

INTERNATIONAL STANDARD



GROUP ENERGY EFFICIENCY PUBLICATION

**Safety of transformers, reactors, power supply units and combination thereof –
Part 2-12: Particular requirements and tests for constant voltage transformers
and power supply units for constant voltage**



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INTERNATIONAL STANDARD



GROUP ENERGY EFFICIENCY PUBLICATION

**Safety of transformers, reactors, power supply units and combination thereof –
Part 2-12: Particular requirements and tests for constant voltage transformers
and power supply units for constant voltage**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF TRANSFORMERS, REACTORS,
POWER SUPPLY UNITS AND COMBINATIONS THEREOF –****Part 2-12: Particular requirements and tests for constant voltage
transformers and power supply units for constant voltage**

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 61558-2-12:2011. 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 61558-2-12 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 2011. 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 International Standard is based on the following documents:

Draft	Report on voting
96/587/FDIS	96/591/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 constant voltage transformers and power supply units for constant voltage*.

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.

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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 2-12: Particular requirements and tests for constant voltage transformers and power supply units for constant voltage

1 Scope

Replacement:

This part of IEC 61558 deals with the safety of **constant voltage transformers** for general applications and **power supply units for constant voltage** for general applications. **Constant voltage 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 **constant voltage transformers** for general applications and **power supply units for constant voltage** for general applications.

This document is applicable to **stationary** or **portable** single-phase or polyphase, air-cooled (natural or forced) **independent** or **associated dry-type**:

- **constant voltage auto-transformers**;
- **constant voltage separating transformers**;
- **constant voltage isolating transformers**;
- **constant voltage safety isolating transformers**.

The windings ~~may~~ can be encapsulated or non-encapsulated.

~~This standard is applicable to **transformers** and **power supply** (linear) with internal operating frequencies not exceeding 500 Hz.~~

~~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 take precedence.~~

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.

The **rated supply voltage** does not exceed 1 000 V AC. The **rated supply frequency** does not exceed 500 Hz, the **internal operating resonant frequency** does not exceed 30 kHz and the **internal operating frequency** does not exceed 100 MHz.

The **rated output** does not exceed:

- 40 kVA for single-phase **constant voltage auto-transformers**;
- 200 kVA for polyphase **constant voltage auto-transformers**;
- 25 kVA for single-phase **constant voltage separating transformers** and **constant voltage isolating transformers**;

- 40 kVA for polyphase **constant voltage separating transformers** and **constant voltage isolating transformers**;
- 10 kVA for single-phase **constant voltage safety isolating transformers**;
- 16 kVA for polyphase **constant voltage safety isolating 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.

Where applicable to **constant voltage auto-transformers**

- the **no-load output voltage** or the **rated output voltage** does not exceed 1 000 V AC or 1 415 V ripple-free DC, and for **independent constant voltage auto-transformers** the **no-load output voltage** and the **rated output voltage** exceed 50 V AC or 120 V ripple-free DC;
- **constant voltage auto-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.

Where applicable to **constant voltage separating transformers**

- the **no-load output voltage** or the **rated output voltage** does not exceed 1 000 V AC or 1 415 V ripple-free DC, and for **independent constant voltage separating transformers** the **no-load output voltage** and the **rated output voltage** exceed 50 V AC or 120 V ripple-free DC;
- **constant voltage separating 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.

Where applicable to **constant voltage isolating transformers**

- the **no-load output voltage** or the **rated output voltage** does exceed 50 V AC or 120 V ripple-free DC and where applicable, does not exceed 500 V AC or 708 V ripple-free DC. The **no-load output voltage** and the **rated output voltage** ~~may~~ can be up to 1 000 V AC or 1 415 V ripple-free DC for special applications;
- **constant voltage isolating transformers** covered by this document are used only in applications where **double** or **reinforced insulation** between circuits is required by the installation rules or by the end product standard.

Where applicable to **constant voltage safety isolating transformers**

- the **no-load output voltage** or the **rated output voltage** does not exceed 50 V AC or 120 V ripple-free DC;
- **constant voltage safety isolating transformers** covered by this document are used only in applications where **double** or **reinforced insulation** between circuits is required by the installation rules or by the end product standard.

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 3~~ 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.) ~~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 be applicable to **transformers** intended for use in special environments.

~~NOTE 4~~ Future technological development of **transformers** may necessitate a need to increase 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

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*

IEC 61558-2-16:2021, *Safety of transformers, reactors, power supply units and combinations thereof – Part 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 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>

3.1 Transformers

Addition:

3.1.101

constant voltage transformer

transformer intended to limit the influence of the input voltage variations

Note 1 to entry: This type of **transformer** ~~may~~ can also limit the influence of transients.

3.5 Ratings

Addition

3.1025.101**regulation tolerance**

deviation in per cent of the **rated output voltage** when the **constant voltage transformer** is supplied within the **rated supply voltage** variation

3.1035.102**internal operating resonant frequency**

frequency produced within a **constant voltage transformer**

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:

- 1 000 V AC or 1 415 V ripple-free DC for **constant voltage auto-transformers** and **constant voltage separating transformers**;
- 250 V AC for single-phase **portable constant voltage isolating transformers**;
- 400 V AC for polyphase **portable constant voltage isolating transformers**, and
- 500 V AC or 708 V ripple-free DC for **constant voltage isolating transformers**. For **constant voltage isolating transformers**, the **rated output voltage** ~~may~~ can be up to 1 000 V AC or 1 415 V ripple-free DC to be in accordance with the national wiring rules or for a special purpose;
- 50 V AC or 120 V ripple-free DC for **constant voltage safety isolating transformers**;

The **rated output voltage** shall exceed:

- 50 V AC or 120 V ripple-free DC for **independent constant voltage auto-transformers**, **constant voltage separating transformers** and **constant voltage isolating transformers**.

