IEC 61558-2-5

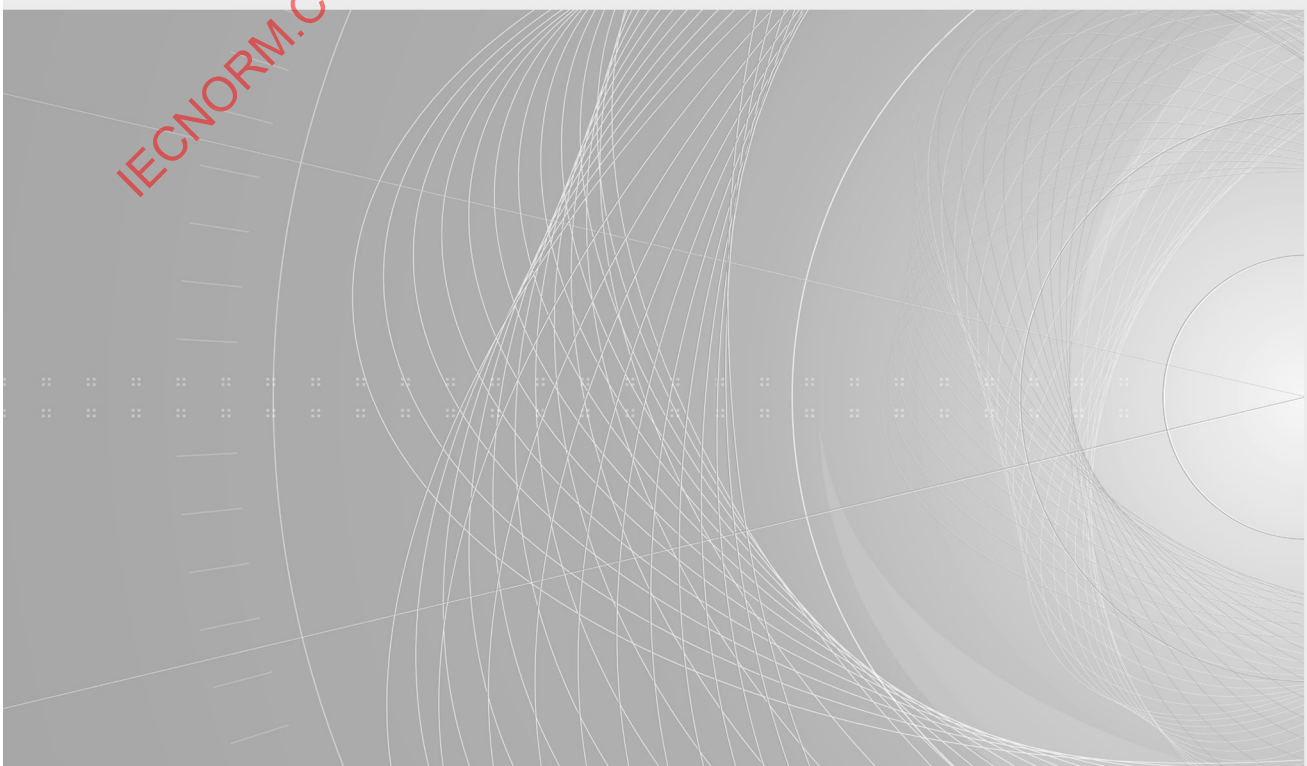
Edition 3.0 2024-08
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

GROUP ENERGY EFFICIENCY PUBLICATION

Safety of transformers, reactors, power supply units and combinations thereof – Part 2-5: Particular requirements and tests for transformers for shavers, power supply units for shavers and shaver supply units



IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC 61558-2-5

Edition 3.0 2024-08
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

GROUP ENERGY EFFICIENCY PUBLICATION

Safety of transformers, reactors, power supply units and combinations thereof – Part 2-5: Particular requirements and tests for transformers for shavers, power supply units for shavers and shaver supply units

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.180

ISBN 978-2-8322-9557-1

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

Part 2-5: Particular requirements and tests for transformers for shavers, power supply units for shavers and shaver supply units

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.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
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.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61558-2-5:2010. 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 61558-2-5 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) new symbol for power supply unit with linearly regulated output voltage.

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

Draft	Report on voting
96/599/FDIS	96/600/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 International Standard 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/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 for shavers, power supply units for shavers and shaver supply units.*

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 60364-4-41:2017, 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 2-5: Particular requirements and tests for transformers for shavers, power supply units for shavers and shaver supply units

1 Scope

Replacement:

This part of IEC 61558 deals with the safety of **shaver transformers**, **power supply units** incorporating a **shaver transformer**, and **shaver supply units. Shaver 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 **shaver transformers** and **power supply units** incorporating **shaver transformers** and **shaver supply units**.

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 take precedence.

This document is applicable to **stationary**, 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 units** (**SMPS**) 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 250 V AC and the **rated supply frequency** and the **internal operating frequencies** do not exceed 500 Hz.

