



## 核电站用1E级K3类低烟无卤阻燃型控制电缆

# Class 1E Category K3, Low-smoke, Halogen-free and Flame-retardant Control Cables for Nuclear Power Plant

### 标准 Standard

本产品按照 Q/320411AVX021 (RCC-E、IEEE 323、IEEE 383) 标准制造。  
It is manufactured according to Q/320411AVX021 (RCC-E、IEEE 323、IEEE 383) standard.

### 适用范围 Application

本产品适用于核电站核岛反应堆厂房外部控制系统中网络的控制和信号连接。该产品通过科技成果部级鉴定，达到国际先进水平。

It is suitable for linking between signals and controlling in the control system network out of the building of nuclear island in nuclear power plant. It appraised the technological achievement, which was organized by the China National Nuclear Corporation(CNNC). It is confirmed an advanced level in international.

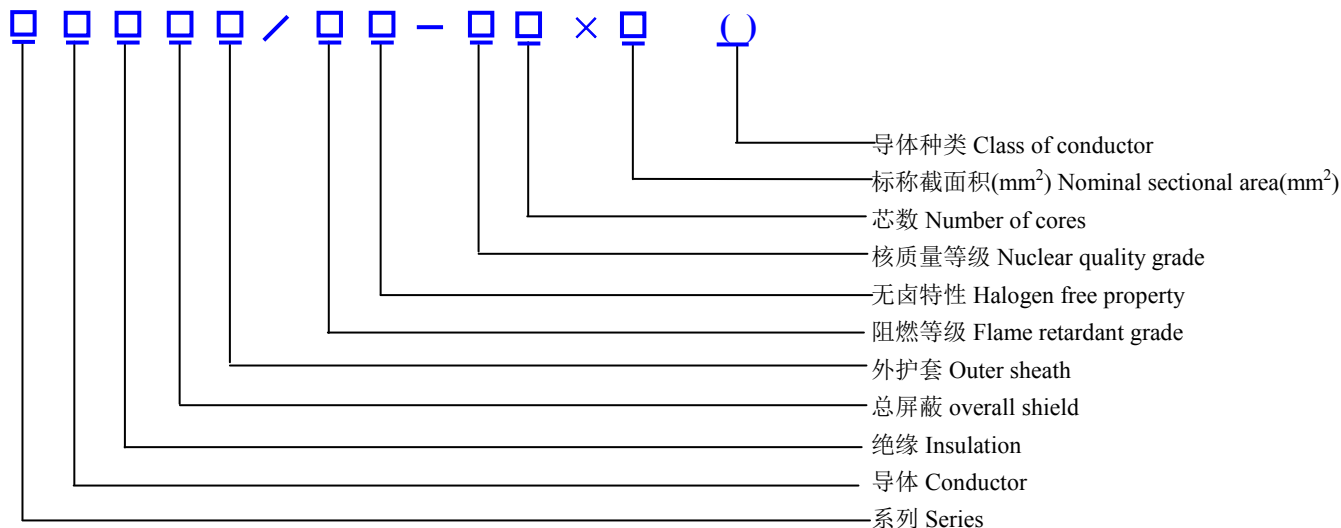
### 基本型号及名称 Basic types and descriptions

表 1 Table 1

基本型号 Basic Type	名称 Description
HKJ2S/B3-K3	核电站用1E级K3类，镀锡铜导体、交联聚烯烃双层绝缘、聚烯烃外护套、低烟无卤阻燃（B类）型控制电缆 Tinned copper conductor, Cross-linked polyolefin double layer insulated, polyolefin sheathed, low-smoke, halogen-free and flame-retardant ( category B) control cable of Class 1E category K3 for nuclear power plant
HKJ2C1S/B3-K3	核电站用1E级K3类，镀锡铜导体、交联聚烯烃双层绝缘、镀锡铜丝编织总屏蔽、聚烯烃外护套、低烟无卤阻燃（B类）型控制电缆 Tinned copper conductor, Cross-linked polyolefin double layer insulated, tinned copper braided overall shield, polyolefin sheathed, low-smoke, halogen-free and flame-retardant ( category B) control cable of Class 1E category K3 for nuclear power plant
HKJ2C2S/B3-K3	核电站用1E级K3类，镀锡铜导体、交联聚烯烃双层绝缘、铜塑复合带绕包总屏蔽、聚烯烃外护套、低烟无卤阻燃（B类）型控制电缆 Tinned copper conductor, Cross-linked polyolefin double layer insulated, Cu/plastic tape wrapped overall shield, polyolefin sheathed, low-smoke, halogen-free and flame-retardant ( category B) control cable of Class 1E category K3 for nuclear power plant
HKJ2C3S/B3-K3	核电站用1E级K3类，镀锡铜导体、交联聚烯烃双层绝缘、铝塑复合带绕包总屏蔽、聚烯烃外护套、低烟无卤阻燃（B类）型控制电缆 Tinned copper conductor, Cross-linked polyolefin double layer insulated, Cu/plastic tape wrapped overall shield, polyolefin sheathed, low-smoke, halogen-free and flame-retardant ( category B) control cable of Class 1E category K3 for nuclear power plant
备注：基本型号中字母代号见表2“型号中各代号表示说明”。随着基本型号中字母的变换，电缆的名称也相应改变，见“表示方法举例”。 Note: The symbols of basic types are shown in table 2 “explanation of the symbols in the type”. While switch the symbol of basic types, the descriptions of cable should be changed according to the “ indication example” in detail.	



