IEC 62911

Edition 1.0 2016-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Audio, video and information technology equipment – Routine electrical safety testing in production

Appareils audio, vidéo et matériel de traitement de l'information – Essais individuels de série, en production, pour la vérification de la sécurité électrique

IEC 62911:2016-01(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 33.160, 35.020

ISBN 978-2-8322-3094-7

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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AUDIO, VIDEO AND INFORMATION TECHNOLOGY EQUIPMENT – ROUTINE ELECTRICAL SAFETY TESTING IN PRODUCTION

FOREWORD

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International Standard IEC 62911 has been prepared by TC108: Safety of electronic equipment within the field of audio/video, information technology and communication technology

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

FDIS	Report on voting
108/616/FDIS	108/635/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

In this standard, the following print types or formats are used:

– requirements proper and normative annexes: in roman type;

– compliance statements and test specifications: in *italic type*;

– notes/explanatory matter: in smaller roman type;

– normative conditions within tables: in smaller roman type;

– terms that are defined in Clause 3: **bold**.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

AUDIO, VIDEO AND INFORMATION TECHNOLOGY EQUIPMENT – ROUTINE ELECTRICAL SAFETY TESTING IN PRODUCTION

1 Scope

This International Standard defines **routine electrical safety test** procedures for use during or after manufacturing of complete equipment, sub-assemblies or components, complying with IEC 60065, IEC 60950-1 or IEC 62368-1 and powered by an **a.c. mains supply** or **d.c. mains supply**, to detect manufacturing failures and unacceptable tolerances in manufacturing and materials.

NOTE All the tests defined in this standard do not necessarily have to be performed at the end product manufacturing location. The optimal location for the **routine electrical safety tests** can be defined by the equipment manufacturer and reviewed under the conformity assessment scheme.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60065, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 62368-1, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60065, IEC 60950-1 and IEC 62368-1, as well as the following apply.

3.1
routine electrical safety test
electrical safety test to which each individual equipment is subjected during or at the end of manufacture

4 Conformance

Equipment shall pass the **routine electrical safety tests** of Clause 5 where applicable and the results of these tests shall be recorded according to Clause 6 prior to shipment from the manufacturing site.

NOTE Practical measures can be used to conduct the test, such as finding an appropriate way to make the connections necessary to perform the relevant test.

5 Routine electrical safety tests

5.1 Resistance of protective bonding system

For **class I equipment**, the continuity of the protective bonding system shall be checked between the protective earth contact of the **mains** plug or appliance inlet, or the **protective earthing terminal** in case of a **permanently connected equipment**, and

– the **accessible** conductive parts that need to be connected to the **protective earthing terminal** for compliance with the requirements of the standard, and

– the protective earth contact of the socket-outlets respectively, if provided to deliver **mains** power to other equipment.

NOTE 1 Functional earth is not considered a part of the protective bonding system and as a consequence, it does not need to be tested.

*The minimum test current is 150 % of the rating of the overcurrent device protecting the **protective bonding conductor** (the **protective current rating**), but not less than 10 A and not more than 25 A (a.c. or d.c.), applied for any duration between 1 s and 4 s. The source shall have a no-load voltage not exceeding 12 V.*

The resistance, calculated from the voltage drop, shall not exceed 0,1 Ω.

*It is permitted to include the power cord (if any) in the resistance measurement and, if the result exceeds 0,1 Ω, to subtract the resistance of the **protective earthing conductor** of the power cord.*

NOTE 2 Ensure that the contact resistance between the tip of the measuring probe and the conductive part under test does not influence the test result.

5.2 Electric strength test

*Routine tests for electric strength shall be carried out between circuits connected to the **mains** (**primary circuits**) and **accessible** conductive parts. For **accessible** circuits not connected to the **mains** (**secondary circuits**), it is permitted to test separately, before final assembly, subassemblies and components, such as transformers, if the relevant insulation cannot be tested in the complete equipment, provided that the complete equipment complies with IEC 60065, IEC 60950-1 or IEC 62368-1 as appropriate.*

The insulation of the equipment shall be checked by the following test:

– *for equipment supplied by an a.c. **mains**, an a.c. test voltage of substantially sine-wave form, having **mains** frequency, or a d.c. test voltage or a combination of both with a peak value as specified in Table 1 is applied;*

– *for equipment supplied by a d.c. **mains**, a d.c. voltage according to Table 2 is applied;*

– *for equipment supplied by either an a.c. **mains** or a d.c. **mains**, the test can be applied at either a.c. or d.c., making sure that the test voltage is the equivalent of the highest of the two required test voltages as given in the above two dashes.*

The test voltages given are the minimum test voltages to be applied. Higher voltages are allowed at the discretion of the manufacturer provided the insulation is not damaged due to overstress by the voltage applied.

