BS EN 61558-2-8:2010

BSI Standards Publication

# Safety of transformers, reactors, power supply units and combinations thereof -

## Part 2-8: Particular requirements and tests for transformers and power supply units for bells and chimes



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**National foreword**

This British Standard is the UK implementation of EN 61558-2-8:2010. It is identical to IEC 61558-2-8:2010. It supersedes BS EN 61558-2-8:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PEL/96, Small transformers.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.



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**Compliance with a British Standard cannot confer immunity from legal obligations.**

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EUROPEAN STANDARD

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# EN 61558-2-8

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English version

# Safety of transformers, reactors, power supply units and combinations thereof - Part 2-8: Particular requirements and tests for transformers and power supply units for bells and chimes

(IEC 61558-2-8:2010)

Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et des combinaisons de ces éléments - Partie 2-8: Règles particulières et essais pour les transformateurs et blocs d'alimentation pour sonneries et carillons
(CEI 61558-2-8:2010)

Sicherheit von Transformatoren, Drosseln, Netzgeräten und entsprechende Kombinationen - Teil 2-8: Besondere Anforderungen und Prüfungen an Transformatoren und Netzgeräten für Klingeln und Läutewerke
(IEC 61558-2-8:2010)

This European Standard was approved by CENELEC on 2010-07-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**



Ref. No. EN 61558-2-8:2010 E

## Foreword

The text of document 96/354/FDIS, future edition 2 of IEC 61558-2-8, prepared by IEC TC 96, Transformers, reactors, power supply units and similar products for low voltage up to 1 100 V, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61558-2-8 on 2010-07-01.

This European Standard supersedes EN 61558-2-8:1998.

The main changes consist of updating this part in accordance with EN 61558-1:2005.

This part has the status of a group safety publication in accordance with IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

| | | |
|---|---|---|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2011-04-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2013-07-01 |

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

This part supplements or modifies the corresponding clauses in EN 61558-1, so as to convert that publication into the EN standard: *Particular requirements and tests for transformers and power supply units for bell and chime*.

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

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

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

In this part, the following print types are used:

– requirements proper: in roman type;

– *test specifications: in italic type*;

– explanatory matters: in smaller roman type.

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

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

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 2006/95/EC.

Annex ZA has been added by CENELEC.

## Endorsement notice

The text of the International Standard IEC 61558-2-8:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

| | |
|---|---|
| IEC 61558-2-16:2009 | NOTE Harmonized as EN 61558-2-8:2009 (not modified). |

# Annex ZA
(normative)

## Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Annex ZA of Part 1 is applicable except as follows:

*Addition:*

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 61558-1 | 2005 | Safety of power transformers, power supplies, reactors and similar products - Part 1: General requirements and tests | EN 61558-1 + corr. August | 2005 2006 |

# CONTENTS

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

## Part 2-8: Particular requirements and tests for transformers and power supply units for bells and chimes

## 1 Scope

*Replacement:*

This part of IEC 61558 deals with the safety of **bell and chime transformers** and **power supply units** incorporating **bell and chime transformers. Transformers** incorporating **electronic circuits** are also covered by this standard.

NOTE 1 Safety includes electrical, thermal and mechanical aspects.

Unless otherwise specified, from here onward, the term **transformer** covers **bell and chime transformers** and **power supply units** incorporating **bell and chime transformers**.

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

This standard is applicable to **transformers** and **power supply** (linear).

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

The **rated supply voltage** does not exceed 250 V a.c., and the **rated supply frequency** and does not exceed 500 Hz. This standard is applicable to **transformers** and linear **power supply** units with internal operating frequency not exceeding 500 Hz.

The **rated output** shall not exceed 100 VA.

The **no-load output voltage** does not exceed 33 V a.c. or 46 V ripple-free d.c., and the **rated output voltage** does not exceed 24 V a.c., or 33 V ripple-free d.c.

**Bell and chime transformers** are generally intended to supply domestic sound signalling equipment and other similar devices where the load is applied for short periods of time.

NOTE 2 A partial load may be applied for illumination purposes.

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

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

NOTE 3 Normally, the **transformers** are intended to be used with equipment to provide voltages different from the supply voltage for the functional requirements of the equipment. The protection against electric shock may be provided (or completed) by other features of the equipment, such as the **body**. Parts of **output circuits** may be connected to the **input circuits** or to protective earth.

This part is applicable to **transformers** associated with specific equipment, to the extent decided upon by the relevant IEC technical committees.

NOTE 4 Attention is drawn to the following:

- 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 **transformer** should also be considered;
- additional requirements in accordance with other appropriate standards and national rules may be applicable to **transformers** intended for use in special environments, such as tropical environment.

NOTE 5 Future technological development of **transformers** may necessitate a need to increase the upper limit of the frequencies, until then this part may be used as a guidance document.

## 2 Normative references

This clause of Part 1 is applicable except as follows:

*Addition:*

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

## 3 Terms and definitions

This clause of Part 1 is applicable except as follows:

*Addition:*

**3.1.101**
**bell and chime transformer**
single-phase **safety isolating transformer** specifically intended to supply household sound signalling equipment and other similar devices

## 4 General requirements

This clause of Part 1 is applicable.

## 5 General notes on tests

This clause of Part 1 is applicable.

## 6 Ratings

*Replacement*:

**6.101** The **rated output voltage** shall not exceed 24 V a.c. or 33 V ripple-free d.c..

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

**6.102** The **rated output** shall not exceed 100 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 a.c.

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

## 7 Classification

This clause of Part 1 is applicable except as follows:

**7.2** *Replacement:*

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

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

**7.4** *Replacement:*

According to their mobility:

– **fixed transformers.**

**7.5** *Replacement:*

According to their **duty-type**:

– **short-time duty cycle;**
– **intermittent duty cycle.**

NOTE A partial load for illumination may be applied continuously.

*Addition:*

**7.101** According to the method of mounting:

– mounting in a distribution assembly;
– mounting in sound signalling devices (bells, chimes, buzzers, etc.);
– mounting on an outlet box or cabinet;
– flush mounted;
– surface mounted.

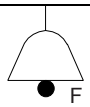
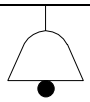
## 8 Marking and other information

This clause of Part 1 is applicable except as follows:

**8.1 h)** *Replacement:*

The **transformers** shall be marked with one of the graphical symbols shown in 8.11;

**8.11** *Addition:*

| Symbol or graphical symbol | Explanation or title | Identification |
|---|---|---|
|   | Fail-safe **bell and chime transformer** | Based on Symbol IEC 60417-5013 (2009-05) |
|  | Short-circuit proof **bell and chime transformer** (inherently or non-inherently) | IEC 60417-5013 (2009-05) |

## 9 Protection against electric shock

This clause of Part 1 is applicable except as follows:

*Addition:*

**9.101** Protection against accidental contact with windings and **hazardous live parts** of the **input circuit** shall be ensured while connecting conductors to the output terminals.

*Compliance is checked by inspection and by the application of the standard test finger shown in Figure 2. It shall not be possible to touch windings or **hazardous live parts** of the **input circuit** with the test finger.*

## 10 Change of input voltage setting

This clause of Part 1 is applicable.

## 11 Output voltage and output current under load

This clause of Part 1 is applicable except as follows:

**11.1** *Replacement*

When the **transformer** is connected to the **rated supply voltage**, at the **rated supply frequency**, and loaded with an impedance resulting in the **rated output** at the **rated output voltage** and, for a.c. current, at the **rated power factor**, the output voltage shall not differ from the rated value by more than:

a) 15 % for the output voltage of **inherently short-circuit proof transformers** with one **rated output voltage**;

b) 15 % for the highest output voltage of **inherently short-circuit proof transformers** with more than one **rated output voltage**;

c) 20 % for the other output voltages of **inherently short-circuit proof transformers** with more than one **rated output voltage**;

d) 15 % for the output voltages of other **transformers**.

*Compliance is checked by measuring the output voltage 2 min after 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 the **rated power factor**.*

*For **transformers** with more than one **rated supply voltage**, the requirement is applicable for each of the **rated supply voltages**.*

*For **transformers** with multiple **output windings**, the loads are applied to every multiple section simultaneously, unless otherwise declared.*

## 12 No-load output voltage

This clause of Part 1 is applicable except as follows:

*Addition:*

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

**12.101** The **no-load output voltage** shall not exceed 33 V a.c. or 46 V ripple free d.c.. The output voltage limitation applies even when independent **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 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 100 %.

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

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

*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 frequency**.*

## 13 Short-circuit voltage

This clause of Part 1 is applicable.

