs.	Conductor insulation color				
	Conductor sequence number				
	1	2	3	4	5
2	grey*	blue	-	-	-
3	grey *	brown	black	-	-
	grey *	blue	green-yellow	-	-
4	grey *	brown	black	blue	-
	grey *	brown	black	green-yellow **	-
5	grey *	brown	black	blue	green-yellow

* - or natural colored; ** - agreed with a customer

Cable electrical specification

Table 7 Cable current carrying capacity

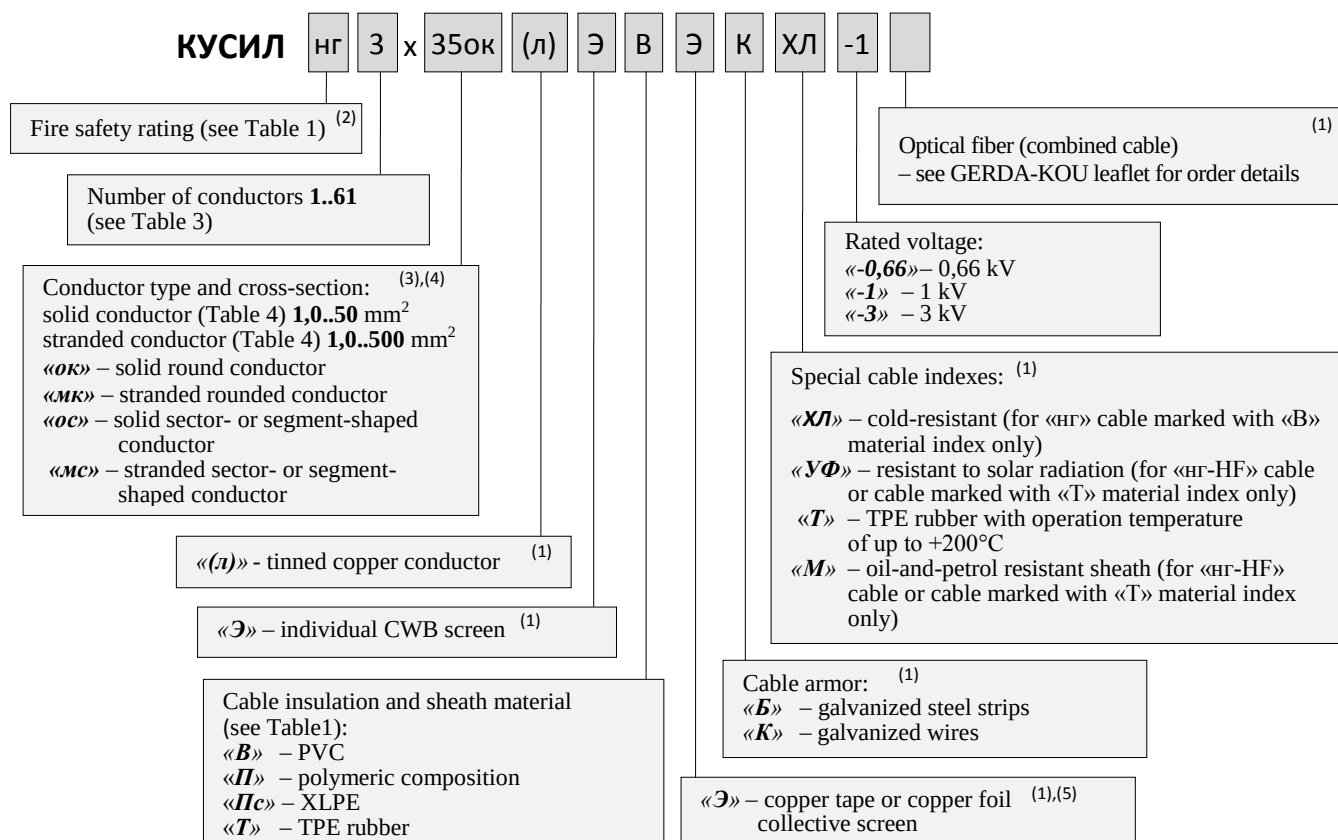
Nominal conductor cross-section area, mm²	Current carrying capacity, A cables with insulation and sheath material marking applied «B», «П», «Т» / «Пс»						Short-circuit carrying capacity (calculated for one second duration), kA***	
	solid conductor				stranded conductor**		for «B», «П», «Т» cable types	for «Пс» cable type, and all types of «FR» cable
	direct current		alternating current*		alternating current			
	open air	underground	open air	underground	open air	underground		
1	17 / 20	24 / 27	14 / 17	18 / 20	13 / 15	16 / 18	0,11	0,14
1,5	29 / 35	41 / 48	22 / 28	30 / 33	21 / 25	27 / 31	0,17	0,21
2,5	37 / 46	55 / 63	30 / 36	39 / 42	27 / 34	36 / 40	0,27	0,34
4	50 / 60	71 / 82	39 / 47	50 / 54	36 / 45	47 / 52	0,43	0,54
6	63 / 76	90 / 102	50 / 59	62 / 67	46 / 56	59 / 64	0,65	0,81
10	86 / 105	124 / 136	68 / 82	83 / 89	63 / 78	79 / 86	1,09	1,36
16	113 / 139	159 / 175	89 / 108	107 / 115	84 / 104	102 / 112	1,74	2,16
25	153 / 188	207 / 228	121 / 146	137 / 147	112 / 141	133 / 144	2,78	3,46
35	187 / 230	249 / 274	147 / 180	163 / 176	137 / 172	158 / 173	3,86	4,8
50	227 / 281	295 / 325	179 / 220	194 / 208	167 / 209	187 / 205	5,23	6,5
70	286 / 356	364 / 399	226 / 279	237 / 255	211 / 265	231 / 253	7,54	9,38
95	354 / 440	436 / 478	280 / 345	285 / 306	261 / 327	279 / 304	10,48	13,03
120	413 / 514	499 / 546	326 / 403	324 / 348	302 / 381	317 / 347	13,21	16,43
150	473 / 591	561 / 614	373 / 464	364 / 392	346 / 437	358 / 391	16,3	20,26
185	547 / 685	637 / 695	431 / 538	442 / 443	397 / 504	405 / 442	20,39	25,35
240	655 / 812	743 / 821	512 / 641	477 / 515	472 / 598	471 / 515	26,8	33,32
300	760 / 956	845 / 924	591 / 739	539 / 501	- / -	- / -	33,49	41,64
400	894 / 1124	971 / 1060	685 / 860	612 / 661	- / -	- / -	39,6	55,2
500	1054 / 1328	1121 / 1223	792 / 997	690 / 746	- / -	- / -	49,5	69

