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**TEST REPORT
IEC 61558-2-16**

**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**

Report Number..... : 220700280SHA-001

Date of issue..... : 2022-08-26

Total number of pages 165

Name of Testing Laboratory
preparing the Report Intertek Testing Services Shanghai.

Applicant's name GlobTek, Inc.

Address..... 186 Veterans Dr. Northvale, NJ 07647 USA

Test specification:

Standard IEC 61558-2-16:2009, AMD1:2013 used in conjunction with
IEC 61558-1:2005, AMD1:2009
Include deviations for Australia and New Zealand

Test procedure SAA

Non-standard test method N/A

Test Report Form No. IEC61558_2_16E

Test Report Form(s) Originator VDE Testing and Certification Institute

Master TRF Dated 2016-12


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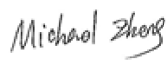
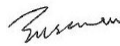
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General disclaimer:

The test results presented in this report relate only to the object tested.

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Test item description :	Power supply
Trade Mark :	
Manufacturer	Same as applicant
Model/Type reference	GT*96180-***** (See page 7 for details)
Ratings	Class I (only for model series GT*96180-***-T3/T3A* with protective earth) or Class II, IP20, ta: 40°C Input:100-240VAC, 50-60Hz or 50/60Hz, 0.6A Output: 5-48VDC, Max. 3.6A, Max. 18W (See page 7 for details)

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	Testing Laboratory:	Intertek Testing Services Shanghai.
Testing location/ address.....:		Building No. 86, 1198 Qinzhou Road (North) 200233 Shanghai CHINA
Tested by (name, function, signature).....:		Michael Zheng (Engineer) 
Approved by (name, function, signature)....:		Susanna Xu (Mandated Reviewer) 
Testing procedure: CTF Stage 1:		
Testing location/ address.....:		
Tested by (name, function, signature).....:		
Approved by (name, function, signature)....:		
Testing procedure: CTF Stage 2:		
Testing location/ address.....:		
Tested by (name + signature)		
Witnessed by (name, function, signature) ..:		
Approved by (name, function, signature)....:		
Testing procedure: CTF Stage 3 or 4:		
Testing location/ address.....:		
Tested by (name, function, signature).....:		
Witnessed by (name, function, signature) ..:		
Approved by (name, function, signature)....:		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment):

Appendix No.1: National differences for Australia/New Zealand (Page 126 to page 128, total 3 pages)

Appendix No. 2: Photos (Page 129 to 150 total 22 pages)

Appendix No. 3: Supplementary tests on plug portion (Page 151 to 164, total 14 pages)

Appendix No.4: Mechanical durability test for non-standard interchangeable plug adapters according IEC 61984: 2008 page 165, total 1 page;

Summary of testing:

The test results presented in this report relate only to the item tested. The results indicate that the specimen complies with standard "IEC 61558-2-16:2009 (First Edition) + A1:2013 used in conjunction with IEC 61558-1:2005 (Second Edition) + A1:2009".

Tests performed (name of test and test clause):

Marking test	8.15
Protection against accessibility to hazardous live parts	9
Full-load output voltage test	11
No-load output voltage test	12
Heating test	14.2
Short-circuit & overload protection (Non-inherently short-circuit proof transformer)	15.3
Mechanical strength test - Impact test	16.2
Mechanical strength test - Direct plug-in transformer	16.4
IP test	17.1
Humidity	17.2
Insulation resistance test	18.2
Dielectric strength test	18.3
Touch current and protective earth conductor current	18.5
Impulse test	18.101
Torque to socket-outlet test (Direct plug-in equipment)	19.15
Overload protection devices test	20.11
Cord anchorage test	22.9.5
Creepage distances, clearances and distances through insulation measurement	26.1
Ball pressure test	27.1
Glow wire test	27.3
Electronic circuits fault test	H.2.3
Dimensional check for integral plug	-

Testing location:

Building No. 86, 1198 Qinzhou Road (North)
200233 Shanghai CHINA

Summary of compliance with National Differences:
List of countries addressed

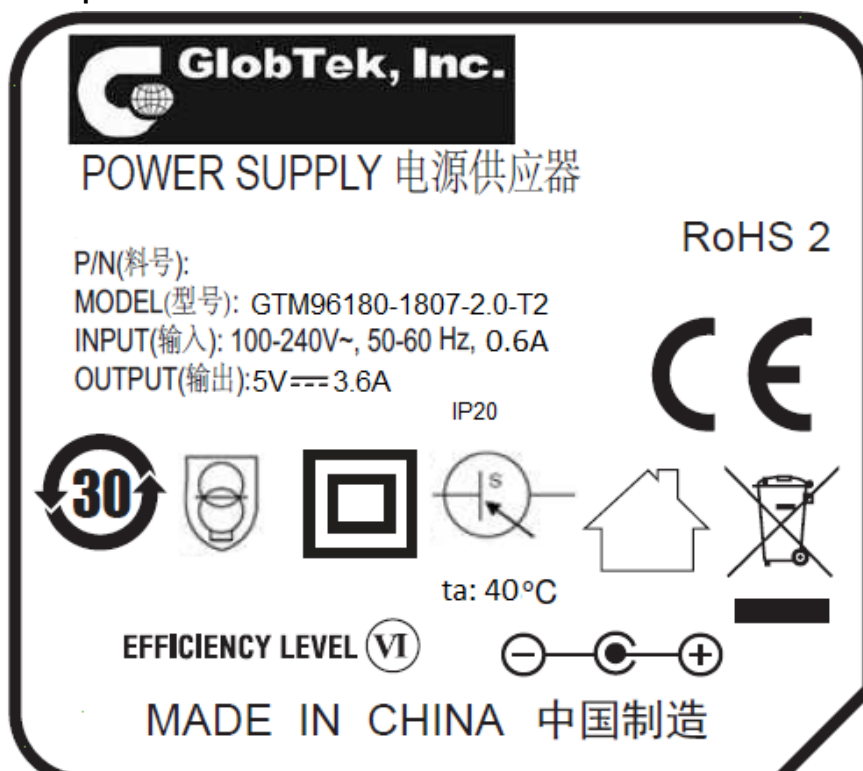
Group differences for Australia and New Zealand are considered.

AS/NZS 61558.2.16:2010 + A1:2010 + A2:2012 + A3:2014

AS/NZS 61558.1:2008 + A1:2009 + A2:2015 + A3:2020

Copy of marking plate: (representative)


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





Note:

The above markings are the minimum requirements required by the safety standard. For the final productions samples, the additional markings which do not give rise to misunderstanding may be added.

The marking for other model is same as above except model name and output rating.

Symbol  will not be marked on the product which rating is Class I.

Symbol   will be marked on the model GT*96180-***-T3/T3A*.

Test item particulars	
Classification of installation and use	Build in (only for model series GT*96180-***-T3/T3A* with protective earth) or Portable
Supply Connection	Direct Plug-in or Appliance inlet
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	2018-11-21
Date (s) of performance of tests.....	2018-11-21 to 2018-12-18
General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report.</p> <p>"(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p> <p>Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.</p> <p>After evaluation, through this report, GTM96180-1807-2.0-T2, GTM96180-1807-2.0, GTM96180-1817.9-5.9, GTM96180-1838-2.0 and GTM96810-1848 were tested as typical model for all tests as they have max. power output with max. output voltage and max. power output with max. output current. The tests for plug portions were also performed on GTM96180-1807-2.0. Torque test to socket, Tumbling barrel test and Cord Anchorage test was also performed on GTM96180-1807-2.0.</p> <p>Note for clause 22.7: It is acceptable that the cross sectional area of the output wires is less than 0.5 mm², based on the following technical rationale: 1) The output of the transformer is a non-hazardous output voltage (max.48.442V DC). 2) The temperature test during normal and abnormal operation complies with the requirement of the standard.</p> <p><i>This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.</i></p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:	
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 (Suzhou) Co., Ltd
Building 4, No. 76 JinLing East Road, Suzhou
Industrial Park, Suzhou, JiangSu, 215021, China
2. GlobTek, Inc.
186 Veterans Dr. Northvale, NJ 07647 USA

General product information:

The products covered by this report are power supply; For indoor use only.

Transformers used in all models are with same construction. The turns of secondary winding may be added or reduced according different output voltage. Each standard rated output voltage designation corresponds to a transformer model. Each transformer model is identical in insulation construction including clearance and creepage except number of turns per coil.

The power supplies can be used appliance inlet with detachable power supply cord or direct plug-in connecting AC mains. Both two constructions are in consideration in this report. Two pieces of outer enclosure are ultrasonic welded. All models have the same circuit diagram, models with appliance inlet have bigger enclosure size.

Different transformer types are alternative, which are identical in same construction except different routing of secondary lead wires and shield foil.

All the types are designed for continuous operation.

The products are not intended to use in environment which altitude exceed 2000m.

Model GT*96180-***-T3/T3A* are build-in product, the output connector cannot be touched by user, and protection against contact with live parts was ensured by insulation capable of withstanding a test voltage for double or reinforced insulation.

Model similarity:

GT*96180-****

The 1st “*” part can be ‘M’ or ‘-’ or ‘H’ for market identification and not related to safety.

The 2nd “*” denotes the rated output wattage designation, which can be “01” to “18”, In step of 1 denote 1W.

The 3rd “*” denotes the standard rated output voltage designation, which can be “07”, “11”, “17.9”, “30”, “38” or “48”;

The 4th “*” is optional deviation, subtracted from standard output voltage, which can be “-0.01” to “-12.0” with interval of 0.01, or blank to indicate no voltage deviation .

The 3rd “*” and 4th “*” together denote the output voltage, with a range of 5 - 48 volts.

The 5th “*” = blank, it means wall plug in with interchangeable blade

=-T2 means desktop class II with C8 AC inlet

=-T2A means desktop class II with C18 AC inlet

=-T3 means class I with protective earth or class II with functional earth with C14 AC inlet

=-T3A means class I with protective earth or class II with functional earth with C6 AC inlet

The last * denote any six character = 0-9 or A-Z or ()[] or – or blank for marketing purposes.

Model list:



GT*96180-**** Interchangeable plug models




Model	Output Voltage	Max. output current	Max. output power
GT*96180-*07**	5-7V	3.6A	18W
GT*96180-*11**	7.1-11V	2.53A	18W
GT*96180-*17.9**	11.1-17.9V	1.62A	18W
GT*96180-*30**	18-30V	1.0A	18W
GT*96180-*38**	30.1-38V	0.6A	18W
GT*96180-*48**	38.1-48V	0.47A	18W











GT*96180-***-T2/T2A/T3/T3A* Desktop models























Model	Output Voltage	Max. output current	Max. output power
GT*96180-*07*-T2/T2A/T3/T3A *	5-7V	3.6A	18W
GT*96180-*11*-T2/T2A/T3/T3A *	7.1-11V	2.53A	18W
GT*96180-*17.9*-T2/T2A/T3/T3A *	11.1-17.9V	1.62A	18W

GT*96180-*30*-T2/T2A/T3/T3A *	18-30V	1.0A	18W
GT*96180-*38*-T2/T2A/T3/T3A *	30.1-38V	0.6A	18W
GT*96180-*48*-T2/T2A/T3/T3A *	38.1-48V	0.47A	18W

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
8	MARKING AND OTHER INFORMATION		P
8.1	Transformer marked with:		P
	a) rated supply voltage or voltage range (V):	See page 5	P
	b) rated output voltage (V):	See page 5	P
	c) rated output (VA, kVA or W):	See page 5	P
	d) rated output current (A):	See page 5	P
	e) rated frequency (Hz):	See page 5	P
	f) rated power factor (if not 1):		N/A
	g) symbol AC for alternating current, or DC for direct current-output	See page 5	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)	For example: 	P
	i) manufacturer's name or trademark or name of the responsible vendor	See page 5	P
	j) model or type reference	See page 5	P
	k) vector group according to IEC 60076 for three-phase transformer		N/A
	l) symbol for Class II		P
	m) symbol for Class III		N/A
	n) index IPXX if other than IP00	See page 5	P
	o) rated max. ambient temperature t_a (if not 25 °C):	See page 5	P
	p) rated minimum ambient temperature t_a min, if <10° C and if a temperature sensitive device is used		N/A
	q) short-time duty cycle: operating time Intermittent duty cycle: operating and resting time (e.g. 5min/30min)		N/A
	r) for tw-marked transformers marked with the rated max. operating temperature, increased by multiples of 5 (e.g. tw 120; tw 125)		N/A
	s) transformers used with forced air cooling shall be marked with "AF" in m/s		N/A
	t) Information from the manufacturer to the purchaser (data sheet) :		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– short-circuit voltage (% rated supply voltage) for stationary transformers > 1000 VA		N/A
	– electrical function of the transformer		N/A
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 short-circuit proof transformers or non-inherently short-circuit proof transformers:	Non-replaceable protective device only	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"		N/A
	Terminal for protective earth marked with earthing symbol		P
	Identification of input terminals: "PRI"		N/A
	Identification of output terminals: "SEC"		N/A
	Symbol for any point/terminal in connection with frame or core		N/A
8.7	Indication for correct connection		N/A
8.8	Instruction sheet for type X, Y, Z attachments		N/A
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
	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.		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
8.11	Correct symbols:		P
	Volts	V	P
	Amperes	A (mA)	P
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	N/A
	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.		N/A
	Three-phase a.c.	3 	N/A
	Three-phase and neutral a.c.	3/N 	N/A
	Power factor	cos ϕ	N/A
	Class II construction		P
	Class III construction		N/A
	Fuse-link	F	N/A
	Rated max. ambient temperature	40°C	P
	Frame or core terminal		N/A
	Protective earth		P
	IP number	IP20	P
	Earth (ground for functional earth)		P
	For indoor use only		P
	tw5 YYY		N/A
	tw10 YYY		N/A
	twx YYY		N/A
	Additional Symbols (IEC 61558-2-16:09)		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	SMPS incorporating a Fail-safe separating transformer	 or 	N/A
	SMPS incorporating a Non-short-circuit-proof separating transformer	 or 	N/A
	SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)	 or 	N/A
	SMPS incorporating a Fail-safe isolating transformer	 or 	N/A
	SMPS incorporating a Non-short-circuit-proof isolating transformer	 or 	N/A
	SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)	 or 	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	 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)		P
8.12	Figures, letters or other visual means for different positions of regulating devices and switches		N/A
	OFF position indicated by figure 0		N/A
	Greater output, input etc. indicated by higher figure		N/A
8.13	Marking not on screws or other easily removable parts		P
	Marking clearly discernible (transformer ready for use)		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Marking for terminals clearly discernible if necessary after removal of the cover		P
	Marking for terminals: no confusion between input and output		N/A
	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	Special information for installation (in the catalogue, data sheet, or instruction sheet) if necessary:		N/A
	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		N/A
	For transformers generating a protective earth conductor current of 10 mA (see also cl. 18.5.2): The installation shall be made according to the wiring rules.		N/A
	For associated- and IP00-transformers: At 10% over or under voltage in the supply voltage, the rated output of the transformer shall be selected accordingly.		N/A
	For stationary transformers exceeding 1000 VA: The short circuit voltage in % of the rated 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
	For associated- and IP00-transformers: The max. abnormal winding temperature		N/A
	For tw-transformers: The specific constant S is (e.g. S6 says S = 6000)		N/A
	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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
8.15	Marking durable and easily legible		P
9	PROTECTION AGAINST ELECTRIC SHOCK		P
9.1	Protection against contact with hazardous live parts		P
9.1.1	A live part is not a hazardous live part if:		P
	– it is separated from the supply by double or reinforced insulation		P
	– the requirements of 9.1.1.1 or 9.1.1.2 are fulfilled		P
9.1.1.1	The touch voltage is ≤ 35 V(peak) a.c. or ≤ 60 Vd.c.	48.442Vd.c Max. (GTM96180-1848)	P
9.1.1.2	If the touch voltage is > 35 V (peak)a.c. or > 60 V d.c., the following requirements shall be fulfilled:		P
	The touch current shall not exceed:		P
	– for a.c. 0,7 mA (peak)	0.096mA peak (GTM96180-1838-2.0)	P
	– for d.c. 2,0 mA (see Annex J)		N/A
	In addition, when a capacitor is connected to live parts:		—
9.1.1.2.1	discharge: $< 45\mu\text{C}$ (between 60 V and 15 kV)		P
9.1.1.2.2	energy: ≤ 350 mJ (voltage > 15 kV)		N/A
9.1.2	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
	Class I transformers: accessible parts are separated from hazardous live parts by at least basic insulation.		N/A
	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.		P
	Hazardous live parts are not accessible after removal of detachable parts except for:	No lamp or fuse holder	N/A
	– lamps having caps larger B9 and E10		N/A
	– type D fuse holder		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Lacquers, enamel, paper, cotton, oxide film on metal parts not used for protection against accidental contact with hazardous live parts:		P
	Shafts, handles, operating levers, knobs are not hazardous life parts.	No such part	N/A
	Compliance is checked by inspection and by relevant tests according to IEC 60 529		P
	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. 2)		P
	for Class II transformers: metal 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
9.1.3	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
	– The no load output voltage is > 35 V peak a.c. or > 60 V ripple free d.c. and ≤ 250 V a.c., only one pole may be accessible		N/A
9.2	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. 25.8Vdc measured (GTM96180-1848)	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 $\leq 0,1 \mu\text{F}$ – 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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	If the measured voltage is > 60 V ripple free d.c., the discharge must be $\leq 45 \mu\text{C}$.		N/A
10	CHANGE OF INPUT VOLTAGE SETTING		N/A
	Voltage setting not possible to change without a tool	Cannot be changed	N/A
	Different rated supply voltages:		N/A
	– indication of voltage for which the transformer is set, is discernible on the transformer.		N/A
10.101	A wide range of the input (120 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		P
	– if the no-load voltage does not exceed the limits of output voltage deviation		P
11	OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD		P
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. 10% ; d.c. 15%		N/A
	b) inherently short-circuit proof transformers with one more than 1 rated output voltage for highest output voltage: a.c. 10%; d.c. 15%		N/A
	c) idem for other output voltages: a.c. 15%; d.c. 20%		N/A
	d) other transformers for output voltages: a.c. 5%; d.c. 10%	(see appended table)	P
12	NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)		P
	Remark: with rectifier measuring on both sides of the rectifier	The rectifier is not accessible to the user	N/A
12.101	The no load output voltage shall not exceed (IEC 61558-2-16:09):		P
	– 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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	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 61558-2-16:2009), Rated output (VA) Rated value %	(see appended table)	P
13	SHORT-CIRCUIT VOLTAGE		N/A
	Difference from marking for short-circuit voltage 20%		N/A
14	HEATING		P
14.1	General requirements		P
	No excessive temperature in normal use		P
	Room temperature: rated ambient temperature $t_a \pm 5^\circ\text{C}$		—
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings	Type Z attachment for output cord	P
	Upri (V): 1,1 times rated supply voltage loaded with rated impedance – for independent transformers	264V	—
	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	Type Z	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:		N/A
	– metal: 70 °C		N/A
	– other material: 80 °C		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		P
	– continuously held parts of metal: 55 °C		N/A
	– continuously held parts of other material: 75 °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:		P
	– rubber: 65 °C		N/A
	– PVC: 70 °C		P
	Temperature of parts where safety can be affected:		N/A
	– rubber: 75 °C		N/A
	– 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		P
	Temperature of printed boards:	T=130 °C	P
	– bonded with phenol-formaldehyde: 105 °C		N/A
	– melamine-formaldehyde: 105 °C		N/A
	– phenol-furfural: 105 °C		N/A
	– polyester: 105 °C		N/A
	– bonded with epoxy: 140 °C		N/A
	Electric strength between input and output windings (18.3, 1 min); test voltage (V)		P

