

CABLE PRODUCTS

TS 3581-010-76960731-2008 KUIN universal instrument cable is designed to be used as instrumentation, control, installation, and measurement cable. The product series include flame retardant "нр", "нр-LS", "нр-HF", fire-resistant "нр-FR", "нр-FRLS" and "нр-FRHF", UV-resistant "УФ", sunlight-resistant, oil-petrol-resistant, armored and unarmored cables

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

KUIN cables are designed to be used in control, monitoring and alarm circuits, building digital databases and instrument interconnections, and can also be applied as sensing wires for resistance thermometers (twisted "pair", "triple" and "quad" cables for 2, 3 and 4-wire connection circuit). The cables are designed for fixed and mobile installations, indoors and outdoors if protected from direct exposure to solar radiation, on the shelves, in trays, chests, ducts, tunnels, earth (trenches), and areas exposed to ground currents. "УФ" marked cables are UV-resistant cables that can be installed outdoors without solar radiation protection. The cables can be used in 0, 1, 2 hazardous zones (in accordance with IEC 60079-14-2008 requirements), as well as in the nuclear power plant safety systems.

Cable design features, materials and types

KUIN cables insulation and sheath marked with "B", "П", "Пс", and "Т" material indexes are available with Class 3 and Class 4 stranded copper conductors respectively. Cables marked with "B" material index are made of PVC, while "нр" material index stands for flame-retardant PVC composition used as a cable material, and "нр-LS" material index means the cable material is flame-retardant and low-smoke. Cables marked with "П" material index have insulation and sheath made of polymer compositions and can also be halogen free ("нр-HF"). Those cables marked with "Пс" material index are made of XLPE and fully meet the "RS" standards for wave resistance (120 ohms). Cables marked with "Т" material index have sheath made of thermoplastic elastomer, so the cables have the increased durability and extended range of operating temperature. All cables can also be covered with fire resistant ("FR") sheath.

We offer layered and unit-type cables (twisted "pair", "triple" and "quad" cables). Cables can also feature a shared and/or a separate screen layer for each twisted pair made of braided copper wire or foil wrap with a drain wire, or may have no screen layer applied at all.

A water swelling tape is applied over the cable core in order to prevent the longitudinal water propagation. 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 as a result.



- Copper stranded (Class 3 or Class 4) conductor; twisted pairs, triples, quad; color or digit conductor marking applied
- Each separate twisted pair (triple, quad) can be covered with separate or collective screen layer
- Conductor cross section varying from 0,35mm² to 4mm²; number of conductors - from 1 to 61; number of twisted pairs - from 1 to 44, number of twisted triples - from 1 to 24, number of twisted quads from 1 to 14
- Wide operating temperature range varying from -60° to +200°C
- Cable marked with special "M" index is resistant to oil-and-petrol
- Cable marked with «FR» index is a fire-resistant cable
- resistant to oil-and-petrol
- Cable marked with "УФ" index is resistant to solar radiation
- New materials are applied for "нр-LS" and "нр-HF" cable
- Cable moisture protection technology is applied
- Wide range of applications, including all hazardous areas
- Combined cable option - copper wires and optical fibers put together in a single cable

Cable marking when ordering:

КУИН ***** **x** ***** **Э** ***** **Э** ***** ***** *****

KUIN universal instrument copper-conductor cable

Fire safety rating *
(see Table 1)

The following values should be added to the number of twisted conductors (pair, triple, quad):

«x2» – twisted pair
«x3» – twisted triple
«x4» – twisted quad

See Table 2 for all possible combinations.