* - laying of cables in trefoil formation

** - value of current carrying capacity for four- and five- conductor cables should be multiplied by 0.93

*** - 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 by the following formula: $K = \frac{1}{\sqrt{r}}$, where r is short-circuit current duration (up to 5 seconds).

Cable marking when ordering:



- ¹ – The field is optional and filled if necessary
- ² – “А” category may be specified in brackets right after “нг” index when marking a group cable laying (e.g. КУСИЛ нг(А)-LS 5x10ок ВБ – 0,66)
- ³ – Nominal conductor cross-section list: 1;1,5;2,5;4;6;10;16;25;35;50;70;95;120;150;185;240;300;400;500 mm²
- ⁴ – Those cables having earth or neutral conductor included should have a corresponding additional “PE” or “N” index put right after the conductor cross-section number (e.g. КУСИЛ нг 3x120мс + 1x70мс(N) ВБ – 1)
- ⁵ – Common screen is required for any unarmored cable with rated voltage of 3 kV

An example of cable marking when ordering

«Кабель КУСИЛ 3х25ок В – 0,66 ТУ 3500-013-76960731-2008»

– the cable consists of three solid round-shaped conductors with a nominal cross-section of 25 mm², with PVC insulation and sheath applied, and is designed for rated voltage of 0,66 kV;

«Кабель КУСИЛ FR-LS 4х70мс ВЭ – 1 ТУ 3500-013-76960731-2008»

– the cable consists of four stranded sector-shaped conductors with a nominal cross-section of 70 mm², with flame retardant and low smoke PVC insulation and sheath applied, includes copper tape collective screen layer, and is designed for rated voltage of 1 kV;

«Кабель КУСИЛ FR-FRHF 5х95мс П-М – 1 ТУ 3500-013-76960731-2008»

– the cable is fire-resistant and consists of five stranded sector-shaped conductors with a nominal cross-section of 95 mm², with insulation and sheath made of halogen-free polymeric composition, and is designed for rated voltage of 1 kV. Cable sheath is oil-and-petrol resistant.