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JIS

JAPANESE INDUSTRIAL STANDARD

600 V Rubber insulated flexible cables

JIS C 3327-1993

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JAPANESE INDUSTRIAL STANDARD J I S

600 V Rubber insulated flexible cables C 3327-1993

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

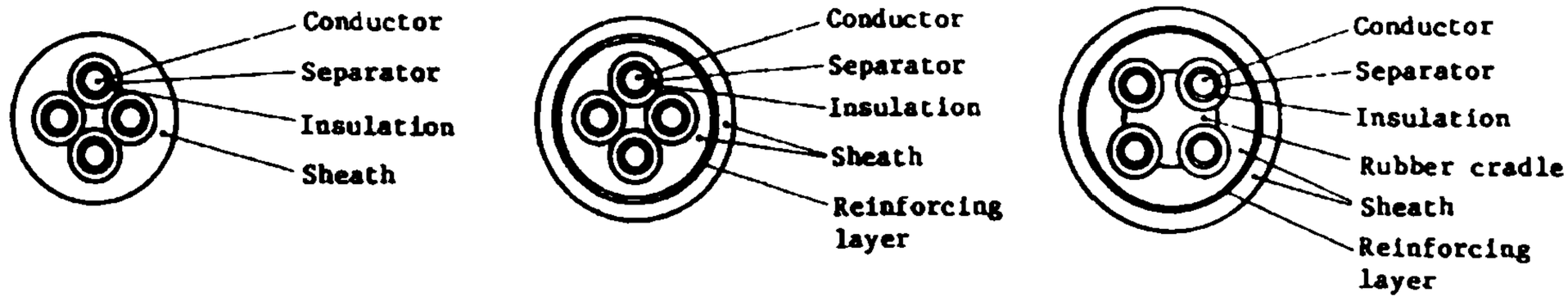
Classification	Symbol(1)
Class 1 natural rubber insulated natural rubber sheathed flexible cable	1 CT
Class 2 natural rubber insulated natural rubber sheathed flexible cable	2 CT
Class 3 natural rubber insulated natural rubber sheathed flexible cable	3 CT
Class 4 natural rubber insulated natural rubber 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

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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.	
		Silicone rubber	Tensile strength	7 MPa{0.71 kgf/mm^2} min.	
			Elongation	200 % min.	
	Sheath	Natural rubber (Class 1)	Tensile strength	10 MPa{1.02 kgf/mm^2} min.	
			Elongation	300 % min.	
		Natural rubber (other than Class 1)	Tensile strength	14 MPa{1.43 kgf/mm^2} min.	
			Elongation	430 % min.	

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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	

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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	5.9
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 abrased 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.

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(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.

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Table 3. Calculation formulae of sheath thickness

Unit: mm

Class	Thickness of sheath	Remarks
Class 1, Class 2 and silicone rubber flexible cable	$t=\frac{D}{15}+1.3$	t : thickness of sheath D : inside diameter of sheath (The value shall be rounded off to the 1st decimal place, counting fractions of 0.5 and over as a unit and discarding the rest)
Class 3	$t=\frac{D}{15}+2.2$	
Class 4	$t=\frac{D}{15}+2.6$	

(7) Reinforcing layer For Class 3 and Class 4 cables, a reinforcing layer of butt-lapped cotton canvas tape or of braiding by twisted thread of cotton yarn, hemp yarn or synthetic fiber, or a reinforcing layer at least equivalent in strength shall be applied on the insulation or twisted core, or inserted in the middle of the sheath. In this case, the reinforcing layer shall be glued to the inner and outer surfaces of the sheath.

(8) Maximum value of overall diameter The maximum value of overall diameter of Class 3 and Class 4 shall be 105 % of the value in Attached Tables 3, 4, 6, 7, 9 and 10. In the case of less than 20 mm in overall diameter, however, it shall be the value given in Attached Tables 3, 4, 6, 7, 9 and 10 plus 1.0 mm.

5. Test methods

5.1 Appearance Appearance shall be checked in accordance with 3. of JIS C 3005.

5.2 Construction Construction shall be checked in accordance with 5. of JIS C 3005.

5.3 Conductor resistance Conductor resistance shall be checked in accordance with 6. of JIS C 3005.

5.4 Dielectric withstand voltage Dielectric withstand voltage shall be checked in accordance with 8. (1) of JIS C 3005.

5.5 Insulation resistance Insulation resistance shall be checked in accordance with 9.1 of JIS C 3005.

5.6 Tensile properties of insulation and sheath Tensile properties of insulation and sheath shall be checked in accordance with 18. of JIS C 3005.

5.7 Thermal aging Thermal aging of insulation and sheath shall be checked in accordance with 19. of JIS C 3005. The temperature and duration of heating shall comply with Table 4.