NOTE 1 Applying an electrical strength test voltage that is too high can result in deterioration or partial damage of the insulation.

*The test voltage is applied between the supply **terminals** connected together and*

– ***terminals** regarded as **accessible**, and*

– ***accessible** conductive parts respectively,*

*that may become **hazardous live** (ES3) in the event of an insulation fault as a result of incorrect assembly.*

NOTE 2 **Terminals** regarded as **accessible** and **accessible** conductive parts can be connected together during the electric strength test.

Table 1 – Test voltage for equipment with a.c. mains

Application of test voltage	**Test voltage** V (peak) a.c or d.c.	
	Rated mains voltage ≤ 150	**Rated mains voltage** > 150
Accessible parts connected to protective earth	1 130 (800 r.m.s.)	2 120 (1 500 r.m.s.)
Accessible parts not connected to protective earth	2 120 (1 500 r.m.s.)	3 540 (2 500 r.m.s.)
Functional earth is not considered to be protective earth. Accessible parts connected to functional earth have to be tested as not being connected to protective earth.		

Table 2 – Test voltage for equipment with d.c. mains

Application of test voltage	**Test voltage** V d.c.	
	Up to and including 60 V	**Over 60 V up to and including 10 kV**
Accessible parts connected to protective earth	No test	see V_a in Table 3
Accessible parts not connected to protective earth	No test	see V_b in Table 3
Functional earth is not considered to be protective earth. Accessible parts connected to functional earth have to be tested as not being connected to protective earth.		

Table 3 – DC test voltages

DC mains supply voltage	V_a d.c.	V_b d.c.
> 60	921	1 472
62	935	1 495
64	947	1 517
66	962	1 538
68	976	1 560
70	988	1 581
72	1 001	1 602
74	1 014	1 622
76	1 027	1 643
78	1 039	1 663
80	1 052	1 683
85	1 082	1 731
90	1 110	1 777
95	1 138	1 821
100	1 167	1 865
105	1 193	1 909
110	1 219	1 950
115	1 244	1 991
120	1 268	2 031
125	1 294	2 069
130	1 316	2 107
135	1 340	2 145
140	1 363	2 180
145	1 386	2 217
150	1 407	2 253
152	1 414	2 262
[a] 155	1 414	2 286
[a] 160	1 414	2 320
[a] 165	1 414	2 353
[a] 170	1 414	2 387
[a] 175	1 414	2 419
[a] 180	1 414	2 450
[a] 184	1 414	2 476
185	1 551	2 482
190	1 571	2 513
200	1 608	2 573
210	1 644	2 631
220	1 681	2 689
230	1 717	2 746
240	1 751	2 800
250	1 783	2 853
260	1 817	2 906
270	1 848	2 958
280	1 881	3 008
290	1 910	3 057
300	1 941	3 105
310	1 971	3 153
320	1 999	3 200
330	2 029	3 247
340	2 057	3 292
350	2 084	3 336

DC mains supply voltage	V_a d.c.	V_b d.c.
360	2 113	3 379
380	2 166	3 466
400	2 219	3 549
420	2 269	3 630
440	2 319	3 709
460	2 367	3 787
480	2 414	3 862
500	2 460	3 937
520	2 506	4 009
540	2 549	4 079
560	2 593	4 149
580	2 636	4 217
588	2 651	4 242
600	2 677	4 242
Linear interpolation is permitted between the nearest two points.		
[a] At these voltages, the values of V_b are determined by the general curve V_b = 155,86 $U^{0,463\,8}$ and are not 1,6 V_a.		

Before the test voltage is applied, contact shall be made between the equipment and the connection devices.

The voltage applied to the insulation under test may be gradually raised from zero to the prescribed voltage and maintained at that value for 1 s to 4 s.

*During the test, mains switches and functional switches conductively connected to the **mains**, if any, shall be in the on-position and it shall be ensured by suitable means that the test voltage is effectively connected to the equipment.*

No flash-over or breakdown shall occur during the test. The test voltage source shall be provided with a current sensing (over-current) device which, when activated, gives an indication "unacceptable". When loaded up to and including the overcurrent activation point, the voltage source shall still deliver the prescribed voltage.

NOTE 3 The manufacturer can define the minimum tripping current, making sure it is high enough to detect breakdown but at the same time taking into account possible operator safety issues.

Activation of the current sensing device is regarded as a flash-over or breakdown.

6 Records of tests

All test results should be kept available. The choice of support and format for reports is left to the manufacturer; separate forms (one for each equipment) or lists of equipment, grouped according to the most suitable parameters (periods of time, model, etc.) are equally acceptable.

The only obligation is the availability of data and their immediate interpretability for all equipment leaving the production line.

The following data should be retrievable as evidence that the test was performed:

– date of test,

– model of the equipment,

– serial number of the equipment or another identifier permitting the identification without ambiguity,