

Australian/New Zealand Standard™

**Auxiliaries for lamps—D.C. or A.C.  
supplied electronic step-down  
convertors for filament lamps—  
General and safety requirements  
(IEC 61046:1993, MOD)**



## AS/NZS 61046:2001

---

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-041, Lamps and Related Equipment. It was approved on behalf of the Council of Standards Australia on 21 March 2001 and on behalf of the Council of Standards New Zealand on 4 May 2001. It was published on 5 May 2001.

---

The following interests are represented on Committee EL-041:

Association of Consulting Engineers Australia  
Australian Chamber of Commerce and Industry  
Australian Electrical and Electronic Manufacturers Association  
Electrical Compliance Testing Association of Australia  
Electrical Regulatory Authorities Council (Australia)  
Energy Efficiency and Conservation Authority of New Zealand  
Illuminating Engineering Society of Australia and New Zealand  
International Accreditation New Zealand  
Ministry of Economic Development, New Zealand

---

### Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Australia web site at [www.standards.com.au](http://www.standards.com.au) or Standards New Zealand web site at [www.standards.co.nz](http://www.standards.co.nz) and looking up the relevant Standard in the on-line catalogue.

Alternatively, both organizations publish an annual printed Catalogue with full details of all current Standards. For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia International or Standards New Zealand at the address shown on the back cover.

---

*This Standard was issued in draft form for comment as DR 99298.*

---

# Australian/New Zealand Standard™

## **Auxiliaries for lamps—D.C. or A.C. supplied electronic step-down convertors for filament lamps— General and safety requirements (IEC 61046:1993, MOD)**

First published as AS/NZS 61046:2001.

### **COPYRIGHT**

© Standards Australia/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Jointly published by Standards Australia International Ltd, GPO Box 5420, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 3857 5

## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-041, Lamps and Related Equipment.

The objective of this Standard is to provide the lighting industry with general and safety requirements for electronic step-down convertors for use on d.c. supplies up to 250 V or a.c. supplies up to 1 000 V and rated output voltage less than or equal to 50 V r.m.s., for use with tungsten-halogen or other filament lamps.

This Standard has been adopted with national modifications from IEC 61046:1993, *Auxiliaries for lamps—D.C. or A.C. supplied electronic step-down convertors for filament lamps—General and safety requirements*, including Amendment 1:1995. The changes made by Amendment 1 are indicated by a marginal bar against each clause, table or figure that is affected.

Variations to IEC 61046:1993 are indicated at appropriate places throughout this Standard. Strikethrough identifies IEC tables, figures and passages of text which, for the purpose of this Australian/New Zealand Standard, are deleted. Where Australian/New Zealand tables, figures or passages of text are added, each is set in its proper place and identified by shading. The variations are listed in Annex ZZ for easy reference.

A reference to an International Standard identified in the Normative References Clause by strikethrough (~~example~~) is replaced by a reference to the Australian or Australian/New Zealand Standard(s) listed immediately thereafter and identified by shading (**example**). Where the struck-through referenced document and the referenced Australian or Australian/New Zealand Standard are identical, this is indicated in parenthesis after the title of the latter.

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (b) In the source text 'this International Standard' should read 'this Australian/New Zealand Standard'.
- (c) A full point should be substituted for a comma when referring to a decimal marker.
- (d) French text on figures should be ignored.

In this Standard, the following print types are used:

- (i) Requirements proper: in arial type.
- (ii) Test specifications: *in italic type*.
- (iii) Notes: in smaller arial type.

The term 'normative' has been used in this Standard to define the application of the annex to which it applies. A 'normative' annex is an integral part of a Standard.

To assist the reader, editorial corrections have been made to Table C.6 and to Table C.7 Item 4)c).

Attention is drawn to Electromagnetic Compatibility (EMC) schemes introduced in their respective countries by the Australian Communications Authority (ACA) and the Ministry of Economic Development, New Zealand to manage the use and performance of devices that either intentionally or unintentionally emit electromagnetic energy in the radiofrequency spectrum. Mandated Standards form an integral part of the EMC compliance schemes. Electrical lighting products fall within the scope of AS/NZS 4051, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment*. AS/NZS 4051 has been reproduced from IEC/CISPR 15 (same title) but contains some changes to limits to protect local radio services.

