

# INTERNATIONAL STANDARD

# IEC 60065

2001

AMENDMENT 1  
2005-10

---

---

Amendment 1

## **Audio, video and similar electronic apparatus – Safety requirements**

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

© IEC 2005 Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland  
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: [inmail@iec.ch](mailto:inmail@iec.ch) Web: [www.iec.ch](http://www.iec.ch)



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE

**Q**

*For price, see current catalogue*

## FOREWORD

This amendment has been prepared by IEC technical committee 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology.

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

FDIS	Report on voting
108/136/FDIS	108/148A/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 maintenance result 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

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- withdrawn,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

---

## CONTENTS

*Replace "Annex L (vacant)" by the following*

"Annex L (normative) Additional requirements for electronic flash apparatus for photographic purposes"

Page 19

### **1 General**

#### **1.1 Scope**

**1.1.1** *Add to the list of examples the following new item:*

- electronic flash apparatus for photographic purposes (see Annex L).

## 1.2 Normative references

*Delete the reference to IEC 60068-2-3.*

*Add the following references:*

IEC 60068-2-78:2001, *Environmental testing – Part 2: Tests – Test Cab: Damp heat, steady state*

IEC 60086-4:2000, *Primary batteries – Part 4: Safety of lithium batteries*

*Add the following amendments to the reference to IEC 60038:*

Amendment 1 (1994)

Amendment 2 (1997)

*Add the following amendment to the reference to IEC 60335-1:*

Amendment 1 (2004)

*Add the following amendment to the reference to IEC 60529:*

Amendment 1 (1999)

*Add the following amendments to the reference to IEC 60664-1:*

Amendment 1 (2000)

Amendment 2 (2002)

*Add the following amendment to the reference to IEC 60695-11-10:*

Amendment 1 (2003)

*Add the following amendment to the reference to IEC 60851-3:*

Amendment 1 (1997)

*Add the following amendments to the reference to IEC 60851-5:*

Amendment 1 (1997)

Amendment 2 (2004)

*Replace the date of IEC 60085 by 2004.*

*Replace the date of IEC 60112 by 2003.*

*Replace the date of IEC 60384-1 by 1999.*

*Replace the date of IEC 60664-3 by 2003.*

*Replace the date of IEC 60691 by 2002.*

*Replace the date of IEC 60998-2-2 by 2002.*

*Replace the date of IEC 61058-1 by 2000.*

*Replace the date of IEC 61965 by 2003.*

Page 49

#### **4 General test conditions**

##### **4.2.1** *Replace the seventh paragraph by the following:*

*Any type of supply for which the apparatus is designed to be used.*

Page 59

#### **4.3 Fault conditions**

*Replace, in the first paragraph, "in turn" by "one at a time".*

##### **4.3.1** *Replace the existing text by the following:*

*Short-circuit across CLEARANCES and CREEPAGE DISTANCES, if they are less than the values specified in Clause 13 for BASIC and SUPPLEMENTARY INSULATION, with the exception of insulation between parts of different polarity DIRECTLY CONNECTED TO THE MAINS.*

NOTE For CLEARANCES between parts of different polarity DIRECTLY CONNECTED TO THE MAINS reference is made to 13.1.

##### **4.3.3** *Replace, in the fourth dash, "in turn" by "one pair at a time".*

##### **4.3.10** *Replace the existing text by the following:*

*The top, sides and the back of an apparatus, if such surfaces have ventilation openings, shall be covered one at a time with a piece of card of 200 g/m<sup>2</sup> density with dimensions not less than each tested surface, covering all openings.*

*Openings on different surfaces on top of the apparatus (if any) are covered simultaneously by separate pieces of card.*

*Openings on top of the apparatus, on a surface inclined at an angle greater than 30° and smaller than 60° to the horizontal, from which an obstruction is free to slide, are excluded.*

*On the back and the sides of the apparatus, the card is attached to the upper edge and allowed to hang freely.*

NOTE There is no test for the bottom surface.

Page 63

#### **5 Marking and instructions**

##### **5.4.1** Add the following items:

- g) A warning that batteries (battery pack or batteries installed) shall not be exposed to excessive heat such as sunshine, fire or the like.

- h) If the apparatus is provided with a CRT with protective film attached to the faceplate as part of the safety implosion protection system in accordance to IEC 61965, the following warning, or wording with a similar meaning, shall be given in the instructions:

#### WARNING

The CRT in this apparatus employs a protective film on the face.  
This film must not be removed as it serves a safety function and  
removal will increase the risk of serious injury.