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Clause	Requirement + Test	Result - Remark	Verdict
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 1 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 isolating 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 isolating system		N/A
	Cycling test (10 cycles):		N/A
	– measuring of the no-load input current (mA)		N/A
14.3.1	– heat run (temperature in table 2)		N/A
14.3.2	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
14.3.3	– moisture treatment (48 h, 17.2)		N/A
14.3.4	Measurements and tests at the beginning and after each test:		N/A
	– 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); 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
15	SHORT-CIRCUIT AND OVERLOAD PROTECTION		P
15.1	General		P
	Tests direct after 14.1 at the same ta and without changing position.	(see appended table)	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Supply voltage between 0,9 times and 1,1 times of the rated supply voltage	90/264V	—
	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)		N/A
	– Max. temperature of winding protected inherently (insulation class): 150 °C (A); 165 °C (E); 175 °C (B); 190 °C (F); 210 °C (H)		N/A
	Winding protected by protective device:		P
	– 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 4 (a) (insulation class): 200 °C (A); 215 °C (E); 225 °C (B); 240 °C (F); 260 °C (H)		N/A
	– Test according 15.3.1: max. temperature of winding during the first hour, peak value (insulation class): 200 °C (A); 215 °C (E); 225 °C (B); 240 °C (F); 260 °C (H)		P
	– Test according 15.3.1: max. temperature of winding after first hour, peak value (insulation class): 175 °C (A); 190 °C (E); 200 °C (B); 215 °C (F); 235 °C (H)		N/A
	– 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)		N/A
	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
15.2	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 3		N/A
15.3	For non-inherently short-circuit proof transformers and for transformers with rectifiers: temperature rises values in table 3		P

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Clause	Requirement + Test	Result - Remark	Verdict
15.3.1	Output terminals short-circuited: protection device operates, test at 0,9 ... 1,1 of the rated supply voltage		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 4.		N/A
15.3.3	If protected by a fuse accordance with either IEC 60 127 or ISO 8820, 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, 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 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 60 898) test with 0,95 times of operating current	Protected by electronic circuit	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 3		N/A
15.4	For non-short-circuit proof transformers: temperature rises values in table 3, 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): t1; 5 h		N/A
15.5.2	During the test:		N/A
	– no flames, molten material, etc.		N/A
	– temperature of enclosure 175 °C		N/A
	– temperature of plywood support 125 °C		N/A
	After the test:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– electric strength (Cl. 18, 1 min, test voltage: 35% of specified value); no flashover or breakdown 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		P
16.1	General		P
	After tests of 16.2, 16.3 and 16.4		P
	– no damage		P
	– hazardous live parts not accessible by test pin according to 9.2		P
	– no damage for insulating barriers		P
	– handles, levers, etc. have not moved on shafts	No such part	N/A
16.2	Transformers (stationary and portable s. 16.1)		P
	For stationary and portable transformers: 3 blows, impact energy 0,5 Nm		P
16.3	Portable transformers (except of plug in transformers)		P
	For portable transformers: 100 falls, 25 mm		P
16.4	Transformers with integrated pins (plug in transformers), the following tests are carried out:		P
	a) plug-in transformers: tumbling barrel test: 50 x ≤ 250 g; 25 x ≥ 250 g	50 times; Max. weight: 58g. (GTM96180-1807-2.0)	P
	b) torque test of the plug pins with 0,4 Nm		P
	c) pull force according to table 5 for each pin		P
17	PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE		P
17.1	Degree of protection (IP code marked on the transformer)	IP20	P
	Test according to 17.1.1 and for other IP ratings test according to IEC 60 529:		P
	– stable operating temperature before starting the test for < IPX8		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– transformer mounted and wired as in normal use		N/A
	– fixed transformer mounted as in normal use by the tests according to 17.1.1 A to L		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		N/A
	After the tests:		P
	– dielectric strength test according to 18.3		P
	Inspection:		P
	a) in dust-proof transformers no deposit of talcum powder		N/A
	b) no deposit of talcum powder inside dust-tight transformers		N/A
	c) 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		N/A
	d) no accumulation of water in transformers IPX1 so as to impair safety		N/A
	e) no trace of water entered in any part of water-tight transformer		N/A
	f) no entry into the transformer by the relevant test probe		P
17.1.1	Tests on transformers with enclosure:		P
	A) Solid-object-proof transformers:		P
	- 2 IP2X test finger (IEC 60 529) and test pin (fig. 3)		P
	B) Solid-object-proof transformers:		N/A
	- wire 2,5 mm; force 3 N		N/A
	- IP4X, wire 1 mm; force 1 N		N/A
	C) Dust-proof transformers, IP5X; dust chamber according to IEC 60 529, fig. 2:		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	d) fan/blower is switched on		N/A
	e) after 1 min transformer is switched off for cooling time of 3 h		N/A
	A) Dust-tight transformers (IP6X) test according to C)		N/A
	B) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min		N/A
	C) 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
	D) 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
	E) 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 $\approx 360^\circ$)		N/A
	F) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)		N/A
	G) Powerful Jet-proof transformer (IPX6) test according to fig. 6 of IEC 60 529 (nozzle 12 mm)		N/A
	H) Watertight transformers (IPX7)		N/A
	I) Pressure watertight transformers (IPX8)		N/A
17.2	After moisture test (48 h for IP20, 168 h for other transformers):	IP20, 48h; 93%R.H.; 40°C	P
	– insulation resistance and electric strength (Cl. 18)		P
18	INSULATION RESISTANCE AND ELECTRIC STRENGTH		P
18.2	Insulation resistance between:		P
	– live parts and body for basic insulation $\geq 2 \text{ M}$		P
	– live parts and body for reinforced insulation $\geq 7 \text{ M}$	Input circuit and outer enclosure (rounded with metal foil): $>199 \text{ M}\Omega$	P
	– input circuits and output circuits for basic insulation $\geq 2 \text{ M}$		N/A
	– input circuits and output circuits for double or reinforced insulation $\geq 5 \text{ M}$	Input circuit and output circuit: $>199 \text{ M}\Omega$	P
	– each input circuit and all other input circuits connected together $\geq 2 \text{ M}$		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– each output circuit and all other output circuits connected together $\geq 2 \text{ M}$		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) $\geq 2 \text{ M}$		N/A
	– body and metal parts with basic insulation (Class II transformers) $\geq 5 \text{ M}$		N/A
	– metal foil in contact with inner and outer surfaces of enclosures $\geq 2 \text{ M}$	$>199\text{M}\Omega$	P
18.3	Electric strength test (1 min): no flashover or breakdown:		P
	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)	(see appended table)	P
	3) basic or supplementary insulation between:		P
	a) live parts of different polarity; working voltage (V); test voltage (V)	(see appended table)	P
	b) live parts and the body if intended to be connected to protective earth		N/A
	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)	(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
18.4	Does not apply (IEC 61558-2-16:09)		-
18.101	Impulse test according Table F5 of IEC 60664-1 with 1,2/50 μs (IEC 61558-2-16)		P
	– After the test of 18.3, 10 impulses of each polarity between input and output terminals	4923V 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

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Clause	Requirement + Test	Result - Remark	Verdict
18.102 (A1)	Partial discharge tests according to 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
18.5	Touch current and protective earth current		P
18.5.1	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 8. Measuring network according Figure J1 (Annex J). If the frequency is >30kHz, measuring across the 500 Ohm resistor of J1 (burn effects).	Max. 0.019mA (GTM96180-1838-2.0)	P
	Measurement of the touch current with switch p of picture 8 in both positions and in combination with switches e and n. The measured values are less than the required values of table 8b.		P
	— switches n and e in on position	Class II, switch e does not exist	P
	— switch n: off and switch e: on		P
	— switch n: on and switch e: off		N/A
18.5.2	Protective earth conductor current		P
	The transformer is connected as in clause 14 Impedance of the ammeter < 0,5 Ohm, connected between earth terminal of the transformer and protective earth conductor		P
	The measured values are less than the required values of table 8b.		P
19	CONSTRUCTION		P
19.1	Separation of input and output circuits		P
19.1.1	SMPS incorporating auto-transformers (IEC 61558-2-16:2009)		N/A
19.1.1.1	For plug connected auto-transformers with rated input voltage > rated output voltage the potential to earth shall not exceed the rated output voltage. (IEC 61558-2-16:2009)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.1.2	SMPS with 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. (IEC 61558-2-16:2009)		N/A
19.1.1.3	A polarity detecting device only energises the output in the case: output potential to earth \leq rated output voltage, also with reversed input plug. (IEC 61558-2-16:2009)		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.2.3 of annex H of part 1. The potential to earth does not exceed the max output voltage for more than 5 s.		N/A
19.1.2	SMPS incorporating separating transformers (IEC 61558-2-16:09)		N/A
19.1.2.1	Input and output circuits electrically separated. (IEC 61558-2-16:09)		N/A
19.1.2.2	The insulation between input and output winding(s) consist of basic insulation (IEC 61558-2-16:09)		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 (IEC 61558-2-16:2009)		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
19.1.2.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation (IEC 61558-2-16:09)		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation (IEC 61558-2-16:2009)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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. (IEC 61558-2-16:2009)		N/A
19.1.2.4	Parts of output circuits may be connected to protective earth (IEC 61558-2-16:09)		N/A
19.1.2.5	No direct contact between output circuits and the body, unless: (IEC 61558-2-16:2009)		N/A
	– Allowed for associated transformers by the equipment standard		N/A
	– Clause 19.8 of part 1 is fulfilled		N/A
19.1.3	SMPS incorporating isolating transformers and safety isolating transformers (IEC 61558-2-16:09)		P
19.1.3.1	Input and output circuits electrically separated (IEC 61558-2-16:09)		P
	No possibility of any connection between these circuits		P
19.1.3.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.3.4) (IEC 61558-2-16:09)		P
	Class I SMPS 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		P
	– Insulation between output windings and body, connected to earth consist of basic insulation rated for the output voltage		P
	Class I SMPS intended for connection to the mains by a plug (EN 61558-2-16:09):		—
	– 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 SMPS (IEC 61558-2-16:2009)		P
	– Insulation between input windings and body consist of double or reinforced insulation rated to the input voltage		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– Insulation between output windings and body consist of double or reinforced insulation, rated to the output voltage		P
19.1.3.3	SMPS with intermediate conductive parts not connected to the body (between input/output) (EN 61558-2-16:09):		N/A
19.1.3.3.1	For class I and class II SMPS the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage (EN 61558-2-16:09).		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. (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
19.1.3.3.2	Class I transformers with earthed core, and not allowed for class II equipment (EN 61558-2-16:09)		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
19.1.3.3.3	Insulation between : input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation (EN 61558-2-16:09)		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
19.1.3.4	For class I SMPS, with protective screen, not connected to the mains by a plug the following conditions comply (EN 61558-2-16:09):		N/A
	– The insulation between input winding and protective screen consist of basic insulation (rated input voltage)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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 SMPS with plug connection to the mains (EN 61558-2-16:09)		N/A
19.1.3.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled (EN 61558-2-16:09).		P
19.1.3.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard) (EN 61558-2-16:09)	No direct connection	N/A
19.1.3.7	The distance between input and output terminals for the connection of external wiring is 25 mm	No terminal	N/A
19.1.3.8	Portable SMPS having an rated output ≤ 630 VA (EN 61558-2-16:09)		P
19.1.3.9	No connection between output circuit and body except of associated transformers (allowed by equipment standard) (EN 61558-2-16:09)	No connection	P
19.1.3.10	Protective screening is not allowed for SMPS with plug connection to the mains (EN 61558-2-16:09)		N/A
19.2	Fiercely burning material not used	Such substance 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	Short-circuit proof	P

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Clause	Requirement + Test	Result - Remark	Verdict
19.4	Class II transformers: contact between accessible metal parts and conduits or metal sheaths of supply wiring impossible	No conduit or metal sheath of supply wiring	N/A
19.5	Class II transformers: part of supplementary or re-inforced insulation, during reassembly after routine servicing not omitted	Enclosure fixed by ultra-sonic welding	P
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)	Input lead wire and output cord fixed on the PCB by soldering and glue	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	No such part	N/A
19.8	Resistors or capacitors connected between hazardous live parts and the body (accessible metal parts) consist of:		P
	– components according to IEC 60 065, 14.1 or capacitor Y1 according to IEC 60 384-14		N/A
	– at least two separate components	Certified two Y capacitors according to IEC 60384-14	P
	– 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
19.9	Insulation material input/output and supplementary insulation of rubber resistant to ageing		N/A
	Creepage distances (if cracks) specified values (Cl. 26)		N/A
19.10	Protection against accidental contact by insulating coating:		N/A
	a) ageing test (section I, IEC 60 068-2-2), test Ba: 168 h; 70 °C		N/A
	b) impact test (spring-operated impact hammer according to IEC 60 068-2-63; $0,5 \pm 0,05$ 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 part	N/A
	– insulating material		N/A
	– supplementary insulation covering		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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:		P
	– of input or output windings or turns thereof		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:		N/A
	– 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 cheekless bobbins the end turns of each layer shall be prevented from being displaced		N/A
19.12.3 (A1)	Insulated windings wires providing basic, supplementary or reinforced insulation, meet the following requirements:		P
	• Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K		P
	• Basic insulation: two wrapped or one extruded wire		N/A
	• Supplementary insulation: two layers, wrapped or extruded		N/A
	• Reinforced insulation: three layers wrapped or extruded		P
	Spirally wrapped insulation:		N/A
	• creepage distances between wrapped layers > cl. 26 _ P1 values		N/A
	• path between wrapped layers sealed, the test voltage of K2 is multiplied with 1,35		N/A
	• test 26.2.3 – Test A, passed for wrapped layers		N/A
	• the finished component pass the electric strength test according to cl. 18.3		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
a)	Insulated winding wire used for basic or supplementary insulation in a wound part:		N/A
	<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:		P
	<ul style="list-style-type: none"> comply with annex K 	Certified triple insulated winding wire	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:		P
	<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
	<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 wirers		P
	for TIW wires values of box 2) c) of table 13, table C.1 and table D.1 of part 1 and of clause 26.106 are not required		P
FIW	<u>Transformers which use FIW wire</u>		-
19.12.101 (A1)	Max. class F for transformers which use FIW-wire		N/A
19.12.102 (A1)	FIW wires comply with IEC 60851-5, Ed.4.1; IEC 60317-0-7 and IEC 60317-56, Ed.1.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> other nominal diameter as mentioned in table 19.101 can be calculated with the formula after table 19.111 		N/A
	FIW wire used for basic or supplementary insulation for transformers according 19.1.2 (separating-transformers) of IEC 61558-2-16:		–
	<ul style="list-style-type: none"> the test voltage of table 8a – part 1, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 19.111 		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 (grad 1, or grad 2 ...) 		N/A
	FIW wire used for double or reinforced insulation for transformers according 19.1.3 (isolating and safety isolating transformers) of IEC 61558-2-16 (PRI and SEC basic insulated FIW-wire):		N/A
	<ul style="list-style-type: none"> the test voltage of table 8a – part 1, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 19.111 		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

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> the test voltage of table 8a – part 1, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 19.111 		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 according to 19.1.3 (basic/supplementary insulated FIW wire + enamelled wire + creepage distance and clearances for basic insulation)		–
	<ul style="list-style-type: none"> the test voltage of table 8a – part 1, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 19.111 		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 part	N/A
19.14	Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool	Rim and ultrasonic welding	P
19.15	Transformer with pins for fixed socket-outlets: no strain on socket-outlet		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Additional torque 0,25 Nm	0.131Nm max. (For direct plug-in models GTM96180-1807-2.0)	P
19.16	Protection index for portable transformers:		P
	200 VA IP20 and instructions for use	IP20	P
	> 200 VA 2,5 kVA IPX4 (single-phase)		N/A
	> 200 VA 6,3 kVA IPX4 (polyphase)		N/A
	> 2,5 VA (single-phase) IP21		N/A
	> 6,3 VA (polyphase) IP21		N/A
19.17	Transformers IPX1 - IPX6 totally enclosed, except for drain hole (diameter 5 mm or 20 mm ² with width 3 mm); drain hole not required for transformer completely filled with insulating materials		N/A
19.18	Transformers IPX1 with a moulded, 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		P
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

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Clause	Requirement + Test	Result - Remark	Verdict
19.23	Class III transformers shall not be provided with means for protective earth		N/A
20	COMPONENTS		P
	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:		N/A
	– 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).		N/A
	– Components without markings tested under transformer conditions including inrush current.		N/A
	– If no IEC standard exists, the component is tested under transformer conditions.		N/A
20.1	Appliance couplers for main supply shall comply with:	Appliance inlet used	P
	– IEC 60 320 for IPX0		P
	– IEC 60 309 for other		N/A
20.2	Automatic controls shall comply with IEC 60 730-1	No control	N/A
20.3	Thermal-links comply with IEC 60691	No thermal-link	N/A
20.4	Switches shall comply with annex F	No switch	N/A
	Disconnection from the supply:		N/A
	– 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
20.5	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