Information on EMC compliance for lighting equipment is to be found on the Internet at <http://www.aca.gov.au/standards/emc.htm> and for NZ at <http://www.moc.govt.nz/rsm>

# CONTENTS

|                                                                                                                                                              | <i>Page</i> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| INTRODUCTION                                                                                                                                                 | iv          |
| SECTION 1: GENERAL REQUIREMENTS                                                                                                                              |             |
| 1 General .....                                                                                                                                              | 1           |
| 2 Definitions .....                                                                                                                                          | 4           |
| 3 General requirements .....                                                                                                                                 | 6           |
| 4 General notes on tests.....                                                                                                                                | 6           |
| 5 Classification .....                                                                                                                                       | 7           |
| 6 Marking .....                                                                                                                                              | 7           |
| 7 Terminals and cords .....                                                                                                                                  | 8           |
| 8 Provisions for earthing.....                                                                                                                               | 9           |
| 9 Construction .....                                                                                                                                         | 9           |
| 10 Creepage distances and clearances .....                                                                                                                   | 10          |
| 11 Protection against accidental contact with live parts .....                                                                                               | 10          |
| 12 Moisture resistance and Insulation.....                                                                                                                   | 11          |
| 13 Electric strength .....                                                                                                                                   | 12          |
| 14 Transformer heating .....                                                                                                                                 | 13          |
| 15 Abnormal conditions .....                                                                                                                                 | 13          |
| 16 Fault conditions .....                                                                                                                                    | 14          |
| 17 Screws, current-carrying parts and connections.....                                                                                                       | 15          |
| 18 Resistance to heat and fire .....                                                                                                                         | 15          |
| 19 Resistance to corrosion .....                                                                                                                             | 17          |
| Annex A Test to establish whether a conductive part is a live part which may<br>cause an electric shock .....                                                | 19          |
| Annex B Particular requirements for d.c. or a.c. supplied electronic step-down<br>convertors for filament lamps with means of protection against overheating | 20          |
| Annex C Particular additional requirements for independent SELV d.c. or a.c.<br>supplied electronic step-down convertors for filament lamps.....             | 23          |
| Annex ZZ Variations to IEC 61046:1993 for application in Australia and<br>New Zealand .....                                                                  | 42          |

## INTRODUCTION

This standard covers general and safety requirements for d.c. or a.c. electronic step-down convertors for filament lamps generally operating with a frequency deviating from the supply frequency.

Performance requirements are the subject of IEC 61047.

NOTE – Safety requirements ensure that electrical equipment constructed in accordance with these requirements, does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it is intended.

This standard refers to d.c. or a.c. supplied electronic step-down convertors for use with tungsten-halogen lamps as specified in IEC 60357 and other filament lamps.

Tests in this standard are type tests. Requirements for testing individual convertors during production are not included.

## STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

**Australian/New Zealand Standard****Auxiliaries for lamps—D.C. or A.C. supplied electronic step-down convertors for filament lamps—General and safety requirements  
(IEC 61046:1993, MOD)****Section 1: General requirements****1 General****1.1 Scope**

This International Standard specifies general and safety requirements for electronic step-down convertors for use on d.c. supplies up to 250 V or a.c. supplies up to 1 000 V at 50 Hz or 60 Hz and rated output voltage  $\leq 50$  V r.m.s. at a frequency deviating from the supply frequency or  $\leq 50 \sqrt{2}$  V unsmoothed d.c. between conductors or between any conductor and earth, associated with tungsten-halogen lamps as specified in IEC 60357 and other filament lamps.

NOTE – The limit of 50 V rated output voltage is in accordance with Band 1 of IEC 60449.

Particular requirements for electronic step-down convertors with means of protection against overheating are given in annex B.

Particular requirements for stationary independent SELV convertors, which are part of the wiring in installations, are given in annex C.

