IEC 61558-2-9

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REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

GROUP ENERGY EFFICIENCY 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~~

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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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9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61558-2-9:2010. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) adjustment of structure and references in accordance with IEC 61558-1:2017;
b) addition of a new symbol for power supply unit with linearly regulated output voltage;
c) document is not only valid for transformers for tungsten filament handlamps.

The text of this International Standard is based on the following documents:

Draft	Report on voting
96/593/FDIS	96/597/RVD

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

The language used for the development of this document is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

It has the status of a group safety publication in accordance with IEC Guide 104.

This document is to be used in conjunction with IEC 61558-1:2017.

This document supplements or modifies the corresponding clauses in IEC 61558-1:2017, so as to convert that publication into the IEC standard: *Particular requirements and tests for transformers and power supply units for class III handlamps.*

A list of all parts in the IEC 61558 series published 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 this document states "*addition*", "*modification*" or "*replacement*", the relevant text of IEC 61558-1:2017 is to be adopted accordingly.

In this document, the following print types are used:

– requirements proper: in roman type;
– *test specifications: in italic type*;
– explanatory matter: in smaller roman type.

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

Subclauses, notes, figures and tables additional to those in IEC 61558-1:2017 are numbered starting from 101; supplementary annexes are entitled AA, BB, etc.

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

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

IEC TC 96 has a group safety function in accordance with IEC Guide 104 for transformers other than those intended to supply distribution networks, in particular transformers and power supply units intended to allow the application of protective measures against electric shock as defined by TC 64, which is about Electrical installations and protection against electric shock, but in certain cases including the limitation of voltage and horizontal safety function for SELV, in accordance with IEC 60364-4-41.

The group safety function (GSF) is used because of responsibility for example for safety extra-low voltage (SELV) in accordance with IEC 61140:2016, 5.2.6 and IEC 60364-4-41:2005, 414.3.1 or control circuits in accordance with IEC 60204-1:2016, 7.2.4.

The group safety function is used for each part of IEC 61558-2 because different standards of the IEC 61558 series can be combined in one construction but in certain cases with no limitation of rated output power.

For example an auto-transformer in accordance with IEC 61558-2-13 can be designed with a separate SELV-circuit in accordance with the particular requirements for IEC 61558-2-6 relating to the general requirements of IEC 61558-1.

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 document.

NOTE 1 Safety includes electrical, thermal and 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~~.

For **power supply units** (linear) this document is applicable. For **switch mode power supply units** IEC 61558-2-16 is applicable together with this document. Where two requirements are in conflict, the most severe takes precedence.

This document is applicable to **stationary** or **portable**, single-phase, air-cooled (natural or forced) **independent** or **associated dry-type transformers.** The windings ~~may~~ can 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 AC and the **rated supply frequency** and the **internal** ~~operational~~ **operating 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 AC or 120 V ripple-free DC;

– there is only a small difference between the **no-load output voltage** and the **rated output voltage**.

The **rated output** does not exceed 10 kVA.

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

NOTE 2 **Transformers** covered by this document are only 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, if necessary:

– 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~~ can be applicable to **transformers** intended for use in special environments.

~~NOTE 3~~ Future technological development of **transformers** ~~may~~ can necessitate a need to increase the upper limit of the frequencies. Until then this document ~~may~~ can be used as a guidance document.

This group safety publication focusing on safety guidance is primarily intended to be used as a product safety standard for the products mentioned in the scope but is also intended to be used by technical committees in the preparation of publications for products similar to those mentioned in the scope of this group safety publication, in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications and/or group safety publications in the preparation of its publications.

2 Normative references

IEC 61558-1:2017, Clause 2 is applicable, except as follows:

Addition:

IEC 60245-4:2011, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 61558-1:~~2005~~2017, ~~*Safety of power transformers, power supplies, reactors and similar products*~~ *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*

IEC 61558-2-16:2021, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units for general applications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61558-1:2017 apply, except as follows:

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Transformers

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

IEC 61558-1:2017, Clause 4 is applicable.

5 General notes on tests

IEC 61558-1:2017, Clause 5 is applicable.

