

Cable handling

Effects of temperature and installation methods on current ratings

De-ratings

It is important to think of cable in the context of its surroundings as the process of applying current to a cable generates heat.

Although many of materials are capable of withstanding very high temperatures, this heat will be radiated out, affecting neighbouring cables, infrastructure and operators who may have to handle the cable.

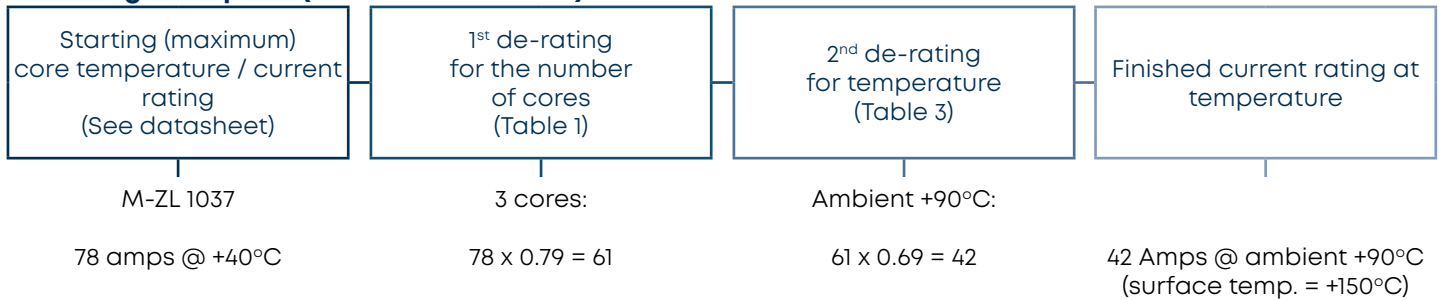
These pages are intended to provide a basic estimate of a cable's current rating. It is important to note that other specifications offer slightly different baseline values (e.g. ambient temperature) or correction factors. More precise values are available on request.

This temperature is generated by a combination of the surrounding air (nominally 40°C) and the heat generated from within by the applied current. It is then necessary to apply de-rating factors to take account of other factors that may reduce the current rating such as increased heat from other, nearby cables, reflected heat from metal surfaces or from solar radiation.

Datasheets assume the core to be at it's maximum temperature when current is applied. If safe handling of the cable is required, then values from Table 4. should be used as the starting (maximum) values, and then de-rated accordingly.

Information provided here is based on IEC 60287 (single cores) and DIN VDE 0298-4 (multicores). These de-rating factors are cumulative as indicated in the examples below:

De-rating example 1 (<40 cores in free air):



De-rating example 2 (<3 cores with installation method):

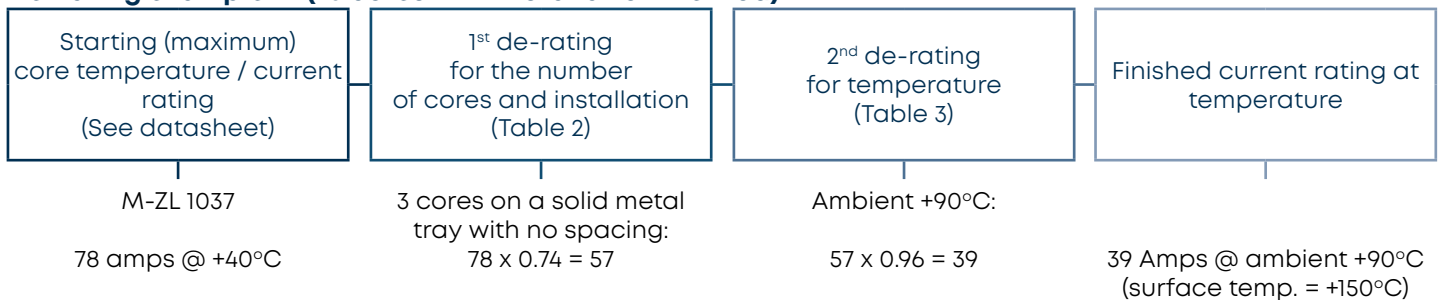


Table 1

Multicore de-rating factors													
	Number of cores												
	2	3	4	6	8	10	12	16	20	24	28	36	40
Factor	0.87	0.79	0.74	0.66	0.61	0.57	0.54	0.49	0.46	0.43	0.41	0.37	0.35

Multiply the current rating as stated on Cable's technical data sheets by the factor stated above to account for the heat generated by multiple cores in close proximity.

