

Australian/New Zealand Standard™

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

**Part 1: General requirements and tests
(IEC 61558-1 Ed 3, MOD)**



AS/NZS 61558.1:2018

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-002, Safety of Household and Similar Electrical Appliances and Small Power Transformers. It was approved on behalf of the Council of Standards Australia on 24 October 2018 and by the New Zealand Standards Approval Board on 6 November 2018.

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Australian/New Zealand Standard™

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

Part 1: General requirements and tests (IEC 61558-1 Ed 3, MOD)

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

AS/NZS 61558.1:2018**Safety of transformers, reactors, power supply units and combinations thereof —****Part 1: General requirements and tests****Foreword**

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-002 - Safety of Household and Similar Electrical Appliances and Small Power Transformers to supersede AS/NZS 61558.1:2008 and its amendments. During this period AS/NZS 61558.1:2008 will also remain current. Regulatory authorities that reference this Standard in regulation may apply these requirements at a different time. Users of this Standard should consult with these authorities to confirm their requirements.

The objective of this Standard is to provide manufacturers, designers, regulatory authorities, testing laboratories and similar organizations with safety requirements designed to give the user protection against hazards that might occur during normal operation and abnormal operation of the appliance and which may be used as the basis for approval for sale or for connection to the electricity supply mains in Australia and New Zealand.

The text of IEC 61558-1 Ed 3, prepared by IEC Technical Committee TC 96, was submitted to the Standards Australia/Standards New Zealand Combined Procedure (dual public comment and committee vote) for adoption of the IEC standard as a Standards Australia/Standards New Zealand joint standard.

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

- a) fully insulated winding wires (FIW), new tables and aging tests for FIW constructions,
- b) overvoltage categories 1, 2, 3 and 4 for clearances and dielectric strength tests (new tables) are included,
- c) development of new symbols for the different overvoltage categories,
- d) symbol for maximum altitudes, if higher than 2 000 m,
- e) symbol for plug in power supply units, if the pins are damaged (tumbling barrel test),
- f) symbol for minimum temperature (even during the transportation),
- g) alternative temperature measurement, simulated load and back to back method according to IEC 60076-11,
- h) short circuit and overload protection, simulated load and back to back method according to IEC 60076-11,
- i) adjustment of temperatures in Table 2 according to IEC Guide 117,
- j) establishing partial discharge test above 750 V for FIW constructions,
- k) requirements for toroidal core constructions, division for basic and for supplementary isolation,
- l) modification of protection indexes for enclosures (IP-code),
- m) dimensioning of rectangular cross section connectors for transformers,
- n) repetition test, 80 % of required dielectric strength test voltage of Table 14,
- o) vibration test for vehicles and railway applications,
- p) two Y1 Capacitors for working voltages above 250 V and not exceeding 500 V with overvoltage category 3.

This Standard is an adoption with national modifications of the third edition of IEC 61558-1 *Safety of transformers, reactors, power supply units and combinations thereof – Part 1 General requirements and tests*. It has been varied as indicated to take account of Australian and New Zealand conditions.

This Standard, referred to as Part 1, is to be used in conjunction with the appropriate Part 2, which contains clauses that supplement or modify the corresponding clauses in Part 1, to provide the relevant requirements for each type of product.

This third edition of Part 1 is only to be used in conjunction with parts 2 based on this edition. Titles of existing standards in this series will be updated at the time of their next edition.

This standard may be applied, as far as is reasonable to transformers, reactors, power supply units and combinations not mentioned in the parts 2, and to transformers, reactors, power supply units and combinations designed on new principles.

In this document, the following print types are used:

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

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

NOTE 1 Subclauses, notes and annexes that are additional to those in the IEC standard are prefixed with the letters AZ.

p NOTE 2 In this document, p is used in the margin to indicate instructions for preparing a consolidated version.

The essential safety requirements in AS/NZS 3820¹ that could be applicable to transformers, reactors, power supply units and combinations thereof are covered by this standard taken in conjunction with any other relevant requirements affecting safety requirements for transformers, reactors, power supply units and combinations thereof are covered by this standard.

