

# CABLE PRODUCTS

## Universal installation twisted-pair cables ГЕРДА-К (В, П, Пс) ТУ 3581-019-76960731-2010

LLC "Donkabel" - quality management system certified according to ISO 9001

ГЕРДА-К (В, П, Пс) cables are designed for data transmission in the frequency range up to 4 MHz in measuring, control and regulating equipment, as well as for hardwiring inter-device connections in electrical instruments and devices operating at voltage up to 500V AC and a frequency of 50 or 60 Hz or voltage up to 750V DC. Cables can be used to form digital data buses, to connect sensors with digital frequency-modulated signal, via RS-485, RS-482, RS-422 interface, in the Foundation Fieldbus, PROFIBUS, HART, and other systems that require the use of "twisted pair" as a data transmission/reception channel. Cables can be installed in hazardous areas of all classes (conforming to the requirements of GOST IEC 60079-14-2013) and outdoors (conforming to the requirements of GOST P 50571.5.52-2011). Cables can be used in underground facilities.

### Cable Design

ГЕРДА-К (В, П, Пс) cables are manufactured with tinned conductors (by default) or non-tinned multiwire stranded conductors ("М") classified not lower than the 3rd class; for cross-section of  $0.35\text{mm}^2$  - not lower than the 4th class.

The conductor's nominal cross-section and the number of pairs is indicated in Table 2. Custom cables with a different number of pairs and a different nominal cross-section of the conductor, as well as with combined cross-section, can also be manufactured if required.

Two mica tapes are wrapped around current-carrying conductors of fire-resistant cables ("FR"), preventing conductors from touching each other in case of fire.

Possible conductor insulation materials:

- PVC plastic "В",
- halogen-free polymer composition "П",
- cross-linked polyethylene "Пс".

Conductors can have numerical or color marking.

Conductors are twisted into pairs with a strand pitch of no more than 60mm; fire-resistant cables with cross-section of  $1.5\text{mm}^2$  and  $2.5\text{mm}^2$  have a slightly larger strand pitch - to make the cable rounder and smaller in diameter.

Each pair of conductors is separately screened:

- "э" - braid of tinned copper wires,
- "эм" - braid of copper wires,
- "эа" - winding of aluminum foil tape with a stranded tinned copper drain wire,
- "эмф" - winding of copper foil tape with a stranded tinned copper drain wire.

Each pair has an individual screen covered with an insulating polymer film that ensures that there is no electrical link between adjacent screens. Extruded polymer layer ("Б") can be used instead of a polymer film, thus reliably isolating pairs of screens.

The conductor pairs are twisted to form the core. The core is covered with a water-blocking tape to prevent the longitudinal propagation of moisture if the outer sheath is damaged.

A collective screen is added on top of the water-blocking tape. Collective screen types:

- braid of copper wires (by default),
- "Л" - braid of copper tinned wires,



### Technical Specifications

(see full specifications in Table 1)



Current-carrying tinned copper or copper conductors can have the following cross-sections:  $0.35\text{mm}^2$ ;  $0.5\text{mm}^2$ ;  $0.75\text{mm}^2$ ;  $1.00\text{mm}^2$ ;  $1.2\text{mm}^2$ ;  $1.5\text{mm}^2$ ;  $2.5\text{mm}^2$



Conductors are twisted into pairs with a strand pitch of no more than 60mm



Cables can have an armor made of:

- zinc-coated steel wires "К"
- zinc-coated steel tapes "Б"

The lowest temperature at which the cable can be installed is  $-40^\circ\text{C}$  for "ЭЛ" cables (Table 1)

Operation temperature ranging from  $-70^\circ$  to  $+200^\circ\text{C}$  (depending on sheath material - Table 4)



Climatic version B with the categories of placement 1-5 (conforming to the requirements of GOST 15150)

Fire-resistant cables ("FR") can be exposed to an open flame for at least 180 minutes (ПО1 of GOST 31565-2012)



Ultraviolet resistant cables ("УФ") are resistant to solar radiation (ultraviolet) during the whole service life. Cables not marked with "УФ" index - at least 2,000 hours.



Water-blocking tape, which protects against spreading of water under the cable sheath, is applied for all kinds of cables



"М" - sheath is resistant to oil, petrol and diesel fuel

"Х" - sheath is resistant to chemically aggressive environments

- "Эа" - winding of aluminum foil tape with a stranded tinned copper drain wire,
- "Эмф" - winding of copper foil tape with a stranded tinned copper drain wire,
- "Эал" - collective screen of Alumoflex with a braid of tinned copper wires on top.

