

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

**Railway applications – Insulation coordination –
Part 1: Basic requirements – Clearances and creepage distances for all electrical
and electronic equipment**

**Applications ferroviaires – Coordination de l'isolement –
Partie 1: Exigences fondamentales – Distances d'isolement dans l'air et lignes
de fuite pour tout matériel électrique et électronique**



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IEC 62497-1

Edition 1.0 2013-03

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

J

ICS 45.060

ISBN 978-2-83220-643-0

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FOREWORD

This amendment has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

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

FDIS	Report on voting
9/1758/FDIS	9/1782/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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1 Scope

Delete from the first paragraph:

" up to 2 000 m above sea level"

2 Normative references

Add:

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

5.1 General

Add the following new paragraph at the end of the subclause:

The clearances given in Table A.3 apply to altitudes up to 2 000 m above sea level. For higher altitudes correction methods are given in 5.4.

5.2.1 Functional insulation

Add at the end of the first sentence:

, for altitudes higher than 2 000 m clearances shall be increased in accordance with 5.4.

5.2.2 Basic and supplementary insulation

Add at the end of the first sentence:

, for altitudes higher than 2 000 m clearances shall be increased in accordance with 5.4.

Add the following new subclause 5.4:

5.4 Clearances for altitudes higher than 2 000 m

The clearances given in Table A.3 apply for use up to 2 000 m above sea level. For altitudes higher than 2 000 m the clearances given in Table A.3 shall be increased.

For circuits with rated impulse voltage U_{Ni} up to and including 60 kV the clearances given in Table A.3 shall be multiplied by the altitude correction factor k_d given in Table A.9.

For circuits with rated impulse voltage U_{Ni} higher than 60 kV the clearances given in Table A.3 shall be multiplied by the altitude correction factor k_d given in Table A.10.

7.3.1 Method and values

Replace the 2nd paragraph by:

The test voltage shall be the value U_i given in Table A.8, based on a distance determined according to Clause 5.

Depending on the atmospheric conditions and the altitude at the location of testing the impulse test voltages U_i given in Table A.8 shall be corrected according to IEC 60664-1 for circuits with rated impulse voltage U_{Ni} up to and including 60 kV and according to IEC 60060-1 for circuits with rated impulse voltage U_{Ni} higher than 60 kV.

7.4.1 Method and values

Replace the 1st paragraph by:

The test shall be carried out in accordance with IEC 60060-1 or IEC 60664-1.

Replace the 2nd paragraph by:

The test voltage shall be the value U_{ac} given in Table A.8, based on a distance determined according to Clause 5.

Depending on the atmospheric conditions and the altitude at the location of testing the test voltages U_{ac} given in Table A.8 shall be corrected according to IEC 60664-1 for circuits with rated impulse voltage U_{Ni} up to and including 60 kV and according to IEC 60060-1 for circuits with rated impulse voltage U_{Ni} higher than 60 kV.

7.5.1 Method and values

Replace the 1st paragraph by:

The test voltage shall be the value U_{dc} given in Table A.8, based on a distance determined according to Clause 5.

Depending on the atmospheric conditions and the altitude at the location of testing the test voltages U_{dc} given in Table A.8 shall be corrected according to IEC 60664-1 for circuits with

rated impulse voltage U_{Ni} up to and including 60 kV and according to IEC 60060-1 for circuits with rated impulse voltage U_{Ni} higher than 60 kV.

8.3.1 Determination of U_{Ni} by method 1

Replace the subclause title by:

Determination of the rated impulse voltage U_{Ni} by method 1

Table A.2

Replace the last line in the table by the following two new lines:

30 ^{a, d}			125	170
30 ^{b, d}			170	200

Table A.3

Replace the title of the table by:

Table A.3 – Minimum clearances in air (in mm) for the standard altitude ranges based on the rated impulse voltage U_{Ni}

Draw in Table A.3 a bold line between U_{Ni} 60 kV and U_{Ni} 75 kV as follows:

...				
50	75	91	101	106
60	90	110	120	125
75	120	135	145	150
95	160	175	180	185
...				