The national variations to IEC 61558-1 Ed 3 form the Australian and New Zealand national variations for purposes of the IECEE scheme for recognition of results of testing to standards for safety of electrical equipment (the CB scheme).

¹ AS/NZS 3820 *Essential safety requirements for electrical equipment*

The text of the International Standard IEC 61558-1 Ed 3 was approved as a joint Australia/New Zealand Standard with the agreed national variations as given below.

AUSTRALIAN NATIONAL VARIATIONS

5 General notes on tests

- p **5.5** *Replace* the text with the following variation:

For a.c., test voltages are of substantially sinusoidal wave form, and if not otherwise specified, have a frequency of 50 Hz.

8 Marking and other information

- p **8.1** *Insert* as a new second paragraph in Item a) the following variation:

The marking of **rated voltage** or **rated voltage range** of single-phase transformers shall cover 240 V and for polyphase transformers 415 V.

14 Heating

- p **Table 2** *Insert* the following entry:

Insulated pins of transformers with pins for insertion into socket-outlets	70
--	----

16 Mechanical strength

- p **16.4.1** *Insert* the following variation:

Items b) and c), Table 7, and the last three paragraphs of the test specification are not applicable.

- p **16.4.2** *Replace* the text with the following variation:

16.4.2 VOID.

19 Construction

- p **19.15** *Replace* the first paragraph of the test specification with the following variation:

Compliance is checked by inserting the transformer, as in normal use into a socket-outlet capable of accepting a 10 A plug complying with Figure 2.1(a) of AS/NZS 3112. The socket-outlet has a horizontal pivot at a distance of 8 mm behind the engagement face of the socket-outlet and in the plane of the lower intersection of the centre lines of the contact apertures.

- p **AZ.19.201** After 19.23 *insert* the following variation:

AZ.19.201 Transformers having integral pins for insertion into socket outlets shall comply with the appropriate requirements of AS/NZS 3112.

Compliance is checked as specified in Appendix J of AS/NZS 3112.

NOTE 1 Clause J3.4 (Internal connections for plug portions) of AS/NZS 3112 is covered by clause 19.6 and clause 21 of this standard

NOTE 2 Clause J4.2 (High voltage test) of AS/NZS 3112, except for the test of the insulation of the insulated pins, is covered by clause 18 of this standard.

NOTE 3 Clause J4.4 (Temperature rise test) of AS/NZS 3112 is covered by clause 14 of this standard

NOTE 4 Clause J4.7 (Equipment with integral pins intended to be supported by the contacts of a socket-outlet) of AS/NZS 3112 is covered by clause 19.15 of this standard

20 Components

- p **20** *Replace* the first paragraph with the following variation:

Components shall comply with the safety requirements specified in the relevant IEC or Australian/New Zealand Standards as far as they reasonably apply.

Replace the third paragraph with the following variation:

Compliance with the IEC or Australian/New Zealand Standards for the relevant component does not necessarily ensure compliance with the requirements of this Standard.

- p **20.6** *Insert* in the second paragraph in the requirement, before IEC 60906-3 the following variation:

Annex E in AS/NZS 3112 or

22 Supply connect and other external flexible cables or cords

- p **22.4** *Replace* the text with the following variation:

- p **22.4** VOID.

- p **22.6** *Replace* in the requirement, “16” with the following variation: “10”.

- p **22.8** *Replace* the second paragraph in the requirement, with the following variation:

Power supply cords of portable transformers shall be fitted with an appropriately rated plug complying with AS/NZS 3112 or AS/NZS 3123 or IEC 60309-1.

Annex H

- p **H.3.1** *Insert after the existing fourth paragraph the following variation:*

During and after the tests the no-load output voltage of an accessible safety extra-low voltage outlet or connector or Universal Serial Bus (USB) outlet shall not have increased by more than 3 V or 10% of its no-load output voltage in normal use, whichever is higher.

NEW ZEALAND NATIONAL VARIATIONS

5 General notes on tests

- p **5.5** *Replace* the text with the following variation:

For a.c., test voltages are of substantially sinusoidal wave form, and if not otherwise specified, have a frequency of 50 Hz.