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

- 40 kVA for single-phase **constant voltage auto-transformers**,
- 200 kVA for polyphase **constant voltage auto-transformers**,
- 25 kVA for single-phase **constant voltage separating** and **isolating transformers**,
- 40 kVA for polyphase **constant voltage separating** and **isolating transformers**,
- 10 kVA for single-phase **constant voltage safety isolating transformers**,
- 16 kVA for polyphase **constant voltage safety isolating transformers**,

except for **constant voltage transformers** subject to an agreement between the purchaser and the manufacturer.

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

6.104 The rated value of the output **regulation tolerance** shall be given at the **rated supply voltage** range, the **rated output**, and the power factor of 1.

6.105 For ~~constant voltage~~ **independent transformers** the input voltage variation shall not be less than 10 %.

6.106 The **internal operating resonant frequency** shall not exceed 30 kHz.

6.107 The **internal operating frequency** shall not exceed 100 MHz.

Compliance with the requirements of 6.101 to 6.107 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

a)

Replacement of the first sentence by the following:

rated supply voltage(s) and the input voltage variation in %;

b)

Replacement of the first sentence by the following:

rated output voltage(s) and the **regulation tolerance** of this voltage(s) in %;

h)

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

relevant graphical symbols shown in ~~8.11~~ Table 101 ~~indicating~~ that indicate the kind of **transformer**;

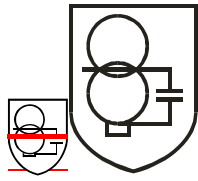
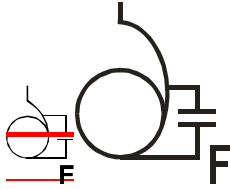
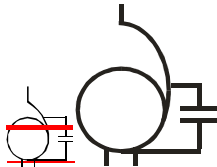
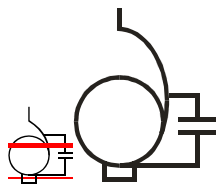
8.11

Addition:

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

Table 101 – Symbols indicating the kind of transformer

Symbol or graphical symbol	Explanation or title	Identification
	Fail-safe constant voltage separating transformer	IEC 60417-6011:2008-02
	Non-short-circuit-proof constant voltage separating transformer	IEC 60417-6011:2008-02
	Short-circuit-proof constant voltage separating transformer	IEC 60417-6011:2008-02
	Fail-safe constant voltage isolating transformer	IEC 60417-6012:2008-09
	Non-short-circuit-proof constant voltage isolating transformer	IEC 60417-6012:2008-09
	Short-circuit-proof constant voltage isolating transformer	IEC 60417-6012:2008-09
	Fail-safe constant voltage safety isolating transformer	IEC 60417-6013:2008-02
	Non-short-circuit-proof constant voltage safety isolating transformer	IEC 60417-6013:2008-02

Symbol or graphical symbol	Explanation or title	Identification
	Short-circuit-proof constant voltage safety isolating transformer	IEC 60417-6013:2008-02
	Fail-safe constant voltage auto-transformer	IEC 60417-6017:2008-02
	Non-short-circuit-proof constant voltage autotransformer	IEC 60417-6017:2008-02
	Short-circuit-proof constant voltage autotransformer	IEC 60417-6017:2008-02
	Power supply unit, linear	IEC 60417-6210:2013-10

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 except as follows:

11.1

Replacement:

11.1 When the **transformer** is connected to the **rated supply voltage** plus or minus the input voltage variation declared by the manufacturer, at the **rated supply frequency**, and loaded with an impedance resulting in the **rated output** at the **rated output voltage** and, for AC, at the **rated power factor**, the output voltage shall not differ from the rated value by more than the **regulation tolerance**.

*Compliance is checked by measuring the output voltage when steady-state conditions are established. During the test, the **transformer** is connected to the **rated supply voltage**, plus or minus the highest input voltage variation, 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** incorporating a rectifier, the output voltage shall be measured at the terminals of the DC circuit by means of a voltmeter giving the arithmetical mean value, unless the effective (RMS) value is specifically stated (see 8.1).*

*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 IEC 61558-1:2017 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:

- 1 000 V AC or 1 415 V ripple-free DC for **constant voltage auto-transformers** and **constant voltage separating transformers**;
- 250 V AC for single-phase **portable constant voltage isolating transformers**;
- 400 V AC for polyphase **portable constant voltage isolating transformers**, and
- 500 V AC or 708 V ripple-free DC for other **constant voltage isolating transformers**.

In this case, the **no-load output voltage** can be up to 1 000 V AC or 1 415 V ripple-free DC to be in accordance with the national wiring rules or for a special purpose;

- 50 V AC or 120 V ripple-free DC for **constant voltage safety isolating transformers**.

The **no-load output voltage** shall exceed:

- 50 V AC or 120 V ripple-free DC for **constant voltage independent auto-, separating and isolating transformers**.

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 ~~difference~~ 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 10 %.

~~NOTE~~—The ratio is determined by Formula (1):

$$\frac{U_{\text{no-load}} - U_{\text{load}}}{U_{\text{load}}} \times 100(\%) \quad (1)$$

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 ~~shall be~~ is checked by measuring the **no-load output voltage** at the ambient temperature when the **transformer** is connected to the **rated supply voltage** plus the highest input voltage variation 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, except as follows:

14.1.1 Temperature-rise test

Replacement of the ~~10th~~ 11th paragraph ~~starting with "Transformers are supplied..." by the following~~ as follows:

The ~~constant voltage~~ transformers are connected to the **rated supply voltage** and loaded with an impedance resulting in the **rated output**, at the **rated output voltage** and, for AC, at the **rated power factor**. The supply voltage is then increased to the value of the highest input voltage variation declared by the manufacturer. After this voltage increase, no change or adjustment is made in the circuit. The test is repeated under no-load condition with the highest or the lowest input voltage variation if this is a more unfavourable condition.

15 Short-circuit and overload protection

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

15.1.1 Short circuit and overload test method

Replacement of the 2nd paragraph ~~starting with "Compliance is checked..." by the following~~ as follows:

Compliance is checked by inspection and by the following tests, which are carried out immediately after the test in accordance with 14.1, at the same ambient temperature, and without changing the position of the ~~constant voltage~~ transformer at the maximum value of the **rated supply voltage** designed for the ~~constant voltage~~ transformer.