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Clause	Requirement + Test	Result - Remark	Verdict
	SELV plug and socket-outlets shall comply with IEC 60 884-2-4 and IEC 60 906-3		N/A
	– 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
	– Socket outlets do not have a protective earth contact		N/A
	PELV plug and socket-outlets shall comply with following:		N/A
	– 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
	– Socket outlets do not have a protective earth contact		N/A
	FELV plug and socket-outlets shall comply with following:		N/A
	– 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
20.6	Thermal cut-outs, overload releases etc. have adequate breaking capacity		P
	– Thermal cut outs fulfil the relevant requirements of 20.7 and 20.8		N/A
	– Thermal links fulfil the relevant requirements of 20.8		N/A
	– The breaking capacity is in accordance with the relevant fuse standard		P
20.6.1	For Fuses According IEC 60127 and IEC 60269, the fuse current does not exceed 1,1 times of the rated value		P
20.7	Thermal cut outs shall meet the requirements of 20.7.1.1 and 20.7.2, or 20.7.1.2 and 20.7.2.		N/A
20.7.1	Requirements according to IEC 60730-1		N/A
20.7.1.1	Thermal cut-out tested as component shall comply with IEC 60 730-1		N/A
20.7.1.2	Thermal cut-out tested as a part of the transformer		N/A
	a) Thermal cut outs type 1 or type 2 (IEC 60730-1)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) Thermal cut outs fulfil the requirements of micro-interruption (type 1C or 2 C) or micro-disconnection, (type 1B or 2B) (see IEC 60730-1)		N/A
	c) Thermal cut outs with manual reset have a trip free mechanism (type 1E and 2E) (see IEC 60730-1)		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
	e) Thermal cut outs fulfil the electrical stress according IEC 60730-1, 6.14.2		N/A
	f) Characteristic of thermal cut-outs:		N/A
	– ratings according IEC 60730-1, cl. 5		N/A
	– classification according to:		N/A
	1) nature of supply to IEC 60730-1, 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, cl. 6.5.1		N/A
	4) degree of protection IP0X to IEC 60730-1, cl. 6.5.2		N/A
	5) pollution degree to IEC 60730-1, cl. 6.5.3		N/A
	6) comparative tracking index to IEC 60730-1, cl. 6.13		N/A
	7) max. ambient temperature to IEC 60730-1, cl. 6.7		N/A
20.7.1.2	Thermal cut-out tested as a part of the transformer, test with 3 samples:		N/A
	– at least micro-interruption or micro-disconnection (IEC 60730-1)		N/A
	– 300 h aged at ta (transformer) + 10°C		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– subjected to a number of cycles for automatic operating according 20.7.1.1		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
20.7.2	Thermal cut-outs shall have adequate breaking capacity		N/A
20.7.2.1	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 ta min		N/A
	– 3 cycles at ta min for transformers with ta min		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
20.7.2.2	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 ta min		N/A
	– 24 h at ta and 24 h at ta min for transformers with ta min		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
20.7.3	Test of a PTC resistor:		-
	5 cycles: transformer short-circuited for 48 h by 1,1 times of the input voltage and max. ta		N/A
	5 cycles: transformer short-circuited for 48 h by 0,9 times of the input voltage and min. ta (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
20.8	Thermal links shall be tested in one of the following two ways.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
20.8.1	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
20.8.2	Thermal-links tested as a part of the transformer:		N/A
	– ageing test 300 h by 35 °C or ta + 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		N/A
	– 3 cycles for replaceable thermal-links		N/A
	– 3 new specimens for not replaceable thermal-links		N/A
20.9	Self-resetting devices not used if mechanical, electrical, etc. hazards		N/A
20.10	Thermal cut-outs which can be reset by soldering operation are not allowed		N/A
20.9	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.	264V	P
21	INTERNAL WIRING		P
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 1,5 mm) or bushings of insulating material		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	Internal wire fixed by soldering and glue	P
21.5	Insulation of heat-resistant and non-hygroscopic material for insulated conductors subject to temperature rise > limiting values given in 14.1		N/A
22	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS		N/A
22.1	All cables, flexible cords etc. shall have appropriate current and voltage ratings	No flexible cord	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
22.2	Input and output wiring inlet and outlet openings for external wiring: separate entries without damage to protective covering of cable or cord		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:		N/A
	– 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 between 2 m and 4 m; without 0,5 mm ²		N/A
22.5	Power supply cords for transformers IPX0 and transformers "for indoor use only" \geq IPX0:		N/A
	– for transformers with a mass \leq 3 kg: 60227 IEC52 (H03VV-..) (60245 IEC 53)		N/A
	– for transformers with a mass $>$ 3 kg: 60227 IEC53 (H05VV-..) or 60245 IEC 53		N/A
	Power supply cords for transformers for outdoor use: \geq IPX0: 60245 IEC57 (H05RN-..)		N/A
22.6	Power supply cords for single-phase portable transformers with input current \leq 16A:		N/A
	– cord set fitted with an appliance coupler in accordance with IEC 60320		N/A
22.7	Nominal cross-sectional area (mm ²); input current (A) at rated output not less than shown in table 9	No flexible cord	N/A
22.8	Class I transformer with power supply flexible cable: green/yellow core connected to earth terminal		N/A
	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		N/A
22.9	Type X, Y or Z attachments: see relevant part 2		N/A
22.9.1	For type Z attachment: moulding enclosure and power supply cable do not affect insulation of cable		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
22.9.2	Inlet openings or inlet bushing: without risk of damage to protective covering of power supply cord		N/A
	Insulation between conductor and enclosure:		N/A
	– for Class I transformer: insulation of conductor plus separate basic insulation		N/A
	– for Class II transformer: insulation of conductor plus double or reinforced insulation		N/A
22.9.3	Inlet bushings:		N/A
	– no damage to power supply cord		N/A
	– reliably fixed		N/A
	– not removable without tool		N/A
	– not integral with power supply 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 portable transformers which are moved while operating:		N/A
	– cord guards, if any, of insulating material and fixed		N/A
	Compliance is tested by the oscillating test according to fig. 7:		N/A
	– loaded force during the test according to fig. 7		N/A
	– 10 N for a cross-sectional area > 0,75		N/A
	– 5 N for a cross-sectional area 0,75		N/A
	After the test according to fig. 7:		N/A
	– 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:		N/A
	– glands in portable transformers not used unless possibility for clamping all types and sizes of cable		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	– 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:	Type Z	P
	– 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		P
	Cord anchorages for type X and Y attachments:	Type Z	N/A
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– labyrinths, if clearly how, permitted		N/A
	Tests for type X with special cords, type Y, type Z	Type Z	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 11		N/A
	– not possible to push cable into transformer		P
	– 25 pulls of 1 s		P
	– 1 min torque according to table 10		P
	– mass (kg); pull (N); torque (Nm) : Max. 0.058kg; 30N, 0.1Nm		—
	– 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:		N/A
	– 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:		N/A
	– 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		P
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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Terminals are integral part of the transformer:		N/A
	– comply with IEC 60 999-1 under transformer conditions		N/A
	Other terminals:		N/A
	– 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
	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 metal parts should conductor break away 50% of specified value (Cl. 26)		N/A
	Transformer with type Y and Z attachments for external conductors: soldered, welded, crimped, etc. connections allowed	Soldered	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 metal parts should conductor break away 50% of specified value (Cl. 26)	Glue used	P
23.2	Terminals for type X with special cords Y and Z attachments shall be suitable for their purpose:		N/A
	– test by inspection according to 23.1 and 23.2		N/A
	– pull of 5 N to the connection before test according to 14.1		N/A
23.3	Other terminals than Y and Z attachments shall be so fixed that when the clamping means is tightened or loosened:		N/A
	– 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:		N/A
	– they clamp the conductor between metallic surfaces with sufficient contact pressure		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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):		N/A
	– 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:		N/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:		N/A
	– between terminal screws and accessible metal parts		N/A
	– between terminal screws and inaccessible metal parts for Class II transformers		N/A
24	PROVISION FOR PROTECTIVE EARTHING		P
24.1	Class I transformers: accessible conductive parts connected to earth terminal		P
	Class II transformers: no provision for 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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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		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 with a min. 25 A or 1,5 rated input current at 1 min		P
24.5	Class I transformers with external flexible cables or cords:		N/A
	– current-carrying conductors becoming touch before the earth conductor		N/A
25	SCREWS AND CONNECTIONS		N/A
25.1	Screwed connections withstand mechanical stresses	No screw	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:		N/A
	– length of engagement 3 mm + 1/2 screw diameter or 8 mm		N/A
	– correct introduction into screw hole		N/A
25.3	Electrical connections: contact pressure not transmitted through insulating material		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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 12. After the test no damage at the transformer and the gland.		N/A
26	CREEPAGE DISTANCES AND CLEARANCES		P
26.1	See 26.101		
26.2	Creepage distances (cr) and clearances (cr)		P
26.2.1	Windings covered with adhesive tape		P
	– 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
26.2.2	Uncemented insulating parts pollution degree P2 or P3	Pollution degree 2	P
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		P
	– values of pollution degree 1 are not applicable		P
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1		N/A
26.2.4	Enclosed parts, by impregnation or potting		N/A
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		N/A
	– 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:		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
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		N/A
	– thermal class		N/A
	– 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
	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
26.3	Distance through insulation		P
	For double or reinforced insulation, the required values of Tables 13, C1, and D1 – boxes 2b, 2c and 7 are fulfilled		P
	The insulation fulfil the material classification according IEC 60085 or 60216 or the test of 14.3	Class B	P
26.3.1	Reduced values of the thickness of insulation for supplementary or reinforced insulation are allowed if the following conditions are fulfilled:		N/A
	– the isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	– the test of 14.3 is fulfilled		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
26.3.2	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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		N/A
	– rated output > 100 VA values in square brackets apply		N/A
	– rated output $\geq 25 \text{ VA} \leq 100 \text{ VA}$ 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
26.3.3	Mandrel test of insulation in thin sheet form (specimen of 70 mm width are necessary):		N/A
	– 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
	– 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
26.101	Creepage distances, clearances and distances through insulation, specified values according to (EN 61558-2-16:09):		P
	– 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	259Vrms;426Vpeak	P
	– rated supply frequency 50/60 Hz		P
	– rated internal frequency		P

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Clause	Requirement + Test	Result - Remark	Verdict
	1. Insulation between input and output circuits (basic insulation):		N/A
	a) measured values specified values (mm)		N/A
	2. Insulation between input and output circuits (double or reinforced insulation):		P
	a) measured values specified values (mm)	(see appended table)	P
	b) measured values specified values (mm)		N/A
	c) measured values specified values (mm)	TIW used as secondary winding and 2 layers of insulation tape between Pri. and Sec. windings	P
	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:		N/A
	a) measured values specified values (mm)		N/A
	b) measured values specified values (mm)		N/A
	c) measured values specified values (mm)		N/A
	5. Basic or supplementary insulation:		P
	a) measured values specified values (mm)	(see appended table)	P
	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)	(see appended table)	P

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Clause	Requirement + Test	Result - Remark	Verdict
	7. Distance through insulation:		P
	a) measured values specified values (mm) :	(see appended table)	P
	b) measured values specified values (mm) :		N/A
	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 (EN 61558-2-16:09)	Measured frequency: 63.48kHz max.	P
	For frequency above 3 MHz clause 7 of IEC 60664-4 is applicable (high frequency testing)		N/A
26.103	Clearance (EN 61558-2-16:09)		P
	a) Clearance for frequency ≥ 30 kHz according figure 101 two determinations are necessary:		P
	– determination based on peak working voltage according Table 104 :		P
	Peak working voltage	(see appended table)	P
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		P
	– 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
	– 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:		N/A
	– determination based on peak working voltage with recurring peak voltages according Table 103 :		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
26.104	The working voltages of Table 102, 103 and 104 are peak voltages including μ sec peaks (EN 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		P
	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	(see appended table)	P
	Pollution degree	2	P
	Basic or supplementary insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value	(see appended table)	P
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		P
	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 (EN 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:		N/A
	– 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
	–		N/A
	–		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For thick layers $d1 \geq 0,75$ the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers $d2 \leq 30$ μ 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
	<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		P
27.1	Resistance to heat		-
	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	Output connector	P
27.1.1	External accessible parts		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The Ball-pressure test -: diameter of impression 2 mm; heating cabinet temperature (° C) at 70 ° C or the temperature T of 14.1 (T + 15) - is fulfilled.	(see appended table)	P
27.1.2	Internal parts		P
	For insulating material retaining current carrying parts in position , the ball-pressure test -: diameter of impression 2 mm; heating cabinet temperature (° C) at 125 ° C or the temperature T of 14.1 (T + 15) - is fulfilled	(see appended table)	P
27.2	Resistance to abnormal heat under fault conditions		N/A
27.3	Resistance to fire		P
	All isolating parts of the transformer shall be resistant to ignition and spread of fire. The test according to IEC 60696-2-10 is required		P
27.3.1	External accessible parts (glow wire tests)		P
	– 650° C for enclosures	Enclosure	P
	– 650 ° C for parts retaining current carrying parts in position and terminals for external conductors Current $\leq 0,2$ A		P
	– 750° C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current $> 0,2$ A	Part of support pins	P
	– 850° C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current $> 0,2$ A	Output connector	P
27.3.2	Internal parts		P
	– 550 °C for internal insulating material – not retaining current carrying parts in position		N/A
	– 650 °C for coil formers (bobbins)	Bobbin	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	PCB	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

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Clause	Requirement + Test	Result - Remark	Verdict
27.4	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 IIIa		N/A
	Test (175 V): no flashover or breakdown before 50 drops		N/A
28	RESISTANCE TO RUSTING		P
	Ferrous parts protected against rusting		P
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Clause	Requirement + Test	Result - Remark	Verdict
E	ANNEX E , GLOW WIRE TEST		
	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		P
E.1	Clause 6, "Severities" of IEC 6095-2-11, apply with the temperature stated in 27.3 of IEC 61558-1		P
E2	Clause 8, "Conditioning", of IEC 60695-2-11 apply, preconditioning is required		P
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.		P
F	ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER		N/A
F.2	Manually operated mechanical switches, tested as separate component, shall comply with IEC 61058 under the conditions of F2.		N/A
F.§	Manually operated mechanical switches tested as part of the transformer shall comply with the conditions specified under F.3		N/A
H	ANNEX H, ELECTRONIC CIRCUITS (IEC 61558-1)		P
H1	General notes on tests (addition to clause 5)		P
			P
H.2	SHORT-CIRCUIT AND OVERLOAD PROTECTION (ADDITION TO CLAUSE 15)		P
H.2.1	Circuits designed and applied so that fault conditions do not render the appliance unsafe		P
	During and after each test:		P
	– temperatures do not exceed values specified in table 3 of Cl. 15.1		P
	– transformer complies with conditions specified in sub-clause 15.1		P





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Clause	Requirement + Test	Result - Remark	Verdict
	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.2.2	Fault conditions a) to f) of sub-clause H.2.3 are not tested if the following conditions are met:		P
	– 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		P
H.2.3	Fault conditions tested as specified when relevant:		P
	a) short-circuit of creepage distances and clearances, if less than specified in Cl. 26		N/A
	b) open circuit at the terminals of any component	Evaluated	P
	c) short-circuit of capacitors, unless they comply with IEC 60 384-14	C1, C4	P
	d) short-circuit of any two terminals of an electronic component as specified	Pin 1-2 of BD1, D4	P
	e) any failure of an integrated circuit as specified	Pin 1-2 of U3, pin 3-4 of U3, Q1	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
	PTC's and NTC's are not short-circuited if they are used as specified		N/A
H.2.4	If for a fuse-link complying with IEC 60 127-3 rated fuse current I1 is used, current I2 is measured as specified:		P
	– if $I_2 < 2,1 \times I_1$ test of 15.8 is repeated with fuse-link short-circuited		N/A
	– if $I_2 > 2,75 \times I_1$, no other tests are necessary		P
	If $I_2 > 2,1 \times I_1$ and $I_2 < 2,75 \times I_1$ test of 15.8 is repeated as specified		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.3	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION		P
H.3.1	For live parts separated by basic insulation smaller cr and cl as in 26 are allowed, if H2 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, clause 4 are applicable,		N/A
	For potted transformers cycling tests acc, 26.2. are applicable		N/A
H.3.2	The ma. surface temperature of optocouplers is 50 K		N/A
K (A1)	ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION		N/A
K.1	Wire construction:		N/A
	<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 45% 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 3.1.1 (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
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
			N/A
	<ul style="list-style-type: none"> high voltage test immediately after this test Dielectric strength test: 5,5 kV for reinforced insulation Dielectric strength test: 2,75 kV for basic or supplementary insulation 		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

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Clause	Requirement + Test	Result - Remark	Verdict
	<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 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
U	ANNEX U – INFORMATIVE – OPTIONAL TW – MARKING FOR TRANSFORMERS		N/A
	The tests of Annex U are based on constant S = 4500. Other constants are possible, if the test of U.5.2 is done with positive result.		N/A
U1	General notes and tests		N/A
	8 transformers of one type are necessary for the test. Tests according U5.		N/A
U.2	Heating (addition to clause 14)		N/A
14.4	Thermal endurance test		N/A
	Test according U5 and measurements according 11.1		N/A
	Transformers tested as an integral part of the equipment (option), assigned with tw		N/A
	The thermal conditions are so adjusted, that the duration of test is as indicated by the manufacturer.		N/A
	If no indications are given, the test period is 30 days		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	After the test, when the transformers have returned to room temperature, they fulfil the following requirements:		N/A
	a) The output voltage has not changed from the measured value at the beginning by more than allowed value of clause 11.1		N/A
	b) The insulation resistance between input and output winding and between windings and body is, measured with 500 V d.c. , not less than 1 MOhm		N/A
	c) The transformer fulfil the dielectric strength test with 35% of the values in Clause 18, Table 8.a.		N/A
	The test result is positive, is min. 6 of the 7 samples have passed the test.		N/A
	The test result is negative, if 2 or more samples fail the test		N/A
	If the result is negative, the test can be repeated with 7 new samples		N/A
U.3	Short circuit and overload protection (addition to clause 15)		N/A
	At short circuit and overload tests the winding temperature if less than the required value of table U.1		N/A
U.5	General requirements and information about thermal endurance test on windings		N/A
U.5.1	Thermal endurance test		N/A
	Transformers tested at rated output		N/A
	Loads outside of the oven		N/A
	7 transformers are placed in the oven		N/A
	The temperature of the hottest winding of each of the 7 transformers is-together with the oven temperature, at the applicable temperature of table U.2		N/A
	After 4 hours measuring of the actual winding temperatures. Regulation of the oven temperature if necessary		N/A
	After 24 hours again measuring of the winding temperature. The temperatures of the 7 samples are very near to the required temperature of the values of table U.2. The test time of the coldest winding is not longer than twice the theoretical test time based on table U.2		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
U.5.2	The use of constant S other than 4500 in tw tests		N/A
U.5.2.1	Procedure a)		N/A
	The manufacturer prepares test results with a minimum of samples of 30.		N/A
	T and log L are calculated from the dates		N/A
	The diagram according to Figure U.2 will be founded.		N/A
U.5.2.3	Procedure b)		N/A
	The testing authority shall test 14 new transformers		N/A
	Test 1, based on clause U.5.1 but at the calculated test room temperature for 10 days. The test is continued until all transformer fail.		N/A
	Calculation of the mean life L ₂ at temperature T ₂ according to U4		N/A
	Test 2, based on clause U.5.1 but at a calculated room temperature T ₂ (for 120 days). The test time with T ₂ exceeds L ₂ .		N/A
V	ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS		N/A
V.2.1.1	Restored by manual operation  IEC 489/98		N/A
V.2.1.2	Restored by disconnection of the supply  IEC 490/98		N/A
V.2.1.3	Thermal link  IEC 491/98		N/A
V.2.2	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	delta Usec no-load output %	further information
GTM96180-1807-2.0 / 5VDC, 3.6A	100/240VAC	4.802 / 4.802	-3.96 / -3.96	4.812 / 4.812	-3.76 / -3.76	For Clause 11: Required ±10% For Clause 12: Required 20%
GTM96180-1817.9- 5.9 / 12VDC, 1.5A	100/240VAC	11.987 / 11.991	-0.108 / -0.075	11.780 / 11.781	-1.83 / -1.825	
GTM96180-1838-2.0 / 36VDC, 0.5A	100/240VAC	35.817 / 35.823	-0.508 / -0.492	35.820 / 35.823	-0.5 / -0.492	
GTM96180-1848 / 48VDC, 0.37A	100/240VAC	47.878 / 47.881	-0.254 / -0.248	47.431 / 47.437	-1.185 / -1.173	
Note: The values are measured at 100Vac and 240Vac respectively						

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Clause	Requirement + Test	Result - Remark	Verdict

14	TABLE: HEATING						P
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information
	Test voltage (V).....:				110/264		—
	Ambient (°C).....:				40		—
Thermocouple Locations			Max. temperature measured, (°C)		Max. temperature limit, (°C)		
			110	264			
Model: GTM96180-1807-2.0							
T1 winding			105	99	110		
T1 core			102	94	Ref		
C1			101	91	105		
U3			93	84	100		
MOV1			82	60	85		
CY1			101	95	125		
CX1			85	63	100		
PCB			111	105	130		
Output wire			55	54	80		
External enclosure			77	73	80		
Internal enclosure			97	88	Ref		
Plug pin sleeve			14	10	45		

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

Model: GTM96180-1807-2.0-T2			
Inlet body	62	58	--
Model: GTM96180-1817.9-5.9			
T1 winding	95	92	110
T1 core	93	92	Ref
C1	99	79	105
U3	76	75	100
MOV1	77	59	85
CY1	86	83	125
CX1	77	60	100
PCB	94	80	130
External enclosure	67	68	80
Internal enclosure	76	77	Ref
Output wire	45	51	80
Plug pin sleeve	13	9	45

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

Model: GTM96180-1838-2.0			
T1 winding	97	88	110
T1 core	95	88	Ref
C1	96	73	105
U3	76	70	100
MOV1	74	55	85
CY1	81	75	125
CX1	71	55	100
PCB	93	74	130
External enclosure	68	62	80
Internal enclosure	71	66	Ref
Output wire	46	47	80
Plug pin sleeve	14	11	45
Model: GTM96180-1848			
T1 winding	92	86	110
T1 core	94	89	Ref
C1	98	78	105
U3	73	69	100
MOV1	77	57	85
CY1	90	84	125
CX1	77	58	100
PCB	95	75	130
External enclosure	66	62	80
Internal enclosure	75	71	Ref
Output wire	47	47	80
Plug pin sleeve	14	11	45
Supplementary information:			
The appliance can be worked continually. The value is recorded under continuous conditions.			

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

15	TABLE: SHORT-CIRCUIT AND OVERLOAD PROTECTION						N/A
	ambient temperature (°C)						
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information
See table below							

15	TABLE: Short circuit and overload protection			P
	Test voltage (V) :			90V / 264V
	Ambient (°C) :			25
Thermocouple Locations		Max. temperature measured, (°C)		Max. temperature limit, (°C)
--		90V	264V	--
Model: GTM96180-1807-2.0				
Support		45	40	105
Transformer winding		106	107	175 (Class B)
Output wire		41	42	85
Enclosure outside		69	70	105
Model: GTM96180-1817.9-5.9				
Support		39	36	105
Transformer winding		103	89	175 (Class B)
Output wire		37	37	85
Enclosure outside		62	58	105
Model: GTM96180-1838-2.0				
Support		36	34	105
Transformer winding		102	89	175 (Class B)
Output wire		33	33	85
Enclosure outside		62	57	105
Model: GTM96180-1848				
Support		42	38	105
Transformer winding		95	82	175 (Class B)
Output wire		35	33	85
Enclosure outside		59	51	105

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

Supplementary information:

The appliance can be worked continually. The value is recorded under continuous conditions.

