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EXTENDED VERSION

Transformatorer, strömförsörjningsdon och liknande –

Säkerhet –

Del 2-10: Särskilda fordringar på skiljetransformatörer med hög isolationsnivå och skiljetransformatörer med utspänning över 1000 V

Safety of transformers, reactors, power supply units and combinations thereof –

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

En så kallad "Extended Version" (EXV) innehåller både standarden som fastställts som SS och den utökade IEC-standard (EXV) på engelska. Den utökade versionen av IEC-standard innehåller även refererad text från en annan standard och ger användaren ett mer komplett innehåll. SEK Svensk Elstandard kan bara ge ut EXV i de fall den finns tillgänglig från IEC.

INTERNATIONAL STANDARD



This extended version of IEC 61558-2-10:2024 includes the content of the references made to IEC 61558-1:2017

GROUP ENERGY EFFICIENCY PUBLICATION

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

INTERNATIONAL
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CONTENTS

FOREWORD	9
INTRODUCTION to IEC 61558-1:2017	12
INTRODUCTION to 61558-2-10:2024	14
1 Scope	15
2 Normative references	16
3 Terms and definitions	19
3.1 Transformers	20
3.2 General terms	23
3.3 Operations and protections	25
3.4 Circuits and windings	26
3.5 Ratings	27
3.6 No-load values	29
3.7 Insulation	29
3.8 Touch current and protective earthing conductor current	33
4 General requirements	33
5 General notes on tests	34
6 Ratings	36
7 Classification	37
8 Marking and other information	38
9 Protection against electric shock	46
9.1 General	46
9.2 Protection against contact with hazardous-live-parts	46
9.2.1 Determination of hazardous-live-parts	46
9.2.2 Accessibility to hazardous-live-parts	47
9.2.3 Accessibility to non hazardous-live-part	49
9.3 Protection against hazardous electrical discharge	49
10 Change of input voltage setting	50
11 Output voltage and output current under load	50
12 No-load output voltage	51
13 Short-circuit voltage	52
14 Heating	52
14.1 General requirements	52
14.1.1 Temperature-rise test	52
14.1.2 Alternative temperature-rise test	54
14.1.3 Determination of steady-state conditions	57
14.2 Application of 14.1 or 14.3 according to the insulation system	58
14.3 Accelerated ageing test for undeclared class of insulation system	59
14.3.1 General	59
14.3.2 Heat run	59
14.3.3 Vibration	60
14.3.4 Moisture treatment	60
14.3.5 Measurements	60
15 Short circuit and overload protection	60
15.1 General requirements	60
15.1.1 Short circuit and overload test method	60

15.1.2	Alternative short circuit and overload test method	63
15.2	Inherently short-circuit proof transformers	63
15.3	Non-inherently short-circuit proof transformers	63
15.4	Non-short-circuit proof transformers	64
15.5	Fail-safe transformers	64
16	Mechanical strength	65
16.1	General	65
16.2	Stationary transformers	65
16.3	Portable transformers (except portable transformers with integral pins for introduction in socket-outlet in the fixed wiring)	66
16.4	Portable transformers provided with integral pins for introduction in socket-outlets of the fixed wiring	66
16.4.1	General requirements	66
16.4.2	Portable transformers provided with integral pins according to EN 50075 (IEC plug type C) for introduction in socket-outlets of the fixed wiring	67
16.5	Additional requirements for transformers to be used in vehicles and railway applications	68
16.5.1	Transformers to be used in vehicles and railway applications	68
16.5.2	Test requirements for the transportation of transformers	69
17	Protection against harmful ingress of dust, solid objects and moisture	70
17.1	Degrees of protection provided by enclosures (IP code)	70
17.1.1	General requirements	70
17.1.2	Tests on transformers with enclosure	71
17.2	Humidity treatment	73
18	Insulation resistance, dielectric strength and leakage current	74
18.1	General	74
18.2	Insulation resistance	74
18.3	Dielectric strength test	75
18.4	Insulation between and within windings	76
18.5	Touch current and protective earthing conductor current	76
18.5.1	General	76
18.5.2	Touch current	77
18.5.3	Protective earthing conductor current	77
19	Construction	78
19.1	General construction	78
19.2	Flammability of materials	79
19.3	Short-circuit characteristics of portable transformers	79
19.4	Class II transformer contact prevention of accessible conductive parts	79
19.5	Class II transformer insulation reassembling after service	79
19.6	Loosening of wires, screws or similar parts	80
19.7	Resistor or capacitor connection with accessible conductive parts	80
19.8	Bridging of separated conductive parts by resistors or capacitors	80
19.9	Insulating material separating input and output windings	81
19.10	Accidental contact protection against hazardous-live-parts provided by isolating coating	81
19.11	Insulating material of handles, operating levers, knobs and similar parts	82
19.12	Winding construction	82
19.13	Fixing of handles, operating levers and similar parts	86
19.14	Fixing of covers providing protection against electric shock	86

