Safety of transformers, reactors, power supply units and combinations thereof – Part 2-9: Particular requirements and tests for transformers and power supply units for class III handlamps for tungsten filament lamps

Sécurité des transformateurs, bobines d’inductance, blocs d’alimentation et des combinaisons de ces éléments – Partie 2-9: Règles particulières et essais pour les transformateurs et blocs d’alimentation pour lampes baladeuses de classe III à filament de tungstène
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF TRANSFORMERS, REACTORS, POWER SUPPLY UNITS AND COMBINATIONS THEREOF –

Part 2-9: Particular requirements and tests for transformers and power supply units for class III handlamps for tungsten filament lamps

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International standard IEC 61558-2-9 has been prepared by IEC technical committee 96: Transformers, reactors, power supply units and combinations thereof.

This second edition cancels and replaces the first edition published in 2002. It constitutes a technical revision. The main changes consist of updating this part in accordance with IEC 61558-1:2005, and adding power supply units to the scope.

This part has the status of a group safety publication in accordance with IEC Guide 104: 1997, The preparation of safety publications and the use of basic safety publications and group safety publications.
The text of this standard is based on the following documents:

<table>
<thead>
<tr>
<th>FDIS</th>
<th>Report on voting</th>
</tr>
</thead>
<tbody>
<tr>
<td>96/355/FDIS</td>
<td>96/362/RVD</td>
</tr>
</tbody>
</table>

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.

This part is intended to be used in conjunction with the latest edition of IEC 61558-1 and its amendments. It is based on the second edition (2005) of that standard.

This part supplements or modifies the corresponding clauses in IEC 61558-1, so as to convert that publication into the IEC standard: *Particular requirements and tests for transformers and power supply units for class III handlamps for tungsten filament lamps.*

A list of all parts of the IEC 61558 series, under the general title: *Safety of transformers, reactors, power supply units and combinations thereof,* can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

Where a particular subclause of Part 1 is not mentioned in this part, that subclause applies as far as is reasonable. Where this part states "addition", "modification" or "replacement", the relevant text of Part 1 is to be adopted accordingly.

In this part, the following print types are used:

- requirements proper: in roman type;
- test specifications: in italic type;
- explanatory matters: in smaller roman type.

In the text of this part, the words in **bold** are defined in Clause 3.

Subclauses additional to those in Part 1 are numbered starting from 101; supplementary annexes are entitled AA, BB, etc.

The committee has decided that the contents of this 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

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

**NOTE** The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 12 months from the date of publication.
Part 2-9: Particular requirements and tests for transformers and power supply units for class III handlamps for tungsten filament lamps

1 Scope

Replacement:

This part of IEC 61558 deals with the safety of transformers for class III handlamps for tungsten filament lamps and power supply units incorporating transformers for class III handlamps for tungsten filament lamps. Transformers incorporating electronic circuits are also covered by this standard.

NOTE 1 Safety includes electrical, thermal, mechanical and chemical aspects.

Unless otherwise specified, from here onward, the term transformer covers transformers for class III handlamps for tungsten filament lamps and power supply units incorporating transformers for class III handlamps for tungsten filament lamps.

This part is applicable to stationary or portable single-phase air-cooled (natural or forced) independent or associated dry-type transformers. The windings may be encapsulated or non-encapsulated.

This standard is applicable to transformers and power supply (linear) with internal operational frequencies not exceeding 500 Hz.

This standard used in combination with Part 2-16 for switch mode power supply (SMPS) units is also applicable to power supplies with internal operational frequencies higher than 500 Hz. Where the two requirements are in conflict, the most severe take precedence.

The rated supply voltage does not exceed 1 000 V a.c., and the rated supply frequency and the internal operational frequencies do not exceed 500 Hz.

Transformers for class III handlamps for tungsten filament lamps have the following additional characteristics:

– the no-load output voltage and the rated output voltage do not exceed 50 V a.c. or 120 V ripple-free d.c.;
– there is only a small difference between the no-load voltage and the rated output voltage.

The rated output does not exceed:

– 10 kVA.

This part is not applicable to external circuits and their components intended to be connected to the input terminals and output terminals of the transformers.

Transformers covered by this part are used in applications where double or reinforced insulation between circuits is required by the installation rules or by the end product standard.

NOTE 2 Attention is drawn to the following:
for transformers intended to be used in vehicles, on board ships, and aircraft, additional requirements (from other applicable standards, national rules, etc.) may be necessary;

- measures to protect the enclosure and the components inside the enclosure against external influences such as fungus, vermin, termites, solar-radiation, and icing should also be considered;

- the different conditions for transportation, storage, and operation of the transformers should also be considered;

- additional requirements in accordance with other appropriate standards and national rules may be applicable to transformers intended for use in special environments.

NOTE 3  Future technological development of transformers may necessitate a need to increase the upper limit of the frequencies, until then this part may be used as a guidance document.

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

IEC 61558-1:2005, Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests

3 Terms and definitions

This clause of Part 1 is applicable, except as follows:

Addition:

3.1.101 transformer for class III handlamps for tungsten filament lamps
associated safety isolating transformer intended to supply one or more class III handlamps for tungsten filament lamps

3.1.102 power supply unit incorporating transformer for class III handlamps for tungsten filament lamps
power supply unit where an associated safety isolating transformer is used intended to supply one or more class III handlamps for tungsten filament lamps

4 General requirements

This clause of Part 1 is applicable.