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Table 4. Temperature and duration of heating

Classification	Temperature and duration of heating
Natural rubber insulation and sheath	As specified in B of Table 5 in 19.2 of JIS C 3005
EP rubber insulation	As specified in C of Table 5 in 19.2 of JIS C 3005
Silicone rubber insulation and sheath	As specified in H of Table 5 in 19.2 of JIS C 3005
Chloroprene rubber sheath	As specified in B of Table 5 in 19.2 of JIS C 3005
Polyethylene chlorosulfonide rubber sheath	As specified in F of Table 5 in 19.2 of JIS C 3005

5.8 Oil resistance

5.8.1 Oil resistance of natural rubber sheath For oil resistance test of natural rubber sheath, take a suitable length of sample from the finished product, wind it one turn or more so that a ring having an inside diameter of about 5 times the overall diameter is formed, and immerse it in Class 1, No. 2 insulating oil specified in JIS C 2320 kept at 95 ± 3°C, for 3 h, with both ends left above the oil surface. Subsequently, inspect the increase of its outside diameter.

5.8.2 Oil resistance of chloroprene rubber sheath and polyethylene chlorosulfonide rubber sheath Oil resistance of chloroprene rubber sheath and polyethylene chlorosulfonide rubber sheath shall be checked in accordance with 20. of JIS C 3005. The immersion temperature and duration shall be in accordance with C in Table 6 of 20. of JIS C 3005.

5.9 Flame retardance Flame retardance test shall be carried out on chloroprene rubber flexible cables and polyethylene chlorosulfonide rubber flexible cables in accordance with 28. of JIS C 3005.

The test method shall be as specified in 28.2 (1) of JIS C 3005.

5.10 Impact Impact test shall be carried out on Class 3 and Class 4 in accordance with 30. of JIS C 3005, at 3 spots located at suitable intervals. The mass and height of the weight to be dropped shall comply with Table 5.

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Table 5. Mass of weight and height of fall

Nominal sectional area mm²		Mass of weight kg	Height m	
			Class 3	Class 4
Single core	14 max.	3	0.2	-
	22, 38	5	0.3	
	60, 100		0.5	
Multicore	2, 3.5		0.3	0.5
	5.5 to 14	10	0.5	0.7
	22, 38	20	0.7	1.0
	60, 100	30	1.0	1.3

5.11 Bending Bending test shall be carried out on cables with nominal sectional area 38 mm² or under, in accordance with 29. (1) (a) of JIS C 3005. The *r* and *l* shall be as given in A of Table 10 in 29. (1) (a) of JIS C 3005 for 5.5 mm² or over, and in B of Table 10 in 29. (1) (a) of JIS C 3005 for 3.5 mm² or under.

5.12 Abrasion Abrasion test shall be carried out in accordance with 31. of JIS C 3005. Mass of weight and number of revolutions of the disk shall comply with Table 6.

Table 6. Mass of weight and number of revolutions of disk

Nominal sectional area mm²		Mass of weight kg	Number of revolutions of disk		
			Class 1	Class 2 and silicone rubber flexible cable	Class 3 Class 4
Single-core	3.5 max.	1	200	250	-
	5.5 to 14		300	400	600
	22, 38	2.5	400	500	750
	60, 100		500	600	900
Multi-core	3.5 max.	1	300	400	500
	5.5 to 14	2.5	500	600	750
	22, 38	5	-	750	1100
	60, 100	10		1000	1500

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5.13 Tearing The tearing test shall be carried out in accordance with JIS K 6252. The test piece shall be that of crescent type stated in 4.1 of JIS K 6252. The test temperature shall be not less than 18°C but not more than 28°C.

6. Inspection Inspection shall be made on the following items in accordance with the test method specified in 5., and the results shall comply with the requirements of 3., 4. and 9. Items may, however, be omitted partly or wholly subject to agreement between the parties concerned with acceptance.

(1) Appearance

(2) Construction

(3) Conductor resistance

(4) Dielectric withstand voltage

(5) Insulation resistance

(6) Tensile properties of insulation and sheath

(7) Thermal aging

(8) Oil resistance

(9) Flame retardance

(10) Impact

(11) Bending

(12) Abrasion

(13) Tearing

7. Packaging Each length of the cable shall be wound on a drum or coiled into a bundle and packaged suitably so as not to be damaged during transportation.

8. Designation of product The product shall be designated by the class and number of cores x nominal sectional area, or by the symbol and number of cores x nominal sectional area.