Cable handling

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Table 2

Installation method de-rating factors												
Number of cores	Clipped to a vertical structure			Clipped to a horizontal structure			On solid metal trays			On aerated metal trays		
	1	2	3	1	2	3	1	2	3	1	2	3
Without spacing	0.94	0.80	0.76	0.89	0.76	0.57	0.97	0.85	0.74	1.00	0.87	0.74
With spacing	0.94	0.90	0.87	0.89	0.81	0.77	0.97	0.96	0.93	1.00	1.00	1.00

Multiply the current rating as stated on Cable's technical data sheets by the factor stated above to account for the additional heating effect that may result from different methods of installation.

Table 3

Temperature de-rating factors										
Ambient air temperature (nom. = 40°C)	Temperature rating of the insulation / sheath (whichever is the lowest)									
	69°C Prolonged handling	80°C (e.g. HFS 80)	85°C Momentary contact	100°C (e.g. HFS 100)	125°C (e.g. HFI 121 XL)	135°C (e.g. HFI 150)	150°C (e.g. ETFE)	180°C (e.g. HFI 260 C)	200°C (e.g. FEP)	260°C e.g. (PTFE)
0°C	1.71	1.52	1.48	1.37	1.28	1.24	1.21	1.18	1.15	1.10
10°C	1.54	1.40	1.37	1.28	1.21	1.19	1.16	1.14	1.11	1.08
20°C	1.37	1.28	1.25	1.19	1.15	1.13	1.10	1.08	1.07	1.05
30°C	1.20	1.14	1.13	1.09	1.07	1.06	1.05	1.04	1.03	1.02
40°C	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
50°C	0.76	0.82	0.86	0.89	0.92	0.93	0.94	0.95	0.96	0.97
60°C	0.49	0.65	0.69	0.78	0.83	0.86	0.88	0.90	0.92	0.94
70°C	-	0.42	0.50	0.65	0.74	0.79	0.82	0.85	0.88	0.91
80°C	-	-	0.25	0.50	0.65	0.71	0.76	0.81	0.84	0.88
90°C	-	-	-	0.40	0.54	0.63	0.69	0.76	0.79	0.85
100°C	-	-	-	-	0.42	0.54	0.61	0.71	0.75	0.82
110°C	-	-	-	-	0.27	0.44	0.53	0.65	0.70	0.79
120°C	-	-	-	-	0.17	0.32	0.45	0.59	0.65	0.75
130°C	-	-	-	-	-	0.16	0.35	0.53	0.60	0.72
140°C	-	-	-	-	-	-	0.23	0.46	0.54	0.69
150°C	-	-	-	-	-	-	-	0.38	0.49	0.65
160°C	-	-	-	-	-	-	-	0.30	0.42	0.61
170°C	-	-	-	-	-	-	-	0.19	0.36	0.57
180°C	-	-	-	-	-	-	-	-	0.28	0.53
190°C	-	-	-	-	-	-	-	-	0.18	0.49
200°C	-	-	-	-	-	-	-	-	-	0.45
210°C	-	-	-	-	-	-	-	-	-	0.40
220°C	-	-	-	-	-	-	-	-	-	0.35
230°C	-	-	-	-	-	-	-	-	-	0.29
240°C	-	-	-	-	-	-	-	-	-	0.23

Multiply the current rating as stated on Cable's technical data sheets by the factor stated above to account for the additional heating or cooling effects that may result from different ambient air temperatures.