18.2	TABLE: insulation resistance measurements		P
Insulation resistance R between:		R (MΩ)	Required R (MΩ)
Hazardous live parts and the body (Reinforced)		199	7
Input circuits and output circuits (Reinforced)		199	5
Core and output circuit (Reinforced)		199	5
Core and body (Reinforced)		199	7
Supplementary information:			

18.3	TABLE: Dielectric Strength		P
Test voltage applied between:		Test potential applied (V)	Breakdown / flashover (Yes/No)
Live parts of input circuits and output circuits (Reinforced)		3818	No
Live parts of different polarity (Basic)		1909	No
Body and live parts (Reinforced)		3818	No
Output circuit and core (Reinforced)		3818	No
Core and accessible part (Reinforced)		3818	No
Supplementary information:			

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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⁾	
PCB	WALEX ELECTRONIC (WUXI) CO LTD	T2, T2A, T2B T4	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E154355	
Alt. use	DONGGUAN HE TONG ELECTRONICS CO LTD	CEM1 2V0 FR4	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E243157	
Alt. use	CHEERFUL ELECTRONIC (HK) LTD	02 03 03A	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E199724	
Alt. use	DONGGUAN DAYSUN ELECTRONIC CO LTD	DS2	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E251754	
Alt. use	DAFENG AREX ELECTRONICS TECHNOLOGY CO LTD	02V0 03V0 04V0	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E186016	
Alt. use	BRITE PLUS ELECTRONICS (SUZHOU) CO LTD	DKV0-3A DGV0-3A	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E177671	
Alt. use	KUOTIANG ENT LTD	C-2 C-2A	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E227299	
Alt. use	SHENZHEN TONGCHUANGXIN ELECTRONICS CO LTD	TCX	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E250336	
Alt. use	PACIFIC WIN INDUSTRIAL LTD	PW-02 PW-03	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E228070	
Alt. use	YUANMAN PRINTED CIRCUIT CO LTD	1V0	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E74757	
Alt. use	SUZHOU XINKE ELECTRONICS CO LTD	XK-2, XK-3	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E231590	
Alt. use	JIANGSU DIFEIDA ELECTRONICS CO LTD	DFD-1	Min. 1.6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E213009	

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Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	Shanghai H-FAST Electronics Co Ltd	211001 411001	Min. 1,6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E337862
Alt. use	Jiangxi ZHONG XIN HUA Electronics Industry Co Ltd	ZXH-1, ZXH-2, ZXH-3	Min. 1,6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E331298
Alt. use	KUNSHAN CITY QIANDENG WUQIAO ELECTRICAL APPLIANCE FACTORY	WQ-A WQ-B WQ-C	Min. 1,6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E492425
Alt. use	SHENZHEN JIA LI CHUANG TECHNOLOGY DEVELOPMENT CO LTD	JLC-2	Min. 1,6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E479892
Fuse (F1, F2) (F2 is optional)	Conquer Electronics Co., Ltd.	MST series	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40017118 UL E82636
Alt. use	Ever Island Electric Co., Ltd. And Walter Electric	2010, ICP	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40018781 UL E220181
Alt. use	Suzhou Walter Electronic Co. Ltd.	2000	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40018790 E56092
Alt. use	Bel Fuse Ltd.	RST-Serie(s)	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40011144 UL E20624
Alt. use	Cooper Bussmann LLC	SS-5	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40015513 UL E19180
Alt. use	Shenzhen Lanson Electronics Co. Ltd.	SMT	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40012592 UL E221465

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Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	Dongguan Better Electronics Technology Co., Ltd.	932	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40033369 UL E300003
Alt. use	Hollyland Company Limited	5ET	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40015669 UL E156471
Alt. use	Sunny East Enterprise Co. Ltd.	CFD-Serie(s)	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40030246 UL E133774
Alt. use	Conquer Electronics Co., Ltd.	MET series	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40017157 UL E82636
Alt. use	Zhongshan Lanbao Electrical Appliances Co., Ltd.	RTI-10 Serie(s)	T1.6A, 250V;	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40017009 UL E213695
Bridging resistor	TY-Ohm Suzhou Electronic Works Co. Ltd	RT	10M Ω , 1W	IEC/EN 60950-1	VDE 40031266 UL E321764
Alt. use	Yageo Components (Suzhou) Co. Ltd	HHV	10M Ω , 1W	IEC/EN 60950-1	VDE 40031974 UL E333286
Y capacitor (CY1, CY2) (Optional)	TDK Corporation	CD	Y1, AC250V, max 2200pF, 55/125/21/B	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40017931 UL E37861
Alt. use	Success Electronics Co., Ltd.	SE	Y1, AC250V, or AC500V, max 2200pF, 40/125/56/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40037211 VDE 40020002 UL E114280
Alt. use	Success Electronics Co., Ltd.	SB	Y1, AC250V, max 2200pF, 40/125/56/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40037221 VDE 40020001 UL E114280

IEC 61558-2-16					
Clause	Requirement + Test			Result - Remark	Verdict
Alt. use	Murata Mfg. Co., Ltd.	KX	Y1, AC250V, max 2200pF, 25/125/21/B	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40002831 UL E37921
Alt. use	Walsin Technology Corp.	AH	Y1, AC250V, max 2200pF, 25/125/21/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40001804 UL E146544
Alt. use	JYA-NAY Co., Ltd.	JN	Y1, AC250V, max 2200pF, 25/125/21/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40001831 UL E201384
Alt. use	Haohua Electronic Co.	CT 7	Y1, AC250V, max 2200pF, 30/125/56/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40003902 UL E233106
Alt. use	Jyh Chung Electronic Co., Ltd.	JD	Y1, AC250V, max 2200pF, 40/125/21/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 137027 UL E187963
Alt. use	Jerro Electronics Corp.	JX-series	Y1, AC250V, max 2200pF, 40/125/21/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40032158 UL E333001
Alt. use	WELSON INDUSTRIAL CO LTD	WD	Y1, AC250V, max 2200pF, 55/125/21/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40016157 UL E104572
Alt. use	Xiangtai Electronic (Shenzhen) Co., Ltd.	YO-series	Y1, AC400V, max 2200pF, 25/125/21/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40036880 UL E319473
Alt. use	SHANTOU HIGH-NEW TECHNOLOGY DEVELOPMNT ZONE SONGTIAN ENTERPRISE CO LTD	CD CE	Y1, AC250V, max 2200pF, 25/125/21/C	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40025754 40025748 UL E208107
X capacitor (CX1) (Optional)	Cheng Tung Industrial Co., Ltd.	CTX	Min. 300VAC, Max. 0.47μF, 110 °C, X1 or X2	IEC 61558-2-16 UL 60384-14 UL 1414	Tested with appliance UL E193049

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	Tenta Electric Industrial Co. Ltd.	MEX	Min. 250VAC, Max. 0.47 μ F, 40/100/21/B, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 119119 UL E222911
Alt. use	Joey Electronics (Dong Guan) Co., Ltd.	MPX	Min. 250VAC, Max. 0.47 μ F, 40/105/21/B, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40032481 UL E216807
Alt. use	Ultra Tech Xiphi Enterprise Co. Ltd.	HQX	Min. 250VAC, Max. 0.47 μ F, 40/100/21/C, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40015608 UL E183780
Alt. use	Yuo Yu Electronics Co. Ltd.	MPX	Min. 250VAC, Max. 0.47 μ F, 40/100/21/C, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40032392 UL E200119
Alt. use	Sinhua Electronics (Huzhou) Co., Ltd.	MPX	Min. 250VAC, Max. 0.47 μ F, 40/100/21/C, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40014686 UL E237560
Alt. use	Jiangsu Xinghua Huayu Electronics Co., Ltd.	MPX - Series	Min. 250VAC, Max. 0.47 μ F, 40/100/21/C, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40022417 UL E311166
Alt. use	Dain Electronics Co., Ltd.	MEX, MPX, NPX	Min. 250VAC, Max. 0.47 μ F, 40/100/21/C, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40018798 UL E147776
Alt. use	Shenzhen Jinghao Capacitor Co., Ltd.	CBB62B	Min. 250VAC, Max. 0.47 μ F, 40/110/56/B, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40018690 UL E252286
Alt. use	SHANTOU HIGH-NEW TECHNOLOGY DEVELOPMNT ZONE SONGTIAN ENTERPRISE CO LTD	MPX MKP CD CE DSY	Min. 250VAC, Max. 0.47 μ F, 40/110/56/B, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40034679 UL E208107

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Photo coupler (U3)	Everlight Electronics Co., Ltd.	EL817	Dti=0.5mm Int. , dcr=6.0mm EXT.dcr=7.7mm, thermal cycling test,110°C	IEC/EN 60747-5-2	VDE 132249
Alt. use	COSMO Electronics Corporation	K1010 / KP1010	Dti=0.6mm Int. , dcr=4.0mm EXT.dcr=5.0mm, thermal cycling test,115°C	IEC/EN 60747-5-2	VDE 101347
Alt. use	Lite-On Technology Corporation	LTV-817	Dti=0.8mm Int. , EXT.dcr=7.8mm, thermal cycling test,100°C	IEC/EN 60747-5-2	VDE 40015248
Alt. use	Fairchild Semiconductor Pte Ltd.	H11A817B / FOD817B	Insulation voltage: 850V; Transient overvoltage: 6000V; CTI175; Int. Cr/ Ext. Cr: ≥7,0/ 7,0 mm; 30/110/21	IEC/EN 60747-5-2	VDE 40026857
Alt. use	Sharp Corporation Electronic Components and Devices Group	PC817	Insulation voltage: 890V; Transient overvoltage: 9000V Int. Cr/ Ext. Cr: 7.62/ 7.62 mm; 30/100/21	IEC/EN 60747-5-2	VDE 40008087
Alt. use	Bright Led Electronics Corp.	BPC-817 A/B/C/D/L BPC-817 M BPC-817 S	Dti=0.4mm EXT.dcr=7.0mm, thermal cycling test,100°C	IEC/EN 60747-5-2	VDE 40007240
Alt. use	Toshiba Corporation Semiconductor & Storage Products Company	TLP781F	Dti > 0.4mm, Ext cr > 8.0mm, Isolation 3000Vac min., 110°C min., Thermal cycling test	IEC/EN 60747-5-2	VDE 40021173
Alt. use	Renesas Electronics Corp.	PS2701-1	Isolation voltage 3750 Vrms, 100°C min	IEC/EN 60747-5-2	VDE 40008902 UL E72422
Varistor MOV1 (Optional)	Thinking Electronic Industrial Co., Ltd.	TVR10471K, TVR14471K	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051- 2-2	VDE 005944

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	Thinking Electronic Industrial Co., Ltd.	TVR10471-M,	Max. Continuous voltage: min 300Vac(rms), 125°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	UL E314979 VDE 40036061
Alt. use	Centra Science Corp.	10D471K, 14D471K	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 4008220
Alt. use	Success Electronics Co., Ltd.	SVR10D471K SVR14D471K	Max. Continuous voltage: min 300Vac(rms), Min.85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40030401 VDE 123677
Alt. use	Walsin Technology Co., Ltd.	14D471K 10D471K	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40010090
Alt. use	BestBright Electronics Co. Ltd	14D471K 10D471K	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40005858
Alt. use	Ceramate Techn. Co., Ltd.	GNR10D471K GNR14D471K	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40031745
Alt. use	Brightking (Shenzhen) Co., Ltd.	14D471K 10D471K	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40027827
Alt. use	BESTBRIGHT ELECTRONICS CO LTD	471KH10-(+)	Max. Continuous voltage: min 300Vac(rms), 125°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	UL E327997 TUV B17029604 8003
Alt. use	Joyin Co., Ltd.	JVR10N471K JVR14N471K	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 005937
Alt. use	SHANTOU HIGH-NEW TECHNOLOGY DEVELOPMNT ZONE SONGTIAN ENTERPRISE CO LTD	07D471K, 10D471K, 14D471K	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40023049 UL E330837

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	Guangdong Huiwan Electronics Technology Co Ltd	V-471K-10D,V-471K-10E V-471K-14D,V-471-14E	Max. Continuous voltage: min 300Vac(rms), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40043880 UL E480104
Appliance inlet CON1 (C8 type)	LECI Electronics Co., Ltd	DB-8	2.5A, 250Vac	IEC/EN 60320-1	VDE 40032028
Alt. use	Rich Bay Co., Ltd.	R-201SN90	2.5A, 250Vac	IEC/EN 60320-1	VDE 40030384
Alt. use	Sun Fair Electric Wire & Cable (HK)Co. Ltd.	S-01	2.5A, 250Vac	IEC/EN 60320-1	VDE 40034449
Alt. use	Rong Feng Industrial Co., Ltd.	RF-180	2.5A, 250Vac	IEC/EN 60320-1	VDE 40030168
Alt. use	Inalways Corporation	0721	2.5A, 250Vac	IEC/EN 60320-1	ENEC 2010087
Alt. use	Zhe Jiang Bei Er jia	ST-A03-005	2.5A, 250Vac	IEC/EN 60320-1	VDE 40014833
Alt. use	Shenzhen Delikang Electronics Technology Co. Ltd.	CDJ-8	2.5A, 250Vac	IEC/EN 60320-1	VDE 40025531
Appliance inlet CON1 (C18 type)	Rong Feng Industrial Co., Ltd.	SS-120A	10A, 250Vac	IEC/EN 60320-1	VDE 40028101
Alt. use	HCR ELECTRONICS CO LTD	SK05	10A, 250Vac	IEC/EN 60320-1	ENEC NO4018
Output cord	JHI WEI ELECTRIC WIRE & CABLE CO LTD	2468	Min. 24AWG, min. 300Vac, min. 80°C	IEC/EN 61558-2-16	Tested with appliance UL E157717
Alt. use	Interchangeable	Interchangeable	Min. 24AWG, min. 300Vac, min. 80°C	IEC/EN 61558-2-16 UL 758	Tested with appliance UL approved
Appliance inlet CON1 Class I units (C6 type)	LECI Electronics Co., Ltd	DB-6	2.5A, 250Vac	IEC/EN 60320-1	VDE 40032465
Alt. use	Rich Bay Co., Ltd.	R-30790	2.5A, 250Vac	IEC/EN 60320-1	VDE 40030381
Alt. use	Sun Fair Electric Wire & Cable (HK) Co. Ltd.	S-02	2.5A, 250Vac	IEC/EN 60320-1	VDE 40034448

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	TECX-UNIONS Technology Corporation	TU-333	2.5A, 250Vac	IEC/EN 60320-1	ENEC 00633
Alt. use	Rong Feng Industrial Co., Ltd.	RF-190	2.5A, 250Vac	IEC/EN 60320-1	VDE 40030379
Alt. use	Inalways Corporation	0724	2.5A, 250Vac	IEC/EN 60320-1	ENEC 2010080
Alt. use	Zhe Jiang Bei Er jia	ST-A04-002	2.5A, 250Vac	IEC/EN 60320-1	VDE 40016045
Appliance inlet CON1 Class I units (C14 type)	LECI Electronics Co., Ltd	DB-14	10A, 250Vac	IEC/EN 60320-1	VDE 40032137
Alt. use	Rich Bay Co., Ltd.	R-301SN	10A, 250Vac	IEC/EN 60320-1	VDE 40030228
Alt. use	Sun Fair Electric Wire & Cable (HK)Co. Ltd.	S-03	10A, 250Vac	IEC/EN 60320-1	VDE 40034447
Alt. use	TECX-UNIONS Technology Corporation	TU-301-S, TU-301-SP	10A, 250Vac	IEC/EN 60320-1	ENEC 00647
Alt. use	Rong Feng Industrial Co., Ltd.	SS-120	10A, 250Vac	IEC/EN 60320-1	VDE 40028101
Alt. use	Inalways Corporation	0711	10A, 250Vac	IEC/EN 60320-1	ENEC 2010084
Alt. use	Zhe Jiang Bei Er jia	ST-A01-003J	10A, 250Vac	IEC/EN 60320-1	VDE 40013388
Heat- shrinkable tubing	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR, RSFR- H, RSFR-HPF	600V, 125 °C	IEC/EN 60950-1 UL 224	Tested with appliance UL E203950
Alt. use	QIFURUI ELECTRONICS CO	QFR-h	600V, 125°C	IEC/EN 60950-1 UL 224	Tested within appliance UL E225897

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	DONGGUAN SALIPT CO LTD	SALIPT S-901-300 SALIPT S-901-600	Min. 300V, 125°C	IEC/EN 60950-1 UL 224	Tested within appliance UL E209436
Alt. use	GUANGZHOU KAIHENG ENTERPRISE GROUP	K-2 (+) K-2 (CB)	Min. 300V, 125°C	IEC/EN 60950-1 UL 224	Tested within appliance UL E214175
Alt. use	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-HFT	Min. 300V, 125°C	IEC/EN 60950-1 UL 224	Tested within appliance UL E180908
Transformer (T1)	ENG / GlobTek / BOAM / HAOPUWEI	TF042, TF043, TF044, TF045, TF046	Class B, TF042 for output voltage 5.0-8.0Vdc, TF043 for output voltage 8.1-14.9Vdc, TF044 for output voltage 15.0-18.9Vdc, TF045 for output voltage 19.0-30.0Vdc, TF046 for output voltage 30.1-48.0Vdc.	IEC 61558-2-16	Tested with appliance
- Magnet wire	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWN/U (UL E201757)	MW28-C, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWS/U (UL E201757)	MW75-C, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	JUNG SHING WIRE CO LTD	UEW-4 (UL E174837)	MW75C, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	JUNG SHING WIRE CO LTD	UEY-2 (UL E174837)	MW28-C, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	JIANGSU HONGLIU MAGNET WIRE TECHNOLOGY CO LTD	2UEW/130 (UL E335065)	MW75-C, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	CHANGZHOU DAYANG WIRE & CABLE CO LTD	2UEW/130 (UL E158909)	MW75-C, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	WUXI JUFENG COMPOUND LINE CO LTD	2UEWB (UL E206882)	MW75#, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	JIANGSU DARTONG M & E CO LTD	UEW (UL E237377)	MW 75-C, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	SHANDONG SAINT ELECTRIC CO LTD	UEW/130 (UL E194410)	MW75#, 130°C	IEC 61558-2-16	Tested with appliance

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	ZHEJIANG LANGLI ELECTRIC EQUIPMENTS CO LTD	UEW (UL E222214)	MW 79#, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	NINGBO JINTIAN NEW MATERIAL CO LTD	2UEW/155 (UL E227047)	MW 79#, 130°C	IEC 61558-2-16	Tested with appliance
Alt. use	HUIZHOU HUILI INDUSTRIAL CO LTD	MIW-B(x) (UL E322908)	MW 79#, 130°C	IEC 61558-2-16	Tested with appliance
-Triple-insulated wire (Secondary)	Great Leoflon Industrial Co., Ltd.	TRW (B) Serie(s)	Class B, reinforced insulation	IEC 61558-2-16	VDE 136581
- Alt. use	KBI COSMOLINK CO.,LTD	TIW-M Serie(s)	Class B, reinforced insulation	IEC 61558-2-16	VDE 138053
- Alt. use	Furukawa Electric Co Ltd.	TEX-E	Class B, reinforced insulation	IEC 61558-2-16	VDE 006735
- Alt. use	E&B TECHNOLOGY CO LTD	E&B-XXXB E&B-XXXB-1	Reinforced insulation, Class B	IEC 61558-2-16	VDE 40023473
- Alt. use	SHENZHEN JIUDING NEW MATERIAL CO LTD	DTIW-B	Reinforced insulation, Class B	IEC 61558-2-16	VDE 40037495 UL E357999
- Alt. use	TOTOKU ELECTRIC CO LTD	TIW-2SLZX\$+, TIW-2SLZXY\$+	Reinforced insulation, Class B	IEC 61558-2-16	VDE 40044910 UL E166483
-Bobbin	CHANG CHUN PLASTICS CO LTD	T375J T375HF T373J	V-0, 150°C, thickness 0,45 mm min.	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E59481
- Alt. use	CHANG CHUN PLASTICS CO LTD	4130	V-0, 140°C, thickness 0,74 mm min.	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E59481
- Alt. use	SUMITOMO BAKELITE CO LTD	PM-9820 PM-9823 PM-9630	V-0, 150°C, thickness 0,45 mm min.	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E41429

