



Traction cable RADOX EN 50264-3-1

Current rating for single core cables

1. Scope :

This document provides guidelines for the selection of cable cross-sections with regard to the current rating for continuous operation. They are valid for single core cables of type 600V M, 1800V M, 1800V MM and 3600V MM.

2. Definitions :

Current load :	current passed through the cable during operation
Continuous operation :	an operation with constant current whose duration is at least long enough to allow the system to reach thermal equilibrium, but may then go on indefinitely
Current rating :	maximum permissible current under determined operation conditions
Permissible operating temperature :	maximum permissible conductor temperature during continuous operation

3. General remarks :

- 3.1 The current rating of a cable depends on the conductor cross-section, on the cable design, on the characteristics of the insulation materials, on the installation condition's and, for larger cross-sections, on the frequency (skin and proximity effects) . Also, additional heating effects due to higher ambient temperatures, due to heating elements and due to bunching of cables have to be taken into account.
- 3.2 The conductor cross-section has to be selected in such a way that the actual current load does not exceed the current rating, i.e. the conductor temperature does not exceed the permissible operating temperature. The determining factor is the appropriate, most unfavourable operating condition, encountered during operation over the whole length of the cable.

4. Current rating under service conditions :

$$I = I_N \cdot f_1 \cdot f_2 \cdot f_3 \cdot f_4$$

- I [A] : Current rating for continuous operation under service conditions
 I_N [A] : Current rating for continuous operation under standard conditions
 f_1 : Reduction factor for increased ambient temperature (see # 4.2)
 f_2 : Reduction factor for deviated conductor temperature (see # 4.3)
 f_3 : Reduction factor for increased frequency (see # 4.4)
 f_4 : Reduction factor for banded cables (see tables on pages 4 and 5)

4.1 Standard conditions for current rating :

- 4.1.1 The tabled values for the current rating were calculated according to IEC 60287 for the following standard conditions:
- continuous operation
 - single circuit for 3-phase current , single conductor for 1-phase current
 - 30°C ambient temperature and sufficiently large and ventilated spaces, whose ambient temperature is not appreciably increased by the heat coming from the cables.
 - 120°C conductor temperature
 - frequency up to 200 Hz

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4.1.2 Installation in air, unrestricted heat dissipation, means that the following installation conditions are observed :

- distance of the cables from the wall, from the floor, from the ceiling > cable diameter
- distance between two adjacent power circuits > 2 x cable diameter
- vertical distance between power circuits laid one upon another for individual cables > 2 x cable diameter and for layers of cables > 200 mm
- perforated tray with a perforation > 30 % of the total surface

4.1.3 Open trays are continuous supports with vertical sides, but without cover. A possible perforation accounts for < 30% of the total surface.

4.1.4 Closed ducts are entirely closed. Pipes belong to this category also.
The max. filling degree is 60%.

4.1.5 Due to the skin effect at higher frequencies (higher than 200 Hz) the current ratings for conductors can be reduced (see # 4.4).

4.2 Reduction factors for increased ambient temperature :

Ambient temperature [°C]	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
Reduction factor f_1	1	0.97	0.94	0.91	0.88	0.85	0.82	0.78	0.75	0.71	0.67	0.62	0.58	0.53	0.47	0.41	0.33	0.22

4.3 Reduction factors for different permissible conductor temperature :

Conductor temperature [°C]	120	110	100	90	80
Reduction factor f_2	1	0.96	0.91	0.85	0.79



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4.4 Reduction factors for increased frequency :

frequency [Hz] *	400	600	800	1000	2000	3000	4000	5000	10000
Conductor size mm ²	factors f ₃								
1.5	1	1	1	1	1	1	1	1	1
2.5	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	1	0.98
6	1	1	1	1	1	1	1	0.99	0.93
10	1	1	1	1	1	1	0.96	0.93	0.82
16	1	1	1	1	1	0.95	0.91	0.87	0.76
25	1	1	1	1	0.94	0.88	0.83	0.80	0.69
35	1	1	1	0.98	0.89	0.82	0.77	0.74	0.64
50	1	1	0.97	0.94	0.83	0.76	0.72	0.69	0.59
70	1	0.95	0.91	0.88	0.77	0.71	0.67	0.63	0.54
95	0.98	0.93	0.88	0.84	0.73	0.67	0.63	0.60	0.51
120	0.94	0.88	0.84	0.80	0.69	0.64	0.60	0.57	0.48
150	0.90	0.85	0.80	0.77	0.66	0.61	0.57	0.54	0.46
185	0.88	0.82	0.77	0.74	0.64	0.58	0.54	0.52	0.44
240	0.85	0.77	0.72	0.69	0.60	0.54	0.51	0.48	0.41
300	0.79	0.73	0.69	0.66	0.57	0.52	0.48	0.46	0.39
400	0.75	0.69	0.65	0.63	0.54	0.49	0.46	0.44	0.37

* For frequencies above 800 Hz and cross-sections higher than 25 mm² special conductor-constructions are recommended (waveguide tubes).