15.2 Inherently short-circuit proof transformers

Replacement:

Inherently short-circuit-proof constant voltage transformers shall be tested as follows:

Before starting the test, it is necessary to determine the highest output current of the ~~constant voltage transformer~~ at the maximum value of the supply voltage designed for the ~~constant voltage transformer~~. The ~~constant voltage transformer~~ is then loaded with the maximum output current or the **output winding(s)** short-circuited, whichever results in the maximum temperature.

15.3 Non-inherently short-circuit proof transformers

Replacement:

Non-inherently short-circuit-proof constant voltage transformers are tested as follows:

15.3.1 ~~Replacement:~~

The **output windings** are short-circuited or overloaded as stated in 15.2. The incorporated overload protection device shall operate before the temperature exceeds the values shown in Table ~~3~~ 5 for any value of the supply voltage between the marked values of **rated supply voltage**.

15.5 Fail-safe transformers

15.5.1

Replacement:

Three additional specimens are required, only for the following test. ~~Constant voltage Transformers~~ used in other tests are not subjected to this test.

Each of the three specimens is mounted as for normal use on a 20 mm thick dull black painted plywood surface. Each ~~constant voltage transformer~~ is operated at **rated supply voltage** plus or minus the input voltage variation declared by the manufacturer. The **output winding** which produced the highest temperature during the test of 14.1 being initially loaded with 1,5 times the **rated output current** (or, if this is not possible, the maximum value of the output current obtainable) until steady-state conditions are reached or the ~~constant voltage transformer~~ fails (whichever occurs first).

If the ~~constant voltage transformer~~ fails, it shall comply, during and after the tests, with the criteria given in 15.5.2.

If the ~~constant voltage transformer~~ does not fail, the time to reach steady-state conditions is noted and the chosen **output winding** is then short-circuited. The test is continued until the ~~constant voltage transformer~~ fails. Each specimen shall do so within a duration, for this part of the test, which is no longer than that necessary to attain steady-state conditions, but in any case it shall not exceed 5 h.

The ~~constant voltage transformer~~ shall fail safely. It shall comply, during and after the test, with the criteria given in 15.5.2.

16 Mechanical strength

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

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, except as follows:

18.2 Insulation resistance

This subclause of IEC 61558-1 is applicable, except as follows:

*Modification for **constant voltage auto-transformers**:*

~~Table 7: values between each **input circuit** and all other **input circuits**, between each **output circuits** and all other **output circuits** are not applicable.~~

In accordance with Table 13 the values between **input circuits** and **output circuits**, between each **input circuit** and all other **input circuits**, between each **output circuits** and all other **output circuits** are not applicable.

18.3 Dielectric strength test

This subclause of IEC 61558-1 is applicable, except as follows:

*Modification for **constant voltage auto-transformers**:*

~~Table 8a: lines 1) and 2) are not applicable.~~

In accordance with Table 14 the values between **input circuits** and **output circuits** are not applicable.

18.4 Insulation between and within windings

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

*Addition for **constant voltage auto-transformers**:*

For windings intended to be connected in series or parallel the dielectric strength test for **functional insulation** in accordance with Table 14 shall be applied.

~~18.101~~

~~Table 101 – Dielectric strength test voltages for constant voltage auto-transformers~~

Application of dielectrical strength test voltage	Working voltage				
	V				
	>50	150	300		
Over functional insulation for windings intended to be connected in series or parallel	Working voltage + 500 V				

19 Construction

Replacement of this clause:

NOTE—This clause reads slightly differently for each type of **constant voltage transformer**:

—constant voltage auto-transformers (see 19.1);

—constant voltage separating transformers (see 19.2);

—constant voltage isolating and safety isolating transformers (see 19.3).

19.1 Constant voltage auto-transformers

19.1.1 ~~Plug connected constant voltage auto-transformers, where the rated input voltage is higher than the rated output voltage, shall not have any potential to earth at the output socket higher than the rated output voltage.~~

This requirement shall be fulfilled by using one of the following methods:

a) ~~Polarized input and output plug and socket outlet system~~

In this case, an instruction shall be given for not using such a transformer with a non-polarized plug and socket outlet system.

b) ~~Polarity detecting device (for non polarised input and output plug and socket outlet system)~~

A polarity detecting device shall only energise the output circuit when the potential to earth at the poles of the output socket does not exceed the **rated output voltage**. The contact separation of the breaking device shall be at least of 3 mm in each pole.

NOTE A magnetic relay is an example of polarity detecting device.

~~Compliance is checked by the following test:~~

~~The auto-transformer is connected to the mains at 1,06 times the rated input voltage under the most unfavourable condition of load and output voltage. The test is repeated with the polarity of the input reversed. During the test, the measured potential to earth of each pole shall not exceed the maximum output voltage under load (1,06 times the rated output voltage taking into account the permissible deviations of Clause 11).~~

The contact separation of the device shall be 3 mm minimum in each pole.

~~Compliance is checked by measurement.~~

If the polarity detecting device uses a current flowing to the earth for the detection, this current shall not exceed 0,75 mA and shall only be flowing for the period of measurement until the polarity is reversed.

~~Compliance is checked by measurement.~~

All the tests are repeated under the fault conditions of H.2.3 of Part 1. In this case, the potential to earth of each pole shall not exceed 1,1 times the maximum output voltage under load for more than 5 s.

~~Compliance is checked by measurement.~~

19.1.2 Protection against direct contact with electrical and moving mechanical parts (contact path and drive) shall be ensured.