Page 75

## 7 Heating under normal operating conditions

### 7.1 General

*Replace in Table 3 under e) the line for lithium batteries as follows:*

Lithium batteries	40 <sup>h)</sup>	50 <sup>l)</sup>
-------------------	------------------	------------------

*Add the following conditions to the table:*

- h) Lithium batteries shall meet the permissible temperature rise, unless such batteries comply with the applicable electrical tests of 6.2.2.1 or 6.2.2.2 of IEC 60086-4.
- l) Lithium batteries shall meet the permissible temperature rise, unless such batteries comply with all electrical tests of 6.3.2 of IEC 60086-4.

Page 83

## 8 Constructional requirements with regard to the protection against electric shock

**8.7** *Replace the text of this subclause with "Void."*

**8.8** *Add the following at the end of the list of requirements:*

For test specifications of non-separable thin sheet insulation, see 8.22.

NOTE The purpose of the tests in 8.22 is to ensure that the material has adequate strength to resist damage when hidden in inner layers of insulation. Therefore, the tests are not applied to insulation in two layers. The tests are also not applied to SUPPLEMENTARY INSULATION.

**8.12** *Replace the text of this subclause with "Void."*

*Add the following new subclause:*

### **8.22 Test specifications of non-separable thin sheet material**

*Compliance is checked by subclause 26.3 in IEC 61558-1 or by the following:*

*Three test samples, each individual sample consisting of three or more layers of non-separable thin sheet material forming REINFORCED INSULATION, are used. One sample at a time is fixed to the mandrel of the test fixture (Figure 14) as shown in Figure 15.*

*A downward force of  $150\text{ N} \pm 10\text{ N}$  is applied to the free end of the sample (see Figure 16), using an appropriate clamping device. The mandrel is rotated by hand without jerks*

- from the initial position (Figure 15) to the final position (Figure 16) and back;*
- as above for the second time;*
- from the initial position to the final position.*

*If a sample breaks during rotation where it is fixed to the mandrel or the clamping device, this does not constitute a failure and the test is repeated on a fresh sample. If a sample breaks at any other place, the test has failed.*

*After this preconditioning, a sheet of metal foil,  $0,035\text{ mm} \pm 0,005\text{ mm}$  thick, at least 200 mm long, is placed along the surface of the sample, hanging down on each side of the mandrel (see Figure 16). The surface of the foil in contact with the sample shall be conductive, not oxidised or otherwise insulated. The foil is positioned so that its edges are not less than 18 mm from the edges of the sample (see Figure 17). The foil is then tightened by two equal weights, one at each end, using appropriate clamping devices.*

*While the mandrel is in its final position, and within the 60 s following the final positioning, a dielectric strength test is applied between the mandrel and the metal foil in accordance with 10.3.2, using a test voltage of 1,5 times the value specified in Table 5 for REINFORCED INSULATION, but not less than 5 kV.*

*The entire test procedure is repeated on the other two samples.*

*No flashover or breakdown shall occur during the test; corona effects and similar phenomena being disregarded.*

Page 101

## **9 Electric shock hazard under normal operating conditions**

### **9.1.1.2 Determination of ACCESSIBLE parts**

*Add the following new paragraph after the fourth paragraph of 9.1.1.2.*

*Moving parts of loudspeaker systems, such as dust caps or cones of drivers or passive radiators, are not regarded as preventing accessibility.*

NOTE See also 13.3.1.

Page 135

## **13 CLEARANCES and CREEPAGE DISTANCES**

### **13.2 Determination of operating voltage**

*Replace the first dashed item by the following:*

- the OPERATING VOLTAGE between any point in a circuit CONDUCTIVELY CONNECTED TO THE MAINS and earth, and between any point in a circuit CONDUCTIVELY CONNECTED TO THE MAINS and a circuit not CONDUCTIVELY CONNECTED TO THE MAINS, shall be assumed to be the greatest of the following:*

- *the RATED SUPPLY VOLTAGE or the highest measured voltage between such points during operation at the RATED SUPPLY VOLTAGE, or*
- *the upper voltage of the RATED SUPPLY VOLTAGE range or the highest measured voltage between such points during operation at any value within the RATED SUPPLY VOLTAGE range;*

### **13.3 CLEARANCES**

#### **13.3.1 General**

Add the following as the new third compliance paragraph to 13.3.1.