The **rated output** is not less than 20 VA and does not exceed 50 VA.

The **no-load output voltage** does not exceed 275 V AC and the **rated output voltage** does not exceed 250 V AC.

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

NOTE 2 **Transformers** covered by this document are only used in applications where **double** or **reinforced insulation** between circuits is ~~required~~ specified by the installation rules for bathrooms and similar locations, or by the appliance specifications.

NOTE 3 **Transformers** covered by this document ~~may~~ can be flush or surface mounted or incorporated in luminaires, mirrors, and other equipment containing one or more socket-outlet(s).

~~NOTE 3~~ Attention is drawn to the following, if applicable:

– 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 4~~ 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

This clause of IEC 61558-1:2017 is applicable except as follows:

Addition:

IEC 60068-2-62:1991, *Environmental testing – Part 2: Test methods – Test Ef: Impact, pendulum hammer*[1]

IEC TR 60083, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60670 (all parts), *Boxes and enclosures for electrical accessories for household and similar fixed electrical installations*

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, *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

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

[1] This publication was withdrawn and replaced with IEC 60068-2-75 (1997), but for the purposes of this document IEC 60068-2-62 is cited.

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

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

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

3.1 Transformers

Addition:

3.1.101
shaver transformer
isolating transformer for fixed installation and with a limited output, designed to supply electric shavers, toothbrushes, and similar appliances rated 50 VA or less used in a bathroom which supplies only one shaver, or the like, at a time

3.1.102
shaver supply unit
accessory embodying a **shaver transformer** or a **power supply unit** incorporating a **shaver transformer,** and one or more socket outlets allowing the use of only one plug at a time

4 General requirements

This clause of IEC 61558-1:2017 is applicable.

5 General notes on tests

This clause of IEC 61558-1:2017 is applicable.

6 Ratings

This clause of IEC 61558-1:2017 is applicable except as follows:

~~*Replacement*~~ *Addition:*

6.101 The **rated output voltage** shall not exceed 250 V AC.

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 be less than 20 VA and shall not exceed 50 VA.

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 250 V AC.

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

7 Classification

This clause of IEC 61558-1:2017 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**;

7.8

Replacement:

7.8 According to their transient overvoltage condition:

– **overvoltage category II**

8 Marking and other information

This clause of IEC 61558-1:2017 is applicable except as follows:

~~**8.1 h)** *Replacement of the first sentence by the following:*~~

relevant graphical symbols shown in 8.11 indicating the kind of **transformer;**

8.1 n) *Modification*:

indication of the protection code IP for **transformers**, if higher than IP00**;**

indication of the protection code IP for **shaver supply units**, if higher than IP21**.**

8.1

h)

Replacement:

Replace the content up to the first semi-colon by the following:

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

m)

Modification:

indication of the degree of protection (IP code) for **transformers**, if higher than IP00;

indication of the degree of protection (IP code) for **shaver supply units**, if higher than IP21.

8.7

Addition:

For **shaver supply units** provided with a single-pole switch, the switched pole shall be connected to the line.

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
	**Shaver supply units and shaver transformers**	IEC 60417-5225 ~~(2009-05)~~:2002-10
	**Power supply unit, linear**	IEC 60417-6210:2013-10

8.13

Addition:

For **shaver supply units**, the marking for **rated output voltage(s)** and for the symbol of 8.11 shall be indicated on the front of the **enclosure** so as to be visible when the unit is mounted as in normal use. For **shaver supply units** intended to provide different output voltages, the selected output voltage setting shall be clearly discernible.

For **transformers**, the marking with the symbol of 8.11 shall be provided only if the **transformer** is supplied separately.

9 Protection against electric shock

This clause of IEC 61558-1:2017 is applicable.

10 Change of input voltage setting

This clause of IEC 61558-1:2017 is applicable.

11 Output voltage and output current under load

This clause of IEC 61558-1:2017 is applicable.

12 No-load output voltage

This clause of IEC 61558-1:2017 is applicable except as follows:

Addition

12.101 The **no-load output voltage** shall not exceed 275 V AC.

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 20 %.

The ratio is determined by Formula (101):

$$\frac{U_{\text{no-load}} - U_{\text{load}}}{U_{\text{load}}} \times 100(\%) \qquad (101)$$

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.

*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 between the **no-load output voltage** measured in this clause and the output voltage under load measured during the test of Clause 11, expressed as a percentage of the latter voltage, shall not exceed 20 %.*~~

~~NOTE The ratio is defined as follows: $\frac{U_{\text{no-load}} - U_{\text{load}}}{U_{\text{load}}} \times 100\ \%$~~

13 Short-circuit voltage

This clause of IEC 61558-1:2017 is applicable.

14 Heating

This clause of IEC 61558-1:2017 is applicable.

15 Short-circuit and overload protection

This clause of IEC 61558-1:2017 is applicable.

