




<p>TEST REPORT IEC 61558-2-16</p> <p>Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units</p>	
Report Number.....	: EFSH23070262-IE-06-L01
Date of issue.....	: 2023-11-10
Total number of pages	: 112
<p>Name of Testing Laboratory preparing the Report : Eurofins Electrical Testing Service (Shanghai) Co., Ltd.</p>	
<p>Applicant's name : GlobTek, Inc.</p>	
<p>Address..... : 186 Veterans Dr. Northvale, NJ 07647 USA</p>	
<p>Test specification:</p> <p>Standard : IEC 61558-2-16:2009, AMD1:2013 used in conjunction with IEC 61558-1:2017</p> <p>Test procedure : Test report</p> <p>Non-standard test method : N/A</p>	
<p>Test Report Form No. : IEC61558_2_16G</p> <p>Test Report Form(s) Originator : Intertek Testing Services (Singapore) Pte Ltd</p> <p>Master TRF : Dated 2019-02-21</p>	
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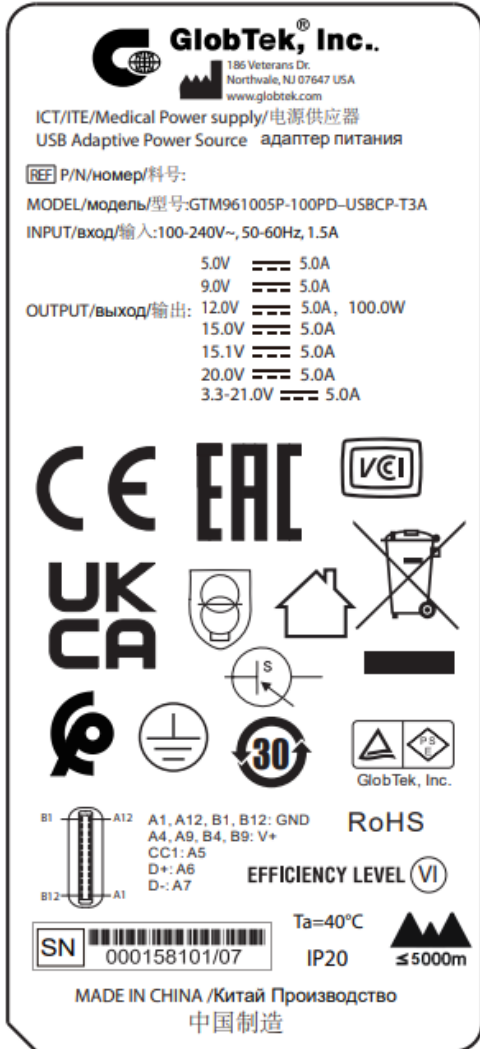
Test item description :	Power Supply
Trade Mark :	G GlobTek, Inc.
Manufacturer	GlobTek, Inc. 186 Veterans Dr. Northvale, NJ 07647 USA
Model/Type reference :	GTM961005P-*PD*** The 1st "*" =1 to 100, with interval of 1, denoting the rated output wattage designation from 1 W to 100 W. The 2nd "*" = -USBCJ means USB Type-C jack in housing = -USBCP means USB Type-C plug on fixed cord with strain-relief in housing The 3rd "*" = -T2 means desktop class II with C8 AC inlet = -T2A means desktop class II with C18 AC inlet = -T3 means desktop class I with C14 AC inlet = -T3A means desktop class I with C6 AC inlet The 4th "*" denotes any six character = 0-9 or A-Z or ()[] or – or blank for marketing purposes.
Ratings :	Input: 100-240 V~, 50-60 Hz, 1.5 A Output: PD mode: 5.0 – 20.0 V===, Max. 5 A, Max. 100 W PPS mode: 3.3 – 21.0 V===, Max. 5 A, Max. 100 W PD+PPS mode: 5.0 – 20.0 V=== and 3.3 – 21.0 V===, Max. 5 A, Max. 100 W

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	Testing Laboratory:	Eurofins Electrical Testing Service (Shanghai) Co., Ltd.
Testing location/ address.....:		Building 18, No. 2168 Chenhang Highway, Minhang District, Shanghai, China
Tested by (name, function, signature).....:		Jack Gan (Project Engineer) 
Approved by (name, function, signature)....:		Jackie Zhao (Reviewer) 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address.....:		
Tested by (name, function, signature).....:		
Approved by (name, function, signature)....:		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address.....:		
Tested by (name + signature)		
Witnessed by (name, function, signature) .:		
Approved by (name, function, signature)....:		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address.....:		
Tested by (name, function, signature).....:		
Witnessed by (name, function, signature) .:		
Approved by (name, function, signature)....:		
Supervised by (name, function, signature) :		

<p>List of Attachments (including a total number of pages in each attachment):</p> <p>Attachment 1: Photo (15 pages)</p> <p>Attachment 2: Australia and New Zealand National Differences (4 pages)</p>	
<p>Summary of testing:</p> <p>The product covered by this report has been tested and found to complies with the applicable requirements of this standard.</p>	
<p>Tests performed (name of test and test clause):</p> <p>Full test.</p>	<p>Testing location:</p> <p>Eurofins Electrical Testing Service (Shanghai) Co., Ltd.</p> <p>Building 18, No. 2168 Chenhang Highway, Minhang District, Shanghai, China</p>
<p>Summary of compliance with National Differences (List of countries addressed):</p> <p>EU Group (No difference), AU, NZ</p> <p><input checked="" type="checkbox"/> The product fulfils the requirements of <u>EN IEC 61558-1:2019 and EN 61558-2-16:2009+A1:2013; AS/NZS 61558.2.16:2010 + A1:2010 +A2:2012 + A3:2014 and AS/NZS 61558.1:2008 +A1:2009 +A2:2015</u></p>	

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBS that own these marks.



GlobTek, Inc.
186 Veterans Dr.
Northvale, NJ 07647 USA
www.globtek.com

ICT/ITE/Medical Power supply/电源供应器
USB Adaptive Power Source адаптер питания

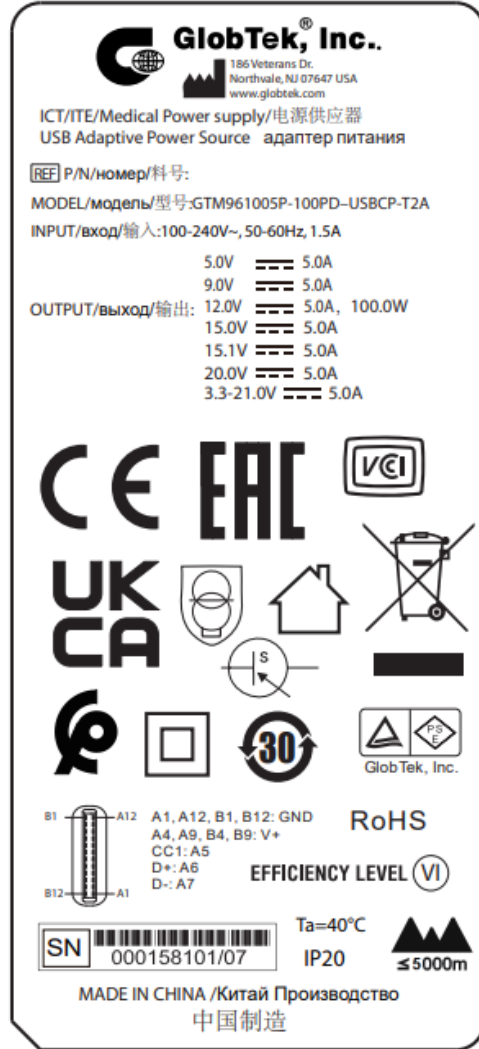
REF P/N/номер/料号:
MODEL/модель/型号:GTM961005P-100PD-USBCP-T3A
INPUT/вход/输入:100-240V~, 50-60Hz, 1.5A

5.0V	===	5.0A
9.0V	===	5.0A
12.0V	===	5.0A, 100.0W
15.0V	===	5.0A
15.1V	===	5.0A
20.0V	===	5.0A
3.3-21.0V	===	5.0A

OUTPUT/выход/输出:

CE EAC VCI
UK CA
RoHS
EFFICIENCY LEVEL VI
Ta=40°C
SN 000158101/07 IP20 ≤5000m
MADE IN CHINA /Китай Производство
中国制造

(Class I model)



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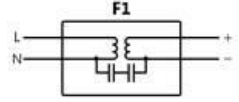
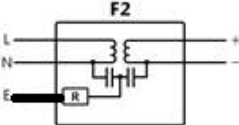
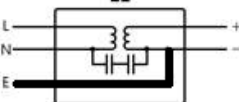
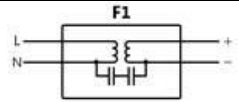
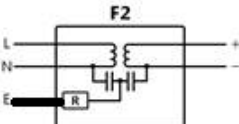
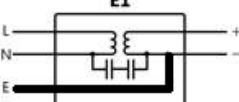
(Class II model)

Note:

1, Markings of other models are similar as above except model name and made in nation.



Test item particulars: See below	
Classification of installation and use: Portable	
Supply Connection: Appliance coupler:	
Possible test case verdicts: - test case does not apply to the test object.....: N/A - test object does meet the requirement.....: P (Pass) - test object does not meet the requirement.....: F (Fail)	
Testing:	
Date of receipt of test item: 2023-06-28	
Date (s) of performance of tests: 2023-07-04 to 2023-08-02	
General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. The related applicable CTL decisions have been considered and the requirements found fulfilled. Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60950-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies): 1. GlobTek, Inc. 186 Veterans Dr. Northvale, NJ 07647 USA 2. GlobTek (Suzhou) Co., Ltd. Building 4, No. 76 JinLing East Road, Suzhou Industrial Park, Suzhou, JiangSu, 215021, China	
General product information and other remarks:	
The equipment is external desktop AC-DC switching mode power supply with type C USB power delivery supporting protocol (PD) 2.0/3.0 + PPS, with max. output power 100 W. Maximum ambient temperature Tma: 40°C. Maximum altitude: 5000m Models with output exceeding 3A or 72 W can only be used as Associated transformers, and the output USB port shall be connected within the end-product.	




All models are identical except for:
 1 rated output power, which is set by firmware;
 2 the following differences:














Model	PCB layout	Appliance inlet and Class of equipment	Earthing type	Output connection	Output Voltage	Output Current	Output Power
GTM961005P- *PD-USBCJ-T2*	The same	C8, Class II		USB Type-C jack in housing	PD mode: 5.0 -20.0 V PPS mode: 3.3-21.0 V PD+PPS mode: 5.0 -20.0 V and 3.3 -21.0 V	Max. 5.0A	Max. 100W
GTM961005P- *PD-USBCJ-T2A*		C18, Class II					
GTM961005P- *PD-USBCJ-T3*		C14, Class I					
GTM961005P- *PD-USBCJ-T3A*		C6, Class I					
GTM961005P- *PD-USBCP-T2*		C8, Class II		USB Type-C plug on fixed cord with strain-relief in housing			
GTM961005P- *PD-USBCP-T2A*		C18, Class II					
GTM961005P- *PD-USBCP-T3*		C14, Class I					
GTM961005P- *PD-USBCP-T3A*		C6, Class I					





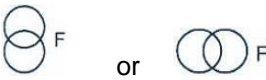


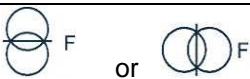
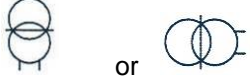
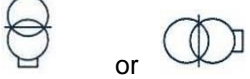



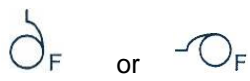
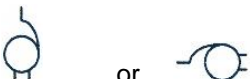

The bold lines in drawings of earthing type represent protective earthing.

After review, model GTM961005P-100PD-USBCP-T3A is subject to all tests.

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
8	MARKING AND OTHER INFORMATION		-
8.1	Transformer marked with (for symbols see Table 1):		-
	a) rated supply voltage or voltage range (V)	100-240 V~	P
	b) rated output voltage (V)	3.3-21 V=	P
	c) rated output (VA, kVA or W)	Max 100 W	P
	d) rated output current (A)	Max 5A	P
	e) rated frequency (Hz)	50-60 Hz	P
	f) rated power factor (if not 1)	Not required	N/A
	g) symbol AC for alternating current, or DC for direct current-output		P
	h) symbol for electrical function (according to one or more part's 2) in addition with the symbol for SMPS (IEC 61558-2-16:09)		P
	i) manufacturer's name or trademark or name of the responsible vendor	See section "copy of marking plate"	P
	j) model or type reference	See section "copy of marking plate"	P
	k) vector group according to IEC 60076 for three-phase transformer		N/A
	l) symbol for Class II	 for class II models	P
	symbol for Class III		N/A
	m) index IPXX if other than IP00	IP20	P
	n) rated max. ambient temperature t_a (if not 25 °C)	$T_a=40^{\circ}\text{C}$	P
	o) rated minimum ambient temperature t_{amin} , if $<10^{\circ}\text{C}$ and if a temperature sensitive device is used		N/A
	p) duty cycle, if any, unless the operating time is limited by the construction of the transformer or corresponds to the operating conditions specified in the relevant part 2	Continuous operation	N/A
	q) symbol for overvoltage category, if other than OVC II;		N/A
	r) transformers used with forced air cooling shall be marked with "AF" in m/s		N/A
	s) Information from the manufacturer to the purchaser (data sheet) :		P
	- short-circuit voltage (% rated supply voltage) for stationary transformers > 1000 VA		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– electrical function of the transformer		P
	– All markings except those under i) and j) may be illustrated as QR Code according ISO/IEC 18004.		N/A
	t) symbol indicating the maximum altitude of installation, if higher than 2 000 m.	≤5000 m	P
8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
8.3	Adjusted voltage easily and clearly discernible		N/A
8.4	For each tapping or winding: rated output voltage and rated output		N/A
	necessary connections clearly indicated		N/A
8.5	For non-short-circuit proof transformers or non-inherently short-circuit proof transformers:	Non-inherently short-circuit proof transformer with nonreplaceable protective devices need no additional marking regarding the protective device.	N/A
	Rated current (A or mA) and symbol for time current characteristics of the fuses for non-inherently short-circuit proof transformer with incorporated fuses and non-short-circuit proof transformer		N/A
	Manufacturer's model or type reference and rating of the device for non-inherently short-circuit proof transformers with incorporated replaceable protective device (other than fuses)		N/A
	Construction sheet for transformers with replaceable protective device (other than fuses) information with information about the replacement.		N/A
8.6	Terminals for neutral: "N"	Approved appliance inlet	P
	Terminal for protective earth marked with earthing symbol	 for Class I models	P
	Identification of input terminals:		N/A
	Identification of output terminals:		N/A
	Symbol for any point/terminal in connection with frame or core		N/A
8.7	Indication for correct connection	The convenient connector or evident marking is provided.	P
8.8	Instruction sheet for type X, Y, Z attachments	Type Z output wire for models with fixed cord	P
8.9	Transformer for indoor use shall be marked with the relevant symbol.		P
8.10	Symbol for Class II construction not confused with maker's name or trademark.		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Class II transformer with parts to be mounted – delivered with all parts for class II after mounting.		N/A
	Symbol for class II transformer placed on the part which provides class II.		P
8.11	Correct symbols:		-
	Volts	V	P
	Amperes	A (mA)	P
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	P
	Hertz	Hz	P
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	d.c. (DC) or 	P
	Neutral	N	N/A
	Single-phase a.c.		P
	Three-phase a.c.	3 	N/A
	Three-phase and neutral a.c.	3N 	N/A
	Power factor	cos φ	N/A
	Class II construction	 for Class II models	P
	Class III construction		N/A
	Equipment of overvoltage category I		N/A
	Equipment of overvoltage category II		N/A
	Equipment of overvoltage category III		N/A
	Equipment of overvoltage category IV		N/A
	Fuse-link		N/A
	Rated max. ambient temperature	$t_a=40\text{ }^\circ\text{C}$	P
	Rated minimum ambient temperature	t_{amin}	N/A
	Rated minimum temperature	t_{min}	N/A
	Frame or core terminal		N/A
	Protective earth	 for Class I models	P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	IP number	IP20	P
	Earth (ground for functional earth)		N/A
	For indoor use only		P
	To indicate that the appliance is intended to be usable up to the maximum altitude 3 000 m.		N/A
	To indicate that the power supply unit shall not be used, if pins of the plug part are damaged.		N/A
	Additional Symbols (IEC 61558-2-16:09)		-
	SMPS incorporating a Fail-safe separating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof separating transformer		N/A
	SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe safety isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof safety isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof safety isolating transformer (inherently or non-inherently)		P
	SMPS incorporating a Fail-safe auto-transformer		N/A
	SMPS incorporating a Non-short-circuit proof auto-transformer		N/A
	SMPS incorporating a Short-circuit proof auto-transformer (inherently or non-inherently)		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	SMPS (Switch mode power supply unit)		P
8.12	Number, letters or other visual means for different positions of regulating devices and switches	No such device	N/A
	OFF position indicated by number 0		N/A
	Greater output, input etc. indicated by higher number		N/A
8.13	Marking not on screws or other easily removable parts		P
	Marking clearly discernible (transformer ready for use)		P
	Marking for terminals clearly discernible if necessary after removal of the cover		N/A
	Marking for terminals: no confusion between input and output		P
	Marking for interchangeable protective devices positioned adjacent to the base		N/A
	Marking for interchangeable protective devices clearly discernible after removal of cover and protective device		N/A
8.14	Visible information (symbols) shall be provided, when it is necessary to take special precautions for installation, transportation or use (in the catalogue, data sheet, instruction sheet or packaging):		P
	For non-inherently short-circuit proof transformers with non-self-resetting or non-replaceable devices (weak-point, thermal link): The device cannot be reset or replaced		P
	For transformers generating a protective earth conductor current greater than 10 mA (see also cl. 18.5.2): The installation shall be made according to the wiring rules.		N/A
	For stationary transformers exceeding 1000 VA: The short circuit voltage in % of the rated supply voltage		N/A
	For all transformers the electrical function: An information about the electrical function of the transformer (e.g. inherently short circuit proof safety isolating transformer)		P
	the limiting temperature of the winding under abnormal conditions which shall be respected when the transformer is built into an appliance as information for appliance design;		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	For transformers with more than one output winding, not for series or parallel connection		N/A
	– an information in the instruction sheet: the transformer is not intended for series/parallel connection		N/A
	For IP00-transformers the test of 27.2 is not performed. The result may be affected by the enclosure in the final application.		N/A
8.15	Marking durable and easily legible		P
8.16	Portable transformers with integrated plugs complying with EN 50075 (IEC plug type C), shall use the symbol IEC 60417-6352:2015-10. The instruction sheet of the plug in transformer shall contain the following information, or equivalent: if the pins of the plug parts are damaged, the plug-in power supply shall be scrapped.		N/A
9	PROTECTION AGAINST ELECTRIC SHOCK		-
9.1	General		P
9.2	Protection against contact with hazardous-live-parts		P
9.2.1	Determination of hazardous-live-parts		P
9.2.1.1	A live part is not a hazardous live part if:		-
	– it is separated from the supply by double or reinforced insulation and		P
	– the requirements of 9.2.1.2 or 9.2.1.3 are fulfilled		P
9.2.1.2	The touch voltage is ≤ 35 V(peak) a.c. or ≤ 60 Vd.c.	21.25 Vd.c.	P
9.2.1.3	If the touch voltage is > 35 V (peak)a.c. or > 60 V d.c., the following requirements shall be fulfilled:		N/A
	The touch current shall not exceed:		N/A
	– for a.c. 0,7 mA (peak)		N/A
	– for d.c. 2,0 mA (see Annex J)		N/A
	In addition, when a capacitor is connected to live parts:		—
9.2.1.3.1	discharge: < 45 μ C (between 60 V and 15 kV)		N/A
9.2.1.3.2	energy: ≤ 350 mJ (voltage > 15 kV)		N/A
9.2.2	Transformers shall have an adequate protection against accessibility to hazardous live parts:		P
	The enclosure of class I and class II transformers gives an adequate protection against accidental contact with hazardous live parts.		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Class I transformers: accessible parts are separated from hazardous live parts by at least basic insulation.		P
	Class II transformers: no accessibility to basic insulation, or conductive parts separated from hazardous live parts by basic insulation.		P
	Hazardous live parts are not accessible after removal of detachable parts.	No detachable part	N/A
	Hazardous live parts are not accessible after removal of detachable parts except for:		N/A
	– lamps having caps larger B9 and E10		N/A
	– type D fuse holder		N/A
	IP00 transformers shall comply with the end product standard after incorporation in the end product.		N/A
	The insulating properties of lacquer, enamel, paper, cotton, oxide film on conductive parts and sealing compound shall not be considered as giving the required protection against accidental contact with hazardous-live-parts with the exception of fully insulated winding wire (FIW).	No such construction	N/A
	Shafts, handles, operating levers, knobs are not hazardous life parts.		N/A
	Compliance is checked by inspection and by relevant tests according to IEC 60529		N/A
	Class II transformers and Class II parts of Class I construction are tested with the test pin (fig. 3)		P
	Hazardous live parts shall not be touchable by test finger (fig. 4) with the exception of fully insulated winding wire (FIW).		N/A
	for Class II transformers: conductive parts separated by basic insulation from hazardous live parts not touchable by test finger		P
	hazardous live parts shall not be touchable with the test pin		P
9.2.3	Accessibility of non-hazardous live parts		P
	Non-hazardous live parts of the output circuit may be accessible if they are isolated from the input circuit by double or reinforced insulation and if the following conditions are fulfilled:		P
	– The no load output voltage is ≤ 35 V peak a.c. or ≤ 60 V ripple free d.c., both poles are accessible		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– The no load output voltage is > 35 V peak a.c. or > 60 V ripple free d.c. and \leq 250 V a.c., only one pole may be accessible		N/A
9.3	Transformers with primary supply plug: 1 s after the interruption of the supply the voltage between the pins do not exceed 35 V (peak) a.c. or 60 V ripple free d.c.	Max. 4V	P
	Transformers without a primary supply plug: 5 s after the interruption of the supply the voltage between the input terminals do not exceed 35 V (peak) a.c. or 60 V ripple free d.c.		N/A
	The following tests are required :		P
	If the nominal capacitance is \leq 0,1 μ F – no test is conducted.		N/A
	– 10 times switch the supply source on and off, or use a special equipment for to switch off at the most unfavourable electrical angle		P
	If the measured voltage is > 60 V ripple free d.c., the discharge must be \leq 45 μ C.		N/A
10	CHANGE OF INPUT VOLTAGE SETTING		-
	Voltage setting not possible to change without a tool		N/A
	Different rated supply voltages:		-
	– indication of voltage for which the transformer is set, is discernible on the transformer.		N/A
10.101	A wide range of the input (100 V a. c, to 240 V a.c voltage is allowed (IEC 61558-2-16:09):		P
	– if the output voltages does not exceed the rated output voltage and		P
	– if the no-load voltage does not exceed the limits of output voltage deviation		P
11	OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD		-
11.1	Difference from rated value (without rectifier; with rectifier):	(see appended table)	P
	a) inherently short-circuit proof transformers with one rated output voltage for output voltage: a.c. \pm 10% ; d.c. \pm 15%		N/A
	b) inherently short-circuit proof transformers with one more than 1 rated output voltage for highest output voltage: a.c. \pm 10%; d.c. \pm 15%		N/A
	c) idem for other output voltages: a.c. \pm 15%; d.c. \pm 20%		N/A
	d) other transformers for output voltages: a.c. \pm 5%; d.c. \pm 10%	Non-inherently short-circuit proof transformer	P