Conductor cross-section (Table 2)
0,35..4 mm²

«Т» - tinned conductor*

Twisted «pair» («triple», «quad») single screen layer*:

«Э» – foil wrap
«Эм» – copper wires
«Эл» – tinned copper wires

Cable sheath and insulation material
(see Table 1):

«B» – PVC
«П» – polymeric composition
«Пс» – XLPE
«Т» – TPE rubber

* – optional fields

* Optical fiber (composite cable) - see separate leaflet for order details

Special cable indexes*:

«ХЛ» – cold-resistant
(for «нр» cable marked with «B» material index only)
«УФ» – resistant to solar radiation
(for «нр-HF» cable or cable marked with «Т» material index only)
«Т» – TPE rubber with operation temperature of up to +200°C
«М» – oil-and-petrol resistant sheath
(for «нр-HF» cable or cable marked with «Т» material index only)
«с» – blue cable sheath

Cable armor applied under outer sheath*:

«К» – wire armor
«Б» – tape armor

Collective screen applied over conductor*:

«Э» – foil wrap
«Эм» – copper wires
«Эл» – tinned copper wires

An example of cable marking when ordering: «Кабель КУИН нр 10х3х0,75 ВЭ-ХЛ ТУ 3581-010-76960731-2008»

– the cable features ten unarmored twisted triples of copper conductors with a cross-section of 0.75 mm² covered with a collective foil wrap screen layer, including flame retardant (if group cable laying is applied) insulation and cold resistant (operating temperature ranging from -60° to +80°C) sheath made of PVC plastics.

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2010-12-14 Revised

Table 1

Sheath and insulation material index	Fire safety index	Sheath and insulation material	Marking example
B	– (no index)	insulation and sheath material - polyvinylchloride (PVC) plastic compound	КУИН 3х2х1,0 В
	нг	insulation material – PVC compounds sheath material - flame retardant PVC compound	КУИН нг 16х1,0 ЭВК
	нг-LS	insulation and sheath material – flame retardant and low smoke PVC compound	КУИН нг-LS 6х3х2,5 ВЭ
	нг-FRLS	insulation and sheath material – flame retardant and low smoke PVC compound. Fire-resistant cable	КУИН нг-FRLS 5х3х2,5 В
II	нг-HF	insulation and sheath material – halogen-free polymer compound	КУИН нг-HF 2х2х0,5ПЭ-М
	нг-FRHF	insulation and sheath material – halogen-free polymer compound. Fire-resistant cable	КУИН нг-FRHF 8х3х1,5 II
Пс	нг-LS	insulation material – XLPE sheath material - flame retardant PVC compound	КУИН нг-LS 3х2х0,5 Пс
	нг-FRLS	insulation material – XLPE sheath material - flame retardant and low smoke PVC compound. Fire-resistant cable	КУИН нг-FRLS 5х1,2 Пс
	нг-HF	insulation material – XLPE sheath material - halogen-free polymer compound	КУИН нг-HF 2х2х0,5Пс-УФ
	нг-FRHF	insulation material – XLPE sheath material - halogen-free polymer compound. Fire-resistant cable	КУИН нг-FRHF 8х3х1,5 Пс
T	нг	insulation and sheath material- flame retardant TPE rubber	КУИН нг 6х3х1,5 ЭТЭ-Т-М
	нг-FR	insulation and sheath material- flame retardant TPE rubber. Fire-resistant cable	КУИН нг-FR 5х2х1,0 Т

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

Custom cables can be manufactured:

- with colored outer sheath (red, yellow or any other color);
- with different conductors cross-section ("pairs", "triples", "quads");
- as combined cable - single cable simultaneously transmits electrical energy (through electric conductor) and optical signals (through optical fiber).