16 Mechanical strength

This clause of IEC 61558-1:2017 is applicable except as follows:

16.1 General

Replacement:

For **shaver supply units**, compliance is checked by the test of 16.101.

Addition:

16.101 ***Shaver supply units*** *are subjected to blows by means of a pendulum hammer, defined in 16.101.1 to 16.101.3.*

16.101.1 *Blows are applied to the specimen according to IEC 60068-2-62.*

*For **shaver supply units** other than flush-type mounted, the specimen is mounted as described in 4.2 of IEC 60068-2-62:1991.*

*For flush-type **shaver supply units**, the specimen is mounted as shown in Figure 3 of IEC 60068-2-62:1991.*

Flush-type equipment which is intended to be installed by means of screws to lugs recessed in the mounting block; flush-type equipment for claw fixing is fixed directly to the block by means of the claws.

The specimen is mounted as in normal use such that the point of impact lies in the vertical plane through the axis of the pivot of the pendulum.

Before applying the blows, mounting screws of bases, covers and the like are tightened with a torque equal to two thirds of that specified in ~~Table 11 of 25.1 of Part 1~~ Table 18 of IEC 61558-1:2017.

The striking element is allowed to fall from a height equal to that shown in ~~Table 101~~ Table 102.

Table ~~101~~ 102 – Values of heights of fall

Height of fall cm	Approximate energy J	Relevant parts
10 ± 0,1	0,2	Cover plates of **shaver supply units** for flush-type mounting and for those parts which are recessed to a depth of at least one quarter of the largest dimension of the recessed part
15 ± 0,1	0,3	**Enclosures**
25 ± 0,1	0,5	Other parts

16.101.2 *The specimens shall be subjected to 10 blows which are evenly distributed over the sample.*

Five blows shall be applied as follows:

– *for **shaver supply units** intended to be flush mounted, one blow in the centre, one at each extremity of the area over the recess in the block, and the other two approximately midway between the previous blows, the specimen being moved horizontally;*

– *for **shaver supply units** not intended for flush-type mounting, one blow in the centre, one on each side of the specimen after it has been turned as far as possible, but not through more than 60° about a vertical axis, and the other two approximately midway between the previous blows.*

The remaining blows are then applied in the same way after the specimen has been turned around through 90° of its axis perpendicular to the plywood.

If cable entries are provided, the specimen shall be mounted such that the two lines of the blows are as far as possible and equidistant from these entries.

16.101.3 After the test, the specimen shall show no damage within the meaning of this document. In particular, **live parts** shall not become accessible.

NOTE 1 Damage to the finish, small dents which do not reduce **creepage distances** or **clearances** below the values specified in Clause 26, and small chips which do not adversely affect the protection against electric shock or moisture are disregarded.

NOTE 2 Cracks not visible with normal vision or corrected vision without magnification and surface cracks in fibre reinforced mouldings and the like are disregarded.

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

This clause of IEC 61558-1:2017 is applicable.

18 Insulation resistance, dielectric strength and leakage current

This clause of IEC 61558-1:2017 is applicable.

19 Construction

This clause of IEC 61558-1:2017 is applicable except as follows:

19.1 General construction

Replacement:

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 ~~earth~~ protective earthing shall consist of at least **basic insulation** rated for the **input voltage**. The insulation between the **output windings** and the **body** connected to ~~earth~~ protective 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 insulation between the **input windings** and any **intermediate conductive part** shall consist of at least **basic insulation**, and the insulation between the **output windings** and any **intermediate conductive part** shall consist of at least **supplementary insulation** (both basic and **supplementary insulations** rated for the **working voltage**).

NOTE 1 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).

NOTE 2 **Basic insulation** and **supplementary insulation** are interchangeable.

In addition, the following applies:

– for **class I transformers**, the insulation between the **input** and **output windings** via the **intermediate conductive parts** (even if they are connected to ~~earth~~ protective earthing) 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 **transformers** 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**).

NOTE 3 In 19.1.2 the possibility to consider the intermediate metal part connected to ~~earth~~ protective earthing and consequently to require **basic insulation** in both circuits (primary and secondary) is not allowed for the following reason:

– the intermediate metal part is normally the iron core made by laminated plates insulated to each other by oxide. It is not assured that all foils are correctly connected to the ~~earth~~ protective earthing.

– for **transformers** different from **independent**, it is not assured that in the final applications the iron core will be connected to ~~earth~~ protective earthing.

Addition:

19.101 There shall be no connections between the **output circuit** and the protective earthing.

19.102 There shall be no connections between the **output circuit** and the **body**.

Compliance is checked by inspection.

19.103 These 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**.*

~~*Addition:*~~

19.~~111~~104 Mounting boxes for **transformers** or **shaver supply units** for flush-type mounting shall comply with IEC 60670 series.

Compliance is checked by inspection.

19.~~112~~105 **Shaver supply units** shall be provided with socket-outlets in the **output circuit**. It shall not be possible to insert more than one plug at the same time. It shall not be possible for any of the plugs listed in 20.5 to be inserted so as to bridge two socket outlets.

