IEC 61558-2-20

Edition 3.0 2022-12
REDLINE VERSION

INTERNATIONAL STANDARD

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GROUP SAFETY PUBLICATION

Safety of transformers, reactors, power supply units and combinations thereof – Part 2-20: Particular requirements and tests for small reactors

IEC 61558-2-20:2022-12 RLV(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-20: Particular requirements and tests for small reactors

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 61558-2-20:2010. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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IEC 61558-2-20 has been prepared by IEC technical committee 96: Transformers, reactors, power supply units and combinations thereof. It is an International Standard.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Adjustment of structure and references in accordance with IEC 61558-1:2017.
b) Additional Annex AA with references for characteristic parameter measurements.
c) Additional Annex BB for associated reactors with frequencies above 500 Hz.
d) Additional Annex CC for partial discharge.

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

Draft	Report on voting
96/556/FDIS	96/564/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/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 small reactors.*

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.

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

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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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, 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 2-20: Particular requirements and tests for small reactors

1 Scope

Replacement

This part of IEC 61558 deals with the safety of **small reactors** for general applications. **Small reactors** 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** or **reactor** covers **small reactors**.

This document is applicable to **stationary** or **portable**, single-phase or polyphase, air-cooled (natural or forced) general purpose **reactors** including alternating current, premagnetised and current compensated **independent** or **associated** **dry-type** **reactors.** The windings can be encapsulated or non-encapsulated.

The **rated supply voltage** does not exceed 1 000 V AC or 1 500 V ripple-free DC, the **rated supply frequency** and the **internal** ~~**operational**~~ **operating** **frequencies** do not exceed ~~1~~ 100 MHz.

This document can be used for **reactors** with a fundamental frequency above 500 Hz (see Annex BB).

The **rated power** does not exceed:

– 25 kVAR AC (25 kW DC) for single-phase **reactors**,
– 50 kVAR AC (50 kW DC) for poly-phase **reactors**.

This document is applicable to **reactors** without limitation of the **rated power** subject to an agreement between the purchaser and the manufacturer.

~~This part is applicable to **dry-type reactors**. The windings may be encapsulated or non-encapsulated.~~

This document does not apply to:

– **reactors** covered by ~~IEC 60289~~ IEC 60076-6 for rated voltages above 1 000 V;
– ballast for tubular fluorescent covered by IEC 61347-2-8;
– ballast for discharge lamps (excluding tubular fluorescent lamps) covered by IEC 61347-2-9.
– fixed inductors for electromagnetic interference suppression covered by IEC 60938 series

NOTE 2 For **reactors** filled with liquid dielectric or pulverised material such as sand, additional requirements are under consideration.

NOTE 3 Normally, **reactors** are intended to be associated with equipment for functional requirements of the equipment or requirements by the installation rules or by other appliance specifications. The protection against electric shock may be provided or completed by other parts or features of the equipment, such as the **body**.

NOTE 4 **Reactors** for particular applications will in the future be covered by complementary normative annexes.

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~~NOTE 3~~ Attention is drawn to the following if necessary:

– for **reactors** 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 **reactors** ~~should also be considered~~;

– additional requirements in accordance with other appropriate standards and national rules may be applicable to **reactors** intended for use in special environments~~, such as tropical environment~~.

~~NOTE 4 Normally, **reactors** are intended to be associated with equipment for functional requirements of the equipment or requirements by the installation rules or by other appliance specifications.~~

~~NOTE 5 **Reactors** incorporating **electronic circuits** and components are also covered by this standard.~~

~~NOTE 6 The protection against electric shock may be provided (or completed) by other parts or features of the equipment, such as the **body**.~~

~~NOTE 7 **Reactors** for particular applications will in the future be covered by complementary normative annexes.~~

~~NOTE 8~~ Future technological development of **reactors** 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 60076-6:2007, *Power transformers – Part 6: Reactors*

IEC 61558-1:~~2005~~2017, *Safety of ~~power transformers, power supplies, reactors and similar products~~ 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

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

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

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

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

Modification

Where IEC 61558-1:2017 is applicable, the word "**transformer**", if used, shall be replaced by "**reactor**".

3.1 Transformers

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

Addition

~~**3.1.101**~~
~~**reactor**~~
~~arrangement comprising one or more windings with an impedance depending on the frequency, working in accordance with the principle of self-induction whereby a magnetising current generates a magnetic field through a magnetically effective core or through air~~

~~NOTE **Reactors** with toroidal core are also included in this definition.~~

3.1.~~102~~101
alternating current reactor
reactor in which the magnetising current generates an alternating magnetic field, changing its polarity depending on the frequency

3.1.~~103~~102
premagnetised reactor
reactor in which the magnetising direct current generates a magnetic field of only one polarity, while a superimposed alternating current alters the direct magnetic field depending on its strength and the frequency

3.1.~~104~~103
current compensated reactor
reactor with at least two windings on a common core, where the magnetising currents are in opposite directions in order to reduce the magnetic flux

Replacement

3.1.~~105~~9
overload proof reactor
reactor in which the temperature does not exceed the specified limits when the **reactor** is overloaded and continues to meet all requirements of this document after the removal of the overload

3.1.~~105~~9.1
non-inherently overload proof reactor
overload proof reactor equipped with a protective device which opens the circuit, or reduces the current in the circuit when the **reactor** is overloaded, and which continues to meet all requirements of this document after the removal of the overload and resetting or replacing of the protective device

Note 1 to entry: Examples of protective devices are fuses, **overload releases**, thermal fuses, **thermal links**, **thermal cut-outs,** PTC resistors, and automatic circuit-breakers.

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Note 2 to entry: In case of protection by a device which cannot be replaced nor re-set, the wording "continues to meet all requirements of this document after removal of the overload" does not imply that the **reactor** continues to operate.

3.1.~~1059~~9.2
inherently overload proof reactor
overload proof reactor not equipped with a device to protect the **reactor** and in which the temperature in the case of overload, by construction, does not exceed the specified limits and which continues to operate and meet all the requirements of this document after the removal of the overload

3.1.~~106~~10
non-overload proof reactor
reactor which is intended to be protected against excessive temperature by means of a protective device not provided with the **reactor** and which continues to meet all the requirements of this document after the removal of the overload and resetting or replacing of the protective device

3.1.~~107~~11
fail-safe reactor
reactor which, after abnormal use, permanently fails to function by an interruption of the failing circuit but presents no danger to the user or surroundings

~~**3.4 Circuits and windings**~~

~~This subclause of Part 1 is not applicable.~~

3.5 Ratings

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

Replacement

3.5.4
rated current
rated current, assigned to the **reactor** by the manufacturer including harmonics, if any, which influence the heating of the **reactor**

Addition

3.5.101
rated power
sum of the products of the **rated voltage drop** and the **rated current** at the **rated frequency** for the different windings

3.5.102
rated inductance
inductance of the **reactor** designed by the manufacturer for the specified operating condition of the **reactor**

Note 1 to entry: The specific operating conditions of DC **reactors** are determined by the DC component and the superimposed AC component.

3.5.103
rated resistance
DC **resistance** of a winding of a **reactor** designed by the manufacturer for the specified operating conditions of the **reactor**

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3.5.104
rated voltage drop
voltage across a winding of the **reactor** at the **rated current** and the **rated frequency** assigned by the manufacturer

3.6 No-load values

This subclause of IEC 61558-1:2017 is not applicable.