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Clause	Requirement + Test	Result - Remark	Verdict
12	NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)		-
	Remark: with rectifier measuring on both sides of the rectifier		N/A
12.101	The no load output voltage shall not exceed (IEC 61558-2-16:09):		-
	– For SMPS incorporating separating or auto-transformers: 1000V a.c. or 1415 V ripple free d.c.		N/A
	– For SMPS including isolating transformers: 500 V a.c. or 708 V ripple-free d.c.		N/A
	– For SMPS including safety isolating transformers: 50 V a.c. or 120 V ripple-free d.c.		P
	For independent transformers, this output voltage limitation applies even when output windings, not for interconnection, are connected in series		N/A
12.202	The difference between output voltage at no load and the output voltage measured in clause 11 does not exceed the values of table 101 (IEC 61558-2-16:09)		P
12.103	Unless otherwise specified by the manufacturer, SMPS with high frequency output rating shall be tested with 20 cm to 200 cm length of wire connected to the output terminals under the most unfavourable conditions. Two twisted wires or cables rated 60227 IEC 53 may be used. The cross sectional area of the conductors shall be determined according to the rated output of the SMPS, and the current density shall not exceed 5 A/mm ² in normal use. (IEC 61558-2-16:09)		N/A
13	SHORT-CIRCUIT VOLTAGE		-
	Difference from marking for short-circuit voltage $\pm 20\%$		N/A
14	HEATING		-
14.1	General requirements		P
14.1.1	Temperature-rise test		P
	No excessive temperature in normal use		P
	The manufacturer may choose the simulated load methods according to 14.1.2.1 or 14.1.2.2 instead of the direct load method that may be applied.		N/A
	Room temperature: rated ambient temperature $t_a \pm 5^\circ\text{C}$	40 \pm 5 °C maintained	—
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings	For output cord	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Upri (V): 1,1 times rated supply voltage loaded with rated impedance – for independent transformers	(see appended table)	—
	Upri (V): 1,1 times rated supply voltage: with I sec (A), measured with rated impedance and 1,0 times of the rated supply voltage for others than independent transformers		—
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings	For output cord	P
	Max. temperature windings.....: (see appended table)		P
	– Class A: ≤ 100 °C		N/A
	– Class E: ≤ 115 °C		N/A
	– Class B: ≤ 120 °C		P
	– Class F: ≤ 140 °C		N/A
	– Class H: ≤ 165 °C		N/A
	– other classes		N/A
	Temperature of external enclosures of stationary transformers:		-
	– bare metal: ≤ 65 °C		N/A
	– metal covered by lac or varnish		N/A
	– other material: ≤ 80 °C		N/A
	Temperature of external enclosure of stationary transformer ≤ 85 °C (not touchable with the IEC test finger)		N/A
	Temperature of external enclosures, handles, etc. of portable transformers:		-
	– continuously held parts of metal: ≤ 48 °C		N/A
	– continuously held parts of other material: ≤ 48 °C		N/A
	– not continuously held parts of metal: ≤ 60 °C		N/A
	– not continuously held parts of other material: ≤ 80 °C		P
	Temperature of terminals for external conductors ≤ 70 °C		N/A
	Temperature of terminals of switches ≤ 70 °C		N/A
	Temperature of internal and external wiring:		-
	– rubber: ≤ 65 °C		N/A
	– PVC: ≤ 70 °C		N/A
	Temperature of parts where safety can be affected:		-
	– rubber: ≤ 75 °C		M/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– phenol-formaldehyde: ≤ 105 °C		N/A
	– urea-formaldehyde: ≤ 85 °C		N/A
	– impregnated paper and fabric: ≤ 85 °C		N/A
	– impregnated wood: ≤ 85 °C		N/A
	– PVC, polystyrene and similar thermoplastic material: ≤ 65 °C		N/A
	– varnished cambric: ≤ 75 °C		N/A
	Temperature rise of supports ≤ 85 °C	(see appended table)	P
	Temperature of printed boards:	(see appended table)	-
	– bonded with phenol-formaldehyde: ≤ 105 °C		P
	– melamine-formaldehyde: ≤ 105 °C		N/A
	– phenol-furfural: ≤ 105 °C		N/A
	– polyester: ≤ 105 °C		P
	– bonded with epoxy: ≤ 140 °C		N/A
	Electric strength between input and output windings (18.3, 1 min); test voltage (V)	4200 V	P
14.101	Winding temperature measured by thermocouples at the surface of the winding (IEC 61558-2-16:09)		P
	– if the internal frequencies is > 1kHz		P
	– the values of Table 2 for windings temperatures are reduced by 10°C		P
14.2	Application of 14.1 or 14.3 according to the insulation system		P
14.2.1	Class of insulation system (classified materials according to IEC 60 085 and IEC 60 216)	Class B	P
14.2.2	No classified material, or system but the measured temperature does not exceed the value of Class A		N/A
14.2.3	No classified material or system but the measured temperature exceeds the value for Class A, the live parts of the transformers are submitted to the test of 14.3		N/A
14.3	Accelerated ageing test for undeclared class of insulation system		N/A
14.3.1	General		N/A
	Cycling test (10 cycles):		-
	– measuring of the no-load input current (mA)		N/A
14.3.2	– heat run (temperature in table 4)		N/A
14.3.3	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
14.3.4	– moisture treatment (48 h, 17.2)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
14.3.5	Measurements and tests at the beginning and after each test:		-
	– deviation of the no-load input current, measured at the beginning of the test is 30%		N/A
	– insulation resistance acc. cl.18.1 and 18.2		N/A
	– electric strength, no breakdown (18.3 and 18.4); 2 min; test voltage 35% of specified value		N/A
	– Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A
15	SHORT-CIRCUIT AND OVERLOAD PROTECTION		-
15.1	General requirements		P
15.1.1	Short circuit and overload test method		P
	Tests direct after 14.1 at the same t_a and without changing position.	(see appended table)	P
	Supply voltage between 0,9 times and 1,1 times of the rated supply voltage	(see appended table)	—
	Transformer with rectifier tests of 15.2 and 15.3 at the input and the output terminals of the rectifier.		P
	Transformers with more than one output winding or tapping, all windings tested with normal load, the winding with the highest temperature is short circuited.		N/A
	Winding protected inherently (15.2)		-
	– Max. temperature of winding protected inherently (insulation class): $\leq 150\text{ °C}$ (A); $\leq 165\text{ °C}$ (E); $\leq 175\text{ °C}$ (B); $\leq 190\text{ °C}$ (F); $\leq 210\text{ °C}$ (H)		N/A
	Winding protected by protective device:		-
	– Test according 15.3.2 - 15.3.3 – 15.3.4: max. temperature of winding during the time required or the time T given in table 6 (insulation class): $\leq 200\text{ °C}$ (A); $\leq 215\text{ °C}$ (E); $\leq 225\text{ °C}$ (B); $\leq 240\text{ °C}$ (F); $\leq 260\text{ °C}$ (H)		N/A
	– Test according 15.3.1: max. temperature of winding during the first hour, peak value (insulation class): $\leq 200\text{ °C}$ (A); $\leq 215\text{ °C}$ (E); $\leq 225\text{ °C}$ (B); $\leq 240\text{ °C}$ (F); $\leq 260\text{ °C}$ (H)	Protected immediately, no higher temperature than temperature-rise test.	P
	– Test according 15.3.1: max. temperature of winding after first hour, peak value (insulation class): $\leq 175\text{ °C}$ (A); $\leq 190\text{ °C}$ (E); $\leq 200\text{ °C}$ (B); $\leq 215\text{ °C}$ (F); $\leq 235\text{ °C}$ (H)	Protected immediately, no higher temperature than temperature-rise test.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	– Test according 15.3.1: max. temperature of winding after first hour, arithmetic mean value (insulation class): ≤ 150 °C (A); ≤ 165 °C (E); ≤ 175 °C (B); ≤ 190 °C (F); ≤ 210 °C (H)	Protected immediately, no higher temperature than temperature-rise test.	P
	– Test according 15.3.5: max. temperature of winding (insulation class): ≤ 175 °C (A); ≤ 190 °C (E); ≤ 200 °C (B); ≤ 215 °C (F); ≤ 235 °C (H)	≤200°C (B)	P
	Max. temperature of external enclosures (accessible by test finger) ≤ 105 °C		P
	Max. temperature of insulation of wiring (rubber and PVC) ≤ 85 °C		P
	Temperature rise of supports ≤ 105 °C		P
15.1.2	Alternative short circuit and overload test method		N/A
15.2	For inherently short-circuit proof transformers and for transformers with rectifiers test by short circuit of the output winding at rated supply voltage x 1,1: temperature rises ≤ values in table 5		N/A
15.3	For non-inherently short-circuit proof transformers and for transformers with rectifiers: temperature rises ≤ values in table 5		P
15.3.1	Output terminals short-circuited: protection device operates, test at 0,9 ... 1,1 of the rated supply voltage	Protected by circuit	P
15.3.2	If protected by a fuse accordance with either IEC 60 269-2 or IEC 60 269-3, or a technical equivalent fuse, the transformer is loaded as in table 6.		N/A
15.3.3	If protected by a fuse accordance with either IEC 60 127(all parts) or ISO 8820(all parts), or a technical equivalent fuse, the transformer is loaded with the current as specified for the longest pre arcing time. <i>If protected by a miniature fuses in accordance to IEC 60127(all parts), 1,5 times of the rated fuse, until steady state condition (in addition)</i>		N/A
15.3.4	If protected by a circuit-breaker according to IEC 60 898(all parts) the transformer is loaded with a current equal to 1,45 times the value of the circuit-breaker rated current		N/A
15.3.5	If other overload protection than a fuse (IEC 60 127) or a circuit-breaker (IEC 60269) test with 0,95 times of operating current	Protected by circuit before fuse operated, lowest protection current: 5.7A	P
	If an internal weak point is used, the test must be repeated with two new samples. The two additional samples works similar to the first sample. Temperatures in the limit of table 5		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
15.4	For non-short-circuit proof transformers: temperature rises \leq values in table 5, tests as indicated in 15.3		N/A
15.5	For fail-safe transformers:		N/A
15.5.1	Three additional new specimens are used		—
	– Upri (V): 1,1 times rated supply voltage		—
	– Isec (A): 1,5 times rated output current		—
	– time until steady-state conditions t1 (h)		—
	– time until failure t2 (h): \leq t1; \leq 5 h		—
15.5.2	During the test:		-
	– no flames, molten material, etc.		N/A
	– temperature of enclosure \leq 175 °C		N/A
	– temperature of plywood support \leq 125 °C		N/A
	After the test:		-
	– electric strength (Cl. 18, 1 min, test voltage: 35% of specified value); no flashover or break-down for primary-to-secondary only for safety isolating, isolating and separating transformer and for primary-to-body for all kinds of transformer		N/A
	– bare hazardous live parts not accessible by test finger through holes of enclosure		N/A
15.101	Electronic circuits of the SMPS fulfil the requirements of Annex H of part 1 . After a fault: no electric shock, no fire hazard and no unintentional operation.	(Details see Annex H)	P
16	MECHANICAL STRENGTH		-
16.1	General		P
	After tests of 16.2, 16.3 and 16.4		-
	– no damage		P
	– hazardous live parts not accessible by test pin according to 9.2.2		P
	– no damage for insulating barriers		P
	– handles, levers, etc. have not moved on shafts	No such parts	N/A
16.2	Stationary transformers		P
	3 blows, impact energy 0,5 \pm 0,05 J		P
16.3	Portable transformers (except of direct plug in transformers)		P
	For portable transformers: 100 falls, 25 mm		P

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Clause	Requirement + Test	Result - Remark	Verdict
16.4	Portable transformers provided with integral pins for introduction in socket outlets of the fixed wiring		N/A
16.4.1	General requirements		N/A
	Portable transformers with integral pins for introduction into fixed socket-outlets shall have adequate mechanical strength.		N/A
	Plug in power supply units with integral main plug complying with IEC TR 60083, without plugs complying with EN 50075 (IEC plug type C) shall be tested:		-
	a) plug-in transformers: tumbling barrel test: 50 x ≤ 250 g; 25 x > 250 g		N/A
	b) torque test of the plug pins with 0,4 Nm		N/A
	c) pull force according to table 7 for each pin		N/A
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		N/A
	a) The test is carried in a tumbling barrel as described in IEC 60068-2-31.		N/A
	- 1000 x ≤ 100 g; 100 g < 500 x ≤ 200 g; 200 g < 100 x		N/A
	- pull force according to IEC 60884-1:2002, 24.10 for each pin		N/A
	b) torque test of the plug pins with 0,4 Nm		N/A
16.5	Additional requirements for transformers to be used in vehicles and railway applications		N/A
16.5.1	Transformers to be used in vehicles and railway applications		N/A
	An test according IEC 61373 shall be performed with conditions of Table 8 and Table 9 and the frequency values depending on the weight of the specimen are defined in Table 10		N/A
16.5.2	Test requirements for the transportation of transformers		N/A
	Shock and vibration testing requirements for transformers subjected to while being transported per IEC 60721-3-2 with conditions according to Table 11 and Figure 8.		N/A
17	PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE		-
17.1	Degree of protection (IP code marked on the transformer)	IP20	P
17.1.1	General requirements		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Test according to 17.1.2 and for other IP ratings test according to IEC 60 529:		-
	- stable operating temperature before starting the test for < IPX8		N/A
	- the water for the test shall be at a temperature of 15±10°C		N/A
	- transformer mounted and wired as in normal use		P
	- fixed transformer mounted as in normal use by the tests according to 17.1.2 A to J		N/A
	- portable transformers placed in the most unfavourable position and wired as in normal use		P
	- glands tightened with a torque equal to two-thirds of 25.6	No protection against ingress of water	N/A
	After the tests:		-
	- dielectric strength test according to 18.3		P
	Inspection:		-
	a) no access with hazardous-live-parts or hazardous moving parts with the relevant test probe according to the test described in 17.1.2, items A 1), B 1) and C 1). The test finger may penetrate but the stop face (ø 50 x 20 mm) shall not pass through the openings for the number 2 of the first characteristic numeral	No opening	P
	b) no entry into the transformer enclosure by the relevant test probe for solid-object-proof transformers according to test described in 17.1.2, items A 2) and B 2). The protection is satisfactory if the full diameter of the probe does not pass through any openings;	No opening	P
	c) no deposit of talcum powder in dust-proof transformers	Not dust-proof transformer	N/A
	d) no deposit of talcum powder inside dust-tight transformers	Not dust-tight transformer	N/A
	e) no trace of water on live parts except SELV parts below 15 V ac or 25 V dc or insulation if hazard for the user or surroundings no reduction of creepage distances	No protection against ingress of water	N/A
	f) no accumulation of water in transformers IPX1 so as to impair safety	No protection against ingress of water	N/A
	g) no trace of water entered in any part of water-tight transformer	No protection against ingress of water	N/A
17.1.2	Tests on transformers with enclosure:		-
	A) Solid-object-proof transformers:		-

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Clause	Requirement + Test	Result - Remark	Verdict
	- 2 IP2X test finger (IEC 60 529) and test pin (fig. 3)	IP20	P
	- rigid sphere		P
	B) Solid-object-proof transformers:		-
	- IP3X, wire 2,5 mm; force 3 N		N/A
	- IP4X, wire 1 mm; force 1 N		N/A
	C) Dust-proof transformers, IP5X;		N/A
	1) At every possible point with a probe according to test probe D of B 1).		N/A
	2) dust chamber according to IEC 60 529, fig. 2:		-
	a) transformer has operating temperature		N/A
	b) transformer, still operating, is placed in the dust chamber		N/A
	c) the door of the dust chamber is closed		N/A
	d) fan/blower is switched on		N/A
	e) after 1 min transformer is switched off for cooling time of 3 h		N/A
	D) Dust-tight transformers (IP6X) test according to C)		N/A
	E) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min		N/A
	F) Rain-proof transformers (IPX2) test according to fig. 3 of IEC 60 529 for 10 min in operation, any angle up to 15°		N/A
	G) Spray proofed transformers (IPX3) test according to fig. 4 of IEC 60 529 for 10 min in operation and 10 min switched off, time for complete oscillation (2 x 120°) is 4 sec.		N/A
	H) Splash-proof transformers (IPX4) test according to fig. 4 of IEC 60 529 (see F) for 10 min in operation and 10 min switched off (the tube shall oscillate ≈360 °)		N/A
	I) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)		N/A
	J) Powerful Jet-proof transformer (IPX6) test according to fig. 6 of IEC 60 529 (nozzle 12 mm)		N/A
	K) Watertight transformers (IPX7)		N/A
	L) Pressure watertight transformers (IPX8)		N/A
17.2	After moisture test (48 h for ≤ IP20, 168 h for other transformers):	48 h	P