An extruded separation layer is applied over a collective screen, filling gaps between conductors (conforming to the requirements of GOST IEC 60079-14-2013). As a result, the cable becomes circular in cross-section (so it can be used with any type of input), and in case of cable damage, the explosive gaseous mixture cannot get from the explosion-hazard area to explosion-proof area under the sheath. Custom non-circular cables (with no extruded filling) can also be manufactured if required.

Cables can be armored with zinc-coated steel wires ("К") or zinc-coated steel tapes ("Б").

Cable sheath is made of PVC plastic or halogen-free polymer compound (Table 3). Cable sheath color is to be specified when placing the order; if the color is not specified, cables are manufactured in black color.

**Custom cables:**

- «Т» – heat-resistant (up to +120°C),
- «ХЛ» – cold-resistant,
- «ЭХЛ» – resistant to extremely low temperatures; cable installation at a temperature of minus 40°C,
- «УФ» – ultraviolet resistant,
- «Х» – resistant to acid, alkali and environments with a high content of hydrogen sulfide,
- «М» – oil-and-petrol resistant,
- «ЗГ» – sheath is protected against rodents, ants and termites.

**Custom cables manufacturing**

It is possible to order the following types of custom-made cables:

- with a colored sheath (orange, red, yellow, or other color),
- with combined cross-section of conductor pairs,
- combined transmission cables - electrical energy (through conductors) and optical signals (through optical fibers) are transmitted simultaneously.

**Table 1** Technical specifications

Operating voltage	- 500V AC and a frequency of 50 or 60 Hz - up to 750V DC
Electrical resistance of insulation during operation, t = +20°C, at least	- 500 MΩ·km for cables with cross-linked polyolefin insulation - 50 MΩ·km for cables with halogen-free polymer compound insulation - 10 MΩ·km for cables with PVC insulation
Electrical resistance of current-carrying conductors	Conforming to the requirements of GOST 22483-2012. Electrical resistance of current-carrying conductors with nominal cross-section of 1.2mm <sup>2</sup> should be no more than 17.6 Ω/km for tinned conductor and 17.3 Ω/km for non-tinned conductor (at a temperature of +20°C)
Testing of cables under alternating voltage	2000V at a frequency of 50 Hz for 1 minute
Maximum capacity at a frequency of (1.0±0.1) kHz, converted to 1 km length, at a temperature of +20°C, at least	Between adjacent conductors: - 70 nF (cross-section 0.35-0.75mm <sup>2</sup> ) and 100 nF (cross-section 1.0-2.5mm <sup>2</sup> ) for cables with cross-linked polyolefin insulation - 140 nF (cross-section 0.35-0.75mm <sup>2</sup> ) and 180 nF (cross-section 1.0-2.5mm <sup>2</sup> ) for cables with PVC and halogen-free polymer compound insulation Between one arbitrary conductor and another conductor connected to the screen: - 180 nF for cables with cross-linked polyolefin insulation - 300 nF for cables with PVC and halogen-free polymer compound insulation
Maximum inductance of cables at a frequency of (1.0±0.1) kHz, converted to 1 km length, at a temperature of +20°C, at least	0.9 mH
Resistance difference between conductors in a pair	no more than 3%
Operating temperature	from -60° to +70°C for cables with the index "ХЛ" from -70° to +70°C for cables with the index "ЭХЛ" from -50° to +120°C for cables with the index "Т" from -50° to +70°C for other types of cables
The lowest temperature at which the cable should be installed, at least	- minus 40°C for cables with the index "ЭХЛ" - minus 30°C for cables with the index "ХЛ" - minus 15°C for other types of cables
Climatic performance according to GOST 15150-69	"B" with the categories of placement 1-5; cables can be used in any macroclimatic areas, including tropics.
Fire-resistance (for "FR" cables)	can be exposed to an open flame and temperatures of +750° C and higher for at least 180 minutes (ПО1 of GOST 31565-2012)
Resistance to longitudinal water propagation under the cable sheath	completely blocked (a water-blocking tape is used in all cables)
Mold fungi resistance	cables are resistant to mold fungi; mold resistance factor - up to 2
Permissible installation and operating cable bend radii (D - outside cable diameter), at least	- 3D for unarmored cables - 4D for cables with wire armor - 5D for cables with tape armor - 7.5D for "ЗГ" cables
Cable service life, at least	25 years (not limited to the specified service life, but is determined by the technical condition of the cable)
Guaranteed service life	2 years