Example: Class 3 EP rubber insulated chloroprene rubber sheathed flexible cable 4 x 60 mm^2 or 3 PNCT 4 x 60 mm^2

9. Marking

9.1 Marking on cable The following information shall be indelibly marked on the suitable places of cable repeatedly.

(1) Manufacturer's name or abbreviation

(2) Year of manufacture or its abbreviation

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9.2 Marking on package The following information shall be marked on each package by a suitable method.

(1) Class or symbol

(2) Number of cores and nominal sectional area

(3) Length

(4) Mass (gross mass too, in the case of drum wound)

(5) Direction of rotation of drum

(6) Manufacturer's name or abbreviation

(7) Year of manufacture or its abbreviation

Related standard:

IEC 245-4 (1980) Rubber insulated cables of rated voltages up to and including 450/750 V. Part 4: Cords and flexible cables

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Attached Table 1. Class 1 natural rubber insulated natural rubber sheathed flexible cable (1CT)

Nominal sectional area	Construction												Conductor resistance (20 °C) Ω/km				Insulation resistance (20 °C)	Informative reference				
	Conductor		Thickness of insulation	Number of cores									Single core		Multi-core			Approx. mass kg/km				Standard unit length
	Composition No. of component wires/ Dia. of component wire	Outside diameter (approx.)		Single core		2-core		3-core		4-core												
				Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)		Without plating	With plating	Without plating	With plating		Single core	2-core	3-core	4-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm						MΩkm					m
0.75	30/0.18	1.1	1.1	1.5	6.4	1.8	10.5	1.8	11.0	1.8	12.0		24.4	25.8	25.1	26.6	1 000	60	155	175	210	200
1.25	50/0.18	1.5		1.6	7.0		11.5		12.0	1.9	13.0		14.7	15.5	15.1	16.0		75	185	225	265	
2	37/0.26	1.8			7.3		12.0	1.9	13.0	2.0	14.0		9.50	9.91	9.79	10.2		85	215	270	320	
3.5	45/0.32	2.5			8.0	1.9	13.5	2.0	14.5	2.1	16.0		5.09	5.38	5.24	5.54		110	295	350	435	
5.5	70/0.32	3.1		1.7	8.8	2.0	15.0	2.1	16.0	2.2	17.5		3.27	3.46	3.37	3.56	900	145	375	460	565	
8	50/0.45	3.7			9.4	2.1	16.5	2.2	17.5	2.3	19.5		2.32	2.45	2.39	2.52	800	175	465	570	715	
14	88/0.45	4.9	1.4	1.8	11.5	2.3	21	2.4	22	2.6	24		1.32	1.39	1.36	1.43	700	270	730	910	1 160	
22	7/20/0.45	7.0		2.0	14.0	—	—	—	—	—	—		0.844	0.892	—	—	600	400	—	—	—	
38	7/34/0.45	9.1	1.8	2.2	17.5	—	—	—		-	—		0.496	0.525	—	—		640	--	-	---	
60	19/20/0.45	11.6		2.3	20	—	—	—	—				0.311	0.329	—	—	500	910	—	—	—	
100	19/34/0.45	15.2	2.3	2.6	26		--	—	—	—	—		0.183	0.193	--			1 490	—	—	-	

Note (2) The thickness of sheath is calculated from the formula of 4. (6) of this text on the basis of cables of average construction. It may sometimes increase or decrease by approximately 0.1 mm according to the structural design of cable.

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Attached Table 2. Class 2 natural rubber insulated natural rubber sheathed flexible cable (2CT)

