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# मानक

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IS 3961-3 (1968): Recommended current ratings for cables,  
Part 3: Rubber insulated cables [ETD 9: Power Cables]



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IS : 3961 (Part III) - 1968

(Reaffirmed 1996)

*Indian Standard*

**RECOMMENDED CURRENT RATINGS FOR  
CABLES**

**PART III RUBBER INSULATED CABLES**

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BUREAU OF INDIAN STANDARDS

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG

NEW DELHI 110002

AMENDMENT NO. 1     SEPTEMBER 1983

TO

1S:3961(Part 3)-1968    RECOMMENDED CURRENT  
RATINGS FOR CABLES

PART 3   RUBBER INSULATED CABLES

Alteration

[*Page 5, clause 3.1, entry(b), under second col.*]  
Substitute 'Clipped direct and unenclosed' *for*  
'Clipped direct and enclosed'.

(ETDC 59)

# *Indian Standard*

## **RECOMMENDED CURRENT RATINGS FOR CABLES**

### **PART III RUBBER INSULATED CABLES**

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(Continued on page 2)

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(Continued on page 1)

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## *Indian Standard*

# **RECOMMENDED CURRENT RATINGS FOR CABLES**

## **PART III RUBBER INSULATED CABLES**

### **0. FOREWORD**

**0.1** This Indian Standard (Part III) was adopted by the Indian Standards Institution on 16 July 1968, after the draft finalized by the Conductors and Cables Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This standard has been drawn up to provide to the users general guidance for loading of cables. The overloading of cables will reduce the life expectancy of the cable and at the same time underloading it will mean uneconomic utilization of its capacity. Depending upon the loading cycle met with in practice, the installation engineer may decide the economic loading of cables.

**0.3** The permissible current ratings have been specified for three commonly adopted conditions of installation, namely, bunched and enclosed, clipped direct and un-enclosed and other defined conditions.

**0.4** The rating factors specified in 4 shall be used to modify the current ratings in respect of ambient temperature and grouping.

**0.5** This standard is being issued in a number of parts covering different types of cables. Other parts published so far are:

IS:3961 (Part I) 1967 Recommended current ratings for cable:  
Part I Paper-insulated lead-sheathed cable:

IS:3961 (Part II)-1967 Recommended current ratings for cable:  
Part II PVC-insulated and PVC sheathed heavy duty cables

IS:3961 (Part IV)-1968 Recommended current ratings for cables:  
Part IV Polythene insulated cables

IS:3961 (Part V)-1968 Recommended current ratings for cables:  
Part V PVC-insulated light duty cables and wires

**0.6** In preparing this standard, assistance has been derived from IEE Regulations for the Electrical Equipment of Buildings of Institution of the Electrical Engineers, U. K.

**0.7** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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## 1. SCOPE

**1.1** This standard (Part III) covers recommended current ratings for both the copper conductored as well as aluminium conductored rubber insulated cables of voltage ratings 250/440 volts and 650/1100 volts covered by IS: 434 (Part I) -1964† and IS: 434 (Part II) - 1964‡ respectively.

## 2. BASIC ASSUMPTIONS

**2.1** The current ratings given in Tables 1 and 2 of the standard are based on the following assumptions:

- a) Ambient air temperature 40°C
- b) Maximum conductor temperature 60°C

## 3. METHOD OF INSTALLATION

**3.1** The current ratings given in this standard are for the methods of installation as given in the following table:

<i>Type of Cable</i>	<i>Type of Installation</i>	<i>Method of Installation</i>
Single-core cables	a) Bunched and enclosed	a) 2 cables, single-phase ac or dc
		b) 3 or 4 cables, three-phase ac
	b) Clipped direct and un-enclosed	a) 2 cables, single-phase ac or dc
		b) 3 or 4 cables, three-phase ac
	c) Defined conditions	a) Flat or vertical (2 cables, single-phase ac or dc, or 3 or 4 cables, three-phase)

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\*Rules for rounding off numerical values (*revised*).

†Specification for rubber insulated cables: Part I With copper conductors (*temmi*).

‡Specification for rubber insulated cables Part II With aluminium conductors (*revised*).