型号、规格说明 Indication



型号中各代号表示说明 Explanation of the symbols in the type

表 2 Table 2

项 目 Item	代 号 Symbol	说 明 Explanation
系列 Series	HK	核电站用低烟无卤阻燃型控制电缆 Low smoke and flame retardant control cable for nuclear power plant
导体 Conductor	(省略) (omitted)	镀锡铜导体 Tinned copper conductor
	T	裸铜导体 Bare copper conductor
绝缘 Insulation	J	交联聚乙烯绝缘 XLPE insulation
	J1	交联聚烯烃绝缘 cross-linked polyolefin insulation
	J2	交联聚烯烃双层绝缘 cross-linked polyolefin double layer insulation
总屏蔽 Common shield	(省略) (omitted)	无屏蔽 No shield
	C	铜丝编织屏蔽 Copper braided shield
	C1	镀锡铜丝编织屏蔽 Tinned copper braided shield
	C2	铜塑复合带绕包屏蔽 Cu/plastic tape wrapped shield
	C3	铝塑复合带绕包屏蔽 Al/plastic tape wrapped shield
外护套 Outer sheath	S	热塑性低烟无卤阻燃聚烯烃 Thermoplastic low-smoke , halogen-free and flame retardant Polyolefin
	G	热固性低烟无卤阻燃聚烯烃 Thermosetting low-smoke , halogen-free and flame retardant Polyolefin
阻燃等级 Flame retardant grade	A	成束A类阻燃 Category A bunched flame-retardant
	B	成束B类阻燃 Category B bunched flame-retardant
	C	成束C类阻燃 Category C bunched flame-retardant
无卤特性 Halogen free property	3	低烟无卤 Low-smoke , halogen-free
核质量等级 Nuclear quality grade	K3	1E级K3类 Class 1E category K3
导体种类 Class of conductor	B	GB/T 3956 (IEC 60228) 中第2类绞合导体 Class 2 stranded conductor, GB/T 3956 (IEC 60228)



续表 2 Table 2(continued)

项 目 Item	代 号 Symbol	说 明 Explanation
规格 Size		芯数×标称截面积(mm <sup>2</sup> ), 其中: cores×normal area(mm <sup>2</sup> ),thereinto: 1) 优选芯数为: 2,3,4,5,6,7,8,9,10,12,14,16,18,19,24,27,30,33,37; Preferred core:2,3,4,5,6,7,8,9,10,12,14,16,18,19,24,27,30,33,37; 2) 标称截面mm <sup>2</sup> : 0.5,0.75,1.0,1.5,2.5,4,6,10; Normal area(mm <sup>2</sup> ): 0.5,0.75,1.0,1.5,2.5,4,6,10; 3) 另可根据顾客的要求, 选择不同的规格。 It may select different size according to the requirement of customer.
备注: 根据上述所列的型号说明, 可以选择各种组合以满足需要。 Note: it may select all kinds of combination to meet with the requirement according to the explanation above.		

### 表示方法举例 Indication example

核电站用1E级K3类低烟无卤阻燃型控制电缆由产品型号、规格表示, 举例如下:

The indication of low smoke, halogen-free and flame-retardant control cable of Class 1E category K3 for nuclear power plant consists of type and size. For example:

核电站用1E级K3类, 2类绞合镀锡铜导体, 交联聚烯烃双层绝缘, 镀锡铜丝编织总屏蔽, 热塑性低烟无卤阻燃聚烯烃外护套, 低烟无卤阻燃(B类)型控制电缆, 7芯, 标称截面1.5mm<sup>2</sup>, 表示为:

Class 2 stranded tinned copper conductor, cross-linked polyolefin double layer insulated, tinned copper braided overall shield, polyolefin sheath, low-smoke, halogen-free and flame-retardant (category B) control cable of Class 1E category K3 for nuclear power plant, 7 cores, normal sectional area is 1.5mm<sup>2</sup>, which is indicated as follows:

HKJ2C1S/B3-K3 7×1.5 mm<sup>2</sup> (B)

### 产品特性 Properties

- 1 电缆额定电压: 0.6/1kV。  
Rated voltage: 0.6/1kV.
- 2 电缆导体的长期允许工作温度: 90℃。  
The permitted long-term working temperature of conductor: 90℃.
- 3 电缆的敷设推荐允许弯曲半径: 应不小于电缆外径的8倍。  
The permitted bending radius of cable: No less than 8 times of the overall diameter of the cable.
- 4 电缆的最低使用环境温度: -15℃。(环境温度可以根据顾客的要求)  
The Min. environmental temperature:-15℃(Ambient temperature can be due to customer demand)
- 5 电缆的最低敷设温度: 0℃。低于最低敷设温度时应预先加热。  
Min. laying temperature of the cable is 0℃. The cable should be pre-heated if it is below the Min. laying temperature
- 6 电缆的正常使用寿命: ≥40年或60年。  
Normally service life: at least 40 or 60 years.
- 7 电缆的燃烧特性Combustibility
  - 7.1 电缆应能通过GB/T 18380 (IEC 60332-3)规定的成束燃烧试验。  
The cable can pass the test according to GB/T 18380 (IEC 60332-3).
  - 7.2 对交联聚烯烃绝缘的电缆, 绝缘线芯应能通过GB/T 18380.12 (IEC60332-1)规定的单根垂直燃烧试验。  
For cross-linked polyolefin insulated cable, the insulated core can pass the test according to GB/T 18380.12 (IEC60332-1).
- 8 电缆应能符合GB/T 17651(IEC 61034)规定的烟浓度试验要求。  
The cable can pass the test according to GB/T 17651(IEC 61034).
- 9 电缆的绝缘料和护套料按GB/T 17650 (IEC 60754-2) 标准规定进行测试, pH值不小于4.3, 导电率不大于10μs/mm。  
Insulation and sheath material of the cable should be tested according to GB/T 17650 (IEC 60754-2), which pH is no less than 4.3, and conductivity should be less than 10μs/mm.
- 10 电缆的电气性能 Electrical properties:
  - 10.1 电缆应能经受AC 3500V/5min 电压试验, 不击穿。  
It can withstand AC 3500V/5min high voltage test.
  - 10.2 电缆20℃时导体直流电阻见表3。  
DC resistance of conductor at 20℃ is shown in the table 3.
  - 10.3 电缆20℃时绝缘电阻见表4。  
Insulation resistance at 20℃ is shown in the table 4.



表 3 Table 3

导体截面积 Size <sup>2</sup> mm	20℃时导体直流电阻 DC resistance of conductor at 20℃	
	裸铜 Bare Copper ≤Ω/km	镀锡铜 Tinned Copper ≤Ω/km
	2类 Class 2	2类 Class 2
0.5	36.0	36.7
0.75	24.5	24.8
1.0	18.1	18.2
1.5	12.1	12.2
2.5	7.41	7.56
4	4.61	4.70
6	3.08	3.11
10	1.83	1.84

备注：导体种类为GB/T 3956（IEC 60228）中的第2类导体。  
Note: The conductor construction may be the class 2 of GB/T 3956（IEC 60228）.

表 4 Table 4

导体截面积 Size <sup>2</sup> mm	20℃时绝缘电阻 Insulation Resistance at 20℃ ≥ MΩ·km		
	交联聚烯烃双层绝缘 Cross-linked Polyolefin double layer insulated	交联聚乙烯绝缘 XLPE insulated	交联聚烯烃绝缘 Cross-linked polyolefin insulated
	2类 Class 2	2类 Class 2	2类 Class 2
0.5	1222	1495	204
0.75	1063	1300	177
1.0	957	1171	160
1.5	835	1021	139
2.5	754	923	126
4	635	776	106
6	539	660	90
10	523	640	87

### 电缆结构尺寸 Construction of the cable

电缆的结构尺寸参见表5。

It is referred to table 5.