~~**3.7 Insulation**~~

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

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:

~~*Replacement:*~~

Addition

6.101 The rated supply voltage shall not exceed 1 000 V AC or 1 500 V ripple-free DC.

6.102 The rated power shall not exceed 25 kVAR AC (25 kW DC) for single-phase reactors and 50 kVAR AC (50 kW DC) for poly-phase reactors~~, except for **reactors** subject to an agreement between the purchaser and the manufacturer~~.

6.103 The rated supply frequency and the internal ~~**operational**~~ operating frequencies ~~does~~ shall not exceed 100 MHz.

6.104 The values of **rated inductance** and **rated resistance** shall be given at the rated ambient temperature, under no load conditions, and the tolerance shall be declared by the manufacturer.

Compliance with the requirements of ~~6.1 to 6.4~~ 6.101 to 6.104 is checked by inspection of the marking.

NOTE 1 Measurements for characteristic parameters are described in Annex AA.

NOTE 2 See Annex BB for **reactors** with a fundamental frequency above 500 Hz.

7 Classification

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

7.1

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Replacement

Reactors are classified according to their protection against electric shock:

– **class I reactors**;
– **class II reactors**;
– **class III reactors**.

NOTE **Incorporated reactors** are not classified; their degree of protection against electric shock is determined by the way in which the **reactors** are incorporated.

7.2

Replacement

Reactors are classified according to the protection against abnormal use:

– **inherently overload proof reactors**;
– **non-inherently overload proof reactors**;
– **non-overload proof reactors**;
– **fail-safe reactors**.

8 Marking and other information

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

8.1

Replacement

Reactors shall be marked with the following parameters:

a) **rated supply voltage** in volts (V);
b) **rated supply frequency** (ies) in hertz (Hz);
c) **rated voltage drop** in volts (V) only for AC reactors;
d) **rated power** in volt-amperes reactive VAR or kilovolt-amperes reactive kVAR for AC, in watts (W) or kilowatts (kW) for DC;
e) **rated current** and harmonics, if any, in amperes (A) or milliamperes (mA);
f) symbol or abbreviation DC for nature of direct current, if applicable;
g) symbol or abbreviation AC for nature of alternating current, if applicable;
h) **rated inductance** of the winding(s) in henries (H) or millihenries (mH) for **reactors** followed by the appropriate tolerance;

~~NOTE 1~~ Only one of the values c), d) or h) needs to be marked~~, as the others can be calculated from the given values~~.

i) the **reactor** shall be marked with one of the graphical symbols shown in 8.11;
j) **rated resistance** of the winding(s) in ohms (Ω) or milliohms (mΩ) followed by the appropriate tolerance;

~~NOTE 2~~ The marking j)~~ may~~ can be given in the literature instead of being marked.

NOTE A description for characteristic parameter measurements is described in Annex AA.

k) model or type references;

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l) name or trademark of the manufacturer or responsible ~~supplier~~ vendor;

m) indication of the protection index IP, if other than IP00;

n) rated maximum ambient temperature t_a, if other than 25 °C;

~~NOTE 3~~ It is recommended that the values of t_a are given in steps of 5 °C for $t_a \leq 50$ °C and in steps of 10 °C for $t_a > 50$ °C.

o) **rated minimum ambient temperature** t_{amin}, if lower than +10 °C and if a temperature sensitive device is used;

~~NOTE 4~~ It is recommended that the values of t_{amin} are given in steps of 5 °C.

p) duty cycle, if any, unless the operating time is limited by the construction of the **reactor** or corresponds to the operating conditions. The marking of **short-time duty cycle** or **intermittent duty cycle** shall correspond to normal use. The operating time for **reactors** with short-time duty shall be expressed in seconds (s) or minutes (min); the operating time and the resting time of **reactors** with **intermittent duty cycle** shall be expressed in seconds (s) or minutes (min), separated by an oblique stroke;

q) symbol for **overvoltage category**, if other than OVC II;

r) switching frequency (ies) of the supplying frequency inverter;

s) **reactors** to be used with forced air cooling where the fan is not a part of the **reactor** shall be marked with "AF" followed by the air speed, expressed in m/s;

t) symbol for **class II** construction, for **class II reactors** only;

u) symbol for **class III** construction, for **class III reactors** only;

~~NOTE 5~~ Additional markings are allowed ~~provide they do not give rise to~~ if there is no misunderstanding.

All markings except those under i) and j) may be illustrated as QR Code according to ISO/IEC 18004.

v) symbol indicating the maximum altitude of installation, if higher than 2 000 m.

8.4

Replacement

Reactors with tapped or multiple windings shall be clearly marked in accordance with 8.1.

8.5

Replacement

Reactors which are declared to be **overload proof reactors** and comply with the requirements for such **reactors** shall be marked with the symbol for **overload proof reactors**.

Non-inherently overload proof reactors with incorporated fuses and **non-overload proof reactors** designed to be protected by fuses shall, in addition, be marked with the **rated current** (amperes or milliamperes) of the protecting fuse-link, followed or preceded by the symbol for the time current characteristics of the fuse in accordance with the relevant standard, if applicable.

Non-inherently overload proof reactors with incorporated replaceable protective devices other than fuses and **non-overload proof reactor** designed to be protected with protective devices other than fuses shall, in addition, be marked with the manufacturer's model or type reference of the device, and/or ratings of the device.

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NOTE **Overload proof reactors** with non-replaceable devices need no additional marking regarding the protective device.

The marking shall be sufficient to ensure correct replacement of the protective device.

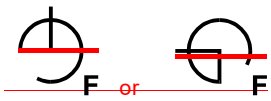
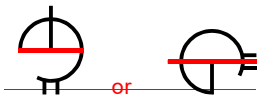
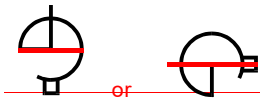
When replaceable protective devices other than fuses are used, appropriate information about their replacement shall be provided in an instruction sheet or the equivalent accompanying the **reactor**.

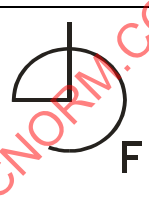
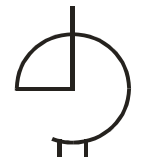
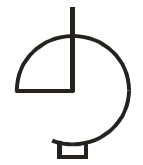
Reactors declared to be **fail-safe reactors** and comply with the requirements for such **reactors** shall be marked with the symbol for **fail-safe reactors**.

8.11

Addition

Table 101 – Symbols indicating the kind of transformer

Symbol or graphical symbol	Explanation or title	Identification
H [a]	Henry	–
Ω [a]	Ohm	–
	**Fail-safe reactor**	IEC 60417-5950 (2002-10)
	**Non-overload proof reactor**	IEC 60417-5951 (2002-10)
	**Overload proof reactor** (inherently or non-inherently)	IEC 60417-5952 (2002-10)
[a] Multiples or submultiples are allowed.		

Symbol or graphical symbol	Explanation or title	Identification
	**Fail-safe reactor**	IEC 60417-5950:2002-10
	**Non-overload proof reactor**	IEC 60417-5951:2002-10
	**Overload proof reactor** (inherently or non-inherently)	IEC 60417-5952:2002-10

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9 Protection against electric shock

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

10 Change of input voltage setting

Replacement of the entire clause by the following:

10 Change of voltage setting

Reactors with more than one **rated supply voltage** or more than one **rated voltage drop** shall be so constructed that the voltage setting cannot be changed without the aid of a **tool**.

Reactors which can be set to different **rated supply voltages** and **rated voltage drops** shall be so constructed that the indication of the voltage to which the **reactor** is set for is discernible on the **reactor** when it is ready for use.