19.15	Strain on fixed socket-outlets caused by pin-transformers connection	87
19.16	Portable transformers for use in irregular or harsh conditions	87
19.17	Drain hole of transformers protected against ingress of water	87
19.18	Plug connected transformers protected against ingress of water	87
19.19	Flexible cable or flexible cord connection for class I portable transformers	87
19.20	SELV- and PELV-circuit separation of live parts	88
19.21	Protection against contact for FELV-circuit	88
19.22	Protective earthing regarding class II transformers	88
19.23	Protective earthing regarding class III transformers	89
20	Components	89
21	Internal wiring	94
22	Supply connection and other external flexible cables or cords	95
23	Terminals for external conductors	101
24	Provisions for protective earthing	103
25	Screws and connections	104
26	Creepage distances, clearances and distances through insulation	107
26.1	General	107
26.2	Creepage distances and clearances	108
26.2.1	General	108
26.2.2	Windings covered with adhesive tape	108
26.2.3	Uncemented insulating parts	108
26.2.4	Cemented insulating parts	108
26.2.5	Enclosed parts (e.g. by impregnation or potting)	109
26.3	Distance through insulation	111
27	Resistance to heat, fire and tracking	122
27.1	General	122
27.2	Resistance to heat	122
27.2.1	General	122
27.2.2	External accessible parts	122
27.2.3	Internal parts	123
27.3	Resistance to abnormal heat under fault conditions	123
27.4	Resistance to fire	124
27.4.1	General	124
27.4.2	External accessible parts	125
27.4.3	Internal parts	125
27.5	Resistance to tracking	126
28	Resistance to rusting	126
Annex A (normative)	Measurement of creepage distances and clearances	127
Annex B (normative)	Testing a series of transformers	131
B.1	General	131
B.2	Requirements	131
B.3	Constructional inspection	132
Annex C (void)	133
Annex D (void)	134
Annex E (normative)	Glow-wire test	135
E.1	General	135
E.2	Severity	135

E.3	Conditioning.....	135
E.4	Test procedure.....	135
Annex F (normative) Requirements for manually operated switches which are parts of transformers assembly.....		136
F.1	General.....	136
F.2	Switches tested as a separate component	136
F.3	Switches tested as part of the transformer	136
Annex G (normative) Tracking test.....		139
G.1	General.....	139
G.2	Test specimen	139
G.3	Test apparatus.....	139
G.4	Procedure	139
Annex H (normative) Electronic circuits.....		140
H.1	General.....	140
H.2	General notes on tests (addition to Clause 5).....	140
H.3	Short circuit and overload protection (addition to Clause 15).....	140
H.4	Creepage distances, clearances and distances through insulation (addition to Clause 26)	142
Annex I (informative) Dimensions for rectangular cross-section connectors of transformers, basic dimensions and coordination		144
Annex J (normative) Measuring network for touch-currents		146
Annex K (normative) Insulated winding wires		147
K.1	General.....	147
K.2	Type tests	147
K.2.1	General	147
K.2.2	Dielectric strength test.....	147
K.2.3	Flexibility and adherence	147
K.2.4	Heat shock	148
K.2.5	Retention of dielectric strength after bending.....	148
K.3	Testing during manufacturing.....	149
K.3.1	General	149
K.3.2	Routine test.....	149
K.3.3	Sampling test.....	149
Annex L (normative) Routine tests (production tests)		150
L.1	General.....	150
L.2	Protective earthing continuity test	150
L.3	Checking of no-load output voltage	150
L.4	Dielectric strength test	150
L.5	Checking of protective devices mounting	151
L.6	Visual inspection.....	151
L.7	Repetition test after routine dielectric strength test	151
Annex M (informative) Examples to be used as a guide for 19.1		152
M.1	General.....	152
M.2	Coil-former.....	152
M.2.1	Concentric type	152
M.2.2	Side-by-side type.....	153
M.3	Windings.....	153
M.3.1	Without screen	153