Compliance is checked by inspection and by manual test.

19.~~113~~106 **Transformers** and **shaver supply units** shall be **inherently** or **non-inherently short-circuit proof** and they shall not incorporate fuses.

Compliance is checked by inspection.

20 Components

This clause of IEC 61558-1:2017 is applicable except as follows:

~~**20.4** *Addition:*~~

20.5

Modification:

Shaver supply units ~~may~~ can be provided with a changeover switch to provide different **rated output voltages** and/or a single-pole switch in the **input circuit**; these switches ~~may~~ can be of micro-gap construction.

Compliance is checked by inspection.

20.~~5~~6

Modification:

Socket outlets in the **output circuits** of **shaver supply units** shall accept one or more type of plugs in accordance with IEC TR 60083 and shall not have a protective earthing contact.

NOTE It is not necessary to check the socket outlet according to IEC 60884-1 as:

– constructional, mechanical and material characteristics are already covered by the existing clauses of IEC 61558-1:2017;

– electrical tests (temperature rise, breaking capacity, normal operation) are not applicable as the socket outlet is supplied by a **transformer** with limited power;

– for the protection against electric shock the requirements of this document are considered sufficient as the socket outlet is supplied by **isolating transformer**.

20.~~9~~10

Replacement:

Transformers ~~may~~ can be provided with self-resetting protective devices.

21 Internal wiring

This clause of IEC 61558-1:2017 is applicable.

22 Supply connection and other external flexible cables or cords

This clause of IEC 61558-1:2017 is applicable except as follows:

22.2

Addition:

Shaver supply units shall be provided with or be designed for use with a mounting box. They shall be designed such that the supply cable ends can be prepared for connection after the box is mounted in position but before the unit is fitted into the box.

Shaver supply units shall be designed and constructed so as to permit easy introduction of the supply conductors into the terminals and provide adequate space within the box such that after installation of the unit, the insulation of the supply conductors is unlikely to come into contact with **live parts** of different polarity or with moving parts such as the spindle of a rotary switch.

23 Terminals for external conductors

This clause of IEC 61558-1:2017 is applicable.

24 Provisions for protective earthing

This clause of IEC 61558-1:2017 is applicable.

25 Screws and connections

This clause of IEC 61558-1:2017 is applicable.

26 Creepage distances, clearances and distances through insulation

This clause of IEC 61558-1:2017 is applicable.

27 Resistance to heat, fire and tracking

This clause of IEC 61558-1:2017 is applicable.

28 Resistance to rusting

This clause of IEC 61558-1:2017 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 60884-1:2022, *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*

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

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 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*~~