Compliance is checked by inspection.

NOTE As an example, the requirement concerning the voltage setting is met if a tool is needed to remove a cover before the voltage setting can be changed.

11 Output voltage and output current under load

Replacement of the entire clause by the following:

11 Voltage drop

11.1 The voltage drop shall not differ by more than 25 % of the rated value.

For **premagnetised reactors** and **reactors** with additional components such as capacitors, rectifiers, etc., the voltage drop shall not differ by more than 30 % of the rated value.

*Compliance is checked by measuring or calculating the voltage drop when steady-state conditions are established, the **reactor** being at the **rated supply frequency** and the **rated ~~supply~~ current**.*

This requirement is valid for each **rated voltage drop** for **reactors** with multiple **rated voltage drops**.

For **reactors** with several windings, each winding group is loaded simultaneously if not stated otherwise.

NOTE The deviation is checked if the rated voltage drop is marked according to 8.1.

11.2 Void.

12 No-load output voltage

This clause of IEC 61558-1:2017 is not applicable.

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13 Short-circuit voltage

This clause of IEC 61558-1:2017 is not applicable.

14 Heating

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

~~**14.1** *Modification:*~~

~~*Replace the 10th paragraph starting by "**Transformers** are supplied..." by the following:*~~

~~*The **reactor** is supplied at **rated supply frequency** by a current equal to 1,1 times the **rated supply current**. After this current increase, no change is made in the supply circuit.*~~

~~*Replace the 16th paragraph starting by "For **transformers** with more than one **input** or **output winding**..." by the following:*~~

~~*For **reactors** with tapped windings, the results to be considered are those showing the highest temperatures.*~~

14.1.1 Temperature-rise test

Replacement

Replace the 11th paragraph as follows:

*The **reactor** is supplied at **rated supply frequency** by a current equal to 1,1 times the **rated current**. After this current increase, no change is made in the supply circuit.*

Replace the 18th paragraph as follows:

*For **reactors** with tapped windings, the results to be considered are those showing the highest* temperatures.

Addition

NOTE The temperature-rise test can be performed with the specific voltage- and current waveform of the application to consider a high content of harmonics which is subject to an agreement between the purchaser and the manufacturer.

15 Short-circuit and overload protection

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

~~**15.1 General**~~

~~*Replace the first paragraph starting with "**Transformers** shall not become..." by the following:*~~

15.1.1 Short circuit and overload test method

Replacement

Replace the 1st paragraph as follows:

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Reactors shall not become unsafe due to overloads which may occur in normal use.

*Compliance is checked by inspection and by the following tests carried out immediately after the test of 14.1 at the same ambient temperature, at the same current, and without changing the position of the **reactor**:*

– *for **inherently overload proof reactors**, by the test of 15.2;*
– *for **non-inherently overload proof reactors**, by the test of 15.3;*
– *for **non-overload proof reactors**, by the test of 15.4;*
– *for **fail-safe reactors**, by the test of 15.5.*

15.2 Inherently short-circuit proof transformers

Replacement

15.2 Inherently overload proof reactors

***Inherently overload proof reactors** are tested at 1,06 times the **rated supply voltage** until steady-state conditions are reached.*

15.3 Non-inherently short-circuit proof transformers

~~*Modification:*~~

Replacement

15.3 Non-inherently overload proof reactors ~~*are tested as follows:*~~

15.3.1 This subclause of IEC 61558-1:2017 is not applicable.

15.4 Non-short-circuit proof transformers

Replacement

15.4 Non-overload proof reactors

***Non-overload proof reactors** are tested as indicated in 15.3. The protective device specified by the manufacturer is connected to the relevant circuit.*

*Associated **non-overload proof reactors** are tested under the most unfavourable conditions of normal use with the correct protective device specified by the manufacturer connected to the circuit, and in the most unfavourable load conditions for the type of equipment or circuit for which the **reactor** is designed for.*

NOTE Examples of load conditions are the following: continuous, short-time or intermittent duty.

15.5 Fail-safe transformers

Replacement

15.5 Fail-safe reactors

15.5.1 Three additional new samples are used specifically for the following test:

*Each of the three specimens is mounted as in normal use on a 20 mm thick dull black painted plywood surface. Each **reactor** is operated at 1,5 times the **rated** ~~**supply**~~ **current** under 1,06 times the **rated supply voltage** until steady-state conditions are reached or the **reactor** fails (whichever occurs first).*

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

*If the **reactor** does not fail, the time to reach steady state conditions shall be recorded. Then, the current is increased in steps of 50 % of the **rated ~~supply~~ current** each 10 min until the **reactor** fails. Each specimen shall be tested within a time duration for this part of the test no longer than the time necessary to obtain steady-state conditions. This time shall not exceed 5 h.*

*The **reactor** shall fail safely and comply, during and after the tests, with the criteria in 15.5.2.*

*If the **reactor** does not fail, it is not considered as a **fail-safe reactor**.*

~~**15.5.2** The subclause 15.5.2 of Part 1 is applicable.~~

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.

19 Construction

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

19.1 General construction

This subclause of IEC 61558-1:2017 is not applicable.

Addition

19.12.101 **Reactors** shall withstand higher currents without displacement or deformation of core, winding and connections.

Compliance is checked by the following test:

*The **reactor** for AC shall be connected directly to a sinusoidal supply voltage at the **rated supply frequency**. The **reactor** for DC shall be connected directly to a half-rectified sinusoidal voltage at the **rated supply frequency**. The circuit shall be protected by a fuse rated 15 times the **rated ~~supply~~ current** of the **reactor**. The voltage is adjusted within 2 s until 15 times the **rated ~~supply~~ current** occurs, but not exceeding 1,06 of the **rated supply voltage**. To avoid thermal overload, the test shall be terminated after 2 s under full load.*

~~NOTE~~ The supply conductors ~~are allowed to~~ can be fixed.

*After the test, a visual inspection shall be conducted to ascertain that the electrical connections have not become loose, the **creepage distances** and **clearances** are not reduced to smaller values than those stated in Clause 26, and no deformation reducing the protection according to Clause 9 is observed. In case of doubt, measurements are made after dismantling the **reactor** if necessary.*

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20 Components

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

20.~~7~~8.3

Replacement

~~In this standard,~~ A PTC resistor of the indirect heating type is considered to be a **non-self-resetting thermal cut-out**.

Compliance is checked by the following test:

*The **reactor** shall operate for 48 h (two days) at 1,1 times of the **rated supply voltage** and the **rated supply frequency**. The output shall be under 1,5 times of the **rated current**.*

The PTC shall operate and stay in high impedance position until the supply is switched off.

*If the PTC does not operate, the current is increased by steps in 10 % of the **rated current** in 15 min max. 5 times of the **rated current**.*

*After 48 h, the **reactor** shall be allowed to cool down to approximately ambient temperature. This test shall be repeated 5 times at the maximum ambient temperature declared for the **reactor**.*

*At the end of the test, the **reactor** shall withstand the test of Clause 18, shall show no damage and shall operate correctly in the sense of this standard.*

NOTE Consider high voltages and arcing which can occur after interruptions especially in DC circuits.

21 Internal wiring

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

22 Supply connection and other external flexible cable 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.

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26 Creepage distances, clearances and distances through insulation

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

NOTE ~~For values for frequencies above 30 kHz the values in IEC 61558-2-16 is applicable.~~ See Annex BB for a **reactors** above 500 Hz.