M.3.2 With screen	154
Annex N (informative) Examples for checking points of dielectric strength test voltages.....	155
Annex O (void).....	157
Annex P (informative) Examples for measurement points of creepage distances and clearances	158
Annex Q (informative) Explanation of IP numbers for degrees of protection	161
Q.1 General.....	161
Q.2 Degrees of protection against access to hazardous parts and against solid foreign objects	161
Q.3 Degrees of protection against ingress of water.....	163
Annex R (normative) Explanations of the application of 6.1.2.2.1 of IEC 60664-1:2007.....	164
R.1 Impulse dielectric test	164
R.2 Example.....	164
Annex S (void)	166
Annex T (void)	167
Annex U (void).....	168
Annex V (informative) Symbols to be used for thermal cut-outs.....	169
V.1 General.....	169
V.2 Non-self-resetting thermal cut-out (see 3.3.4)	169
V.3 Self-resetting thermal cut-out (see 3.3.3)	169
Annex W (normative) Coated printed circuit boards.....	170
W.1 Preamble	170
W.2 General.....	170
W.3 Cold.....	170
W.4 Rapid change of temperature	170
W.5 Additional tests	170
Bibliography.....	171
Index of defined terms	174
Figure 1 – IEC 61558 principle.....	13
Figure 2 – Mounting box for flush-type transformer	36
Figure 3 – Test pin (see IEC 61032, test probe 13)	47
Figure 4 – Standard test finger (see IEC 61032, test probe B)	49
Figure 5 – Example of back-to-back method – Single phase	56
Figure 6 – Example of back-to-back method – Three phase	56
Figure 7 – Amplitude spectrum density for random testing	69
Figure 8 – Normalised spectrum of shock	70
Figure 10 – Test configuration: single-phase equipment on star TN or TT system	77
Figure 11 – Abrasion resistance test for insulating coated layers	82
Figure 12 – Flexing test apparatus	99
Figure 13 – Test arrangement for checking mechanical withstanding of insulating materials in thin sheet layers	114
Figure 14 – Ball-pressure apparatus	122
Figure A.1 – Example 1.....	127
Figure A.2 – Example 2.....	128
Figure A.3 – Example 3.....	128

Figure A.4 – Example 4.....	128
Figure A.5 – Example 5.....	129
Figure A.6 – Example 6.....	129
Figure A.7 – Example 7.....	130
Figure A.8 – Example 8.....	130
Figure H.1 – Example of an electronic circuit with low-power points.....	143
Figure J.1 – Measuring network for touch-current	146
Figure M.1 – Examples for concentric type constructions	152
Figure M.2 – Examples for side-by-side type constructions	153
Figure M.3 – Examples for winding constructions without screen	153
Figure M.4 – Examples for wrapped winding constructions	154
Figure M.5 – Examples for winding constructions with screen	154
Figure N.1 – Transformer of class I construction with metal enclosure	155
Figure N.2 – Transformer of class II construction with metal enclosure	156
Figure N.3 – Transformer of class II construction with enclosure of insulating material	156
Figure P.1 – Transformer of class I construction	158
Figure P.2 – Transformer of class I construction with earthed metal screen	159
Figure P.3 – Transformer of class II construction with metal enclosure	159
Figure P.4 – Transformer of class II construction with enclosure of insulating material.....	160
Figure V.1 – Restored by manual operation	169
Figure V.2 – Restored by disconnection of the supply	169
Figure V.3 – Thermal link (see 3.3.5)	169
Figure V.4 – Self-resetting thermal cut-out.....	169
Table 1 – Symbols used on equipment or in instructions	42
Table 101 – Symbols indicating the kind of transformer	44
Table 102 – Output voltage difference	52
Table 2 – Values of maximum temperatures in normal use.....	57
Table 3 – Explanation of the maximum winding temperatures required in Table 2	58
Table 4 – Test temperature and testing time (in days) per cycle	59
Table 5 – Maximum values of temperatures under short-circuit or overload conditions.....	62
Table 6 – Values of T and k for fuses	63
Table 7 – Pull force on pins	67
Table 8 – Conditions for vibration testing (random)	68
Table 9 – Amplitude spectrum density ASD values for accelerated life testing	68
Table 10 – Frequency values depending on the weight of the specimen.....	69
Table 11 – Excitation values for vibration testing	69
Table 12 – Solid-object-proof transformer test	72
Table 13 – Values of insulation resistance	75
Table 103 – Table of dielectric strength test voltages for working voltages above 1 000 V	75
Table 15 – Limits for currents	78
Table 16 – Nominal cross-sectional areas of external flexible cables or cords.....	96

Table 17 – Pull and torque to be applied to external flexible cables or cords fixed to stationary and portable transformers	100
Table 18 – Torque to be applied to screws and connections	105
Table 19 – Torque test on glands.....	107
Table 104 – Minimum clearances in air up to 2 000 m above sea level.....	110
Table 105 – Minimum creepage distances for basic or supplementary insulation.....	111
Table 20 – Clearances in mm	115
Table 21 – Creepage distances in mm	116
Table 22 – Distance through insulation in mm.....	117
Table 23 – Creepage distances and clearance between terminals for external connection	118
Table 24 – Values of FIW wires with minimum overall diameter and minimum test voltages according to the total enamel increase	120
Table A.1 – Width of groove values depending on the pollution degree	127
Table F.1 – Peak surge current of additional loads.....	137
Table I.1 – Dimensions of rectangular copper connectors	144
Table K.1 – Mandrel diameter	148
Table K.2 – Oven temperature	148
Table Q.1 – Degrees of protection against access to hazardous parts indicated by the first characteristic numeral.....	162
Table Q.2 – Degrees of protection against solid foreign objects indicated by the first characteristic numeral.....	162
Table Q.3 – Degrees of protection indicated by the second characteristic numeral	163
Table R.1 – Impulse test voltage according to 6.1.2.2.1 of IEC 60664-1:2007	164

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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

FOREWORD

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This extended version (EXV) of the official IEC Standard provides the user with the comprehensive content of the Standard.