6 Ratings

IEC 61558-1:2017, Clause 6 is applicable, except as follows:

Addition:

6.101 The **rated output voltage** shall not exceed 50 V AC or 120 V ripple-free DC.

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

6.102 The **rated output** shall not exceed 10 kVA.

6.103 The **rated supply frequency** and the **internal ~~operational~~ operating frequencies** shall not exceed 500 Hz.

6.104 The **rated supply voltage** shall not exceed 1 000 V AC.

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

7 Classification

IEC 61558-1:2017, Clause 7 is applicable, except as follows:

7.2

Replacement:

7.2 According to short-circuit ~~protection~~ characteristic or protection against abnormal ~~conditions~~ use:

– **inherently short-circuit proof transformers**;
– **non-inherently short-circuit proof transformers.**

7.3

Replacement:

7.3 According to their degree of protection ~~provided~~ ensured by the **enclosure** ~~for~~

– **portable transformers** shall ~~be code~~ have a degree of protection of at least IP24 ~~or higher~~.

7.5

Replacement:

7.5 According to their **duty-~~time~~type**:

– **continuous operation.**

7.8

Replacement:

7.8 According to their transient overvoltage condition:

– **overvoltage category II.**

8 Marking and other information

IEC 61558-1:2017, Clause 8 is applicable, except as follows:

8.1 h)

Replacement of the content up to the first semi-colon by the following:

relevant graphical symbols shown in Table 101 that indicate the kind of **transformer;**

8.11

Addition:

The symbol for linear **power supply units** shall be used in conjunction with the symbol indicating the kind of **transformer**.

Table 101 – Symbols indicating the kind of transformer

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
	**Power supply unit, linear**	IEC 60417-6210:2013-10

Addition:

8.101

~~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

IEC 61558-1:2017, Clause 9 is applicable.

10 Change of input voltage setting

IEC 61558-1:2017, Clause 10 is applicable.

11 Output voltage and output current under load

IEC 61558-1:2017, Clause 11 is applicable, except as follows:

11.1

Replacement of the first paragraph by the following:

11.1 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 AC 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

IEC 61558-1:2017, Clause 12 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 AC or 120 V ripple free DC.

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 ratio between the **no-load output voltage** measured in Clause 12 and the **output voltage** under load measured during the test of Clause 11, expressed as a percentage of the latter voltage, shall not exceed the values shown in Table 102.*

~~The difference is expressed as a percentage of the latter voltage calculated according to the following formula:~~

The ratio is determined by Formula (1):

$$\frac{U_{\text{no-load}} - U_{\text{load}}}{U_{\text{load}}} \times 100(\%) \quad (1)$$

where

$U_{\text{no-load}}$ is the no-load output voltage, expressed in V;

U_{load} is the output voltage under load, expressed in V.

Table ~~101~~ 102 – ~~Ratio of output voltages for transformers for class III tungsten filament handlamps~~ Output voltage ratio

Rated output 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

IEC 61558-1:2017, Clause 13 is applicable.

14 Heating

IEC 61558-1:2017, Clause 14 is applicable.

15 Short-circuit and overload protection

IEC 61558-1:2017, Clause 15 is applicable.

16 Mechanical strength

IEC 61558-1:2017, Clause 16 is applicable.

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

IEC 61558-1:2017, Clause 17 is applicable.

18 Insulation resistance, dielectric strength and leakage current

IEC 61558-1:2017, Clause 18 is applicable.

19 Construction

IEC 61558-1:2017, Clause 19 is applicable, except as follows:

19.1 General construction

Replacement:

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, either directly or indirectly ~~via~~, through other ~~metal~~ **conductive parts**, except by deliberate action.

Compliance is checked by inspection and measurements, taking Clause 18 and Clause 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 earthing shall consist of at least **basic insulation** rated for the **input voltage**. The insulation between the **output windings** and the **body** connected to earthing, 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.

19.1.2.1 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** other than **independent** (e.g. 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**);

19.1.2.2 As an alternative to 19.1.2.1 for **class I transformer** not intended to be connected by means of a plug and for **transformer** different from independent (e.g. IP00), if the construction assure that all laminated plates of the iron core are connected to earthing (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 earthing 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 earthing, shall consist of at least **basic insulation** (rated for the **input** and **output voltage**);

19.1.2.3 In addition to 19.1.2.1 and 19.1.2.2 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~~ can 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 **output winding** and the **protective screen** 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;

– the lead-out wire shall be soldered to the **protective screen** or secured in an equally reliable manner.

NOTE For the purpose of this subclause, the term “windings” does not include **internal circuits.**

Examples of construction of windings are given in Annex M of IEC 61558-1:2017.

19.16 Portable transformers for use in irregular or harsh conditions

Replacement:

Portable transformers shall have a degree of protection ~~code~~ of at least IP24.

