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INTERNATIONAL STANDARD

AMENDMENT 2

Information technology – Telecommunications cabling requirements for remote powering of terminal equipment

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Information technology – Telecommunications cabling requirements for remote powering of terminal equipment

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INFORMATION TECHNOLOGY – TELECOMMUNICATIONS CABLING REQUIREMENTS FOR REMOTE POWERING OF TERMINAL EQUIPMENT

AMENDMENT 2

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Amendment 2 to IEC ISO/IEC TS 29125:2017 has been prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

The text of this Amendment is based on the following documents:

Draft	Report on voting
JTC1-SC25/3272/DTS	JTC1-SC25/3289/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Amendment is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

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INTRODUCTION to the amendment

This amendment incorporates changes necessary to extend the current for remote powering using single pair cabling up to 2 000 mA.

Introduction

Insert the following after the first bullet of the fourth paragraph:

- guidance on wire diameter and bundling on heating;

1 Scope

Replace the second bullet of list item a), added by Amendment 1, with:

- 1-pair balanced cabling using currents per conductor of up to 2 000 mA;

In the NOTE, delete "4-pair".

6.3 Temperature rise and current capacity

Replace the last sentence of the first paragraph with the following sentence:

The standards in the ISO/IEC°11801 series specify this temperature up to 60 °C in MICE C_1 environments and 70 °C in MICE C_2 and C_3 environments.

Replace the existing Table 5, added by Amendment 1, with the following new Table 5:

Table 5 – Maximum current per conductor versus temperature rise in a 37 1-pair cable bundle in air and conduit

Temperature rise	Current per conductor					
	0,57 mm wire diameter		0,40 mm stranded wire diameter (cords)		1,02 mm stranded wire diameter (cords)	
K	mA		mA		mA	
	air	conduit	air	conduit	air	conduit
5	866	738	608	518	1 550	1 320
7,5	1 061	904	744	634	1 900	1 620
10	1 225	1 044	860	732	2 190	1 870
12,5	1 370	1 167	961	819	-	2 090
15	1 501	1 278	1 053	897	-	-
17,5	1 621	1 381	1 137	969	-	-
20	1 733	1 476	1 216	1 036	-	-

Temperature rise above 10 K shown in grey background is not recommended for cables installed in an environment that can reach 50 °C.

NOTE 1 These values are based on conductor temperature measurement of typical cables and cords.

NOTE 2 Currents above 2 000 mA are for information only.

In Table 6, added by Amendment 1, delete column "0,32 mm diameter", as follows:

Table 6 – Calculated worst case current per conductor versus temperature rise in a bundle of 37 1-pair cables of different conductor diameters in air and conduit

ΔT	0,40 mm diameter		0,51 mm diameter		0,57 mm diameter		0,65 mm diameter		0,81 mm diameter		1,02 mm diameter	
	mA		mA		mA		mA		mA		mA	
°C	air	conduit	air	conduit	air	conduit	air	conduit	air	conduit	air	conduit
2	384	327	490	417	548	466	624	532	779	663	981	835
4	543	463	693	590	775	660	883	753	1 101	938	1 387	1 181
6	666	567	849	723	949	808	1 082	922	1 349	1 149	1 699	1 446
8	769	655	981	835	1 096	933	1 249	1 065	1 558	1 327	1 962	1 670
10	860	732	1 096	934	1 225	1 044	1 397	1 190	1 742	1 484	2 194	1 867
12	942	802	1 201	1 023	1 342	1 143	1 530	1 304	1 908	1 625	2 403	2 046
14	1 017	867	1 297	1 105	1 450	1 235	1 653	1 409	2 061	1 755	2 596	2 210
16	1 087	926	1 387	1 181	1 550	1 320	1 767	1 506	2 203	1 877	2 775	2 362
18	1 153	983	1 471	1 253	1 644	1 400	1 874	1 597	2 337	1 991	2 943	2 506
20	1 216	1 036	1 551	1 321	1 733	1 476	1 976	1 684	2 463	2 098	3 102	2 641

Temperature rise above 10 °C shown in grey background is not recommended.

The values in this table are based on the implicit DC resistance derived from the insertion loss of the various conductor diameters of cable. Manufacturers' and/or suppliers' specifications give information relating to a specific cable.

NOTE 1 The current per conductor for each 1-pair cable is also dependent on the cable construction.

NOTE 2 Currents above 2 000 mA are for information only.