IEC 61558-2-10:2024 EXV includes the content of IEC 61558-2-10:2024, and the references made to IEC 61558-1:2017.

The specific content of IEC 61558-2-10:2024 is displayed on a blue background.

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

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

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

- a) adjustment of structure and references in accordance with IEC 61558-1:2017;
- b) overvoltage categories I, II, III and IV for clearances and dielectric strength tests are included;
- c) clearances for homogenous field conditions deleted.

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

Draft	Report on voting
96/589/FDIS	96/595/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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

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

This document supplements or modifies the corresponding clauses in IEC 61558-1:2017, so as to convert that publication into the IEC standard: *Particular requirements and tests for separating transformers with high insulation level and separating transformers with output voltages exceeding 1 000 V*.

A list of all parts in the IEC 61558 series published under the general title *Safety of transformers, reactors, power supply units and combinations thereof*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

Where this document states "*addition*", "*modification*" or "*replacement*", the relevant text of IEC 61558-1:2017 is to be adapted accordingly.

In this document, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type*;
- explanatory matter: in smaller roman type.

In the text of this document, the words in **bold** are defined in Clause 3.

Subclauses, notes, figures and tables additional to those in IEC 61558-1:2017 are numbered starting from 101; supplementary annexes are entitled AA, BB, etc.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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.

INTRODUCTION to IEC 61558-1:2017

This document covers safety requirements for **transformers**. Where the term **transformer** is used, it covers **transformers**, **reactors** and **power supply units** where applicable.

During the development of this document, to the extent possible, the requirements of IEC 60364 (all parts) were taken into consideration, so that a **transformer** can be installed in accordance with the wiring rules contained in that document. However, national wiring rules can differ.

This document recognizes the internationally accepted levels of protection against the possible electrical, mechanical, and fire hazards caused by **transformers** operating under normal conditions in accordance with the manufacturer's instructions. It also covers abnormal conditions which can occur in practice.

A **transformer** complying with this document will not necessarily be judged to comply with the safety principles of this document if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

A **transformer** employing materials or having forms of construction differing from those detailed in this document may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the safety principles of this document.

The document dealing with non-safety aspects of electromagnetic compatibility (EMC) of **transformers** is IEC 62041. However, that document also includes tests that can subject the **transformer** to conditions involving safety aspects.

The objective of IEC 61558-1 is to provide a set of requirements and tests considered to be generally applicable to most types of **transformers**, and which can be called up as required by the relevant part of IEC 61558-2. IEC 61558-1 is thus not to be regarded as a specification by itself for any type of **transformer**, and its provisions apply only to particular types of **transformers** to the extent determined by the appropriate part of IEC 61558-2. IEC 61558-1 also contains normative routine tests.