Nominal sectional area	Construction											Conductor resistance (20 °C) Ω/km				Insulation resistance (20 °C)	Informative reference				
	Conductor		Thickness of insulation	Number of cores								Single core		Multi-core			Approx. mass kg/km				Standard unit length
				Single core		2-core		3-core		4-core											
	Composition No. of component wires/No. of component wire	Outside diameter (approx.)		Thickness of sheath(*)	Overall diameter (approx.)	Thickness of sheath(*)	Overall diameter (approx.)	Thickness of sheath(*)	Overall diameter (approx.)	Thickness of sheath(*)	Overall diameter (approx.)	Without plating	With plating	Without plating	With plating		Single core	2-core	3-core	4-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm					MΩkm					m
0.75	30/0.18	1.1	1.1	1.5	6.4	1.8	10.5	1.8	11.0	1.8	12.0	24.4	25.8	25.1	26.6	1 000	55	130	155	190	200
1.25	50/0.18	1.5		1.6	7.0		11.5		12.0	1.9	13.0	14.7	15.5	15.1	16.0		65	160	190	235	
2	37/0.26	1.8			7.3		12.0	1.9	13.0	2.0	14.0	9.50	9.91	9.79	10.2		80	190	225	285	
3.5	45/0.32	2.5			8.0	1.9	13.5	2.0	14.5	2.1	16.0	5.09	5.38	5.24	5.54		100	255	315	395	
5.5	70/0.32	3.1		1.7	8.8	2.0	15.0	2.1	16.0	2.2	17.5	3.27	3.46	3.37	3.56	900	130	330	415	515	
8	50/0.45	3.7			9.4	2.1	16.5	2.2	17.5	2.3	19.5	2.32	2.45	2.89	2.52	800	160	415	520	660	
14	88/0.45	4.9	1.4	1.8	11.5	2.3	21	2.4	22	2.6	24	1.32	1.39	1.36	1.43	700	250	655	835	1 060	
22	7/20/0.45	7.0		2.0	14.0	2.6	26	2.7	27	2.9	30	0.844	0.892	0.869	0.919	600	380	1 040	1 320	1 680	
38	7/34/0.45	9.1	1.8	2.2	17.5	3.0	32	3.2	35	3.4	38	0.496	0.525	0.511	0.541		615	1 660	2 160	2 770	
60	19/20/0.45	11.6		2.3	20	3.4	38	3.5	41	3.8	45	0.311	0.329	0.320	0.339	500	880	2 430	3 130	4 030	
100	19/34/0.45	15.2	2.3	2.6	26	4.0	48	4.2	52	4.5	58	0.183	0.193	0.188	0.199		1 440	4 050	5 020	6 690	

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Attached Table 3. Class 3 natural rubber insulated natural rubber sheathed flexible cable (3CT)

Nominal sectional area	Construction																		Conductor resistance (20 °C) Ω/km				Insulation resistance (20 °C)	Informative reference					
	Conductor		Thickness of insulation	Number of cores															Single core		Multi-core			Approx. mass kg/km					Standard unit length
				Single core			2-core			3-core			4-core			5-core													
	Composition No. of component wires/ Dia. of component wire	Outside diameter (approx.)		Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Without plating	With plating	Without plating	With plating		Single core	2-core	3-core	4-core	5-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm					MΩkm						m
2	37/0.26	1.8	1.4	—	—	—	2.8	0.5	16.0	2.9	0.5	17.0	3.0	0.5	18.5	3.0	0.5	20	—	—	9.79	10.2	1 000	–	315	365	430	515	200
3.5	45/0.32	2.5		—	—	—	2.9		18.0	3.0		19.0	3.1		21	3.2		22	—	—	5.24	5.54		—	395	465	560	680	
5.5	70/0.32	3.1		—	—	—	3.0		19.0	3.1		21	3.2		22	3.3		24	—	—	3.37	3.56		—	480	575	705	845	
8	50/0.45	3.7		2.6	0.5	13.0	3.1		21			22	3.3		24	3.4		26	2.32	2.45	2.39	2.52	900	240	575	685	855	1 030	
14	88/0.45	4.9		2.7		14.5	3.2	1.0	24	3.3	1.0	26	3.5	1.0	28	3.6	1.0	31	1.32	1.39	1.36	1.43	700	330	840	1 030	1 280	1 550	
22	7/20/0.45	7.0	1.8	2.9		18.0	3.6		31	3.8		33	3.9		36	4.1		40	0.844	0.892	0.869	0.919		510	1 390	1 710	2 120	2 580	
38	7/34/0.45	9.1		3.1		21	3.9		36	4.1		38	4.3		42	4.5		46	0.496	0.525	0.511	0.541	600	725	1 950	2 450	3 060	3 750	
60	19/20/0.45	11.6	2.3	3.3		24	4.4		44	4.6		47	4.8		52	5.2		57	0.311	0.329	0.320	0.339		1 070	2 980	3 760	4 730	5 840	
100	19/34/0.45	15.2		3.5		28	4.9		52	5.1		56	5.4		62	5.8		68	0.183	0.193	0.188	0.199	500	1 580	4 340	5 590	7 100	8 760	

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Attached Table 4. Class 4 natural rubber insulated natural rubber sheathed flexible cable (4CT)