Addition:

19.101 There shall be no connection between **output circuits** and the protective earthing, unless this is allowed for **associated transformers** by the relevant equipment standard.

19.102 There shall be no connection between **output circuits** and the **body,** unless this is allowed for **associated transformers** by the relevant equipment standard.

Compliance is checked by inspection.

19.103 The input and output terminals for the connection of external wiring shall be so located that the distance measured between the points of introduction of the conductors into these terminals is not less than 25 mm. If a barrier is used to obtain this distance, the measurement shall be made over and around the barrier which shall be of insulating material and permanently fixed to the **transformer**.

*Compliance is checked by inspection and by measurement disregarding **intermediate conductive parts**.*

19.104 **Portable transformers** having a **rated output** not exceeding 630 VA shall be **class II**.

20 Components

IEC 61558-1:2017, Clause 20 is applicable.

21 Internal wiring

IEC 61558-1:2017, Clause 21 is applicable.

22 Supply connection and other external flexible cables or cords

IEC 61558-1:2017, Clause 22 is applicable, except as follows:

22.5

Addition:

Power supply cords of **transformers** with a degree of protection ~~code~~ of other than IPX0 shall ~~not~~ be ~~lighter than~~ at least ordinary polychloroprene sheathed cords ~~(code designation 60245 IEC 57)~~ according to IEC 60245-4:2011 – type 60245 IEC 57).

23 Terminals for external conductors

IEC 61558-1:2017, Clause 23 is applicable.

24 Provisions for protective earthing

IEC 61558-1:2017, Clause 24 is applicable.

25 Screws and connections

IEC 61558-1:2017, Clause 25 is applicable.

26 Creepage distances, clearances and distances through insulation

IEC 61558-1:2017, Clause 26 is applicable ~~except as follows:~~

~~*Addition:*~~

~~**26.101** The values for **creepage distances**, **clearances** and distances through insulation for **working voltage**s above 1 000 V may be found by extrapolation~~.

27 Resistance to heat, fire and tracking

IEC 61558-1:2017, Clause 27 is applicable.

28 Resistance to rusting

IEC 61558-1:2017, Clause 28 is applicable.

Annexes

The annexes of IEC 61558-1:2017 are applicable.

Bibliography

The bibliography of IEC 61558-1:2017 is applicable, except as follows:

Addition:

~~IEC 61558-2-16:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units*~~

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 61558 (all parts), *Safety of transformers, reactors, power supply units and combinations thereof*

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications*

IEC 61558-2-13, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-13: Particular requirements and tests for auto-transformers and power supply units incorporating auto-transformers for general applications*

IEC Guide 104:2019, *The preparation of safety publications and the use of basic safety publications and group safety publications*

ISO/IEC Guide 51:2014, *Safety aspects – Guidelines for their inclusion in standards*

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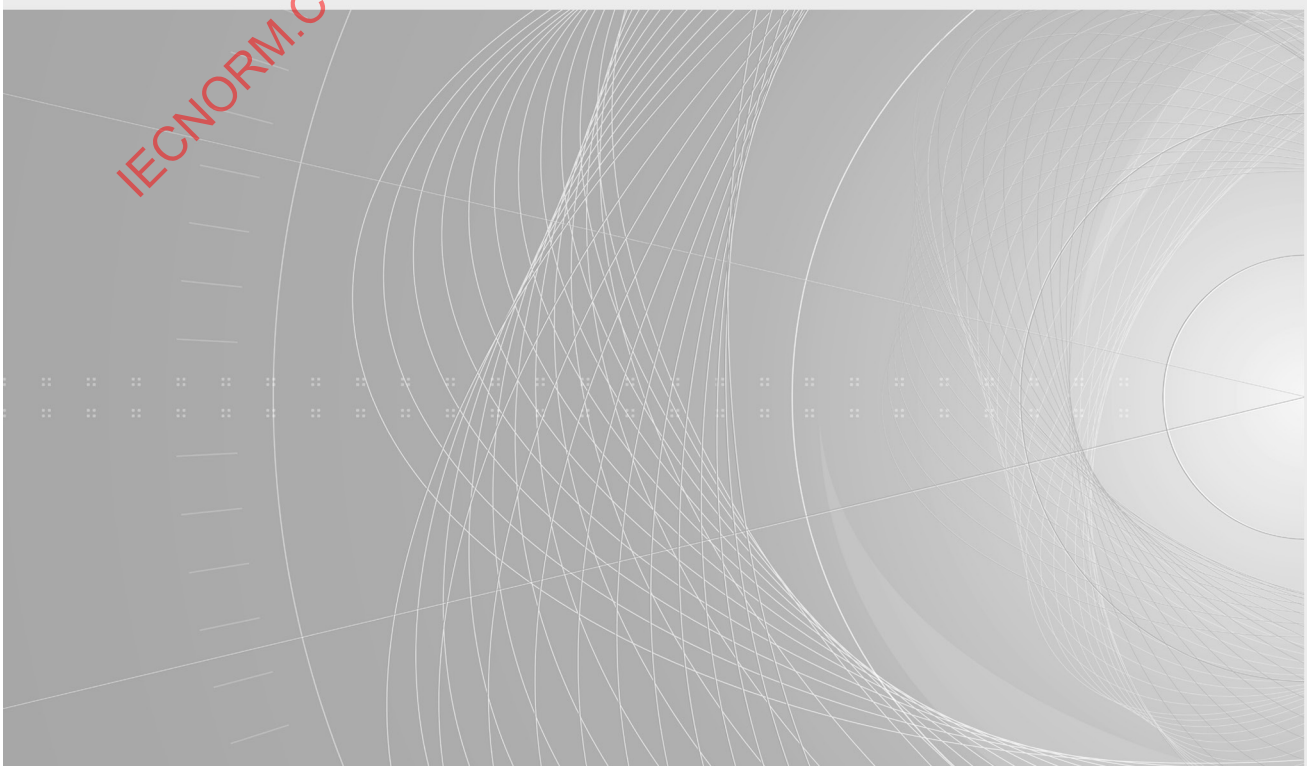
Safety of transformers, reactors, power supply units and combinations thereof – Part 2-9: Particular requirements and tests for transformers and power supply units for class III handlamps

Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et des combinaisons de ces éléments – Partie 2-9: Exigences particulières et essais pour les transformateurs et blocs d'alimentation pour lampes baladeuses de classe III



IEC 61558-2-9:2024-06(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
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6) All users should ensure that they have the latest edition of this publication.
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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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

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

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) adjustment of structure and references in accordance with IEC 61558-1:2017;
b) addition of a new symbol for power supply unit with linearly regulated output voltage;
c) document is not only valid for transformers for tungsten filament handlamps.

The text of this International Standard is based on the following documents:

Draft	Report on voting
96/593/FDIS	96/597/RVD

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

The language used for the development of this document is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

It has the status of a group safety publication in accordance with IEC Guide 104.

This document is to be used in conjunction with IEC 61558-1:2017.

This document supplements or modifies the corresponding clauses in IEC 61558-1:2017, so as to convert that publication into the IEC standard: *Particular requirements and tests for transformers and power supply units for class III handlamps*.

A list of all parts in the IEC 61558 series published 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 this document states "*addition*", "*modification*" or "*replacement*", the relevant text of IEC 61558-1:2017 is to be adopted accordingly.

In this document, the following print types are used:

– requirements proper: in roman type;

– *test specifications: in italic type*;

– explanatory matter: in smaller roman type.

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

Subclauses, notes, figures and tables additional to those in IEC 61558-1:2017 are numbered starting from 101; supplementary annexes are entitled AA, BB, etc.

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

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

IEC TC 96 has a group safety function in accordance with IEC Guide 104 for transformers other than those intended to supply distribution networks, in particular transformers and power supply units intended to allow the application of protective measures against electric shock as defined by TC 64, which is about Electrical installations and protection against electric shock, but in certain cases including the limitation of voltage and horizontal safety function for SELV, in accordance with IEC 60364-4-41.

The group safety function (GSF) is used because of responsibility for example for safety extra-low voltage (SELV) in accordance with IEC 61140:2016, 5.2.6 and IEC 60364-4-41:2005, 414.3.1 or control circuits in accordance with IEC 60204-1:2016, 7.2.4.

The group safety function is used for each part of IEC 61558-2 because different standards of the IEC 61558 series can be combined in one construction but in certain cases with no limitation of rated output power.

For example an auto-transformer in accordance with IEC 61558-2-13 can be designed with a separate SELV-circuit in accordance with the particular requirements for IEC 61558-2-6 relating to the general requirements of IEC 61558-1.

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

1 Scope

Replacement:

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

NOTE 1 Safety includes electrical, thermal and mechanical aspects.

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

For **power supply units** (linear) this document is applicable. For **switch mode power supply units** IEC 61558-2-16 is applicable together with this document. Where two requirements are in conflict, the most severe takes precedence.