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

IEC 61558-2-5

Edition 3.0 2024-08

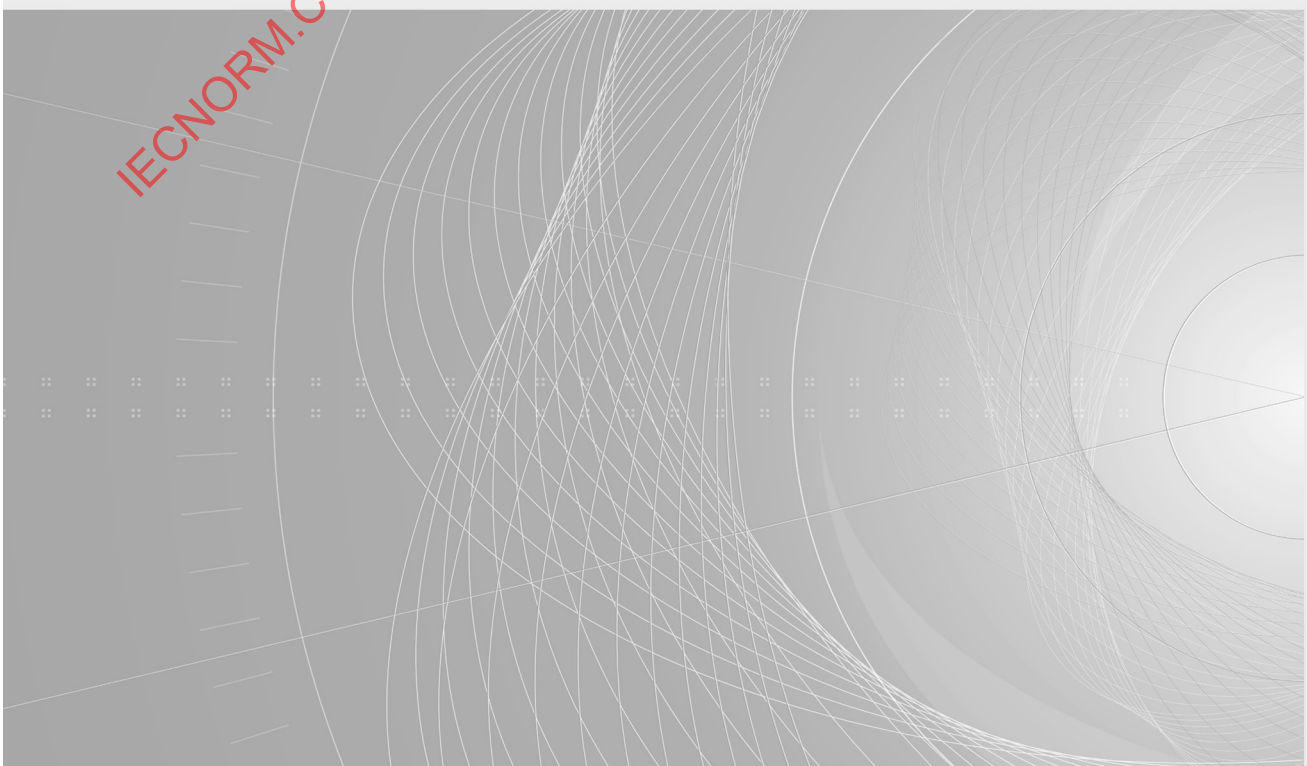
INTERNATIONAL STANDARD

NORME INTERNATIONALE

GROUP ENERGY EFFICIENCY PUBLICATION
PUBLICATION GROUPÉE SUR L'EFFICACITÉ ÉNERGÉTIQUE

Safety of transformers, reactors, power supply units and combinations thereof – Part 2-5: Particular requirements and tests for transformers for shavers, power supply units for shavers and shaver supply units

Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et combinaisons de ces éléments – Partie 2-5 : Exigences particulières et essais pour les transformateurs pour rasoirs, les blocs d'alimentation incorporant un transformateur pour rasoir et les blocs d'alimentation pour rasoirs



IEC 61558-2-5:2024-08(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

Part 2-5: Particular requirements and tests for transformers for shavers, power supply units for shavers and shaver supply units

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.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
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 61558-2-5 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) new symbol for power supply unit with linearly regulated output voltage.

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

Draft	Report on voting
96/599/FDIS	96/600/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 International Standard 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/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 for shavers, power supply units for shavers and shaver supply units.*

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 60364-4-41:2017, 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 2-5: Particular requirements and tests for transformers for shavers, power supply units for shavers and shaver supply units

1 Scope

Replacement:

This part of IEC 61558 deals with the safety of **shaver transformers**, **power supply units** incorporating a **shaver transformer**, and **shaver supply units. Shaver 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 **shaver transformers** and **power supply units** incorporating **shaver transformers** and **shaver supply units**.

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 take precedence.

This document is applicable to **stationary**, 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 250 V AC and the **rated supply frequency** and the **internal operating frequencies** do not exceed 500 Hz.

The **rated output** is not less than 20 VA and does not exceed 50 VA.

The **no-load output voltage** does not exceed 275 V AC and the **rated output voltage** does not exceed 250 V AC.

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

NOTE 2 **Transformers** covered by this document are only used in applications where **double** or **reinforced insulation** between circuits is specified by the installation rules for bathrooms and similar locations, or by the appliance specifications.

NOTE 3 **Transformers** covered by this document can be flush or surface mounted or incorporated in luminaires, mirrors, and other equipment containing one or more socket-outlet(s).

Attention is drawn to the following, if applicable:

– 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

This clause of IEC 61558-1:2017 is applicable except as follows:

Addition:

IEC 60068-2-62:1991, *Environmental testing – Part 2: Test methods – Test Ef: Impact, pendulum hammer*[1]

IEC TR 60083, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60670 (all parts), *Boxes and enclosures for electrical accessories for household and similar fixed electrical installations*

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

IEC 61558-2-16, *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 terminology databases for use in standardization at the following addresses:

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

[1] This publication was withdrawn and replaced with IEC 60068-2-75 (1997), but for the purposes of this document IEC 60068-2-62 is cited.

3.1 Transformers

Addition:

3.1.101
shaver transformer
isolating transformer for fixed installation and with a limited output, designed to supply electric shavers, toothbrushes, and similar appliances rated 50 VA or less used in a bathroom which supplies only one shaver, or the like, at a time

3.1.102
shaver supply unit
accessory embodying a **shaver transformer** or a **power supply unit** incorporating a **shaver transformer,** and one or more socket outlets allowing the use of only one plug at a time

4 General requirements

This clause of IEC 61558-1:2017 is applicable.

5 General notes on tests

This clause of IEC 61558-1:2017 is applicable.

6 Ratings

This clause of IEC 61558-1:2017 is applicable except as follows:

Addition:

6.101 The **rated output voltage** shall not exceed 250 V AC.

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 be less than 20 VA and shall not exceed 50 VA.

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 250 V AC.