6.4.3 Cable count within a bundle

Replace the first three paragraphs, added by Amendment 1, with the following text:

This document uses 37-cable bundles as the basis for developing the temperature rise and current per conductor with all pairs energized. For other cases (e.g. where bundle count exceeds 37 cables), the guidelines provided in 6.4.4 can be used.

Refer to Table 7 to determine the maximum temperature rise using 2 000 mA per conductor for 1-pair cable bundles of different count.

NOTE The temperature rise of one cable is lower than that of a 7-cable bundle shown in all tables.

6.4.4 Reducing temperature increase

In the sixth paragraph, replace "Figure 1" with "Figure 3".

In the seventh paragraph, replace "Figure 2" with "Figure 4".

In Table 4, replace the left column heading "No. of pairs" with "No. of energized pairs" and replace "°C" with "K" in two places.

Replace Table 8, Figure 3, Table 9 and Figure 4, all added by Amendment 1, with the following new Table 8, Figure 3, Table 9 and Figure 4:

Table 8 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in air

Bundle size	Current mA									
	200	400	600	800	1 000	1 200	1 400	1 600	1 800	2 000
	ΔT K									
7	0,1	0,4	0,9	1,7	2,6	3,7	5,1	6,6	8,4	10,3
19	0,2	0,7	1,6	2,9	4,5	6,5	8,8	11,5	14,6	18,0
37	0,3	1,1	2,4	4,3	6,7	9,6	13,0	17,0	21,6	26,6
61	0,4	1,4	3,2	5,8	9,0	13,0	17,7	23,1	29,2	36,0
91	0,5	1,9	4,2	7,4	11,6	16,7	22,7	29,6	37,5	46,3

Temperature rise above 10 K shown in grey background is not recommended for cables installed in an environment that can reach 50 °C.

The values in this table are based on the DC resistance of the cable conductors. Manufacturers' and/or suppliers' specifications give information relating to a specific cable.

NOTE The temperature rise for a particular cable is also dependent on the cable construction.

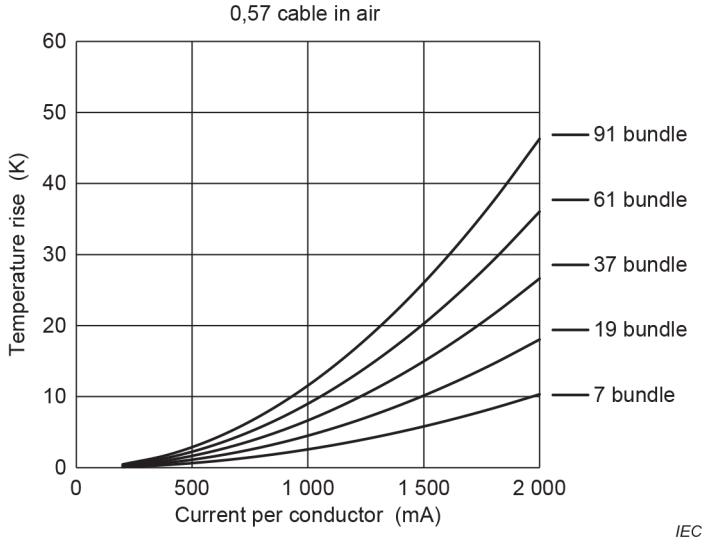

Figure 3 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in air

Table 9 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit

Bundle size	Current mA									
	200	400	600	800	1 000	1 200	1 400	1 600	1 800	2 000
	ΔT K									
7	0,2	0,6	1,4	2,4	3,8	5,3	7,2	9,3	11,7	14,5
19	0,3	1,0	2,3	4,1	6,4	9,0	12,0	15,5	19,5	24,0
37	0,4	1,5	3,3	5,9	9,2	12,8	17,0	22,0	27,6	33,8
61	0,5	1,9	4,4	7,8	12,1	16,8	22,2	28,6	35,7	43,7
91	0,6	2,4	5,5	9,8	15,2	20,9	27,6	35,3	44,1	53,8

Temperature rise above 10 K shown in grey background is not recommended for cables installed in an environment that can reach 50 °C.

The values in this table are based on the DC resistance of the cable conductors. Manufacturers' and/or suppliers' specifications give information relating to a specific cable.

NOTE The temperature rise for a particular cable is also dependent on the cable construction.