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
- Alt. use	SHOWA DENKO MATERIALS TECHNO SERVICE CO., LTD.	CP-J-8800	V-0	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance E514814
-Insulating tape	3M COMPANY ELECTRICAL MARKETS DIV (EMD)	1350F-1 1350T-1 44	Min.130°C	IEC 61558-2-16 UL 510	Tested with appliance UL E17385
- Alt. use	BONDTEC PACIFIC CO LTD	370S	Min.130°C	IEC 61558-2-16 UL 510	Tested with appliance UL E175868
- Alt. use	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PZ CT WF	Min.130°C	IEC 61558-2-16 UL 510	Tested with appliance UL E165111
- Alt. use	HUIZHOU YAHUA ELECTRONIC TECHNOLOGY CO LTD	CT	Min.130°C	IEC 61558-2-16 UL 510	Tested with appliance UL E495875
- Alt. use	JINGJIANG JINGYI ADHESIVE PRODUCT CO LTD	JY25-A	Min.130°C	IEC 61558-2-16 UL 510	Tested with appliance UL E246950
- Alt. use	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-XX	Min.130°C	IEC 61558-2-16 UL 510	Tested with appliance UL E246820
-PTFE tubing	GREAT HOLDING INDUSTRIAL CO LTD	TFT / TFS	Min. 300V, 200oC, VW-1	IEC 61558-2-16	Tested with appliance UL E156256
-Alt. use	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	WF	600V, 200°C, VW-1	IEC 61558-2-16	Tested with appliance UL E203950
-Alt. use	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-TT-T / CB-TT-S	Min. 300V, 200°C, VW-1	IEC 61558-2-16	Tested with appliance UL E180908
Enclosure (all parts)	SABIC INNOVATIVE PLASTICS B V	SE1X, SE1	PPE+PS, Min. V-1, Min. thickness:2.0mm, 105°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E45329

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	SABIC INNOVATIVE PLASTICS B V	SE100	PPE+PS, Min. V-1, Min. thickness:2.0mm, 95°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E45329
Alt. use	SABIC INNOVATIVE PLASTICS B V	C2950	PC/ABS, Min. V-0, Min. thickness:2.0mm, 85°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E45329
Alt. use	SABIC INNOVATIVE PLASTICS B V	CX7211	PC/ABS, Min. V-1, Min. thickness:2.0mm, 90°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E45329
Alt. use	SABIC INNOVATIVE PLASTICS B V	945	PC, Min. V-1, Min. thickness: 2.0mm, 120°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E45329
Alt. use	SABIC INNOVATIVE PLASTICS B V	HF500R	PC, V-0, Min. thickness:2.0mm, 125°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E45329
Alt. use	SABIC JAPAN L L C	SE1X, SE1	PPE+PS, Min. V-1, Min. thickness:2.0mm, 105°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E207780
Alt. use	SABIC JAPAN L L C	SE100	PPE+PS, Min. V-1, Min. thickness:2.0mm, 95°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E207780
Alt. use	SABIC JAPAN L L C	C2950	PC/ABS, Min. V-0, Min. thickness:2.0mm, 85°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E207780

IEC 61558-2-16					
Clause	Requirement + Test		Result - Remark		Verdict
Alt. use	SABIC JAPAN L L C	CX7211	PC/ABS, Min. V-1, Min. thickness:2.0mm, 90°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E207780
Alt. use	SABIC JAPAN L L C	945	PC, Min. V-1, Min. thickness: 2.0mm, 120°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E207780
Alt. use	SABIC JAPAN L L C	HF500R	PC, V-0, Min. thickness:2.0mm, 125°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E207780
Alt. use	SABIC INNOVATIVE PLASTICS US L L C	945	PC, Min. V-1, Min. thickness: 2.0mm, 120°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E121562
Alt. use	TEIJIN CHEMICALS LTD	LN-1250G	PC, Min. V-0, Min. thickness:2.0mm, 115°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E50075
Earthing wire for Class I model	Interchangeable	1015, 1007, 1185	Min. 20 AWG, Min. 300V, Min. 80°C	IEC/EN 61558-2-16	Tested with appliance
Output wire	Interchangeable	Interchangeable	Min. 24 AWG, Min. 300V, Min. 80°C	IEC/EN 61558-2-16	Tested with appliance
1) An asterisk indicates a mark which assures the agreed level of surveillance.					

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

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Clause	Requirement + Test	Result - Remark	Verdict

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)
L to N before fuse(FI)	400	240	2.4	3.75	2.44	3.75
Two poles of fuse(FI)	400	240	2.4	2.46	2.44	2.46
Live parts to accessible parts(RI)	426	259	4.82	8.2	5.18	8.2
Primary circuits to secondary circuits(RI)	426	259	4.82	6.53	5.18	6.53
Primary winding to secondary winding(RI)	426	259	4.82	6.5	5.18	6.5
Secondary winding to core(RI)	426	259	4.82	7.2	5.18	7.2
Core to secondary parts(RI)	426	259	4.82	7.1	5.18	7.1
Supplementary information:						

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)	
Input to output through transformer	259	3818	Triple insulation winding add basic insulation	Triple insulation winding + 2-layer insulating tape	
Enclosure thickness	259	3818	1.0	2.0	
Supplementary information:					

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Clause	Requirement + Test	Result - Remark	Verdict

26.2 TEST A	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				NA
	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	

BB.26.2 TEST B	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				NA
	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	

26.2 TEST C	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				NA
	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	

26.107 61558-2- 16/A1	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				NA
	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	

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

27.1	TABLE: ball-pressure test		P
Material designation	Temperature (°C)	Result (mm)	
Enclosure and Plug Holder (SE1)	125	1.54	
Enclosure and Plug Holder (SE1X)	125	1.51	
Enclosure and Plug Holder (CX7211)	125	1.44	
Enclosure and Plug Holder (LN-1250G)	125	1.56	
Enclosure and Plug Holder (SE100)	125	1.55	
Enclosure and Plug Holder (945)	125	1.42	
Enclosure and Plug Holder (C2950)	125	1.24	
Enclosure and Plug Holder (HF500R)	125	1.12	
PCB (T2)	125	0.62	
PCB (T2A)	125	0.65	
PCB (T2B)	125	0.64	
PCB (T4)	125	0.62	
PCB (CEM1)	125	0.58	
PCB (2V0)	125	0.66	
PCB (FR4)	125	0.72	
PCB (02)	125	0.65	
PCB (03)	125	0.68	
PCB (03A)	125	0.63	
PCB (DS2)	125	0.62	
PCB (02V0)	125	0.65	
PCB (03V0)	125	0.65	
PCB (04V0)	125	0.65	
PCB (DKV0-3A)	125	0.68	
PCB (DGV0-3A)	125	0.68	
PCB (C-2)	125	0.71	
PCB (C-2A)	125	0.71	
PCB (TCX)	125	0.59	
PCB (PW-02)	125	0.65	
PCB (PW-03)	125	0.65	
PCB (1V0)	125	0.72	
PCB (XK-2)	125	0.70	

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Clause	Requirement + Test	Result - Remark	Verdict
PCB (XK-3)	125	0.68	
PCB (DFD-1)	125	0.71	
PCB (211001)	125	0.68	
PCB (411001)	125	0.67	
PCB (ZXH-1)	125	0.73	
PCB (ZXH-2)	125	0.71	
PCB (ZXH-3)	125	0.69	
PCB (WQ-A)	125	0.69	
PCB (WQ-B)	125	0.68	
PCB (WQ-C)	125	0.70	
PCB (JLC-2)	125	0.71	
Bobbin (T375J)	125	1.03	
Bobbin (T375HF)	125	1.05	
Bobbin (T373J)	125	1.05	
Bobbin (4130)	125	1.08	
Bobbin (PM-9820)	125	0.98	
Bobbin (PM-9823)	125	1.01	
Bobbin (PM-9630)	125	0.99	
Bobbin (CP-J-8800)	125	1.06	

27.3	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	
			te	ti	te	ti		
Enclosure (SE1)	SABIC INNOVATIVE PLASTICS B V	--	NI	NI	NI	NI	--	P
Enclosure (SE1X)	SABIC INNOVATIVE PLASTICS B V	--	NI	NI	NI	NI	--	P
Enclosure (SE100)	SABIC INNOVATIVE PLASTICS B V	--	NI	NI	NI	NI	--	P

IEC 61558-2-16								
Clause	Requirement + Test					Result - Remark		Verdict
Enclosure (C2950)	SABIC INNOVATIVE PLASTICS B V	--	NI	NI	NI	NI	--	P
Enclosure (CX7211)	SABIC INNOVATIVE PLASTICS B V	--	NI	NI	NI	NI	--	P
Enclosure (945)	SABIC INNOVATIVE PLASTICS B V	--	NI	NI	NI	NI	--	P
Enclosure (HF500R)	SABIC INNOVATIVE PLASTICS B V	--	NI	NI	NI	NI	--	P
Enclosure (SE1)	SABIC JAPAN L L C	--	NI	NI	NI	NI	--	P
Enclosure (SE1X)	SABIC JAPAN L L C	--	NI	NI	NI	NI	--	P
Enclosure (SE100)	SABIC JAPAN L L C	--	NI	NI	NI	NI	--	P
Enclosure (C2950)	SABIC JAPAN L L C	--	NI	NI	NI	NI	--	P
Enclosure (CX7211)	SABIC JAPAN L L C	--	NI	NI	NI	NI	--	P
Enclosure (945)	SABIC JAPAN L L C	--	NI	NI	NI	NI	--	P
Enclosure (HF500R)	SABIC JAPAN L L C	--	NI	NI	NI	NI	--	P
Enclosure (945)	SABIC INNOVATIVE PLASTICS US L L C	--	NI	NI	NI	NI	--	P
Enclosure (LN-1250G)	TEIJIN CHEMICALS LTD	--	NI	NI	NI	NI	--	P
PCB (T2)	WALEX ELECTRONIC (WUXI) CO LTD	--	--	--	NI	NI	--	P

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Clause	Requirement + Test	Result - Remark						Verdict
PCB (T2A)	WALEX ELECTRONIC (WUXI) CO LTD	--	--	--	NI	NI	--	P
PCB (T2B)	WALEX ELECTRONIC (WUXI) CO LTD	--	--	--	NI	NI	--	P
PCB (T4)	WALEX ELECTRONIC (WUXI) CO LTD	--	--	--	NI	NI	--	P
PCB (CEM1)	DONGGUAN HE TONG	--	--	--	NI	NI	--	P
PCB (2V0)	DONGGUAN HE TONG	--	--	--	NI	NI	--	P
PCB (FR4)	DONGGUAN HE TONG	--	--	--	NI	NI	--	P
PCB (02)	CHEERFUL ELECTRONIC (HK) LTD	--	--	--	NI	NI	--	P
PCB (03)	CHEERFUL ELECTRONIC (HK) LTD	--	--	--	NI	NI	--	P
PCB (03A)	CHEERFUL ELECTRONIC (HK) LTD	--	--	--	NI	NI	--	P
PCB (DS2)	DONGGUAN DAYSUN	--	--	--	NI	NI	--	P
PCB (02V0)	SHANGHAI AREX PRECISION	--	--	--	NI	NI	--	P
PCB (03V0)	SHANGHAI AREX PRECISION	--	--	--	NI	NI	--	P
PCB (04V0)	SHANGHAI AREX PRECISION	--	--	--	NI	NI	--	P

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Clause	Requirement + Test				Result - Remark			Verdict
PCB (DKV0-3A)	BRITE PLUS ELECTRONICS	--	--	--	NI	NI	--	P
PCB (DGV0-3A)	BRITE PLUS ELECTRONICS	--	--	--	NI	NI	--	P
PCB (C-2)	KUOTIANG ENT LTD	--	--	--	NI	NI	--	P
PCB (C-2A)	KUOTIANG ENT LTD	--	--	--	NI	NI	--	P
PCB (TCX)	SHENZHEN TONGCHUANGXIN	--	--	--	NI	NI	--	P
PCB (PW-02)	PACIFIC WIN INDUSTRIAL LTD	--	--	--	NI	NI	--	P
PCB (PW-03)	PACIFIC WIN INDUSTRIAL LTD	--	--	--	NI	NI	--	P
PCB (1V0)	YUANMAN PRINTED CIRCUIT CO LTD	--	--	--	NI	NI	--	P
PCB (XK-2)	SUZHOU XINKE	--	--	--	NI	NI	--	P
PCB (XK-3)	SUZHOU XINKE	--	--	--	NI	NI	--	P
PCB (DFD-1)	JIANGSU DIFEIDA	--	--	--	NI	NI	--	P
PCB (211001)	Shanghai H-FAST Electronics Co Ltd	--	--	--	NI	NI	--	P
PCB (411001)	Shanghai H-FAST Electronics Co Ltd	--	--	--	NI	NI	--	P

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Clause	Requirement + Test	Result - Remark						Verdict
PCB (ZXH-1)	Jiangxi ZHONG XIN HUA Electronics Industry Co Ltd	--	--	--	NI	NI	--	P
PCB (ZXH-2)	Jiangxi ZHONG XIN HUA Electronics Industry Co Ltd	--	--	--	NI	NI	--	P
PCB (ZXH-3)	Jiangxi ZHONG XIN HUA Electronics Industry Co Ltd	--	--	--	NI	NI	--	P
PCB (WQ-A)	KUNSHAN CITY QIANDENG WUQIAO ELECTRICAL APPLIANCE FACTORY	--	--	--	NI	NI	--	P
PCB (WQ-B)	KUNSHAN CITY QIANDENG WUQIAO ELECTRICAL APPLIANCE FACTORY	--	--	--	NI	NI	--	P

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Clause	Requirement + Test	Result - Remark						Verdict
PCB (WQ-C)	KUNSHAN CITY QIANDENG WUQIAO ELECTRICAL APPLIANCE FACTORY	--	--	--	NI	NI	--	P
PCB (JLC-2)	SHENZHEN JIA LI CHUANG TECHNOLOGY DEVELOPMENT CO LTD	--	--	--	NI	NI	--	P
Bobbin (T375J)	CHANG CHUN PLASTICS CO.,LTD	--	NI	NI	--	--	--	P
Bobbin (T375HF)	CHANG CHUN PLASTICS CO.,LTD	--	NI	NI	--	--	--	P
Bobbin (T373J)	CHANG CHUN PLASTICS CO.,LTD	--	NI	NI	--	--	--	P
Bobbin (4130)	CHANG CHUN PLASTICS CO.,LTD	--	NI	NI	--	--	--	P
Bobbin (PM-9820)	Sumitomo Bakelite Co Ltd	--	NI	NI	--	--	--	P
Bobbin (PM-9823)	Sumitomo Bakelite Co Ltd	--	NI	NI	--	--	--	P
Bobbin (PM-9630)	Sumitomo Bakelite Co Ltd	--	NI	NI	--	--	--	P

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Clause	Requirement + Test					Result - Remark		Verdict
Bobbin (CP-J-8800)	HITACHI CHEMICAL CO LTD	--	NI	NI	--	--	--	P
Output terminal/--	--	--	--	--	--	--	NI	P
Object/ Part No./ Material	Manufacturer / trademark	Glow-wire flammability index (GWFI), °C				GW ignition temp. (GWIT), °C		Verdict
		550	650	750	850	675	775	
								NA
:								
If no, then surrounding parts passed the needle-flame test of annex E (Yes/No) :								Yes
The test specimen passed the test by virtue of most of the flaming material being withdrawn with the glow-wire (Yes/No)? :								Yes
Ignition of the specified layer placed underneath the test specimen (Yes/No) :								No
Supplementary information: 550 °C GWT not relevant (or applicable) to parts of material classified at least HB40 or if relevant HBF The GWIT pre-selection option, the 850 °C GWFI pre-selection option, and the 850 °C GWT are not relevant (or applicable) for attended appliances.								

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Clause	Requirement + Test	Result - Remark	Verdict

Annex U	U.5.1 THERMAL ENDURANCE TEST													
Type ref.														
Rated PRI-Voltage														
Rated SEC-Voltage														
Material of Winding														
Material of bobbin														
Material of resin														
Material of potting														
Material of foil														
Components removed for test														
tw														
S														
Objective test duration (days)														
Theoretical test temperature														
Sample	1		2		3		4		5		6		7	
Winding	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC
Start – R _k														
After 4 h – R _w														
After 4 h – winding temperature														
After 4 h - oven temperature														
After 24 h – R _w														
After 24 h – winding temperature														
After 24 h - oven temperature														
Final test period (days)														
Output voltage (11.1) under load														
Insulating														

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







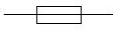


resistance															
High voltage test (35% of the values in Table 8.a)															
Annex U	U.5.2 The use of another constant S other than 4500 in tw tests Test1:10 days														
Type ref.															
Rated PRI-Voltage															
Rated SEC- Voltage															
Material of Winding															
Material of bobbin															
Material of resin															
Material of potting															
Material of foil															
Components removed for test															
tw															
S															
Objective test duration (days)															
Theoretical test temperature															
Sample	1		2		3		4		5		6		7		
Winding	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	
Start – Rk															
After 4 h – Rw															
After 4 h – winding temperature															
After 4 h - oven temperature															
After 24 h – Rw															
After 24 h – winding temperature															
After 24 h - oven temperature															



















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

Final test period (days)															
Output voltage (11.1) under load															
Insulating resistance															
High voltage test (35% of the values in Table 8.a)															
IEC 61558-2-16															
Annex U	U.5.2 The use of another constant S other than 4500 in tw tests Test2:120 days														
Type ref.															
Rated PRI-Voltage															
Rated SEC-Voltage															
Material of Winding															
Material of bobbin															
Material of resin															
Material of potting															
Material of foil															
Components removed for test															
tw															
S															
Objective test duration (days)															
Theoretical test temperature															
Sample	1		2		3		4		5		6		7		
Winding	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	PRI	SEC	
Start – Rk															
After 4 h – Rw															
After 4 h – winding temperature															
After 4 h - oven temperature															

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Clause	Requirement + Test	Result - Remark	Verdict

After 24 h – R _w														
After 24 h – winding temperature														
After 24 h - oven temperature														
Final test period (days)														
Output voltage (11.1) under load														
Insulating resistance														
High voltage test (35% of the values in Table 8.a)														

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
AA	Annex AA		N/A
	Partial discharge (PD) test		N/A
BB	Annex BB		N/A
	Particular requirements for associated transformers for switch mode power supplies with internal frequencies > 500 Hz		N/A
	See separate test report-form for these Annex.		N/A
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:		N/A
	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	cosφ	N/A
	Class II construction		N/A
	Class III construction		N/A
	Fuse-link		N/A
	Rated max. ambient temperature	t_a	N/A
	Frame or core terminal		N/A
	Protective earth		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	IP number	IPXX	N/A
	Earth (ground for functional earth)		N/A
	For indoor use only		N/A
	tw5 YYY		N/A
	tw10 YYY		N/A
	twx YYY		N/A
	Additional Symbols (IEC 61558-2-16:09)		N/A
	SMPS incorporating a Fail-safe separating transformer	 or 	N/A
	Additional Symbols (IEC 61558-2-16:09)		N/A
	SMPS incorporating a Non-short-circuit-proof separating transformer	 or 	N/A
	SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)	 or 	N/A
	SMPS incorporating a Fail-safe isolating transformer	 or 	N/A
	SMPS incorporating a Non-short-circuit-proof isolating transformer	 or 	N/A
	SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)	 or 	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)		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