表5 Table 5

规格 Size mm <sup>2</sup>	导体种类 class of conductor	最大外径Max. diameter (mm)	
		HKJ2S/B3-K3	HKJ2C1S/B3-K3 HKJ2C2S/B3-K3 HKJ2C3S/B3-K3
2×0.5	2类 class 2	11.0	11.5
3×0.5		11.0	12.0
4×0.5		12.0	12.5
5×0.5		12.5	13.5
6×0.5		13.0	14.0
7×0.5		13.0	14.0
8×0.5		14.0	15.0
9×0.5		14.5	16.0
10×0.5		15.5	16.5
12×0.5		16.0	17.0
14×0.5		16.5	18.0
16×0.5		17.5	18.5
18×0.5		18.0	19.0
19×0.5		18.0	19.0
24×0.5		20.5	21.5
27×0.5		21.0	22.0
30×0.5		21.5	22.5
33×0.5		22.0	23.0
37×0.5	23.0	24.0	
2×0.75	2类 class 2	11.0	12.0
3×0.75		11.5	12.5
4×0.75		12.5	13.0
5×0.75		13.0	14.0
6×0.75		14.0	14.5
7×0.75		14.0	14.5
8×0.75		15.0	16.0
9×0.75		15.5	16.5
10×0.75		16.5	17.5
12×0.75		17.0	18.0
14×0.75		17.5	18.5
16×0.75		18.5	19.5
18×0.75		19.0	20.5
19×0.75		19.0	20.5
24×0.75		22.0	23.0
27×0.75		22.0	23.0
30×0.75		23.0	24.0
33×0.75		23.5	24.5
37×0.75	24.5	25.5	
2×1.0	2类 class 2	11.5	12.5
3×1.0		12.0	13.0
4×1.0		13.0	13.5
5×1.0		13.5	14.5
6×1.0		14.5	15.5
7×1.0		14.5	15.5
8×1.0		15.5	16.5
9×1.0		16.0	17.0
10×1.0		17.5	18.5



续表5 Table 5(continued)

规格 Size <sup>2</sup> mm	导体种类 class of conductor	最大外径Max. diameter (mm)	
		HKJ2S/B3-K3	HKJ2C1S/B3-K3 HKJ2C2S/B3-K3 HKJ2C3S/B3-K3
12×1.0	2类 class 2	18.0	19.0
14×1.0		18.5	19.5
16×1.0		19.0	20.5
18×1.0		20.0	21.0
19×1.0		20.0	21.0
24×1.0		23.0	24.0
27×1.0		23.5	24.5
30×1.0		24.0	25.0
33×1.0		25.0	26.0
37×1.0		25.5	27.0
2×1.5	2类 class 2	12.0	13.0
3×1.5		12.5	13.5
4×1.5		13.5	14.5
5×1.5		14.5	15.5
6×1.5		15.5	16.5
7×1.5		15.5	16.5
8×1.5		16.5	17.5
9×1.5		17.0	18.5
10×1.5		18.5	19.5
12×1.5		19.0	20.0
14×1.5		20.0	21.0
16×1.5		20.5	21.5
18×1.5		21.5	22.5
19×1.5		21.5	22.5
24×1.5		24.5	25.5
27×1.5		25.0	26.0
30×1.5		26.0	27.0
33×1.5		27.0	28.0
37×1.5		27.5	29.0
2×2.5		2类 class 2	13.5
3×2.5	14.0		15.0
4×2.5	15.0		16.5
5×2.5	16.5		17.5
6×2.5	17.5		18.5
7×2.5	17.5		18.5
8×2.5	19.0		20.0
9×2.5	20.0		21.0
10×2.5	21.5		22.5
12×2.5	22.0		23.0
14×2.5	23.0		24.0
16×2.5	24.0		25.0
18×2.5	25.0		26.0
19×2.5	25.0		26.0
24×2.5	29.0		30.0
27×2.5	29.5		31.0
30×2.5	30.5		31.5
33×2.5	32.0		33.0
37×2.5	33.0		34.0



续表5 Table 5(continued)

规格 Size mm <sup>2</sup>	导体种类 class of conductor	最大外径Max. diameter (mm)	
		HKJ2S/B3-K3	HKJ2C1S/B3-K3 HKJ2C2S/B3-K3 HKJ2C3S/B3-K3
2×4	2类 class 2	14.5	16.0
3×4		15.5	16.5
4×4		16.5	17.5
5×4		18.0	19.0
6×4		19.0	20.0
7×4		19.0	20.0
8×4		2类 class 2	21.0
9×4	21.5		23.0
10×4	23.5		24.5
12×4	24.0		25.0
14×4	25.0		26.5
2×6	2类 class 2	16.0	17.0
3×6		16.5	18.0
4×6		18.0	19.0
5×6		19.5	20.5
6×6		21.0	22.0
7×6		2类 class 2	21.0
8×6	23.0		24.0
9×6	24.0		25.0
10×6	26.0		27.0
12×6	26.5		27.5
14×6	28.0		29.0
2×10	2类 class 2	18.5	20.0
3×10		17.5	18.5
4×10		19.0	20.0
5×10		20.5	21.5
6×10		22.0	23.0
7×10		2类 class 2	22.0
8×10	24.5		25.5
9×10	25.5		26.5
10×10	27.5		28.5
12×10	28.5		29.5
14×10	29.5		31.0