Plug-in convertors, being part of the luminaire, are covered as built-in convertors together with the additional requirements of the luminaire standard.

NOTE – These proposals have also been submitted to SC 14D for introduction in IEC 60742.

**1.2 Normative references**

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

References to International Standards that are struck through in this Clause are replaced by references to equivalent Australian or Australian/New Zealand Standards that are listed immediately thereafter and identified by shading. Any Australian or Australian/New Zealand Standard that is identical to the International Standard it replaces is appropriately identified.

**1.2.1 IEC standards**

IEC 60051, *Direct acting indicating analogue electrical-measuring instruments and their accessories*

~~IEC 65: 1985, Safety requirements for mains operated electronic and related apparatus for household and similar general use  
Amendment No. 1 (1987). Amendment No. 2 (1989)~~

AS/NZS 3250, Approval and test specification—Mains operated electronic and related equipment for household and similar general use

~~IEC 83: 1975, Plugs and socket-outlets for domestic and similar general use. Standards Amendment No. 1 (1979)~~

AS 3112, Approval and test specification—Plugs and socket-outlets

~~IEC 85: 1894, Thermal evaluation and classification of electrical insulation~~

AS 2768, Electrical insulating materials—Evaluation and classification based on thermal endurance

IEC 60127, Miniature fuses

IEC 60249, Base materials for printed circuits

~~IEC 269-2: 1986, Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)~~

~~IEC 269-3: 1987, Low-voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)~~

AS 2005, Low voltage fuses—Fuses with enclosed fuse-links

AS 2005.20, Part 20: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)—Common requirements

AS 2005.30, Part 30: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)

IEC 60317, Specifications for particular types of winding wires

IEC 60357: 1982, Tungsten-halogen lamps (non-vehicle)  
Amendment No. 1 (1984), Amendment No. 2 (1985), Amendment No. 3 (1987), Amendment No. 4 (1989)

IEC 60364-4-41: 1982, Electrical installations of buildings - Part 4: Protection for safety - Chapter 41: Protection against electric shock

~~IEC 417: 1973, Graphical symbols for use on equipment. Index, survey and compilation of the single sheets~~

AS 1104, Informative symbols for use on electrical and electronic equipment (identical to IEC 417)

IEC 60449: 1973, Voltage bands for electrical installations of buildings.  
Amendment No. 1 (1979)

IEC 60454, Specifications for pressure-sensitive adhesive tapes for electrical purposes

~~IEC 529: 1989, Degrees of protection provided by enclosures (IP Code)~~

AS 1939, *Degrees of protection provided by enclosures for electrical equipment (IP Code)* (identical to IEC 529)

~~IEC 598-1: 1986, *Luminaires—Part 1: General requirements and tests*.  
Amendment No. 1 (1988)~~

~~IEC 598-2-6: 1979, *Luminaires—Part 2: Particular requirements—Section Six: Luminaires with built-in transformers for filament lamps*.  
Amendment No. 1 (1987)~~

AS/NZS 60598, *Luminaires*

AS/NZS 60598.1, Part 1: *General requirements and tests*

AS/NZS 60598.2.6, Part 2: *Particular requirements—Luminaires with built-in transformers or convertors for filament lamps*

IEC 60691: 1980, *Thermal-links*

~~IEC 695-2-1: 1980, *Fire hazard testing—Part 2: Test methods—Glow-wire test and guidance*~~

~~IEC 695-2-2: 1980, *Fire hazard testing—Part 2: Test methods—Needle-flame test*~~

AS/NZS 4695, *Fire hazard testing of electrotechnical products*

AS/NZS 4695.2.2, Part 2.2: *Test methods—Needle-flame test*

AS/NZS 4695.2.10, Part 2.10: *Test methods—Glow-wire test methods—General*

AS/NZS 4695.2.11, Part 2.11: *Test methods—Glow-wire end-product test and guidance*

AS/NZS 4695.2.12, Part 2.12: *Test methods—Glow-wire flammability test on materials*

