BUREAU OF INDIAN STANDARDS
DRAFT FOR COMMENTS ONLY

Draft Indian Standard

Recommended Current Ratings for Cables
Part 3 Rubber Insulated Cables
(First Revision)

Power Cables Sectional Committee, ETD 09

Last date for comments- 07 08 2024

FOREWORD

This draft Indian Standard (Part 3) (First Revision) will be adopted by the Bureau of Indian Standards on the recommendation of the Power Cables Sectional Committee and approval of the Electrotechnical Division Council.

This standard was first published in 1968. This first revision has been undertaken to align it with the International practices to the extent possible.

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 under loading 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.

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.

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

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

IS 3961 (Part 2): 2017	Recommended current ratings for cables: Part 2 pvc insulated and pvc sheathed heavy duty cables (First Revision)
IS 3961 (Part 5): 1968	Recommended current ratings for cables: Part 5 pvc insulated light duty cables.
IS 3961 (Part 6): 2016	Recommended Current Ratings for Cables Part 6 Crosslinked Polyethylene Insulated PVC Sheathed Cables
IS 3961 (Part 7): 2017	Recommended current ratings for cables: Part 7 crosslinked polyethylene insulated thermoplastic sheathed cables.

The composition of the Committee, responsible for the formulation of this standard is given in Annex A.

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: 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

RECOMMENDED CURRENT RATINGS FOR CABLES
PART 3 RUBBER INSULATED CABLES

(First Revision)

1 SCOPE

1. This Indian standard (Part 3) (First Revision) covers recommended current ratings for the copper conductor elastomer insulated cables up to 1100 volts covered by IS 9968 (Part 1).

2 BASIC ASSUMPTIONS

2.1 The current ratings given in various tables of this standard are based on the following assumptions:

a) Ambient air temperature 30°C
b) Maximum conductor temperature 90°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:

TYPE OF CABLE (1)	TYPE OF INSTALLATION (2)	METHOD OF INSTALLATION (3)
Single-Core Cables	A) Enclosed in conduit in thermally insulating wall etc., or enclosed in conduit on a wall or in trucking etc.	A) 2 cables, single-phase a.c. or d.c. B) 3 or 4 cables, three- phase ac
	B) Clipped direct and un- enclosed and spaced by one cable dia.	A) 2 cables, single-phase a.c. or d.c. B) 3 or 4 cables, three- phase a.c.
	C) Defined conditions (in air)	A) Flat or vertical (2 cables, single-phase ac or dc, or 3 or 4 cables, three-phase a.c.) B) trefoil (3 cables, three-phase)
Twin and multi-core cables	A) Enclosed in conduit in thermally insulating wall etc. Or enclosed in conduit on a wall or in trucking etc.	A) One-two core cable, single-phase a.c. or d.c. B) One, three or four core cable, three-phase a.c.
	B) clipped direct and unenclosed	A) One, two core cable, single-phase a.c. or d.c. B) One, three or four core cable three-phase a.c.
	C) single and multi-core flexible cables	A) Two cable single phase a.c. or d.c. or three or four single core cables for three-phase a.c. or one two core cable single phase a.c. or d.c. or one three or four core cable for three-phase a.c. for portable equipment

4 DEFINED CONDITIONS

4.1 The current ratings in the columns of the tables headed ‘defined conditions’ apply to cables run under the conditions defined below.

4.1.1 *Single-Core Cables*

4.1.1.1 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^2 are installed at a distance between centres of twice the overall diameter of the cable,
- **b)** Cables in which the conductor cross-sectional area exceeds 185 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.

4.1.1.2 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.

4.1.2 *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

4.1.3 *Single and Multi-core Flexible Cables* — These cables are used in portable equipment's where low bending radius is required cable may be used singly or in a group.

5 RATING FACTORS

5.1 For Variation in Ambient Air Temperature — The current ratings for cables given in various Tables are based on an ambient air temperature of 30°C. Where the ambient air temperature differs from this value, the appropriate rating factor given shall be applied.