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Clause	Requirement + Test	Result - Remark	Verdict
	– insulation resistance and electric strength (Cl. 18)		P
18	INSULATION RESISTANCE AND ELECTRIC STRENGTH		-
18.2	Insulation resistance between:		-
	– live parts and body for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	– live parts and body for reinforced insulation $\geq 7 \text{ M}\Omega$		P
	– input circuits and output circuits for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	– input circuits and output circuits for double or reinforced insulation $\geq 5 \text{ M}\Omega$		P
	– each input circuit and all other input circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	– each output circuit and all other output circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) $\geq 2 \text{ M}\Omega$		P
	– body and metal parts with basic insulation (Class II transformers) $\geq 5 \text{ M}\Omega$		N/A
	– metal foil in contact with inner and outer surfaces of enclosures $\geq 7 \text{ M}\Omega$		P
18.3	Electric strength test (1 min): no flashover or breakdown:		-
	Overvoltage category : OVC II		P
	1) functional insulation; working voltage (V); test voltage (V) :	(see appended table)	P
	2) basic insulation; working voltage (V); test voltage (V)	(see appended table)	P
	3) supplementary insulation; working voltage (V); test voltage (V)		P
	4) double or reinforced insulation:	(see appended table)	P
	5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V) (IEC 61558-2-16:09)		N/A
18.3.1	A partial discharge test according to IEC 60664-1, (see test description below) shall be performed, if FIW wires or TIW wires are used and if the recurring peak working voltage U_t across the insulation is greater than 750 V. The relevant recurring peak voltage is the maximum measured voltage between the input and the output circuit, if the secondary side is earthed. The measuring shall be done at 1,0 of the maximum rated input voltage.		N/A
18.4	Does not apply (IEC 61558-2-16:09)		P

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Clause	Requirement + Test	Result - Remark	Verdict
18.101	Impulse test according Table F5 of IEC 60664-1 with 1,2/50 μ s (IEC 61558-2-16)		P
	– After the test of 18.3, 10 impulses of each polarity between input and output terminals	4923 V at sea level	P
	– During the tests no breakdown of the insulation between turns of a winding, between input and output circuits, or between windings and any conductive core		P
18.102 (A1)	Partial discharge tests according to IEC 60664-1, if the working voltage is > 750 V peak		N/A
	Partial discharge is \leq 10 pC at time P2 See Fig. 19.101		N/A
18.5	Touch current and protective earthing conductor current		P
18.5.1	General		P
18.5.2	Touch current		P
	Touch current measured after the clause 14 test (hot) for class I and class II transformers (class II transformers with metal foil at the plastic surface). The test circuit according figure 10. Measuring network according Figure J.1 (Annex J). If the frequency is >30kHz, measuring across the 500 Ohm resistor of J.1 (burn effects).		P
	Measurement of the touch current with switch p in both positions and in combination with switches e and n. The measured values are less than the required values of table 15.		P
	– switches n and e in on position		P
	– switch n: off and switch e: on		P
	– switch n: on and switch e: off		P
18.5.3	Protective earthing conductor current		P
	The transformer is connected as in clause 14 Impedance of the ammeter < 0,5 Ohm, connected between earthing terminal of the transformer and protective earthing conductor		P
	The measured values are less than the required values of table 15.		P
19	CONSTRUCTION		-
19.1	General construction		P
19.1.1	General		P
19.1.2	Auto-transformers		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.2.1	For plug connected auto-transformers with rated input voltage > rated output voltage, the potential to earth shall not exceed the rated output voltage.		N/A
19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction is given with the information, that the transformer shall not be used with non-polarised plug and socket outlet system.		N/A
19.1.2.3	A polarity detecting device only energises the output in the case: output potential to earth \leq rated output voltage, also with reversed input plug.		N/A
	– The contact separation of the device is \geq 3mm		N/A
	– A current to earth does not exceed 0,75 mA.		N/A
	– All tests are repeated under fault conditions of H.3.3 of annex H of part 1. The potential to earth does not exceed the max output voltage for more than 5 s.		N/A
19.1.3	Separating transformers		N/A
19.1.3.1	Input and output circuits electrically separated.		N/A
19.1.3.2	The insulation between input and output winding(s) consist of basic insulation		N/A
	Class I SMPS		N/A
	– Insulation between input windings and body consist of basic insulation		N/A
	– Insulation between output windings and body consist of basic insulation		N/A
	Class II SMPS		N/A
	– Insulation between input windings and body consist of double or reinforced insulation		N/A
	– Insulation between output windings and body consist of double or reinforced insulation		N/A
19.1.3.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation		N/A
	For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation.		N/A
19.1.3.4	Parts of output circuits may be connected to protective earthing		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.3.5	No direct contact between output circuits and the body, unless:		N/A
	– Allowed for associated transformers by the equipment standard		N/A
19.1.4	Isolating transformers and safety isolating transformers		P
19.1.4.1	Input and output circuits electrically separated		P
	No possibility of any connection between these circuits		P
19.1.4.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.4.4)		P
	Class I transformers not intended for connection to the mains by a plug:		—
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the input voltage		N/A
	– Insulation between output windings and body, connected to earth consist of basic insulation rated for the output voltage		N/A
	Class I transformers intended for connection to the mains by a plug:		N/A
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the working voltage		N/A
	– Insulation between output windings and body, connected to earth consist of supplementary insulation rated for the working voltage		N/A
	Class II transformers		-
	– Insulation between input windings and body consist of double or reinforced insulation rated to the input voltage		P
	– Insulation between output windings and body consist of double or reinforced insulation, rated to the output voltage		P
19.1.4.3	For transformers with intermediate conductive parts not connected to the body (between input/output):		P
19.1.4.3.1	For class I and class II transformers the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> For class II transformers the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (rated to the input voltage and output voltage), for SELV circuits only basic insulation is required. 		P
	<ul style="list-style-type: none"> For transformers, different from independent, the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage. 		N/A
19.1.4.3.2	Class I transformers with earthed core, and not allowed for class II equipment		N/A
	<ul style="list-style-type: none"> Insulation between the input winding and the earthed core: basic insulation rated for the input voltage 		N/A
	<ul style="list-style-type: none"> Insulation between the output winding and the earthed core: basic insulation rated for the output voltage 		N/A
19.1.4.3.3	Insulation between : input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation		N/A
	<ul style="list-style-type: none"> If the insulation from input or output to the intermediate metal part is less than basic insulation, the part is considered to be connected to input or output. 		P
19.1.4.4	For class I transformers, with protective screen, not connected to the mains by a plug the following conditions comply:		N/A
	<ul style="list-style-type: none"> The insulation between input winding and protective screen consist of basic insulation (rated for the input voltage) 		N/A
	<ul style="list-style-type: none"> The insulation between output winding and protective screen consist of basic insulation (rated for the output voltage) 		N/A
	<ul style="list-style-type: none"> The protective screen consist of metal foil or a wire wound screen extending the full width of the windings and has no gaps or holes 		N/A
	<ul style="list-style-type: none"> Where the protective screen does not cover the entire width of the input winding, additional insulation to ensure double insulation in this area, is used. 		N/A
	<ul style="list-style-type: none"> If the protective screen is made by a foil, the turns are isolated, overlap at least 3 mm 		N/A
	<ul style="list-style-type: none"> The cross-section of the screen and the lead out wire is at least corresponding to the rated current of the overload protective device 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– The lead out wire is soldered or fixed to the protective screen.		N/A
	Protective screening is not allowed for transformers with plug connection to the mains		N/A
19.1.4.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled.	19.8 is fulfilled	N/A
19.1.4.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard)		P
19.1.4.7	The distance between input and output terminals for the connection of external wiring is ≥ 25 mm		N/A
19.1.4.8	Portable transformers having an rated output ≤ 630 VA shall be class II.		P
19.1.4.9	No connection between output circuit and body except of associated transformers (allowed by equipment standard)		P
19.1.4.10	Protective screening is not allowed for transformers with plug connection to the mains		N/A
19.2	Fiercely burning material not used		P
	Unimpregnated cotton, silk, paper and fibrous material not used as insulation		P
	Wax-impregnated, etc. not used		P
19.3	Portable transformer: short-circuit proof or fail-safe		P
19.4	Class II transformers: contact between accessible metal parts and conduits or metal sheaths of supply wiring impossible		N/A
19.5	Class II transformers: part of supplementary or reinforced insulation, during reassembly after routine servicing not omitted	No routine servicing, enclosure fixed by ultrasonic welding	N/A
19.6	Class I and II transformers: creepage distances and clearances over supplementary or reinforced insulation if wire, screw, nut, etc. become loose or fall out of position not $< 50\%$ specified values (Cl. 26)	Internal wires are soldered on PCB, glue as supplementary fixing method	P
19.7	Conductive parts connected to accessible metal parts by resistors or capacitors shall be separated from hazardous live parts by double or reinforced insulation	See 19.8	P
19.8	Resistors or capacitors connected between hazardous live parts and the body (accessible metal parts) consist of:		-
	– components according to IEC 60 065, 14.2 or capacitor Y2 according to IEC 60 384-14	Two certified Y capacitor used in series	P
	– at least two separate components		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– if one component is short-circuited or opened, values specified in Cl. 9 shall not be exceeded		P
	– if the working voltage is ≤ 250 V, one Y1 capacitor according 60384-14 is allowed		N/A
	– For a working voltage above 250 V AC and not exceeding 500 V AC and an overvoltage category III, two Y1 capacitors are required.		N/A
19.9	Insulation material input/output and supplementary insulation of rubber resistant to ageing	No such material	N/A
	Creepage distances (if cracks) \geq specified values (Cl. 26)		N/A
19.10	Protection against accidental contact by insulating coating:	No such coating	N/A
	a) ageing test (IEC 60068-2-14), test Ba: 168 h; 70 °C		N/A
	b) impact test (spring-operated impact hammer according to IEC 60 068-2-75; $0,5 \pm 0,05$ J)		N/A
	c) scratch test (hardened steel pin) electric strength test according to Cl. 18		N/A
19.11	Handles, levers, knobs, etc.:	No such parts	N/A
	– insulating material		N/A
	– supplementary insulation covering		N/A
	– separated from shafts or fixing by supplementary insulation		N/A
19.12	Windings construction		P
19.12.1	Undue displacement in all types of transformers not allowed:		-
	– of input or output windings or turns thereof	Fixed by bobbin and insulation tape	P
	– of internal wiring or wires for external connection		P
	– of parts of windings or of internal wiring in case of rupture or loosening		P
19.12.2	Serrated tape:		-
	– distance through insulation according to table 22		N/A
	– one additional layer of serrated tape, and		N/A
	– one additional layer without serration		N/A
	– in case of cheekless bobbins the end turns of each layer shall be prevented from being displaced		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.12.3	Insulated windings wires providing basic, supplementary or reinforced insulation, meet the following requirements:		-
	<ul style="list-style-type: none"> Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K 	Certified	P
	<ul style="list-style-type: none"> Basic insulation: two wrapped or one extruded wire 		N/A
	<ul style="list-style-type: none"> Supplementary insulation: two layers, wrapped or extruded 		N/A
	<ul style="list-style-type: none"> Reinforced insulation: three layers wrapped or extruded 	Approval triple insulated wire used in secondary winding of transformer (T1).	P
	Spirally wrapped insulation:		-
	<ul style="list-style-type: none"> creepage distances between wrapped layers > cl. 26 _ P1 values 		N/A
	<ul style="list-style-type: none"> path between wrapped layers sealed, the test voltage of K2 is multiplied with 1,35 		N/A
	<ul style="list-style-type: none"> test 26.2.4 – Test A, passed for wrapped layers 		N/A
	<ul style="list-style-type: none"> the finished component pass the electric strength test according to cl. 18.3 		N/A
a)	Insulated winding wire used for basic or supplementary insulation in a wound part:		-
	<ul style="list-style-type: none"> comply with annex K 		N/A
	<ul style="list-style-type: none"> two layers for supplementary insulation 		N/A
	<ul style="list-style-type: none"> one layer for basic insulation 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation between the insulated wires of primary and secondary. This layer fulfils the requirement of basic insulation. 		N/A
b)	Insulated winding wire used for reinforced insulation in a wound part:		-
	<ul style="list-style-type: none"> comply with annex K 	Certified triple insulated wire used	P
	<ul style="list-style-type: none"> three layers 		P
	<ul style="list-style-type: none"> relevant dielectric strength test of 18.3 		P
	Where the insulated winding wire is wound:		-
	<ul style="list-style-type: none"> upon metal or ferrite cores 		P
	<ul style="list-style-type: none"> upon enamelled wire 		P
	<ul style="list-style-type: none"> under enamelled wire 		P

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> one layer for mechanical separation between the insulated wires and the core or the enamelled wires is required. This layer fulfils the requirement of basic insulation. 		P
	<ul style="list-style-type: none"> both windings shall not touch each other and also not the core. 		P
	100 % routine test of Annex K3 of part 1 is fulfilled		N/A
	no creepage distances and clearances for insulated winding wires		P
c)	Toroidal cores used with TIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		-
	1) a coating which fulfils the requirements of basic insulation between a winding and the core		N/A
	2) The primary winding consists of TIW wire with 3 layers (reinforced insulation) and the secondary winding consists of enamelled wire. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire with 3 layers and the secondary winding consists of a TIW wire with 1 layer (requirements for primary and secondary windings can be changed). This construction also is allowed for use with EE-cores or similar.		N/A
d)	Toroidal cores used with FIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		-
	1) a coating, which fulfil the requirements of basic insulation.		N/A
	2) The primary winding consists of FIW wire for reinforced insulation and the secondary winding consist of FIW wire – of basic insulation. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength test for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding and the secondary winding consist of FIW wire for reinforced insulation. This construction also is allowed to use for EE-core or similar.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
e)	Toroidal cores used with TIW in combination with FIW wire, for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		-
	1) a coating, which fulfils the requirements of basic insulation.		N/A
	2) The primary winding consists of FIW wire for reinforced insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for reinforced insulation (3 layer) and the secondary winding consists of FIW wire for reinforced insulation. This construction also is allowed for use with EE-cores or similar.		N/A
f)	Toroidal cores used with TIW in combination with FIW wire, for basic insulation between the primary and secondary circuits shall comply with the following:		-
	1) a coating, which fulfils the requirements of basic insulation		N/A
	2) The primary winding consists of FIW wire for basic insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfils the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for supplementary insulation (2 layers) and the secondary winding consists of FIW wire for basic insulation. This construction also is allowed for use with EE-cores or similar.		N/A
	4) Further polyfilar constructions with FIW and TIW wires in combination with enamelled wires for basic insulation only: 4.1) Primary winding consists of enamelled wire, secondary winding consists of FIW wire for reinforced insulation 4.2) Primary winding consists of enamelled wire, secondary winding consists of TIW wire for reinforced insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.12.3.1	Max. class F for transformers which use FIW-wire		N/A
19.12.3.2	FIW wires comply with IEC 60851-5:2008, IEC 60317-0-7 and IEC 60317-56.		N/A
	<ul style="list-style-type: none"> other nominal diameter as mentioned in table 24 can be calculated with the Formula (6) in 26.3.5: 		N/A
	FIW wire used for basic or supplementary insulation for transformers according 19.1.3:		-
	<ul style="list-style-type: none"> the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation 		N/A
	<ul style="list-style-type: none"> between FIW and enamelled wire, no requirements of creepage distances and clearances 		N/A
	<ul style="list-style-type: none"> no touch of FIW and enamelled wires 		N/A
	FIW wire used for double or reinforced insulation for transformers according 19.1.4:		-
	<ul style="list-style-type: none"> the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24 		N/A
	<ul style="list-style-type: none"> for primary and secondary winding FIW-wire for basic insulation is used 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation 		N/A
	<ul style="list-style-type: none"> no touch between the basic insulated PRI and SEC FIW-wires 		N/A
	<ul style="list-style-type: none"> between PRI- and SEC-FIW wires, no requirements of creepage distances and clearances 		N/A
	Alternative construction used for reinforced insulation (reinforced insulated FIW wire and enamelled wire)		N/A
	<ul style="list-style-type: none"> the test voltage of table 14, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 24 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> one layer for mechanical separation is located between the reinforced insulated FIW wire and the enamelled wire. This layer fulfil the requirement of basic insulation 		N/A
	<ul style="list-style-type: none"> no touch between the FIW wire and the enamelled wire 		N/A
	<ul style="list-style-type: none"> between the reinforced FIW wire and any other parts, no requirements of creepage distances and clearances exist 		N/A
	Alternative construction with FIW wires, basic or supplementary insulated for transformers with double or reinforced insulation:		-
	<ul style="list-style-type: none"> the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24 		N/A
	<ul style="list-style-type: none"> PRI or SEC basic insulated FIW wire and to the other winding (enamelled wire) requirements of supplementary insulation 		N/A
	<ul style="list-style-type: none"> creepage distances and clearances between the basic insulated FIW wire and the enamelled wire for basic or supplementary insulation are required. 		N/A
	Where the FIW wire is wound		N/A
	<ul style="list-style-type: none"> upon metal or ferrite cores 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation between the insulated wires and the core or the enamelled wires is required. This layer fulfils the requirement of basic insulation. 		N/A
	<ul style="list-style-type: none"> both windings shall not touch each other and also not the core. 		N/A
19.13	Handles, operating levers and the like shall be fixed	No such parts	N/A
19.14	Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool	Enclosure is secured together by ultrasonic welding and screws	P
19.15	Transformer with pins for fixed socket-outlets: no strain on socket-outlet		N/A
	Additional torque $\leq 0,25$ Nm		N/A
19.16	Portable transformers for use in irregular or harsh conditions		N/A
	Portable transformers having a weight not exceeding 18 kg shall have a protection index IPX4 or higher.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.17	Transformers IPX1 - IPX6 totally enclosed, except for drain hole (diameter \geq 5 mm or 20 mm ² with width \geq 3 mm); drain hole not required for transformer completely filled with insulating materials		N/A
19.18	Transformers > IPX1 with a moulded-on plug, if any		N/A
19.19	Class I transformers with a non-detachable flexible cable or cord with earth conductor and a plug with earth contact		N/A
19.20	Live parts of SELV and PELV-circuits: separation not less than PRI/SEC of a safety isolating transformer		P
	– SELV output circuits separated by double or reinforced insulation from all other than SELV or PELV circuits		P
	– SELV output circuits separated by basic insulation from other SELV or PELV circuits		N/A
19.20.1	SELV circuits and parts not connected to protective earth, to live parts, or protective conductors forming part of other circuits		P
	Nominal voltage (V) > 25 V a.c. or 60 V d.c., the required insulation fulfils the high voltage test according to table 8 a		N/A
19.20.2	PELV-circuits double or reinforced insulation is necessary		P
19.21	FELV-circuits: protection against contact fulfils the min. test voltage required for the primary circuit		N/A
19.22	Class II transformers shall not be provided with means for protective earth		P
	For fixed transformers an earth conductor with double or reinforced insulation to accessible metal parts is allowed		N/A
19.23	Class III transformers shall not be provided with means for protective earth		N/A
20	COMPONENTS		-
20.1	Components such as switches, plugs, fuses, lamp holders, flexible cables and cords, comply with relevant IEC standard		P
	Components inside the transformer pass all tests of this standard together with the transformer tests		P
	Testing of components separately to the transformer according the relevant standard:		-