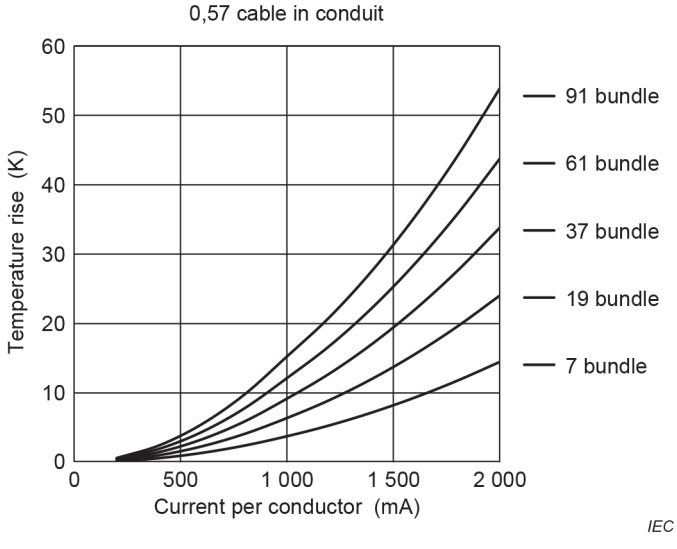

Figure 4 – Temperature rise for a 0,57 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit

Add the following new text, tables and figures at the end of 6.4.4.

Table 10 shows the temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in air. Figure 6 shows these data in graphical form.

Table 11 shows the temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit. Figure 7 shows these data in graphical form.

Table 10 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in air

Bundle size	Current mA									
	200	400	600	800	1 000	1 200	1 400	1 600	1 800	2 000
	ΔT K									
7	0,1	0,2	0,3	0,5	0,8	1,1	1,5	1,9	2,4	3,0
19	0,3	0,4	0,6	1,0	1,4	1,9	2,6	3,3	4,1	5,0
37	0,5	0,7	1,0	1,5	2,1	2,8	3,7	4,7	5,8	7,1
61	0,7	1,0	1,4	2,0	2,8	3,8	4,9	6,2	7,6	9,3
91	1,1	1,4	1,9	2,7	3,6	4,8	6,1	7,7	9,5	11,5

Temperature rise above 10 K shown in grey background is not recommended for cables installed in an environment that can reach 50 °C.

The values in this table are based on the DC resistance of the cable conductors. Manufacturers' and/or suppliers' specifications give information relating to a specific cable.

NOTE The temperature rise for a particular cable is also dependent on the cable construction.

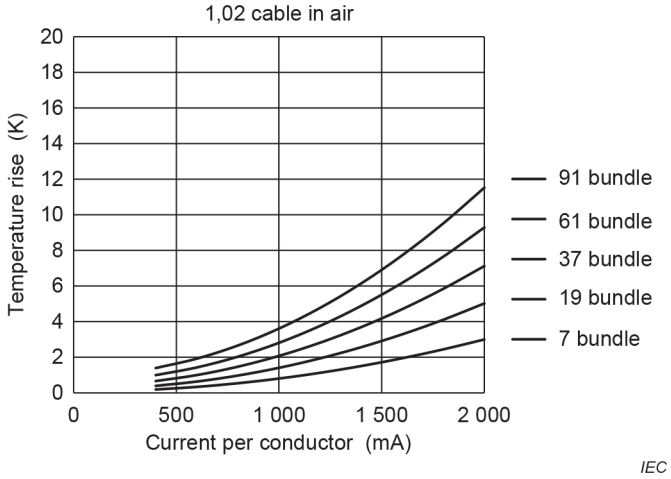

Figure 6 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in air

Table 11 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit

Bundle size	Current mA									
	200	400	600	800	1 000	1 200	1 400	1 600	1 800	2 000
	ΔT K									
7	0,1	0,2	0,5	0,8	1,2	1,7	2,2	2,9	3,7	4,5
19	0,2	0,4	0,8	1,3	2,0	2,8	3,8	4,9	6,1	7,5
37	0,4	0,7	1,2	1,9	2,9	4,0	5,3	6,9	8,6	10,6
61	0,6	1,0	1,7	2,6	3,8	5,2	6,9	8,9	11,2	13,7
91	0,9	1,4	2,2	3,3	4,8	6,5	8,6	11,0	13,8	16,8

Temperature rise above 10 K shown in grey background is not recommended for cables installed in an environment that can reach 50 °C.

The values in this table are based on the DC resistance of the cable conductors. Manufacturers' and/or suppliers' specifications give information relating to a specific cable.

NOTE The temperature rise for a particular cable is also dependent on the cable construction.