8 Marking and other information

- p **8.1** *Insert* as a new second paragraph in Item a) the following variation:

The marking of **rated voltage** or **rated voltage range** of single-phase transformers shall cover 230 V and for polyphase transformers 400 V.

14 Heating

- p **Table 2** *Insert* the following entry:

Insulated pins of transformers with pins for insertion into socket-outlets	70
--	----

16 Mechanical strength

- p **16.4.1** *Insert* the following variation:

Items b) and c), Table 7, and the last three paragraphs of the test specification are not applicable.

- p **16.4.2** *Replace* the text with the following variation:

16.4.2 VOID.

19 Construction

- p **19.15** *Replace* the first paragraph of the test specification with the following variation:

Compliance is checked by inserting the transformer, as in normal use into a socket-outlet capable of accepting a 10 A plug complying with Figure 2.1(a) of AS/NZS 3112. The socket-outlet has a horizontal pivot at a distance of 8 mm behind the engagement face of the socket-outlet and in the plane of the lower intersection of the centre lines of the contact apertures.

- p **AZ.19.201** After 19.23 *insert* the following variation:

AZ.19.201 Transformers having integral pins for insertion into socket outlets shall comply with the appropriate requirements of AS/NZS 3112.

Compliance is checked as specified in Appendix J of AS/NZS 3112.

NOTE 1 Clause J3.4 (Internal connections for plug portions) of AS/NZS 3112 is covered by clause 19.6 and clause 21 of this standard

NOTE 2 Clause J4.2 (High voltage test) of AS/NZS 3112, except for the test of the insulation of the insulated pins, is covered by clause 18 of this standard.

NOTE 3 Clause J4.4 (Temperature rise test) of AS/NZS 3112 is covered by clause 14 of this standard

NOTE 4 Clause J4.7 (Equipment with integral pins intended to be supported by the contacts of a socket-outlet) of AS/NZS 3112 is covered by clause 19.15 of this standard

20 Components

- p **20** *Replace* the first paragraph with the following variation:

Components shall comply with the safety requirements specified in the relevant IEC or Australian/New Zealand Standards as far as they reasonably apply.

Replace the third paragraph with the following variation:

Compliance with the IEC or Australian/New Zealand Standards for the relevant component does not necessarily ensure compliance with the requirements of this Standard.

- p **20.6** *Insert* in the second paragraph in the requirement, before IEC 60906-3 the following variation:

Annex E in AS/NZS 3112 or

22 Supply connect and other external flexible cables or cords

- p **22.4** *Replace* the text with the following variation:

- p **22.4** VOID.

- p **22.6** *Replace* in the requirement, "16" with the following variation: "10".

- p **22.8** *Replace* the second paragraph in the requirement, with the following variation:

Power supply cords of portable transformers shall be fitted with an appropriately rated plug complying with AS/NZS 3112 or AS/NZS 3123 or IEC 60309-1.

Annex H

- p **H.3.1** *Insert after the existing fourth paragraph the following variation:*

During and after the tests the no-load output voltage of an accessible safety extra-low voltage outlet or connector or Universal Serial Bus (USB) outlet shall not have increased by more than 3 V or 10% of its no-load output voltage in normal use, whichever is higher.

**Annex ANZ
(normative)**
**Normative references to international publications with their corresponding joint
Australia/New Zealand publications**