27 Resistance to heat, fire and tracking

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

27.~~2~~3 This subclause of IEC 61558-1:2017 is not applicable.

28 Resistance to rusting

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

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Annexes

Annexes A to ~~V~~ W of IEC 61558-1:2017 are applicable.

Addition

Annex AA
(informative)

Characteristic parameter measurements

A detailed description for characteristic parameter measurements can be found in IEC 60076-6:2007 for instance in 7.8.5, 9.10.5, 11.8.5, 12.8.5, Clause B.3 or Clause B.4.

Addition

Annex BB
(normative)

Particular requirements for associated reactors with frequencies > 500 Hz

BB.0 General

This annex is applicable for separate testing of **associated reactors** with a fundamental frequency > 500 Hz and the high frequency requirements of BB.4.2 can be found in IEC 61558-2-16, which is applicable together with this document. Where two requirements are in conflict, the most severe take precedence.

BB.1 Scope

Clause 1 is applicable, except as follows.

Addition

Annex BB applies to **associated** single-phase or polyphase air-cooled **reactors** having a **rated frequency** exceeding 500 Hz but not exceeding 100 MHz.

This document is applicable to **dry type reactors**. The windings can be encapsulated or non-encapsulated.

BB.4 General requirements

Clause 4 of IEC 61558-1:2017 is applicable, except as follows:

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BB.4.2

Replacement

*The **reactor** shall comply with the relevant clauses of this document and respectively IEC 61558-2-16 and the conditions under which they are used in the appliance or equipment shall be in accordance with their marking. However, for associated **reactors** used in an appliance or equipment for which a relevant appliance or equipment standard exists, they can be tested under the conditions present in the appliance or equipment for which they are intended.*

*Consequently, such **reactors** shall comply with the following clauses, subclauses or parts of the following standards.*

IEC 61558-2-20:

1 – 2 – 3 – 4 – 5.1 – 5.2 – 5.3 – 5.4 – 5.5 – 5.6 – 5.7– 5.15 – 7.2 – 7.5 – 7.8 – 8.2 – 8.11 – 14.2 – 14.3 – 18.1 – 18.2 – 18.3 – 19.12 – 26.1 – 26.2 – 26.3 – Annexes A, E, G, K, L, M, N, P, R, W

IEC 61558-2-16:

14.101 – 14.102 – 26.101 – 26.102 – 26.103 – 26.104 – 26.105 – 26.106

Other clauses shall be taken from the relevant product standard. If the product standard does not fully cover the remaining clauses, the corresponding missing clauses of this **reactor** standard shall be used instead.

BB.6 Ratings

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

Addition

BB.6.101 Rated frequencies range from 500 Hz to 100 MHz.

BB.18 Insulation resistance, dielectric strength and leakage current

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

Addition

BB.18.101 For **associated reactors** a partial discharge type test in accordance with Annex CC shall be performed.

BB.26 Creepage distances, clearances and distances through insulation

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

Addition

For frequencies above 500 Hz the values in IEC 61558-2-16 are applicable.

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Addition

Annex CC
(normative)

Partial discharge (PD) test

A partial discharge test shall be performed as type test in accordance with 18.3.1 of IEC 61558-1:2017 for any **reactor** above a **peak working voltage** of 750 V defined in Annex BB.

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Bibliography

The Bibliography of IEC 61558-1:2017 is applicable, except as follows:

Addition

~~IEC 60289:1988, *Reactors*[1]~~

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*
IEC 60204-1:2016/AMD1:2021

IEC 60938-1:2021, *Fixed inductors for electromagnetic interference suppression – Part 1: Generic specification*

IEC 60938-2:2021, *Fixed inductors for electromagnetic interference suppression – Part 2: Sectional specification on power line chokes*

IEC 61347-2-8:2000, *Lamp controlgear – Part 2-8: Particular requirements for ballasts for fluorescent lamps*
IEC 61347-2-8:2000/AMD1:2006

IEC 61347-2-9:~~2000~~2012, *Lamp controlgear – Part 2-9: Particular requirements for ~~ballasts~~ electromagnetic controlgear for discharge lamps (excluding fluorescent lamps)*

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

IEC 61558-2-13:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-13: Particular requirements and tests for auto transformers and power supply units incorporating auto transformers*

~~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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~~[1] This publication was withdrawn and replaced by IEC 60076-6 (2007).~~

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IEC 61558-2-20

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

GROUP SAFETY PUBLICATION
PUBLICATION GROUPÉE DE SÉCURITÉ

Safety of transformers, reactors, power supply units and combinations thereof – Part 2-20: Particular requirements and tests for small reactors

Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et combinaisons de ces éléments – Partie 2-20: Exigences particulières et essais pour les petites bobines d'inductance

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-20: Particular requirements and tests for small reactors

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 61558-2-20 has been prepared by IEC technical committee 96: Transformers, reactors, power supply units and combinations thereof. It is an International Standard.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Adjustment of structure and references in accordance with IEC 61558-1:2017.
b) Additional Annex AA with references for characteristic parameter measurements.
c) Additional Annex BB for associated reactors with frequencies above 500 Hz.
d) Additional Annex CC for partial discharge.

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

Draft	Report on voting
96/556/FDIS	96/564/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/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 small reactors.*

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

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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, 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 2-20: Particular requirements and tests for small reactors

1 Scope

Replacement

This part of IEC 61558 deals with the safety of **small reactors** for general applications. **Small reactors** 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** or **reactor** covers **small reactors**.

This document is applicable to **stationary** or **portable**, single-phase or polyphase, air-cooled (natural or forced) general purpose **reactors** including alternating current, premagnetised and current compensated **independent** or **associated dry-type reactors.** The windings can be encapsulated or non-encapsulated.

The **rated supply voltage** does not exceed 1 000 V AC or 1 500 V ripple-free DC, the **rated supply frequency** and the **internal operating frequencies** do not exceed 100 MHz.

This document can be used for **reactors** with a fundamental frequency above 500 Hz (see Annex BB).

The **rated power** does not exceed:

– 25 kVAR AC (25 kW DC) for single-phase **reactors**,
– 50 kVAR AC (50 kW DC) for poly-phase **reactors**.

This document is applicable to **reactors** without limitation of the **rated power** subject to an agreement between the purchaser and the manufacturer.

This document does not apply to:

– **reactors** covered by IEC 60076-6 for rated voltages above 1 000 V;
– ballast for tubular fluorescent covered by IEC 61347-2-8;
– ballast for discharge lamps (excluding tubular fluorescent lamps) covered by IEC 61347-2-9.
– fixed inductors for electromagnetic interference suppression covered by IEC 60938 series

NOTE 2 For **reactors** filled with liquid dielectric or pulverised material such as sand, additional requirements are under consideration.

NOTE 3 Normally, **reactors** are intended to be associated with equipment for functional requirements of the equipment or requirements by the installation rules or by other appliance specifications. The protection against electric shock may be provided or completed by other parts or features of the equipment, such as the **body**.

NOTE 4 **Reactors** for particular applications will in the future be covered by complementary normative annexes.

Attention is drawn to the following if necessary:

– for **reactors** intended to be used in vehicles, on board ships, and aircraft, additional requirements (from other applicable standards, national rules, etc.);

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– 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 **reactors**;

– additional requirements in accordance with other appropriate standards and national rules may be applicable to **reactors** intended for use in special environments.

Future technological development of **reactors** 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 60076-6:2007, *Power transformers – Part 6: Reactors*

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 61558-1:2017 apply.