Add to Note 5 of Table A.3:

5.1, 5.4

Table A.8

Replace the title of the table by:

Table A.8 – Test voltages for verifying clearances at atmospheric and altitude reference conditions, not to be used for routine dielectric tests

Add the following new Table A.9:

Table A.9 – Altitude correction factors for clearances in circuits with U_{Ni} up to and including 60 kV when equipment is intended to be used above 2 000 m

Altitude (above sea level) m	Altitude correction factor k_d
≤ 2 000	1,00
2 500	1,07
3 000	1,14
3 500	1,21
4 000	1,29
4 500	1,38
5 000	1,48

NOTE 1 For altitudes in between or above, linear interpolation is allowed.

NOTE 2 The altitude correction factors are determined in accordance with Table A.2 of IEC 60664-1:2007.

NOTE 3 This table is cited in 5.4. [IEC 62497-1:2010/AMD1:2013](https://standards.iteh.ai/catalog/standards/sist/d1d66dcd-c88f-40ad-9eb6-c553a286e392/iec-62497-1-2010-amd1-2013)

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Add the following new Table A.10:

Table A.10 – Altitude correction factors for clearances in circuits with U_{Ni} higher than 60 kV when equipment is intended to be used above 2 000 m

Altitude (above sea level) m	Altitude correction factor k_d
2 000	1,000
2 500	1,145
3 000	1,217
3 500	1,294
4 000	1,376
4 500	1,465
5 000	1,555

NOTE 1 For altitudes in between or above, linear interpolation is allowed.

NOTE 2 The altitude correction factors above 2 000 m are determined in accordance with 4.2.2 of IEC 60071-2 based on an altitude of 1 400 m and exponent $m = 1$.

NOTE 3 This table is cited in 5.4.

B.2.1 General

Replace the penultimate paragraph by:

The test shall be carried out

- for circuits with rated impulse voltage U_{Ni} up to and including 60 kV in accordance with Clause 6 of IEC 60664-1:2007;
- for circuits with rated impulse voltage U_{Ni} higher than 60 kV in accordance with IEC 60060-1.

Table B.1

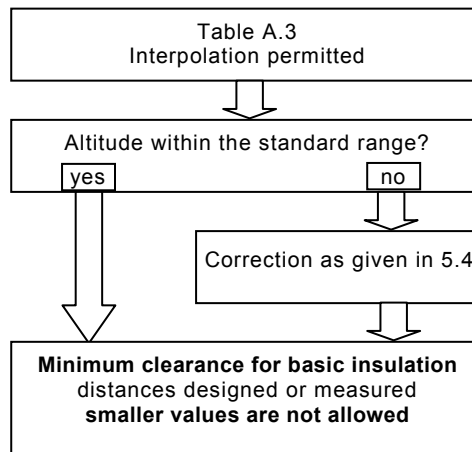
Add new values 135 kV, 60 kV and 180 kV, 85 kV as follows:

Rated impulse voltage	Test voltage
U_{Ni} kV	U_a kV
0,33	0,2
0,5	0,3
0,8	0,42
1,5	0,7
2,5	1,2
3	1,4
3,5	1,6
4	1,9
4,5	2,0
5	2,3
6	2,8
8	3,6
10	4,6
12	5,5
15	6,9
18	8,3
20	9,2
25	11,5
30	14
35	17
40	18,5
50	23
60	27,5
75	34,5
95	44
125	50
135	60
145	70
170	80
180	85
200	95
250	95
325	140

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Figure F.1

Add, in Step 5 after "PD from Step 4", the following:



as illustrated below:

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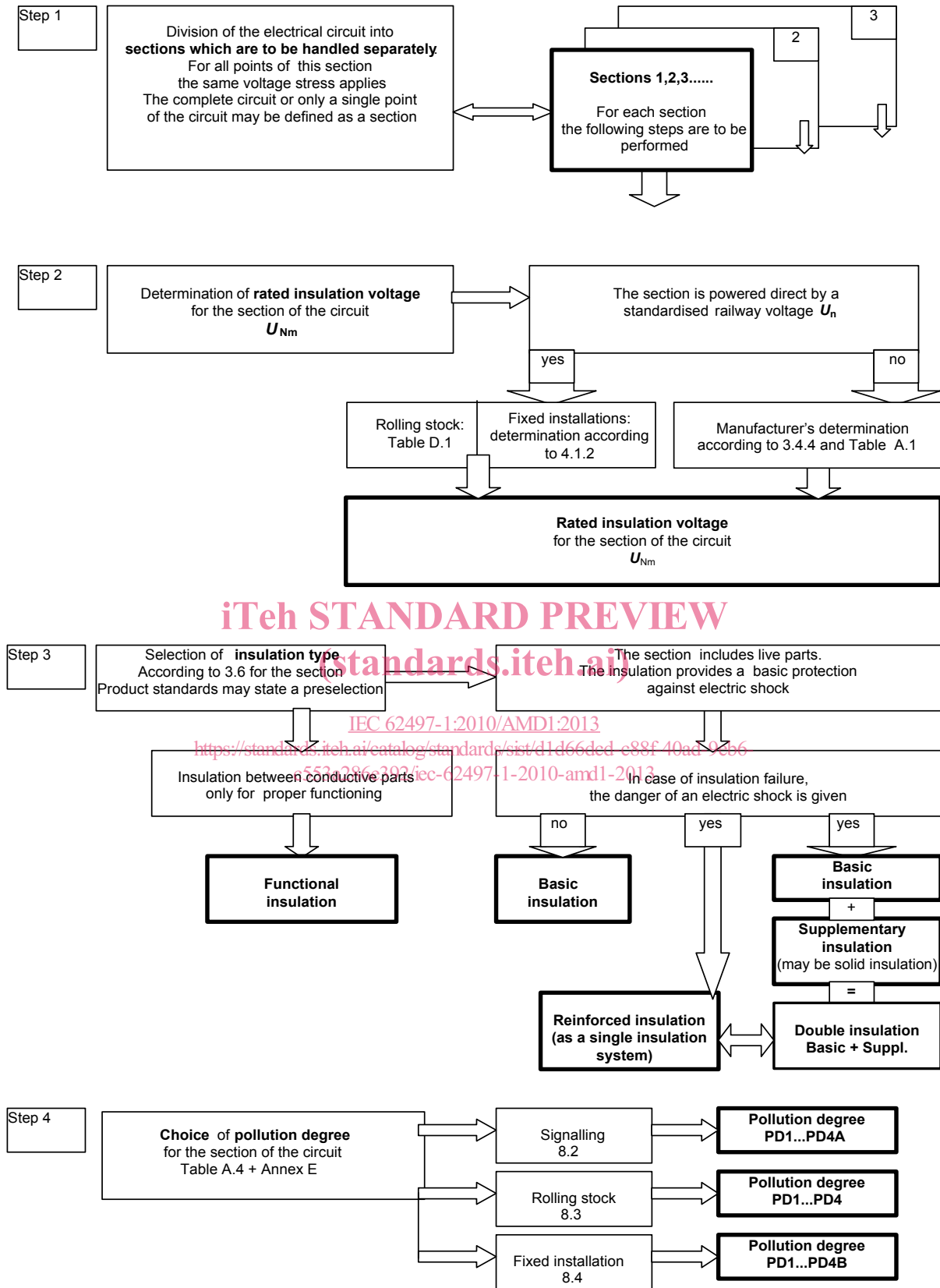