The following referenced documents are indispensable for the application 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 When an international publication has been modified by national variations the relevant joint Australia/New Zealand publications applies if the national variations are needed to ensure the safety of the appliance for Australia/New Zealand conditions. These international publications are indicated by (mod). If an international publication is not so indicated, then either it or the listed Australia/New Zealand publication may be used.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>AS/NZS</u>	<u>Year</u>
		<i>Approval and test specification — Plugs and socket-outlets</i>	3112	
		<i>Plugs, socket-outlets and couplers for general industrial application</i>	3123	
IEC 60065	2014	<i>Audio, video and similar electronic apparatus – Safety requirements</i>	60065	2018
IEC 60068-2-6		<i>Environmental testing – Part 2-6: Tests – Test FC: Vibration (sinusoidal)</i>		
IEC 60068-2-14		<i>Environmental testing – Part 2-14: Tests – Test N: Change of temperature</i>		
IEC 60068-2-31		<i>Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment- type specimens</i>		
IEC 60068-2-75		<i>Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests</i>		
IEC 60076-1		<i>Power transformers – Part 1: General</i>		
IEC 60076-11	2004	<i>Power transformers – Part 11: Dry-type transformers</i>		
IEC TR 60083		<i>Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC</i>		
IEC 60085	2011	<i>Electrical insulation – Thermal evaluation and designation</i>		
IEC 60112	2003	<i>Method for the determination of the proof and the comparative tracking indices of solid insulating materials</i>		
IEC 60112/AMD1	2009			
IEC 60127 (all parts)	2014	<i>Miniature fuses</i>		
IEC 60127-3		<i>Miniature fuses – Part 3: Sub-miniature fuse-links</i>		
IEC 60216 (all parts)		<i>Electrical insulating materials – Thermal endurance properties</i>		

IEC 60227 (all parts)		<i>Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V</i>		
IEC 60227-5	2011	<i>Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)</i>	60227.5 A1	2003 2004
IEC 60245 (all parts)		<i>Rubber insulated cables – Rated voltages up to and including 450/750 V</i>		
IEC 60245-4	2011	<i>Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables</i>	60245.4 A1	2003 2004
IEC 60269 (all parts)		<i>Low voltage fuses</i>		
IEC 60269-2	2013	<i>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</i>	60269.2	2000
IEC 60269-3	2010	<i>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</i>	60269.3	2000
IEC 60309 (all parts)		<i>Plugs, socket-outlets and couplers for industrial purposes</i>		
IEC 60317 (all parts)		<i>Specifications for particular types of windings wires</i>		
IEC 60317-0-7	2012	<i>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</i>		
IEC 60317-56		<i>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</i>		
IEC 60320 (all parts)		<i>Appliance couplers for household and similar general purposes</i>		
IEC 60320-2-3		<i>Appliance couplers for household and similar general purposes – Part 2-3: Appliance couplers with a degree of protection higher than IPX0</i>		

IEC 60335-1		<i>Household and similar electrical appliances – Safety – Part 1: General requirements</i>	60335.1
IEC 60384-14	2013	<i>Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains</i>	
IEC 60417		<i>Graphical symbols for use on equipment</i> (available at http://www.graphical-symbols.info/equipment)	
IEC 60454 (all parts)		<i>Pressure-sensitive adhesive tapes for electrical purposes</i>	
IEC 60529	1989	<i>Degrees of protection provided by enclosures (IP Code)</i>	
IEC 60529/AMD1	1999		
IEC 60529/AMD2	2013		
IEC 60664-1	2007	<i>Insulation coordination for equipment within low voltage systems – Part 1: Principles, requirements and tests</i>	
IEC 60664-3	2016	<i>Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution</i>	
IEC 60691	2015	<i>Thermal-links – Requirements and application guide</i>	
IEC 60695-2-10	2013	<i>Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure</i>	
IEC 60695-2-11	2014	<i>Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods –Glow-wire flammability test method for end-products</i>	
IEC 60721-3-2		<i>Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 2: Transportation</i>	
IEC 60730 (all parts)		<i>Automatic electrical controls</i>	
IEC 60730-1	2013	<i>Automatic electrical controls – Part 1: General requirements</i>	
IEC 60851-3	2009	<i>Winding wires – Test methods: Part 3: Mechanical properties</i>	
IEC 60851-5	2008	<i>Winding wires – Test methods: Part 5: Electrical properties</i>	
IEC 60851-6	2012	<i>Winding wires – Test methods: Part 6: Thermal properties</i>	