<i>Type of Cable</i>	<i>Type of Installation</i>	<i>Method of Installation</i>
Twin and multi-core cables	a) Enclosed in a conduit or trunking	b) Trefoil (3 cables, three-phase)
		a) One-flat twin cable, single-phase ac or dc
		b) One-flat three-core cable, three-phase
	b) Clipped direct and enclosed	a) One-flat twin cable, single-phase ac or dc
		b) One-flat three-core cable, three-phase
		c) One-circular twin cable, single-phase ac or dc
		d) One-circular three- or four-core cable, three-phase
	c) Defined conditions	a) One-circular twin cable, single-phase ac or dc
		b) One-circular three-core cable, three-phase

#### 4. RATING FACTORS

**4.1 For Variation in Ambient Temperature**— The current ratings for cables given in Tables 1 and 2 are based on an ambient air temperature of 40°C. Where the ambient air temperature differs from this value, the appropriate rating factor given below shall be applied:

<i>Ambient Temperature</i> °C	<i>Rating Factor</i>
25	1.32
30	1.22
35	1.12
45	0.86
50	0.71
55	0.50

**4.2 For Groups** — The current ratings given in Tables 1 and 2 are for tingle circuits only. For groups, the appropriate rating factor given in **4.2.1** shall be applied.

## IS : 3961 (Part III) - 1968

**4.2.1** For groups of cables\* (or circuits†) un-enclosed, the single-circuit ratings apply provided that:

- a) the horizontal clearance between cables\* (or circuits†) is:
  - 1) *For Single-Core Cables*
    - i) not less than 6 times the overall diameter of an individual cable, and
    - ii) not less than the overall width of an individual circuit, except that the horizontal clearance need not in any case exceed 150 mm.
  - 2) *For Twin and Multi-core Cables*

not less than b times the overall diameter of an individual cable except that the horizontal clearance need not in any case exceed 150 mm.
- b) the vertical clearance between cables\* (or circuits!) is not less than 150 mm; and
- c) if the number of cables\* (or circuits†) exceed 4, they are installed in a horizontal plane.

In all other cases, unless a more precise evaluation of current rating has been made, based on experimental work or calculated data, the following factors are applicable:

*Rating Factor for Number of Cables\* (or Circuits†) [Pair of cables in single-phase ac or dc; 3 cables per circuit or 4 cables (three-phase + 1 neutral) per circuit ]*

	2	3	4	5	6	8	10	12	14	16‡	18‡	20‡
Single-core cable	0.80	0.69	0.62	0.59	0.55	0.51	0.48	0.43	0.41	0.39	0.38	0.36
Twin and multi-core cable†	0.80	0.70	0.65	0.60	0.57	0.53	0.48	0.45	0.43	0.41	0.39	0.38

## 5. DEFINED CONDITIONS

**5.1** The current ratings in the columns of the tables headed 'defined conditions' apply to cables run under the conditions defined below.

### 5.1.1 Single-Core Cables

**5.1.1.1** Two or three single-core cables are installed one above the other, fixed to the vertical surface of a wall or open cable trench as follows, the distance between the wall and the surface of the cable being 25 mm in each instance:

- a) Cables in which the conductor cross-sectional area does not exceed 185 mm<sup>2</sup> are installed at a distance between centres of twice the overall diameter of the cable,

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\*For twin and multi-core cables.

†For single-core cables,

‡In case of single-core cables, not applicable to three-phase.

- b) Cables in which the conductor cross-sectional area exceeds  $185 \text{ mm}^2$  are installed at a distance between centres of 90 mm, and
- c) The ratings for two cables may be applied with safety *in* instances where such cables are installed in horizontal formation on brackets fixed to a wall, either spaced as indicated above, or touching throughout.

**5.1.1.2** Three single-core cables are installed in trefoil formation, fixed to the vertical surface of a wall or open cable trench, the cables touching throughout and the distance between the wall and the surface of the nearest cable being 25 mm; or alternatively, three single-core cables are installed in a trefoil formation and laid on a non-metallic floor, the cables touching each other and the floor throughout.

The ratings given apply provided that the sheaths of single-core metal-sheathed cables are electrically bonded at each end of the run.

The cables are assumed to be remote from iron, steel, or ferro-concrete other than the cable supports.

**5.1.2 Multi-core Cables** — Cables of all types other than single-core cables are installed singly fixed to the vertical surface of a wall or open cable trench, the distance between the surface of the cable and the wall being 25 mm in every instance.

For cables spaced by distances less than those described above, the current ratings in the columns headed 'clipped direct' to a surface should be applied.