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

7 Classification

This clause of IEC 61558-1:2017 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**;

7.8

Replacement:

7.8 According to their transient overvoltage condition:

– **overvoltage category II**

8 Marking and other information

This clause of IEC 61558-1:2017 is applicable except as follows:

8.1

h)

Replacement:

Replace the content up to the first semi-colon by the following:

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

m)

Modification:

indication of the degree of protection (IP code) for **transformers**, if higher than IP00;

indication of the degree of protection (IP code) for **shaver supply units**, if higher than IP21.

8.7

Addition:

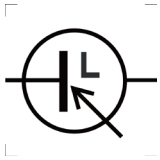
For **shaver supply units** provided with a single-pole switch, the switched pole shall be connected to the line.

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
	**Shaver supply units and shaver transformers**	IEC 60417-5225:2002-10
	**Power supply unit, linear**	IEC 60417-6210:2013-10

8.13

Addition:

For **shaver supply units**, the marking for **rated output voltage(s)** and for the symbol of 8.11 shall be indicated on the front of the **enclosure** so as to be visible when the unit is mounted as in normal use. For **shaver supply units** intended to provide different output voltages, the selected output voltage setting shall be clearly discernible.

For **transformers**, the marking with the symbol of 8.11 shall be provided only if the **transformer** is supplied separately.

9 Protection against electric shock

This clause of IEC 61558-1:2017 is applicable.

10 Change of input voltage setting

This clause of IEC 61558-1:2017 is applicable.

11 Output voltage and output current under load

This clause of IEC 61558-1:2017 is applicable.

12 No-load output voltage

This clause of IEC 61558-1:2017 is applicable except as follows:

Addition

12.101 The **no-load output voltage** shall not exceed 275 V AC.

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 20 %.

The ratio is determined by Formula (101):

$$\frac{U_{\text{no-load}} - U_{\text{load}}}{U_{\text{load}}} \times 100(\%) \quad (101)$$

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.

*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

This clause of IEC 61558-1:2017 is applicable.

14 Heating

This clause of IEC 61558-1:2017 is applicable.

15 Short-circuit and overload protection

This clause of IEC 61558-1:2017 is applicable.

16 Mechanical strength

This clause of IEC 61558-1:2017 is applicable except as follows:

16.1 General

Replacement:

For **shaver supply units**, compliance is checked by the test of 16.101.

Addition:

16.101 ***Shaver supply units*** *are subjected to blows by means of a pendulum hammer, defined in 16.101.1 to 16.101.3.*

16.101.1 *Blows are applied to the specimen according to IEC 60068-2-62.*

*For **shaver supply units** other than flush-type mounted, the specimen is mounted as described in 4.2 of IEC 60068-2-62:1991.*

*For flush-type **shaver supply units**, the specimen is mounted as shown in Figure 3 of IEC 60068-2-62:1991.*

Flush-type equipment which is intended to be installed by means of screws to lugs recessed in the mounting block; flush-type equipment for claw fixing is fixed directly to the block by means of the claws.

The specimen is mounted as in normal use such that the point of impact lies in the vertical plane through the axis of the pivot of the pendulum.

Before applying the blows, mounting screws of bases, covers and the like are tightened with a torque equal to two thirds of that specified in Table 18 of IEC 61558-1:2017.

The striking element is allowed to fall from a height equal to that shown in Table 102.

Table 102 – Values of heights of fall

Height of fall cm	Approximate energy J	Relevant parts
10 ± 0,1	0,2	Cover plates of **shaver supply units** for flush-type mounting and for those parts which are recessed to a depth of at least one quarter of the largest dimension of the recessed part
15 ± 0,1	0,3	**Enclosures**
25 ± 0,1	0,5	Other parts

16.101.2 *The specimens shall be subjected to 10 blows which are evenly distributed over the sample.*

Five blows shall be applied as follows:

– *for **shaver supply units** intended to be flush mounted, one blow in the centre, one at each extremity of the area over the recess in the block, and the other two approximately midway between the previous blows, the specimen being moved horizontally;*

– *for **shaver supply units** not intended for flush-type mounting, one blow in the centre, one on each side of the specimen after it has been turned as far as possible, but not through more than 60° about a vertical axis, and the other two approximately midway between the previous blows.*

The remaining blows are then applied in the same way after the specimen has been turned around through 90° of its axis perpendicular to the plywood.

If cable entries are provided, the specimen shall be mounted such that the two lines of the blows are as far as possible and equidistant from these entries.

16.101.3 After the test, the specimen shall show no damage within the meaning of this document. In particular, **live parts** shall not become accessible.

NOTE 1 Damage to the finish, small dents which do not reduce **creepage distances** or **clearances** below the values specified in Clause 26, and small chips which do not adversely affect the protection against electric shock or moisture are disregarded.

NOTE 2 Cracks not visible with normal vision or corrected vision without magnification and surface cracks in fibre reinforced mouldings and the like are disregarded.

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

This clause of IEC 61558-1:2017 is applicable.

18 Insulation resistance, dielectric strength and leakage current

This clause of IEC 61558-1:2017 is applicable.