5.2 For Groups — The current ratings given in various Tables are for single circuits only. For groups, the appropriate rating factor given shall be applied.

5.2.1 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

I. Not less than 6 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.

*For twin and multi-core cables.
†For single-core cables,
‡In case of single-core cables, not applicable to three-phase

5.2.2 Suitable derating factors shall be applied for numbers of layers of cable in the reeling drum for flexible cables.

TABLE 1

TWIN AND MULTI-CORE 90°C ELASTOMER INSULATED AND SHEATHED CABLES, NON-ARMOURED WITH COPPER CONDUCTOR

Current-Carrying Capacity (Amperes)											
Conductor Cross-Sectional Area	Enclosed In Conduit In Thermally Insulating Wall Etc.		Enclosed In Conduit on a Wall or In Trucking Etc.		Clipped Direct (Spaced By one Cable Diameter.)		In Free Air or on a Perforated Cable Tray Etc. Horizontal or Vertical Etc.			In Free Air	
							Touching			(Spaced By one Cable Diameter)	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables three-phase a.c.	2 cables single-phase a.c. or d.c.	3 or 4 cables three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c.	
										Horizontal	Vertical
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(mm^2)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1	14	13	17	15	19	17.5	–	–	–	–	–
1.5	19	17	23	20	25	23	–	–	–	–	–
2.5	26	23	31	28	34	31	–	–	–	–	–
4	35	31	42	37	46	41	–	–	–	–	–
6	45	40	54	48	59	54	–	–	–	–	–
10	61	54	75	66	81	74	–	–	–	–	–
16	81	73	100	88	109	99	–	–	–	–	–
25	106	95	133	117	143	130	161	141	135	182	161
35	131	117	164	144	176	161	200	176	169	226	201
50	158	141	198	175	228	209	242	216	207	275	246
70	200	179	253	222	293	268	310	279	268	353	318
95	241	216	306	269	355	326	377	342	328	430	389
120	278	249	354	312	413	379	437	400	383	500	454

150	318	285	393	342	476	4036	504	464	444	577	527
185	362	324	449	384	545	500	575	533	510	661	605
240	424	380	528	450	644	590	679	634	607	781	719
300	486	435	603	514	743	681	783	736	703	902	833
400	–	–	683	584	868	793	940	868	823	1,085	1,008
500	–	–	783	666	990	904	1,083	998	946	1,253	1,169
630	–	–	900	764	1,130	1,033	1,254	1,151	1,088	1,454	1,362
800	–	–	–	–	1,288	1,179	1,358	1,275	1,214	1,581	1,485
1,000	–	–	–	–	1,443	1,323	1,520	1,436	1,349	1,775	1,671

NOTE — Current rating of cable with Aluminum conductor shall be 78 percent of the copper conductor.

TABLE 2

Current-Carrying Capacity (Amperes)								
Conductor cross-sectional area	**Enclosed in conduit in thermally insulating wall etc.**		**Enclosed in conduit on a wall or in trucking etc.**		**Clipped direct**		**Free air or on a perforated cable tray etc. Horizontal or vertical**	
	1 two-core cable, single-phase a.c. or d.c.	**1 three- or four-core cable*, three-phase a.c.**	**1 two-core cable, single-phase a.c. or d.c.**	**1 three- or four-core cable*, three-phase a.c.**	**1 two-core cable, single-phase a.c. or d.c.**	**1 three- or four-core cable*, three-phase a.c.**	**1 two-core cable, single-phase a.c. or d.c.**	**1 three- or four-core cable*, three-phase a.c.**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
(mm^2)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1	14.5	13	17	15	19	14	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75
16	76	68	91	80	107	96	115	100
25	99	89	119	105	138	119	149	127
35	121	109	146	128	171	147	185	158
50	145	130	175	154	209	179	225	192
70	183	164	221	194	269	229	289	246
95	220	197	265	233	328	278	352	298
120	253	227	305	268	382	322	410	346
150	290	259	334	300	441	371	473	399
185	329	295	384	340	506	424	542	456
240	386	346	459	398	599	500	641	538
300	442	396	532	455	693	576	741	621
400	–	–	625	536	803	667	865	741

NOTE — Current rating of cable with Aluminum conductor shall be 78% of the copper conductor.