~~Compliance is checked by inspection.~~

~~19.2 Constant voltage separating transformers~~

~~19.2.1 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, via other conductive parts, except by deliberate action.~~

~~Compliance is checked by inspection and measurements, taking Clauses 18 and 26 of Part 1 into consideration.~~

~~19.2.2 The insulation between the input and output winding(s) shall consist of at least basic insulation (rated for the working voltage).~~

In addition, the following applies:

- ~~— for class I transformers, the insulation between the input windings and the body, and between the output windings and the body, shall consist of at least basic insulation (both basic insulations 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, shall consist of double or reinforced insulation (both double or reinforced insulations rated for the working voltage).~~

~~19.2.3 For constant voltage transformers with intermediate conductive part (e.g. the iron core) or a resonant circuit not connected to the body and located between the input and output windings, the insulation between the intermediate conductive part (or a resonant circuit) and the input windings and between the intermediate conductive part (or a resonant circuit) and the output windings shall consist of at least basic insulation (rated for the working voltage).~~

~~NOTE—An intermediate conductive part (or a resonant circuit) 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).~~

In addition, the following applies:

- ~~— for class I transformers, the insulation between the input and output windings via the intermediate conductive parts shall consist of at least basic 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).~~

~~19.2.4 Parts of output circuits may be connected to protective earth.~~

~~19.2.5 There shall be no connections between the output circuit and the body, unless for associated transformers—allowed by the relevant equipment standard.~~

~~Compliance is checked by inspection.~~

~~19.3 Constant voltage isolating and safety isolating transformers~~

~~19.3.1 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, via other conductive parts, except by deliberate action.~~

~~Compliance is checked by inspection and measurements, taking Clauses 18 and 26 of Part 1 into consideration.~~

~~19.3.1.1 The insulation between the input and output winding(s) shall consist of double or reinforced insulation (rated for the working voltage) unless the requirements of 19.3.1.3 are complied with.~~

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 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);~~

~~19.3.1.2 For constant voltage transformers with intermediate conductive parts (e.g. the iron core) or a resonant circuit not connected to the body and located between the input and output windings, the following requirements are applicable:~~

- ~~a) for class I and class II transformers, 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);~~
 - ~~— 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 SELV circuits basic insulation only is required.~~
 - ~~— for transformer 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);~~
- ~~b) as alternative to a) for class I transformer not intended to be connected by means of a plug and for transformer different from independent (IP00), if the construction assure that all laminated plates of the iron core are connected to earth (e.g. by soldering/ welding) and if in the data sheet or instruction sheet clearly state that the safety of the transformer depends on the earth connection and that is not possible to use in class II equipment, than the following apply: the insulation between the input windings and the intermediate conductive part connected to earth, and between the output windings and the intermediate conductive part connected to earth, shall consist of at least basic insulation (rated for the input and output voltage);~~
- ~~c) in addition to a) and b) the insulation between the intermediate conductive parts and the input windings, and between the intermediate conductive parts and the output windings shall consist of at least basic insulation (rated for the input and output voltage). 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).~~

~~19.3.1.3 For class I constant voltage transformers not intended for connection to the mains supply by means of a plug, the insulation between the input and output windings may consist of basic insulation plus protective screening instead of double or reinforced insulation, provided the following conditions are complied with:~~

- ~~— the insulation between the **input winding** and the protective screen shall comply with the requirements for **basic insulation** (rated for the input voltage);~~
- ~~— the insulation between the **output winding** and the protective screen shall comply with the requirements for **basic insulation** (rated for the output voltage);~~
- ~~— the protective screen shall, unless otherwise specified, consist of a metal foil or of a wire wound screen extending at least the full width of the **input winding** and shall have no gaps or holes;~~
- ~~— where the protective screen does not cover the entire width of the **input winding**, additional adhesive tapes or equivalent insulation shall be used to ensure **double insulation** in that area;~~
- ~~— if the protective screen is made of a foil, the turns shall be insulated from each other. In case of only one turn, it shall have an isolated overlap of at least 3 mm;~~
- ~~— the wire of a wire wound screen and the lead out wire of the protective screen shall have a cross-sectional area at least corresponding to the rated current of the overload device to ensure that if a breakdown of insulation should occur, the overload protective device will open the circuit before the lead out wire is destroyed;~~
- ~~— the lead out wire shall be soldered to the protective screen or secured in an equally reliable manner.~~

NOTE For the purpose of this subclause, the term "windings" does not include **internal circuits** such as the resonant circuit.

Examples of the construction of windings are given in Annex M of Part 1.

19.3.1.4 Transformers shall not be provided with capacitors which electrically connect **input** and **output circuits**.

19.3.2 There shall be no connection between the **output circuits** and the protective earth, unless this is allowed for **associated transformers** by the relevant equipment standard.

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

Compliance is checked by inspection.

19.3.4 The 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 be permanently fixed to the **transformer**.

Compliance is checked by inspection and by measurement disregarding intermediate conductive parts.

19.3.5 Portable transformers having a **rated output** not exceeding 630 VA shall be **class II**.

19.3.6 For **transformers** for connection to the mains by the means of a plug of many type (incorporating or not), the alternative with **basic insulation** plus **protective screening** is not allowed.

This clause of IEC 61558-1:2017 is applicable and general requirements for the different **transformer** types are defined in the following subclauses of IEC 61558-1:2017:

19.1.2 Auto-transformers

This subclause of IEC 61558-1:2017 is applicable for **constant voltage auto-transformers**.

Addition:

19.1.2.101 Protection against direct contact with electrical and moving mechanical parts (contact path and drive) shall be ensured.

Compliance is checked by inspection.

19.1.3 Separating transformers

This subclause of IEC 61558-1:2017 is applicable for **constant voltage separating transformers**.

19.1.4 Isolating transformers and safety isolating transformers

This subclause of IEC 61558-1:2017 is applicable for **constant voltage isolating transformers** and **constant voltage safety isolating transformers**.

19.1.4.4

Modification:

NOTE For the purpose of this subclause, the term "windings" does not include internal circuits such as the resonant circuit.

Addition:

19.1.4.101 Transformers shall not be provided with capacitors which electrically connect **input** and **output circuits**.

20 Components

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

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.

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.