Figure F.1 – Determination of minimum clearances and creepage distances

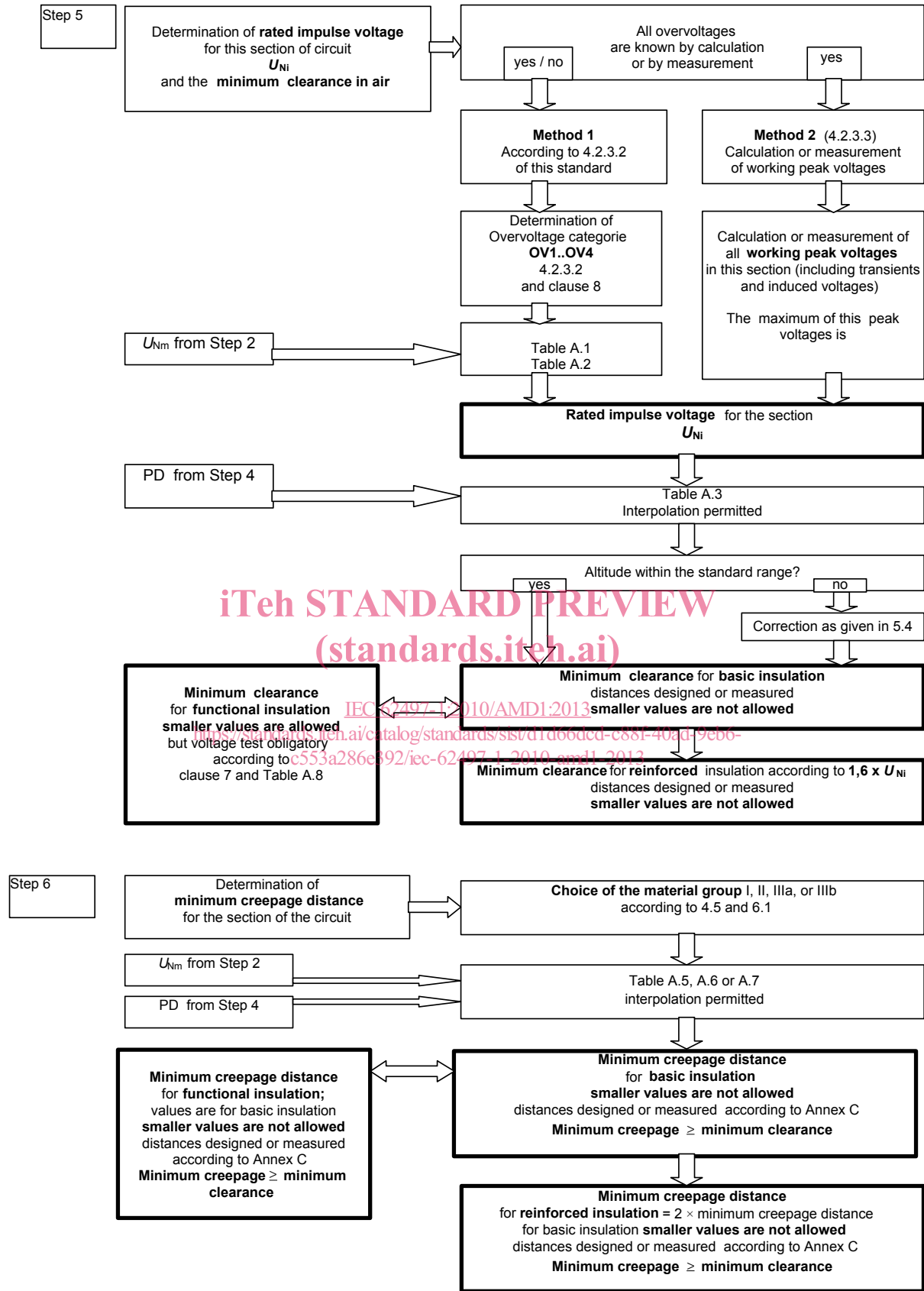


Figure F.1 (continued)