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

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

Modification

Where IEC 61558-1:2017 is applicable, the word "**transformer**", if used, shall be replaced by "**reactor**".

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3.1 Transformers

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

Addition

3.1.101
alternating current reactor
reactor in which the magnetising current generates an alternating magnetic field, changing its polarity depending on the frequency

3.1.102
premagnetised reactor
reactor in which the magnetising direct current generates a magnetic field of only one polarity, while a superimposed alternating current alters the direct magnetic field depending on its strength and the frequency

3.1.103
current compensated reactor
reactor with at least two windings on a common core, where the magnetising currents are in opposite directions in order to reduce the magnetic flux

Replacement

3.1.9
overload proof reactor
reactor in which the temperature does not exceed the specified limits when the **reactor** is overloaded and continues to meet all requirements of this document after the removal of the overload

3.1.9.1
non-inherently overload proof reactor
overload proof reactor equipped with a protective device which opens the circuit, or reduces the current in the circuit when the **reactor** is overloaded, and which continues to meet all requirements of this document after the removal of the overload and resetting or replacing of the protective device

Note 1 to entry: Examples of protective devices are fuses, **overload releases**, thermal fuses, **thermal links**, **thermal cut-outs,** PTC resistors, and automatic circuit-breakers.

Note 2 to entry: In case of protection by a device which cannot be replaced nor re-set, the wording "continues to meet all requirements of this document after removal of the overload" does not imply that the **reactor** continues to operate.

3.1.9.2
inherently overload proof reactor
overload proof reactor not equipped with a device to protect the **reactor** and in which the temperature in the case of overload, by construction, does not exceed the specified limits and which continues to operate and meet all the requirements of this document after the removal of the overload

3.1.10
non-overload proof reactor
reactor which is intended to be protected against excessive temperature by means of a protective device not provided with the **reactor** and which continues to meet all the requirements of this document after the removal of the overload and resetting or replacing of the protective device

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3.1.11
fail-safe reactor
reactor which, after abnormal use, permanently fails to function by an interruption of the failing circuit but presents no danger to the user or surroundings

3.5 Ratings

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

Replacement

3.5.4
rated current
rated current, assigned to the **reactor** by the manufacturer including harmonics, if any, which influence the heating of the **reactor**

Addition

3.5.101
rated power
sum of the products of the **rated voltage drop** and the **rated current** at the **rated frequency** for the different windings

3.5.102
rated inductance
inductance of the **reactor** designed by the manufacturer for the specified operating condition of the **reactor**

Note 1 to entry: The specific operating conditions of DC **reactors** are determined by the DC component and the superimposed AC component.

3.5.103
rated resistance
DC **resistance** of a winding of a **reactor** designed by the manufacturer for the specified operating conditions of the **reactor**

3.5.104
rated voltage drop
voltage across a winding of the **reactor** at the **rated current** and the **rated frequency** assigned by the manufacturer

3.6 No-load values

This subclause of IEC 61558-1:2017 is not applicable.

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.

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6 Ratings

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

Addition

6.101 The rated supply voltage shall not exceed 1 000 V AC or 1 500 V ripple-free DC.

6.102 The rated power shall not exceed 25 kVAR AC (25 kW DC) for single-phase reactors and 50 kVAR AC (50 kW DC) for poly-phase reactors.

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

6.103 The rated supply frequency and the internal operating frequencies shall not exceed 100 MHz.

6.104 The values of **rated inductance** and **rated resistance** shall be given at the rated ambient temperature, under no load conditions, and the tolerance shall be declared by the manufacturer.

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

NOTE 1 Measurements for characteristic parameters are described in Annex AA.

NOTE 2 See Annex BB for **reactors** with a fundamental frequency above 500 Hz.

7 Classification

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

7.1

Replacement

Reactors are classified according to their protection against electric shock:

– **class I reactors**;
– **class II reactors**;
– **class III reactors**.

NOTE **Incorporated reactors** are not classified; their degree of protection against electric shock is determined by the way in which the **reactors** are incorporated.

7.2

Replacement

Reactors are classified according to the protection against abnormal use:

– **inherently overload proof reactors**;
– **non-inherently overload proof reactors**;
– **non-overload proof reactors**;
– **fail-safe reactors**.

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8 Marking and other information

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

8.1

Replacement

Reactors shall be marked with the following parameters:

a) **rated supply voltage** in volts (V);
b) **rated supply frequency** (ies) in hertz (Hz);
c) **rated voltage drop** in volts (V) only for AC reactors;
d) **rated power** in volt-amperes reactive VAR or kilovolt-amperes reactive kVAR for AC, in watts (W) or kilowatts (kW) for DC;
e) **rated current** and harmonics, if any, in amperes (A) or milliamperes (mA);
f) symbol or abbreviation DC for nature of direct current, if applicable;
g) symbol or abbreviation AC for nature of alternating current, if applicable;
h) **rated inductance** of the winding(s) in henries (H) or millihenries (mH) for **reactors** followed by the appropriate tolerance;

Only one of the values c), d) or h) needs to be marked.

i) the **reactor** shall be marked with one of the graphical symbols shown in 8.11;
j) **rated resistance** of the winding(s) in ohms (Ω) or milliohms (mΩ) followed by the appropriate tolerance;

The marking j) can be given in the literature instead of being marked.

NOTE A description for characteristic parameter measurements is described in Annex AA.

k) model or type references;
l) name or trademark of the manufacturer or responsible vendor;
m) indication of the protection index IP, if other than IP00;
n) rated maximum ambient temperature t_a, if other than 25 °C;

It is recommended that the values of t_a are given in steps of 5 °C for $t_a \leq 50$ °C and in steps of 10 °C for $t_a > 50$ °C.

o) **rated minimum ambient temperature** t_{amin}, if lower than +10 °C and if a temperature sensitive device is used;

It is recommended that the values of t_{amin} are given in steps of 5 °C.

p) duty cycle, if any, unless the operating time is limited by the construction of the **reactor** or corresponds to the operating conditions. The marking of **short-time duty cycle** or **intermittent duty cycle** shall correspond to normal use. The operating time for **reactors** with short-time duty shall be expressed in seconds (s) or minutes (min); the operating time and the resting time of **reactors** with **intermittent duty cycle** shall be expressed in seconds (s) or minutes (min), separated by an oblique stroke;
q) symbol for **overvoltage category**, if other than OVC II;
r) switching frequency (ies) of the supplying frequency inverter;
s) **reactors** to be used with forced air cooling where the fan is not a part of the **reactor** shall be marked with “AF” followed by the air speed, expressed in m/s;

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t) symbol for **class II** construction, for **class II reactors** only;

u) symbol for **class III** construction, for **class III reactors** only;

Additional markings are allowed if there is no misunderstanding.

All markings except those under i) and j) may be illustrated as QR Code according to ISO/IEC 18004.

v) symbol indicating the maximum altitude of installation, if higher than 2 000 m.

8.4

Replacement

Reactors with tapped or multiple windings shall be clearly marked in accordance with 8.1.

8.5

Replacement

Reactors which are declared to be **overload proof reactors** and comply with the requirements for such **reactors** shall be marked with the symbol for **overload proof reactors**.

Non-inherently overload proof reactors with incorporated fuses and **non-overload proof reactors** designed to be protected by fuses shall, in addition, be marked with the **rated current** (amperes or milliamperes) of the protecting fuse-link, followed or preceded by the symbol for the time current characteristics of the fuse in accordance with the relevant standard, if applicable.