IEC 60884-1	2002	<i>Plugs and socket-outlets for household and similar purposes – Part 1: General requirements</i>		
IEC 60884-1AMD1	2006			
IEC 60884-1AMD2	2013			
IEC 60884-2-4		<i>Plugs and socket-outlets for household and similar purposes – Part 2-4: Particular requirements for plugs and socket-outlets for SELV</i>		
IEC 60898 (all parts)		<i>Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations</i>		
IEC 60906-1		<i>IEC system of plugs and socket-outlets for household and similar purposes – Part 1: Plugs and socket-outlets 16 A 250 V a.c.</i>		
IEC 60906-3		<i>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.</i>		
IEC 60947-7-1		<i>Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors</i>	60947.7.1	
IEC 60990	2016	<i>Methods of measurement of touch current and protective conductor current</i>		
IEC 60998-2-1		<i>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</i>	60998.2.1	
IEC 60998-2-2		<i>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</i>	60998.2.2	
IEC 60999-1		<i>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)</i>	60999.1	
IEC 61032		<i>Protection of persons and equipment by enclosures – Probes for verification</i>		
IEC 61058-1	2016	<i>Switches for appliances – Part 1: General requirements</i>	61058.1	2008
IEC 61058-1-1	2016	<i>Switches for appliances – Part 1-1: Requirements for mechanical switches</i>		
IEC 61140	2016	<i>Protection against electric shock – Common aspects for installation and equipment</i>		
IEC 61373		<i>Railway applications – Rolling stock equipment – Shock and vibration tests</i>		

ISO 8820		<i>Road vehicles – Fuse-links</i>
EN 50075	1990	<i>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</i>
DIN 43671	1975	<i>Copper bus bars; design for continuous current</i>
DIN 43670	1995	<i>Aluminium bus bars; design for continuous current</i>
DIN 43670-2	1985	<i>Aluminium bus bars copper cladding; design for continuous current</i>

NOTES

CONTENTS

FOREWORD.....	9
INTRODUCTION.....	11
1 Scope.....	14
2 Normative references	16
3 Terms and definitions	19
3.1 Transformers	20
3.2 General terms	23
3.3 Operations and protections	24
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.....	36
8 Marking and other information	37
9 Protection against electric shock	43
9.1 General.....	43
9.2 Protection against contact with hazardous-live-parts	44
9.2.1 Determination of hazardous-live-parts	44
9.2.2 Accessibility to hazardous-live-parts	44
9.2.3 Accessibility to non hazardous-live-part.....	47
9.3 Protection against hazardous electrical discharge.....	47
10 Change of input voltage setting	47
11 Output voltage and output current under load	48
12 No-load output voltage	49
13 Short-circuit voltage.....	49
14 Heating.....	49
14.1 General requirements	49
14.1.1 Temperature-rise test	49
14.1.2 Alternative temperature-rise test.....	51
14.1.3 Determination of steady-state conditions	54
14.2 Application of 14.1 or 14.3 according to the insulation system.....	55
14.3 Accelerated ageing test for undeclared class of insulation system	56
14.3.1 General	56
14.3.2 Heat run	56
14.3.3 Vibration.....	57
14.3.4 Moisture treatment.....	57
14.3.5 Measurements.....	57
15 Short circuit and overload protection.....	57
15.1 General requirements	57
15.1.1 Short circuit and overload test method.....	57

15.1.2	Alternative short circuit and overload test method	60
15.2	Inherently short-circuit proof transformers	60
15.3	Non-inherently short-circuit proof transformers	60
15.4	Non-short-circuit proof transformers	61
15.5	Fail-safe transformers	61
16	Mechanical strength	62
16.1	General	62
16.2	Stationary transformers	62
16.3	Portable transformers (except portable transformers with integral pins for introduction in socket-outlet in the fixed wiring)	63
16.4	Portable transformers provided with integral pins for introduction in socket-outlets of the fixed wiring	63
16.4.1	General requirements	63
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	64
16.5	Additional requirements for transformers to be used in vehicles and railway applications	65
16.5.1	Transformers to be used in vehicles and railway applications	65
16.5.2	Test requirements for the transportation of transformers	66
17	Protection against harmful ingress of dust, solid objects and moisture	67
17.1	Degrees of protection provided by enclosures (IP code)	67
17.1.1	General requirements	67
17.1.2	Tests on transformers with enclosure	68
17.2	Humidity treatment	70
18	Insulation resistance, dielectric strength and leakage current	71
18.1	General	71
18.2	Insulation resistance	71
18.3	Dielectric strength test	72
18.4	Insulation between and within windings	74
18.5	Touch current and protective earthing conductor current	74
18.5.1	General	74
18.5.2	Touch current	75
18.5.3	Protective earthing conductor current	76
19	Construction	77
19.1	General construction	77
19.1.1	General	77
19.1.2	Auto-transformers	77
19.1.3	Separating transformers	78
19.1.4	Isolating transformers and safety isolating transformers	79
19.2	Flammability of materials	81
19.3	Short-circuit characteristics of portable transformers	81
19.4	Class II transformer contact prevention of accessible conductive parts	81
19.5	Class II transformer insulation reassembling after service	81
19.6	Loosening of wires, screws or similar parts	82
19.7	Resistor or capacitor connection with accessible conductive parts	82
19.8	Bridging of separated conductive parts by resistors or capacitors	82
19.9	Insulating material separating input and output windings	83
19.10	Accidental contact protection against hazardous-live-parts provided by isolating coating	83