TABLE 3

MULTI-CORE 90°C ELASTOMER INSULATED CABLES WITH COPPER CONDUCTOR

Current-Carrying Capacity (Amperes):			
Sl. No.	**Conductor**	**Clipped direct**	**In free air or on a perforated cable tray etc.,**

	cross-sectional area			horizontal or vertical		
		1 two-core cable single-phase a.c. or d.c.	1 three-or 1 four-core cable, three-phase a.c.	1 two-core cable single-phase a.c. or d.c.	1 three-or 1 four-core cable, three-phase a.c.	
(1)	(2)	(3)	(4)	(5)	(6)	
1.	$(mm)^2$	(A)	(A)	(A)	(A)	
2.	1.5	27	23	29	25	
3.	2.5	36	31	39	33	
4.	4	49	42	52	44	
5.	6	62	53	66	56	
6.	10	85	73	90	78	
7.	16	110	94	115	99	
8.	25	146	124	152	131	
9.	35	180	154	188	162	
10.	50	219	187	228	197	
11.	70	279	238	291	251	
12.	95	338	289	354	304	
13.	120	392	335	410	353	
14.	150	451	386	472	406	
15.	185	515	441	539	463	
16.	240	607	520	636	546	
17.	300	698	599	732	628	
18.	400	787	673	847	728	

TABLE 4

90°C ELASTOMER INSULATED AND SHEATHED AND 150°C SILICONE RUBBER INSULATED AND GLASS FIBER BRAIDED AND VARNISHED FLEXIBLE CABLES WITH COPPER CONDUCTOR

Sl. No	Current-Carrying Capacity (Amperes):		
	Conductor cross-sectional area (mm2)	1 three-core or four-core cable or 3 or 4 single core cable bunched for three phase a.c.	1 two core or 2 single-core cables, bunched for single phase a.c. or d.c.
(1)	(2)	(3)	(4)
1.	1.5	24	29
2.	2.5	32	38
3.	4	43	52
4.	6	56	68
5.	10	78	94
6.	16	104	126
7.	25	138	167
8.	35	171	200
9.	50	213	250
10.	70	263	310
11.	95	317	369
12.	120	370	432
13.	150	425	497
14.	185	485	567
15.	240	560	673
16.	300	650	773

TABLE 5

RATING FACTOR FOR VARIATION IN AMBIENT AIR TEMPERATURE

90°C Elastomer Insulated Cables:											
Ambient Temperature:	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C	75°C		
Correction Factor:	0.95	0.91	0.86	0.82	0.76	0.70	0.64	0.57	0.50		
150°C Silicone Insulated Cables:											
Ambient Temperature:	35°C to 90°C		95°C	100°C	105°C	110°C	150°C	120°C	125°C	130°C	135°C
Correction Factor:	1.0		0.96	0.91	0.86	0.81	0.76	0.70	0.64	0.57	0.50

TABLE 6

RATING FACTOR FOR NUMBER OF CABLES * (OR CIRCUITS +) (PAIR OF CABLES IN SINGLE PHASE A.C. OR D.C. 3 CABLES OR 4 CABLES 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	0.8	0.3	0.1	0.39	0.38	0.363
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

TABLE 7

Number of layer	Mono spiral	1	2	3	4
Rating factors	0.8	0.76	0.58	0.47	0.40

*For twin and multi core cables
+For single core cables

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Power Cables Sectional Committee- ETD 09