

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

GROUP ENERGY EFFICIENCY PUBLICATION  
PUBLICATION GROUPEE SUR L'EFFICACITE ENERGÉTIQUE

**Safety of transformers, reactors, power supply units and combinations thereof –  
Part 2-10: Particular requirements and tests for separating transformers with  
high insulation level and separating transformers with output voltages  
exceeding 1 000 V**

**Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et des  
combinaisons de ces éléments –**

**Partie 2-10 : Exigences particulières et essais pour les transformateurs  
d'isolement à enroulements séparés à niveau d'isolement élevé et pour les  
transformateurs d'isolement à enroulements séparés à tensions secondaires  
supérieures à 1 000 V**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF TRANSFORMERS, REACTORS,  
POWER SUPPLY UNITS AND COMBINATIONS THEREOF –****Part 2-10: Particular requirements and tests for separating  
transformers with high insulation level and separating  
transformers with output voltages exceeding 1 000 V**

## FOREWORD

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IEC 61558-2-10 has been prepared by IEC technical committee 96: Transformers, reactors, power supply units and combinations thereof. It is an International Standard.

This second edition cancels and replaces the first edition published in 2014. 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) overvoltage categories I, II, III and IV for clearances and dielectric strength tests are included;

c) clearances for homogenous field conditions deleted.

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

Draft	Report on voting
96/589/FDIS	96/595/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 International Standard 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 separating transformers with high insulation level and separating transformers with output voltages exceeding 1 000 V*.

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 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 [webstore.iec.ch](http://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 **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.

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[IEC 61558-2-10:2024](https://standards.iteh.ai/catalog/standards/iec/4d511291-770a-429c-b4cd-333b35249b17/iec-61558-2-10-2024)

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

### Part 2-10: Particular requirements and tests for separating transformers with high insulation level and separating transformers with output voltages exceeding 1 000 V

#### 1 Scope

##### *Replacement:*

This part of IEC 61558 deals with the safety of **separating transformers with high insulation level** and **separating transformers with output voltages exceeding 1 000 V**. 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 **separating transformers with high insulation level** and **separating transformers with output voltages exceeding 1 000 V AC or 1 500 V DC**.

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.

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

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 **rated output** does not exceed:

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

This document is applicable to **transformers** without limitation of the **rated output** 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 1 500 V DC for **separating transformers with high insulation level**;
- does exceed 1 000 V AC or 1 500 V DC and does not exceed 15 000 V AC or 15 000 V DC for **separating transformers with output voltage exceeding 1 000 V**.

This document does not apply to:

- **transformers** covered by IEC 60076-11;
- neon **transformers** covered by IEC 61050; and
- **power supplies** and converters for use with or in products according to IEC 61347-2-10.



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 **double or reinforced insulation** between circuits is not 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 can be provided (or completed) by other features of the equipment, such as the **body**. Parts of **output circuits** can be connected to the **input circuits** or to **protective earthing**.

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

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.

It is possible that future technological development of **transformers** will require an increase in the upper limit of the frequencies. Until then this document can be used as a guidance document.

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

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

## 2 Normative references

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

*Addition:*

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

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61558-1 apply.

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

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

### 3.1 Transformers

*Addition:*

#### 3.1.101

##### **separating transformer with high insulation level**

**separating transformer** where the **output voltage** does not exceed 1 000 V AC or 1 500 V DC and does exceed 50 V AC or DC for **independent transformers**, the **output winding(s)** is (are) isolated from both, **input winding(s)** and **body** for a **working voltage** exceeding 1 000 V AC or 1 500 V DC but not exceeding 15 000 V AC or 15 000 V DC

#### 3.1.102

##### **separating transformer with output voltages exceeding 1 000 V**

**separating transformer** where the **output circuits** of which are designed to give voltages exceeding 1 000 V AC or 1 500 V DC and not exceeding 15 000 V AC or 15 000 V DC

## 4 General requirements

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

## 5 General notes on tests

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

## 6 Ratings

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

*Addition:*

**6.101** The **rated output voltage** is limited as follows.

For **separating transformers with high insulation level**:

- the **no-load output voltage** or the **rated output voltage** shall not exceed 1 000 V AC or 1 500 V DC;
- for **independent transformers** the **rated output voltage** shall exceed 50 V AC or 50 V DC and this **output voltage** applies even when **output windings**, not intended for interconnection, are connected in series.

For **separating transformers with no load output voltages exceeding 1 000 V**:

- the **rated output voltage** shall exceed 1 000 V AC or 1 500 V DC and shall not exceed 15 000 V AC or 15 000 V DC;
- for **independent transformers** these **output voltage** limitations apply even when **output windings**, not intended for interconnection, are connected in series.

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

- 25 kVA for single-phase **transformers**;
- 40 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.

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

## 7 Classification

IEC 61558-1:2017, Clause 7 is applicable.

## 8 Marking and other information

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

### 8.1 h)

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

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

The voltage of the **insulation level**, expressed in kV is not a part of the symbol.

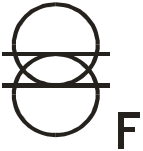
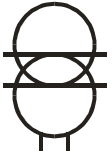
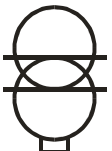
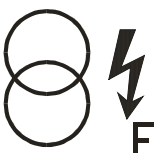
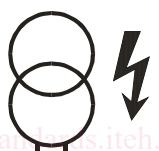
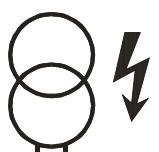
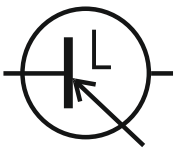
### 8.11

*Addition:*

The symbol for linear **power supply units** shall be used in conjunction with the symbol indicating the kind of **transformer**. [IEC 61558-2-10:2024](https://standards.iteh.ai/catalog/standards/iec/4d511291-770a-429c-b4cd-333b35249b17/iec-61558-2-10-2024)

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**Table 101 – Symbols indicating the kind of transformer**

Symbol or graphical symbol	Explanation or title	Identification
	<p><b>Fail-safe separating transformers with high insulation level</b></p> <p>The voltage of the insulation level, expressed in kV, shall be marked adjacent to the symbol.</p>	IEC 60417-6063:2011-05
	<p><b>Non-short-circuit proof separating transformer with high insulation level</b></p> <p>The voltage of the insulation level, expressed in kV, shall be marked adjacent to the symbol.</p>	IEC 60417-6064:2011-05
	<p><b>Short-circuit-proof separating transformer with high insulation level (inherently or non-inherently)</b></p> <p>The voltage of the insulation level, expressed in kV, shall be marked adjacent to the symbol.</p>	IEC 60417-6065:2011-05
	<p><b>Fail-safe separating transformers with output voltages exceeding 1 000 V</b></p>	IEC 60417-6066:2011-06
	<p><b>Non-short-circuit-proof separating transformer with output voltages exceeding 1 000 V</b></p>	IEC 60417-6067:2011-06
	<p><b>Short-circuit-proof separating transformer with output voltages exceeding 1 000 V (inherently or non-inherently)</b></p>	IEC 60417-6068:2011-06
	<p><b>Power supply unit, linear</b></p>	IEC 60417-6210:2013-10

*Addition:*

**8.101 Separating transformers with high insulation level** shall be marked with the voltage of the **insulation level**, expressed in kV on the right side of the symbol.

## 9 Protection against electric shock

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