AS/NZS 4695.2.13, Part 2.13: *Test methods—Glow-wire ignitability test on materials*

IEC 60730-2-3: 1990, *Automatic electrical controls for household and similar use - Part 2: particular requirements for thermal protectors for ballasts for tubular fluorescent lamps*

~~IEC 742: 1983, *Isolating transformers and safety isolating transformers—Requirements*~~

AS/NZS 3108, *Approval and test specifications—Particular requirements for isolating transformers and safety isolating transformers*

IEC 60906, *IEC System of plugs and socket-outlets for household and similar purposes*

~~IEC 920: 1990, *Ballasts for tubular fluorescent lamps—General and safety requirements*~~

AS 3168, *Approval and test specifications —Fluorescent lamp ballasts*

AS/NZS 61047:2001\*, *D.C. or A.C. supplied electronic step-down convertors for filament lamps—Performance requirements*

### 1.2.2 ISO standard

ISO 4046: 1978, *Paper, board, pulp and related terms - Vocabulary*

---

\* In course of publication

## 2 Definitions

For the purposes of this International Standard the following definitions apply:

### 2.1 Convertors

#### 2.1.1 electronic step-down convertor (convertor):

Unit inserted between the supply and one or more tungsten-halogen or other filament lamps which serves to supply the lamp(s) with its (their) rated voltage, generally at high frequency. The unit may consist of one or more separate components.

It may include means for dimming, correcting the power factor and suppressing radio interference.

#### 2.1.2 independent convertor:

Convertor which can be mounted separately outside the luminaire and without any additional enclosure. This may consist of a built-in convertor housed in a suitable enclosure which provides all the necessary protection according to its markings.

#### 2.1.3 built-in convertor:

Convertor exclusively designed to be built into a luminaire, a box, an enclosure or the like.

#### 2.1.4 integral convertor:

Convertor which forms a non-replaceable part of a luminaire and which cannot be tested separately from the Luminaire.

#### 2.1.5 d.c. or a.c. supplied convertor:

A d.c. to a.c. or a.c. to a.c. convertor including stabilizing elements for operating one or more filament lamps, generally at high frequency.

#### 2.1.6 safety isolating SELV-equivalent convertor:

Built-in convertor for operating one or more filament lamps with an output voltage equivalent to SELV.

NOTE – For the purposes of this standard, SELV-equivalent convertors, complying with 11.2, are deemed as giving protection against electric shock equivalent to SELV.

#### 2.1.7 isolating convertor:

Convertor, the input and output circuit of which is electrically separated to limit hazards due to accidental simultaneous contact with earth and live parts or metal parts which may become live in the event of an insulation fault.

#### 2.1.8 independent SELV convertor:

Independent convertor providing a SELV output isolated from the supply mains by means such as a safety isolating transformer as specified in IEC 60742.

#### 2.1.9 associated convertor:

Convertor designed to supply specific appliances or equipments, incorporated in or not, but specially designed to be used only with the specific appliance(s) or equipment.

**2.1.10 stationary convertor:**

Either a fixed convertor or a convertor which cannot be easily removed from one place to another.

**2.1.11 plug-in convertor:**

Convertor incorporated in an enclosure provided with an integral plug as the means of connection of the electrical supply.

**2.2 Voltages****2.2.1 supply voltage:**

Voltage applied to the input circuit of the convertor.

**2.2.2 working voltage:**

Highest r.m.s. voltage which may occur across any insulation, transients being neglected, in open-circuit conditions or during lamp operation when the convertor is operated at its rated supply voltage.

**2.2.3 rated output voltage:**

Output voltage, at rated supply voltage, rated frequency and at unity power factor, assigned to the convertor.

**2.3 supply current:**

Current supplied to the complete circuit of lamp(s) and convertor.

**2.4 live part:**

Conductive part which may cause an electric shock in normal use. The test to determine whether or not a conductive part is a live part which may cause an electric shock is given in annex A (normative).

**2.5 End of lamp life effects****2.5.1 half resistance effect:**

Effect which can occur at the end of lamp life due to filament deformation or crystallization effects resulting in a partial short-circuit of the lamp filament, which can cause overloading of the convertor.