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Clause	Requirement + Test	Result - Remark	Verdict
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):		N/A
	– 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:		N/A
	– 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); 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:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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:		N/A
	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:		N/A
	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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	Separation of input and output circuits		N/A
BB.19.1.1	SMPS incorporating auto-transformers (IEC 61558-2-16:2009)		N/A
BB.19.1.2	SMPS incorporating separating transformers (IEC 61558-2-16:2009)		N/A
BB.19.1.2.1	Input and output circuits electrically separated. (IEC 61558-2-16:09)		N/A
BB.19.1.2.2	The insulation between input and output winding(s) consist of basic insulation (IEC 61558-2-16:09)		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 (IEC 61558-2-16:09)		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.19.1.2.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation (IEC 61558-2-16:09)		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation (IEC 61558-2-16:09)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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 (IEC 61558-2-16:09)		N/A
BB.19.1.2.4	Parts of output circuits may be connected to protective earth (IEC 61558-2-16:09)		N/A
BB.19.1.2.5	No direct contact between output circuits and the body, unless: (IEC 61558-2-16:2009)		N/A
	– Allowed for associated transformers by the equipment standard		N/A
	– Clause 19.8 of part 1 is fulfilled		N/A
BB.19.1.3	SMPS incorporating isolating transformers and safety isolating transformers (IEC 61558-2-16:09)		N/A
BB.19.1.3.1	Input and output circuits electrically separated (IEC 61558-2-16:09)		N/A
	No possibility of any connection between these circuits		N/A
BB.19.1.3.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.3.4) (IEC 61558-2-16:09)		N/A
	Class I SMPS 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 SMPS intended for connection to the mains by a plug (EN 61558-2-16:09):		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 SMPS (IEC 61558-2-16:09)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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.19.1.3.3	SMPS with intermediate conductive parts not connected to the body (between input/output) (EN 61558-2-16:09):		N/A
19.1.3.3.1	For class I and class II SMPS the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage (EN 61558-2-16:09)		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. (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.19.1.3.3.2	Class I transformers with earthed core, and not allowed for class II equipment (EN 61558-2-16:09)		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.19.1.3.3.3	Insulation between : input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation (EN 61558-2-16:09)		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.19.1.3.4	For class I SMPS, with protective screen, not connected to the mains by a plug the following conditions comply (EN 61558-2-16:09):		N/A
	– 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 our wire is soldered or fixed to the protective screen.		N/A
	Protective screening is not allowed for SMPS with plug connection to the mains (EN 61558-2-16:09)		N/A
BB.19.1.3.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled (EN 61558-2-16:09)		N/A
BB.19.1.3.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard) (EN 61558-2-16:09)		N/A
BB.19.1.3.7	The distance between input and output terminals for the connection of external wiring is 25 mm		N/A
BB.19.1.3.8	Portable SMPS having an rated output ≤ 630 VA (EN 61558-2-16:09)		N/A
BB.19.1.3.9	No connection between output circuit, and body except of associated transformers (allowed by equipment standard) (EN 61558-2-16:09)		N/A
BB.19.1.3.10	Protective screening is not allowed for SMPS with plug connection to the mains (EN 61558-2-16:09)		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
BB.19.11	Handles, levers, knobs, etc.:		N/A
	– insulating material		N/A
	– supplementary insulation covering		N/A
	– separated from shafts or fixing by supplementary insulation		N/A
BB.19.12	Windings construction		N/A
BB.19.12.1	Undue displacement in all types of transformers not allowed:		N/A
	– of input or output windings or turns thereof		N/A
	– 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:		N/A
	– 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 (A1)	Insulated windings wires providing basic, supplementary or reinforced insulation, meet the following requirements:		N/A
	• Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K		N/A
	• Basic insulation: two wrapped or one extruded wire		N/A
	• Supplementary insulation: two layers, wrapped or extruded		N/A
	• Reinforced insulation: three layers wrapped or extruded		N/A
	Spirally wrapped insulation:		N/A
	• creepage distances between wrapped layers > cl. 26 _ P1 values		N/A
	• path between wrapped layers sealed, the test voltage of K2 is multiplied with 1,35		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> test 26.2.3 – 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:		N/A
	<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:		N/A
	<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:		N/A
	<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 wirers		N/A
	for TIW wires values of box 2) c) of table 13, table C.1 and table D.1 of part 1 and of clause 26.106 are not required		N/A
FIW	<u>Transformers which use FIW wire</u>		N/A
BB 19.12.101 (A1)	Max. class F for transformers which use FIW-wire		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB 19.12.102 (A1)	FIW wires comply with IEC 60851-5, Ed.4.1; IEC 60317-0-7 and IEC 60317-56, Ed.1.		N/A
	<ul style="list-style-type: none"> other nominal diameter as mentioned in table 19.101 can be calculated with the formula after table 19.111 		N/A
	FIW wire used for basic or supplementary insulation for transformers according 19.1.2 (separating-transformers) of IEC 61558-2-16:		N/A
	<ul style="list-style-type: none"> the test voltage of table 8a – part 1, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 19.111 		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 (grad 1, or grad 2 ...) 		N/A
	FIW wire used for double or reinforced insulation for transformers according 19.1.3 (isolating and safety isolating transformers) of IEC 61558-2-16 (PRI and SEC basic insulated FIW-wire):		N/A
	<ul style="list-style-type: none"> the test voltage of table 8a – part 1, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 19.111 		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

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> the test voltage of table 8a – part 1, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 19.111 		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 according to 19.1.3 (basic/supplementary insulated FIW wire + enamelled wire + creepage distance and clearances for basic insulation)		N/A
	<ul style="list-style-type: none"> the test voltage of table 8a – part 1, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 19.111 		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
BB.20	COMPONENTS		N/A
BB.21	INTERNAL WIRING		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, with uninsulated wires, without impregnation or potting	(see appended table)	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

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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled 		N/A
	<ul style="list-style-type: none"> all isolating materials are classified acc. to IEC 60085 and IEC 60216 		N/A
	Test B		N/A
	<ul style="list-style-type: none"> thermal class 		N/A
	<ul style="list-style-type: none"> working voltage 		
	<ul style="list-style-type: none"> Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint. 	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	<ul style="list-style-type: none"> the relevant humidity treatment according to 17.2 (48 h) 		N/A
	<ul style="list-style-type: none"> the relevant dielectric strength test of 18.3 multiplied with factor 1,25 		N/A
	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required) 		N/A
	<ul style="list-style-type: none"> all isolating materials are classified acc. to IEC 60085 and IEC 60216 		N/A
	Test C		N/A
	<ul style="list-style-type: none"> thermal class 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– working voltage		N/A
	– Test with three specimens, potted or impregnated. (finished components)	(see appended table)	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
	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:		N/A
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	– 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:		N/A
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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):		N/A
	– 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
	– 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 (EN 61558-2-16:09):		N/A
	– 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):		N/A
	a) measured values specified values (mm)		N/A
	2. Insulation between input and output circuits (double or reinforced insulation):		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		N/A
	a) measured values specified values (mm)		N/A
	b) measured values specified values (mm)		N/A
	c) measured values specified values (mm)		N/A
	5. Basic or supplementary insulation:		N/A
	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:		N/A
	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
BB.26.102	Values of IEC 61558-2-16 applicable for frequency up to 3 MHz (EN 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 (EN 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
	– 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 (EN 61558-2-16:09)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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 (EN 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:		N/A
	– 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 $d_1 \geq 0,75$ the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers $d_2 \leq 30 \mu\text{m}$ the peak value of the field strength is ≤ 10 kV/mm		N/A
	For $d_1 > d > d_2$ 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
	• 10 cycles are required		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<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		
	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
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

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Clause	Requirement + Test	Result - Remark	Verdict
BB.K 61558-2-16/A1	ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION		N/A
BB.K.1	Wire construction:		N/A
	<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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	<ul style="list-style-type: none"> Dielectric strength test: 3 kV for basic or supplementary insulation 		N/A

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

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

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	

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	

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	

BB.26.107 61558-2- 16/A1	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION				NA
	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	

	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 18.3	TABLE: insulation resistance measurements			N/A
Insulation resistance R between:		R (MΩ)	Required R (MΩ)	
Between mains poles (primary fuse disconnected)				
Between parts separated by basic or supplementary insulation				
Between parts separated by double or reinforced insulation				
Supplementary information:				

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:						

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:					

Appendix No. 1: National differences for Australia and New Zealand

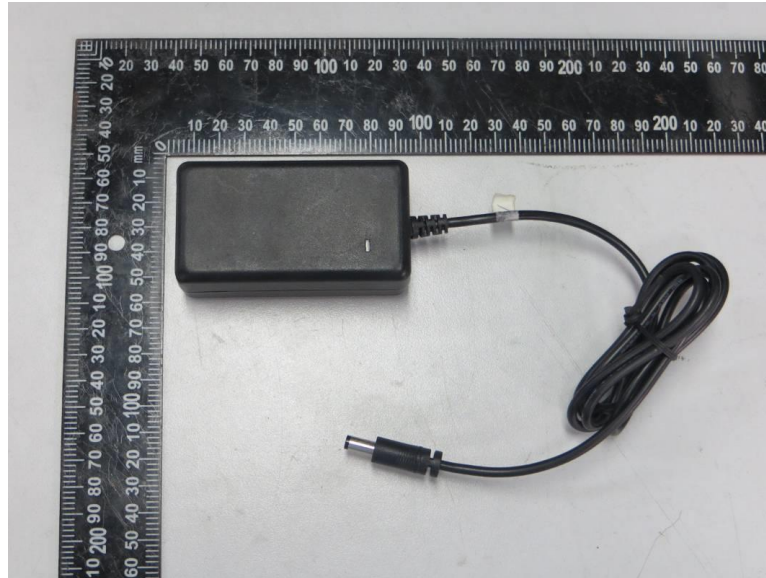
IEC 61558-2-16 - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT IEC 61558-2-16 (AUSTRALIA/NEW ZEALAND) NATIONAL DIFFERENCES (Safety of power transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Safety – Part 2.16: Particular requirements and tests 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 AS/NZS 61558.1:2008 +A1:2009 + A2:2015 + A3:2020	
TRF template used:		IECEE OD-2020-F3, Ed. 1.1	
Attachment Form No.		AU_NZ_ND_IEC61558_2-16E	
Attachment Originator.....		NZ Electrotechnical Committee/Standards New Zealand	
Master Attachment		Date 2020-12-27	
Copyright © 2020 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.			
	National Differences		—
5	GENERAL CONDITIONS FOR THE TESTS		P
5.2	Add the following variation:		P
	If the tests of AZ.19.201 need to be performed they are carried out on separate specimens, the number of specimens is that required by AS/NZS 3112. (AS/NZS 61558.1:2008/A3:2020)		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
16	MECHANICAL STRENGTH		P
16.4	Replace the text with the following variation:		P
	VOID (AS/NZS 61558.1:2008/A3:2020)		P
19	CONSTRUCTION		P
19.15	Replace the text with the following variation:		N/A
	VOID (AS/NZS 61558.1:2008/A3:2020)		N/A
19.16	Replace the text with the following variation:		N/A

IEC 61558-2-16 - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	VOID (AS/NZS 61558.1:2008)		N/A
	Insert the following variation		P
19.201	Transformers having integral pins for insertion into socket outlets shall comply with the appropriate requirements of AS/NZS 3112.		P
	Compliance is checked as specified in Appendix J of AS/NZS 3112 (AS/NZS 61558.1:2008/A3:2020)		P
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
	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		N/A
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)		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)		N/A
ANNEX H	ELECTRONIC CIRCUITS		P
H.2.1	Add the following to the test specification after the existing fourth paragraph		P

IEC 61558-2-16 - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	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/A2:2015)	Voltage normal use: 48V Voltage abnormal operation: 48.44V Deviation: 0.92%	P
	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/A2:2015)		N/A
	Special national conditions (if any)		—
	Australia		—
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/A3:2020)	100-240VAC	P
	New Zealand		—
8	MARKING AND OTHER INFORMATION		P
8.1	After Item a) insert the following variation:		P
	The marking of rated voltage of single-phase transformers shall be 230 V and for polyphase transformers shall be 400 V. The marking of rated voltage range of single-phase transformers shall cover 230 V and for polyphase transformers, 400 V (AS/NZS 61558.1:2008/A3:2020)	100-240VAC	P

Appendix 2: Photoes

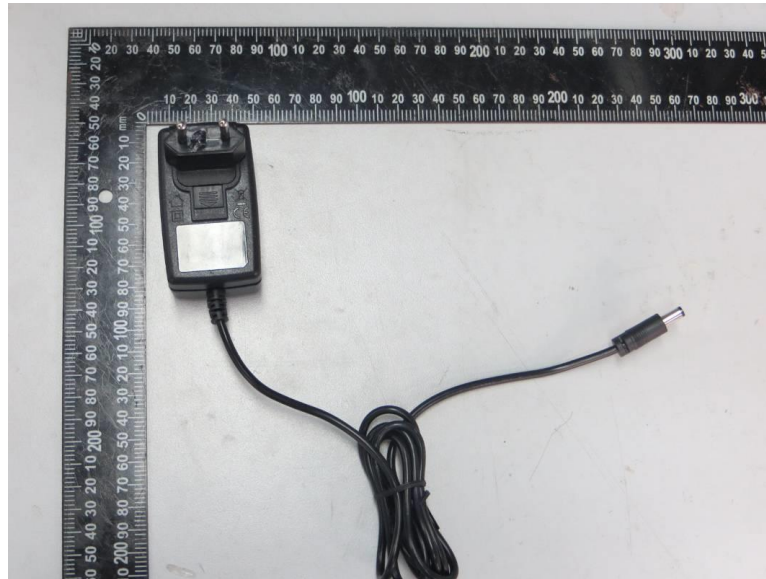
External view for GTM96180 series (desktop)



External view for GTM96180 series (desktop)



External view for GTM96180 series (Interchangeable plug)



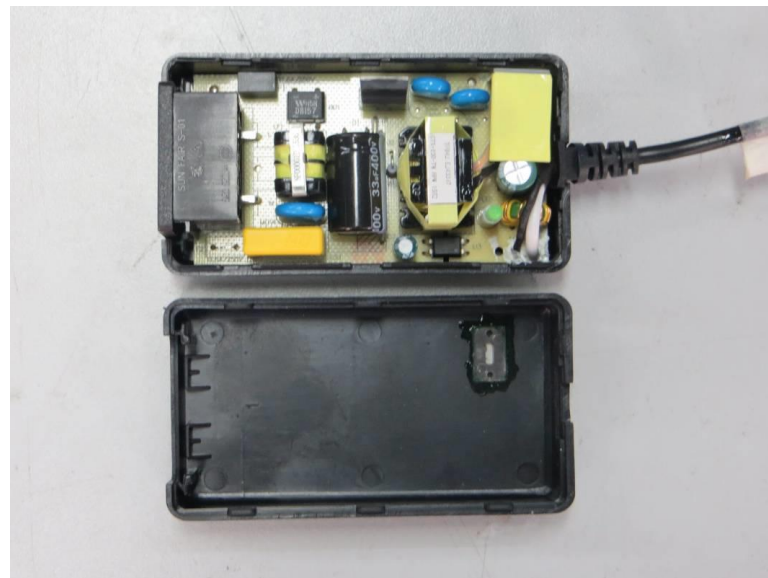
External view for GTM96180 series (Interchangeable plug)



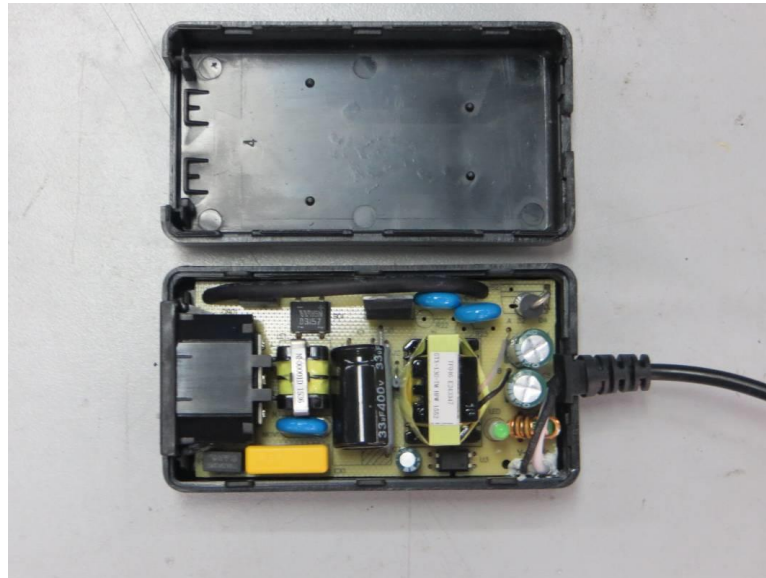
External view for GTM96180 series (Interchangeable plug)



Internal view for GTM96180 series (desktop)



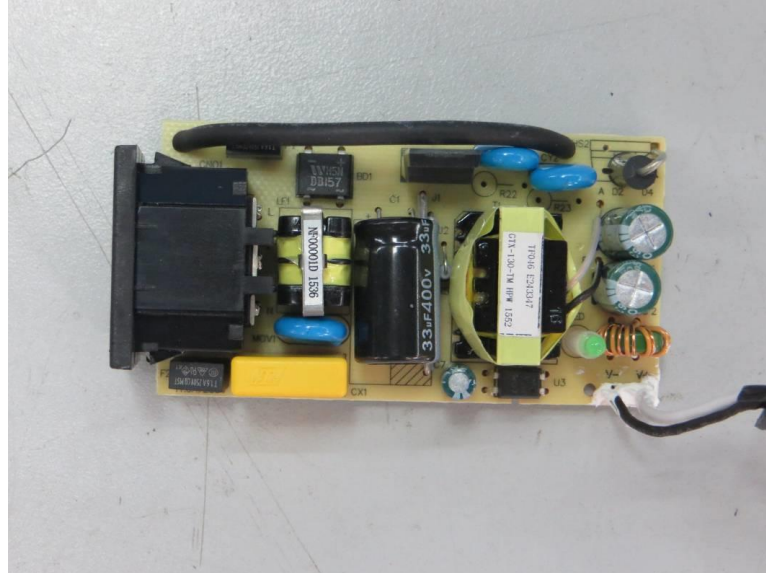
Internal view for GTM96180 series (Class I)



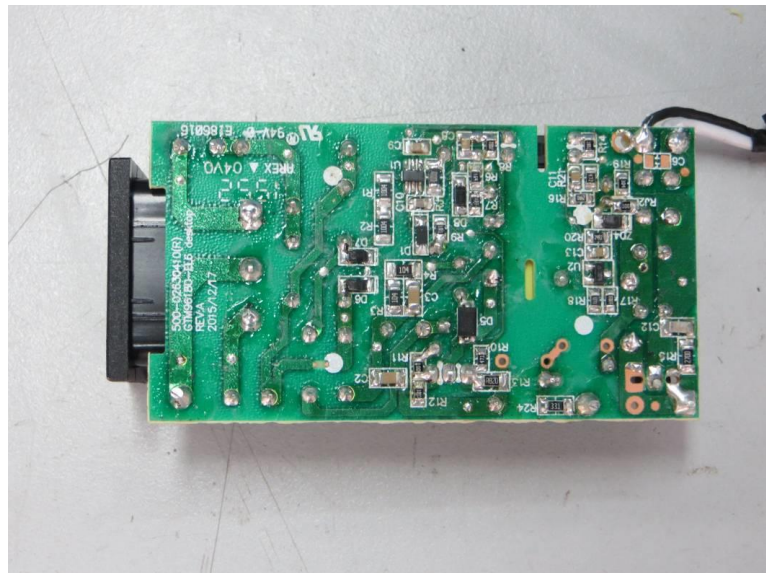
Internal view for GTM96180 series (Class I)