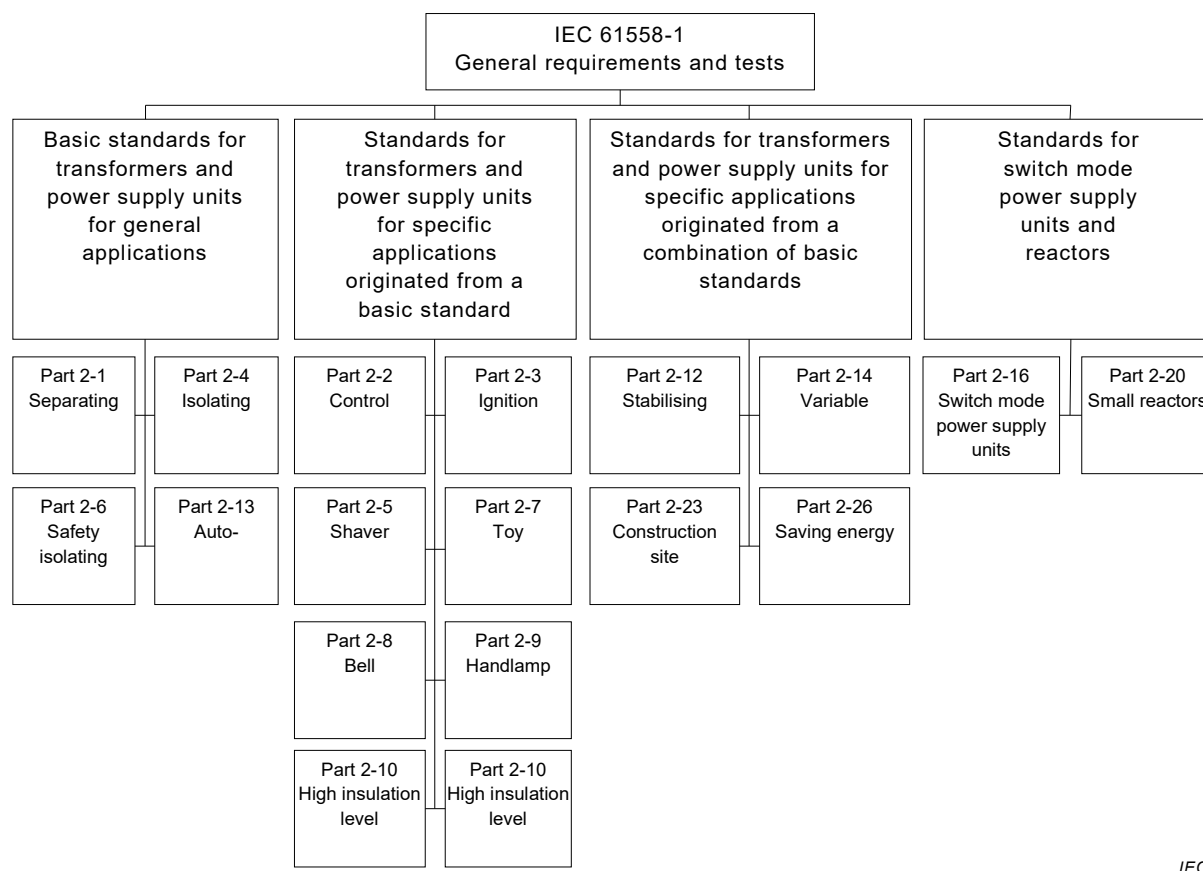
Each part of IEC 61558-2 in conjunction with this document contains all the necessary requirements for the **transformer** being covered and does not contain references to other parts of IEC 61558-2. For **transformers** with a protection index IP00 and associated **transformers**, it is possible to have circuits corresponding to different parts of IEC 61558-2 within the same construction (e.g. SELV output circuit according to IEC 61558-2-6 and a 230 V output circuit according to IEC 61558-2-4). However, if the **transformer** is covered by different parts IEC 61558-2, to the extent reasonable, the relevant part of IEC 61558-2 is applied to each function/application separately. If applicable, the effect of one function on the other is taken into consideration.

If an appropriate part of IEC 61558-2 does not exist for a particular **transformer** or group of **transformers**, the nearest applicable part may be used as a guide to the requirements and tests.

However, individual countries may wish to consider its application, to the extent reasonable, to transformers not mentioned in the IEC 61558-2 series, and to transformers designed on new principles.

Where the requirements of any of the clauses of a part of IEC 61558-2 refer to IEC 61558-1 by the phrase "This clause of Part 1 is applicable", this phrase means that all the requirements of that clause of IEC 61558-1 are applicable, except those requirements that are clearly not applicable to the particular type of **transformer** covered by that part of IEC 61558-2.

The principle for the preparation of the different parts of IEC 61558-2 is as shown in Figure 1.



IEC

Figure 1 – IEC 61558 principle

Relevant clauses of this document (e.g. clauses dealing with thermal endurance test for windings) apply also to **transformers** forming an integral part of an appliance and which cannot be tested separately.

The IEC 61558 series consists of the following parts, under the general title *Safety of transformers, reactors, power supply units and combination thereof*:¹

- Part 1: General requirements and tests
- Part 2-1: Particular requirements and tests for separating transformers for general applications
- Part 2-2: Particular requirements and tests for control transformers
- Part 2-3: Particular requirements and tests for ignition transformers for gas and oil burners
- Part 2-4: Particular requirements and tests for isolating transformers
- Part 2-5: Particular requirements and tests for shaver transformers and shaver supply units
- Part 2-6: Particular requirements and tests for safety isolating transformers
- Part 2-7: Particular requirements and tests for transformers for toys
- Part 2-8: Particular requirements and tests for transformers for bells and chimes
- Part 2-9: Particular requirements and tests for transformers for class III handlamps for tungsten filament lamps

¹ Some of the parts of this series published earlier appeared under the general title *Safety of power transformers, power supplies, reactors and similar products* or *Safety of power transformers, power supply units and similar* or *Safety of power transformers, power supply units and similar devices*. Future editions of these parts will be issued under the new general title indicated above.

- Part 2-10: Particular requirements and tests for separating transformers with high insulation level and separating transformers with output voltages exceeding 1 000 V
- Part 2-12: Particular requirements and tests for constant voltage transformers
- Part 2-13: Particular requirements and tests for auto transformers
- Part 2-14: Particular requirements and tests for variable transformers
- Part 2-15: Particular requirements and tests for isolating transformers for the supply of medical locations
- Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units
- Part 2-20: Particular requirements and tests for small reactors
- Part 2-23: Particular requirements and tests for transformers and power supply units for construction sites
- Part 2-26: Particular requirements and tests for transformers and power supply units all for saving energy and other purposes

Other parts are under consideration.