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Annexes

The annexes of IEC 61558-1:2017 are applicable, except as follows:

~~Annex C~~ (normative)

~~Creepage distances (cr), clearances (cl) and distances through insulation (dti) — Material group II ($400 \leq \text{CTI} < 600$)~~

~~This annex of Part 1 is applicable, except as follows:~~

~~Modification for **Constant voltage auto-transformers**:~~

~~Line 3) of Table C.1 is for functional insulation.~~

~~Annex D~~ (normative)

~~Creepage distances (cr), clearances (cl) and distances through insulation (dti) — Material group I ($\text{CTI} \geq 600$)~~

~~This annex of Part 1 is applicable, except as follows:~~

~~Modification for **constant voltage auto-transformers**:~~

~~Line 3) of Table D.1 is for functional insulation.~~

Annex L (normative)

Routine tests (production test)

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

Addition:

L.101 The output voltage **regulation tolerance** shall be within the limit declared by the manufacturer.

*Compliance is checked by measurement of the output voltage **regulation tolerance** at **rated output** according to 11.1 but at room temperature of $25\text{ °C} \pm 10\text{ °C}$ with the **transformer** in cold condition.*

Annex R
(normative)

Explanations of the application of 4.1.1.2.1 of IEC 60664-1 (see 26.2)

~~This annex of Part 1 is applicable.~~

Bibliography

The Bibliography of IEC 61558-1 is applicable, except as follows:

Addition:

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

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

~~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*

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INTERNATIONAL STANDARD

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**Safety of transformers, reactors, power supply units and combination thereof –
Part 2-12: Particular requirements and tests for constant voltage transformers
and power supply units for constant voltage**

**Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et des
combinaisons de ces éléments –
Partie 2-12: Exigences particulières et essais pour les transformateurs à tension
constante et les blocs d'alimentation pour tension constante**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF TRANSFORMERS, REACTORS,
POWER SUPPLY UNITS AND COMBINATIONS THEREOF –****Part 2-12: Particular requirements and tests for constant voltage
transformers and power supply units for constant voltage**

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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IEC 61558-2-12 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 2011. 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 International Standard is based on the following documents:

Draft	Report on voting
96/587/FDIS	96/591/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 constant voltage transformers and power supply units for constant voltage*.

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 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 2-12: Particular requirements and tests for constant voltage transformers and power supply units for constant voltage

1 Scope

Replacement:

This part of IEC 61558 deals with the safety of **constant voltage transformers** for general applications and **power supply units for constant voltage** for general applications. **Constant voltage 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 **constant voltage transformers** for general applications and **power supply units for constant voltage** for general applications.

This document is applicable to **stationary** or **portable** single-phase or polyphase, air-cooled (natural or forced) **independent** or **associated dry-type**:

- **constant voltage auto-transformers**;
- **constant voltage separating transformers**;
- **constant voltage isolating transformers**;
- **constant voltage safety isolating 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 take precedence.

The **rated supply voltage** does not exceed 1 000 V AC. The **rated supply frequency** does not exceed 500 Hz, the **internal operating resonant frequency** does not exceed 30 kHz and the **internal operating frequency** does not exceed 100 MHz.

The **rated output** does not exceed:

- 40 kVA for single-phase **constant voltage auto-transformers**;
- 200 kVA for polyphase **constant voltage auto-transformers**;
- 25 kVA for single-phase **constant voltage separating transformers** and **constant voltage isolating transformers**;
- 40 kVA for polyphase **constant voltage separating transformers** and **constant voltage isolating transformers**;
- 10 kVA for single-phase **constant voltage safety isolating transformers**;
- 16 kVA for polyphase **constant voltage safety isolating 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.

Where applicable to **constant voltage auto-transformers**

- the **no-load output voltage** or the **rated output voltage** does not exceed 1 000 V AC or 1 415 V ripple-free DC, and for **independent constant voltage auto-transformers** the **no-load output voltage** and the **rated output voltage** exceed 50 V AC or 120 V ripple-free DC;
- **constant voltage auto-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.

Where applicable to **constant voltage separating transformers**

- the **no-load output voltage** or the **rated output voltage** does not exceed 1 000 V AC or 1 415 V ripple-free DC, and for **independent constant voltage separating transformers** the **no-load output voltage** and the **rated output voltage** exceed 50 V AC or 120 V ripple-free DC;
- **constant voltage separating 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.

Where applicable to **constant voltage isolating transformers**

- the **no-load output voltage** or the **rated output voltage** does exceed 50 V AC or 120 V ripple-free DC and where applicable, does not exceed 500 V AC or 708 V ripple-free DC. The **no-load output voltage** and the **rated output voltage** can be up to 1 000 V AC or 1 415 V ripple-free DC for special applications;
- **constant voltage isolating transformers** covered by this document are used only in applications where **double** or **reinforced insulation** between circuits is required by the installation rules or by the end product standard.

Where applicable to **constant voltage safety isolating transformers**

- the **no-load output voltage** or the **rated output voltage** does not exceed 50 V AC or 120 V ripple-free DC;
- **constant voltage safety isolating transformers** covered by this document are used only in applications where **double** or **reinforced insulation** between circuits is required by the installation rules or by the end product standard.

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**.

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 may be applicable to **transformers** intended for use in special environments.

Future technological development of **transformers** may necessitate a need to increase 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

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*

IEC 61558-2-16:2021, *Safety of transformers, reactors, power supply units and combinations thereof – Part 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 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>

3.1 Transformers

Addition

3.1.101

constant voltage transformer

transformer intended to limit the influence of the input voltage variations

Note 1 to entry: This type of **transformer** can also limit the influence of transients.

3.5 Ratings

Addition

3.5.101

regulation tolerance

deviation in per cent of the **rated output voltage** when the **constant voltage transformer** is supplied within the **rated supply voltage** variation

3.5.102

internal operating resonant frequency

frequency produced within a **constant voltage transformer**

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:

- 1 000 V AC or 1 415 V ripple-free DC for **constant voltage auto-transformers** and **constant voltage separating transformers**;
- 250 V AC for single-phase **portable constant voltage isolating transformers**;
- 400 V AC for polyphase **portable constant voltage isolating transformers**, and
- 500 V AC or 708 V ripple-free DC for **constant voltage isolating transformers**. For **constant voltage isolating transformers**, the **rated output voltage** can be up to 1 000 V AC or 1 415 V ripple-free DC to be in accordance with the national wiring rules or for a special purpose;
- 50 V AC or 120 V ripple-free DC for **constant voltage safety isolating transformers**;

The **rated output voltage** shall exceed:

- 50 V AC or 120 V ripple-free DC for **independent constant voltage auto-transformers**, **constant voltage separating transformers** and **constant voltage isolating transformers**.