19.11	Insulating material of handles, operating levers, knobs and similar parts.....	84
19.12	Winding construction.....	84
19.13	Fixing of handles, operating levers and similar parts	88
19.14	Fixing of covers providing protection against electric shock	88
19.15	Strain on fixed socket-outlets caused by pin-transformers connection	89
19.16	Portable transformers for use in irregular or harsh conditions	89
19.17	Drain hole of transformers protected against ingress of water	89
19.18	Plug connected transformers protected against ingress of water	89
19.19	Flexible cable or flexible cord connection for class I portable transformers	89
19.20	SELV- and PELV-circuit separation of live parts.....	89
19.21	Protection against contact for FELV-circuit.....	90
19.22	Protective earthing regarding class II transformers	90
19.23	Protective earthing regarding class III transformers	91
20	Components	91
21	Internal wiring.....	96
22	Supply connection and other external flexible cables or cords	96
23	Terminals for external conductors	103
24	Provisions for protective earthing.....	104
25	Screws and connections	106
26	Creepage distances, clearances and distances through insulation.....	108
26.1	General.....	108
26.2	Creepage distances and clearances.....	109
26.2.1	General	109
26.2.2	Windings covered with adhesive tape	109
26.2.3	Uncemented insulating parts	109
26.2.4	Cemented insulating parts	109
26.2.5	Enclosed parts (e.g. by impregnation or potting)	110
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	.....	173
Figure 1	– IEC 61558 principle.....	12
Figure 2	– Mounting box for flush-type transformer	35
Figure 3	– Test pin (see IEC 61032, test probe 13).....	45
Figure 4	– Standard test finger (see IEC 61032, test probe B)	46
Figure 5	– Example of back-to-back method – Single phase	53
Figure 6	– Example of back-to-back method – Three phase	53
Figure 7	– Amplitude spectrum density for random testing	66
Figure 8	– Normalised spectrum of shock	67
Figure 9	– Test voltage sequence	74
Figure 10	– Test configuration: single-phase equipment on star TN or TT system	76
Figure 11	– Abrasion resistance test for insulating coated layers	84
Figure 12	– Flexing test apparatus.....	100

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	41
Table 2 – Values of maximum temperatures in normal use.....	54
Table 3 – Explanation of the maximum winding temperatures required in Table 2	55
Table 4 – Test temperature and testing time (in days) per cycle.....	56
Table 5 – Maximum values of temperatures under short-circuit or overload conditions.....	59
Table 6 – Values of T and k for fuses	60
Table 7 – Pull force on pins	64
Table 8 – Conditions for vibration testing (random)	65
Table 9 – Amplitude spectrum density ASD values for accelerated life testing	65
Table 10 – Frequency values depending on the weight of the specimen.....	66
Table 11 – Excitation values for vibration testing	66
Table 12 – Solid-object-proof transformer test	69
Table 13 – Values of insulation resistance	72

Table 14 – Table of dielectric strength test voltages.....	73
Table 15 – Limits for currents	76
Table 16 – Nominal cross-sectional areas of external flexible cables or cords.....	98
Table 17 – Pull and torque to be applied to external flexible cables or cords fixed to stationary and portable transformers.....	102
Table 18 – Torque to be applied to screws and connections	107
Table 19 – Torque test on glands.....	108
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 1: General requirements and tests**

FOREWORD

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International Standard IEC 61558-1 has been prepared by IEC technical committee 96: Transformers, reactors, power supply units and combinations thereof.

