

INTERNATIONAL STANDARD

NORME INTERNATIONALE

GROUP SAFETY PUBLICATION
PUBLICATION GROUPEE DE SÉCURITÉ

**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

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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:

FDIS	Report on voting
96/355/FDIS	96/362/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.

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.

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

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:

Symbol or graphical symbol	Explanation or title	Identification
	Short-circuit proof transformer for class III tungsten filament handlamps (inherently or non-inherently)	IEC 60417-5953 (2002-10)

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:

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

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

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

Rated output of transformer VA	Ratio between no-load output voltage and output voltage under load %
– up to and including 63	7,5
– over 63 up to and including 630	5,0
– over 630	2,5

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

at least **supplementary insulation** (both basic and **supplementary insulations** rated for the **working voltage**);

- for **class II transformers**, the insulation between the **input windings** and the **body** shall consist of double or **reinforced insulation** (rated for the input voltage). The insulation between the **output windings** and the **body**, shall consist of double or **reinforced insulation** (rated for the output voltage).

19.1.2 For **transformers** with **intermediate conductive parts** (e.g. the iron core) not connected to the **body** and located between the input and **output windings**, the following requirements are applicable:

- for class I and **class II transformers**, the insulation between the input and output windings via the **intermediate conductive parts** shall consist of double or **reinforced insulation** (rated for the **working voltage**);
- for **class II transformers**, the insulation between the **input windings** and the **body**, and between the **output windings** and the **body** via the **intermediate conductive parts** shall consist of double or **reinforced insulation** (rated for the input and output voltage);
- for **transformer** different from independent (IP00), the insulation between the input and **output windings** via the **intermediate conductive parts** shall consist of double or **reinforced insulation** (rated for the **working voltage**);
- as alternative to the above mentioned requirements for **class I transformer** not intended to be connected by means of a plug and for **transformer** different from independent (IP00), if the construction assure that all laminated plates of the iron core are connected to earth (e.g by soldering / welding) and if the in data sheet or instruction sheet clearly state that the safety of the **transformer** depends on the earth connection and that is not possible to use in class II equipment, than the following apply: the insulation between the **input windings** and the **intermediate conductive part** connected to earth, and between the **output windings** and the **intermediate conductive part** connected to earth, shall consist of at least **basic insulation** (rated for the input and output voltage);
- in addition to the above requirements the insulation between the **intermediate conductive parts** and the **input windings**, and between the **intermediate conductive parts** and the **output windings** shall consist of at least **basic insulation** (rated for the input and output voltage). An **intermediate conductive part** not separated from the input or **output windings** or the **body** by at least **basic insulation** is considered to be connected to the relevant part(s).

19.1.3 For **class I transformers** not intended for connection to the mains supply by means of a plug, the insulation between the input and **output windings** may consist of **basic insulation** plus **protective screening** instead of double or **reinforced insulation**, provided the following conditions are complied with:

- the insulation between the **input winding** and the **protective screen** shall comply with the requirements for **basic insulation** (rated for the input voltage);
- the insulation between the **protective screen** and the **output winding** shall comply with the requirements for **basic insulation** (rated for the output voltage);
- the **protective screen** shall, unless otherwise specified, consist of a metal foil or of a wire- wound screen extending at least the full width of the **input winding** and shall have no gaps or holes;
- where the **protective screen** does not cover the entire width of the **input winding**, additional adhesive tapes or equivalent insulation shall be used to ensure **double insulation** in that area;
- if the **protective screen** is made of a foil, the turns shall be insulated from each other. In case of only one turn, it shall have an isolated overlap of at least 3 mm;
- the wire of a wire-wound screen and the lead-out wire of the **protective screen** shall have a cross-sectional area at least corresponding to the rated current of the overload protective device to ensure that if a breakdown of insulation should occur, the overload protective device will open the circuit before the lead-out wire is destroyed;