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

- 40 kVA for single-phase **constant voltage auto-transformers**,
- 200 kVA for polyphase **constant voltage auto-transformers**,
- 25 kVA for single-phase **constant voltage separating** and **isolating transformers**,
- 40 kVA for polyphase **constant voltage separating** and **isolating transformers**,
- 10 kVA for single-phase **constant voltage safety isolating transformers**,
- 16 kVA for polyphase **constant voltage safety isolating transformers**,

except for **constant voltage transformers** subject to an agreement between the purchaser and the manufacturer.

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

6.104 The rated value of the output **regulation tolerance** shall be given at the **rated supply voltage** range, the **rated output**, and the power factor of 1.

6.105 For **independent transformers** the input voltage variation shall not be less than 10 %.

6.106 The **internal operating resonant frequency** shall not exceed 30 kHz.

6.107 The **internal operating frequency** shall not exceed 100 MHz.

Compliance with the requirements of 6.101 to 6.107 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

a)

Replacement of the first sentence by the following:

rated supply voltage(s) and the input voltage variation in %;

b)

Replacement of the first sentence by the following:

rated output voltage(s) and the **regulation tolerance** of this voltage(s) in %;

h)

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

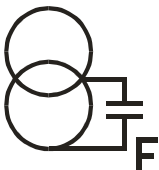
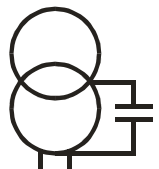
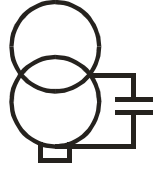
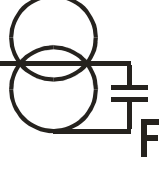
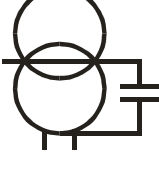
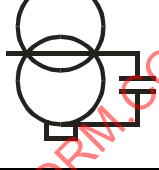
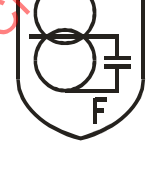
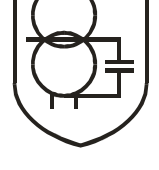
relevant graphical symbols shown in Table 101 that indicate the kind of **transformer**;

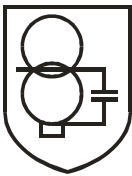
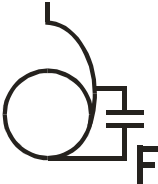
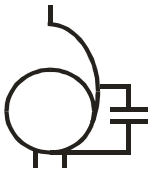
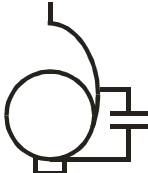
8.11

Addition:

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

Table 101 – Symbols indicating the kind of transformer

Symbol or graphical symbol	Explanation or title	Identification
	Fail-safe constant voltage separating transformer	IEC 60417-6011:2008-02
	Non-short-circuit-proof constant voltage separating transformer	IEC 60417-6011:2008-02
	Short-circuit-proof constant voltage separating transformer	IEC 60417-6011:2008-02
	Fail-safe constant voltage isolating transformer	IEC 60417-6012:2008-09
	Non-short-circuit-proof constant voltage isolating transformer	IEC 60417-6012:2008-09
	Short-circuit-proof constant voltage isolating transformer	IEC 60417-6012:2008-09
	Fail-safe constant voltage safety isolating transformer	IEC 60417-6013:2008-02
	Non-short-circuit-proof constant voltage safety isolating transformer	IEC 60417-6013:2008-02

Symbol or graphical symbol	Explanation or title	Identification
	Short-circuit-proof constant voltage safety isolating transformer	IEC 60417-6013:2008-02
	Fail-safe constant voltage auto-transformer	IEC 60417-6017:2008-02
	Non-short-circuit-proof constant voltage autotransformer	IEC 60417-6017:2008-02
	Short-circuit-proof constant voltage autotransformer	IEC 60417-6017:2008-02
	Power supply unit, linear	IEC 60417-6210:2013-10

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 except as follows:

11.1

Replacement:

11.1 When the **transformer** is connected to the **rated supply voltage** plus or minus the input voltage variation declared by the manufacturer, at the **rated supply frequency**, and loaded with an impedance resulting in the **rated output** at the **rated output voltage** and, for AC, at the **rated power factor**, the output voltage shall not differ from the rated value by more than the **regulation tolerance**.

*Compliance is checked by measuring the output voltage when steady-state conditions are established. During the test, the **transformer** is connected to the **rated supply voltage**, plus or minus the highest input voltage variation, 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** incorporating a rectifier, the output voltage shall be measured at the terminals of the DC circuit by means of a voltmeter giving the arithmetical mean value, unless the effective (RMS) value is specifically stated (see 8.1).*

*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 IEC 61558-1:2017 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:

- 1 000 V AC or 1 415 V ripple-free DC for **constant voltage auto-transformers** and **constant voltage separating transformers**;
- 250 V AC for single-phase **portable constant voltage isolating transformers**;
- 400 V AC for polyphase **portable constant voltage isolating transformers**, and
- 500 V AC or 708 V ripple-free DC for other **constant voltage isolating transformers**.

In this case, the **no-load output voltage** can be up to 1 000 V AC or 1 415 V ripple-free DC to be in accordance with the national wiring rules or for a special purpose;

- 50 V AC or 120 V ripple-free DC for **constant voltage safety isolating transformers**.

The **no-load output voltage** shall exceed:

- 50 V AC or 120 V ripple-free DC for **constant voltage independent auto-, separating and isolating transformers**.