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

The **rated supply voltage** does not exceed 1 000 V AC and the **rated supply frequency** and the **internal operating frequencies** do not exceed 500 Hz.

Transformers have the following additional characteristics:

– **the no-load output voltage** and the **rated output voltage** do not exceed 50 V AC or 120 V ripple-free DC;

– there is only a small difference between the **no-load output voltage** and the **rated output voltage**.

The **rated output** does not exceed 10 kVA.

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

NOTE 2 **Transformers** covered by this document are only used in applications where **double** or **reinforced insulation** between circuits is required by the installation rules or by the end product standard.

Attention is drawn to the following, if necessary:

– for **transformers** intended to be used in vehicles, on board ships, and aircraft, additional requirements (from other applicable standards, national rules, etc.);

– measures to protect the **enclosure** and the components inside the enclosure against external influences such as fungus, vermin, termites, solar-radiation, and icing;

– the different conditions for transportation, storage, and operation of the **transformers**;

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

Future technological development of **transformers** can necessitate a need to increase the upper limit of the frequencies. Until then this document can be used as a guidance document.

This group safety publication focusing on safety guidance is primarily intended to be used as a product safety standard for the products mentioned in the scope but is also intended to be used by technical committees in the preparation of publications for products similar to those mentioned in the scope of this group safety publication, in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications and/or group safety publications in the preparation of its publications.

2 Normative references

IEC 61558-1:2017, Clause 2 is applicable, except as follows:

Addition:

IEC 60245-4:2011, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 61558-1:2017, *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*

IEC 61558-2-16:2021, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units for general applications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61558-1:2017 apply, except as follows:

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Transformers

Addition:

3.1.101
transformer for class III handlamps
associated **safety isolating transformer** intended to supply one or more class III handlamps

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

4 General requirements

IEC 61558-1:2017, Clause 4 is applicable.

5 General notes on tests

IEC 61558-1:2017, Clause 5 is applicable.

6 Ratings

IEC 61558-1:2017, Clause 6 is applicable, except as follows:

Addition:

6.101 The **rated output voltage** shall not exceed 50 V AC or 120 V ripple-free DC.

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

6.102 The **rated output** shall not exceed 10 kVA.

6.103 The **rated supply frequency** and the **internal operating frequencies** shall not exceed 500 Hz.

6.104 The **rated supply voltage** shall not exceed 1 000 V AC.

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

7 Classification

IEC 61558-1:2017, Clause 7 is applicable, except as follows:

7.2

Replacement:

7.2 According to short-circuit characteristic or protection against abnormal use:

– **inherently short-circuit proof transformers**;
– **non-inherently short-circuit proof transformers.**

7.3

Replacement:

7.3 According to their degree of protection ensured by the **enclosure**

– **portable transformers** shall have a degree of protection of at least IP24.

7.5

Replacement:

7.5 According to their **duty-type**:

– **continuous operation.**

7.8

Replacement:

7.8 According to their transient overvoltage condition:

– **overvoltage category II.**

8 Marking and other information

IEC 61558-1:2017, Clause 8 is applicable, except as follows:

8.1 h)

Replacement of the content up to the first semi-colon by the following:

relevant graphical symbols shown in Table 101 that indicate the kind of **transformer;**

8.11

Addition:

The symbol for linear **power supply units** shall be used in conjunction with the symbol indicating the kind of **transformer**.

Table 101 – Symbols indicating the kind of transformer

Symbol or graphical symbol	Explanation or title	Identification
	**Short-circuit proof transformer for class III handlamps (inherently** or **non-inherently)**	IEC 60417-5953:2002-10
	**Power supply unit, linear**	IEC 60417-6210:2013-10

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

IEC 61558-1:2017, Clause 9 is applicable.

10 Change of input voltage setting

IEC 61558-1:2017, Clause 10 is applicable.

11 Output voltage and output current under load

IEC 61558-1:2017, Clause 11 is applicable, except as follows:

11.1

Replacement of the first paragraph by the following:

11.1 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 AC 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

IEC 61558-1:2017, Clause 12 is applicable, except as follows:

Addition

12.101 The **no-load output voltage** shall not exceed 50 V AC or 120 V ripple free DC.

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 shall not be excessive.

*The ratio between the **no-load output voltage** measured in Clause 12 and the **output voltage** under load measured during the test of Clause 11, expressed as a percentage of the latter voltage, shall not exceed the values shown in Table 102.*

The ratio is determined by Formula (1):

$$\frac{U_{\text{no-load}} - U_{\text{load}}}{U_{\text{load}}} \times 100(\%) \quad (1)$$

where

$U_{\text{no-load}}$ is the no-load output voltage, expressed in V;

U_{load} is the output voltage under load, expressed in V.

