

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

GROUP SAFETY PUBLICATION  
PUBLICATION GROUPEE DE SÉCURITÉ

**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**

**Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et  
combinaisons de ces éléments –  
Partie 2-13: Exigences particulières et essais pour les autotransformateurs et les  
blocs d'alimentation qui incorporent des autotransformateurs pour applications  
d'ordre général**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International standard IEC 61558-2-13 has been prepared by IEC technical committee 96: Transformers, reactors, power supply units and combinations thereof.

This third edition cancels and replaces the second edition published in 2009. 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) description of constructions moved to IEC 61558-1:2017;
- c) new symbol for power supply unit with linearly regulated output voltage.

The text of this document is based on the following documents:

Draft	Report on voting
96/549/FDIS	96/555/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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

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

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

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 a particular subclause of IEC 61558-1:2017 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 IEC 61558-1:2017 is to be adapted 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 "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

## 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, but in certain cases including the limitation of voltage and horizontal safety function for SELV, in accordance with IEC 60364-4-41.

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

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

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

**iTeh Standards**  
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[IEC 61558-2-13:2022](#)

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# 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

### 1 Scope

#### *Replacement:*

This part of IEC 61558 deals with the safety of **auto-transformers** for general applications and **power supply units** incorporating **auto-transformers** for general applications. **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 **auto-transformers** for general applications and **power supply units** incorporating **auto-transformers** for general applications.

For **power supply units** (linear) this document is applicable. For **switch mode power supply units** IEC 61558-2-16 is applicable.

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

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

The **core power** does not exceed:

- 2 kVA for single-phase **transformers**;
- 10 kVA for polyphase **transformers**.

The **rated output** does not exceed:

- 40 kVA for single-phase **transformers**;
- 200 kVA for polyphase **transformers**.

This document is applicable to **transformers** without limitations of the **core power** and the **rated output** both being subject to an agreement between the purchaser and the manufacturer.

Where applicable, the **no-load output voltage** or the **rated output voltage** does not exceed 1 000 V AC or 1 415 V ripple-free DC. For **independent transformers**, the **no-load output voltage** and the **rated output voltage** is not less than 50 V AC or 120 V ripple-free DC.

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

NOTE 2 **Transformers** covered by this document are used only in applications where no **insulation** between circuits is required by the installation rules or by the end product standard.



Attention is drawn to the following, if necessary:

- for **transformers** intended to be used in vehicles, on board ships, and aircraft, additional requirements (from other applicable standards, national rules, etc.);
- measures to protect the **enclosure** and the components inside the enclosure against external influences such as fungus, vermin, termites, solar-radiation, and icing;
- the different conditions for transportation, storage, and operation of the **transformers**;
- additional requirements in accordance with other appropriate standards and national rules can be applicable to **transformers** intended for use in special environments.

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

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

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

## 2 Normative references

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

*Addition:*

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

<https://standards.iteh.ai/catalog/standards/iec/7d90447d-5570-45cb-853c-55da3e80a23d/iec-61558-2-13-2022>

## 3 Terms and definitions

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

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

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

*Replacement:*

### 3.1.5

#### **auto-transformer**

**transformer** in which **input** and **output windings** have a common part

Note 1 to entry: **Auto-transformers** can have supplementary windings (see Figure 101) or tapings (see Figure 102) for adjustment purposes.

Note 2 to entry: Transformers with windings separated at least by functional insulation and electrically connected, will be treated as **auto-transformers** (see Figure 103).

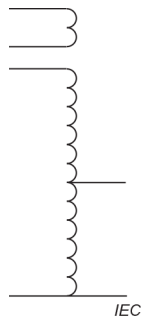


Figure 101 – Windings

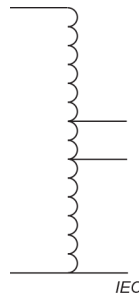


Figure 102 – Tappings

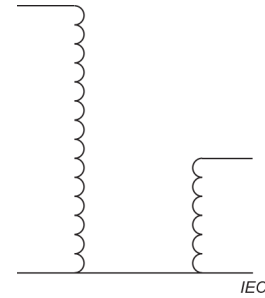


Figure 103 – Windings separated by functional isolation

*Addition:*

### 3.5.101 core power

power transformed by the core, if this core was used in a **transformer** with separate windings at the same **supply voltage**, **output voltage**, **frequency**, **power factor** and thermal characteristics

## 4 General requirements

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

## 5 General notes on tests

<https://standards.iteh.ai/IEC/61558-2-13/2022/5570-45cb-853c-55da3e80a23d/iec-61558-2-13-2022>  
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 1 000 V AC or 1 415 V ripple-free DC. For **independent transformers** the **rated output voltage** shall exceed 50 V AC or 120 V ripple-free DC.

**6.102** The **rated output** shall not exceed:

- 40 kVA for single-phase **transformers**;
- 200 kVA for polyphase **transformers**.

**Transformers** without limitation of the **rated output** shall be subject to agreement between the purchaser and the manufacturer.

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

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

**6.105** The **core power** shall not exceed:

- 2 kVA for single-phase **transformers**;
- 10 kVA for polyphase **transformers**.

**Transformers** without limitation of the **core power** shall be subject to agreement between the purchaser and the manufacturer.

The relation between the **core power** and the **rated output** is determined by Formula (1):

$$\text{Corepower [VA]} = \frac{V_{\max} - V_{\min}}{V_{\max}} \times \text{rated output [VA]} \quad (1)$$

where

$V_{\max}$  is the highest value of **rated supply voltage** or **rated output voltage**, expressed in V;

$V_{\min}$  is the lowest value of **rated supply voltage** or **rated output voltage**, expressed in V.

NOTE In this case, the limitation of the **core power** is applicable to the **rated output**.

Formula (1) is not applicable to a **transformer** with separate windings which are electrically connected (see Figure 103). In this case, the **core power** of the **transformer** is equal to the **rated output**.

*Compliance with the requirements of 6.101 to 6.105 is checked by inspection of the marking.*

## 7 Classification

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

## 8 Marking and other information

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

### 8.1 h)

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

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

### 8.11

*Addition:*

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