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 10 %.

The ratio is determined by Formula (1):

$$\frac{U_{\text{no-load}} - U_{\text{load}}}{U_{\text{load}}} \times 100(\%) \quad (1)$$

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** plus the highest input voltage variation 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, except as follows:

14.1.1 Temperature-rise test

Replacement of the 11th paragraph as follows:

*The **transformers** are connected to the **rated supply voltage** and loaded with an impedance resulting in the **rated output**, at the **rated output voltage** and, for AC, at the **rated power factor**. The supply voltage is then increased to the value of the highest input voltage variation declared by the manufacturer. After this voltage increase, no change or adjustment is made in the circuit. The test is repeated under no-load condition with the highest or the lowest input voltage variation if this is a more unfavourable condition.*

15 Short-circuit and overload protection

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

15.1.1 Short circuit and overload test method

Replacement of the 2nd paragraph as follows:

*Compliance is checked by inspection and by the following tests, which are carried out immediately after the test in accordance with 14.1, at the same ambient temperature, and without changing the position of the **transformer** at the maximum value of the **rated supply voltage** designed for the **transformer**.*

15.2 Inherently short-circuit proof transformers

Replacement:

Inherently short-circuit-proof constant voltage transformers shall be tested as follows:

*Before starting the test, it is necessary to determine the highest output current of the **transformer** at the maximum value of the supply voltage designed for the **transformer**. The **transformer** is then loaded with the maximum output current or the **output winding(s)** short-circuited, whichever results in the maximum temperature.*

15.3 Non-inherently short-circuit proof transformers

Replacement:

Non-inherently short-circuit-proof constant voltage transformers are tested as follows:

15.3.1 The **output windings** are short-circuited or overloaded as stated in 15.2. The incorporated overload protection device shall operate before the temperature exceeds the values shown in Table 5 for any value of the supply voltage between the marked values of **rated supply voltage**.

15.5 Fail-safe transformers

15.5.1

Replacement:

Three additional specimens are required, only for the following test. **Transformers** used in other tests are not subjected to this test.

*Each of the three specimens is mounted as for normal use on a 20 mm thick dull black painted plywood surface. Each **transformer** is operated at **rated supply voltage** plus or minus the input voltage variation declared by the manufacturer. The **output winding** which produced the highest temperature during the test of 14.1 being initially loaded with 1,5 times the **rated output current** (or, if this is not possible, the maximum value of the output current obtainable) until steady-state conditions are reached or the **transformer** fails (whichever occurs first).*

*If the **transformer** fails, it shall comply, during and after the tests, with the criteria given in 15.5.2.*

*If the **transformer** does not fail, the time to reach steady-state conditions is noted and the chosen **output winding** is then short-circuited. The test is continued until the **transformer** fails. Each specimen shall do so within a duration, for this part of the test, which is no longer than that necessary to attain steady-state conditions, but in any case it shall not exceed 5 h.*

*The **transformer** shall fail safely. It shall comply, during and after the test, with the criteria given in 15.5.2.*

16 Mechanical strength

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

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, except as follows:

18.2 Insulation resistance

This subclause of IEC 61558-1 is applicable, except as follows:

*Modification for **constant voltage auto-transformers**:*

In accordance with Table 13 the values between **input circuits** and **output circuits**, between each **input circuit** and all other **input circuits**, between each **output circuits** and all other **output circuits** are not applicable.

18.3 Dielectric strength test

This subclause of IEC 61558-1 is applicable, except as follows:

*Modification for **constant voltage auto-transformers**:*

In accordance with Table 14 the values between **input circuits** and **output circuits** are not applicable.

18.4 Insulation between and within windings

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

*Addition for **constant voltage auto-transformers**:*

For windings intended to be connected in series or parallel the dielectric strength test for **functional insulation** in accordance with Table 14 shall be applied.

19 Construction

This clause of IEC 61558-1:2017 is applicable and general requirements for the different **transformer** types are defined in the following subclauses of IEC 61558-1:2017:

19.1.2 Auto-transformers

This subclause of IEC 61558-1:2017 is applicable for **constant voltage auto-transformers**.

Addition:

19.1.2.101 Protection against direct contact with electrical and moving mechanical parts (contact path and drive) shall be ensured.

Compliance is checked by inspection.

19.1.3 Separating transformers

This subclause of IEC 61558-1:2017 is applicable for **constant voltage separating transformers**.

19.1.4 Isolating transformers and safety isolating transformers

This subclause of IEC 61558-1:2017 is applicable for **constant voltage isolating transformers** and **constant voltage safety isolating transformers**.

19.1.4.4

Modification:

NOTE For the purpose of this subclause, the term "windings" does not include internal circuits such as the resonant circuit.

Addition:

19.1.4.101 Transformers shall not be provided with capacitors which electrically connect **input** and **output circuits**.

20 Components

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

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.

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.

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Annexes

The annexes of IEC 61558-1:2017 are applicable, except as follows:

Annex L (normative)

Routine tests (production test)

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

Addition:

L.101 The output voltage **regulation tolerance** shall be within the limit declared by the manufacturer.

*Compliance is checked by measurement of the output voltage **regulation tolerance** at **rated output** according to 11.1 but at room temperature of $25\text{ °C} \pm 10\text{ °C}$ with the **transformer** in cold condition.*

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Bibliography

The Bibliography of IEC 61558-1 is applicable, except as follows:

Addition:

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

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

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

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**SÉCURITÉ DES TRANSFORMATEURS, BOBINES D'INDUCTANCE,
BLOCS D'ALIMENTATION ET DES COMBINAISONS DE CES ÉLÉMENTS –****Partie 2-12: Exigences particulières et essais pour les transformateurs à
tension constante et les blocs d'alimentation pour tension constante****AVANT-PROPOS**

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L'IEC 61558-2-12 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 2011. 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) la description des constructions a été déplacée dans l'IEC 61558-1:2017;
- c) 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
96/587/FDIS	96/591/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.

Le présent 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/standardsdev/publications.