Nominal sectional area	Construction																Conductor resistance (20 °C) Ω/km		Insulation resistance (20 °C)	Informative reference				
	Conductor		Thickness of insulation	Thickness of core cradle	Number of cores												Multi-core			Approx. mass kg/km				Standard unit length
					2-core			3-core			4-core			5-core										
	Composition No. of compo-nent wires/ Dia. of component wire	Outside diameter (approx.)			Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Without plating	With plating		2-core	3-core	4-core	5-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm			MΩkm					m
2	37/0.26	1.8	1.4	1.9	3.4	0.5	19.5	3.4	0.5	21	3.5	0.5	23	3.7	0.5	25	9.79	10.2	1 000	430	485	580	720	200
3.5	45/0.32	2.5		2.0	3.5		21	3.5		22	3.7		25	3.8		27	5.24	5.54		525	605	755	910	
5.5	70/0.32	3.1					22	3.6		24	3.8		26	3.9		29	3.37	3.56		605	725	880	1 090	
8	50/0.45	3.7		2.1	3.6		24	3.7		26	3.9		28	4.0		31	2.39	2.52	900	710	860	1 070	1 310	
14	88/0.45	4.9		2.2	3.8	1.0	28	3.9	1.0	30	4.1	1.0	33	4.3	1.0	36	1.36	1.43	700	1 010	1 250	1 550	1 900	
22	7/20/0.45	7.0	1.8	2.5	4.2		35	4.3		37	4.6		41	4.8		46	0.869	0.919		1 630	1 970	2 470	3 020	
38	7/34/0.45	9.1		2.7	4.5		40	4.7		43	4.9		47	5.2		52	0.511	0.541	600	2 260	2 760	3 490	4 300	
60	19/20/0.45	11.6	2.3	3.1	5.0		48	5.2		52	5.5		57	5.9		64	0.320	0.339		3 390	4 180	5 330	6 580	
100	19/34/0.45	15.2		3.4	5.5		57	5.7		61	6.1		68	6.6		75	0.188	0.199	500	4 870	6 210	7 830	9 820	

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Attached Table 5. Class 2 natural rubber insulated chloroprene rubber sheathed flexible cable (2RNCT)

Nominal sectional area	Construction											Conductor resistance (20 °C) Ω/km				Insulation resistance (20 °C)	Informative reference				
	Conductor		Thickness of insulation	Number of cores								Single core		Multi-core			Approx. mass kg/km				Standard unit length
				Single core		2-core		3-core		4-core											
	Composition No. of component wires/ Dia. of component wire	Outside diameter (approx.)		Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Without plating	With plating	Without plating	With plating		Single core	2-core	3-core	4-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm					MΩkm					m
0.75	30/0.18	1.1	1.1	1.5	6.4	1.8	10.5	1.8	11.0	1.8	12.0	24.4	25.8	25.1	26.6	1 000	60	150	170	205	200
1.25	50/0.18	1.5		1.6	7.0		11.5		12.0	1.9	13.0	14.7	15.5	15.1	16.0		75	185	210	260	
2	37/0.26	1.8			7.3		12.0	1.9	13.0	2.0	14.0	9.50	9.91	9.79	10.2		85	205	250	310	
3.5	45/0.32	2.5			8.0	1.9	13.5	2.0	14.5	2.1	16.0	5.09	5.38	5.24	5.54		110	285	345	430	
5.5	70/0.32	3.1		1.7	8.8	2.0	15.0	2.1	16.0	2.2	17.5	3.27	3.46	3.37	3.56	900	140	365	450	550	
8	50/0.45	3.7			9.4	2.1	16.5	2.2	17.5	2.3	19.5	2.32	2.45	2.39	2.52	800	170	455	560	700	
14	88/0.45	4.9	1.4	1.8	11.5	2.3	21	2.4	22	2.6	24	1.32	1.39	1.36	1.43	700	270	725	905	1 150	
22	7/20/0.45	7.0		2.0	14.0	2.6	26	2.7	27	2.9	30	0.844	0.892	0.869	0.919	600	410	1 130	1 410	1 780	
38	7/34/0.45	9.1	1.8	2.2	17.5	3.0	32	3.2	35	3.4	38	0.496	0.525	0.511	0.541		650	1 830	2 290	2 910	
60	19/20/0.45	11.6		2.3	20	3.4	38	3.5	41	3.8	45	0.311	0.329	0.320	0.339	500	925	2 650	3 330	4 250	
100	19/34/0.45	15.2	2.3	2.6	26	4.0	48	4.2	52	4.5	58	0.183	0.193	0.188	0.199		1 510	4 300	5 400	6 880	

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Attached Table 6. Class 3 natural rubber insulated chloroprene rubber sheathed flexible cable (3RNCT)

