

JIS

JAPANESE INDUSTRIAL STANDARD

600 V Rubber insulated flexible cables

JIS C 3327—1993

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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600 V Rubber insulated flexible cables

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1. Scope This Japanese Industrial Standard specifies rubber insulated flexible cables, mainly used in power supply circuit of portable electrical machinery and apparatus not higher than 600 V and in other cases where flexibility and bending resistance are required (hereafter referred to as "cables").

Remarks 1. The following Standards are cited in this Standard:

JIS C 2320 Electrical insulating oils

JIS C 3005 Test methods for rubber or plastic insulated wires and cables

JIS C 3102 Annealed copper wires for electrical purposes

JIS C 3152 Tin coated annealed copper wires

JIS K 6252 Tear testing methods for vulcanized rubber

2. The units and numerical values shown in { } in this Standard are based on the traditional units and are appended for informative reference.

2. Classification and symbols The classes and symbols of the cable shall be as shown in Table 1, and the examples of construction and sectional view are shown in Fig. 1.

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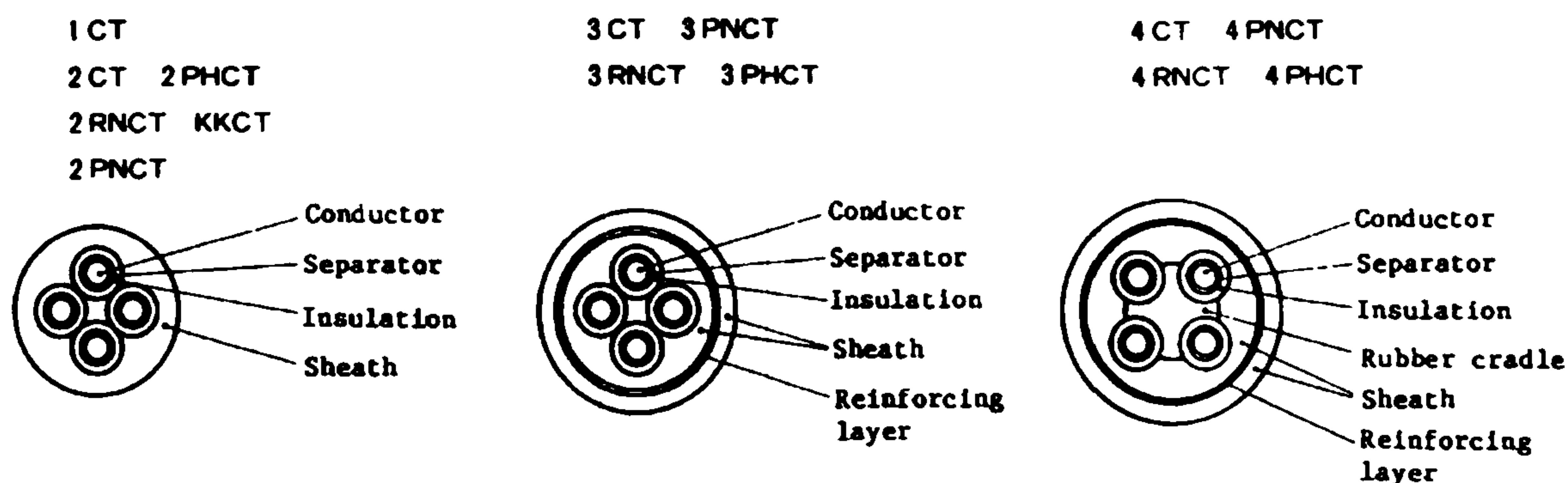
Table 1. Classification and symbols

Classification	Symbol ⁽¹⁾
Class 1 natural rubber insulated natural rubber sheathed flexible cable	1 CT
Class 2 natural rubber insulated natural rubber sheathed flexible cable	2 CT
Class 3 natural rubber insulated natural rubber sheathed flexible cable	3 CT
Class 4 natural rubber insulated natural rubber sheathed flexible cable	4 CT
Class 2 natural rubber insulated chloroprene rubber sheathed flexible cable	2 RNCT
Class 3 natural rubber insulated chloroprene rubber sheathed flexible cable	3 RNCT
Class 4 natural rubber insulated chloroprene rubber sheathed flexible cable	4 RNCT
Class 2 EP rubber insulated chloroprene rubber sheathed flexible cable	2 PNCT
Class 3 EP rubber insulated chloroprene rubber sheathed flexible cable	3 PNCT
Class 4 EP rubber insulated chloroprene rubber sheathed flexible cable	4 PNCT
Class 2 EP rubber insulated polyethylene chlorosulfonide rubber sheathed flexible cable	2 PHCT
Class 3 EP rubber insulated polyethylene chlorosulfonide rubber sheathed flexible cable	3 PHCT
Class 4 EP rubber insulated polyethylene chlorosulfonide rubber sheathed flexible cable	4 PHCT
Silicone rubber insulated silicone rubber sheathed flexible cable	KKCT

Note (1) The symbols and their meanings are as follows:

CT: flexible cable H: polyethylene chlorosulfonide rubber
 R: natural rubber K: silicone rubber
 P: EP rubber (ethylene propylene rubber)
 N: chloroprene rubber

Fig. 1. Structure and sectional view (example)



3. Characteristics The characteristics of the cables shall be as shown in Table 2 when the tests are carried out in accordance with 5.