Table 102 – Output voltage ratio

Rated output 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**.*

13 Short-circuit voltage

IEC 61558-1:2017, Clause 13 is applicable.

14 Heating

IEC 61558-1:2017, Clause 14 is applicable.

15 Short-circuit and overload protection

IEC 61558-1:2017, Clause 15 is applicable.

16 Mechanical strength

IEC 61558-1:2017, Clause 16 is applicable.

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

IEC 61558-1:2017, Clause 17 is applicable.

18 Insulation resistance, dielectric strength and leakage current

IEC 61558-1:2017, Clause 18 is applicable.

19 Construction

IEC 61558-1:2017, Clause 19 is applicable, except as follows:

19.1 General construction

Replacement:

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, either directly or indirectly, through other **conductive parts**, except by deliberate action.

Compliance is checked by inspection and measurements, taking Clause 18 and Clause 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 earthing shall consist of at least **basic insulation** rated for the **input voltage**. The insulation between the **output windings** and the **body** connected to earthing, 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.

19.1.2.1 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** other than **independent** (e.g. 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**);

19.1.2.2 As an alternative to 19.1.2.1 for **class I transformer** not intended to be connected by means of a plug and for **transformer** different from independent (e.g. IP00), if the construction assure that all laminated plates of the iron core are connected to earthing (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 earthing 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 earthing, shall consist of at least **basic insulation** (rated for the **input** and **output voltage**);

19.1.2.3 In addition to 19.1.2.1 and 19.1.2.2 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** can 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 **output winding** and the **protective screen** 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;

– the lead-out wire shall be soldered to the **protective screen** or secured in an equally reliable manner.

NOTE For the purpose of this subclause, the term “windings” does not include **internal circuits.**

Examples of construction of windings are given in Annex M of IEC 61558-1:2017.

19.16 Portable transformers for use in irregular or harsh conditions

Replacement:

Portable transformers shall have a degree of protection of at least IP24.

Addition:

19.101 There shall be no connection between **output circuits** and the protective earthing, unless this is allowed for **associated transformers** by the relevant equipment standard.

19.102 There shall be no connection between **output circuits** and the **body,** unless this is allowed for **associated transformers** by the relevant equipment standard.

Compliance is checked by inspection.

19.103 The input and output terminals for the connection of external wiring shall be so located that the distance measured between the points of introduction of the conductors into these terminals is not less than 25 mm. If a barrier is used to obtain this distance, the measurement shall be made over and around the barrier which shall be of insulating material and permanently fixed to the **transformer**.

*Compliance is checked by inspection and by measurement disregarding **intermediate conductive parts**.*

19.104 **Portable transformers** having a **rated output** not exceeding 630 VA shall be **class II**.

20 Components

IEC 61558-1:2017, Clause 20 is applicable.

21 Internal wiring

IEC 61558-1:2017, Clause 21 is applicable.

22 Supply connection and other external flexible cables or cords

IEC 61558-1:2017, Clause 22 is applicable, except as follows:

22.5

Addition:

Power supply cords of **transformers** with a degree of protection of other than IPX0 shall be at least ordinary polychloroprene sheathed cords according to IEC 60245-4:2011 – type 60245 IEC 57).

23 Terminals for external conductors

IEC 61558-1:2017, Clause 23 is applicable.

24 Provisions for protective earthing

IEC 61558-1:2017, Clause 24 is applicable.

25 Screws and connections

IEC 61558-1:2017, Clause 25 is applicable.

26 Creepage distances, clearances and distances through insulation

IEC 61558-1:2017, Clause 26 is applicable.

27 Resistance to heat, fire and tracking

IEC 61558-1:2017, Clause 27 is applicable.

28 Resistance to rusting

IEC 61558-1:2017, Clause 28 is applicable.

Annexes

The annexes of IEC 61558-1:2017 are applicable.