Non-inherently overload proof reactors with incorporated replaceable protective devices other than fuses and **non-overload proof reactor** designed to be protected with protective devices other than fuses shall, in addition, be marked with the manufacturer's model or type reference of the device, and/or ratings of the device.

Overload proof reactors with non-replaceable devices need no additional marking regarding the protective device.

The marking shall be sufficient to ensure correct replacement of the protective device.

When replaceable protective devices other than fuses are used, appropriate information about their replacement shall be provided in an instruction sheet or the equivalent accompanying the **reactor**.

Reactors declared to be **fail-safe reactors** and comply with the requirements for such **reactors** shall be marked with the symbol for **fail-safe reactors**.

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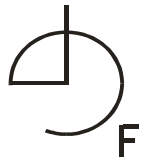
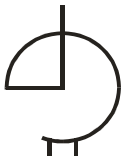
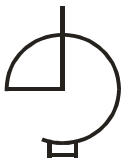
8.11

Addition

Table 101 – Symbols indicating the kind of transformer

Symbol or graphical symbol	Explanation or title	Identification
	**Fail-safe reactor**	IEC 60417-5950:2002-10
	**Non-overload proof reactor**	IEC 60417-5951:2002-10
	**Overload proof reactor** (inherently or non-inherently)	IEC 60417-5952:2002-10

9 Protection against electric shock

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

10 Change of input voltage setting

Replacement of the entire clause by the following:

10 Change of voltage setting

Reactors with more than one **rated supply voltage** or more than one **rated voltage drop** shall be so constructed that the voltage setting cannot be changed without the aid of a **tool**.

Reactors which can be set to different **rated supply voltages** and **rated voltage drops** shall be so constructed that the indication of the voltage to which the **reactor** is set for is discernible on the **reactor** when it is ready for use.

Compliance is checked by inspection.

NOTE As an example, the requirement concerning the voltage setting is met if a tool is needed to remove a cover before the voltage setting can be changed.

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11 Output voltage and output current under load

Replacement of the entire clause by the following:

11 Voltage drop

11.1 The voltage drop shall not differ by more than 25 % of the rated value.

For **premagnetised reactors** and **reactors** with additional components such as capacitors, rectifiers, etc., the voltage drop shall not differ by more than 30 % of the rated value.

*Compliance is checked by measuring or calculating the voltage drop when steady-state conditions are established, the **reactor** being at the **rated supply frequency** and the **rated current**.*

This requirement is valid for each **rated voltage drop** for **reactors** with multiple **rated voltage drops**.

For **reactors** with several windings, each winding group is loaded simultaneously if not stated otherwise.

NOTE The deviation is checked if the rated voltage drop is marked according to 8.1.

11.2 Void.

12 No-load output voltage

This clause of IEC 61558-1:2017 is not applicable.

13 Short-circuit voltage

This clause of IEC 61558-1:2017 is not applicable.

14 Heating

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

14.1.1 Temperature-rise test

Replacement

Replace the 11th paragraph as follows:

*The **reactor** is supplied at **rated supply frequency** by a current equal to 1,1 times the **rated current**. After this current increase, no change is made in the supply circuit.*

Replace the 18th paragraph as follows:

*For **reactors** with tapped windings, the results to be considered are those showing the highest* temperatures.

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Addition

NOTE The temperature-rise test can be performed with the specific voltage- and current waveform of the application to consider a high content of harmonics which is subject to an agreement between the purchaser and the manufacturer.

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

Replace the 1st paragraph as follows:

Reactors shall not become unsafe due to overloads which may occur in normal use.

*Compliance is checked by inspection and by the following tests carried out immediately after the test of 14.1 at the same ambient temperature, at the same current, and without changing the position of the **reactor**:*

– *for **inherently overload proof reactors**, by the test of 15.2;*
– *for **non-inherently overload proof reactors**, by the test of 15.3;*
– *for **non-overload proof reactors**, by the test of 15.4;*
– *for **fail-safe reactors**, by the test of 15.5.*

15.2 Inherently short-circuit proof transformers

Replacement

15.2 Inherently overload proof reactors

***Inherently overload proof reactors** are tested at 1,06 times the **rated supply voltage** until steady-state conditions are reached.*

15.3 Non-inherently short-circuit proof transformers

Replacement

15.3 Non-inherently overload proof reactors

15.3.1 This subclause of IEC 61558-1:2017 is not applicable.

15.4 Non-short-circuit proof transformers

Replacement

15.4 Non-overload proof reactors

***Non-overload proof reactors** are tested as indicated in 15.3. The protective device specified by the manufacturer is connected to the relevant circuit.*

*Associated **non-overload proof reactors** are tested under the most unfavourable conditions of normal use with the correct protective device specified by the manufacturer connected to the circuit, and in the most unfavourable load conditions for the type of equipment or circuit for which the **reactor** is designed for.*

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NOTE Examples of load conditions are the following: continuous, short-time or intermittent duty.

15.5 Fail-safe transformers

Replacement

15.5 Fail-safe reactors

15.5.1 Three additional new samples are used specifically for the following test:

Each of the three specimens is mounted as in normal use on a 20 mm thick dull black painted plywood surface. Each ***reactor*** *is operated at 1,5 times the* ***rated current*** *under 1,06 times the* ***rated supply voltage*** *until steady-state conditions are reached or the* ***reactor*** *fails (whichever occurs first).*

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

If the ***reactor*** *does not fail, the time to reach steady state conditions shall be recorded. Then, the current is increased in steps of 50 % of the* ***rated current*** *each 10 min until the* ***reactor*** *fails. Each specimen shall be tested within a time duration for this part of the test no longer than the time necessary to obtain steady-state conditions. This time shall not exceed 5 h.*

The ***reactor*** *shall fail safely and comply, during and after the tests, with the criteria in 15.5.2.*

If the ***reactor*** *does not fail, it is not considered as a* ***fail-safe reactor****.*

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.

19 Construction

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

19.1 General construction

This subclause of IEC 61558-1:2017 is not applicable.

Addition

19.12.101 **Reactors** shall withstand higher currents without displacement or deformation of core, winding and connections.

Compliance is checked by the following test:

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*The **reactor** for AC shall be connected directly to a sinusoidal supply voltage at the **rated supply frequency**. The **reactor** for DC shall be connected directly to a half-rectified sinusoidal voltage at the **rated supply frequency**. The circuit shall be protected by a fuse rated 15 times the **rated current** of the **reactor**. The voltage is adjusted within 2 s until 15 times the **rated current** occurs, but not exceeding 1,06 of the **rated supply voltage**. To avoid thermal overload, the test shall be terminated after 2 s under full load.*

The supply conductors can be fixed.

*After the test, a visual inspection shall be conducted to ascertain that the electrical connections have not become loose, the **creepage distances** and **clearances** are not reduced to smaller values than those stated in Clause 26, and no deformation reducing the protection according to Clause 9 is observed. In case of doubt, measurements are made after dismantling the **reactor** if necessary.*

20 Components

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

20.8.3

Replacement

A PTC resistor of the indirect heating type is considered to be a **non-self-resetting thermal cut-out**.

Compliance is checked by the following test:

*The **reactor** shall operate for 48 h (two days) at 1,1 times of the **rated supply voltage** and the **rated supply frequency**. The output shall be under 1,5 times of the **rated current**.*

The PTC shall operate and stay in high impedance position until the supply is switched off.