Nominal sectional area	Construction: Conductor: Composition No. of component wires/ Dia. of component wire	Construction: Conductor: Outside diameter (approx.)	Construction: Thickness of insulation	Construction: Number of cores: Single core: Thickness of sheath(2)	Single core: Thickness of reinforcing layer (approx.)	Single core: Overall diameter	2-core: Thickness of sheath(2)	2-core: Thickness of reinforcing layer (approx.)	2-core: Overall diameter	3-core: Thickness of sheath(2)	3-core: Thickness of reinforcing layer (approx.)	3-core: Overall diameter	4-core: Thickness of sheath(2)	4-core: Thickness of reinforcing layer (approx.)	4-core: Overall diameter	5-core: Thickness of sheath(2)	5-core: Thickness of reinforcing layer (approx.)	5-core: Overall diameter	Conductor resistance (20 °C) Ω/km: Single core: Without plating	Single core: With plating	Multi-core: Without plating	Multi-core: With plating	Insulation resistance (20 °C)	Informative reference: Approx. mass kg/km: Single core	2-core	3-core	4-core	5-core	Standard unit length
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	—	—	—	—	MΩkm	—	—	—	—	—	m
2	37/0.26	1.8	1.4	—	—	—	2.8	0.5	16.0	2.9	0.5	17.0	3.0	0.5	18.5	3.0	0.5	20	—	—	9.79	10.2	1 000	—	360	430	485	570	200
3.5	45/0.32	2.5		—	—	—	2.9		18.0	3.0		19.0	3.1		21	3.2		22	—	—	5.24	5.54		—	450	540	620	745	
5.5	70/0.32	3.1		—	—	—	3.0		19.0	3.1		21	3.2		22	3.3		24	—	—	3.37	3.56		—	535	660	780	925	
8	50/0.45	3.7		2.6	0.5	13.0	3.1		21			22	3.3		24	3.4		26	2.32	2.45	2.39	2.52	900	265	650	780	935	1 120	
14	88/0.45	4.9		2.7		14.5	3.2	1.0	24	3.3	1.0	26	3.5	1.0	28	3.6	1.0	31	1.32	1.39	1.36	1.43	700	350	940	1 130	1 390	1 690	
22	7/20/0.45	7.0	1.8	2.9		18.0	3.6		31	3.8		33	3.9		36	4.1		40	0.844	0.892	0.869	0.919		560	1 570	1 880	2 300	2 810	
38	7/34/0.45	9.1		3.1		21	3.9		36	4.1		38	4.3		42	4.5		46	0.496	0.525	0.511	0.541	600	775	2 200	2 660	3 300	4 020	
60	19/20/0.45	11.6	2.3	3.3		24	4.4		44	4.6		47	4.8		52	5.2		57	0.311	0.329	0.320	0.339		1 150	3 350	4 090	5 100	6 250	
100	19/34/0.45	15.2		3.5		28	4.9		52	5.1		56	5.4		62	5.8		68	0.183	0.193	0.188	0.199	500	1 690	4 670	5 820	7 360	9 110	

Attached Table 7. Class 4 natural rubber insulated chloroprene rubber sheathed flexible cable (4RNCT)

Nominal sectional area	Construction				Number of cores												Conductor resistance (20 °C) Ω/km		Insulation resistance (20 °C)	Informative reference				
	Conductor		Thickness of insulation	Thickness of core cradle	2-core			3-core			4-core			5-core			Multi-core			Approx. mass kg/km				Standard unit length
	Composition No. of component wires/ Dia. of component wire	Outside diameter (approx.)			Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter				2-core	3-core	4-core	5-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Without plating	With plating	MΩkm					m
2	37/0.26	1.8	1.4	1.9	3.4	0.5	19.5	3.4	0.5	21	3.5	0.5	23	3.7	0.5	25	9.79	10.2	1 000	490	555	660	825	200
3.5	45/0.32	2.5		2.0	3.5		21	3.5		22	3.7		25	3.8		27	5.24	5.54		600	690	855	1 030	
5.5	70/0.32	3.1					22	3.6		24	3.8		26	3.9		29	3.37	3.56		695	815	1 060	1 230	
8	50/0.45	3.7		2.1	3.6		24	3.7		26	3.9		28	4.0		31	2.39	2.52	900	810	965	1 210	1 470	
14	88/0.45	4.9		2.2	3.8	1.0	28	3.9	1.0	30	4.1	1.0	33	4.3	1.0	36	1.36	1.43	700	1 120	1 390	1 730	2 110	
22	7/20/0.45	7.0	1.8	2.5	4.2		35	4.3		37	4.6		41	4.8		46	0.869	0.919		1 790	2 230	2 780	3 410	
38	7/34/0.45	9.1		2.7	4.5		40	4.7		43	4.9		47	5.2		52	0.511	0.541	600	2 450	3 080	3 880	4 850	
60	19/20/0.45	11.6	2.3	3.1	5.0		48	5.2		52	5.5		57	5.9		64	0.320	0.339		3 670	4 630	5 910	7 300	
100	19/34/0.45	15.2		3.4	5.5		57	5.7		61	6.1		68	6.6		75	0.188	0.199	500	5 330	6 570	8 350	10 390	

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Attached Table 8. Class 2 EP rubber insulated chloroprene rubber sheathed flexible cable (2PNCT)
Class 2 EP rubber insulated polyethylene chlorosulfonide rubber sheathed flexible cable (2PHCT)