Safe handling

All ratings given above assume the cable to be at its maximum temperature (e.g. PTFE at +260°C). This is too high to be safely handled. safe handling temperature guidelines are as recommended in MIL-STD-1472G: 5.7.6.9

- Thermal contact hazards: defined as: **+69°C (+156°F) = Prolonged contact or handling** or **+85°C (+185°F) = Momentary contact**. For current ratings that will comply with these values, current ratings should not exceed those stated in Table 4.

Cable handling

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Table 4

Size		Stranding # x mm	Diameter Nom Ø mm	Maximum single core current rating at 40°C ambient air temperature	
AWG	CSA mm ²			Prolonged contact or manual handling +85°C surface temperature	Momentary contact +69°C surface temperature
	-	400	2,013 x 0.500	30.0	989 Amps
-	300	1,525 x 0.500	26.0	812 Amps	634 Amps
-	240	1,221 x 0.500	23.0	692 Amps	540 Amps
-	185	925 x 0.500	20.0	570 Amps	445 Amps
-	150	777 x 0.500	18.0	502 Amps	392 Amps
-	120	629 x 0.500	16.0	432 Amps	337 Amps
0000	107	2,109 x 0.254	15.2	394 Amps	307 Amps
-	95.0	475 x 0.500	14.3	360 Amps	281 Amps
000	81.0	1,675 x 0.254	13.7	322 Amps	251 Amps
-	70.0	361 x 0.500	12.4	297 Amps	232 Amps
00	68.0	1,330 x 0.254	11.8	282 Amps	220 Amps
0	53.0	1,045 x 0.254	10.5	240 Amps	187 Amps
-	50.0	399 x 0.400	10.3	233 Amps	182 Amps
1	41.4	817 x 0.254	9.40	204 Amps	159 Amps
-	35.0	278 x 0.400	8.40	181 Amps	141 Amps
2	34.0	665 x 0.254	8.40	178 Amps	139 Amps
-	25.0	196 x 0.400	7.20	144 Amps	112 Amps
4	21.6	133 x 0.454	6.60	130 Amps	101 Amps
-	16.0	126 x 0.400	5.70	107 Amps	83 Amps
6	13.6	133 x 0.361	5.27	96 Amps	75 Amps
-	10.0	80 x 0.400	3.93	76 Amps	59 Amps
8	8.60	133 x 0.287	4.15	71 Amps	55 Amps
-	6.00	84 x 0.300	2.92	54 Amps	42 Amps
10	4.74	37 x 0.404	2.74	47 Amps	37 Amps
-	4.00	56 x 0.300	2.48	42 Amps	33 Amps
12	3.09	19 x 0.455	2.15	36 Amps	28 Amps
-	2.50	50 x 0.250	1.95	31 Amps	24 Amps
14	1.94	19 x 0.361	1.706	26 Amps	21 Amps
-	1.50	30 x 0.250	1.50	22 Amps	17 Amps
16	1.23	19 x 0.287	1.358	20 Amps	15 Amps
-	1.00	32 x 0.200	1.20	17 Amps	13 Amps
18	0.963	19 x 0.254	1.201	17 Amps	13 Amps
-	0.75	24 x 0.200	1.050	15 Amps	11 Amps
20	0.615	19 x 0.203	0.961	13 Amps	10 Amps
-	0.5	19 x 0.185	0.880	11 Amps	9 Amps
22	0.382	19 x 0.160	0.757	10 Amps	7 Amps
24	0.241	19 x 0.127	0.600	7 Amps	6 Amps
26	0.155	19 x 0.102	0.480	5 Amps	4 Amps
28	0.089	7 x 0.127	0.381	4 Amps	3 Amps
30	0.057	7 x 0.102	0.306	3 Amps	2 Amps

Use these current ratings in place of any given on the cable datasheet if safe handling temperatures need to be met. Ratings here are suitable for all materials supplied with the exception of cables containing: HFI 90 L, HFS 80, HFS 80 T or HFS 80 N, for which the +69°C momentary contact rating should be considered the maximum rating.