*If the PTC does not operate, the current is increased by steps in 10 % of the **rated current** in 15 min max. 5 times of the **rated current**.*

*After 48 h, the **reactor** shall be allowed to cool down to approximately ambient temperature. This test shall be repeated 5 times at the maximum ambient temperature declared for the **reactor**.*

*At the end of the test, the **reactor** shall withstand the test of Clause 18, shall show no damage and shall operate correctly in the sense of this standard.*

NOTE Consider high voltages and arcing which can occur after interruptions especially in DC circuits.

21 Internal wiring

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

22 Supply connection and other external flexible cable or cords

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

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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.

NOTE See Annex BB for a **reactors** above 500 Hz.

27 Resistance to heat, fire and tracking

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

27.3 This subclause of IEC 61558-1:2017 is not applicable.

28 Resistance to rusting

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

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Annexes

Annexes A to W of IEC 61558-1:2017 are applicable.

Addition

Annex AA
(informative)

Characteristic parameter measurements

A detailed description for characteristic parameter measurements can be found in IEC 60076-6:2007 for instance in 7.8.5, 9.10.5, 11.8.5, 12.8.5, Clause B.3 or Clause B.4.

Addition

Annex BB
(normative)

Particular requirements for associated reactors with frequencies > 500 Hz

BB.0 General

This annex is applicable for separate testing of **associated reactors** with a fundamental frequency > 500 Hz and the high frequency requirements of BB.4.2 can be found in IEC 61558-2-16, which is applicable together with this document. Where two requirements are in conflict, the most severe take precedence.

BB.1 Scope

Clause 1 is applicable, except as follows.

Addition

Annex BB applies to **associated** single-phase or polyphase air-cooled **reactors** having a **rated frequency** exceeding 500 Hz but not exceeding 100 MHz.

This document is applicable to **dry type reactors**. The windings can be encapsulated or non-encapsulated.

BB.4 General requirements

Clause 4 of IEC 61558-1:2017 is applicable, except as follows:

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BB.4.2

Replacement

*The **reactor** shall comply with the relevant clauses of this document and respectively IEC 61558-2-16 and the conditions under which they are used in the appliance or equipment shall be in accordance with their marking. However, for associated **reactors** used in an appliance or equipment for which a relevant appliance or equipment standard exists, they can be tested under the conditions present in the appliance or equipment for which they are intended.*

*Consequently, such **reactors** shall comply with the following clauses, subclauses or parts of the following standards.*

IEC 61558-2-20:

1 – 2 – 3 – 4 – 5.1 – 5.2 – 5.3 – 5.4 – 5.5 – 5.6 – 5.7– 5.15 – 7.2 – 7.5 – 7.8 – 8.2 – 8.11 – 14.2 – 14.3 – 18.1 – 18.2 – 18.3 – 19.12 – 26.1 – 26.2 – 26.3 – Annexes A, E, G, K, L, M, N, P, R, W

IEC 61558-2-16:

14.101 – 14.102 – 26.101 – 26.102 – 26.103 – 26.104 – 26.105 – 26.106

Other clauses shall be taken from the relevant product standard. If the product standard does not fully cover the remaining clauses, the corresponding missing clauses of this **reactor** standard shall be used instead.

BB.6 Ratings

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

Addition

BB.6.101 Rated frequencies range from 500 Hz to 100 MHz.

BB.18 Insulation resistance, dielectric strength and leakage current

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

Addition

BB.18.101 For **associated reactors** a partial discharge type test in accordance with Annex CC shall be performed.

BB.26 Creepage distances, clearances and distances through insulation

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

Addition

For frequencies above 500 Hz the values in IEC 61558-2-16 are applicable.

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Addition

Annex CC
(normative)

Partial discharge (PD) test

A partial discharge test shall be performed as type test in accordance with 18.3.1 of IEC 61558-1:2017 for any **reactor** above a **peak working voltage** of 750 V defined in Annex BB.

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Bibliography

The Bibliography of IEC 61558-1:2017 is applicable, except as follows:

Addition

IEC 60204-1:2016, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*
IEC 60204-1:2016/AMD1:2021

IEC 60938-1:2021, *Fixed inductors for electromagnetic interference suppression – Part 1: Generic specification*

IEC 60938-2:2021, *Fixed inductors for electromagnetic interference suppression – Part 2: Sectional specification on power line chokes*

IEC 61347-2-8:2000, *Lamp controlgear – Part 2-8: Particular requirements for ballasts for fluorescent lamps*
IEC 61347-2-8:2000/AMD1:2006

IEC 61347-2-9:2012, *Lamp controlgear – Part 2-9: Particular requirements for electromagnetic controlgear for discharge lamps (excluding fluorescent lamps)*

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

IEC 61558-2-13:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-13: Particular requirements and tests for auto transformers and power supply units incorporating auto transformers*

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

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SOMMAIRE

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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

Partie 2-20: Exigences particulières et essais pour les petites bobines d'inductance

AVANT-PROPOS

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L'IEC 61558-2-20 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 2010. 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) l'Annexe AA a été ajoutée et contient des références pour les mesurages des paramètres caractéristiques;

c) l'Annexe BB a été ajoutée pour les bobines d'inductance associées dont les fréquences sont supérieures à 500 Hz;

d) l'Annexe CC a été ajoutée pour l'essai de décharge partielle.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
96/556/FDIS	96/564/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.

Ce 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/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 petites bobines d'inductance.*

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 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 de ce 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 document sera

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- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
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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, 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 COMBINAISONS DE CES ÉLÉMENTS –

Partie 2-20: Exigences particulières et essais pour les petites bobines d'inductance

1 Domaine d'application

Remplacement

La présente partie de l'IEC 61558 traite de la sécurité des **petites bobines d'inductance** pour applications d'ordre général. Les **petites bobines d'inductance** qui incorporent des **circuits électroniques** sont également couvertes par le présent document.

NOTE 1 La sécurité comprend les aspects électrique, thermique et mécanique.

Sauf spécification contraire dans la suite du document, le terme **transformateur** ou **bobine d'inductance** couvre les **petites bobines d'inductance**.

Le présent document s'applique aux **bobines d'inductance fixes** ou **mobiles** à usage général, monophasées ou polyphasées, à refroidissement par air (circulation naturelle ou forcée), y compris les **bobines d'inductance de type sec** à courant alternatif, prémagnétisées et à courant compensé, **indépendantes** ou **associées**. Les enroulements peuvent être enrobés ou non enrobés.

La **tension primaire assignée** ne dépasse pas 1 000 V en courant alternatif ou 1 500 V en courant continu lissé; la **fréquence d'alimentation assignée** et les **fréquences de fonctionnement interne** ne dépassent pas 100 MHz.

Le présent document peut être utilisé pour les **bobines d'inductance** dont la fréquence fondamentale est supérieure à 500 Hz (voir l'Annexe BB).

La **puissance assignée** ne dépasse pas:

– 25 kVAR en courant alternatif (25 kW en courant continu) pour les **bobines d'inductance** monophasées;
– 50 kVAR en courant alternatif (50 kW en courant continu) pour les **bobines d'inductance** polyphasées.

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

Le présent document ne s'applique pas:

– aux **bobines d'inductance** couvertes par l'IEC 60076-6 pour les tensions assignées supérieures à 1 000 V;
– aux ballasts pour lampes tubulaires à fluorescence couverts par l'IEC 61347-2-8;
– aux ballasts pour lampes à décharge (à l'exclusion des lampes tubulaires à fluorescence) couverts par l'IEC 61347-2-9;
– aux bobines d'inductance fixes d'antiparasitage couvertes par la série IEC 60938.