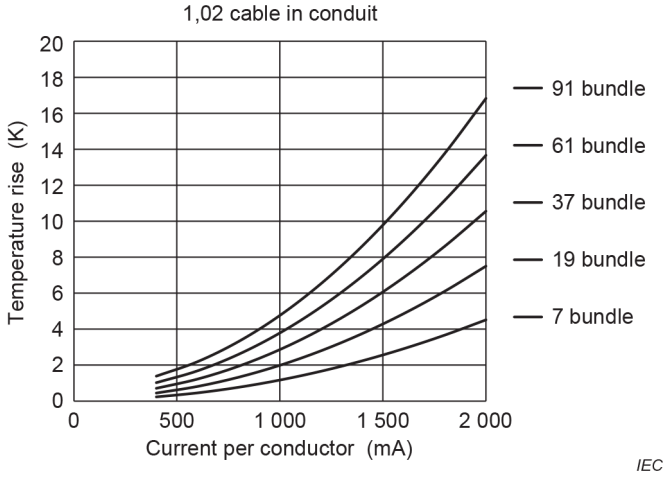

Figure 7 – Temperature rise for a 1,02 mm conductor diameter 1-pair cable versus current for different bundle sizes in conduit

8.2 4-pair balanced cabling

In the first paragraph of this subclause, added by Amendment 1, replace the second sentence with the following:

Connecting hardware contacts can deteriorate as a result of mating or un-mating under electrical load, leading to possible degradation of transmission characteristics (see IEC 60512-99-001 and IEC 60512-99-002).

Replace the NOTE with the following new NOTE:

NOTE A test schedule for connectors under electrical load is described in IEC 60512-99-001 and IEC 60512-99-002.

8.3 1-pair balanced cabling

*In the second paragraph and NOTE of this subclause, added by Amendment 1, replace "*IEC 60512-99-002*" with "*IEC 60512-99-003*" (two occurrences).*

B.2 Power dissipated (P)

Replace the entry for n_c with the following text:

n_c is the number of conductors per cable carrying remote powering current (i_c)

= 2 times the number of pairs carrying remote powering current:

n_c = 2 for 1-pair cables;

n_c = 8 for 4-pair cables;

B.3 Temperature difference from ambient temperature to bundle surface (ΔT_u)

Replace "°C*" in Formula (B.2) with "*K*".*

B.3.2 Typical values for constant ρ_u

Add the following at the end of the subclause:

In this document all calculated conduit tables assume a ρ-factor of 0,25. Environments with different ρ-factors shall be recalculated.

B.4 Temperature difference from bundle surface to bundle centre (ΔT_{th})

Replace "°C" in Formulae (B.3) and (B.4) with "K".

B.7 Adaptation model used to derive temperature rise vs. cables in a bundle

Replace the first two lines below "where" with the following:

ΔT is the temperature rise in K,

I is the current per conductor in A,

B.9 Example

In the first and second paragraphs, replace "°C" with "K" (two occurrences).

B.10 Coefficients for air and conduit

Replace Table B.1 with the following table:

Table B.1 – Bundling coefficients for different types of 4-pair cables and cords (all 4 pairs energized) in air and conduit

Cable type	Bundling coefficients			
	Open air		Conduit	
	C_1	C_2	C_1	C_2
0,4 mm cords	0,578 0	7,120 0	0,792 0	11,700 0
Category 5 cables	0,506 8	3,973 2	0,633 2	6,120 0
Category 6 cables	0,422 8	2,828 0	0,482 4	4,713 2
Category 6_A cables	0,342 8	2,505 2	0,370 4	3,986 8
Category 7 cables	0,342 8	2,505 2	0,370 4	3,986 8
Category 7_A cables	0,174 4	2,060 0	0,222 0	3,364 0
NOTE The bundling coefficients for Category 7_A cables were determined from the relative resistance values in IEC TR 61156-1-6.				

In Table B.2, added by Amendment 1, delete the line for 0,32 mm conductor diameter.

C.1.2 1-pair cabling

Replace the entire text of this subclause, added by Amendment 1, with the following new text:

The DC loop resistance requirements of each pair of a channel are specified in ISO/IEC 11801-1:2017/AMD1:–, when measured in accordance with IEC 61935-4. For convenience, Table C.4 shows those requirements.

Table C.4 – Maximum DC loop resistance of 1-pair channels

T1-A-1000	T1-A-400	T1-A-100	T1-B	T1-C
47,0 Ω	58,5 Ω	14,9 Ω	14,9 Ω	14,9 Ω
NOTE DC loop resistance applies only to pairs that provide DC continuity end-to-end. For testing connectivity, refer to IEC 61935-4.				