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Clause	Requirement + Test	Result - Remark	Verdict
	– Ratings of the component in line with the transformer ratings, including inrush current. Component test according the component standard, based on the component marking (rating).		P
	– Components without markings tested under transformer conditions including inrush current.		P
	– If no IEC standard exists, the component is tested under transformer conditions.		P
20.2	Appliance couplers for main supply shall comply with:		-
	– IEC 60 320 for IPX0		P
	– 60320-2-3 or IEC 60 309 for other		N/A
20.3	Automatic controls shall comply with IEC 60 730-1		N/A
20.4	Thermal-links comply with IEC 60691		N/A
20.5	Switches shall comply with annex F		N/A
	Disconnection from the supply:		-
	– by a switch, disconnecting all poles of the supply (full disconnection under the relevant overvoltage category		N/A
	– or a flexible supply cable and cord with plug		N/A
	– or an instruction sheet: disconnection by all-poles switches incorporated in fixed wiring		N/A
20.6	Socket-outlets of the output circuit shall be such that there is no unsafe compatibility to plugs complying with input circuit.		P
	Plugs and socket-outlets for SELV systems with both a rated current = 3A and a rated voltage =24 V shall comply with following:		N/A
	SELV plug and socket-outlets shall comply with IEC 60 884-2-4 and IEC 60 906-3	For models with output exceeding 3A or 72 W	P
	– It is not possible for plugs to enter socket-outlets of other standardised voltage system	For models with output not exceeding 3A or 72 W	P
	– Socket outlets do not accommodate plugs of other standardised voltage systems		P
	– Socket outlets do not have a protective earth contact		P
	PELV plug and socket-outlets shall comply with following:		-
	– It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	– Socket outlets do not accommodate plugs of other standardised voltage systems		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– Socket outlets do not have a protective earth contact		N/A
	FELV plug and socket-outlets shall comply with following:		-
	– It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	– Socket outlets do not accommodate plugs of other standardised voltage systems		N/A
20.7	Thermal cut-outs, overload releases etc. have adequate breaking capacity	No thermal cut-out	P
	– Thermal cut outs fulfil the relevant requirements of 20.8 and 20.9		N/A
	– Thermal links fulfil the relevant requirements of 20.9		N/A
	– The breaking capacity is in accordance with the relevant fuse standard		N/A
20.7.1	For Fuses According IEC 60127 and IEC 60269, the fuse current does not exceed 1,1 times of the rated value		P
20.8	Thermal cut outs shall meet the requirements of 20.8.1.1 and 20.8.2, or 20.8.1.2 and 20.8.2.		N/A
20.8.1	Requirements according to IEC 60730-1		N/A
20.8.1.1	Thermal cut-out tested as component shall comply with IEC 60 730-1		N/A
	a) Thermal cut outs type 1 or type 2 (see 6.4 of IEC 60730-1:2013)		N/A
	b) Thermal cut outs fulfil the requirements of micro-interruption (type 1.C or 2.C) or micro-disconnection, (type 1.B or 2.B) (see IEC 60730-1:2013)		N/A
	c) Thermal cut outs with manual reset have a trip free mechanism (type 1.E and 2.E) (see IEC 60730-1:2013)		N/A
	d) The number of cycles of automatic action shall be:		N/A
	– 3000 cycles for self-resetting thermal cut-outs		N/A
	– 300 cycles for non-self-resetting thermal cut-outs resetting by hand		N/A
	– 300 cycles for non-self-resetting thermal cut-outs resetting disconnecting		N/A
	– 30 cycles for non-self-resetting thermal cut-outs which are only resettable by a tool		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	e) Thermal cut outs fulfil the electrical stress according 6.14.2 of IEC 60730-1:2013		N/A
	f) Characteristic of thermal cut-outs:		N/A
	– ratings according IEC 60730-1:2013, cl. 5		N/A
	– classification according to:		N/A
	1) nature of supply to IEC 60730-1:2013, cl. 6.1		N/A
	2) type of load controlled to IEC 60730-1, cl. 6.2		N/A
	3) degree of protection IPX0 to IEC 60730-1:2013, cl. 6.5.1		N/A
	4) degree of protection IP0X to IEC 60730-1:2013, cl. 6.5.2		N/A
	5) pollution degree to IEC 60730-1:2013, cl. 6.5.3		N/A
	6) comparative tracking index to IEC 60730-1:2013, cl. 6.13		N/A
	7) max. ambient temperature to IEC 60730-1:2013, cl. 6.7		N/A
20.8.1.2	Thermal cut-out tested as a part of the transformer, test with 3 samples:		-
	– at least micro-interruption or micro-disconnection (IEC 60730-1:2013)		N/A
	– 300 h aged at t_a (transformer) + 10°C		N/A
	– subjected to a number of cycles for automatic operating according 20.8.1.1		N/A
	During the test no sustaining arcing shall occur, during and after the test no damage at the thermal cut out and the transformer in the sense of this standard		N/A
20.8.2	Thermal cut-outs shall have adequate breaking capacity		-
20.8.2.1	The output of the transformer with a non-self-resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage. After opening of the cut off, the supply voltage is switched of, until the transformer is cooling down.		N/A
	– 3 cycles at 25° C for transformers without t_{amin}		N/A
	– 3 cycles at t_{amin} for transformers with t_{amin}		N/A
	– after the 3 cycles short circuit of the output at 1,1 of rated supply voltage for 48 h.		N/A
	During the tests no sustaining arcing shall occur After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
20.8.2.2	The output of the transformer with a self-resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage.		N/A
	– 48 h at 25° C for transformers without t_{amin}		N/A
	– 24 h at t_a and 24 h at t_{amin} for transformers with t_{amin}		N/A
	During the tests no sustaining arcing shall occur After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.8.3	Test of a PTC resistor:		-
	5 cycles: transformer short-circuited for 48 h by 1,1 times of the input voltage and max. t_a		N/A
	5 cycles: transformer short-circuited for 48 h by 0,9 times of the input voltage and min. t_a (if declared)		N/A
	After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.9	Thermal links shall be tested in one of the following two ways.		-
20.9.1	Thermal-links shall comply with IEC 60 691 as a separate component.		N/A
	– electrical conditions to IEC 60691, cl. 6.1		N/A
	– thermal conditions to IEC 60691, cl. 6.2		N/A
	– ratings to IEC 60691, cl. 8 b		N/A
	– suitability of sealing components, impregnating fluids or cleaning solvents IEC 60691, cl. 8 c		N/A
20.9.2	Thermal-links tested as a part of the transformer:		-
	– ageing test 300 h by 35 °C or $t_a + 10$ °C		N/A
	– After transformer fault condition the thermal link operate without sustaining arcing		N/A
	– after opening the thermal-link shall have an insulation resistance of at least 0,2 M Ω		N/A
	– 3 cycles for replaceable thermal-links		N/A
	– 3 new specimens for not replaceable thermal-links		N/A
20.10	Self-resetting devices not used if mechanical, electrical, etc. hazards		P
20.11	Thermal cut-outs which can be reset by soldering operation are not allowed		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
20.12	Overload protection devices do not operate during test (20 times switched on and off, at no load); Upri (V): 1,1 times rated supply voltage.		P
21	INTERNAL WIRING		-
21.1	Internal wiring and electrical connections protected or enclosed		P
	Wire-ways smooth and free from sharp edges		P
21.2	Openings in sheet metal: edges rounded (radius $\geq 1,5$ mm) or bushings of insulating material	No opening	N/A
21.3	Bare conductors: distances adequately maintained		P
21.4	When external wires are connected to terminal, internal wiring shall not work loose		N/A
21.5	Insulation of heat-resistant and non-hygroscopic material for insulated conductors subject to temperature rise > limiting values given in 14.1		P
22	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS		-
22.1	All cables, flexible cords etc. shall have appropriate current and voltage ratings		P
22.2	Input and output wiring inlet and outlet openings for external wiring: separate entries without damage to protective covering of cable or cord	Output	P
	Input and output wiring inlet and outlet openings for flexible cables or cords: insulating material or bushing of insulating material		P
	Bushings for external wiring: reliably fixed, not of rubber unless part of cord guard		P
22.3	Fixed transformer:	Portable transformer	-
	– possible to connect after fixing		N/A
	– inside space for wires allow easy introduction and connection of conductors		N/A
	– fitting of cover without damage to conductors		N/A
	– contact between insulation of external supply wires and live parts of different polarity not allowed		N/A
22.4	Length of power supply cord for portable transformers:	Not provided	-
	– not exceed 2 m for cross-sectional area of 0,5 mm ²		N/A
	– exceed 2 m for cross-sectional areas greater than 0,5 mm ² .		N/A
22.5	Power supply cords for transformers IP20 or higher and transformers "for indoor use only" \geq IP20:		-

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Clause	Requirement + Test	Result - Remark	Verdict
	– for transformers with a mass ≤ 3 kg: IEC 60227-5:2011 – type 60227 IEC 52 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53;		N/A
	– for transformers with a mass > 3 kg: IEC 60227-5:2011 – type 60227 IEC 53 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53.		N/A
	Power supply cords for transformers for outdoor use: \geq IPX0: IEC 60245-4:2011 – type 60245 IEC 57		N/A
22.6	Power supply cords for single-phase portable transformers with input current ≤ 16 A:		-
	– cord set fitted with an appliance coupler in accordance with IEC 60320(all parts)		N/A
22.7	Nominal cross-sectional area (mm ²); input current (A) at rated output not less than shown in table 16		N/A
22.8	Class I transformer with power supply flexible cable: green/yellow core connected to earth terminal	For Class I models	P
	Plug for single-phase transformer with input current at rated output ≤ 16 A according to IEC 60 083, IEC 60 906-1 or IEC 60 309(all parts)		N/A
22.9	Type X, Y or Z attachments: see relevant part of IEC 61558-2.	Type Z for output wire	P
22.9.1	For type Z attachment: moulding enclosure and external flexible cable or cord do not affect insulation of cable	Cord guard used	P
22.9.2	Inlet openings or inlet bushing: without risk of damage to protective covering of external flexible cable or cord	SELV / PELV output	P
	Insulation between conductor and enclosure:		-
	– for Class I transformer: insulation of conductor plus separate basic insulation		P
	– for Class II transformer: insulation of conductor plus double or reinforced insulation		P
	The sheath of an external flexible cable or cord equivalent to at least that of a cord complying with IEC 60227 (all parts) or 60245 (all parts) is regarded as basic insulation.		N/A
	A lining or a bushing of insulating material in a metallic enclosure is only regarded as supplementary insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	An enclosure of insulating material is regarded as reinforced insulation		P
22.9.3	Inlet bushings:		-
	– no damage to external flexible cable or cord		N/A
	– reliably fixed		N/A
	– not removable without tool		N/A
	– not integral with external flexible cable or cord (for type X attachment)		N/A
	– not of natural rubber except for Class I transformer with type X, Y and Z attachments		N/A
22.9.4	For transformers which are moved while operating:		-
	– cord guards, if any, of insulating material and fixed		N/A
	Compliance is tested by the oscillating test according to fig. 12:		-
	– loaded force during the test according to fig. 12		N/A
	– 10 N for a cross-sectional area > 0,75		N/A
	– 5 N for other cords		N/A
	After the test according to fig. 12:		-
	– no short-circuit between the conductors		N/A
	– no breakage of more than 10% of strands of any conductor		N/A
	– no separation of the conductor from the terminal		N/A
	– no loosening of any cord guards		N/A
	– no damage of the cord or cord guard		N/A
	– no broken strands piercing the insulation and not becoming accessible		N/A
22.9.5	Cord anchorages for type X attachment:		-
	– glands in portable transformers not used unless possibility for clamping all types and sizes of cable		N/A
	– moulded-on designs, tying the cable into a knot and tying the end with string not allowed		N/A
	– labyrinths, if clearly how, permitted		N/A
	– replacement of cable easily possible		N/A
	– protection against strain and twisting clearly how		N/A
	– suitable for different types of cable unless only one type of cable for transformer		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– the entire flexible cable or cord with covering can be mounted into the cord anchorage		N/A
	– if tightened or loosened no damage		N/A
	– no contact between cable or cord and accessible or electrically connected clamping screws		N/A
	– cord clamped by metal screw not allowed		N/A
	– one part securely fixed to transformer		N/A
	– for Class I transformer: insulating material or insulated from metal parts		N/A
	– for Class II transformers: insulating material or supplementary insulation from metal parts		N/A
	Cord anchorages for type X, Y, Z attachments: cores of power external flexible cable or cord insulated from accessible metal parts by:		-
	– basic insulation (Class I transformers), separate insulating barrier/cord anchorage		N/A
	– supplementary insulation (Class II transformers), special lining/cable or cord sheath of cable sheath of cable		N/A
	Cord anchorages for type X and Y attachments:		-
	– replacement of external flexible cable or cord does not impair compliance with standard		N/A
	– the entire flexible cable or cord with covering can be mounted into the cord anchorage		N/A
	– if tightened or loosened no damage		N/A
	– no contact between cable or cord and accessible or electrically connected clamping screws		N/A
	– cord clamped by metal screws not allowed		N/A
	– knots in cord not used		N/A
	– labyrinths, if clearly how, permitted		N/A
	Tests for type X with special cords, type Y, type Z	Type Z attachment for output	P
	Test for type X attachments one test with a cord with smallest and one test with a cord with the largest cross-sectional area:		N/A
	– for the test with clamping screws or tightened with torque 2/3 of that specified in table 18		N/A
	– not possible to push cable into transformer		P
	– 25 pulls of 1 s		P
	– 1 min torque according to table 17		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– mass (kg); pull (N); torque (Nm)	Mass < 1 kg, 30 N, 0.1 Nm	—
	– during test: cable not damaged		P
	– after test: longitudinal displacement ≤ 2 mm for cable or cord and ≤ 1 mm for conductors in terminals		P
	– creepage distances and clearances ≥ values specified in Cl. 26		P
22.9.6	Space for external cords or cable for fixed wiring and for type X and Y attachments:	Type Z attachment	-
	– before fitting cover, possibility to check correct connection and position of conductors		N/A
	– cover fitted without damage to supply cords		N/A
	– for portable transformers: contact with accessible metal parts if conductor becomes loose not allowed unless for type X and Y attachments terminations of cords do not slip free of conductor		N/A
	Space for external cords or cable for type X attachment and for connection to fixed wiring, in addition:		-
	– conductor easily introduced and connected		N/A
	– possibility of access to terminal for external conductor after removal of covers without special purpose tool		N/A
23	TERMINALS FOR EXTERNAL CONDUCTORS		-
23.1	Transformer for connection to fixed wiring and transformer without power supply cords with type Y and Z attachments: only connections by screws, nuts, terminals	Type Z attachment for output wire	P
	Terminals are integral part of the transformer:		-
	– comply with IEC 60 999-1 under transformer conditions		N/A
	Other terminals:		-
	– separately checked according to IEC 60 998-2-1, IEC 60 998-2-2 or IEC 60 947-7-1		N/A
	– used in accordance with their marking		N/A
	– checked according to IEC 60 999-1 under transformer conditions		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Transformer with type X attachments: soldered connection permitted if reliance not placed upon soldering, crimping or welding alone unless by barriers, creepage distances and clearances between hazardous live parts and other conductive part cannot be reduced to less than 50% of specified value (Cl.26) should conductor break away		N/A
	Transformer with type Y and Z attachments for external conductors: soldered, welded, crimped, etc. connections allowed		P
	For Class II transformer: reliance not placed upon soldering, crimping or welding alone unless by barriers, creepage distances and clearances between hazardous live parts and other conductive parts cannot be reduced to less than 50% of specified value (Cl.26) should conductor break away		P
23.2	Terminals for type X with special cords Y and Z attachments shall be suitable for their purpose:	Type Z attachment	-
	– test by inspection according to 23.1 and 23.2		P
	– pull of 5 N to the connection before test according to 14.1		P
23.3	Other terminals than Y and Z attachments shall be so fixed that when the clamping means is tightened or loosened:		-
	– terminal does not work loose		N/A
	– internal wiring is not subjected to stress		N/A
	– creepage distances and clearance are not reduced below the values specified in Cl. 26		N/A
23.4	Other terminals than Y and Z attachments shall be so designed that:		-
	– they clamp the conductor between metallic surfaces with sufficient contact pressure		N/A
	– without damage to the conductor		N/A
	– test by inspection according to 23.3 and 23.4		N/A
	– 10 times fastening and loosening a conductor with the largest cross-sectional area with 2/3 of the torque specified in Cl. 25		N/A
23.5	Terminals for fixed wiring and for type X: located near their associated terminals of different polarities and the earth terminal if any		N/A
23.6	Terminal blocks not accessible without the aid of a tool		N/A
23.7	Transformer with type X attachments: stranded conductor test (8 mm removed):		-

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Clause	Requirement + Test	Result - Remark	Verdict
	– Class I transformers: no connection between live parts and accessible metal parts		N/A
	– free wire of earth terminal: no touching of live parts		N/A
	– Class II transformers: no connection between live parts and accessible metal parts, no connection between live parts and metal parts separated from accessible metal parts by supplementary insulation		N/A
23.8	Terminals for a current > 25 A:		-
	– pressure plate, or		N/A
	– two clamping screws		N/A
23.9	When terminal, other than protective earth conductor, screws loosened as far as possible, no contact:		-
	– between terminal screws and accessible metal parts		N/A
	– between terminal screws and accessible metal parts separated only by basic or supplementary insulation for Class II transformers		N/A
24	PROVISION FOR PROTECTIVE EARTHING		-
24.1	Class I transformers: accessible conductive parts connected to earth terminal		P
	Class II transformers: no provision for protective earth		P
24.2	Protective earth terminal for connection to fixed wiring and for type X attachment transformers: comply with Cl. 23, adequately locked, not possible to loosen without a tool	Approved appliance inlet	N/A
24.3	No risk of corrosion from contact between metal of earth terminal and other terminal		P
	In case of earth terminal body of Al, no risk of corrosion from contact between Cu and Al	Not such earth terminal	N/A
	Body of earth terminal or screws/nuts of brass or other metal resistant to corrosion		N/A
24.4	Resistance of connection between earth terminal and metal parts $0,1\Omega$ with a min. 25 A or 1,5 times rated input current at 1 min	For Class I models	P
24.5	Class I transformers with external flexible cables or cords:		-
	– current-carrying conductors becoming touch before the earth conductor		N/A
25	SCREWS AND CONNECTIONS		-