19 Construction

This clause of IEC 61558-1:2017 is applicable except as follows:

19.1 General construction

Replacement:

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 protective earthing shall consist of at least **basic insulation** rated for the **input voltage**. The insulation between the **output windings** and the **body** connected to protective 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 insulation between the **input windings** and any **intermediate conductive part** shall consist of at least **basic insulation**, and the insulation between the **output windings** and any **intermediate conductive part** shall consist of at least **supplementary insulation** (both basic and **supplementary insulations** rated for the **working voltage**).

NOTE 1 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).

NOTE 2 **Basic insulation** and **supplementary insulation** are interchangeable.

In addition, the following applies:

– for **class I transformers**, the insulation between the **input** and **output windings** via the **intermediate conductive parts** (even if they are connected to protective earthing) 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 **transformers** 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**).

NOTE 3 In 19.1.2 the possibility to consider the intermediate metal part connected to protective earthing and consequently to require **basic insulation** in both circuits (primary and secondary) is not allowed for the following reason:

– the intermediate metal part is normally the iron core made by laminated plates insulated to each other by oxide. It is not assured that all foils are correctly connected to the protective earthing.

– for **transformers** different from **independent**, it is not assured that in the final applications the iron core will be connected to protective earthing.

Addition:

19.101 There shall be no connections between the **output circuit** and the protective earthing.

19.102 There shall be no connections between the **output circuit** and the **body**.

Compliance is checked by inspection.

19.103 These 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 Mounting boxes for **transformers** or **shaver supply units** for flush-type mounting shall comply with IEC 60670 series.

Compliance is checked by inspection.

19.105 **Shaver supply units** shall be provided with socket-outlets in the **output circuit**. It shall not be possible to insert more than one plug at the same time. It shall not be possible for any of the plugs listed in 20.5 to be inserted so as to bridge two socket outlets.

Compliance is checked by inspection and by manual test.

19.106 **Transformers** and **shaver supply units** shall be **inherently** or **non-inherently short-circuit proof** and they shall not incorporate fuses.

Compliance is checked by inspection.

20 Components

This clause of IEC 61558-1:2017 is applicable except as follows:

20.5

Modification:

Shaver supply units can be provided with a changeover switch to provide different **rated output voltages** and/or a single-pole switch in the **input circuit**; these switches can be of micro-gap construction.

Compliance is checked by inspection.

20.6

Modification:

Socket outlets in the **output circuits** of **shaver supply units** shall accept one or more type of plugs in accordance with IEC TR 60083 and shall not have a protective earthing contact.

NOTE It is not necessary to check the socket outlet according to IEC 60884-1 as:

– constructional, mechanical and material characteristics are already covered by the existing clauses of IEC 61558-1:2017;

– electrical tests (temperature rise, breaking capacity, normal operation) are not applicable as the socket outlet is supplied by a **transformer** with limited power;

– for the protection against electric shock the requirements of this document are considered sufficient as the socket outlet is supplied by **isolating transformer**.

20.10

Replacement:

Transformers can be provided with self-resetting protective devices.

21 Internal wiring

This clause of IEC 61558-1:2017 is applicable.

22 Supply connection and other external flexible cables or cords

This clause of IEC 61558-1:2017 is applicable except as follows:

22.2

Addition:

Shaver supply units shall be provided with or be designed for use with a mounting box. They shall be designed such that the supply cable ends can be prepared for connection after the box is mounted in position but before the unit is fitted into the box.

Shaver supply units shall be designed and constructed so as to permit easy introduction of the supply conductors into the terminals and provide adequate space within the box such that after installation of the unit, the insulation of the supply conductors is unlikely to come into contact with **live parts** of different polarity or with moving parts such as the spindle of a rotary switch.

23 Terminals for external conductors

This clause of IEC 61558-1:2017 is applicable.

24 Provisions for protective earthing

This clause of IEC 61558-1:2017 is applicable.

25 Screws and connections

This clause of IEC 61558-1:2017 is applicable.

26 Creepage distances, clearances and distances through insulation

This clause of IEC 61558-1:2017 is applicable.

27 Resistance to heat, fire and tracking

This clause of IEC 61558-1:2017 is applicable.

28 Resistance to rusting

This clause of IEC 61558-1:2017 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 60884-1:2022, *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*

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

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*

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

_____

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

_____

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

Partie 2-5: Exigences particulières et essais pour les transformateurs pour rasoirs, les blocs d'alimentation incorporant un transformateur pour rasoir et les blocs d'alimentation pour rasoirs

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.
2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
9) L'IEC attire l'attention sur le fait que la mise en application du présent document peut entraîner l'utilisation d'un ou de plusieurs brevets. L'IEC ne prend pas position quant à la preuve, à la validité et à la portée de ces droits de propriété. À la date de publication du présent document, l'IEC n'a reçu aucune déclaration relative à des droits de brevets, qui pourraient être exigés pour la mise en œuvre du présent document. Toutefois, il est rappelé aux responsables de cette mise en œuvre qu'il ne s'agit peut-être pas des informations les plus récentes, qui peuvent être obtenues dans la base de données disponible à l'adresse https://patents.iec.ch. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'IEC 61558-2-5 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.