*CLEARANCES between a loudspeaker voice coil and adjacent conductive parts shall be disregarded.*

### **13.4 CREEPAGE DISTANCES**

*Add the following note at the end of the subclause:*

NOTE The presence of adhesive on insulation tapes should be considered in determining the CTI.

### **13.6 Jointed insulation**

*Replace the last three paragraphs, including the note by:*

*One apparatus, component or subassembly is subjected to the relevant dielectric strength test of 10.3, without the humidity treatment of 10.2, however, the test voltage is multiplied by 1,6.*

*This test is performed immediately after the 68 h temperature conditioning of the last cycle.*

*Upon conclusion of the complete number of cycles, the two remaining apparatus, components or subassemblies are subjected to the relevant dielectric strength test of 10.3; however, the test voltages are multiplied by 1,6.*

NOTE The test voltage is higher than the normal test voltage in order to ensure that, if the surfaces are not cemented together, a breakdown occurs.

Page 159

## **14 Components**

### **14.1 Resistors**

*Replace the second compliance paragraph by the following:*

*Before test a) or b), the resistance of each sample is measured and the sample is then subjected to the damp heat test according to IEC 60068-2-78 with the following severity parameters:*

- *Temperature: (40 ± 2) °C,*
- *Humidity: (93 ± 3) % RH,*
- *Test duration: 21 days.*

**14.2.5 Capacitors or RC-units not covered by 14.2.1 to 14.2.4**

*Replace the paragraph below b) by the following:*

This subclause is not applicable to metal-cased capacitors and RC-units. Thin coating or tubing in such a case is ignored.

**14.6.1 Delete the note.**

*Replace the first paragraph by the following:*

MANUALLY OPERATED MECHANICAL SWITCHES which

- control currents exceeding 0,2 A r.m.s. a.c. or d.c., and/or
- have voltage across the open switch contacts exceeding 35 V (peak) a.c. or 24 V d.c.

shall meet one of the following requirements:

Page 193

**15 TERMINALS****15.1.1** *Replace the last paragraph in the requirements, by the following:*

Conductors of internal wiring of socket-outlets providing MAINS power to other apparatus either directly or via a MAINS SWITCH shall have a nominal cross-sectional area as specified in 16.2 for external flexible cords, except where the apparatus complies with Clause 11 when 4.3.9 is applied.

**15.2** *Delete the third paragraph.*

Page 219

**18 Mechanical strength of picture tubes and protection against the effects of implosion**

*Replace the paragraph by the following:*

Picture tubes shall comply with the requirements of 18.1. As an alternative, for intrinsically protected tubes, manufacturers may choose the picture tubes to comply with IEC 61965.

NOTE The present test of 18.2 will be replaced by a full reference to IEC 61965 in the forthcoming Amendment 2 to IEC 60065.

**18.1 General**

*Add the following as the second paragraph:*

A protective film, attached to the faceplate of the picture tube as part of the implosion protection system, shall be covered on all edges by the enclosure of the apparatus.



## 19 Stability and mechanical hazards

*Replace the text up to the paragraph beginning “During the tests...” by the following:*

Apparatus having a mass of 7 kg or more shall have adequate stability. In addition, the stability shall be ensured when legs, carts or stands supplied or recommended by the manufacturer are fitted.

*Compliance is checked by the tests of 19.1, 19.2 and 19.3.*

Apparatus intended to be fastened in place is not required to be subjected to these tests, and the test of 19.3 applies only to

- apparatus with a mass of 25 kg or more, or
- apparatus, excluding loudspeaker systems, with a height of 1 m or more, or
- apparatus, excluding loudspeaker systems, in combination with a supplied or recommended cart or stand with a total height of 1 m or more.

**19.3** *Replace the existing text by the following:*

*The apparatus or apparatus in combination with a supplied or recommended cart or stand is placed on a horizontal non-skid surface. All doors, drawers, casters, adjustable feet and other moveable parts are arranged in any combination that results in the least stability.*

*The apparatus or apparatus in combination with a supplied or recommended cart or stand shall be blocked, if necessary, by means of a stop of the smallest dimensions possible, to keep it from sliding or rolling.*

*An externally applied horizontal force of 13 % of the weight of the apparatus or 100 N, whichever is less, is applied in a horizontal direction to that point on the apparatus that will result in the least stability. The force shall not be applied more than 1,5 m above floor level.*

*If the apparatus or apparatus in combination with a supplied or recommended cart or stand becomes unstable, it shall not overturn at a tilt of less than 15° from the vertical.*

**19.5** *Replace the compliance paragraph by the following:*

*Compliance is checked by the test of 12.1.3 using the impact hammer only.*

Page 227

## 20 Resistance to fire

### 20.1 Electrical components and mechanical parts

*Replace the text by the following:*

Electrical components and mechanical parts, with the exception of those in a) and b), shall comply with the requirements of 20.1.1, 20.1.2, 20.1.3 and 20.1.4.