5 General notes on tests

This clause of Part 1 is applicable.

6 Ratings

This clause of Part 1 is applicable, except as follows:

Addition:

6.101 The rated output voltage shall not exceed 50 V a.c. or 120 V ripple-free d.c.
6.102 The rated output shall not exceed 10 kVA.

6.103 The rated supply frequency and internal operational frequencies shall not exceed 500 Hz.

6.104 The rated supply voltage shall not exceed 1 000 V a. c.

Compliance with 6.101 to 6.104 is checked by inspection of the marking.

7 Classification

This clause of Part 1 is applicable, except as follows:

7.2 Replacement:

According to short-circuit protection or protection against abnormal conditions:

– inherently short-circuit proof transformers;

– non-inherently short-circuit proof transformers.

7.3 Replacement:

Degree of protection provided by the enclosure for portable transformers shall be code IP24 or higher.

7.5 Replacement:

According to their duty-time:

– continuous operation.

8 Marking and other information

This clause of Part 1 is applicable, except as follows:

8.11 Addition:

<table>
<thead>
<tr>
<th>Symbol or graphical symbol</th>
<th>Explanation or title</th>
<th>Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>Short-circuit proof transformer for class III tungsten filament handlamps (inherently or non-inherently)</td>
<td>IEC 60417-5953 (2002-10)</td>
</tr>
</tbody>
</table>

Addition:

8.101 For transformers intended for connection to the supply by means of a cable or cord and a plug, an instruction sheet or the equivalent shall be delivered with the transformer, drawing the attention of the user to the fact that the output circuit(s) shall be protected in accordance with national wiring rules.

9 Protection against electric shock

This clause of Part 1 is applicable.
10 Change of input voltage setting

This clause of Part 1 is applicable.

11 Output voltage and output current under load

This clause of Part 1 is applicable, except as follows:

11.1 Replace the first paragraph by the following:

When the transformer is connected to the rated supply voltage at the rated supply frequency, and loaded with an impedance resulting in the rated output at the rated output voltage, and for a.c. current, at the rated power factor, the output voltage under load shall not differ from the rated output voltage by more than 5 %. For transformers with rectifiers, the output voltage under load shall not differ from the rated output voltage by more than 10 %.

12 No-load output voltage

This clause of Part 1 is applicable except as follows:

Addition:

The no-load output voltage is measured when the transformer is connected to the rated supply voltage at the rated supply frequency at ambient temperature.

12.101 The no-load output voltage shall not exceed 50 V a.c. or 120 V ripple-free d.c.

For independent transformers, this output voltage limitation applies even when output windings, not intended for interconnection, are connected in series.

12.102 The difference between the no-load output voltage and the output voltage under load (as measured in 11.1) shall not be excessive. The difference is expressed as a percentage of the latter voltage calculated according to the following formula:

\[
\frac{U_{\text{no-load}} - U_{\text{load}}}{U_{\text{load}}} \times 100 \text{ (%)}
\]

where \(U_{\text{no-load}}\) is the no-load output voltage and \(U_{\text{load}}\) is the output voltage under load.

**Table 101 – Ratio of output voltages for transformers for class III tungsten filament handlamps**

<table>
<thead>
<tr>
<th>Rated output of transformer VA</th>
<th>Ratio between no-load output voltage and output voltage under load %</th>
</tr>
</thead>
<tbody>
<tr>
<td>− up to and including 63</td>
<td>7,5</td>
</tr>
<tr>
<td>− over 63 up to and including 630</td>
<td>5,0</td>
</tr>
<tr>
<td>− over 630</td>
<td>2,5</td>
</tr>
</tbody>
</table>

Compliance with the requirements of 12.101 and 12.102 is checked by measuring the no-load output voltage at the ambient temperature when the transformer is connected to the rated supply voltage at the rated supply frequency.
The difference shall not exceed the values shown in Table 101.

13 Short-circuit voltage

This clause of Part 1 is applicable.

14 Heating

This clause of Part 1 is applicable.

15 Short-circuit and overload protection

This clause of Part 1 is applicable.

16 Mechanical strength

This clause of Part 1 is applicable.

17 Protection against harmful ingress of dust, solid objects and moisture

This clause of Part 1 is applicable.

18 Insulation resistance, dielectric strength and leakage current

This clause of Part 1 is applicable.

19 Construction

This clause of Part 1 is applicable except as follows:

Replacement of 19.1:

19.1 The input and output circuits shall be electrically separated from each other, and the construction shall be such that there is no possibility of any connection between these circuits directly or indirectly via other metal parts, except by deliberate action.

Compliance is checked by inspection and measurements, taking Clauses 18 and 26 into consideration.

19.1.1 The insulation between input and output winding(s) shall consist of double or reinforced insulation (rated for the working voltage).

In addition, the following applies:

- for class I transformers not intended for connection to the mains supply by means of a plug, the insulation between the input windings and the body connected to earth shall consist of at least basic insulation rated for the input voltage. The insulation between the output windings and the body connected to earth, shall consist of at least basic insulation (rated for the output voltage);
- for class I transformers intended for connection to the mains supply by means of a plug, the insulation between the input windings and the body shall consist of at least basic insulation, and the insulation between the output windings and the body shall consist of