NOTE 2 Pour les **bobines d'inductance** à remplissage par diélectrique liquide ou par des matières pulvérulentes comme le sable, des exigences supplémentaires sont à l'étude.

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NOTE 3 Normalement, les **bobines d'inductance** sont destinées à être associées à des équipements dans le but de satisfaire aux exigences fonctionnelles de l'équipement ou aux exigences définies par les règles d'installation ou par d'autres spécifications d'appareils. La protection contre les chocs électriques peut être assurée ou complétée par d'autres parties ou caractéristiques de l'équipement, comme la **masse**.

NOTE 4 Les **bobines d'inductance** pour applications particulières seront à l'avenir couvertes par des annexes normatives complémentaires.

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

– des exigences supplémentaires (définies dans d'autres normes applicables, règles nationales, etc.) s'appliquent aux **bobines d'inductance** destinées à être utilisées 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;

– les **bobines d'inductance** sont soumises à différentes conditions de transport, de stockage et de fonctionnement;

– d'autres normes et règles nationales applicables peuvent définir des exigences supplémentaires pour les **bobines d'inductance** destinées à être utilisées dans un environnement particulier.

Les évolutions techniques futures des **bobines d'inductance** 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 l'exception suivante:

Addition

IEC 60076-6:2007, *Transformateurs de puissance – Partie 6: Bobines d'inductance*

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*

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3 Termes et définitions

Pour les besoins du présent document, les termes et définitions de l'IEC 61558-1:2017 s'appliquent.

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 https://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse https://www.iso.org/obp

Modification

Lorsque l'IEC 61558-1:2017 s'applique, le mot "**transformateur**", s'il est utilisé, doit être remplacé par "**bobine d'inductance**".

3.1 Transformateurs

Le paragraphe de l'IEC 61558-1:2017 s'applique, avec les exceptions suivantes:

Addition

3.1.101
bobine d'inductance à courant alternatif
bobine d'inductance dans laquelle le courant magnétisant génère un champ magnétique alternatif, qui change de polarité en fonction de la fréquence

3.1.102
bobine d'inductance prémagnétisée
bobine d'inductance dans laquelle le courant continu magnétisant génère un champ magnétique d'une seule polarité, tandis qu'un courant alternatif superposé modifie le champ magnétique continu proportionnellement à son intensité et sa fréquence

3.1.103
bobine d'inductance à courant compensé
bobine d'inductance qui comporte au moins deux enroulements sur un noyau commun dont les courants magnétisants sont de directions opposées afin de réduire le flux magnétique

Remplacement

3.1.9
bobine d'inductance résistante aux surcharges
bobine d'inductance dont la température ne dépasse pas les limites spécifiées lorsque la **bobine d'inductance** est surchargée et qui continue de satisfaire à l'ensemble des exigences du présent document après suppression de la surcharge

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3.1.9.1
bobine d'inductance résistante aux surcharges par dispositif incorporé
bobine d'inductance résistante aux surcharges équipée d'un dispositif de protection qui ouvre le circuit ou réduit le courant dans le circuit lorsque la **bobine d'inductance** est surchargée, et qui continue de satisfaire à l'ensemble des exigences du présent document après suppression de la surcharge et réarmement ou remplacement du dispositif de protection

Note 1 à l'article: Les fusibles, **relais à maximum de courant**, les fusibles thermiques, les **protecteurs thermiques**, les **coupe-circuit thermiques**, les résistances CTP et les disjoncteurs automatiques sont des exemples de dispositifs de protection.

Note 2 à l'article: Lorsque la protection est assurée par un dispositif qui ne peut être ni remplacé ni réarmé, l'expression "continue de satisfaire à l'ensemble des exigences du présent document après suppression de la surcharge" ne signifie pas nécessairement que la **bobine d'inductance** continue de fonctionner.

3.1.9.2
bobine d'inductance résistante aux surcharges par construction
bobine d'inductance résistante aux surcharges qui ne comporte pas de dispositif de protection et dont la température en cas de surcharge, par construction, ne dépasse pas les limites spécifiées, et qui continue de fonctionner et de satisfaire à l'ensemble des exigences du présent document, après suppression de la surcharge

3.1.10
bobine d'inductance non résistante aux surcharges
bobine d'inductance qui est prévue pour être protégée contre les températures excessives au moyen d'un dispositif de protection non fourni avec la **bobine d'inductance**, et qui continue de satisfaire à l'ensemble des exigences du présent document après suppression de la surcharge et réarmement ou remplacement du dispositif de protection

3.1.11
bobine d'inductance non dangereuse en cas de défaillance
bobine d'inductance qui, à la suite d'un usage anormal, ne remplit plus sa fonction de manière permanente en interrompant le circuit défaillant, mais qui ne présente aucun danger pour l'usager ou l'environnement

3.5 Caractéristiques assignées

Le paragraphe de l'IEC 61558-1:2017 s'applique, avec les exceptions suivantes:

Remplacement

3.5.4
courant assigné
courant assigné à la **bobine d'inductance** par le fabricant, y compris les harmoniques, s'il y a lieu, qui influencent l'échauffement de la **bobine d'inductance**

Addition

3.5.101
puissance assignée
somme du produit de la **chute de tension assignée** et du **courant assigné** à la **fréquence assignée** pour les différents enroulements

3.5.102
inductance assignée
inductance de la **bobine d'inductance** conçue par le fabricant pour les conditions spécifiées de fonctionnement de la **bobine d'inductance**

Note 1 à l'article: Les conditions spécifiques de fonctionnement des **bobines d'inductance** à courant continu sont définies par la composante continue et la composante alternative superposée.

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3.5.103
résistance assignée
résistance en courant continu d'un enroulement de la **bobine d'inductance** conçue par le fabricant pour les conditions spécifiées de fonctionnement de la **bobine d'inductance**

3.5.104
chute de tension assignée
tension aux bornes d'un enroulement de la **bobine d'inductance** traversée par le **courant assigné** à la **fréquence assignée** spécifiés par le fabricant

3.6 Valeurs à vide

Le paragraphe de l'IEC 61558-1:2017 ne s'applique pas.

4 Exigences générales

L'article de l'IEC 61558-1:2017 s'applique.

5 Généralités sur les essais

L'article de l'IEC 61558-1:2017 s'applique.

6 Caractéristiques assignées

L'article de l'IEC 61558-1:2017 s'applique, avec l'exception suivante:

Addition

6.101 La tension primaire assignée ne doit pas dépasser 1 000 V en courant alternatif ou 1 500 V en courant continu lissé.

6.102 La puissance assignée ne doit pas dépasser 25 kVAR en courant alternatif (25 kW en courant continu) pour les bobines d'inductance monophasées et 50 kVAR en courant alternatif (50 kW en courant continu) pour les bobines d'inductance polyphasées.

Les **bobines d'inductance** sans limitation de la **puissance secondaire assignée** doivent faire l'objet d'un accord entre l'acheteur et le fabricant.

6.103 La fréquence d'alimentation assignée et les fréquences de fonctionnement interne ne doivent pas dépasser 100 MHz.

6.104 Les valeurs d'**inductance assignée** et de **résistance assignée** doivent être données pour la température ambiante assignée, à vide, et la tolérance doit être déclarée par le fabricant.

La conformité aux exigences du 6.101 au 6.104 est vérifiée par examen du marquage.

NOTE 1 Les mesurages des paramètres caractéristiques sont décrits à l'Annexe AA.

NOTE 2 Pour les bobines d'inductance dont la fréquence fondamentale est supérieure à 500 Hz, voir l'Annexe BB.

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