- a) Components that are contained in an enclosure having a flammability category of V-0 according to IEC 60695-11-10 and having openings only for the connecting wires filling the openings completely, and for ventilation not exceeding 1 mm in width regardless of length.
- b) The following parts, which would contribute negligible fuel to a fire:
  - small mechanical parts, such as mounting parts, gears, cams, belts and bearings, if the mass of the non-metallic material of each part does not exceed 4 g, excluding metal, glass and ceramic;
  - small electrical components, such as:
    - integrated circuits, transistors, optocoupler packages;
    - capacitors with a volume not exceeding 1 750 mm<sup>3</sup>,provided these components are mounted on material of flammability category V-1 or better according to IEC 60695-11-10.

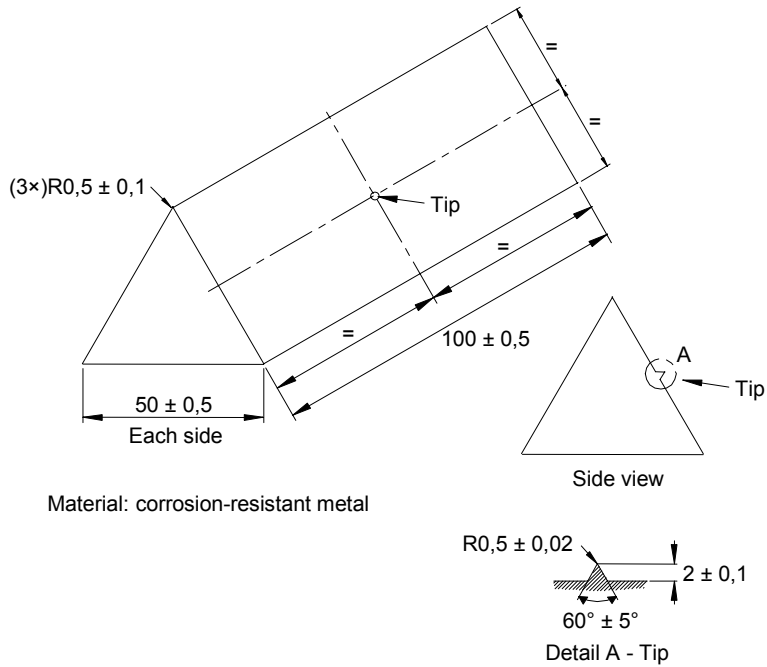
NOTE 1 Connectors are regarded as electrical components.

NOTE 2 In considering how to minimise propagation of fire and what "small parts" are, account should be taken of the cumulative effect of small parts adjacent to each other for the possible effect of propagating fire from one part to another.

NOTE 3 In the forthcoming Amendment 2 of IEC 60065, other occurrences of IEC 60707 will be replaced.

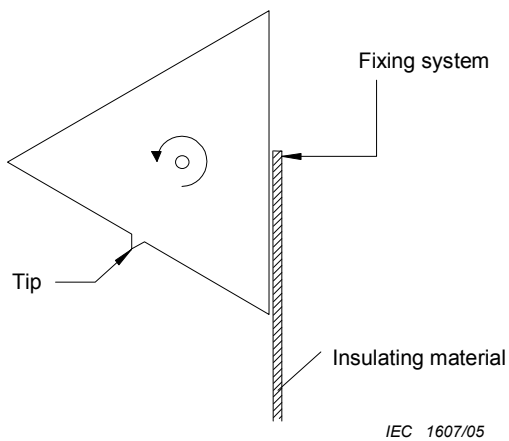
Add the following figures:

Dimensions in millimeters



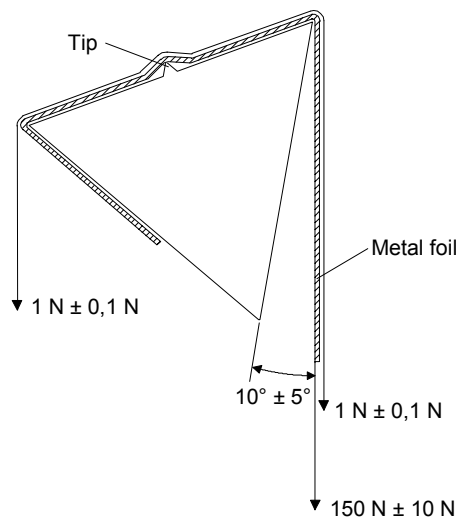
IEC 1608/05

Figure 14 – Mandrel



IEC 1607/05

Figure 15 – Initial position of mandrel

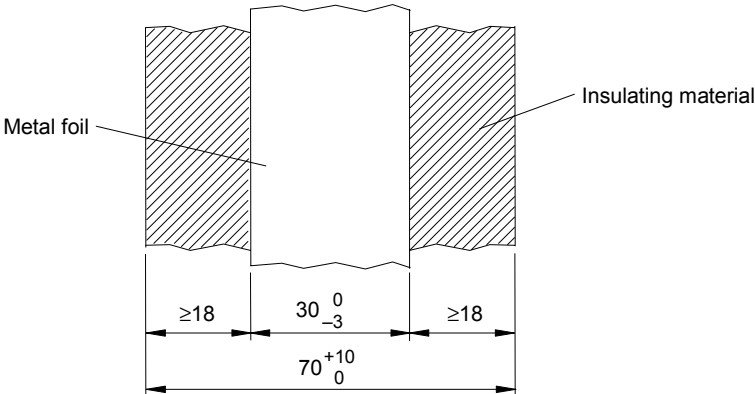


IEC 1608/05

The final position of the mandrel is rotated 230° ± 5° from the initial position

Figure 16 – Final position of mandrel

Dimensions in millimeters



IEC 1609/05

**Figure 17 – Position of metal foil on insulating material**

- NOTE 1 Figure 17 is the same as Figure 6c of IEC 61558-1.  
Figures 15 and 16 are slightly modified compared with Figure 6b from IEC 61558-1.
- NOTE 2 See 8.22.

Page 301

Add, after Annex K, the following annex:

## **Annex L** (normative)

### **Additional requirements for electronic flash apparatus for photographic purposes**

The requirements of this standard, supplemented or replaced by those contained in this annex, apply to electronic flash apparatus for photographic purposes.

NOTE This annex replaces IEC Publication 60491:1984.

#### **L.1 General<sup>1)</sup>**

Add the following to 1.1.1:

**L.1.1.1** This annex applies to the following electronic flash apparatus for photographic purposes, having a stored energy not exceeding 2 000 J, together with associated apparatus and not intended to be subjected to dripping or splashing:

- apparatus of the single-flash type which can have more than one flash head operating at the same time;
- apparatus for the illumination of sequential photographic exposures;
- battery chargers and SUPPLY APPARATUS to be used in connection with electronic flash apparatus for photographic purposes. These auxiliary units may form a part of the MAINS plug;
- accessories specified in the instruction leaflet.

This annex does not apply to stroboscopes.

NOTE 1 As long as no appropriate requirements exist for apparatus having a stored energy exceeding 2 000 J, this annex may be used, in so far as it is applicable. Additional requirements may be necessary, for example, for explosion and thermal radiation.

NOTE 2 This annex is intended to cover apparatus which can be used both in moderate and tropical climates.

NOTE 3 For the modelling lamps combined with electronic flash apparatus for photographic purposes, additional requirements may be taken from IEC 60598-2-9 or IEC 60598-2-17, as far as applicable.

#### **L.4 General test conditions**

Add the following subclauses after 4.2.12:

**L.4.2.13** *The apparatus is tested with or without connection of flash heads, capacitors and other accessories.*

**L.4.2.14** *If the apparatus can be MAINS-operated, it is switched on for a period of 4 h without flashing; if only battery or rechargeable battery is supplied, it is switched on for 30 s.*

---

1) The clause numbering of this annex refers to the clauses of this standard.

*Thereupon as many consecutive flashes as can be produced, with a maximum of 40, are made as quickly as possible. The rate of flashing is determined by the indicator or, if no indicator, by the measured voltage on the flash capacitors, which should be 85 % of the maximum peak voltage. The apparatus is supplied at its RATED SUPPLY VOLTAGE.*

*A battery charger is connected for 4 h to a fully discharged rechargeable battery for which the charger has been designed.*

*Add the following dashed items to 4.3.3:*

#### **L.4.3.3**

- *interruption of filaments of lamps;*
- *short and open circuiting of glow-discharge lamps (used for indication or regulation).*

*Add the following item to 4.3.4:*

#### **L.4.3.4**

- g) self-healing capacitors (for example, of the metallized paper type) as far as overheating is concerned.*

### **L.5 Marking and instructions**

*Add the following to 5.4, after Note 2:*

**L.5.4** Battery chargers and SUPPLY APPARATUS shall be accompanied by an instruction leaflet in which shall be indicated the type or model number of flash apparatus with which they are to be used.