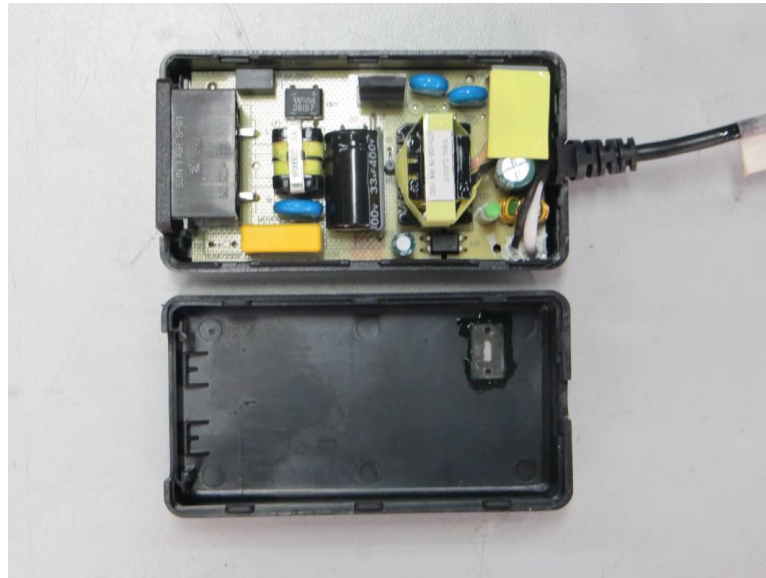
PCB for GTM96180 series (Class I)



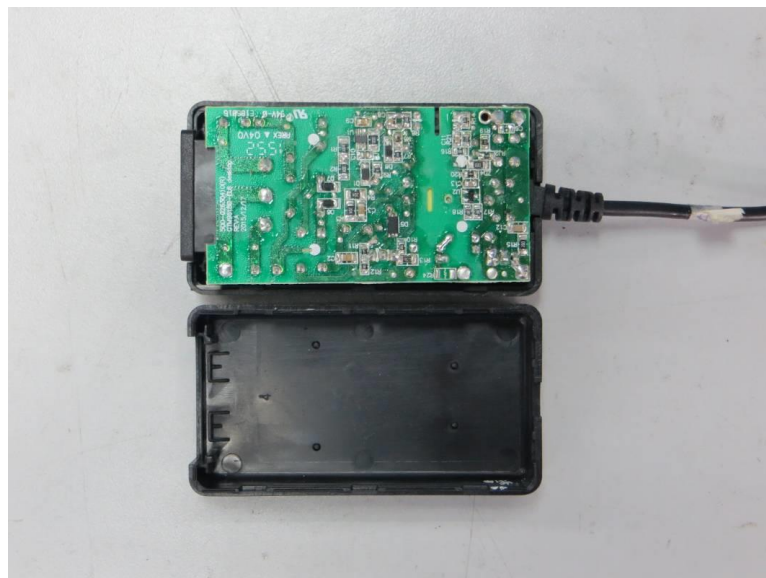
PCB for GTM96180 series (Class I)



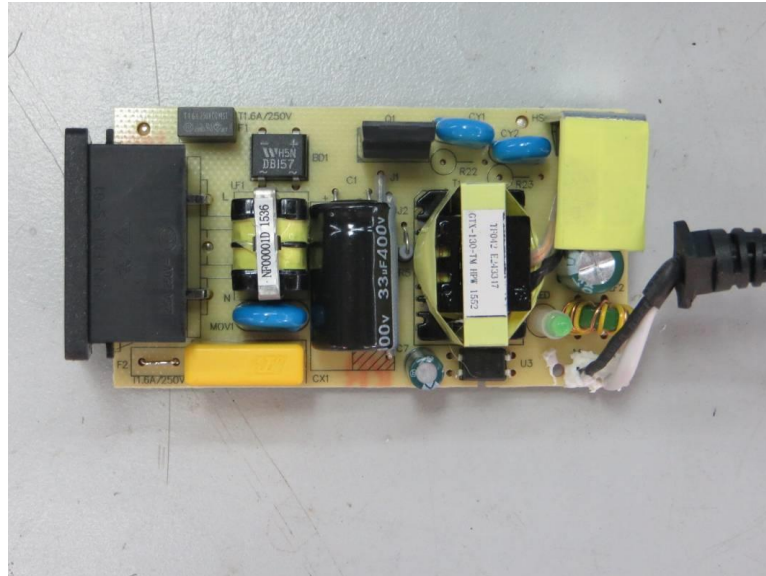
Internal view for GTM96180 series (Class II)



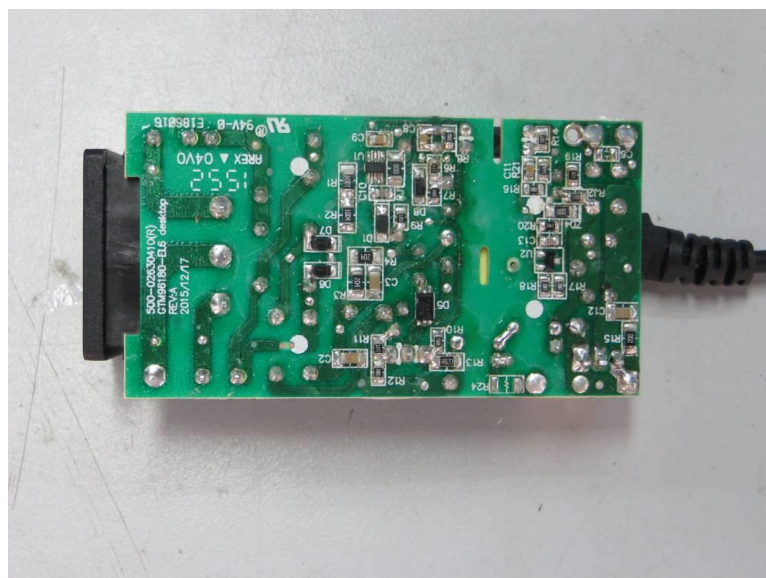
Internal view for GTM96180 series (Class II)



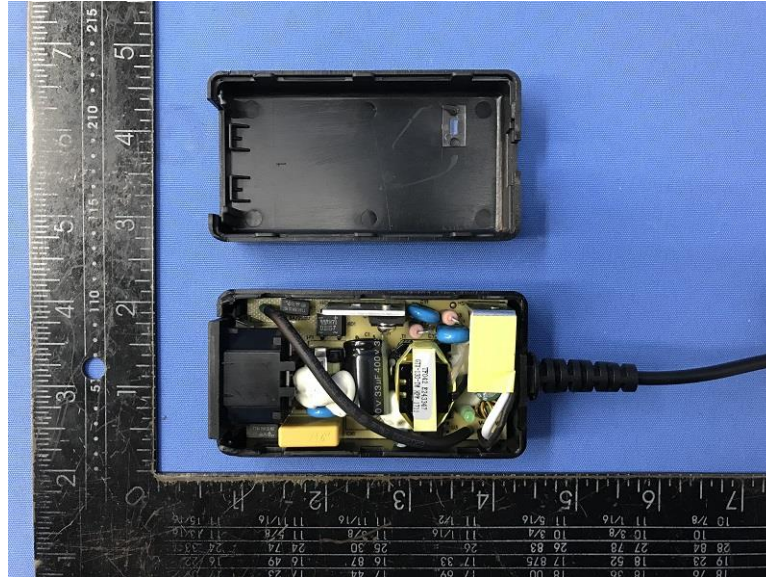
PCB for GTM96180 series (Class II)



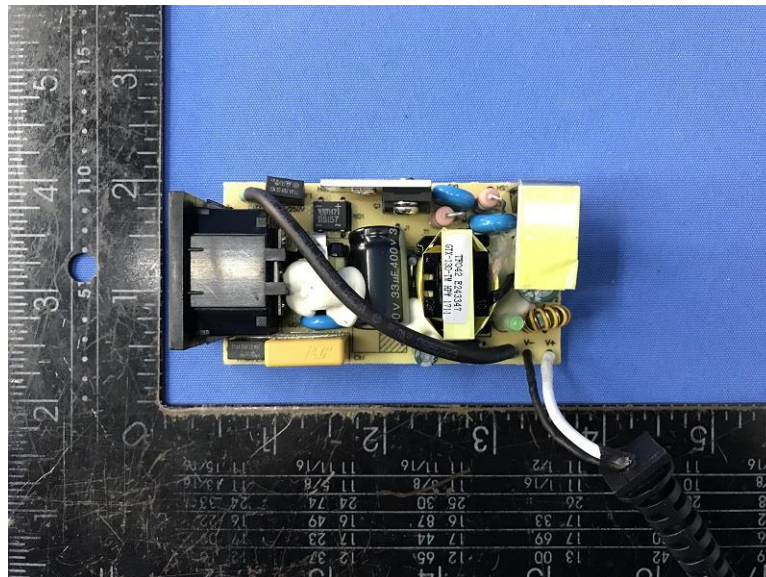
PCB for GTM96180 series (Class II)



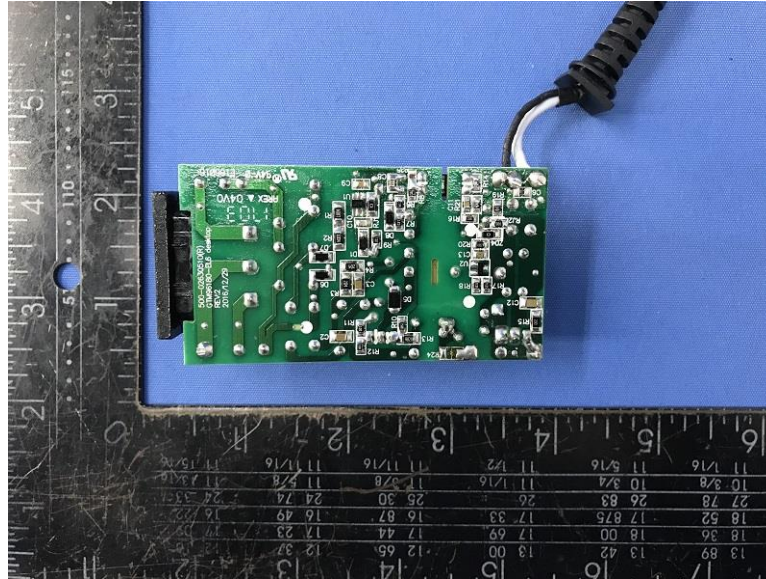
Internal view for GTM96180 series (Class I) with R22, R23 and without R24



PCB view for GTM96180 series (Class I) with R22, R23 and without R24



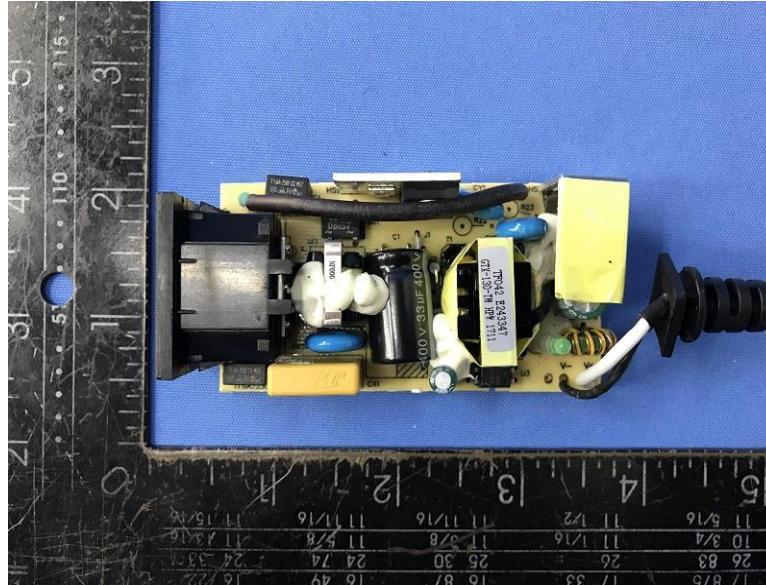
PCB view for GTM96180 series (Class I) with R22, R23 and without R24



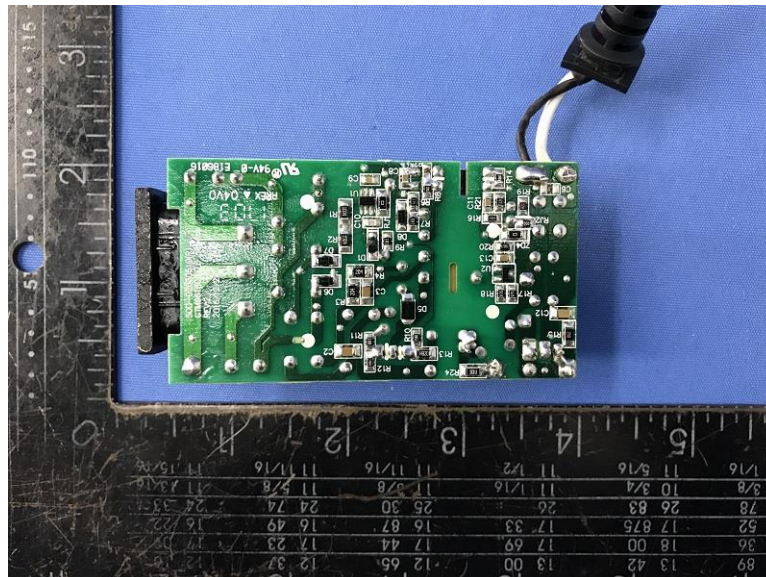
Internal view for GTM96180 series (Class I) without R22, R23 and with R24



PCB view for GTM96180 series (Class I) without R22, R23 and with R24



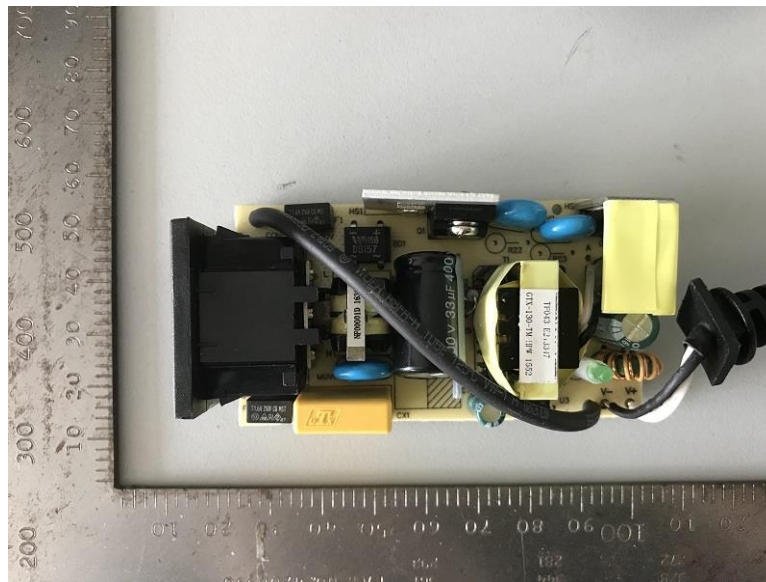
PCB view for GTM96180 series (Class I) without R22, R23 and with R24



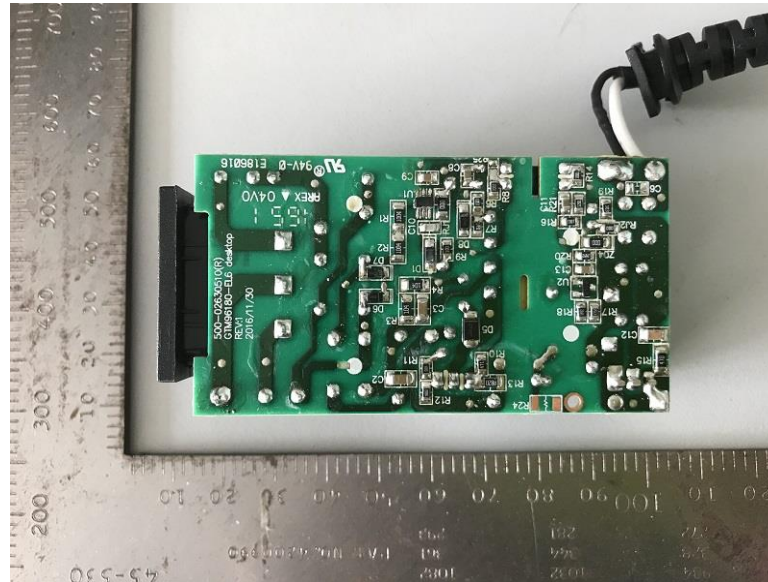
Internal view for GTM96180 series (Class I) without R22, R23 and with R24



PCB view for GTM96180 series (Class I) without R22, R23 and with R24



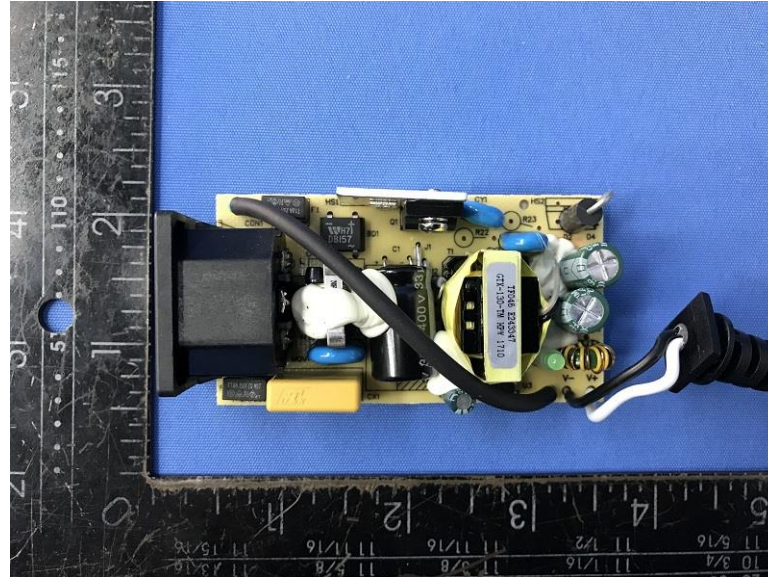
PCB view for GTM96180 series (Class I) without R22, R23 and R24



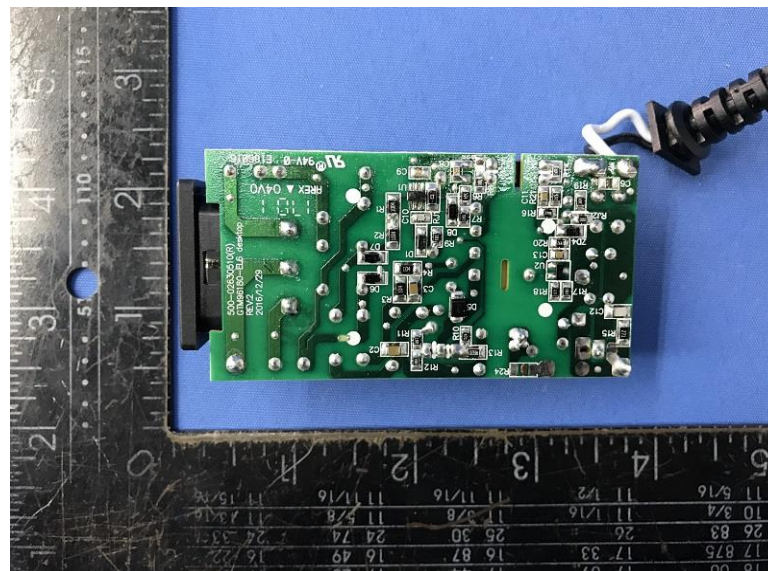
Internal view for GTM96180 series (Class I) without heatsink for D2