Bibliography

The bibliography of IEC 61558-1:2017 is applicable, except as follows:

Addition:

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 61558 (all parts), *Safety of transformers, reactors, power supply units and combinations thereof*

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers for general applications*

IEC 61558-2-13, *Safety of transformers, reactors, power supply units and combinations thereof – Part 2-13: Particular requirements and tests for auto-transformers and power supply units incorporating auto-transformers for general applications*

IEC Guide 104:2019, *The preparation of safety publications and the use of basic safety publications and group safety publications*

ISO/IEC Guide 51:2014, *Safety aspects – Guidelines for their inclusion in standards*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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SÉCURITÉ DES TRANSFORMATEURS, BOBINES D'INDUCTANCE, BLOCS D'ALIMENTATION ET DES COMBINAISONS DE CES ÉLÉMENTS –

Partie 2-9: Exigences particulières et essais pour les transformateurs et blocs d'alimentation pour lampes baladeuses de classe III

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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L'IEC 61558-2-9 a été établie par le comité d'études 96 de l'IEC: Transformateurs, bobines d'inductance, blocs d'alimentation et combinaisons de ces éléments. Il s'agit d'une Norme internationale.

Cette troisième édition annule et remplace la deuxième édition parue en 2010. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) la structure et les références ont été alignées sur l'IEC 61558-1:2017;
b) un nouveau symbole a été ajouté pour les blocs d'alimentation dont la régulation de la tension secondaire est linéaire;
c) le document ne s'applique pas seulement aux transformateurs pour lampes baladeuses à filament de tungstène.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport on vote
96/593/FDIS	96/597/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de ce document est l'anglais.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Il a le statut d'une publication groupée de sécurité conformément au Guide IEC 104.

Le présent document doit être utilisé conjointement avec l'IEC 61558-1:2017.

Le présent document complète ou modifie les articles correspondants de l'IEC 61558-1:2017, de façon à transformer cette publication en norme IEC: *Exigences particulières et essais pour les transformateurs et blocs d'alimentation pour lampes baladeuses de classe III.*

Une liste de toutes les parties de la série IEC 61558, publiées sous le titre général *Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et des combinaisons de ces éléments*, se trouve sur le site web de l'IEC.

Les futures normes de cette série porteront le nouveau titre général cité ci-dessus. Le titre des normes qui existent déjà dans cette série sera mis à jour lors de leur prochaine édition.

Lorsque le présent document mentionne "*addition*", "*modification*" ou "*remplacement*", le texte correspondant de l'IEC 61558-1:2017 doit être adapté en conséquence.

Dans le présent document, les caractères d'imprimerie suivants sont utilisés:

– exigences proprement dites: caractères romains;
– *modalités d'essais: caractères italiques*;
– commentaires: petits caractères romains.

Dans le texte du présent document, les termes en **gras** sont définis à l'Article 3.

Les paragraphes, notes, figures et tableaux qui s'ajoutent à ceux de l'IEC 61558-1:2017 sont numérotés à partir de 101; les annexes qui sont ajoutées sont désignées AA, BB, etc.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

INTRODUCTION

Le CE 96 de l'IEC a une fonction groupée de sécurité, conformément au Guide 104 de l'IEC pour les transformateurs autres que ceux destinés à alimenter les réseaux de distribution, en particulier les transformateurs et les blocs d'alimentation destinés à permettre l'application de mesures de protection contre les chocs électriques telles que définies par le CE 64, qui traite des Installations électriques et de la protection contre les chocs électriques, mais, dans certains cas, comprenant la limitation de tension, ainsi qu'une fonction horizontale de sécurité pour les très basses tensions de sécurité (TBTS), conformément à l'IEC 60364-4-41.

La fonction groupée de sécurité (GSF, *Group Safety Function*) est utilisée en raison, par exemple, de la responsabilité de la très basse tension de sécurité (TBTS), conformément au 5.2.6 de l'IEC 61140:2016 et au 414.3.1 de l'IEC 60364-4-41:2005, ou des circuits de commande, conformément au 7.2.4 de l'IEC 60204-1:2016.

La fonction groupée de sécurité est utilisée pour chacune des parties de l'IEC 61558-2, car différentes normes de la série IEC 61558 peuvent être combinées en une seule et même construction, mais dans certains cas sans aucune limitation de la puissance assignée.

Un autotransformateur conforme à l'IEC 61558-2-13 peut par exemple être conçu avec un circuit TBTS distinct, conformément aux exigences particulières de l'IEC 61558-2-6 liées aux exigences générales de l'IEC 61558-1.

SÉCURITÉ DES TRANSFORMATEURS, BOBINES D'INDUCTANCE, BLOCS D'ALIMENTATION ET DES COMBINAISONS DE CES ÉLÉMENTS –

Partie 2-9: Exigences particulières et essais pour les transformateurs et blocs d'alimentation pour lampes baladeuses de classe III

1 Domaine d'application

Remplacement:

La présente partie de l'IEC 61558 traite de la sécurité des **transformateurs pour lampes baladeuses de classe III** et des **blocs d'alimentation qui incorporent des transformateurs pour lampes baladeuses de classe III**. Les **transformateurs** qui incorporent des **circuits électroniques** sont également couverts par le présent document.