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

La présente Norme internationale doit être utilisée 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 à tension constante et les blocs d'alimentation pour tension constante*.

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 du présent document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le présent document sera

- reconduit,
- supprimé, ou
- révisé.

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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 de 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 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 60364-4-41:2005, 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 secondaire 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.

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

Partie 2-12: Exigences particulières et essais pour les transformateurs à tension constante et les blocs d'alimentation pour tension constante

1 Domaine d'application

Remplacement:

La présente partie de l'IEC 61558 traite de la sécurité des **transformateurs à tension constante** pour applications d'ordre général et des **blocs d'alimentation pour tension constante** pour applications d'ordre général. Les **transformateurs à tension constante** qui incorporent des **circuits électroniques** sont également couverts par le présent document.

NOTE 1 La sécurité comprend les aspects électriques, thermiques et mécaniques.

Sauf spécification contraire, dans la suite du document, le terme **transformateur** couvre les **transformateurs à tension constante** pour applications d'ordre général et les **blocs d'alimentation pour tension constante** pour applications d'ordre général.

Le présent document s'applique aux **transformateurs de type sec fixes** ou **mobiles**, monophasés ou polyphasés, à refroidissement par air (naturel ou forcé) **indépendants** ou **associés**:

- **autotransformateurs à tension constante**;
- **transformateurs à tension constante à enroulements séparés**;
- **transformateurs à tension constante de séparation des circuits**;
- **transformateurs à tension constante de sécurité**.

Les enroulements peuvent être enrobés ou non enrobés.

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.

La **tension primaire assignée** ne dépasse pas 1 000 V en courant alternatif. La **fréquence d'alimentation assignée** ne dépasse pas 500 Hz, la **fréquence de résonance de fonctionnement interne** ne dépasse pas 30 kHz et la **fréquence de fonctionnement interne** ne dépasse pas 100 MHz.

La **puissance assignée** ne dépasse pas:

- 40 kVA pour les **autotransformateurs à tension constante** monophasés;
- 200 kVA pour les **autotransformateurs à tension constante** polyphasés;
- 25 kVA pour les **transformateurs à tension constante à enroulements séparés** et les **transformateurs à tension constante de séparation des circuits** monophasés;
- 40 kVA pour les **transformateurs à tension constante à enroulements séparés** et les **transformateurs à tension constante de séparation des circuits** polyphasés;
- 10 kVA pour les **transformateurs à tension constante de sécurité** monophasés;
- 16 kVA pour les **transformateurs à tension constante de sécurité** polyphasés.

Le présent document s'applique aux **transformateurs** sans limitation de la **puissance assignée**, qui font l'objet d'un accord entre l'acheteur et le fabricant.

NOTE 2 Le domaine d'application ne couvre pas les **transformateurs** destinés à alimenter les réseaux de distribution.

Quand cela s'applique aux **autotransformateurs à tension constante**

- la **tension secondaire à vide** ou la **tension secondaire assignée** ne dépasse pas 1 000 V en courant alternatif ou 1 415 V en courant continu lissé et, pour les **autotransformateurs à tension constante indépendants**, la **tension secondaire à vide** et la **tension secondaire assignée** dépassent 50 V en courant alternatif ou 120 V en courant continu lissé;
- les **autotransformateurs à tension constante** couverts par le présent document ne sont utilisés que dans le cadre d'applications pour lesquelles les règles d'installation ou la norme du produit final n'exigent aucune **isolation** entre les circuits.

Quand cela s'applique aux **transformateurs à tension constante à enroulements séparés**

- la **tension secondaire à vide** ou la **tension secondaire assignée** ne dépasse pas 1 000 V en courant alternatif ou 1 415 V en courant continu lissé et, pour les **transformateurs à tension constante à enroulements séparés indépendants**, la **tension secondaire à vide** et la **tension secondaire assignée** dépassent 50 V en courant alternatif ou 120 V en courant continu lissé;
- les **transformateurs à tension constante à enroulements séparés** couverts par le présent document ne sont utilisés que dans le cadre d'applications pour lesquelles les règles d'installation ou la norme du produit final n'exigent aucune **isolation double** ou **renforcée** entre les circuits.

Quand cela s'applique aux **transformateurs à tension constante de séparation des circuits**

- la **tension secondaire à vide** ou la **tension secondaire assignée** dépasse 50 V en courant alternatif ou 120 V en courant continu lissé et, le cas échéant, ne dépasse pas 500 V en courant alternatif ou 708 V en courant continu lissé. La **tension secondaire à vide** et la **tension secondaire assignée** peuvent atteindre 1 000 V en courant alternatif ou 1 415 V en courant continu lissé pour des applications spéciales;
- les **transformateurs à tension constante de séparation des circuits** couverts par le présent document ne sont utilisés que dans le cadre d'applications pour lesquelles les règles d'installation ou la norme du produit final exigent une **isolation double** ou **renforcée** entre les circuits.

Quand cela s'applique aux **transformateurs à tension constante de sécurité**

- la **tension secondaire à vide** ou la **tension secondaire assignée** ne dépasse pas 50 V en courant alternatif ou 120 V en courant continu lissé;
- les **transformateurs à tension constante de sécurité** couverts par le présent document ne sont utilisés que dans le cadre d'applications pour lesquelles les règles d'installation ou la norme du produit final exigent une **isolation double** ou **renforcée** entre les circuits.

Le présent document ne s'applique pas aux circuits externes et à leurs composants destinés à être connectés aux bornes primaires et bornes secondaires des **transformateurs**.

L'attention est attirée sur les points suivants, si nécessaire:

- 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'avions;
- des mesures visent à protéger l'**enveloppe** et les composants situés à l'intérieur de celle-ci 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 les exceptions suivantes:

Addition:

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*

IEC 61558-2-16:2021, *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 s'appliquent avec les exceptions suivantes:

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 à tension constante

transformateur destiné à limiter l'influence des variations de la tension primaire

Note 1 à l'article: Ce type de **transformateur** peut aussi limiter l'influence des phénomènes transitoires.