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Clause	Requirement + Test	Result - Remark	Verdict
25.1	Screwed connections withstand mechanical stresses	No such screws	N/A
	Screws transmitting contact pressure or likely to be tightened by the user or having a diameter < 2,8 mm, shall screw into metal		N/A
	Screws not of metal which is soft or liable to creep (Zn, Al)		N/A
	Screws of insulating material: not used for electrical connection		N/A
	Screws not of insulating material if their replacement by metal screws can impair supplementary or reinforced insulation		N/A
	Screws to be removed (replacement etc. of power supply cord) not of insulating material if their replacement by metal screws can impair basic insulation		N/A
	No damage after torque test: diameter (mm); torque (Nm); ten times		N/A
	No damage after torque test: diameter (mm); torque (Nm); five times		N/A
25.2	Screws in engagement with thread of insulating material:		-
	– length of engagement 3 mm + 1/3 screw diameter or 8 mm whichever is shorter		N/A
	– correct introduction into screw hole		N/A
25.3	Electrical connections: contact pressure not transmitted through insulating material		P
25.4	In case of use of thread-forming (sheet metal) screws for connection of current-carrying parts: clamping and locking means provided		N/A
	Thread-cutting (self-tapping) screws used for the connection of current-carrying parts allowed if they generate a full form machine screw thread and if not operated by the user		N/A
	Thread-cutting screws and thread-forming screws used for earth continuity allowed if at least 2 screws for each connection are used and it is not necessary to disturb the connection in normal use		N/A
25.5	Screws for current-carrying mechanical connections locked against loosening		N/A
	Rivets for current-carrying connections subject to torsion locked against loosening		N/A
25.6	Test of screwed glands with a torque according table 19. After the test no damage at the transformer and the gland.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
26	CREEPAGE DISTANCES AND CLEARANCES		-
26.2	Creepage distances (cr) and clearances (cr)		P
26.2.1	General		P
26.2.2	Windings covered with adhesive tape	No such construction	N/A
	– the values of pollution degree 1 are fulfilled		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	– test A of 26.2.4 is fulfilled		N/A
26.2.3	Uncemented insulating parts pollution degree P2 or P3	P2	P
	– all isolating material are classified acc. to IEC 60085 and IEC 60216(all parts)		P
	– values of pollution degree 1 are not applicable		P
26.2.4	Cemented insulating parts	No such parts	N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	– values of distance through insulation (dti) are fulfilled		N/A
	– creepage distances and clearances are not required		N/A
	– test A of this sub clause is fulfilled		N/A
	Test A		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, with uninsulated wires, without impregnation or potting		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1		N/A
26.2.5	Enclosed parts, by impregnation or potting		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
26.2.5.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	Test B		N/A
	– thermal class		N/A
	– test voltage of 500 V or the working voltage		N/A
	– Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint.		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,25		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007– see Annex R of IEC 61558-1		N/A
26.2.5.2	– The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	Test C		N/A
	– thermal class		N/A
	– test voltage of 500 V or the working voltage		N/A
	– Test with three specimens, potted or impregnated. (finished components)		N/A
	– Neither cracks, nor voids in the insulating compounds		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The three spacemen pass the Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1		N/A
26.3	Distance through insulation		P
26.3.1	For supplementary, double or reinforced insulation, the required values of Tables 22 are fulfilled		P
	The insulation fulfil the material classification according IEC 60085 and 60216(all parts) or the test of 14.3		P
26.3.2	Reduced values of the thickness of insulation for supplementary or reinforced insulation are allowed if the following conditions are fulfilled:		-
	– the isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	– the test of 14.3 is fulfilled		N/A
	– If both requirements are fulfilled, the required values for solid insulation can be multiplied by 0,4		N/A
	– Minimum thickness of reinforced insulation $\geq 0,2$ mm		N/A
	– Minimum thickness of supplementary insulation $\geq 0,1$ mm		N/A
26.3.3	Insulation in thin sheet form		P
	– If the layers are non-separable (glued together):		N/A
	– The requirement of 3 layers is fulfilled		N/A
	– The mandrel test according 26.3.4 is fulfilled with 150 ± 10 N		N/A
	– The required values for d.t.i. of thin layers in Tables 22 is fulfilled.		N/A
	– If the layers are separated:		P
	– The requirement of 2 layers is fulfilled		P
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.4 is fulfilled on each layer with 50 ± 5 N		P
	– The required values for d.t.i. of thin layers in Tale 22 is fulfilled.		P
	– If the layers are separated (alternative):		N/A
	– The requirement of 3 layers is fulfilled		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.4 is fulfilled on 2/3 of the layers with 100±5 N		N/A
	– The required values for d.t.i. of thin layers in Tale 22 is fulfilled.		N/A
	Test according to 14.3 and if the isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts) no distances through insulation are required for insulation in thin sheet form		N/A
	The values for thin layers are used for insulation in thin sheet form as follows:		-
	– rated output > 100 VA values for thin layers apply		N/A
	– rated output 25 VA 100 VA 2/3 of the values for thin layers apply		P
	– rated output _ 25 VA 1/3 of the values for thin layers apply		N/A
26.3.4	Mandrel test of insulation in thin sheet form (specimen of 70±0,5 mm width are necessary):		-
	– If the layers are non-separable – at least 3 layers glued together fulfil the test:		N/A
	– pull force of 150±10 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
	– If the layers are separable and 2/3 of at least 3 layers fulfil the test.		N/A
	– pull force of 100±5 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.		N/A
	– If the layers are separable 1 of at least 2 layers fulfil the test:		P
	– pull force of 50±5 N		P
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		P
26.3.5	For transformers with FIW wires		N/A
	– thermal cycles		N/A
	– test voltage of 500 V or the working voltage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– Test with three specimens		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 immediately at the end of the last cycle with high temperature		N/A
	The partial discharge test shall be done at the end of the cycling test at normal room temperature as performed in 18.3.1.		N/A
	The values of allowed voltage strength for other FIW dimensions than defined in Table 24 are calculated		N/A
26.101	Creepage distances, clearances and distances through insulation, specified values according to (IEC 61558-2-16:09):		-
	– table 13, material group IIIa (part 1)		P
	– table C, material group II (part 1)		N/A
	– table D, material group I (part 1)		N/A
	– working voltage		P
	– rated supply frequency 50/60 Hz		P
	– rated internal frequency	>60 K Hz	-
	1. Insulation between input and output circuits (basic insulation):		N/A
	a) measured values \geq specified values (mm)		N/A
	2. Insulation between input and output circuits (double or reinforced insulation):		-
	a) measured values \geq specified values (mm)	(see appended table)	P
	b) measured values \geq specified values (mm)		N/A
	c) measured values \geq specified values (mm)		N/A
	3. Insulation between adjacent input circuits: measured values \geq specified values (mm) :		N/A
	Insulation between adjacent output circuits: measured values \geq specified values (mm) . :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	4. Insulation between terminals for external connection:		N/A
	a) measured values \geq specified values (mm)		N/A
	b) measured values \geq specified values (mm)		N/A
	c) measured values \geq specified values (mm)		N/A
	5. Basic or supplementary insulation:		-
	a) measured values \geq specified values (mm)	(see appended table)	P
	b) measured values \geq specified values (mm)		N/A
	c) measured values \geq specified values (mm)		N/A
	d) measured values \geq specified values (mm)	(see appended table)	P
	e) measured values \geq specified values (mm)	(see appended table)	P
	6. Reinforced or double insulation: measured values specified values (mm)	(see appended table)	P
	7. Distance through insulation:		-
	a) measured values \geq specified values (mm)		N/A
	b) measured values \geq specified values (mm)	(see appended table)	P
	c) measured values specified values (mm)	(see appended table)	P
26.102	Values of IEC 61558-2-16 applicable for frequency up to 3 MHz (IEC 61558-2-16:09)		P
	For frequency above 3 MHz clause 7 of IEC 60664-4 is applicable (high frequency testing)		N/A
26.103	Clearance (IEC 61558-2-16:09)		-
	a) Clearance for frequency \geq 30 kHz according figure 101 two determinations are necessary:	>60 kHz	P
	– determination based on peak working voltage according Table 104 :	The value found less than required of IEC 61558-1, value of IEC 61558-1 applicable	N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Double or reinforced insulation: required / measured value		N/A
	– and alternative if applicable for approximately homogeneous field according to Table 102	The value found less than required of IEC 61558-1, value of IEC 61558-1 applicable	N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		P
	The minimum clearance is the greater of the two values.		P
	b) Clearance for frequency ≤ 30 kHz according figure 101 two determinations are necessary:		P
	– determination based on peak working voltage with recurring peak voltages according Table 103 :		P
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		P
	The minimum clearance is the greater of the two values.		P
26.104	The working voltages of Table 102, 103 and 104 are peak voltages including μ sec peaks (IEC 61558-2-16:09)		P
	The working voltage according to Table 13 of part 1 are r.m.s. voltages		P
26.105	Creepage distances		-
	Two determinations of creepage distances are necessary (see Figure 102)		P
	– determination based on measured peak working voltage according Tables 105 to 110		P
	Peak working voltage		P
	Pollution degree	2	P
	Basic or supplementary insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		P
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		P

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Clause	Requirement + Test	Result - Remark	Verdict
	If the values based on table 105 to 110 are lower than the relevant values in Tables 13, C.1 or D.1, the higher values shall be applicable		P
26.106	Distance through insulation (IEC 61558-2-16:09)		-
	Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:		-
	– the max. frequency is < 10 MHz		N/A
	– the field strength approximately comply with Figure 103		N/A
	– no voids or gaps are present in between the solid insulation		N/A
	For thick layers $d1 \geq 0,75$ the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers $d2 \leq 30 \mu\text{m}$ the peak value of the field strength is ≤ 10 kV/mm		N/A
	For $d1 > d > d2$ equation (1) is used for calculation the field strength		N/A
26.107 (A1)	For transformers with FIW wires the following test is required		N/A
	<ul style="list-style-type: none"> 10 cycles are required 		N/A
	<ul style="list-style-type: none"> 68 h test at max heating temperature + 10°C or test at max. allowed winding temperature based on the insulation class (required in table 1) + 10°C 		N/A
	<ul style="list-style-type: none"> 1 h at 25° C 		N/A
	<ul style="list-style-type: none"> 2 h at 0° C 		N/A
	<ul style="list-style-type: none"> 1 h at 25° C – (next cycle start again with 68 h max winding temp + 10) 		N/A
	<ul style="list-style-type: none"> during the 10 cycles test 2 x working voltage is connected between PRI and SEC 		N/A
	<ul style="list-style-type: none"> after 10 cycle test 2 transformers are subjected to the 17.2 test for 48 h and direct after the 48 h the dielectric strength test of 18.3 (100 % test voltage) is done 		N/A
	<ul style="list-style-type: none"> after the 10 cycle test the third sample is tested at the end of the last cycle in the hot position with the dielectric strength test of 18.3 (100 % test voltage) 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> the partial discharge test according to 18.101 is done after the cycling test and after the high voltage test, if the peak working voltage is >750 V 		N/A
27	RESISTANCE TO HEAT, FIRE AND TRACKING		-
27.1	General		P
27.2	Resistance to heat		P
27.2.1	All insulating parts are resistant to heat		P
	For parts of rubber, which passed the test of 19.9, no additional test is required.		N/A
	The tests are not required for cables and small connectors with a rated current ≤ 3 A, a rated voltage ≤ 24 V a.c. or 60 V d.c. and a power ≤ 72 W		N/A
27.2.2	External accessible parts		P
	The Ball-pressure test -: diameter of impression ≤ 2 mm; heating cabinet temperature ($^{\circ}$ C) at 70 ± 2 $^{\circ}$ C or the temperature T of 14.1 ($T + 15 \pm 2$) - is fulfilled.		P
27.2.3	Internal parts		P
	For insulating material retaining current carrying parts in position , the ball-pressure test -: diameter of impression ≤ 2 mm; heating cabinet temperature ($^{\circ}$ C) at 125 ± 2 $^{\circ}$ C or the temperature T of 14.1 ($T + 15 \pm 2$) - is fulfilled		P
27.3	Resistance to abnormal heat under fault conditions	Switch mode power supply	N/A
27.4	Resistance to fire		-
27.4.1	All isolating parts of the transformer shall be resistant to ignition and spread of fire. The test according to IEC 60695-2-10 is required		P
27.4.2	External accessible parts (glow wire tests)		P
	– 650 $^{\circ}$ C for enclosures	Enclosure	P
	– 650 $^{\circ}$ C for parts retaining current carrying parts in position and terminals for external conductors Current $\leq 0,2$ A		N/A
	– 750 $^{\circ}$ C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current > 0,2 A		N/A
	– 850 $^{\circ}$ C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current > 0,2 A		N/A
27.4.3	Internal parts		-
	– 550 $^{\circ}$ C for internal insulating material – not retaining current carrying parts in position		N/A





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Clause	Requirement + Test	Result - Remark	Verdict
	– 650 °C for coil formers (bobbins)	See below	P
	– 650 °C for parts retaining current carrying parts in position and terminals for external conductors. Current $\leq 0,2$ A		N/A
	– 750 °C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current $> 0,2$ A	Bobbin	P
	– 850 °C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current $> 0,2$ A		N/A
27.5	For IP other than IPX0: If insulating parts retaining current carrying parts in position and under P3 conditions, the material resistance to tracking is at least material of group IIIb	IP20	N/A
	Material group IIIb ($100 \leq CTI \leq 175$) is not recommended for application in pollution degree 3 above 630V		N/A
	Test (175 V): no flashover or breakdown before 50 drops		N/A
28	RESISTANCE TO RUSTING		-
	Ferrous parts protected against rusting		N/A
E	ANNEX E , GLOW WIRE TEST		
E.1	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		P
E.2	The requirements of 8.2, “Test temperatures” of IEC 60695-2-11:2014, apply with the temperature stated in 27.4 of IEC 61558-1		P
E.3	Clause 7, “Conditioning”, of IEC 60695-2-11:2014 apply, preconditioning is required		P
E.4	Clause 8, “Test procedure”, of IEC 60695-2-11:2014 apply, The tip of the glow wire is applied to the flat side of the surface.		P
F	ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER		-
F.2	Manually operated mechanical switches, tested as separate component, shall comply with IEC 61058:2016 under the conditions of F.2.		N/A
F.3	Manually operated mechanical switches tested as part of the transformer shall comply with the conditions specified under F.3		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
H	ANNEX H, ELECTRONIC CIRCUITS (IEC 61558-1)		-
H.1	For transformers including electronic circuits, the following requirements apply additionally to Clauses 5, 15, 26. This annex is not required for associated transformers		P
H.2	General notes on tests (addition to clause 5)		P
H.3	SHORT-CIRCUIT AND OVERLOAD PROTECTION (ADDITION TO CLAUSE 15)		-
H.3.1	Circuits designed and applied so that fault conditions do not render the appliance unsafe		P
	During and after each test:		-
	– temperatures do not exceed values specified in table 5		P
	– transformer complies with conditions specified in sub-clause 15.1		P
	If a conductor of a pcb becomes open circuited, the transformer is considered to have withstood the particular test, provided that all six conditions as specified are met		N/A
H.3.2	Fault conditions a) to f) of sub-clause H.3.3 are not tested if the following conditions are met:		-
	– electronic circuit is a low-power circuit as specified		N/A
	– safety of the appliance as specified does not rely on correct functioning of the electronic circuit		N/A
H.3.3	Fault conditions tested as specified when relevant:		-
	a) short-circuit of creepage distances and clearances, if less than specified in Cl. 26		P
	b) open circuit at the terminals of any component		P
	c) short-circuit of capacitors, unless they comply with IEC 60 384-14		P
	d) short-circuit of any two terminals of an electronic component as specified		P
	e) any failure of an integrated circuit as specified		P
	f) low-power circuit: low-power points are connected to the supply source		N/A
	Cl. 15 is repeated with a simulated fault as indicated in a) to e), if the transformer incorporates an electronic circuit to ensure compliance with Cl. 15		P
	Fault condition e) is applied for encapsulated and similar components		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	PTC's and NTC's are not short-circuited if they are used as specified		N/A
H.3.4	If for a fuse-link complying with IEC 60 127-3 rated fuse current I1 is used, current I2 is measured as specified:		-
	– if $I2 < 2,1 \times I1$ test of 15.8 is repeated with fuse-link short-circuited		N/A
	– if $I2 > 2,75 \times I1$, no other tests are necessary		P
	If $I2 > 2,1 \times I1$ and $I2 < 2,75 \times I1$ test of 15.8 is repeated as specified		N/A
	For fuses other than those complying with IEC 60 127-3, the test is carried out as specified 15.3.2 to 15.3.5		N/A
H.4	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION		-
H.4.1	For live parts separated by basic insulation smaller cr and cl as in 26 are allowed, if H.3 is fulfilled.		N/A
	In optocouplers no requirements of cr and cl		P
	For coatings annex W applies. Smaller distances as required in IEC 60664-3:2016, clause 4 are applicable,		N/A
	For potted transformers cycling tests acc, 26.2. are applicable		N/A
H.4.2	The max. surface temperature of optocouplers is 50 K		N/A
K	ANNEX K, INSULATED WINDING WIRES		-
K.1	Wire construction:	Certified triple insulated winding wire is used.	-
	<ul style="list-style-type: none"> insulated winding wire for basic or supplementary insulation (see 19.12.3) 		N/A
	<ul style="list-style-type: none"> insulated winding wire for reinforced insulation (see 19.12.3) 		N/A
	<ul style="list-style-type: none"> solid circular winding wires and stranded winding wires with 0,05 to 5 mm diameter 		N/A
	<ul style="list-style-type: none"> spirally wrapped insulation – overlapping 		N/A
K.2	Type tests		N/A
K.2.1	General Tests between ambient temperature between 15° C and 35° C and at an humidity between 25% and 75 %		N/A
K.2.2	Electric strength test		N/A
K.2.2.1	Solid circular winding wires and stranded winding wires		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test samples prepared according to clause 4.4.1 of IEC 60851-5:2008 (twisted pair)		N/A
	Dielectric strength test: 6 kV for reinforced insulation		N/A
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
K.2.2.2	Square or rectangular wires .		N/A
	Test samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
K.2.3	Flexibility and adherence		N/A
	Claus 5.1 in Test 8 of IEC 60851-3:2009 shall be used		N/A
	Test samples prepared according to clause 5.1.1.4 of IEC 60851-3:2009		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
	Mandrel diameter according table K.1		N/A
	The tension to the wire during winding on mandrel is 118 N/mm ² (118 MPa)		N/A
K.2.4	Heat shock		N/A
	Test samples prepared according to 3.2.1 (in Test 9) of IEC 60851-6:2012		N/A
	<ul style="list-style-type: none"> high voltage test immediately after this test 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 5,5 kV for reinforced insulation 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 2,75 kV for basic or supplementary insulation 		N/A
K.2.5	Retention of dielectric strength after bending (test as specified under test 13 of 4.6.1 c) of IEC 60 851-5)		N/A
	<ul style="list-style-type: none"> high voltage test immediately after this test 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 5,5 kV for reinforced insulation 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 2,75 kV for basic or supplementary insulation 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
K.3	Testing during manufacturing		N/A
K.3.1	General Tests as subjected in K.3.2 and K.3.3		N/A
K.3.2	Routine test		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 4,2 kV for reinforced insulation 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 2,1 kV for basic or supplementary insulation 		N/A
K.3.3	Sampling test		N/A
K.3.3.1	Solid circular winding wires and stranded winding wires		N/A
	Test with a twisted pair, prepared according clause 4.4.1 of IEC 60851-5:2008		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 6 kV for reinforced insulation 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 3 kV for basic or supplementary insulation 		N/A
K.3.3.2	Square or rectangular wire		N/A
	Samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 5,5 kV for reinforced insulation 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 3 kV for basic or supplementary insulation 		N/A

V	ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS		-
Figure V.1	Restored by manual operation  IEC 489/98		N/A
Figure V.2	Restored by disconnection of the supply  IEC 490/98		N/A
Figure V.3	Thermal link  IEC 491/98		N/A
Figure V.4	Self-resetting thermal cut-out  IEC 492/98		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

11 and 12		TABLE: OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD; NO-LOAD OUTPUT VOLTAGE				P
Clause		11		12		
type/rated output/	rated voltage (V)	sec. voltage (V)	delta Usec (%)	Usec V no-load output (V)	delta Usec no-load output (%)	further information
GTM961005P-100PD-USBCP-T3A/ 100W	5.0	4.913 / 4.906	-1.77 / -1.91	4.975 / 4.975	1.26 / 1.40	Input voltage: 100V / 240V, 50 Hz
	5.0	4.893 / 4.917	-2.18 / -1.68	4.974 / 4.974	1.65 / 1.15	Input voltage: 100V / 240V, 60 Hz
	9.0	8.933 / 8.939	-0.75 / -0.68	9.004 / 9.004	0.79 / 0.72	Input voltage: 100V / 240V, 50 Hz
	9.0	8.929 / 8.933	-0.79 / -0.75	9.005 / 9.005	0.85 / 0.80	Input voltage: 100V / 240V, 60 Hz
	12.0	11.937 / 11.928	-0.52 / -0.60	12.016 / 12.015	0.66 / 0.72	Input voltage: 100V / 240V, 50 Hz
	12.0	11.938 / 11.941	-0.52 / -0.49	12.014 / 12.016	0.63 / 0.63	Input voltage: 100V / 240V, 60 Hz
	15.0	14.916 / 14.922	-0.56 / -0.52	15.008 / 15.013	0.61 / 0.61	Input voltage: 100V / 240V, 50 Hz
	15.0	14.933 / 14.933	-0.45 / -0.49	15.015 / 15.013	0.55 / 0.53	Input voltage: 100V / 240V, 60 Hz
	15.1	15.046 / 15.036	-0.36 / -0.42	15.112 / 15.114	0.44 / 0.52	Input voltage: 100V / 240V, 50 Hz
	15.1	15.034 / 15.030	-0.44 / -0.46	15.114 / 15.114	0.53 / 0.56	Input voltage: 100V / 240V, 60 Hz
	20.0	19.93 / 19.94	-0.35 / -0.30	20.02 / 20.03	0.45 / 0.45	Input voltage: 100V / 240V, 50 Hz
	20.0	19.94 / 19.94	-0.30 / -0.30	20.02 / 20.02	0.40 / 0.40	Input voltage: 100V / 240V, 60 Hz
	21.0	20.55 / 20.55	-2.19 / -2.19	21.25 / 21.26	3.40 / 3.45	Input voltage: 100V / 240V, 50 Hz
21.0	20.55 / 20.55	-2.19 / -2.19	21.25 / 21.25	3.40 / 3.40	Input voltage: 100V / 240V, 60 Hz	

14	TABLE: Heating Test			P
	Supply voltage (V)	90	264	—
	Ambient (°C)	24.0 / Shift to 40	24.0 / Shift to 40	—

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Clause	Requirement + Test				Result - Remark		Verdict
Maximum measured temperature T of part/at	T (°C)				Max. temperature limit, (°C)		
	24.0	Shift to 40	24.0	Shift to 40			
Appliance inlet	54.3	70.3	48.6	64.4	75		
MOV	63.4	79.4	52.7	68.7	105		
X capacitor	74.9	90.9	62.3	78.3	100		
Inductor LF2	86.4	102.4	66.8	82.8	110		
Inductor L1	91.9	107.9	72.2	88.2	110		
Insulation tube	80.4	96.4	71.4	87.4	125		
E-cap C4	87.3	103.3	77.0	93.0	105		
Inductor L2	86.2	102.2	72.2	88.2	110		
Winding of transformer	91.5	107.5	82.7	98.7	110		
Bobbin of transformer	87.1	103.1	77.9	93.9	110		
Y1 capacitor	82.1	98.1	74.7	90.7	125		
Optocoupler	79.4	95.4	73.5	89.5	110		
PCB material	85.6	101.6	76.7	92.7	130		
E-cap C27	85.0	101.0	82.1	98.1	105		
Rectifier bridge	81.0	97.0	66.8	82.8	105		
Internal enclosure	78.6	94.6	71.9	87.9	120		
Output wire	41.8	57.8	41.1	57.1	75		
Surface of plastic enclosure	58.6	74.6	56.4	72.4	80		
Wooden support	57.7	73.7	55.1	71.1	85		
Supplementary information: Ta: 40°C The max. limit temperature is listed below: Transformer(T1) winding class B → Tmax =120°C-10°C=110°C (Thermocouple is mounted on surface of transformer)							
Temperature T of winding:	t ₁ (°C)	R ₁ (Ω)	t ₂ (°C)	R ₂ (Ω)	T (°C)	Allowed T _{max} (°C)	Insulation class
-	-	-	-	-	-	-	-
Supplementary information:							

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Clause	Requirement + Test					Result - Remark	Verdict
15	TABLE: SHORT-CIRCUIT AND OVERLOAD PROTECTION						P
	ambient temperature (°C) : 20						-
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information
GTM961005P-100PD-USBCP-T3A / 20 VDC, 5.0A	-	-	-	-	-	-	Tested at 90 and 264 VAC. After short-circuited, EUT shut down immediately.
Supplementary information: Short-circuit test of clause 15.3.1, the appliance protected immediately.							

15	TABLE: Short circuit and overload protection			P
	Test voltage (V) :	90		—
	Ambient (°C) :	24		—
Thermocouple Locations		max. temperature measured, (°C)	max. temperature limit, (°C)	
Primary winding of transformer		109.9	200	
Secondary winding of transformer		114.3	200	
Output wire		41.0	105	
External enclosure		76.0	105	
support		71.0	105	
Supplementary information: Test for Clause 15.3.5 Max output current: 5.7A Only the most unfavourable test result was recorded.				

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Clause	Requirement + Test	Result - Remark	Verdict

18.2	TABLE: insulation resistance measurements		P
Insulation resistance R between:	R (MΩ)	Required R (MΩ)	
Between input to the body (reinforced insulation)	>5000	7	
Between input circuits and output circuits	>5000	5	
Between primary winding and secondary winding	>5000	5	
Between core and secondary winding	>5000	5	
Supplementary information: N/A			

18.3	TABLE: Dielectric Strength		P
Test voltage applied between:	Test potential applied (V)	Breakdown / flashover (Yes/No)	
Between mains poles (fuse disconnected)	750	No	
Between input to the body (reinforced insulation)	4200	No	
Between input circuits and output circuits	4200	No	
Between primary winding and secondary winding	4200	No	
Between core and secondary winding	4200	No	
Supplementary information: N/A			

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Clause	Requirement + Test	Result - Remark	Verdict

20	TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾	
AC inlet for Class I model (C6 type)	LECI Electronics Co., Ltd.	DB-6	2.5A, 250Vac Standard sheet: C6	IEC/EN 60320-1 UL 60320-1	VDE 40032465 UL E302229	
Alt.	Rich Bay Co., Ltd.	R-30790	2.5A, 250Vac Standard sheet: C6	IEC/EN 60320-1 UL 60320-1	VDE 40030381 UL E184638	
Alt.	Sun Fair Electric Wire & Cable (HK)Co. Ltd	S-02	2.5A, 250Vac Standard sheet: C6	IEC/EN 60320-1 UL 498	VDE 40034448 UL E226643	
Alt.	TECX-UNIONS Technology Corporation	TU-333 series	2.5A, 250Vac Standard sheet: C6	IEC/EN 60320-1 UL 60320-1	ENEC-01933 UL E220004	
Alt.	Rong Feng Industrial Co., Ltd.	RF-190	2.5A, 250Vac Standard sheet: C6	IEC/EN 60320-1 UL 60320-1	VDE 40030379 UL E102641	
Alt.	ZHE JIANG BEI ER JIA ELECTRONIC CO LTD	ST-A04-001, ST-A04-002	2.5A, 250Vac Standard sheet: C6	IEC/EN 60320-1 UL 60320-1	VDE 40016045 UL E225980	
AC inlet for Class I model (C14 type)	LECI Electronics Co., Ltd.	DB-14	10A, 250Vac Standard sheet: C14	IEC/EN 60320-1 UL 60320-1	VDE 40032137 UL E302229	
Alt.	Rich Bay Co., Ltd.	R-301SN	10A, 250Vac Standard sheet: C14	IEC/EN 60320-1 UL 60320-1	VDE 40030228 UL E184638	
Alt.	Sun Fair Electric Wire & Cable (HK)Co. Ltd.	S-03	10A, 250Vac Standard sheet: C14	IEC/EN 60320-1 UL 498	VDE 40034447 UL E226643	
Alt.	TECX-UNIONS Technology Corporation	TU-301-S, TU-301-SP	10A, 250Vac Standard sheet: C14	IEC/EN 60320-1 UL 60320-1	ENEC-01898-M1 UL E220004	
Alt.	Rong Feng Industrial Co., Ltd.	SS-120	10A, 250Vac Standard sheet: C14	IEC/EN 60320-1 UL 60320-1	VDE 40028101 UL E102641	
Alt.	ZHE JIANG BEI ER JIA ELECTRONIC CO LTD	ST-A01-001L ST-A01-002L ST-A01-003J ST-A01-003K	10A, 250Vac Standard sheet: C14	IEC/EN 60320-1 UL 60320-1	VDE40013388 UL E225980	

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
20	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Appliance inlet for Class II model (C8 type)	LECI Electronics Co., Ltd.	DB-8	2.5A, 250Vac Standard sheet: C8	IEC/EN 60320-1 UL 60320-1	VDE 40032028 UL E302229
Alt.	Rich Bay Co., Ltd.	R-201SN90	2.5A, 250Vac Standard sheet: C8	IEC/EN 60320-1 UL 60320-1	VDE 40030384 UL E184638
Alt.	Sun Fair Electric Wire & Cable (HK)Co. Ltd.	S-01	2.5A, 250Vac Standard sheet: C8	IEC/EN 60320-1 UL 498	VDE 40034449 UL E226643
Alt.	TECX-UNIONS Technology Corporation	SO-222 series	2.5A, 250Vac Standard sheet: C8	IEC/EN 60320-1 UL 60320-1	ENEC-02099 UL E220004
Alt.	Rong Feng Industrial Co., Ltd.	RF-180	2.5A, 250Vac Standard sheet: C8	IEC/EN 60320-1 UL 60320-1	VDE 40030168 UL E102641
Alt	ZHE JIANG BEI ER JIA ELECTRONIC CO LTD	ST-A03-008B, ST-A03-005	2.5A, 250Vac Standard sheet: C8	IEC/EN 60320-1 UL 60320-1	ENEC-01508-M1 UL E225980
Appliance inlet for Class II model (C18 type)	Rong Feng Industrial Co., Ltd	SS-120	10A, 250V	IEC/EN 60320-1	VDE40028101
Alt.	HCR ELECTRONICS CO., LTD	SK05	10A, 250V	IEC/EN 60320-1	CB:NO69247
PCB	GUANGDE BOYA XINXIANG ELECTRONIC TECHNOLOGY CO LTD	BY-1	Min. V-0, min 1.6 mm thickness , 130°C	IEC/EN 61558-1 IEC/EN 61558-2-16 UL 796	Tested with appliance UL E475783
Alt.	SHUANG MING INDUSTRY CO LTD	T005V0, T015V0	Min. V-0, min 1.6 mm thickness, 130°C	UL 796	UL E78017

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
20	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Alt.	JIANGXI ZHONG XIN HUA ELECTRONICS INDUSTRY CO LTD	ZXH-1, ZXH-2	Min. V-0, min 1.6 mm thickness, 130°C	UL 796	UL E331298
Alt.	SHENZHEN JIA LI CHUANG TECHNOLOGY DEVELOPMENT CO LTD	JLC-1, JLC-2	Min. V-0, min 1.6 mm thickness, 130°C	UL 796	UL E479892
Alt.	Interchangeable	Interchangeable	Min. V-0, min 1.6 mm thickness, 130°C	UL 796	UL Approved.
Fuse (F1, F2) (F2 is optional for Class II models)	Conquer Electronics Co., Ltd.	MST	T3.15A, 250V	IEC/EN 60127-2 UL 248-1 UL 248-14	VDE 40017118 UL E82636
Alt.	Suzhou Walter Electronic Co., Ltd.	2010	T3.15A, 250V	IEC/EN 60127-2 UL 248-1 UL 248-14	VDE 40018781 UL E56092
Alt.	Bel Fuse Ltd.	RST	T3.15A, 250V	IEC/EN 60127-2 UL 248-1 UL 248-14	VDE 40011144 UL E20624
Alt.	Conquer Electronics Co., Ltd.	MET	T3.15A, 250V	IEC/EN 60127-2 UL 248-1 UL 248-14	VDE 40017157 UL E82636
X capacitor (CX1) (optional)	Cheng Tung Industrial Co., Ltd.	CTX	X1 or X2, AC310V, 110 °C Max. 0.47µF,	IEC/EN 60384-14 UL 60384-14	ENEC-02671 UL E193049
Alt.	Tenta Electric Industrial Co. Ltd.	MEX	X1 or X2, AC275V, 100 °C Max. 0.47µF,	IEC/EN 60384-14 UL 60384-14	VDE 119119 UL E222911
Alt.	Ultra Tech Xiphi Enterprise Co. Ltd.	HQX	X1 or X2, AC275V, 110 °C Max. 0.47µF,	IEC/EN 60384-14 UL 60384-14	VDE40024534 UL E183780

IEC 61558-2-16					
Clause	Requirement + Test			Result - Remark	Verdict
20	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Alt.	Dain Electronics Co., Ltd.	MPX, MEX, NPX	X1 or X2, AC275V, 110 °C Max. 0.47µF,	IEC/EN 60384-14 UL 60384-14	VDE 40018798 UL E147776
Alt.	Shantou High-New Technology Dev.Zone Songtian Enterprise Co., Ltd.	MPX	X1 or X2, AC275V, 110 °C Max. 0.47µF	IEC/EN 60384-14 UL 60384-14	VDE 40034679 UL E208107
Varistor (MOV1) (optional)	Xiamen Set Electronics Co.,Ltd	TFV8S471K	Max. Continuous voltage: 300Vac(rms), Min. 105°C, The coating is Min. V-0	IEC 61051-1, IEC 61051-2, IEC 61051-2-2, IEC 62368-1:2018 Annex G.8.1 and G.8.2	TUV-RH (J 50554061)
Alt.	SHANTOU HIGH-NEW TECHNOLOGY DEVELOPMNT ZONE SONGTIAN ENTERPRISE CO LTD	10D621K	Max. Continuous voltage: 385Vac(rms), Min. 125°C, The coating is Min. V-0	IEC/EN 61051-1 IEC/EN 61051-2 UL1449	VDE 40023049 UL E330837
Alt.	Guangdong Huiwan Electronics Technology Co.Ltd.	V-621K-10 DEH	Max. Continuous voltage: 385Vac(rms), Min. 125°C, The coating is Min. V-0	IEC/EN 61051-1 IEC/EN 61051-2 UL1449	VDE 40043880 UL E480104
Optocoupler (U4)	LITE-ON Technology Corporation	LTV-10xx	Ext. Cr: min. 8.0 mm; Ext. Cl: min. 8.0mm; Max. operating temp.: 115°C	IEC/EN 60747-5-5 UL 1577	VDE 138213 UL E113898

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
20	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Alt.	Everlight Electronics Co., Ltd.	EL1019	Ext. Cr: min. 8.1 mm; Ext. Cl: min. 8.1mm; Max. operating temp.: 110°C	IEC/EN 60747-5-5 UL 1577	VDE 40028391 UL E214129
Alt.	VISHAY Semiconductor GmbH	TCLT1019	Ext. Cr: min. 8.0 mm; Ext. Cl: min. 8.0mm; Max. operating temp.: 110°C	IEC/EN 60747-5-5 UL 1577	VDE 132473 UL E76222
Bleeder Resistor (R3, R3A, R4, R4A)	Various	Various	Max. 12KΩ, Min. 1/4W	IEC/EN 61558-1 IEC/EN 61558-2-16	Tested with appliance
PFC Choke (L2)	GlobTek/HAOPU WEI/HEJIA/BOAM	LF060	Min. 130°C	IEC/EN 61558-1 IEC/EN 61558-2-16	Tested with appliance
Transformer (T1)	GlobTek/HAOPUWEI/BOAM	TF131	Class B, with insulation system and critical component listed below	IEC/EN 61558-1 IEC/EN 61558-2-16	Tested with appliance
-Insulation system	GLOBTEK INC	GTX-130-TM	Class 130(B)	IEC/EN 61558-1 IEC/EN 61558-2-16 UL 1446	Tested with appliance UL E243347
-Alt.	WUXI HAOPUWEI ELECTRONICS CO LTD	ZT-130	Class 130(B)	UL 1446	UL E315275

IEC 61558-2-16					
Clause	Requirement + Test	Result - Remark			Verdict
20	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
-Alt.	SHAN DONG BOAM ELECTRIC CO LTD	BOAM-01, B1	Class 130(B)	UL 1446	UL E252329
-Primary winding	NINGBO JINTIAN NEW MATERIAL CO LTD	2UEW	MW 75C, min.130°C	IEC/EN 61558-1 IEC/EN 61558-2- 16 UL 1446	Tested with appliance UL E227047
-Alt.	SHENZHEN DAYANG INDUSTRY CO LTD	2UEW	MW75-C, Min.130°C	UL 1446	UL E176101
-Alt.	WUXI JUFENG COMPOUND LINE CO LTD	2UEW, 2UEWB	MW75#, min.130°C	UL 1446	UL E206882
-Alt.	ZHEJIANG LANGLI ELECTRIC EQUIPMENTS CO LTD	UEW	MW 79-C, min.130°C	UL 1446	UL E222214
-Alt.	JIANGSU DARTONG M&E CO.,LTD	2UEW	MW 75-C, min.130°C	UL 1446	UL E237377
-Alt.	SHANDONG SAINT ELECTRIC CO LTD	2UEW	MW75#, min.130°C	UL 1446	UL E194410
-Alt.	Interchangeable	Interchangeable	Min.130 °C	UL 1446	UL
-Triple-insulated wire (Secondary)	GREAT LEOFLON INDUSTRIAL CO LTD	TRW(B)	Min.130°C	IEC/EN 62368-1 UL 2353	Tested with appliance UL E211989
-Alt.	KBI COSMOLINK CO LTD	TIW-M	Min.130°C	UL 2353	UL E213764
-Alt.	FURUKAWA ELECTRIC CO LTD	TEX-E	Min.130°C	UL 2353	UL E206440
-Alt.	TOTOKU INC.	TIW-2	Min.130°C	UL 2353	UL E166483

IEC 61558-2-16					
Clause	Requirement + Test			Result - Remark	Verdict
20	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
-Alt.	HOI LUEN ELECTRICAL MFR CO LTD	THL-F-xx, THL-F-SB-xx,	Min.130°C	UL 2353	UL E257525
-Bobbin	CHANG CHUN PLASTICS CO LTD	T375J, T375HF	V-0, 150°C,	IEC/EN 62368-1 UL 94 UL 746 A/B/C/D	Tested with appliance UL E59481
-Alt.	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C,	UL 94 UL 746 A/B/C/D	UL E41429
-Alt.	Resonac Corporation	CP-J-8800	V-0, 150°C,	UL 94 UL 746 A/B/C/D	UL E42956
-Alt.	CHUANG CHUN PLASTICS CO LTD	4130	V-0, 150°C,	UL 94 UL 746 A/B/C/D	UL E59481
-Insulating tape	3M COMPANY	1350F-1, 1350T-1, 44	Min.130°C	IEC/EN 61558-1 IEC/EN 61558-2-16 UL 510	Tested with appliance UL E17385
-Alt.	BONDTEC PACIFIC CO LTD	370S	Min.130°C	UL 510	UL E175868
-Alt.	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PZ, CT, WF	Min.130°C	UL 510	UL E165111
-Alt.	JINGJIANG JINGYI ADHESIVE PRODUCT CO LTD	JY25-A	Min.130°C	UL 510	UL E246950
-Alt.	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-XX	Min.130°C	UL 510	UL E246820

IEC 61558-2-16					
Clause	Requirement + Test			Result - Remark	Verdict
20	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Insulating tube for earthing wire	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR, RSFR-H, RSFR-HPF, WF	600V, 125°C	IEC/EN 61558-1 IEC/EN 61558-2-16 UL 224	Tested with appliance UL E203950
Alt.	QIFURUI ELECTRONICS CO	QFR-h	600V, 125°C	UL 224	UL E225897
Alt.	DONGGUAN SALIPT CO LTD	SALIPT S-901-300, SALIPT S-901-600	Min. 300V, 125°C	UL 224	UL E209436
Alt.	GUANGZHOU KAIHENG ENTERPRISE GROUP	K-2 (+), K-2 (CB)	Min. 300V, 125°C	UL 224	UL E214175
Alt.	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-HFT CB-TT-T, CB-TT-S	Min. 300V, 125°C	UL 224	UL E180908
Enclosure	SABIC JAPAN L C	945(GG)	Min.V-0, 120°C, Min. 2.0 mm	IEC/EN 61558-1 IEC/EN 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E207780
Alt.	SABIC INNOVATIVE PLASTICS B V	945(GG)	Min.V-0, 120°C, Min. 2.0 mm	UL 94 UL 746 A/B/C/D	UL E45329
Earthing wire for Class I model	KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIES CO LTD	1815, 1015, 1007	Min. 20 AWG, Min.300V, Min. 80°C Min. VW-1	IEC/EN 61558-1 IEC/EN 61558-2-16 UL 758	Tested with appliance UL E237831
Alt.	ZHUANG SHAN CHUAN ELECTRICAL PRODUCTS (KUNSHAN) CO LTD	1815, 1015, 1007	Min. 20 AWG, Min.300V, Min. 80°C Min. VW-1	UL 758	UL E333601

IEC 61558-2-16					
Clause	Requirement + Test			Result - Remark	Verdict
20	TABLE: Critical components information				P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Alt.	Suzhou Jiahuishu Electronic Co Ltd	1815, 1015, 1007	Min. 20 AWG, Min.300V, Min. 80°C Min. VW-1	UL 758	UL E353532
Alt.	GlobTek, Inc.	1815, 1015, 1007	Min. 20 AWG, Min.300V, Min. 80°C Min. VW-1	UL 758	UL E464257
Alt.	Interchangeable	1815, 1015, 1007	Min. 20 AWG, Min.300V, Min. 80°C Min. VW-1	UL 758	UL
Y-Capacitor (CY1, CY2) (optional)	SUCCESS ELECTRONICS CO LTD	SE,	max. 2200pF min.250ac min.125°C type Y1	IEC/EN 60384-14 UL 60384-14	VDE40037211 VDE40020002 UL E114280
Alt.	SUCCESS ELECTRONICS CO LTD	SB	max. 2200pF min.250ac min.125°C type Y1	IEC/EN 60384-14 UL 60384-14	VDE40037221 VDE40020001 UL E114280
Alt.	Shantou High-New Technology Dev.Zone Songtian Enterprise Co., Ltd.	CD	max. 2200pF min.250ac min.125°C type Y1	IEC/EN 60384-14 UL 60384-14	VDE 40025754 UL E208107
Alt.	MURATA MFG CO LTD	KX	max. 2200pF min.250ac min.125°C type Y1	IEC/EN 60384-14 UL 60384-14	VDE 40002831 UL E37921
Alt.	TDK CORP	CD	max. 2200pF min.250ac min.125°C type Y1	IEC/EN 60384-14 UL 60384-14	VDE 40029780 UL E37861
Output cord	KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIES CO LTD	2725	Min. 28AWG, Min.30V, Min. 60°C Min. VW-1	IEC/EN 62368-1 UL 758	Tested with appliance UL E237831

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict

20	TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾	
Alt.	ZHUANG SHAN CHUAN ELECTRICAL PRODUCTS (KUNSHAN) CO LTD	2725	Min. 28AWG, Min.30V, Min. 60°C Min. VW-1	UL 758	UL E333601	
Alt.	Suzhou Jiahuishu Electronic Co Ltd	2725	Min. 28AWG, Min.30V, Min. 60°C Min. VW-1	UL 758	UL E353532	
Alt.	GlobTek, Inc.	2725	Min. 28AWG, Min.30V, Min. 60°C Min. VW-1	UL 758	UL E464257	
Alt.	Interchangeable	Interchangeable	Min. 28AWG, Min.30V, Min. 60°C Min. VW-1	UL 758	UL	
Inductor L1	Interchangeable	Interchangeable	Min. 130°C, 464 µH	--	--	
Inductor L2	Interchangeable	Interchangeable	Min. 130°C, 420 µH±10%	--	--	
Rectifier BD1	Interchangeable	Interchangeable	Min. 600 V, 8 A	--	--	
E-cap C4	Interchangeable	Interchangeable	Min. 450 V, 100 µF	--	--	

Supplementary information:

¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.

²⁾ License available upon request.

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict

25	TABLE: Threaded Part Torque Test			N/A
Threaded part identification	Diameter of thread (mm)	Column number (I, II, or III)	Applied torque (Nm)	
Supplementary information:				

26	TABLE: Clearance And Creepage Distance Measurements						P
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)	
BI: different polarity of PCB trace (before fuse)	339	240	1.5	3.2	2.5	3.2	
Between input to the body	339	240	3.0	9.2	5.0	9.2	
Between input circuits and output circuits (optocoupler)	339	240	3.0	8	5.0	8	
Between core and secondary winding	679.5	457.8	5.5	13.7	9.2	15.4	
Between primary circuit to ground (appliance inlet)	339	240	1.5	4	2.5	4	
Supplementary information: material group IIIa, core considered as primary.							

26	TABLE: Distance Through Insulation Measurements				P
Distance through insulation di at/of:	U r.m.s. (V)	Test voltage (V)	Required di (mm)	di (mm)	
Enclosure	240	4200	1.0	Min. 2	
Insulation tape	457.8	4200	0.4	Min. 0.5	
Supplementary information: di of insulation tape includes air distance for RI.					

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict

26.2 TEST A	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three special prepared specimens with uninsulated wires, without potting or impregnation					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

26.2 TEST B	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three specially prepared specimens with potted – P1 values are required					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

IEC 61558-2-16					
Clause	Requirement + Test	Result - Remark			Verdict
26.2 TEST C	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				N/A
	Test with three specially prepared specimens with potting (only dti is required)				
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					











26.107 61558-2- 16/A1	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				N/A
	Test for transformers, use FIW-wire				
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					








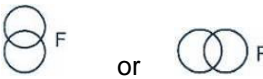


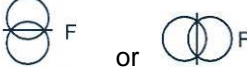
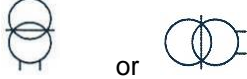
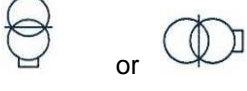


27.2	TABLE: Ball Pressure Test of Thermoplastics		P
Allowed impression diameter (mm)	≤ 2 mm		—









IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)
Enclosure	See CDF (table 20)	109.6	1.4
Bobbin	See CDF (table 20)	125	0.5
PCB	See CDF (table 20)	125	0.4
Supplementary information:			

27.4	TABLE: Resistance to heat and fire - Glow wire tests									P
Object/ Part No./ Material	Manufacturer / trademark	Glow wire test (GWT); (°C)								Verdict
		550		650		750		850		
		t _E	t _A	t _E	t _A	t _E	t _A	t _E	t _A	
Enclosure#	See table 20	-	-	NI	NI	-	-	-	-	P
Bobbin	See table 20	-	-	-	-	NI	NI	-	-	P
Ignition of the specified layer placed underneath the test specimen (Yes/No) :										No
Supplementary information: NI: No ignition										

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict

AA	Annex AA		
	Partial discharge (PD) test		N/A
BB	Annex BB		
	Particular requirements for associated transformers for switch mode power supplies with internal frequencies > 500 Hz		-
	See separate test report-form for these Annex.		-
BB.8	MARKING AND OTHER INFORMATION		N/A
BB.8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
BB.8.11	Correct symbols:		-
	Volts	V	N/A
	Amperes	A (mA)	N/A
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	N/A
	Hertz	Hz	N/A
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	d.c. (DC) or 	N/A
	Neutral	N	N/A
	Single-phase a.c.		N/A
	Three-phase a.c.	3 	N/A
	Three-phase and neutral a.c.	3N 	N/A
	Power factor	cos φ	N/A
	Class II construction		N/A
	Class III construction		N/A
	Equipment of overvoltage category I		N/A
	Equipment of overvoltage category II		N/A
	Equipment of overvoltage category III		N/A
	Equipment of overvoltage category IV		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Fuse-link		N/A
	Rated max. ambient temperature	t_a	N/A
	Rated minimum ambient temperature	t_{amin}	N/A
	Rated minimum temperature	t_{min}	N/A
	Frame or core terminal		N/A
	Protective earth		N/A
	IP number	IPXX	N/A
	Earth (ground for functional earth)		N/A
	For indoor use only		N/A
	To indicate that the appliance is intended to be usable up to the maximum altitude 3 000 m.	 ≤ 3000m	N/A
	To indicate that the power supply unit shall not be used, if pins of the plug part are damaged.		N/A
	Additional Symbols (IEC 61558-2-16:09)		-
	SMPS incorporating a Fail-safe separating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof separating transformer		N/A
	SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe safety isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof safety isolating transformer		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	SMPS incorporating a Short-circuit-proof safety isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe auto-transformer	 or 	N/A
	SMPS incorporating a Non-short-circuit proof auto-transformer	 or 	N/A
	SMPS incorporating a Short-circuit proof auto-transformer (inherently or non-inherently)	 or 	N/A
	SMPS (Switch mode power supply unit)		N/A
BB.9	PROTECTION AGAINST ELECTRIC SHOCK		N/A
BB.10	CHANGE OF INPUT VOLTAGE SETTING		N/A
BB.11	OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD		N/A
BB.12	NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)		N/A
BB.13	SHORT-CIRCUIT VOLTAGE		N/A
BB.14	HEATING		N/A
BB.14.2	Application of 14.1 or 14.3 according to the insulation system		N/A
BB.14.2.1	Class of isolating system (classified materials according to IEC 60 085 and IEC 60 216)		N/A
BB.14.2.2	No classified material, or system but the measured temperature does not exceed the value of Class A		N/A
BB.14.2.3	No classified material or system but the measured temperature exceeds the value for Class A, the live parts of the transformers are submitted to the test of 14.3		N/A
BB.14.3	Accelerated ageing test for undeclared class of isolating system		N/A
	Cycling test (10 cycles):		-
	– measuring of the no-load input current (mA)		N/A
BB.14.3.1	– heat run (temperature in table 2)		N/A
BB.14.3.2	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
BB.14.3.3	– moisture treatment (48 h, 17.2)		N/A
BB.14.3.4	Measurements and tests at the beginning and after each test:		-
	– deviation of the no-load input current, measured at the beginning of the test is 30%		N/A
	– insulation resistance acc. cl.18.1 and 18.2		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– electric strength, no breakdown (18.3); 2 min; test voltage 35% of specified value (table VI)		N/A
	– Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A
BB.15	SHORT-CIRCUIT AND OVERLOAD PROTECTION		N/A
BB.16	MECHANICAL STRENGTH		N/A
BB.17	PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE		N/A
BB.18	INSULATION RESISTANCE AND ELECTRIC STRENGTH		N/A
BB.18.2	Insulation resistance between:		-
	– live parts and body for basic insulation 2 M		N/A
	– live parts and body for reinforced insulation 7 M		N/A
	– input circuits and output circuits for basic insulation 2 M		N/A
	– input circuits and output circuits for double or reinforced insulation 5 M		N/A
	– each input circuit and all other input circuits connected together 2 M		N/A
	– each output circuit and all other output circuits connected together 2 M		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) 2 M		N/A
	– body and metal parts with basic insulation (Class II transformers) 5 M		N/A
	– metal foil in contact with inner and outer surfaces of enclosures 2 M		N/A
BB.18.3	Electric strength test (1 min): no flashover or breakdown:		-
	1) basic insulation between input circuits and output circuits; working voltage (V); test voltage (V)		N/A
	2) double or reinforced insulation between input circuits and output circuits; working voltage (V); test voltage (V)		N/A
	3) basic or supplementary insulation between:		-
	a) live parts of different polarity; working voltage (V); test voltage (V)		N/A
	b) live parts and the body if intended to be connected to protective earth		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) inlet bushings and cord guards and anchorages		N/A
	d) live parts and an intermediate conductive part		N/A
	e) intermediate conductive parts and body :		N/A
	4) Reinforced insulation between the body and live parts; working voltage (V); test voltage (V)		N/A
	5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V) (IEC 61558-2-16:2009)		N/A
18.102 (A1)	Partial discharge tests according IEC 60664-1 , if the working voltage is > 750 V peak		N/A
	Partial discharge is ≤ 10 pC at time P2 See Fig. 19.101		N/A
BB.19	CONSTRUCTION		N/A
BB.19.1	General construction		N/A
BB.19.1.1	General		N/A
BB.19.1.2	Auto-transformers		N/A
BB.19.1.2.1	For plug connected auto-transformers with rated input voltage > rated output voltage the potential to earth shall not exceed the rated output voltage.		N/A
BB.19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction is given with the information, that the transformer shall not be used with non-polarised plug and socket outlet system.		N/A
BB.19.1.2.3	A polarity detecting device only energises the output in the case: output potential to earth \leq rated output voltage, also with reversed input plug.		N/A
	– The contact separation of the device is ≥ 3 mm		N/A
	– A current to earth does not exceed 0,75 mA.		N/A
	– All tests are repeated under fault conditions of H.3.3 of annex H of part 1. The potential to earth does not exceed the max output voltage for more than 5 s.		N/A
BB.19.1.3	Separating transformers		N/A
BB.19.1.3.1	Input and output circuits electrically separated.		N/A
BB.19.1.3.2	The insulation between input and output winding(s) consist of basic insulation		N/A
	Class I SMPS		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– Insulation between input windings and body consist of basic insulation		N/A
	– Insulation between output windings and body consist of basic insulation		N/A
	Class II SMPS		N/A
	– Insulation between input windings and body consist of double or reinforced insulation		N/A
	– Insulation between output windings and body consist of double or reinforced insulation		N/A
BB.19.1.3.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation		N/A
	For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation.		N/A
BB.19.1.3.4	Parts of output circuits may be connected to protective earth		N/A
BB.19.1.3.5	No direct contact between output circuits and the body, unless:		N/A
	– Allowed for associated transformers by the equipment standard		N/A
BB.19.1.4	Isolating transformers and safety isolating transformers		N/A
BB.19.1.4.1	Input and output circuits electrically separated		N/A
	No possibility of any connection between these circuits		N/A
BB.19.1.4.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.4.4)		N/A
	Class I transformers not intended for connection to the mains by a plug:		-
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the input voltage		N/A
	– Insulation between output windings and body, connected to earth consist of basic insulation rated for the output voltage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Class I transformers intended for connection to the mains by a plug:		-
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the working voltage		N/A
	– Insulation between output windings and body, connected to earth consist of supplementary insulation rated for the working voltage		N/A
	Class II transformers		-
	– Insulation between input windings and body consist of double or reinforced insulation rated to the input voltage		N/A
	– Insulation between output windings and body consist of double or reinforced insulation, rated to the output voltage		N/A
BB.19.1.4.3	For transformers with intermediate conductive parts not connected to the body (between input/output):		-
BB.19.1.4.3.1	For class I and class II transformers the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A
	– For class II transformers the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (rated to the input voltage, for SELV circuits only basic insulation to the body)		N/A
	– For transformers, different from independent, the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A
BB.19.1.4.3.2	Class I transformers with earthed core, and not allowed for class II equipment		N/A
	– Insulation from the input to the earthed core: basic insulation rated for the input voltage		N/A
	– Insulation from the output voltage to the earthed core: basic insulation rated for the output voltage		N/A
BB.19.1.4.3.3	Insulation between : input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation		N/A
	– If the insulation from input or output to the intermediate metal part is less than basic insulation, the part is considered to be connected to input or output.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.19.1.4.4	For class I transformers, with protective screen, not connected to the mains by a plug the following conditions comply:		-
	– The insulation between input winding and protective screen consist of basic insulation (rated input voltage)		N/A
	– The insulation between output winding and protective screen consist of basic insulation (rated output voltage)		N/A
	– The protective screen consist of metal foil or a wire wound screen extending the full width of the windings and has no gaps or holes		N/A
	– Where the protective screen does not cover the entire width of the input winding, additional insulation to ensure double insulation in this area, is used.		N/A
	– If the screen is made by a foil, the turns are isolated, overlap at least 3 mm		N/A
	– The cross-section of the screen and the lead out wire is at least corresponding to the rated current of the overload device		N/A
	– The lead out wire is soldered or fixed to the protective screen.		N/A
	Protective screening is not allowed for transformers with plug connection to the mains		N/A
BB.19.1.4.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled.		N/A
BB.19.1.4.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard)		N/A
BB.19.1.4.7	The distance between input and output terminals for the connection of external wiring is ≥ 25 mm		N/A
BB.19.1.4.8	Portable transformers having an rated output ≤ 630 VA shall be class II.		N/A
BB.19.1.4.9	No connection between output circuit and body except of associated transformers (allowed by equipment standard)		N/A
BB.19.1.4.10	Protective screening is not allowed for transformers with plug connection to the mains		N/A
BB.19.12	Windings construction		N/A
BB.19.12.1	Undue displacement in all types of transformers not allowed:		-
	– of input or output windings or turns thereof		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– of internal wiring or wires for external connection		N/A
	– of parts of windings or of internal wiring in case of rupture or loosening		N/A
BB.19.12.2	Serrated tape:		-
	– distance through insulation according to table 13		N/A
	– one additional layer of serrated tape, and		N/A
	– one additional layer without serration		N/A
	– in case of cheek less bobbins the end turns of each layer shall be prevented from being displaced		N/A
BB.19.12.3	Insulated windings wires providing basic, supplementary or reinforced insulation, meet the following requirements:		-
	<ul style="list-style-type: none"> Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K 		N/A
	<ul style="list-style-type: none"> Basic insulation: two wrapped or one extruded wire 		N/A
	<ul style="list-style-type: none"> Supplementary insulation: two layers, wrapped or extruded 		N/A
	<ul style="list-style-type: none"> Reinforced insulation: three layers wrapped or extruded 		N/A
	Spirally wrapped insulation:		-
	<ul style="list-style-type: none"> creepage distances between wrapped layers > cl. 26 _ P1 values 		N/A
	<ul style="list-style-type: none"> path between wrapped layers sealed, the test voltage of K2 is multiplied with 1,35 		N/A
	<ul style="list-style-type: none"> test 26.2.4 – Test A, passed for wrapped layers 		N/A
	<ul style="list-style-type: none"> the finished component pass the electric strength test according to cl. 18.3 		N/A
a)	Insulated winding wire used for basic or supplementary insulation in a wound part:		-
	<ul style="list-style-type: none"> comply with annex K 		N/A
	<ul style="list-style-type: none"> two layers for supplementary insulation 		N/A
	<ul style="list-style-type: none"> one layer for basic insulation 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation between the insulated wires of primary and secondary. This layer fulfils the requirement of basic insulation. 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
b)	Insulated winding wire used for reinforced insulation in a wound part:		-
	<ul style="list-style-type: none"> comply with annex K 		N/A
	<ul style="list-style-type: none"> three layers 		N/A
	<ul style="list-style-type: none"> relevant dielectric strength test of 18.3 		N/A
	Where the insulated winding wire is wound:		-
	<ul style="list-style-type: none"> upon metal or ferrite cores 		N/A
	<ul style="list-style-type: none"> upon enamelled wire 		N/A
	<ul style="list-style-type: none"> under enamelled wire 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation between the insulated wires and the core or the enamelled wires is required. This layer fulfils the requirement of basic insulation. 		N/A
	<ul style="list-style-type: none"> both windings shall not touch each other and also not the core. 		N/A
	100 % routine test of Annex K3 of part 1 is fulfilled		N/A
	no creepage distances and clearances for insulated winding wires		N/A
c)	Toroidal cores used with TIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		-
	4) a coating which fulfils the requirements of basic insulation between a winding and the core		N/A
	5) The primary winding consists of TIW wire with 3 layers (reinforced insulation) and the secondary winding consists of enamelled wire. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	6) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire with 3 layers and the secondary winding consists of a TIW wire with 1 layer (requirements for primary and secondary windings can be changed). This construction also is allowed for use with EE-cores or similar.		N/A
d)	Toroidal cores used with FIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		-
	4) a coating, which fulfil the requirements of basic insulation.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	5) The primary winding consists of FIW wire for reinforced insulation and the secondary winding consist of FIW wire – of basic insulation. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength test for basic insulation.		N/A
	6) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding and the secondary winding consist of FIW wire for reinforced insulation. This construction also is allowed to use for EE-core or similar.		N/A
e)	Toroidal cores used with TIW in combination with FIW wire, for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		-
	4) a coating, which fulfils the requirements of basic insulation.		N/A
	5) The primary winding consists of FIW wire for reinforced insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	6) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for reinforced insulation (3 layer) and the secondary winding consists of FIW wire for reinforced insulation. This construction also is allowed for use with EE-cores or similar.		N/A
f)	Toroidal cores used with TIW in combination with FIW wire, for basic insulation between the primary and secondary circuits shall comply with the following:		-
	1) a coating, which fulfils the requirements of basic insulation		N/A
	2) The primary winding consists of FIW wire for basic insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfils the dielectric strength tests for basic insulation.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for supplementary insulation (2 layers) and the secondary winding consists of FIW wire for basic insulation. This construction also is allowed for use with EE-cores or similar.		N/A
	4) Further polyfilar constructions with FIW and TIW wires in combination with enamelled wires for basic insulation only: 4.1) Primary winding consists of enamelled wire, secondary winding consists of FIW wire for reinforced insulation 4.2) Primary winding consists of enamelled wire, secondary winding consists of TIW wire for reinforced insulation		N/A
BB.19.12.3.1	Max. class F for transformers which use FIW-wire		N/A
BB.19.12.3.2	FIW wires comply with IEC 60851-5:2008, IEC 60317-0-7 and IEC 60317-56.		-
	<ul style="list-style-type: none"> other nominal diameter as mentioned in table 24 can be calculated with the Formula (6) in 26.3.5: 		N/A
	FIW wire used for basic or supplementary insulation for transformers according 19.1.3:		-
	<ul style="list-style-type: none"> the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation 		N/A
	<ul style="list-style-type: none"> between FIW and enamelled wire, no requirements of creepage distances and clearances 		N/A
	<ul style="list-style-type: none"> no touch of FIW and enamelled wires 		N/A
	FIW wire used for double or reinforced insulation for transformers according 19.1.4:		-
	<ul style="list-style-type: none"> the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24 		N/A
	<ul style="list-style-type: none"> for primary and secondary winding FIW-wire for basic insulation is used 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation 		N/A
	<ul style="list-style-type: none"> no touch between the basic insulated PRI and SEC FIW-wires 		N/A
	<ul style="list-style-type: none"> between PRI- and SEC-FIW wires, no requirements of creepage distances and clearances 		N/A
	Alternative construction used for reinforced insulation (reinforced insulated FIW wire and enamelled wire)		-
	<ul style="list-style-type: none"> the test voltage of table 14, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 24 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation is located between the reinforced insulated FIW wire and the enamelled wire. This layer fulfil the requirement of basic insulation 		N/A
	<ul style="list-style-type: none"> no touch between the FIW wire and the enamelled wire 		N/A
	<ul style="list-style-type: none"> between the reinforced FIW wire and any other parts, no requirements of creepage distances and clearances exist 		N/A
	Alternative construction with FIW wires, basic or supplementary insulated for transformers with double or reinforced insulation:		-
	<ul style="list-style-type: none"> the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24 		N/A
	<ul style="list-style-type: none"> PRI or SEC basic insulated FIW wire and to the other winding (enamelled wire) requirements of supplementary insulation 		N/A
	<ul style="list-style-type: none"> creepage distances and clearances between the basic insulated FIW wire and the enamelled wire for basic or supplementary insulation are required. 		N/A
	Where the FIW wire is wound		-
	<ul style="list-style-type: none"> upon metal or ferrite cores 		N/A
	<ul style="list-style-type: none"> one layer for mechanical separation between the insulated wires and the core or the enamelled wires is required. This layer fulfils the requirement of basic insulation. 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> both windings shall not touch each other and also not the core. 		N/A
BB.20	COMPONENTS		N/A
BB.21	INTERNAL WIRING		N/A
BB.22	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS		N/A
BB.23	TERMINALS FOR EXTERNAL CONDUCTORS		N/A
BB.24	PROVISION FOR PROTECTIVE EARTHING		N/A
BB.25	SCREWS AND CONNECTIONS		N/A
BB.26	CREEPAGE DISTANCES AND CLEARANCES		N/A
BB.26.1	See 26.101		N/A
BB.26.2	Creepage distances (cr) and clearances (cr)		N/A
BB.26.2.1	Windings covered with adhesive tape		N/A
	– the values of pollution degree 1 are fulfilled		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		N/A
	– test A of 26.2.3 is fulfilled		N/A
BB.26.2.2	Uncemented insulating parts pollution degree P2 or P3		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		N/A
	– values of pollution degree 1 are not applicable		N/A
BB.26.2.3	Cemented insulating parts		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	– values of distance through insulation (dti) are fulfilled		N/A
	– creepage distances and clearances are not required		N/A
	– test A of this sub clause is fulfilled		N/A
	Test A		-
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, with uninsulated wires, without impregnation or potting		N/A
	Two of the three specimens are subjected to:		-
	– the relevant humidity treatment according to 17.2 (48 h)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1		N/A
BB.26.2.4	Enclosed parts, by impregnation or potting		N/A
BB.26.2.4.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	Test B		-
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint.		N/A
	Two of the three specimens are subjected to:		-
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,25		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1		N/A
BB.26.2.4.2	– The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	Test C		-
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specimens, potted or impregnated. (finished components)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– Neither cracks, nor voids in the insulating compounds		N/A
	Two of the three specimens are subjected to:		-
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1		N/A
BB.26.3	Distance through insulation		N/A
	For double or reinforced insulation, the required values of Tables 13, C1, and D1 – boxes 2b, 2c and 7 are fulfilled		N/A
	The insulation fulfil the material classification according IEC 60085 or 60216 or the test of 14.3		N/A
BB.26.3.1	Reduced values of the thickness of insulation for supplementary or reinforced insulation are allowed if the following conditions are fulfilled:		-
	– the isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	– the test of 14.3 is fulfilled		N/A
	– If both requirements are fulfilled, the required values for solid insulation can be multiplied by 0,4		N/A
	– Minimum thickness of reinforced insulation $\geq 0,2$ mm		N/A
	– Minimum thickness of supplementary insulation $\geq 0,1$ mm		N/A
BB.26.3.2	Insulation in thin sheet form		N/A
	– If the layers are non-separable (glued together):		N/A
	– The requirement of 3 layers is fulfilled		N/A
	– The mandrel test according 26.3.3 is fulfilled with 150 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" is fulfilled.		N/A
	– If the layers are separated:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– The requirement of 2 layers is fulfilled		N/A
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.3 is fulfilled on each layer with 50 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" is fulfilled.		N/A
	– If the layers are separated (alternative:		N/A
	- The requirement of 3 layers is fulfilled		N/A
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.3 is fulfilled on 2/3 of the layers with 100 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index "e" is fulfilled.		N/A
	Test according to 14.3 and if the isolating materials are classified acc. to IEC 60085 and IEC 60216 no distances through insulation are required for insulation in thin sheet form		N/A
	The figures within square brackets in box 2 and 7 of table 13 (C.1/D.1) are used for insulation in thin sheet form as follows:		-
	– rated output > 100 VA values in square brackets apply		N/A
	– rated output 25 VA 100 VA 2/3 of the value in square brackets apply		N/A
	– rated output _ 25 VA 1/3 of the value in square brackets apply		N/A
BB.26.3.3	Mandrel test of insulation in thin sheet form (specimen of 70 mm width are necessary):		-
	– If the layers are non-separable – at least 3 layers glued together fulfil the test:		N/A
	– pull force of 150 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
	– If the layers are separable and 2/3 of at least 3 layers fulfil the test.		N/A
	– pull force of 100 N		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.		N/A
	– If the layers are separable 1 of at least 2 layers fulfil the test:		N/A
	– pull force of 50 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
BB.26.101	Creepage distances, clearances and distances through insulation, specified values according to (IEC 61558-2-16:09):		-
	– table 13, material group IIIa (part 1)		N/A
	– table C, material group II (part 1)		N/A
	– table D, material group I (part 1)		N/A
	– working voltage		N/A
	– rated supply frequency 50/60 Hz		N/A
	– rated internal frequency		N/A
	1. Insulation between input and output circuits (basic insulation):		-
	a) measured values specified values (mm)		N/A
	2. Insulation between input and output circuits (double or reinforced insulation):		-
	a) measured values specified values (mm)		N/A
	b) measured values specified values (mm)		N/A
	c) measured values specified values (mm)		N/A
	3. Insulation between adjacent input circuits: measured values specified values (mm)		N/A
	Insulation between adjacent output circuits: measured values specified values (mm)		N/A
	4. Insulation between terminals for external connection:		-
	a) measured values specified values (mm)		N/A
	b) measured values specified values (mm)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) measured values specified values (mm)		N/A
	5. Basic or supplementary insulation:		-
	a) measured values specified values (mm)		N/A
	b) measured values specified values (mm)		N/A
	c) measured values specified values (mm)		N/A
	d) measured values specified values (mm)		N/A
	e) measured values specified values (mm)		N/A
	6. Reinforced or double insulation: measured values specified values (mm)		N/A
	7. Distance through insulation:		-
	a) measured values specified values (mm)		N/A
	b) measured values specified values (mm)		N/A
	c) measured values specified values (mm)		N/A
BB.26.102	Values of IEC 61558-2-16 applicable for frequency up to 3 MHz (IEC 61558-2-16:09)		N/A
	For frequency above 3 MHz clause 7 of IEC 60664-4 is applicable (high frequency testing)		N/A
BB.26.103	Clearance (IEC 61558-2-16:09)		N/A
	a.) Clearance for frequency ≥ 30 kHz according figure 101 two determinations are necessary:		N/A
	– determination based on peak working voltage according Table 104 :		N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– and alternative if applicable for approximately homogeneous field according to Table 102		N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	The minimum clearance is the greater of the two values.		N/A
	b.) Clearance for frequency ≤ 30 kHz according figure 101 two determinations are necessary:		N/A
	– determination based on peak working voltage with recurring peak voltages according Table 103 :		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	The minimum clearance is the greater of the two values.		N/A
BB.26.104	The working voltages of Table 102, 103 and 104 are peak voltages including μ sec peaks IEC 61558-2-16:09)		N/A
	The working voltage according to Table 13 of part 1 are r.m.s. voltages		N/A
BB.26.105	Creepage distances		N/A
	Two determinations of creepage distances are necessary (see Figure 102)		N/A
	– determination based on measured peak working voltage according Tables 105 to 110		N/A
	Peak working voltage		N/A
	Pollution degree		N/A
	Basic or supplementary insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	If the values based on table 105 to 110 are lower than the relevant values in Tables 13, C.1 or D.1, the higher values shall be applicable		N/A
BB.26.106	Distance through insulation (IEC 61558-2-16:09)		N/A
	Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:		-
	– the max. frequency is < 10 MHz		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– the field strength approximately comply with Figure 103		N/A
	– no voids or gaps are present in between the solid insulation		N/A
	For thick layers $d1 \geq 0,75$ the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers $d2 \leq 30$ μm the peak value of the field strength is ≤ 10 kV/mm		N/A
	For $d1 > d > d2$ equation (1) is used for calculation the field strength		N/A
BB.26.107 (A1)	For transformers with FIW wires the following test is required		N/A
	<ul style="list-style-type: none"> 10 cycles are required 		N/A
	<ul style="list-style-type: none"> 68 h test at max heating temperature + 10°C or test at max. allowed winding temperature based on the insulation class (required in table 1) + 10°C 		N/A
	<ul style="list-style-type: none"> 1 h at 25° C 		N/A
	<ul style="list-style-type: none"> 2 h at 0° C 		N/A
	<ul style="list-style-type: none"> 1 h at 25° C – (next cycle start again with 68 h max winding temp + 10) 		N/A
	<ul style="list-style-type: none"> during the 10 cycles test 2 x working voltage is connected between PRI and SEC 		N/A
	<ul style="list-style-type: none"> after 10 cycle test 2 transformers are subjected to the 17.2 test for 48 h and direct after the 48 h the dielectric strength test of 18.3 (100 % test voltage) is done 		N/A
	<ul style="list-style-type: none"> after the 10 cycle test the third sample is tested at the end of the last cycle in the hot position with the dielectric strength test of 18.3 (100 % test voltage) 		N/A
	<ul style="list-style-type: none"> the partial discharge test according to 18.101 is done after the cycling test and after the high voltage test, if the peak working voltage is >750 V 		N/A
BB.27	RESISTANCE TO HEAT, FIRE AND TRACKING		N/A
IEC 61558-2-16 Annex BB			
Clause	Requirement + Test	Result - Remark	Verdict
BB.E	ANNEX E , GLOW WIRE TEST		N/A
	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		N/A
BB.E.1	Clause 6, "Severities" of IEC 6095-2-11, apply with the temperature stated in 27.3 of IEC 61558-1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.E2	Clause 8, "Conditioning", of IEC 60695-2-11 apply, preconditioning is required		N/A
BB.E3	Clause 10, "Test Procedure", of IEC 60695-2-11 apply, The tip of the glow wire is applied to the flat side of the surface.		N/A
BB.F	ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER		N/A
BB.H	ANNEX H, ELECTRONIC CIRCUITS (IEC 61558-1)		N/A
BB.K	ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION		N/A
BB.K.1	Wire construction:		-
	<ul style="list-style-type: none"> insulated winding wire for basic or supplementary insulation (see 19.12.3) 		N/A
	<ul style="list-style-type: none"> insulated winding wire for reinforced insulation (see 19.12.3) 		N/A
	<ul style="list-style-type: none"> solid circular winding wires and stranded winding wires with 0,05 to 5 mm diameter 		N/A
	<ul style="list-style-type: none"> spirally wrapped insulation - overlapping 		N/A
BB.K.2	Type tests		N/A
BB.K.2.1	General Tests between ambient temperature between 15° C and 35° C and at an humidity between 45% and 75 %		N/A
BB K.2.2	Electric strength test		N/A
BB K.2.2.1	Solid circular winding wires and stranded winding wires		N/A
	Test samples prepared according to clause 4.4.1 of IEC 60851-5:2008 (twisted pair)		N/A
	Dielectric strength test: 6 kV for reinforced insulation		N/A
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
BB K.2.2.2	Square or rectangular wires .		N/A
	Test samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
BB K.2.3	Flexibility and adherence		N/A
	Claus 5.1 in Test 8 of IEC 60851-3:2009 shall be used		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test samples prepared according to clause 5.1.1.4 of IEC 60851-3:2009		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
	Mandrel diameter according table K.1		N/A
	The tension to the wire during winding on mandrel is 118 N/mm ² (118 MPa)		N/A
BB.K.2.4	Heat shock		N/A
	Test samples prepared according to 3.1.1 (in Test 9) of IEC 60851-6:1996		N/A
	<ul style="list-style-type: none"> high voltage test immediately after this test 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 5,5 kV for reinforced insulation 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 2,75 kV for basic or supplementary insulation 		N/A
BB.K.2.5	Retention of dielectric strength after bending (test as specified under test 13 of 4.6.1 c) of IEC 60 851-5)		N/A
	<ul style="list-style-type: none"> high voltage test immediately after this test 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 5,5 kV for reinforced insulation 		
	<ul style="list-style-type: none"> Dielectric strength test: 2,75 kV for basic or supplementary insulation 		
BB.K.3	Testing during manufacturing		N/A
BB.K.3.1	General Tests as subjected in K.3.2 and K.3.3		N/A
BB K.3.2	Routine test		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 4,2 kV for reinforced insulation 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 2,1 kV for basic or supplementary insulation 		N/A
BB K.3.3	Sampling test		N/A
BB K.3.3.1	Solid circular winding wires and stranded winding wires		N/A
	Test with a twisted pair, prepared according clause 4.4.1 of IEC 60851-5:2008		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 6 kV for reinforced insulation 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> Dielectric strength test: 3 kV for basic or supplementary insulation 		N/A
BB K.3.3.2	Square rectangular wire		N/A
	Samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 5,5 kV for reinforced insulation 		N/A
	<ul style="list-style-type: none"> Dielectric strength test: 3 kV for basic or supplementary insulation 		N/A
BB.U	ANNEX U – INFORMATIVE – OPTIONAL TW – MARKING FOR TRANSFORMERS		N/A
V	ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS		N/A