**2.5.2 arcing:**

Effect which can occur in lamps at a voltage of  $\geq 20$  V and which can cause overloading of the convertor.

**2.6 type test:**

Test or series of tests made on a type-test sample for the purposes of checking compliance of the design of a given product with the requirements of the relevant specification.

**2.7 type test sample:**

Sample consisting of one or more similar units submitted by the manufacturer or responsible vendor for the purposes of a type test.

## **2.8 rated maximum operating temperature of a case of a built-in convertor (symbol $t_c$ ):**

Highest permissible temperature which may occur on the outer surface (at the indicated place if marked) of the built-in convertor under normal operating conditions and at the rated supply voltage or the maximum of the rated supply voltage range.

## **3 General requirements**

Convertors shall be so designed and constructed that in normal use they operate without danger to the user or surroundings.

*Compliance is checked by carrying out all the tests specified.*

In addition, the outer case of independent convertors shall comply with the requirements of IEC 60598-1, including the classification and marking requirements of that standard.

In addition, independent SELV convertors shall comply with the requirements of annex C. This also includes the insulation resistance, electric strength, creepage distances and clearances of the outer case.

## **4 General notes on tests**

### **4.1 Tests according to this standard are type tests.**

NOTE – The requirements and tolerances permitted by this standard are related to testing of a type test sample submitted by the manufacturer for that purpose. Compliance of the type test sample does not ensure compliance of the whole production of a manufacturer with this safety standard.

Conformity of production is the responsibility of the manufacturer and may include routine tests and quality assurance in addition to type testing.

### **4.2 Unless otherwise specified, the tests are carried out at an ambient temperature between 10°C and 30°C.**

**4.3** *For the thermal test, independent convertors shall be mounted in a test corner consisting of three dull-black painted boards 15 mm - 20 mm thick and arranged so as to imitate two walls and the ceiling of a room. The convertor is secured to the ceiling as close as possible to the walls, the ceiling extending at least 250 mm beyond the other side of the convertor.*

### **4.4 The tests are carried out in the order of the clauses unless otherwise specified.**

### **4.5 The type test is carried out on one type test sample.**

If the tests of C.7.5 have to be made, they are carried out on three additional specimens. These specimens are used only for the tests of C.7.5.

For associated convertors, the equipment standard may prescribe other numbers of specimens to be tested.

Additional specimens may also be necessary if other tests require partial destruction of the convertor.

## 5 Classification

Convertors are classified according to:

### 5.1 the mode of installation:

- independent convertors;
- SELV convertors;
- convertors for building-in (built-in convertors);
- integral convertors.

### 5.2 the protection against electric shock:

- SELV-equivalent convertors (this type of convertor can be used instead of double-wound transformers with reinforced insulation, see IEC 60598-2-6);
- isolating convertors (this type of convertor can be used instead of double-wound transformers, see IEC 60598-2-6);
- auto-wound convertors.

## 6 Marking

### 6.1 Mandatory markings

Convertors other than integral convertors shall be clearly marked as follows:

- a) Mark of origin. This may take the form of a trade mark or the manufacturer's name or the name of the responsible vendor.
- b) Model number or type reference of the manufacturer.
- c) Wiring diagram indicating the position of terminals. In the case of convertors not having terminals, a clear indication shall be given on the wiring diagram of the significance of the code used for the connecting wires.
- d) The correlation between replaceable parts, including fuses, of a convertor shall be marked unambiguously by legends on the convertor or, with the exception of fuses, be specified in the manufacturer's catalogue.
- e) Rated supply voltage (or voltages, if there are several), supply frequency and supply current(s); the supply current may be given in the manufacturer's literature.

The marking of the rated voltage, or rated voltage range, shall cover 240 V for Australia and 230 V for New Zealand.