INTRODUCTION to 61558-2-10:2024

IEC TC 96 has a group safety function in accordance with IEC Guide 104 for transformers other than those intended to supply distribution networks, in particular transformers and **power supply units** intended to allow the application of protective measures against electric shock as defined by TC 64, which is about electrical installations and protection against electric shock, but in certain cases including the limitation of voltage and horizontal safety function for SELV, in accordance with IEC 60364-4-41.

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

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

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

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

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

1 Scope

This part of IEC 61558 deals with the safety of **separating transformers with high insulation level** and **separating transformers with output voltages exceeding 1 000 V**. **Transformers** incorporating **electronic circuits** are also covered by this document.

NOTE 1 Safety includes electrical, thermal and mechanical aspects.

Unless otherwise specified, from here onward, the term **transformer** covers **separating transformers** with **high insulation level** and **separating transformers** with **output voltages** exceeding 1 000 V AC or 1 500 V DC.

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

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

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

The **rated output** does not exceed:

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

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

Where applicable the **no-load output voltage** or the **rated output voltage**:

- does not exceed 1 000 V AC or 1 500 V DC for **separating transformers with high insulation level**;
- does exceed 1 000 V AC or 1 500 V DC and does not exceed 15 000 V AC or 15 000 V DC for **separating transformers with output voltage exceeding 1 000 V**.

This document does not apply to:

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

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

NOTE 2 **Transformers** covered by this document are used only in applications where **double or reinforced insulation** between circuits is not required by the installation rules or by the end product standard.

NOTE 3 Normally, the **transformers** are intended to be used with equipment to provide voltages different from the **supply voltage** for the functional requirements of the equipment. The protection against electric shock can be provided (or completed) by other features of the equipment, such as the **body**. Parts of **output circuits** can be connected to the **input circuits** or to **protective earthing**.

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

Attention is drawn to the following if necessary:

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

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

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

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60065:2014, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test FC: Vibration (sinusoidal)*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-31, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60076-1, *Power transformers – Part 1: General*

IEC 60076-11:2004, *Power transformers – Part 11: Dry-type transformers*

IEC TR 60083, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60085:2007, *Electrical insulation – Thermal evaluation and designation*

IEC 60112:2003, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60127 (all parts), *Miniature fuses*

IEC 60127-3, *Miniature fuses – Part 3: Sub-miniature fuse-links*

IEC 60216 (all parts), *Electrical insulating materials – Thermal endurance properties*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60227-5:2011, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*

IEC 60245 (all parts), *Rubber insulated cables – Rated voltages up to and including 450/750 V*

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

IEC 60269 (all parts), *Low voltage fuses*

IEC 60269-2:2013, *Low voltage fuses – Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) – Examples of standardized systems of fuses A to K*

IEC 60269-3:2010, *Low voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household or similar applications) – Examples of standardized systems of fuses A to F*

IEC 60309 (all parts), *Plugs, socket-outlets and couplers for industrial purposes*

IEC 60317 (all parts), *Specifications for particular types of windings wires*

IEC 60317-0-7:2012, *Specifications for particular types of winding wires – Part 0-7: General requirements – Fully insulated (FIW) zero-defect enamelled round copper wire with nominal conductor diameter of 0,040 mm to 1,600 mm*

IEC 60317-56, *Specifications for particular types of winding wires – Part 56: Solderable fully insulated (FIW) zero-defect polyurethane enamelled round copper wire with nominal conductor diameter 0,040 mm to 1,600 mm, class 180*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

IEC 60320-2-3, *Appliance couplers for household and similar general purposes – Part 2-3: Appliance couplers with a degree of protection higher than IPX0*

IEC 60384-14:2013, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60417, *Graphical symbols for use on equipment*
(available at <http://www.graphical-symbols.info/equipment>)

IEC 60454 (all parts), *Pressure-sensitive adhesive tapes for electrical purposes*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60664-1:2007, *Insulation coordination for equipment within low voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60691:2015, *Thermal-links – Requirements and application guide*

IEC 60695-2-10:2013, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

IEC 60721-3-2, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 2: Transportation*

IEC 60730 (all parts), *Automatic electrical controls*

IEC 60730-1:2013, *Automatic electrical controls – Part 1: General requirements*

IEC 60851-3:2009, *Winding wires – Test methods: Part 3: Mechanical properties*

IEC 60851-5:2008, *Winding wires – Test methods: Part 5: Electrical properties*

IEC 60851-6:2012, *Winding wires – Test methods: Part 6: Thermal properties*

IEC 60884-1:2002, *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*
IEC 60884-1:2002/AMD1:2006
IEC 60884-1:2002/AMD2:2013

IEC 60884-2-4, *Plugs and socket-outlets for household and similar purposes – Part 2-4: Particular requirements for plugs and socket-outlets for SELV*

IEC 60898 (all parts), *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations*