**TABLE 1 CURRENT RATINGS FOR SINGLE-CIRCUIT SINGLE-CORE RUBBER INSULATED SHEATHED OR UNSHEATHED UNARMoured CABLES ACCORDING TO IS : 434 (Parts I & II) - 1964**

(Clauses 2.1, 4.1 and 4.2)

NOMINAL AREA OF CONDUCTOR	BUNCHED AND ENCLOSED		CLIPPED DIRECT AND UN-ENCLOSED		DEFINED CONDITIONS [FLAT OR VERTICAL (2 CABLES), SINGLE-PHASE ac OR dc, OR 3 OR 4 CABLES, THREE-PHASE]		T R E I L T H R E E - P H A S E	
	2 Cables, Single-Phase ac or dc		3 or 4 Cables, Three-Phase ac		2 Cables, Single-Phase ac or dc		3 or 4 Cables, Three-Phase ac	
	Cu	Al	Cu	Al	Cu	Al	Cu	Al
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
mm <sup>2</sup>	A	A	A	A	A	A	A	A
1	11	8	9	7	13	10	11	9
1.5	14	11	12	9	17	13	15	12
2.5	18	14	15	12	22	17	20	15
4	24	19	21	16	29	22	27	21
6	31	24	25	20	37	28	34	26
10	42	32	36	28	51	39	46	36
16	57	45	49	38	68	53	62	48
25	73	56	62	48	88	68	79	61
35	88	69	75	58	107	83	96	75
50	108	84	93	72	131	102	118	91
70	133	103	114	88	161	124	143	111
95	164	127	139	108	196	152	176	137
120	190	147	161	125	224	174	203	157
150	—	—	—	—	257	199	230	179
185	—	—	—	—	293	227	264	205
225	—	—	—	—	331	257	297	230
240	—	—	—	—	344	266	310	240
300	—	—	—	—	400	310	360	279
400	—	—	—	—	488	378	438	339
500	—	—	—	—	570	442	513	398
625	—	—	—	—	655	507	591	458

TABLE 2 CURRENT RATINGS FOR SINGLE-CIRCUIT TWIN AND MULTI-CORE RUBBER INSULATED SHEATHED OR UNSHEATHED UNARMoured CABLES ACCORDING TO IS : 434 (Parts I & II) - 1964  
(Clause 2.1, 4.1 and 4.2)

NOMINAL AREA OF CONDUCTOR	ENCLOSED IN CONDUIT OR TRUNKING		CLIPPED DIRECT AND UN-ENCLOSED				DEFINED CONDITIONS									
	One-Flat Twin Cable, Single-Phase ac or dc		One-Flat Twin Cable, Single-Phase ac or dc		One-Flat 3- Core Cable, Three-Phase		One-Circular Twin Cable, Single-Phase ac or dc		One-Circular Twin Cable, Single-Phase ac or dc		One-Circular Twin Cable, Three-Phase ac					
	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al	Cu	Al				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
mm <sup>2</sup>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1	10	8	9	7	12	9	10	8	10	8	9	7	—	—	—	—
1.5	13	10	11	9	15	12	14	11	13	10	12	9	—	—	—	—
2.5	17	13	15	11	20	16	18	14	18	14	16	12	—	—	—	—
4	23	18	20	17	27	21	24	18	23	18	21	16	27	21	24	18
6	29	22	25	20	34	26	30	23	30	23	26	20	33	25	29	22
10	39	31	34	27	46	36	40	31	41	32	36	28	46	36	40	31
16	53	41	47	36	62	46	57	43	55	43	48	37	63	49	55	43
25	67	52	60	46	79	61	70	54	70	54	61	47	83	65	72	58
35	—	—	—	—	—	—	—	—	86	66	75	58	101	78	88	68
50	—	—	—	—	—	—	—	—	109	84	92	71	125	97	110	85
70	—	—	—	—	—	—	—	—	128	100	112	87	156	121	138	107*
95	—	—	—	—	—	—	—	—	157	121	137	106	188	146	167	130
120	—	—	—	—	—	—	—	—	180	139	157	123	214	166	193	150
150	—	—	—	—	—	—	—	—	205	159	178	138	243	189	218	169
185	—	—	—	—	—	—	—	—	234	181	204	158	276	214	245	190
225	—	—	—	—	—	—	—	—	264	205	231	179	309	239	274	212
240	—	—	—	—	—	—	—	—	275	213	240	186	321	249	284	220
300	—	—	—	—	—	—	—	—	319	247	280	217	370	287	328	254

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