This third edition cancels and replaces the second edition published in 2005 and Amendment 1:2009. This edition constitutes a technical revision.

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

- a) fully insulated winding wires (FIW), new tables and aging tests for FIW constructions,
- b) overvoltage categories 1, 2, 3 and 4 for clearances and dielectric strength tests (new tables) are included,
- c) development of new symbols for the different overvoltage categories,
- d) symbol for maximum altitudes, if higher than 2 000 m,
- e) symbol for plug in power supply units, if the pins are damaged (tumbling barrel test),

- f) symbol for minimum temperature (even during the transportation),
- g) alternative temperature measurement, simulated load and back to back method according to IEC 60076-11,
- h) short circuit and overload protection, simulated load and back to back method according to IEC 60076-11,
- i) adjustment of temperatures in Table 2 according to CENELEC Guide 29,
- j) establishing partial discharge test above 750 V for FIW constructions,
- k) requirements for toroidal core constructions, division for basic and for supplementary isolation,
- l) modification of protection indexes for enclosures (IP-code),
- m) dimensioning of rectangular cross section connectors for transformers,
- n) repetition test, 80 % of required dielectric strength test voltage of Table 14,
- o) vibration test for vehicles and railway applications,
- p) two Y1 Capacitors for working voltages above 250 V and not exceeding 500 V with overvoltage category 3.

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

FDIS	Report on voting
96/466/FDIS	96/468/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

A list of all parts of the IEC 61558 series, published under the general title *Safety of transformers, reactors, power supply units and combination 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.

In this document, the following print types are used:

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://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.

INTRODUCTION

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.

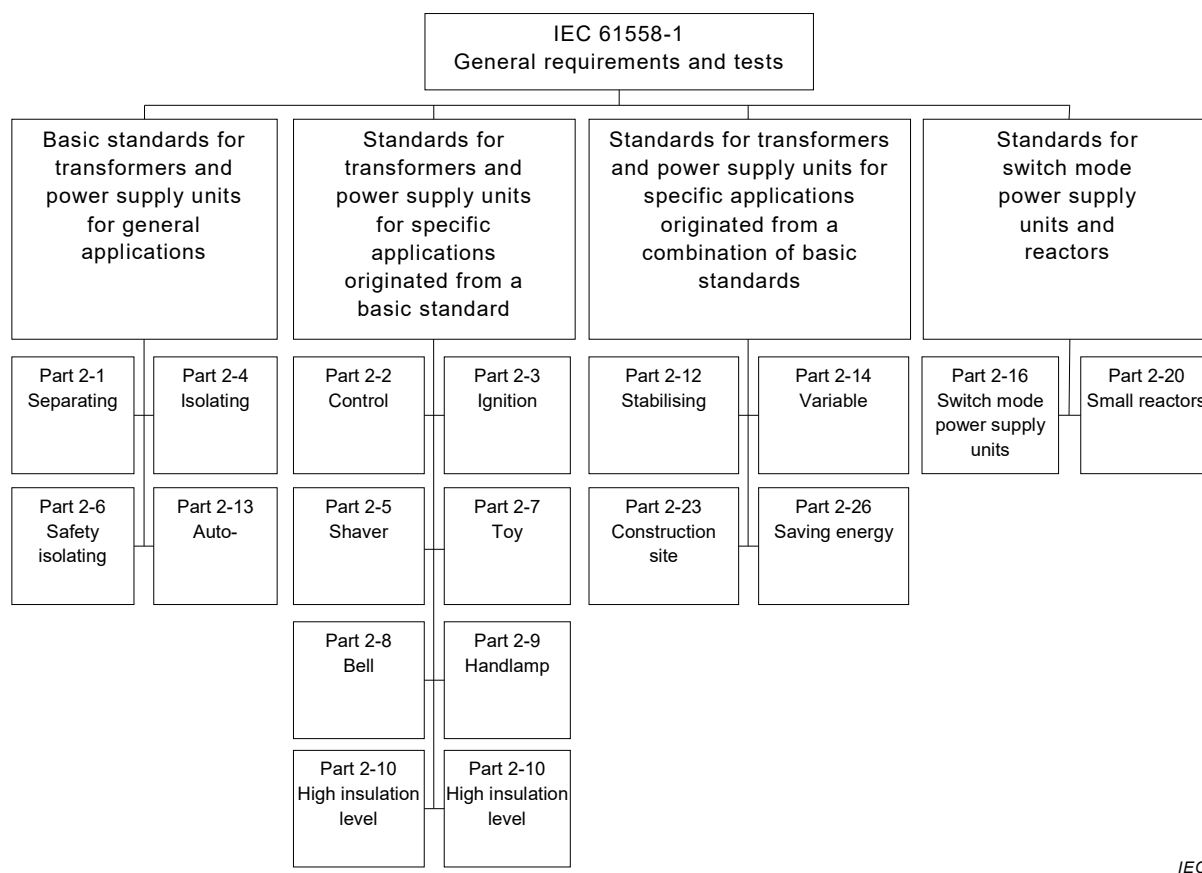
Each part of IEC 61558-2 in conjunction with this document contains all the necessary requirements for the **transformer** being covered and does not contain references to other parts of IEC 61558-2. For **transformers** with a protection index IP00 and associated **transformers**, it is possible to 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.