Nominal sectional area	Construction											Conductor resistance (20 °C) Ω/km				Insulation resistance (20 °C)	Informative reference				
	Conductor		Thickness of insulation	Number of cores								Single core		Multi-core			Approx. mass kg/km				Standard unit length
				Single core		2-core		3-core		4-core											
	Composition No. of component wires/ Dia. of component wire	Outside diameter (approx.)		Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Without plating	With plating	Without plating	With plating		Single core	2-core	3-core	4-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm					MΩkm					m
0.75	30/0.18	1.1	0.8	1.5	5.8	1.7	9.0	1.7	9.4	1.8	10.5	24.4	25.8	25.1	26.6	500	48	115	130	160	200
1.25	50/0.18	1.5			6.2		9.8	1.8	10.5		11.5	14.7	15.5	15.1	16.0		60	140	175	195	
2	37/0.26	1.8			6.5	1.8	11.0		11.5	1.9	12.5	9.50	9.91	9.79	10.2		70	175	200	245	
3.5	45/0.32	2.5		1.6	7.4	1.9	12.5	1.9	13.0	2.0	14.5	5.09	5.38	5.24	5.54	400	95	245	290	355	
5.5	70/0.32	3.1	1.0		8.4	2.0	14.5	2.0	15.5	2.1	17.0	3.27	3.46	3.37	3.56		130	350	415	515	
8	50/0.45	3.7		1.7	9.2	2.1	16.0	2.1	17.0	2.2	18.5	2.32	2.45	2.39	2.52		165	435	525	655	
14	88/0.45	4.9		1.8	11.0	2.2	18.5	2.3	20	2.4	22	1.32	1.39	1.36	1.43	300	240	640	795	1 000	
22	7/20/0.45	7.0	1.2	1.9	13.5	2.6	25	2.7	27	2.8	29	0.844	0.892	0.869	0.919		375	1 070	1 330	1 670	
38	7/34/0.45	9.1		2.1	16.0	2.9	30	3.0	32	3.2	35	0.496	0.525	0.511	0.541	200	570	1 630	2 020	2 550	
60	19/20/0.45	11.6	1.5	2.3	19.5	3.3	37	3.4	39	3.7	44	0.311	0.329	0.320	0.339		870	2 520	3 150	4 020	
100	19/34/0.45	15.2	2.0	2.6	25	3.9	47	4.1	50	4.4	56	0.183	0.193	0.188	0.199		1 430	4 200	5 270	6 720	

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Attached Table 9. Class 3 EP rubber insulated chloroprene rubber sheathed flexible cable (3PNCT)
Class 3 EP rubber insulated polyethylene chlorosulfonide rubber sheathed flexible cable (3PHCT)

Nominal sectional area	Construction																		Conductor resistance (20 °C) Ω/km				Insulation resistance (20 °C)	Informative reference					
	Conductor		Thickness of insulation	Number of cores															Single core		Multi-core			Approx. mass kg/km					Standard unit length
				Single core			2-core			3-core			4-core			5-core													
	Composition No. of component wires/ Dia. of component wire	Outside diameter (approx.)		Thickness of sheath(1)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(1)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(1)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(1)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(1)	Thickness of reinforcing layer (approx.)	Overall diameter	Without plating	With plating	Without plating	With plating		Single core	2-core	3-core	4-core	5-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm					MΩkm						m
2	37/0.26	1.8	1.2	—	—	—	2.8	0.5	15.5	2.8	0.5	16.0	2.9	0.5	17.5	3.0	0.5	19.0	—	—	9.79	10.2	500	—	315	355	420	495	200
3.5	45/0.32	2.5		—	—	—	2.9		17.0	2.9		18.0	3.0		19.5	3.1		21	—	—	5.24	5.54		—	405	460	550	655	
5.5	70/0.32	3.1		—	—	—			18.0	3.0		19.5	3.1		21	3.2		23	—	—	3.37	3.56		—	485	570	690	825	
8	50/0.45	3.7		2.6	0.5	12.5	3.0		19.5	3.1		21	3.2		23	3.3		25	2.32	2.45	2.39	2.52	400	230	585	695	845	1 010	
14	88/0.45	4.9		2.7		14.0	3.2	1.0	24	3.3	1.0	25	3.4	1.0	27	3.5	1.0	29	1.32	1.39	1.36	1.43		315	855	1 020	1 260	1 520	
22	7/20/0.45	7.0	1.6	2.9		17.5	3.6		30	3.7		32	3.9		35	4.1		39	0.844	0.892	0.869	0.919	300	485	1 410	1 680	2 070	2 450	
38	7/34/0.45	9.1		3.0		19.5	3.9		35	4.0		37	4.2		41	4.5		45	0.496	0.525	0.511	0.541		685	2 000	2 420	3 020	3 720	
60	19/20/0.45	11.6	2.1	3.3		24	4.3		43	4.5		46	4.8		51	5.1		56	0.311	0.329	0.320	0.339		1 040	3 060	3 750	4 690	5 780	
100	19/34/0.45	15.2		3.5		28	4.8		51	5.0		55	5.4		61	5.7		67	0.183	0.193	0.188	0.199	200	1 550	4 590	5 510	7 190	8 830	