- f) Rated output voltage.
- g) Symbol for earthing, if applicable, in accordance with IEC 60417.
- h) The value of  $t_c$ . If  $t_c$  relates to a certain place on the convertor, this place shall be indicated or specified in the manufacturer's catalogue.
- i) Symbol for temperature declared thermally protected convertor:  (see annex B), if applicable. The dots in the triangle shall be replaced by the value of the rated maximum case temperature in °C assigned by the manufacturer. Values increasing in multiples of 10.
- j) Symbol for an independent convertor  if applicable.

## 6.2 Information to be provided if applicable

In addition to the above mandatory markings, the following information, if applicable, shall be given either on the convertor, or be made available in the manufacturer's catalogue or the like.

- Rated wattage or the designation as indicated on the lamp data sheet of the type or types of lamp for which the convertor is designed. If the convertor may be used with more than one lamp, the number and wattage of each lamp shall be indicated.  
NOTE – It is assumed that a marked wattage range includes all ratings within the range unless otherwise indicated in the manufacturer's literature.
- A declaration if the convertor does not rely upon the luminaire enclosure for protection against accidental contact.
- A declaration of the cross-section of conductor(s) for which the terminals, if any, are suitable.  
Symbol: relevant value(s) in mm<sup>2</sup> followed by a small square: ... □
- A declaration if the convertor has mains connected windings.
- A declaration for SELV-equivalent convertors if applicable.

## 6.3 Test for marking

*The durability of the marking shall be checked by trying to remove it by rubbing lightly for 15 s with a piece of cloth soaked with water and, after drying, for a further 15 s with a piece of cloth soaked with hexane. The marking shall be legible after the test.*

## Section 2 - Safety requirements

### 7 Terminals

~~Screw terminals shall comply with section fourteen of IEC 598-1. Screwless terminals shall comply with section fifteen of IEC 598-1.~~

## 7 Terminals and cords

### 7.1 Terminals

Screw terminals shall comply with section fourteen of AS/NZS 60598.1. Screwless terminals shall comply with section fifteen of AS/NZS 60598.1.

The connecting facilities of a built-in converter shall be tested in accordance with the relevant procedure as follows:

- Converters provided with directly connected flexible leads* A weight having a mass of 9 kg shall be hung from each lead in turn in accordance with the following procedure:

The converter shall be held with the 9kg weight freely suspended and the termination in its normal position. It shall then be inclined slowly through 45 degrees, brought back through the normal position to 45 degrees in the opposite direction, and finally returned to the normal position, the entire action taking place in the one vertical plane. The test shall be repeated at 90 degrees to the initial test plane.

- Converters provided with other means of connecting facilities (including quick-connect terminals)* The terminal fixed to the converter shall be subjected to a direct pull of 50 N applied along the longitudinal axis of each terminal in turn. The pull shall be increased uniformly to 50 N over a period of 10 s, maintained at that value for a further 10 s, and then released. The test shall then be repeated with the direction of the force reversed so that a direct push is applied along the same longitudinal axis of the fixed terminal.

No noticeable fracture of the seals or connecting wires shall have taken place nor shall there be any sign of deterioration as a result of the test.

## 7.2 Flexible cords

Any flexible cord provided with an independent or integral converter for the purpose of connecting it to the supply mains shall be of a sheathed type not inferior to light duty polyvinyl chloride sheathed cord duty type in accordance with AS/NZS 3191, and shall be correctly wired in accordance with the requirements for flexible cords and connecting plugs contained in AS/NZS 3100.

Facilities for the anchorage of the flexible cord shall be provided in accordance with the requirements for entry of flexible cords contained in AS/NZS 3100 and the anchorage shall pass the test for cord anchorage contained in AS/NZS 3100.

Where no flexible cord is provided, the tests shall be carried out using a light duty polyvinyl chloride sheathed cord.

## 8 Provisions for earthing

### 8.1 Protective earth (ground). Symbol 417C-IEC-5019

Any earthing-terminal shall comply with the requirements of clause 7. The electrical connection shall be adequately locked against loosening and it shall not be possible to loosen the electrical connection by hand. For screwless terminals, it shall not be possible to loosen the clamping means unintentionally.