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

Projet	Rapport de vote
96/599/FDIS	96/600/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 cette Norme internationale est l'anglais.

Ce 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/publications.

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

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 pour rasoirs, les blocs d'alimentation incorporant un transformateur pour rasoir et les blocs d'alimentation pour rasoirs.*

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 www.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 relatif aux transformateurs autres que ceux destinés à alimenter les réseaux de distribution, notamment les transformateurs et les blocs d'alimentation destinés à permettre l'application de mesures de protection contre les chocs électriques, comme cela est défini par le CE 64,qui traite des installations électriques et de la protection contre les chocs électriques mais qui incluent également dans certains cas la limitation de la tension et la fonction de sécurité horizontale pour la 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 60364-4-41:2017, 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 COMBINAISONS DE CES ÉLÉMENTS –

Partie 2-5: Exigences particulières et essais pour les transformateurs pour rasoirs, les blocs d'alimentation incorporant un transformateur pour rasoir et les blocs d'alimentation pour rasoirs

1 Domaine d'application

Remplacement

La présente partie de l'IEC 61558 traite de la sécurité des **transformateurs pour rasoirs**, des **blocs d'alimentation** incorporant un **transformateur pour rasoir** et des **blocs d'alimentation pour rasoirs**. Les **transformateurs pour rasoirs** 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 document, le terme **transformateur** couvre les **transformateurs pour rasoirs** et les **blocs d'alimentation** incorporant des **transformateurs pour rasoirs** et les **blocs d'alimentation pour rasoirs**.

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**, 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 250 V en courant alternatif, et la **fréquence d'alimentation assignée** et les **fréquences de fonctionnement interne** ne dépassent pas 500 Hz.

La **puissance assignée** est supérieure ou égale à 20 VA et ne dépasse pas 50 VA.

La **tension secondaire à vide** ne dépasse pas 275 V en courant alternatif, et la **tension secondaire assignée** ne dépasse pas 250 V en courant alternatif.

Le présent document ne s'applique pas aux circuits externes et à leurs composants destinés à être connectés aux bornes primaires et secondaires ou aux socles de prises de courant 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 pour salles de bains et lieux analogues ou les spécifications de l'appareil spécifient une **isolation double** ou **renforcée** entre les circuits.

NOTE 3 Les **transformateurs** couverts par le présent document peuvent être encastrés ou montés en saillie, ou être incorporés dans des luminaires, miroirs, et autres équipements contenant un ou plusieurs socles de prises de courant.

L'attention est attirée sur les points suivants, le cas échéant:

– 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'aéronefs;
– mesures qui visent à protéger l'**enveloppe** et les composants situés à l'intérieur de l'**enveloppe** 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'article de l'IEC 61558-1:2017 s'applique, avec l'exception suivante:

Addition

IEC 60068-2-62:1991, *Essais d'environnement – Partie 2: Méthodes d'essai – Essai Ef: Impacts, marteau pendulaire* [1]

IEC TR 60083, *Prises de courant pour usages domestiques et analogues normalisées par les pays membres de l'IEC*

IEC 60670 (toutes les parties), *Boîtes et enveloppes pour appareillage électrique pour installations électriques fixes pour usages domestiques et analogues*

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*

[1] Cette publication a été supprimée et remplacée par l'IEC 60068-2-75 (1997), mais pour les besoins du présent document, l'IEC 60068-2-62 est citée.

IEC 61558-2-16, *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 l'exception suivante:

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

3.1 Transformateurs

Addition

3.1.101
transformateur pour rasoir
transformateur de séparation des circuits pour installation à poste fixe ayant une puissance limitée, conçu pour alimenter des rasoirs électriques, des brosses à dents électriques, et des appareils électriques analogues de puissance assignée inférieure ou égale à 50 VA utilisés dans une salle de bain et qui alimente uniquement un rasoir, ou un appareil analogue, à la fois

3.1.102
bloc d'alimentation pour rasoir
appareillage qui comporte un **transformateur pour rasoir** ou un **bloc d'alimentation** incorporant un **transformateur pour rasoir**, ainsi qu'un ou plusieurs socles de prises de courant permettant l'utilisation d'une seule fiche à la fois

4 Exigences générales

L'article de l'IEC 61558-1:2017 s'applique.

5 Généralités sur les essais

L'article de l'IEC 61558-1:2017 s'applique.

6 Caractéristiques assignées

L'article de l'IEC 61558-1:2017 s'applique, avec l'exception suivante:

Addition

6.101 La **tension secondaire assignée** ne doit pas dépasser 250 V en courant alternatif.

Pour les **transformateurs indépendants**, la limitation de la **tension secondaire** s'applique même si les **enroulements secondaires**, non destinés à l'interconnexion, sont connectés en série.