Table 2. Characteristics

Item				Characteristics	Applicable subclause of test method
Conductor resistance				Not more than the value in Attached Tables 1 to 11.	5.3
Dielectric withstand voltage				Capable of withstanding 3000 V for 1 min.	5.4
Insulation resistance				Not less than the value in Attached Tables 1 to 11.	5.5
Tensile properties of insulation and sheath	Insulation	Natural rubber	Tensile strength	6 MPa{0.61 kgf/mm ² } min.	5.6
			Elongation	250 % min.	
		EP rubber	Tensile strength	4 MPa{0.41 kgf/mm ² } min.	
			Elongation	300 % min.	
	Sheath	Silicone rubber	Tensile strength	7 MPa{0.71 kgf/mm ² } min.	5.6
			Elongation	200 % min.	
		Natural rubber (Class 1)	Tensile strength	10 MPa{1.02 kgf/mm ² } min.	
			Elongation	300 % min.	
	Sheath	Natural rubber (other than Class 1)	Tensile strength	14 MPa{1.43 kgf/mm ² } min.	5.6
			Elongation	430 % min.	

Table 2. (Continued)

Item			Characteristics		Applicable subclause of test method
Tensile properties of insulation and sheath	Sheath	Chloroprene rubber	Tensile strength	13 MPa{1.33 kgf/mm ² } min.	5.6
			Elongation	300 % min.	
		Polyethylene chlorosulfonide rubber	Tensile strength	13 MPa{1.33 kgf/mm ² } min.	
			Elongation	300 % min.	
		Silicone rubber	Tensile strength	7 MPa{0.71 kgf/mm ² } min.	
			Elongation	200 % min.	
Thermal aging	Insulation	Natural rubber	Tensile strength	Not less than 60 % of the value before heating	5.7
			Elongation		
		EP rubber	Tensile strength	Not less than 80 % of the value before heating	
			Elongation		
		Silicone rubber	Tensile strength	Not less than 70 % of the value before heating	
			Elongation	Not less than 60 % of the value before heating	
	Sheath	Natural rubber	Tensile strength	Not less than 50 % of the value before heating	
			Elongation		
		Chloroprene rubber	Tensile strength	Not less than 65 % of the value before heating	
			Elongation		
		Polyethylene chlorosulfonide rubber	Tensile strength	Not less than 80 % of the value before heating	
			Elongation	Not less than 70 % of the value before heating	
		Silicone rubber	Tensile strength	Not less than 70 % of the value before heating	
			Elongation	Not less than 60 % of the value before heating	

Table 2. (Continued)

Item				Characteristics	Applicable subclause of test method
Oil resistance	Sheath	Natural rubber	Increase of outside diameter	Increase of outside diameter shall be 3 mm or under. However, for multicore cables with nominal sectional area of 22 mm ² or over, the increase rate of outside diameter shall be 10 % or under.	5.8
		Chloroprene rubber and polyethylene chlorosulfonide rubber	Tensile strength	Not less than 60 % of the value before oil immersion. However, for the test piece less than 1 mm in thickness, not less than 50 %.	
			Elongation		
		Flame retardance	To disappear naturally within 60 s		
Impact (Class 3, Class 4)				No damage nor crack to develop, number of broken component wires in each core not to exceed 30 %.	5.10
Bending					5.11
Abrasion				Sheath not to be so abraded as to expose the insulation.	5.12
Tearing (Silicone rubber)				250 N/cm{25.5 kgf/cm} min.	5.13

4. Materials, construction and manufacturing method The materials, construction and manufacturing method shall comply with Attached Tables 1 to 11 and the following particulars:

- (1) Conductor The conductor shall be a stranded wire composed of the tinned annealed copper wires specified in JIS C 3152. A suitable separator may be applied on the conductor.

When separators are used, tin-plating may be omitted. In this case, the conductor shall be a stranded wire of the annealed copper wires specified in JIS C 3102 or a stranded hard-drawn copper wire annealed after stranding.

- (2) Insulation Natural rubber, EP rubber or silicone rubber of the appropriate thickness given in Attached Tables shall be applied on the conductor of (1) as the insulation. The average thickness of the insulation shall be not less than 90 % of the value in Attached Tables 1 to 11 and the minimum thickness shall be not less than 80 % of the value in Attached Tables.

A suitable tape may be applied on the insulation.

- (3) Identification of cores Identification of cores shall be made by the color of insulation, color of insulation surface, or other suitable means, and the colors shall be as follows:

Two cores	Black, white
Three cores	Black, white, red
Four cores	Black, white, red, green
Five cores	Black, white, red, green, black.

- (4) Stranding of cores For the multicore cable, the requisite number of cores shall be stranded in S lay, with a lay ratio of not more than 20 times the pitch circle diameter. Class 4 cables shall be stranded by inserting rubber padding between the cores.

Cores may be stranded with a suitable filler. In such a case, suitable binders may be applied.

- (5) Core cradle The average thickness of core cradle located in Class 4 cables shall be not less than 90 % of the value in Attached Tables 4, 7 and 10 and the minimum thickness shall be not less than 70 % of the value in Attached Tables 4, 7 and 10.

- (6) Sheath Natural rubber, chloroprene rubber, polyethylene chlorosulfonide rubber or silicone rubber sheath shall be applied, in the thickness calculated from the formulae given in Table 3, on the insulation of (2), for the single-core cable, or on the stranded cores of (4), for the multicore cables. The average thickness of sheath shall be not less than 90 % of the value calculated from the formulae given in Table 3, and the minimum thickness shall be not less than 85 % of the value calculated from the formulae given in Table 3. However, the thickness of reinforcing layer shall not be included in the thickness of sheath.

As for 3 RNCT and 4 RNCT, the sheath under the reinforcing layer may be natural rubber. The surface of cable shall be free from detrimental scratch or the like.