## 14 Heatingss

This clause of Part 1 is applicable except as follows:

**14.1** *Replacement of the second paragraph by the following*:

*Temperatures are determined under the following conditions.*

*Replacement of the tenth paragraph by the following:*

***Transformers** are supplied at **rated supply voltage** and loaded with an impedance Z producing **rated output** at the **rated output voltage** and, for a.c. current, at the **rated power factor**. The value of output current is measured after 1 min. Then the supply voltage is increased by 10 % and the output impedance is adjusted so that the new impedance Z' gives the same output current than the value measured before. **Transformers** are submitted to 20 cycles of 1 min operation with the impedance Z' and 5 min operation with 5 times the impedance Z'. Temperature rises are measured during the last cycle.*

*Addition:*

*Addition of the following footnote to table* “f“ *to* "external **enclosures**" *in Table 1*:

f The external **enclosure** of a **transformer** only includes the parts accessible to the standard test finger when mounted in accordance with 14.1.

*Addition of the following footnote to table* “g“ *to* "supports" *in Table 1*:

g Support includes any area of the black painted plywood support, but excludes any metal parts of the mounting system (rails, outlet boxes, etc.).

## 15 Short-circuit and overload protection

This clause of Part 1 is applicable except as follows:

*Addition:*

**15.101** The maximum short-circuit output current shall not exceed 10 A, measured 5 s after applying the short-circuit, the **transformer** being supplied with 1,1 times the **rated supply voltage**.

## 16 Mechanical strength

This clause of Part 1 is applicable except as follows:

*Replacement:*

**16.2** The impact hammer shall have an energy of (0,2 ± 0,05) J.

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

This clause of Part 1 is applicable.

## 18 Insulation resistance, dielectric strength and leakage current

This clause of Part 1 is applicable.

## 19 Construction

This clause of Part 1 is applicable except as follows:

*Replacement:*

**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 Clauses 18 and 26 into consideration.*

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

In addition, the following applies:

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

– for **class I transformers** intended for connection to the mains supply by means of a plug, the insulation between the **input windings** and the **body** shall consist of at least **basic insulation**, and the insulation between the **output windings** and the **body** shall consist of at least **supplementary insulation** (both basic and **supplementary insulation**s 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 insulation**s 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 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) 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** via the **intermediate conductive parts** (if any) shall consist of double or **reinforced insulation** (rated for the input voltage), and the insulation between the **body** and the **output windings** via the **intermediate conductive parts** (if any) 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 this clause the possibility to consider the intermediate metal part connected to earth and consequently to require **basic insulation** in both circuit (primary and secondary) is not allowed for the following reason:

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

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

*Addition:*

**19.101** There shall be no connections between the **output circuit** and the protective earth, unless – for **associated transformers** - allowed by the relevant equipment standard.

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

*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**.*

## 20 Components

This clause of Part 1 is applicable except as follows:

*Modification:*

**20.4** If the **transformer** incorporates a switch intended to disconnect the **input winding** from the supply, this switch may be of single-pole micro-gap construction and may disconnect either pole.

## 21 Internal wiring

This clause of Part 1 is applicable.

## 22 Supply connection and other external flexible cables or cords

This clause of Part 1 is applicable except as follows:

*Modification:*

**22.3** *Replace the first paragraph as follows:*

**Flush-type transformers** may be so designed that connection of the "external" conductors to the terminals has to be made before the **transformer** is fitted into a flush mounting box.

*Replacement:*

**22.5 Power supply cords** of **transformers** shall not be lighter than light polyvinyl chloride sheathed flexible cords (code designation 60227 IEC 53) or ordinary tough rubber sheathed flexible cords (code designation 60245 IEC 53).

## 23 Terminals for external conductors

This clause of Part 1 is applicable.

## 24 Provisions for protective earthing

This clause of Part 1 is applicable.

## 25 Screws and connections

This clause of Part 1 is applicable except as follows:

**25.3** *Addition:*

This requirement is not applicable to electrical connections other than protective earthing connections on the **output circuits** of the **transformers** with a **rated output** not exceeding 12 VA.

## 26 Creepage distances, clearances and distances through insulation

This clause of Part 1 is applicable.

## 27 Resistance to heat, fire and tracking

This clause of Part 1 is applicable.

## 28 Resistance to rusting

This clause of Part 1 is applicable.

## Annexes

The annexes of Part 1 are applicable except as follows:

## Annex F

## Requirements for manually operated switches which are parts of transformer assemblies

This annex of Part 1 is applicable with the following addition:

**F.2** *Addition:*

*Add a third dash after the first paragraph of F.2:*

– subclause 7.1.4.4: the number of operating cycles shall be 1 000.

## Bibliography

The Bibliography of Part 1 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*

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