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

Part 1: General requirements and tests

1 Scope

This part of IEC 61558 deals with safety aspects of **transformers**, reactors, power supply units and combinations thereof such as electrical, thermal and mechanical safety.

This document covers the following **independent** or **associated** stationary or portable types of **dry-type transformers**, **power supply units**, including **switch mode power supply units**, **reactors** and combinations thereof in the field of safety. The windings can be encapsulated or non-encapsulated. They are not forming a part of the distribution network.

NOTE 1 The distinction between transformers, power supply units and switch mode power supply units is as follows:

- for **transformers**, there is no change in frequency. However, **transformers** (e.g. constant voltage **transformers**) can have an internal resonance frequency not exceeding 30 kHz;
- for **power supply units**, the **internal operational frequency** and waveform are different from the **supply frequency** and waveform, and the **internal operational frequency** does not exceed 500 Hz (see definition 3.1.19);
- for **switch mode power supply units**, the **internal operational frequency** and waveform are different from the **supply frequency** and waveform and the **internal operational frequency** exceeds 500 Hz and does not exceed 100 MHz.

The relevant parts of IEC 61558-2 can be found in the introduction of this document.

a) Stationary or portable, single-phase or poly-phase, air-cooled (natural or forced), **isolating** and **safety isolating transformers**, **independent** or **associated** with the following characteristics:

- **rated supply voltage** not exceeding 1 000 V AC;
- **rated supply frequency** not exceeding 500 Hz;

and complying with the following values, unless otherwise specified in the relevant part of IEC 61558-2:

- for **isolating transformers**:
 - rated output for single phase **transformers**, not exceeding 25 kVA, and for poly-phase **transformers** not exceeding 40 kVA;
 - **no-load output voltage** and the **rated output voltage** exceeding 50 V AC, and not exceeding 500 V a.c, or 1 000 V AC to be in accordance with the national wiring rules or for a special application.
- for **safety isolating transformers**:
 - **rated output** for single phase **transformers** not exceeding 10 kVA, and for poly-phase **transformers** not exceeding 16 kVA;
 - **no-load output voltage** and the **rated output voltage** not exceeding 50 V AC between conductors, or between any conductor and protective earthing.

NOTE 2 **Isolating** and **safety isolating transformers** are used where **double** or **reinforced insulation** between circuits is required by the installation rules or by the appliance specification (for example toys, bells, portable **tools**, handlamps).

b) **Stationary** or **portable**, single-phase or polyphase, air-cooled (natural or forced) **separating transformers**, **auto-transformers**, **variable transformers** and small **reactors**, **independent** or **associated** with the following characteristics:

- **rated supply voltage** not exceeding 1 000 V AC;