Nominal conductor cross-section and diameter, number of conductors, and number of pairs, triples, quads

Table 2

Construction element	Nominal conductor cross-section, mm ²	Number of conductors, and number of pairs («2»), triples («3»), quads («4»)
Conductor	0,35; 0,5; 0,75; 1,0; 1,2; 1,5; 2,5; 4,0	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 27, 30, 37, 40, 44, 48, 52, 61
Pair («2»)	0,35; 0,5; 0,75; 1,0; 1,2; 1,5; 2,5	1х2, 2х2, 3х2, 4х2, 5х2, 6х2, 7х2, 8х2, 9х2, 10х2, 11х2, 12х2, 13х2, 14х2, 15х2, 16х2, 18х2, 19х2, 20х2, 21х2, 22х2, 24х2, 27х2, 30х2, 37х2, 40х2, 44х2
Triple («3»)		1х3, 2х3, 3х3, 4х3, 5х3, 6х3, 7х3, 8х3, 9х3, 10х3, 11х3, 12х3, 13х3, 14х3, 15х3, 16х3, 18х3, 19х3, 20х3, 21х3, 22х3, 24х3
Quad («4»)		1х4, 2х4, 3х4, 4х4, 5х4, 6х4, 7х4, 8х4, 9х4, 10х4, 11х4, 12х4, 13х4, 14х4

Cable characteristics

Table 3

Operating temperature	- from -60° to $+70^{\circ}\text{C}$ for “XJ” cables - from -60° to $+125^{\circ}\text{C}$ for cables marked with “T” material index - from -50° to $+200^{\circ}\text{C}$ for cables marked with “T-T” material index - from -50° to $+80^{\circ}\text{C}$ for other cable types
Minimum cable installation temperature	- 30°C or higher for «XJ» cables marked with «T» material index - 15°C or higher for other cable types
Rated voltage	- up to 600V AC at frequencies of up to 1MHz - up to 1000V DC
Insulation resistance during operation $t = +20^{\circ}\text{C}$	- at least $10\text{ M}\Omega\cdot\text{km}$ for cables marked with “B” material index - at least $100\text{ M}\Omega\cdot\text{km}$ for cables marked with “П”, “T” material indexes - at least $500\text{ M}\Omega\cdot\text{km}$ for cables marked with “Пс” material index
DC resistance of conductors	meets the requirements of GOST 22483-77 standard
Cable bend radius (D –outside diameter of cable)	- at least 6D for unarmored cables - at least 10D for armored cables
Alternating bending strength	up to 10,000 alternating bends for cables marked with "T" material index
Climatic category	“B” index, with the categories of placement 2 and 5 (according to GOST 15150-69 standard). Can be used in any climatic region, including tropics.
Resistance to longitudinal water propagation under the cable sheath	moisture is completely blocked
Fire-resistance (for “FR” cables)	can be exposed to an open fire and temperatures of $+750^{\circ}\text{C}$ and higher for at least 90 minutes
Mold resistance	mold resistance factor – up to 2
Cable service life	- at least 30 years - at least 25 years for cables marked with “T” material index

Cable electrical specification

Table 4 Maximum operating capacity and inductance of a “twisted pair” at 20°C , calculated for 1 km of cable length

Frequency, kHz	Maximum operating capacity, nF					Maximum inductances, mH				
Cross-section, mm^2	0,50	0,75	1,00	1,50	2,50	0,50	0,75	1,00	1,50	2,50
0,05	99	113	122	124	128	0,73	0,68	0,66	0,62	0,51
8,00	97	109	117	118	122	0,71	0,67	0,64	0,61	0,50
16,00	95	106	113	114	119	0,71	0,67	0,64	0,59	0,48
64,00	88	97	104	105	108	0,70	0,64	0,60	0,54	0,43
256,00	86	93	99	100	102	0,65	0,59	0,55	0,49	0,37

Table 5 Maximum cable inductance to resistance ratio at 20°C , calculated for 1 km of cable length

Frequency, kHz	Maximum cable inductance to resistance ratio, $\mu\text{H}/\Omega$				
Cross-section, mm^2	0,50	0,75	1,00	1,50	2,50
0,05	9,3	13,2	17,3	24,6	55,0
8,00	8,9	12,5	16,2	22,4	40,0
16,00	7,9	10,8	13,3	16,6	27,4
64,00	6,2	7,4	7,7	8,2	10,6
256,00	3,2	3,2	3,2	3,3	3,4