Earthing of convertors other than independent convertors via means of fixing the convertor to earthed metal is permitted. However, if a convertor has an earthing terminal, this terminal shall only be used for earthing the convertor.

**8.2** All parts of an earthing terminal shall be such as to minimize the danger of electrolytic corrosion resulting from contact with the earth conductor or any other metal in contact with them. The screw or the other parts of the earthing terminal shall be made of brass or other metal no less resistant to corrosion, or material with a non-rusting surface and at least one of the contact surfaces shall be bare metal.

*Compliance is checked by inspection.*

Conductors for protective earthing provided by tracks on printed circuit boards shall be tested as follows:

A current from an a.c. source of 25 A is passed for 1 min between the earthing terminal or earthing contact via the track on the printed board and each of the accessible metal parts in turn.

After the test, the requirement of IEC 60598-1, subclause 7.2.3 shall apply.

## 9 Construction

**9.1** Socket-outlets in the output circuit shall not accept plugs complying with IEC 60083 and IEC 60906; neither shall it be possible to engage plugs accepted by socket-outlets in the output circuit with socket-outlets complying with IEC 60083 and IEC 60906.

*Compliance is checked by inspection and by manual test.*

## 10 Creepage distances and clearances

Creepage distances and clearances shall be not less than the values given in table 1 unless otherwise specified in clause 16.

**Table 1 - Creepage distances and clearances**

| Working voltage<br>(r.m.s.)                                                                                                                                                                                                                  | Up to and<br>including<br>50 V | Above 50 V<br>up to and<br>including<br>250 V | Above 250 V<br>up to and<br>including<br>500 V | Above 500 V<br>up to and<br>including<br>750 V | Above<br>750 V up<br>to and<br>including<br>1 000 V |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------|------------------------------------------------|------------------------------------------------|-----------------------------------------------------|
|                                                                                                                                                                                                                                              | mm                             | mm                                            | mm                                             | mm                                             | mm                                                  |
| Creepage distance and clearance<br>1) Between live parts of<br>different polarity                                                                                                                                                            | 2                              | 3(2)                                          | 4(2)                                           | 5(3)                                           | 6(4)                                                |
| 2) Between live parts and<br>accessible metal parts which are<br>permanently fixed to the convertor<br>including screws or devices for<br>fixing covers or fixing the convertor<br>to its support.                                           | 2                              | 4(2)                                          | 5(3)                                           | 6(4)                                           | (6(4))                                              |
| Clearance<br>3) Between live parts and<br>flat supporting surface or a loose<br>metal cover, if any, if the<br>construction does not ensure that<br>the values under 2) above are<br>maintained under the most<br>unfavourable circumstances | 2                              | 6                                             | 8                                              | 10                                             | 10                                                  |
| NOTE – The values between brackets apply to creepage distances and clearances where the surface area is not liable to contamination by dust or moisture                                                                                      |                                |                                               |                                                |                                                |                                                     |

*Convertors are not checked when the components are so encapsulated in a self-hardening compound bonded to the relevant surfaces that clearances do not exist*

*Printed boards are exempt from the requirements of clause 10 because they are tested. according to clause 16.*

*The contribution to the creepage distance of any groove less than 1 mm wide shall be limited to its width.*

*Any air-gap less than 1 mm shall be ignored in computing the total air path.*

NOTE – Creepage distances are measured along the external surface of the insulating material.

*A metallic enclosure shall have an insulation lining according to the requirements of 9.3.6 of IEC 60065, if in the absence of such a lining the creepage distance or clearance between the live parts and the enclosure is smaller than the value specified above.*

## 11 Protection against accidental contact with live parts

**11.1** Convertors, which do not rely upon the luminaire enclosure for protection against electric shock, see item b) of 6.2. when installed as in normal use, shall be sufficiently protected against accidental contact with live parts as specified in annex A.

Lacquer or enamel is not deemed to be adequate protection or insulation for the purpose of this requirement.

Parts providing protection against accidental contact shall have adequate mechanical strength and shall not work loose in normal use. It shall not be possible to remove them without the aid of a tool.