NOTE 1 La sécurité comprend les aspects électrique, thermique et mécanique.

Sauf spécification contraire, dans la suite du présent document, le terme **transformateur** couvre les **transformateurs pour lampes baladeuses de classe III** et les **blocs d'alimentation qui incorporent des transformateurs pour lampes baladeuses de classe III**.

Pour les **blocs d'alimentation** (linéaires), le présent document s'applique. Pour les **blocs d'alimentation à découpage**, l'IEC 61558-2-16 et le présent document s'appliquent. Lorsque deux exigences sont contradictoires, la plus contraignante prévaut.

Le présent document s'applique aux **transformateurs** de **type sec fixes** ou **mobiles**, monophasés, à refroidissement par air (naturel ou forcé) **indépendants** ou **associés**. Les enroulements peuvent être enrobés ou non enrobés.

La **tension primaire assignée** ne dépasse pas 1 000 V en courant alternatif, et la **fréquence d'alimentation assignée** et les **fréquences de fonctionnement interne** ne dépassent pas 500 Hz.

Les **transformateurs** présentent les caractéristiques supplémentaires suivantes:

– la **tension secondaire à vide** et la **tension secondaire assignée** ne dépasse pas 50 V en courant alternatif ou 120 V en courant continu lissé;

– il n'existe qu'une faible différence entre la **tension secondaire à vide** et la **tension secondaire assignée**.

La **puissance assignée** ne dépasse pas 10 kVA.

Le présent document ne s'applique pas aux circuits externes et à leurs composants destinés à être connectés aux bornes primaires et bornes secondaires des **transformateurs**.

NOTE 2 Les **transformateurs** couverts par le présent document ne sont utilisés que dans le cadre d'applications pour lesquelles les règles d'installation ou la norme du produit final exigent une **isolation double** ou **renforcée** entre les circuits.

L'attention est attirée sur les points suivants, si nécessaire:

– exigences supplémentaires (issues d'autres normes applicables, règles nationales, etc.) pour les **transformateurs** destinés à être utilisés dans des véhicules, à bord de navires ou d'avions;

– mesures qui visent à protéger l'**enveloppe** et les composants situés à l'intérieur de celle-ci contre les facteurs d'influence externes comme les champignons, la vermine, les termites, les rayonnements solaires et le givre;

– différentes conditions de transport, de stockage et de fonctionnement pour les **transformateurs**;

– exigences supplémentaires qui peuvent s'appliquer aux **transformateurs** destinés à être utilisés dans un environnement particulier, au regard d'autres normes et règles nationales applicables.

Les évolutions techniques futures des **transformateurs** peuvent nécessiter une augmentation de la limite supérieure des fréquences. En attendant, le présent document peut être utilisé à titre de recommandation.

La présente publication groupée de sécurité portant sur des recommandations de sécurité est avant tout destinée à être utilisée en tant que norme en matière de sécurité des produits pour les produits cités dans le domaine d'application, mais elle est également destinée à être utilisée par les comités d'études dans le cadre de l'élaboration de publications pour des produits similaires à ceux cités dans le domaine d'application de la présente publication groupée de sécurité, conformément aux principes établis dans le Guide 104 de l'IEC et le Guide 51 de l'ISO/IEC.

L'une des responsabilités d'un comité d'études consiste, le cas échéant, à utiliser les publications fondamentales de sécurité et/ou les publications groupées de sécurité dans le cadre de l'élaboration de ses publications.

2 Références normatives

L'IEC 61558-1:2017, Article 2 s'applique, avec l'exception suivante:

Addition:

IEC 60245-4:2011, *Conducteurs et câbles isolés au caoutchouc – Tension assignée au plus égale à 450/750 V – Partie 4: Câbles souples*

IEC 61558-1:2017, *Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et des combinaisons de ces éléments – Partie 1: Exigences générales et essais*

IEC 61558-2-16:2021, *Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et combinaisons de ces éléments – Partie 2-16: Exigences particulières et essais pour les blocs d'alimentation à découpage et les transformateurs pour blocs d'alimentation à découpage pour applications d'ordre général*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions de l'IEC 61558-1:2017 s'appliquent, avec les exceptions suivantes:

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp