

INTERNATIONAL STANDARD



GROUP ENERGY EFFICIENCY PUBLICATION

**Safety of transformers, reactors, power supply units and combinations thereof –
Part 2-23: Particular requirements and tests for transformers and power supply
units for construction sites**

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IEC 61558-2-23

Edition 3.0 2024-06
REDLINE VERSION

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.180

ISBN 978-2-8322-9150-4

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-23: Particular requirements and tests for transformers and power supply units for construction sites

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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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61558-2-23:2010. 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 61558-2-23 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 units with linearly regulated output voltage.

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

Draft	Report on voting
96/590/FDIS	96/596/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/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 transformers and power supply units for construction sites*.

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 in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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

Part 2-23: Particular requirements and tests for transformers and power supply units for construction sites

1 Scope

Replacement:

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

NOTE 1 Safety includes electrical, thermal and mechanical aspects.

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

This document is applicable to **stationary** or **portable**, single-phase or polyphase, air-cooled (natural or forced) **independent** or **associated transformers**, being **isolating** or **safety isolating dry-type transformers** for the use on construction sites. The windings ~~may~~ 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.

<https://standards.iteh.ai/> IEC 61558-2-23:2024
The **rated supply voltage** does not exceed 1 000 V AC, and the **rated supply frequency** and **internal operating frequencies** do not exceed 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 operating frequencies** higher than 500 Hz. Where the two requirements are in conflict the most severe take precedence~~

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.

NOTE 2 **Transformers** intended to supply distribution networks are not included in the scope.

~~**Isolating transformers and power supply units incorporating**~~ **Isolating transformers** for construction sites have a **no-load output voltage** and a **rated output voltage** exceeding 50 V AC and not exceeding 250 V AC.

~~**Safety isolating transformers and power supply units incorporating**~~ **Safety isolating transformers** for construction sites have a **no-load output voltage** and a **rated output voltage** not exceeding 50 V AC.

NOTE 3 This document is applicable to **transformers** for the supply of electricity in locations as specified in IEC 60364-7-704. The latter also specifies the protection by using an earthed midpoint or starpoint of the **output winding**.

NOTE 4 ~~Transformers and power supply units~~ covered by this document are used in applications where it is required by the installation rules or by the appliance specification for protection purposes.

When the ~~transformers or power supply units~~ are incorporated into **low voltage switchgear and controlgear assemblies for construction sites** as specified in ~~IEC 60439-4~~ IEC 61439-4, the additional requirements of ~~IEC 60439-4~~ IEC 61439-4 apply to the assembly.

NOTE 4 5 For **transformers** filled with liquid dielectric or pulverised material, such as sand, additional requirements are under consideration.

~~NOTE 5~~ 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 ~~should also be considered~~;
- the different conditions for transportation, storage, and operation of the **transformers and power supply units** ~~should also be considered~~;
- additional requirements in accordance with other appropriate standards and national rules ~~may~~ can be applicable to **transformers and power supply units** intended for use in special environments ~~such as tropical environment~~.

~~NOTE 6~~ It is possible that the future technological development of **transformers** ~~may necessitate a need to~~ will require an increase in the upper limit of the frequencies. Until then this document may 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 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

~~IEC 60439-4, Low voltage switchgear and controlgear assemblies – Part 4: Particular requirements for assemblies for construction sites (ACS)~~

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

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

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>

3.2 General terms

Addition:

3.2.101

low voltage switchgear and controlgear assembly for construction sites ~~(ACS)~~

combination of one or several transforming or switching devices with associated control, measuring, signalling, protective and regulating equipment complete with all their internal electrical and mechanical connections and structural parts, designed and built for use on all construction sites, indoors or outdoors-

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

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

Addition:

6.101 The **rated output voltage** shall not exceed:

- 250 V AC for **isolating transformers** with a non-earthed mid-point (single-phase) or a non-earthed star-point (three-phase) or delta connection (three-phase) ~~and for power supply units incorporating such transformers;~~
- ~~110~~ 115 V AC for **isolating transformers** with a mid-point (single-phase) earthed in the construction or a star-point (three-phase) earthed in the construction ~~and for power supply units incorporating such transformers;~~
- 50 V AC for **safety isolating transformers** ~~and for power supply units incorporating safety isolating transformers.~~

The **rated output voltage** shall exceed:

- 50 V AC for isolating transformers ~~and for power supply units incorporating isolating transformers.~~

Preferred values for the **rated output voltage** are

- ~~110~~ 115 V and 230 V for **portable**, single-phase **isolating transformers**;
- 72 V, ~~110~~ 115 V and 230 V for other **isolating transformers**;

- 6 V, 12 V, 24 V, 42 V and 48 V for **safety isolating transformers**.

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

- 25 kVA for single-phase isolating and **safety isolating transformers** ~~and power supply units incorporating such transformers~~;
- 40 kVA for polyphase isolating and **safety isolating transformers** ~~and power supply units incorporating such transformers~~;

Preferred values for the **rated output** are

- 25 VA, 40 VA, 63 VA, 100 VA, 160 VA, 250 VA, 400 VA, 630 VA, 1 000 VA, 1 600 VA, 2 500 VA, 4 000 VA, 6 300 VA, 10 kVA, 16 kVA and 25 kVA for single-phase **transformers**;
- 630 VA, 1 000 VA, 1 600 VA, 2 500 VA, 4 000 VA, 6 300 VA, 10 kVA, 16 kVA, 25 kVA and 40 kVA for polyphase **transformers**.

Intermittent duty cycle ~~may~~ can be assigned only to **portable transformers** ~~and power supply units~~ having a **rated output** not exceeding 6,3 kVA.

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

6.103 The **rated supply frequency** shall not exceed 500 Hz.

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

6.105 **Transformers** with **intermittent duty cycle** shall be intended for a **rated** operating time of 5 min "on" and a resting time of 15 min "off".

6.106 The supply current is limited to a maximum of 125 A, and in the case of flexible cable or socket outlet, to 63 A.

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Compliance with 6.101 to 6.106 is checked by inspection of the marking.*

7 Classification

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

Replacement:

7.5 Transformers are classified in accordance with their duty type:

- **continuous duty**;
- **intermittent duty cycle**.

8 Marking and other information

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

8.1 h)

Replacement:

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

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**

8.11

Addition:





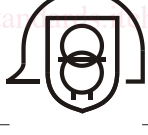
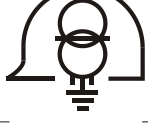

The symbol for linear **power supply units** shall be used in conjunction with the symbol indicating the kind of **transformer**.

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Table 101 – Symbols indicating the kind of transformer

Symbol or graphical symbol	Explanation or title	Identification
	Isolating transformer for construction sites, fail-safe	IEC 60417-6010-1:2007-02
	Safety isolating transformer for construction sites, fail-safe	IEC 60417-6010-2:2007-02
	Isolating transformer for construction sites, fail-safe, mid-point or star-point earthed	IEC 60417-6010-3:2007-02
	Isolating transformer for construction sites, non-short-circuit proof	IEC 60417-6010-4:2007-02
	Safety isolating transformer for construction sites, non-short-circuit proof	IEC 60417-6010-5:2007-02
	Isolating transformer for construction sites, non-short-circuit proof, mid-point or star-point earthed	IEC 60417-6010-6:2007-02
	Isolating transformer for construction sites, short-circuit proof (inherently or non-inherently)	IEC 60417-6010-7:2007-02
	Safety isolating transformer for construction sites, short-circuit proof (inherently or non-inherently)	IEC 60417-6010-8:2007-02