BB.26.2 TEST A	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three special prepared specimens with uninsulated wires, without potting or impregnation					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

BB.26.2 TEST B	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three specially prepared specimens with potted – P1 values are required					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						

IEC 61558-2-16					
Clause	Requirement + Test			Result - Remark	Verdict
BB.26.2 TEST B	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				N/A
	Test with three specially prepared specimens with potted – P1 values are required				
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict

BB.26.2 TEST C	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three specially prepared specimens with potting (only dti is required)					
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C		
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

BB.26.107 61558-2- 16/A1	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test for transformers, use FIW-wire					
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C		
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
BB 18.2	TABLE: insulation resistance measurements		N/A
Insulation resistance R between:		R (MΩ)	Required R (MΩ)
Supplementary information:			

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
BB 18.3	TABLE: Dielectric Strength		N/A
Test voltage applied between:		Test potential applied (V)	Breakdown / flashover (Yes/No)
Supplementary information:			

IEC 61558-2-16							
Clause	Requirement + Test					Result - Remark	Verdict
BB 26	TABLE: Clearance And Creepage Distance Measurements						N/A
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)	
Supplementary information:							

IEC 61558-2-16					
Clause	Requirement + Test			Result - Remark	Verdict
BB 26	TABLE: Distance Through Insulation Measurements				N/A
Distance through insulation di at/of:	U r.m.s. (V)	Test voltage (V)	Required di (mm)	di (mm)	
Supplementary information:					

IEC61558_2_16G - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT AUSTRALIA / NEW ZEALAND NATIONAL DIFFERENCES (SAFETY OF POWER TRANSFORMERS, REACTORS, POWER SUPPLY UNITS, SIMILAR PRODUCTS FOR VOLTAGES UP TO 1 100 V - PART 2-16: PARTICULAR REQUIREMENTS AND TESTS FOR SWITCH MODE POWER SUPPLY UNITS AND TRANSFORMERS FOR SWITCH MODE POWER SUPPLY UNITS)			
Differences according to		AS/NZS 61558.2.16:2010 + A1:2010 +A2:2012 + A3:2014 used in conjunction with AS/NZS 61558.1:2008 +A1:2009 +A2:2015	
TRF template used:		IECEE OD-2020-F3, Ed. 1.1	
Attachment Form No.		AU_NZ_ND_IEC61558a_2_16G	
Attachment Originator		NZ Electrotechnical Committee/Standards New Zealand	
Master Attachment		Date 2020-10-09	
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	National Differences		P
5	GENERAL CONDITIONS FOR THE TESTS		P
5.5	Replace the text with the following variation:		P
	For a.c., test voltages are of substantially sinusoidal wave form, and, if not otherwise specified, have a frequency of 50 Hz. (AS/NZS 61558.1:2008)		P
14	HEATING		N/A
Table 1	Insert the following entry		N/A
	The temperature of insulated pins of transformers having integral pins for insertion into socket-outlets shall not exceed 70 °C: (AS/NZS 61558.1:2008)		N/A
	Temperature (°C).....:		N/A
16	MECHANICAL STRENGTH		N/A
16.4	After item a) insert the following variation:		N/A
	Items b) and c), Table 5, and the last four paragraphs of the test specification are not applicable. (AS/NZS 61558.1:2008)		N/A
19	CONSTRUCTION		N/A
19.15	Replace the test specification with the following variation:		N/A

IEC61558_2_16G - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>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> <p>The additional torque which has to be applied to the socket-outlet to maintain the engagement face in the vertical plane shall not exceed 0,25 Nm. (AS/NZS 61558.1:2008)</p>		N/A
	Additional torque (Nm).....:		N/A
19.16	Replace the text with the following variation:		N/A
	VOID (AS/NZS 61558.1:2008)		N/A
	Insert the following variation		N/A
19.201	Transformers having integral pins for insertion into socket outlets shall comply with the appropriate requirements of AS/NZS 3112.		N/A
	<p>Compliance is checked as specified in Appendix J of AS/NZS 3112</p> <p>NOTE 1 Clause J.2.2.3 (Internal connections for plug portions) of AS/NZS 3112 is covered by clause 19.6 and clause 21 of this standard.</p> <p>NOTE 2 Clause J.2.2.6.2 (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.</p> <p>NOTE 3 Clause J.2.2.6.4 (Temperature rise test) of AS/NZS 3112 is covered by clause 14 of this standard</p> <p>NOTE 4 Clause J.2.2.6.7 (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. (AS/NZS 6158.1:2008)</p>		N/A
20	COMPONENTS		P
	Replace the first paragraph with the following variation:		P
	Components shall comply with the safety requirements specified in the relevant IEC or Australian/New Zealand Standards as far as they reasonably apply. (AS/NZS 61558.1:2008)		P
	Replace the third paragraph with the following variation:		P

IEC61558_2_16G - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	Compliance with the IEC or Australian/New Zealand Standards for the relevant component does not necessarily ensure compliance with the requirements of this Standard (AS/NZS 61558.1:2008)		P
20.5	Insert the following variation:		N/A
	Plugs and socket-outlets for SELV systems may also comply with the requirements of Annex E in AS/NZS 3112 (AS/NZS 61558.1:2008)		N/A
22	SUPPLY CONNECTION AND OTHER EXTERNAL FLEXIBLE CABLES OR CORDS		
22.4	Replace the text by the following variation:		N/A
	VOID. (AS/NZS 61558.1:2008)		N/A
22.6	Replace the text by the following variation		N/A
	Power supply cords may be cord sets fitted with appliance couplers in accordance with IEC 60320, provided the transformers are single-phase portable transformers with input current not exceeding 10 A at the rated output (AS/NZS 61558.1:2008)	Component, to be evaluated in the end-product	N/A
22.8	Replace the second paragraph in the requirement, with the following variation:		N/A
	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 (AS/NZS 61558.1:2008)	Component, to be evaluated in the end-product	N/A
ANNEX H	ELECTRONIC CIRCUITS		P
H.2.1	Add the following to the test specification after the existing third paragraph		P
	The no-load output voltage at an SELV appliance outlet or connector shall not increase by more than 10% of its no-load output voltage in normal use. (AS/NZS 61558.1:2008)		N/A
	The no-load output voltage of a USB outlet or connector shall not increase by more than 3 V or 10% of its no-load output voltage in normal use, whichever is higher. (AS/NZS 61558.1:2008)		P
	Special national conditions (if any)		P
	Australia		P
8	MARKING AND OTHER INFORMATION		P
8.1	After Item a) insert the following variation:		P
	The marking of rated voltage or rated voltage range of single-phase transformers shall cover 240 V and for polyphase transformers, 415 V (AS/NZS 61558.1:2008)		P
	New Zealand		P
8	MARKING AND OTHER INFORMATION		P
8.1	After Item a) insert the following variation:		P

IEC61558_2_16G - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	The marking of rated voltage or rated voltage range of single-phase transformers shall cover 230 V and for polyphase transformers, 400 V (AS/NZS 61558.1:2008)		P