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Attached Table 10. Class 4 EP rubber insulated chloroprene rubber sheathed flexible cable (4PNCT)
Class 4 EP rubber insulated polyethylene chlorosulfonide rubber sheathed flexible cable (4PHCT)

Nominal sectional area	Construction																	Conductor resistance (20 °C) Ω/km		Insulation resistance (20 °C)	Informative reference				
	Conductor		Thickness of insulation	Thickness of core cradle	Number of cores													Multi-core			Approx. mass kg/km				Standard unit length
					2-core			3-core			4-core			5-core											
	Composition No. of component wires/ Dia. of component wire	Outside diameter (approx.)			Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter	Thickness of sheath(2)	Thickness of reinforcing layer (approx.)	Overall diameter		Without plating	With plating		2-core	3-core	4-core	5-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm			MΩkm					m
2	37/0.26	1.8	1.2	1.9	3.3	0.5	18.5	3.4	0.5	20	3.5	0.5	22	3.6	0.5	23		9.79	10.2	500	420	490	590	705	200
3.5	45/0.32	2.5			3.4		20	3.5		21	3.6		24	3.7		26		5.24	5.54		520	605	740	885	
5.5	70/0.32	3.1		2.0	3.5		22	3.6		23	3.7		25	3.8		28		3.37	3.56		620	735	895	1 080	
8	50/0.45	3.7		2.1	3.6		23	3.7		25	3.8		27	4.0		30		2.39	2.52	400	735	875	1 070	1 320	
14	88/0.45	4.9		2.2	3.7	1.0	27	3.8	1.0	29	4.0	1.0	31	4.2	1.0	35		1.36	1.43		1 020	1 230	1 540	1 880	
22	7/20/0.45	7.0	1.6	2.5	4.2		34	4.3		36	4.5		40	4.8		44		0.869	0.919	300	1 650	1 980	2 460	3 040	
38	7/34/0.45	9.1		2.7	4.4		38	4.6		42	4.9		46	5.2		51		0.511	0.541		2 260	2 800	3 520	4 570	
60	19/20/0.45	11.6	2.1	3.0	4.9		47	5.1		51	5.5		56	5.8		62		0.320	0.339		3 430	4 210	5 350	6 880	
100	19/34/0.45	15.2		3.4	5.4		56	5.7		60	6.1		67	6.5		73		0.188	0.199	200	5 060	6 320	8 020	10 100	

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Attached Table 11. Silicone rubber insulated silicone rubber sheathed flexible cable (KKCT)

Nominal sectional area	Construction											Conductor resistance (20 °C) Ω/km				Insulation resistance (20 °C)	Informative reference				
	Conductor		Thickness of insulation	Number of cores								Single core		Multi-core			Approx. mass kg/km				Standard unit length
				Single core		2-core		3-core		4-core											
	Composition No. of component wires/ Dia. of component wire	Outside diameter (approx.)		Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Thickness of sheath(2)	Overall diameter (approx.)	Without plating	With plating	Without plating	With plating		Single core	2-core	3-core	4-core	
mm²	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm					MΩkm					m
0.75	30/0.18	1.1	1.1	1.5	6.4	1.8	10.5	1.8	11.0	1.8	12.0	24.4	25.8	25.1	26.6	1 000	45	115	135	160	200
1.25	50/0.18	1.5		1.6	7.0		11.5		12.0	1.9	13.0	14.7	15.5	15.1	16.0		55	140	165	200	
2	37/0.26	1.8			7.3		12.0	1.9	13.0	2.0	14.0	9.50	9.91	9.79	10.2		65	165	200	250	
3.5	45/0.32	2.5			8.0	1.9	13.5	2.0	14.5	2.1	16.0	5.09	5.38	5.24	5.54		90	230	280	350	
5.5	70/0.32	3.1		1.7	8.8	2.0	15.0	2.1	16.0	2.2	17.5	3.27	3.46	3.37	3.56	900	115	295	370	465	
8	50/0.45	3.7			9.4	2.1	16.5	2.2	17.5	2.3	19.5	2.32	2.45	2.39	2.52	800	145	375	470	590	

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