**Table 2** Nominal conductor cross-section and number of pairs

Nominal conductor cross-section, mm <sup>2</sup>	Number of twisted pairs (x2)
0.35; 0.5; 0.75; 1.0; 1.2; 1.5; 2.5	1x2; 2x2; 3x2; 4x2; 5x2; 6x2; 7x2; 8x2; 9x2; 10x2; 12x2; 14x2; 15x2; 16x2; 19x2; 20x2; 21x2; 24x2; 27x2; 30x2; 37x2; 40x2; 44x2

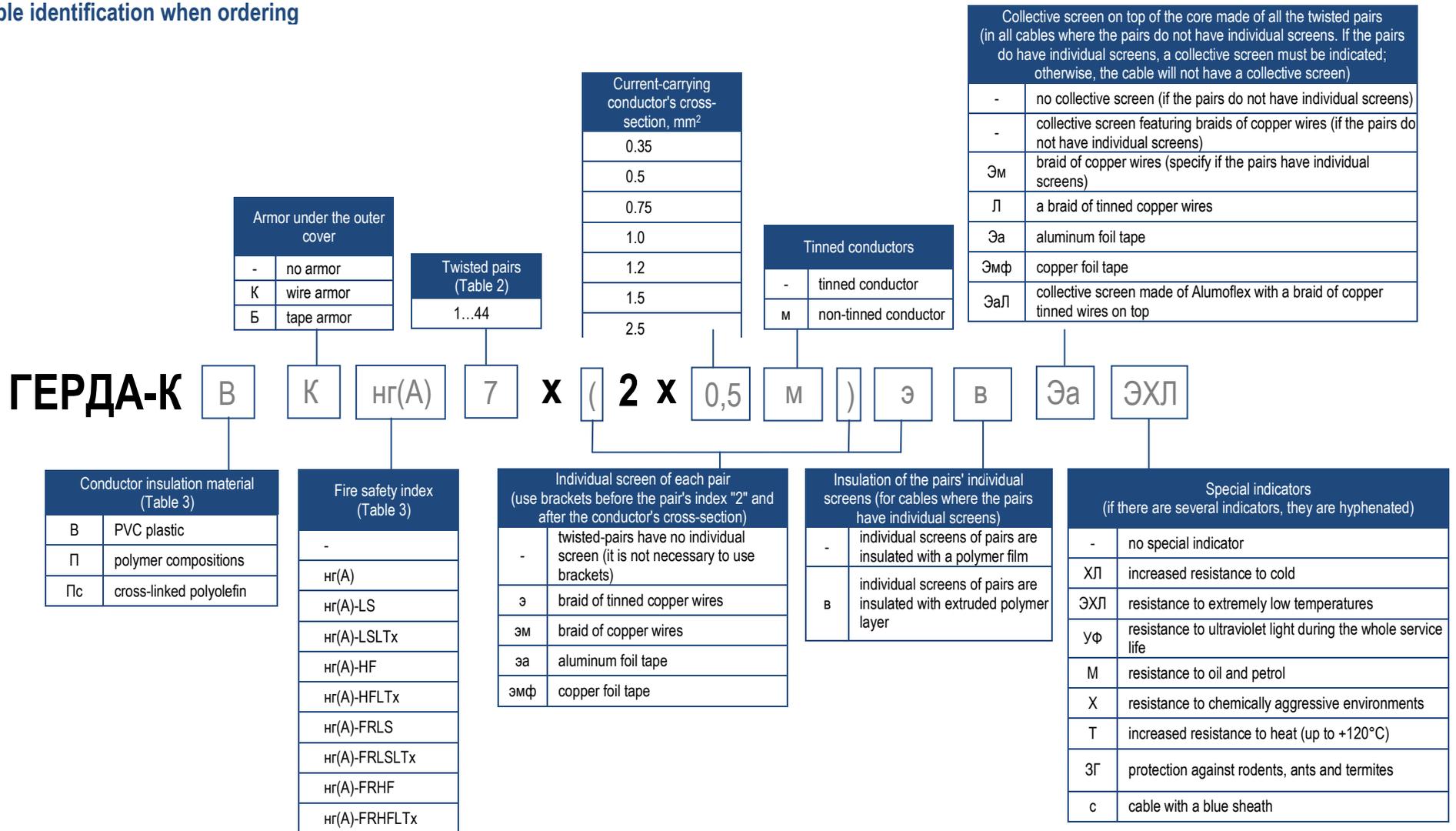
**Table 3** Fire safety index depending on the sheath and insulation material