IEC 60906-1, *IEC system of plugs and socket-outlets for household and similar purposes – Part 1: Plugs and socket-outlets 16 A 250 V a.c.*

IEC 60906-3, *IEC system of plugs and socket-outlets for household and similar purposes – Part 3: SELV plugs and socket-outlets, 16 A 6 V, 12 V, 24 V, 48 V, a.c. and d.c.*

IEC 60947-7-1, *Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 60998-2-1, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units*

IEC 60998-2-2, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units*

IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)*

IEC 61032, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61058-1:2016, *Switches for appliances – Part 1: General requirements*

IEC 61058-1-1:2016, *Switches for appliances – Part 1-1: Requirements for mechanical switches*

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

IEC 61373, *Railway applications – Rolling stock equipment – Shock and vibration tests*

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

ISO 8820 (all parts), *Road vehicles – Fuse-links*

EN 50075:1990, *Specification for flat non-wirable two-pole plugs 2.5 A 250 V, with cord, for the connection of class II-equipment for household and similar purposes*

DIN 43671:1975, *Copper bus bars; design for continuous current*

DIN 43670:1975, *Aluminium bus bars; design for continuous current*

DIN 43670-2:1985, *Aluminium bus bars copper cladding; design for continuous current*

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Transformatorer, strömförsörjningsdon och liknande – Säkerhet –

Del 2-10: Särskilda fordringar på skiljetransformatorer med hög isolationsnivå och skiljetransformatorer med utspänning över 1000 V

Safety of transformers, reactors, power supply units and combinations thereof –

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

Som svensk standard gäller europastandarden EN IEC 61558-2-10:2024. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 61558-2-10:2024.

Nationellt förord

Europastandarden EN IEC 61558-2-10:2024

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 61558-2-10, Second edition, 2024 – Safety of transformers, reactors, power supply units and combinations thereof – Part 2-10: Particular requirements and tests for separating transformers with high insulation level and separating transformers with output voltages exceeding 1 000 V**

utarbetad inom International Electrotechnical Commission, IEC.

Standarden ska användas tillsammans med SS-EN IEC 61558-1, utg 3:2019.

Tidigare fastställd svensk standard SS-EN 61558-2-10, utg 1:2014 med eventuella tillägg, ändringar och rättelser gäller ej fr o m 2027-07-12.

ICS 29.180.00

Denna standard är fastställd av SEK Svensk Elstandard,
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Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

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English Version

Safety of transformers, reactors, power supply units and combinations thereof - Part 2-10: Particular requirements and tests for separating transformers with high insulation level and separating transformers with output voltages exceeding 1 000 V (IEC 61558-2-10:2024)

Sécurité des transformateurs, bobines d'inductance, blocs d'alimentation et des combinaisons de ces éléments - Partie 2-10 : Exigences particulières et essais pour les transformateurs d'isolement à enroulements séparés à niveau d'isolement élevé et pour les transformateurs d'isolement à enroulements séparés à tensions secondaires supérieures à 1 000 V (IEC 61558-2-10:2024)

Sicherheit von Transformatoren, Drosseln, Netzgeräten und entsprechenden Kombinationen - Teil 2-10: Besondere Anforderungen und Prüfungen für Netztransformatoren mit hohem Isolationspegel und Netztransformatoren mit Ausgangsspannungen über 1 000 V (IEC 61558-2-10:2024)

This European Standard was approved by CENELEC on 2024-07-12. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 96/589/FDIS, future edition 2 of IEC 61558-2-10, prepared by IEC/TC 96 "Transformers, reactors, power supply units, and combinations thereof" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61558-2-10:2024.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2025-04-12 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2027-07-12 document have to be withdrawn

This document supersedes EN 61558-2-10:2014 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61558-2-10:2024 was approved by CENELEC as a European Standard without any modification.

The endorsement notice of EN IEC 61558-1:2019 applies, except as follows.

Addition:

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 60076-11:2018	NOTE	Approved as EN IEC 60076-11:2018 (not modified)
IEC 60204-1:2016	NOTE	Approved as EN 60204-1:2018
IEC 61050:1991	NOTE	Approved as EN 61050:1992
IEC 61050:1991/A1:1994	NOTE	Approved as EN 61050:1992/A1:1995
IEC 61347-2-10:2000	NOTE	Approved as EN 61347-2-10:2001 (not modified)
IEC 61347-2-10:2000/A1:2008	NOTE	Approved as EN 61347-2-10:2001/A1:2009 (not modified)
IEC 61558 series	NOTE	Approved as EN 61558 series
IEC 61558-2-16:2021	NOTE	Approved as EN IEC 61558-2-16:— ¹ (not modified)
IEC 62477-1:2022	NOTE	Approved as EN IEC 62477-1:2023 (not modified)

¹ to be published, Stage at the time of publication: FprEN IEC 61558-2-16:2021.