The flash apparatus shall be accompanied by an instruction leaflet in which shall be indicated the type or model number of SUPPLY APPARATUS or battery charger with which it is to be used.

NOTE It is also permitted to give this information on the apparatus themselves.

*Compliance is checked by inspection.*

### **L.7 Heating under normal operating conditions**

*Add the following to 7.1.5 after the first paragraph:*

**L.7.1.5** Lithium batteries shall meet the permissible temperature rise in Table 3, "Normal operating conditions", unless such batteries comply with the applicable electrical tests of 6.2.2.1 or 6.2.2.2 of IEC 60086-4.

## L.9 Electric shock hazard under normal operating conditions

Add the following to 9.1.1 after Note 1:

**L.9.1.1** TERMINALS for the connection to the synchronizer of the camera shall not be HAZARDOUS LIVE.

Add the following to 9.1.1.1 after the first paragraph:

**L.9.1.1.1** If possible, flashing is made during the measurements.

## L.10 Insulation requirements

Add the following to 10.3.2 directly before Table 5:

**L.10.3.2** In the case of apparatus with high frequency pulse ignition, the ignition pulse is ignored in computing the test voltage if the duration of the pulse does not exceed 1 ms.

## L.11 Fault conditions

Add the following to 11.2.6 after the first paragraph:

**L.11.2.6** Lithium batteries shall meet the permissible temperature rise in Table 3, "Fault conditions", unless such batteries comply with all electrical tests of 6.3.2 of IEC 60086-4.

## L.12 Mechanical strength

Add the following after the fourth paragraph of 12.1.3:

**L.12.1.3** Windows for flash tubes are excluded from the steel ball impact test.

## L.14 Components

Add the following subclause at the end of 14.6:

**L.14.6.6** Furthermore, for MAINS SWITCHES, the characteristics of the switch, with reference to the marking, shall be appropriate for the function of the switch in the apparatus under normal conditions.

*Compliance is checked by inspection and by measurement.*

*The rated MAINS current of a flash apparatus is determined by the following formula:*

$$I_r = 1/3\sqrt{\hat{i}_o^2 + \hat{i}_o\hat{i}_1 + \hat{i}_1^2}$$

where

$\hat{i}_o$  is the maximum MAINS current (peak value) immediately after a flash has been made.

$\hat{i}_1$  is the MAINS current (peak value) at the end of the re-charge period of the flash capacitor. The end of the re-charge period is determined by the indicator or, if there is no indicator, by the measured voltage on the flash capacitor, which shall be 85 % of the maximum peak voltage, the apparatus supplied at its RATED SUPPLY VOLTAGE.

The apparatus is operated under normal operating conditions except that the apparatus is connected to its RATED SUPPLY VOLTAGE.

$\hat{i}_0$  and  $\hat{i}_1$  are measured when the apparatus is ready for flash operation and has been connected to the MAINS supply for at least 30 min.

The peak surge current is the maximum peak value of the MAINS current when the flash apparatus is switched on, after the flash capacitor has been discharged completely. Current spikes up to 100  $\mu$ s duration are disregarded.

The measured peak surge current and calculated rated MAINS current ( $I_r$ ) shall not exceed the marked current rating of the MAINS SWITCH.

## **L.20 Resistance to fire**

Add the following to 20.1:

**L.20.1 c)** A trigger coil circuit for discharge purposes in a flash apparatus is not considered to be a POTENTIAL IGNITION SOURCE.



## **Bibliography**

*Add the following:*

IEC 60598-2-9:1987, *Luminaires – Part 2: Particular requirements – Section 9: Photo and film luminaires (non-professional)*  
Amendment 1 (1993)

IEC 60598-2-17:1984, *Luminaires – Part 2: Particular requirements – Section 17: Luminaires for stage lighting, television and film studios (outdoor and indoor)*  
Amendment 2 (1990)

---

ISBN 2-8318-8246-X



9 782831 882468

---

**ICS 97.020**

---

Typeset and printed by the IEC Central Office  
GENEVA, SWITZERLAND