Sheath material index	Fire safety index	Sheath and insulation material description and type, according to fire safety index (in accordance with GOST 31565-2012)
B	- (no index)	cables with insulation and sheath made of PVC plastic that is flame-retardant during single cable laying
	нг(A)	cables with insulation made of PVC plastic and a low-flammability PVC plastic sheath that is flame-retardant during group cable laying
	нг(A)-LS	cables with insulation and sheath made of low-flammability PVC plastic that is flame-retardant during group cable laying, with low smoke and gas emission
	нг(A)-LSLTx	cables with insulation and sheath made of low-flammability PVC plastic that is flame-retardant during group cable laying, with low smoke and gas emission and low toxicity of combustion products
	нг(A)-FRLS	fire-resistant cables with insulation and sheath made of low-flammability PVC plastic that is flame-retardant during group cable laying, with low smoke and gas emission
	нг(A)-FRLSLTx	fire-resistant cables with insulation and sheath made of low-flammability PVC plastic that is flame-retardant during group cable laying, with low smoke and gas emission and low toxicity of combustion products
П	нг(A)-HF	cables with insulation and sheath made of halogen-free polymer compounds that are flame-retardant during group cable laying; no corrosive gaseous products are emitted under combustion or smoldering
	нг(A)-HFLTx	cables with insulation and sheath made of halogen-free polymer compounds that are flame-retardant during group cable laying; no corrosive gaseous products are emitted under combustion or smoldering; low toxicity of combustion products
	нг(A)-FRHF	fire-resistant cables with insulation and sheath made of halogen-free polymer compounds that are flame-retardant during group cable laying; no corrosive gaseous products are emitted under combustion or smoldering
	нг(A)-FRHFLTx	fire-resistant cables with insulation and sheath made of halogen-free polymer compounds that are flame-retardant during group cable laying; no corrosive gaseous products are emitted under combustion or smoldering; low toxicity of combustion products
Пс	нг(A)-LS	cables with insulation made of cross-linked polyolefin and a low-flammability PVC plastic sheath that is flame-retardant during group cable laying, with low smoke and gas emission
	нг(A)-FRLS	fire-resistant cables with insulation made of cross-linked polyolefin and a low-flammability PVC plastic sheath that is flame-retardant during group cable laying, with low smoke and gas emission
	нг(A)-HF	cables with insulation made of cross-linked polyolefin and a halogen-free polymer compound sheath that is flame-retardant during group cable laying; no corrosive gaseous products are emitted under combustion or smoldering
	нг(A)-FRHF	fire-resistant cables with insulation made of cross-linked polyolefin and a halogen-free polymer compound sheath that is flame-retardant during group cable laying; no corrosive gaseous products are emitted under combustion or smoldering

**Table 4** Attenuation coefficient and wave impedance at a temperature of 20°C

Frequency, kHz	Attenuation coefficient, dB/100 m, no more than		Wave impedance, Ohm	
	Cables with insulation made of cross-linked polyolefin	Other types of cables	Cables with insulation made of cross-linked polyolefin	Other types of cables
1	0.15	1.25	-	-
39	0.50	4.49	120±15	80±20
1 000	2.60	18.61	100±15	
4 000	3.50	28.23		

## Cable identification when ordering



An example of cable identification when ordering	Description
<b>ГЕРДА-КВК нг(А) 7х(2х0,5)э ХЛ</b> TY 3581-019-76960731-2010	Twisted-pair installation cable featuring seven pairs of tinned copper conductors with a cross-section of 0.5 mm <sup>2</sup> shielded with tinned copper wire braids; no collective screen, insulation made of PVC plastic and a low-flammability PVC plastic sheath. The armor under the outer cover is made of zinc-coated steel wires. The cable is cold-resistant - operating temperature ranges from -60° to +70°C; the lowest temperature at which the cable should be installed is minus 30°C
<b>ГЕРДА-КПсК нг(А)-FRLS 10х2х1,0М</b> TY 3581-019-76960731-2010	Fire-resistant twisted-pair installation cable with insulation made of cross-linked polyolefin, ten pairs of copper conductors with a cross-section of 1.0mm <sup>2</sup> , collective screen featuring copper wires, wire armor, in a low-flammability PVC plastic sheath; operating temperature ranges from -50° to +70°C; the lowest temperature at which the cable should be installed is minus 15°C
<b>ГЕРДА-КП нг(А)-HF 19х(2х1,5)эм Эм ЭХЛ</b> TY 3581-019-76960731-2010	Twisted-pair installation cable featuring nineteen pairs of tinned copper conductors with a nominal cross-section of 1.5 mm <sup>2</sup> shielded with copper wire braids; insulation and sheath are made of halogen-free polymer compounds, and collective screen features a braid of copper wires. The cable is resistant to extremely low temperatures - operating temperature ranges from -70° to +70°C; the lowest temperature at which the cable should be installed is minus 40°C