Annex ZA
(normative)

**Normative references to international publications
with their corresponding European publications**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Annex ZA of EN IEC 61558-1:2019 applies, except as follows.

Addition:

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61558-1	2017	Safety of transformers, reactors, power supply units and combinations thereof - Part 1: General requirements and tests	EN IEC 61558-1	2019

INTERNATIONAL STANDARD

NORME INTERNATIONALE

GROUP ENERGY EFFICIENCY PUBLICATION
PUBLICATION GROUPEE SUR L'EFFICACITE ÉNERGÉTIQUE

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

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

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

INTERNATIONAL
ELECTROTECHNICAL
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CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	7
3 Terms and definitions	7
4 General requirements	8
5 General notes on tests	8
6 Ratings.....	8
7 Classification.....	9
8 Marking and other information	9
9 Protection against electric shock	10
10 Change of input voltage setting	11
11 Output voltage and output current under load	11
12 No-load output voltage	11
13 Short-circuit voltage.....	12
14 Heating.....	12
15 Short-circuit and overload protection	12
16 Mechanical strength	12
17 Protection against harmful ingress of dust, solid objects and moisture.....	12
18 Insulation resistance, dielectric strength and leakage current	12
19 Construction	13
20 Components	14
21 Internal wiring.....	14
22 Supply connection and other external flexible cables or cords	14
23 Terminals for external conductors.....	14
24 Provisions for protective earthing.....	14
25 Screws and connections	15
26 Creepage distances, clearances and distances through insulation.....	15
27 Resistance to heat, fire and tracking.....	16
28 Resistance to rusting	16
Annexes	17
Bibliography.....	18
Table 101 – Symbols indicating the kind of transformer	10
Table 102 – Output voltage difference	12
Table 103 – Table of dielectric strength test voltages for working voltages above 1 000 V	13
Table 104 – Minimum clearances in air up to 2 000 m above sea level.....	15
Table 105 – Minimum creepage distances for basic or supplementary insulation.....	16

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
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- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

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

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

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

- a) adjustment of structure and references in accordance with IEC 61558-1:2017;
- b) overvoltage categories I, II, III and IV for clearances and dielectric strength tests are included;

c) clearances for homogenous field conditions deleted.

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

Draft	Report on voting
96/589/FDIS	96/595/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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

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

This document supplements or modifies the corresponding clauses in IEC 61558-1:2017, so as to convert that publication into the IEC standard: *Particular requirements and tests for separating transformers with high insulation level and separating transformers with output voltages exceeding 1 000 V*.

A list of all parts in the IEC 61558 series published under the general title *Safety of transformers, reactors, power supply units and combinations thereof*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

Where this document states "*addition*", "*modification*" or "*replacement*", the relevant text of IEC 61558-1:2017 is to be adapted accordingly.

In this document, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type*;
- explanatory matter: in smaller roman type.

In the text of this document, the words in **bold** are defined in Clause 3.

Subclauses, notes, figures and tables additional to those in IEC 61558-1:2017 are numbered starting from 101; supplementary annexes are entitled AA, BB, etc.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

IEC TC 96 has a group safety function in accordance with IEC Guide 104 for transformers other than those intended to supply distribution networks, in particular transformers and **power supply units** intended to allow the application of protective measures against electric shock as defined by TC 64, which is about electrical installations and protection against electric shock, but in certain cases including the limitation of voltage and horizontal safety function for SELV, in accordance with IEC 60364-4-41.

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

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

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

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

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

1 Scope

Replacement:

This part of IEC 61558 deals with the safety of **separating transformers with high insulation level** and **separating transformers with output voltages exceeding 1 000 V**. Transformers incorporating **electronic circuits** are also covered by this document.

NOTE 1 Safety includes electrical, thermal and mechanical aspects.

Unless otherwise specified, from here onward, the term **transformer** covers **separating transformers** with **high insulation level** and **separating transformers** with **output voltages** exceeding 1 000 V AC or 1 500 V DC.

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

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

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

The **rated output** does not exceed:

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

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

Where applicable the **no-load output voltage** or the **rated output voltage**:

- does not exceed 1 000 V AC or 1 500 V DC for **separating transformers with high insulation level**;
- does exceed 1 000 V AC or 1 500 V DC and does not exceed 15 000 V AC or 15 000 V DC for **separating transformers with output voltage exceeding 1 000 V**.

This document does not apply to:

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

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

NOTE 2 **Transformers** covered by this document are used only in applications where **double or reinforced insulation** between circuits is not required by the installation rules or by the end product standard.

NOTE 3 Normally, the **transformers** are intended to be used with equipment to provide voltages different from the **supply voltage** for the functional requirements of the equipment. The protection against electric shock can be provided (or completed) by other features of the equipment, such as the **body**. Parts of **output circuits** can be connected to the **input circuits** or to **protective earthing**.

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

Attention is drawn to the following if necessary:

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

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

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

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

2 Normative references

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

Addition:

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