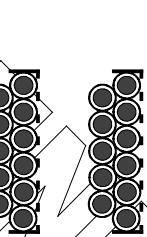
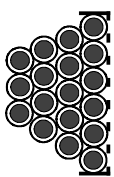
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Continuous current rating

Conductor temperature 120 °C

Ambient temperature 30 °C

1. Cables in free air or perforated trays																																																																	
Installation method	Number of simultaneous loaded conductors on each tray																																																																
		1	2	3	4	6	8	10	16	20	4	6	8	10	16	20	4	6	8	10	16	20	4	6	8	10	16	20	4	6	8	10	16	20																															
Reduction factor f4	1	0.87	0.81	0.78	0.75	0.74	0.73	0.72	0.71	0.71	0.62	0.57	0.53	0.47	0.45	0.67	0.59	0.54	0.50	0.45	0.43	0.71	0.58	0.52	0.48	0.41	0.38																																						
Conductor size mm²																																																																	
1.0	30	26	25	24	23	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22																															
1.5	37	33	31	29	28	28	28	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27																															
2.5	49	43	40	39	37	37	36	36	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35																															
4	68	60	56	54	52	51	50	50	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49																															
6	89	78	73	70	67	66	65	65	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64																															
10	126	110	103	99	95	94	93	91	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90																															
16	163	142	133	128	123	121	120	118	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116																															
25	223	194	181	174	167	165	163	161	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158																															
35	282	246	229	220	212	209	206	203	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201	201																															
50	356	310	289	278	268	264	260	257	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253																															
70	445	388	361	348	334	330	325	321	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316																															
95	534	465	433	417	401	396	390	385	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380																															
120	630	549	511	492	473	467	461	454	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448																															
150	727	633	589	567	546	538	531	524	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517	517																															
185	831	723	673	648	624	615	607	599	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590	590																															
240	1000	872	812	782	752	742	731	721	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711	711																															
300	1150	1000	932	897	863	851	840	828	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817	817																															
400	1410	1227	1142	1100	1057	1043	1029	1015	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000																															



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Continuous current rating
Conductor temperature 120 °C
Ambient temperature 30 °C

Installation method	2. on floor or wall													3. fixed on a ceiling or under floor													4. in conduit in a void or in a pipe												
Number of simultaneous loaded conductors per installation																																							
	1	2	3	4	1	2	3	4	5	6	7	8	≥ 9	1	2	3	4	5	6	7	8	9	10	12	14	16	20												
Reduction faktor f4	0.85	0.79	0.75	0.75	0.95	0.81	0.72	0.68	0.66	0.64	0.63	0.62	0.61	1	0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.48	0.45	0.43	0.41	0.38												
Conductor size mm²	Current rating in [A]																																						
1.0	28	24	23	21	27	23	21	20	19	18	18	18	18	23	19	17	15	14	13	12	12	11	11	10	10	10	9												
1.5	35	30	28	27	34	29	26	24	24	23	23	22	22	28	23	20	19	18	17	16	15	14	14	13	12	12	11												
2.5	47	40	38	36	45	39	34	32	32	31	30	30	29	37	30	26	25	23	22	21	20	19	18	17	16	16	15												
4	65	56	52	49	62	53	47	45	43	42	41	41	40	52	42	37	34	32	31	29	28	26	25	24	22	22	20												
6	85	73	68	64	81	69	62	58	57	55	54	53	52	68	55	48	45	42	40	38	36	34	32	31	29	28	26												
10	120	102	95	90	114	98	87	82	80	77	76	75	74	96	77	68	63	59	56	53	51	48	46	44	41	40	37												
16	155	132	123	117	148	126	112	106	103	100	98	97	95	124	100	87	81	76	72	69	66	62	59	56	53	51	48												
25	211	180	167	159	201	171	152	144	140	136	133	131	129	169	136	119	110	104	99	93	90	85	80	77	71	70	65												
35	268	228	212	201	255	218	193	183	177	172	169	167	164	214	172	150	140	131	125	118	114	107	101	97	90	88	82												
50	338	288	268	254	322	274	244	230	224	217	213	210	207	271	217	190	177	166	158	150	144	136	128	122	114	112	103												
70	423	360	335	318	402	343	305	288	280	271	267	263	259	338	271	237	220	207	197	186	180	169	159	153	142	139	129												
95	507	431	401	381	482	411	366	345	335	325	320	315	310	406	325	285	264	248	236	224	216	203	191	183	171	167	155												
120	599	510	474	450	570	486	432	408	396	384	378	372	366	479	384	336	312	293	278	264	254	240	226	216	202	197	183												
150	691	588	546	519	657	560	498	470	457	443	436	429	422	552	442	387	359	337	321	304	293	276	260	249	232	227	210												
185	789	671	624	592	750	640	569	537	521	505	498	490	482	631	505	442	411	385	366	348	335	316	297	285	266	259	240												
240	951	809	752	714	904	771	685	647	628	609	600	590	581	761	609	533	495	465	442	419	404	381	358	343	320	313	290												
300	1092	929	863	819	1038	885	787	743	721	699	688	678	667	874	700	612	569	534	507	481	464	437	411	394	368	359	333												
400	1339	1139	1058	1005	1273	1085	965	911	884	857	844	831	817	1071	857	750	697	654	622	590	568	536	504	482	450	440	407												