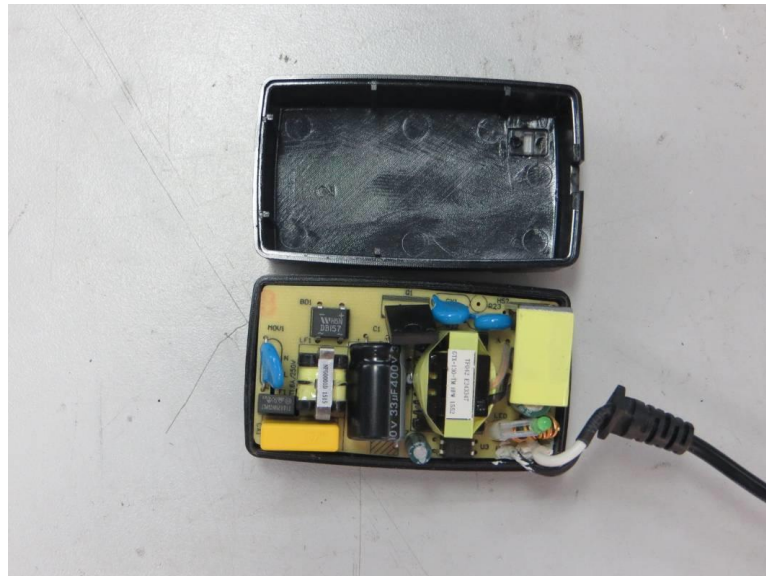
PCB view for GTM96180 series (Class I) without heatsink for D2



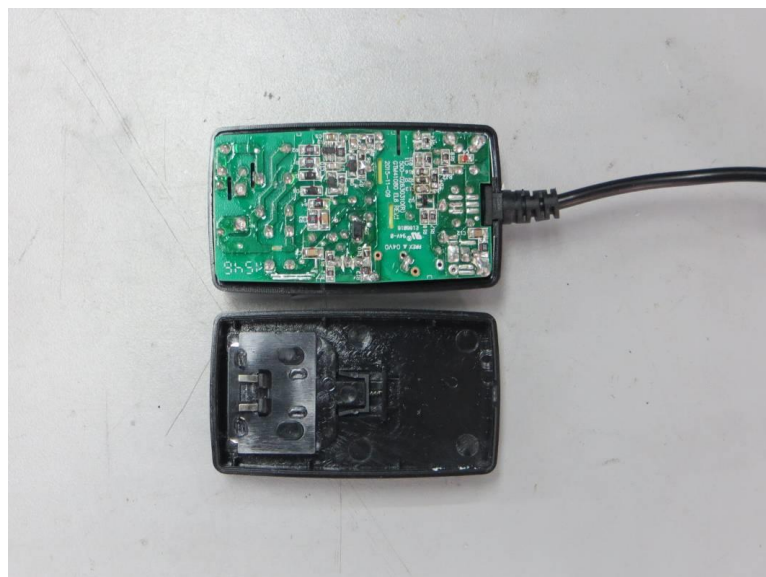
PCB view for GTM96180 series (Class I) without heatsink for D2



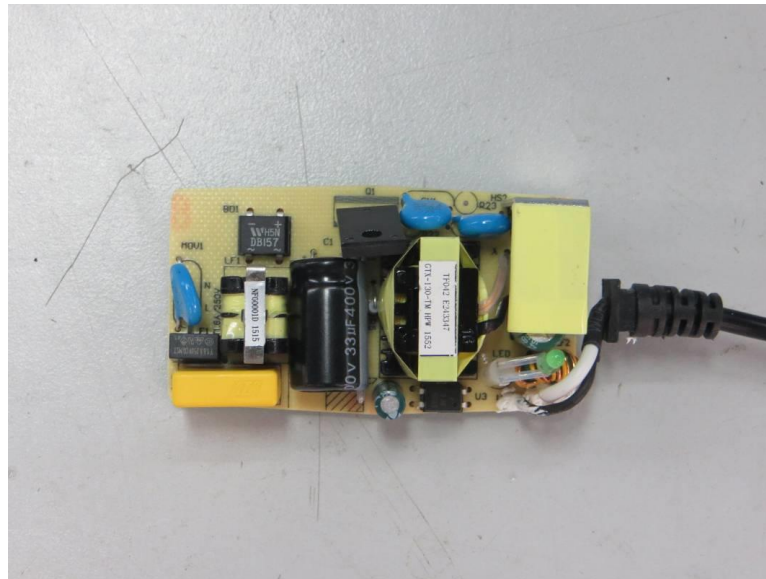
Internal view for GTM96180 series (Interchangeable plug)



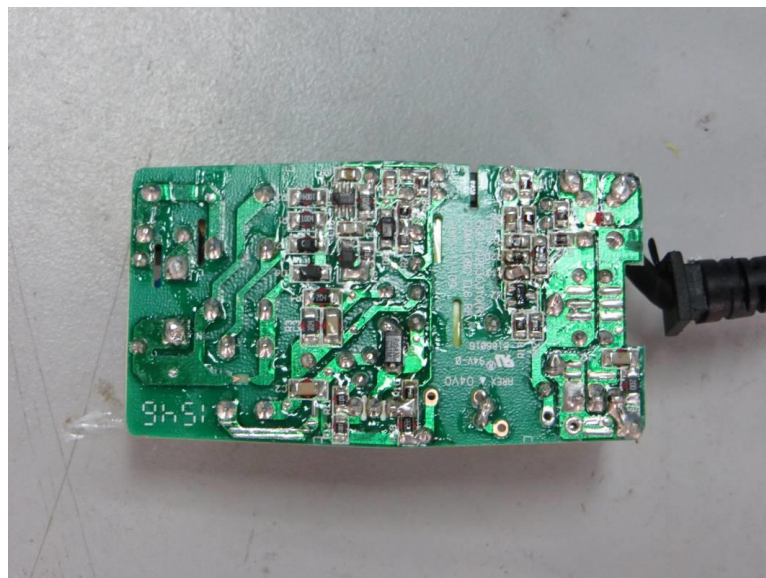
Internal view for GTM96180 series (Interchangeable plug)



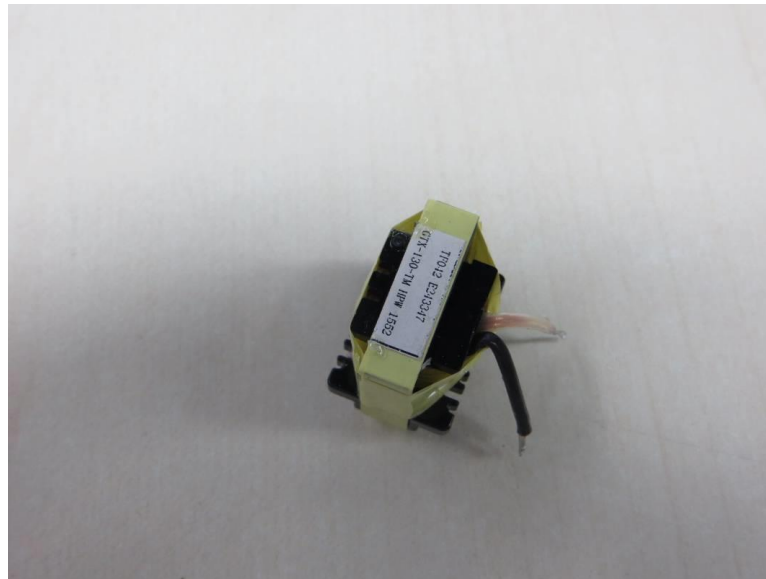
PCB for GTM96180 series (Interchangeable plug)



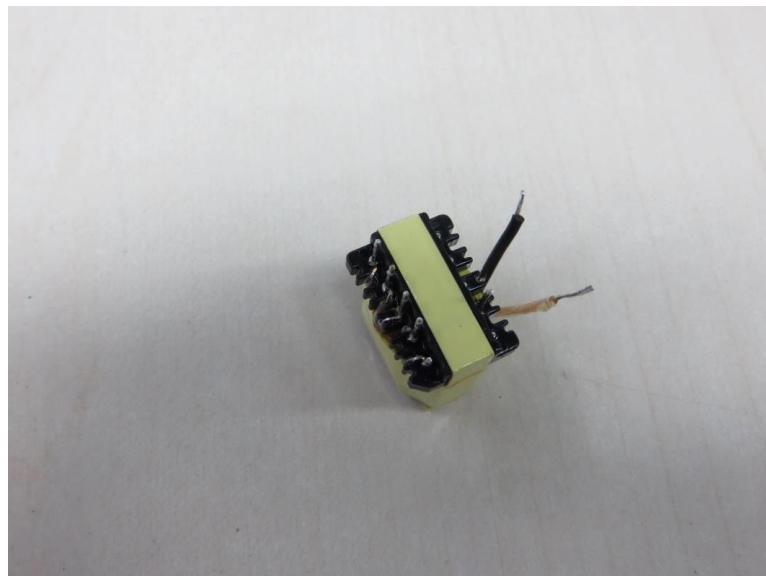
PCB for GTM96180 series (Interchangeable plug)



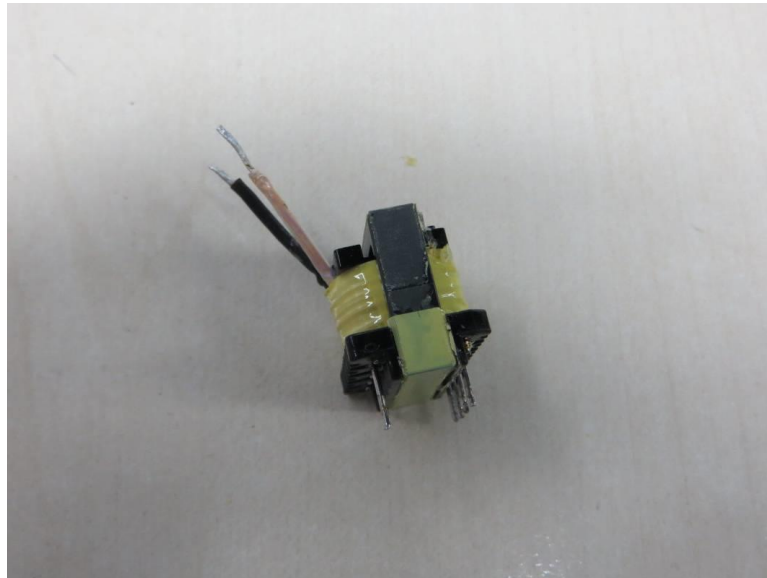
Transformer (EE16)



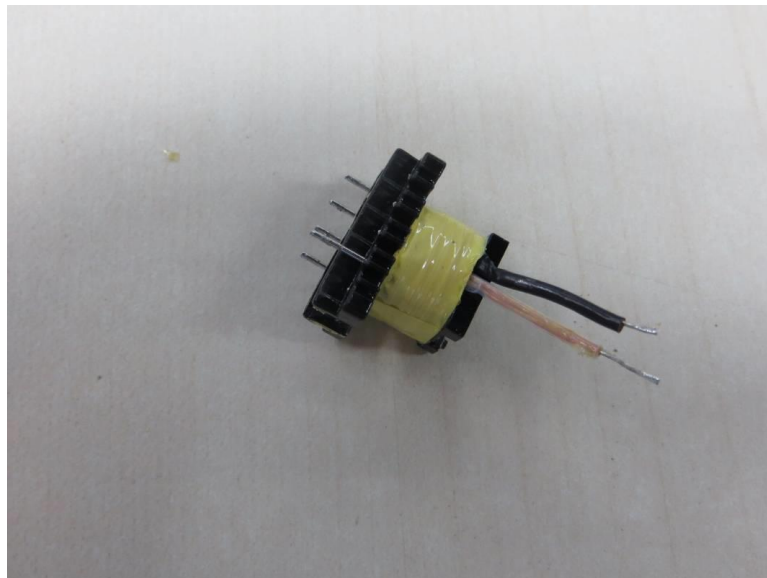
Transformer (EE16)



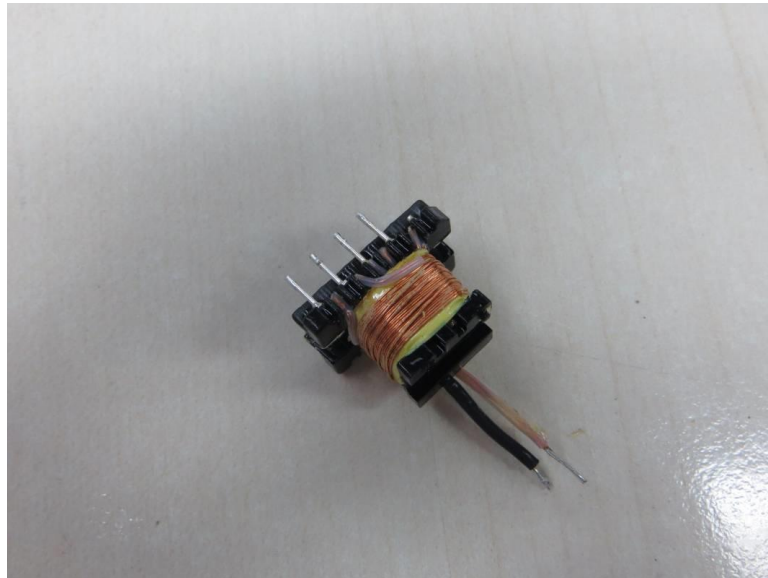
Transformer (EE16)



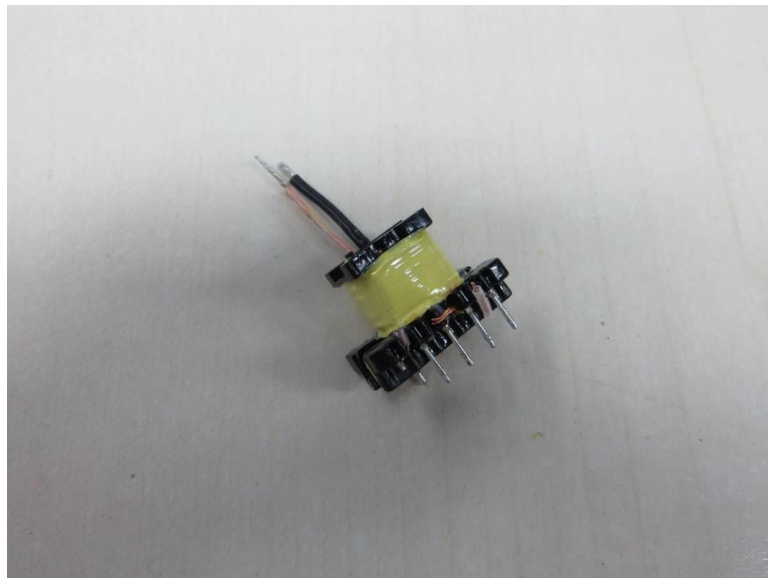
Transformer (EE16)



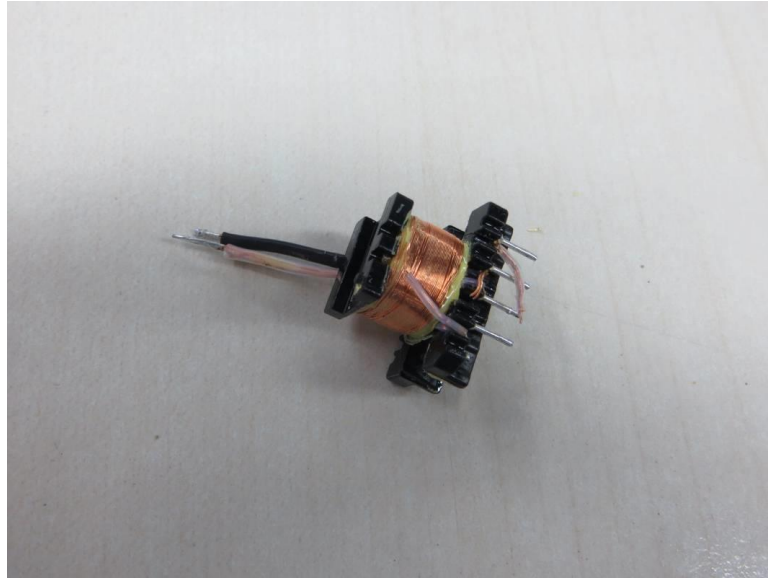
Transformer (EE16)



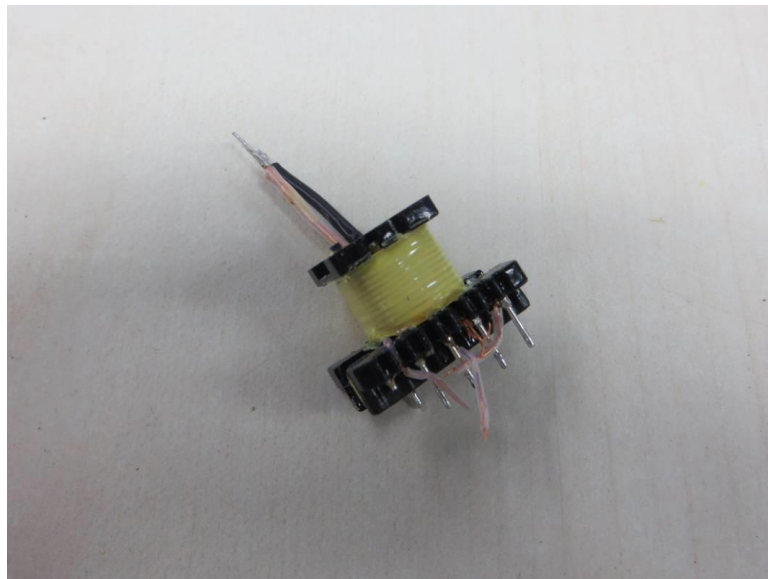
Transformer (EE16)



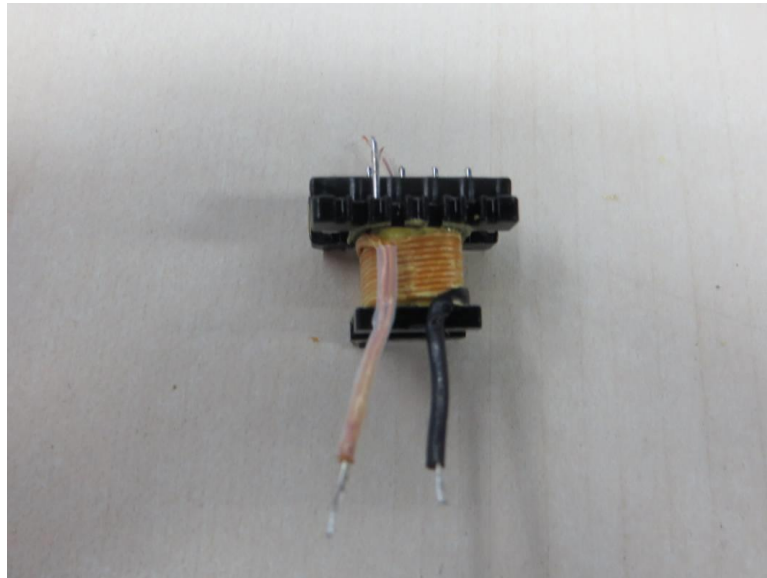
Transformer (EE16)



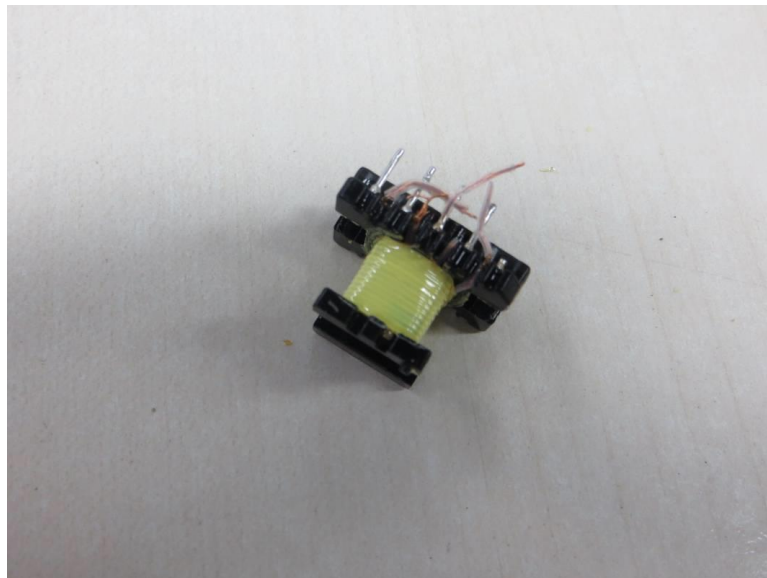
Transformer (EE16)



Transformer (EE16)



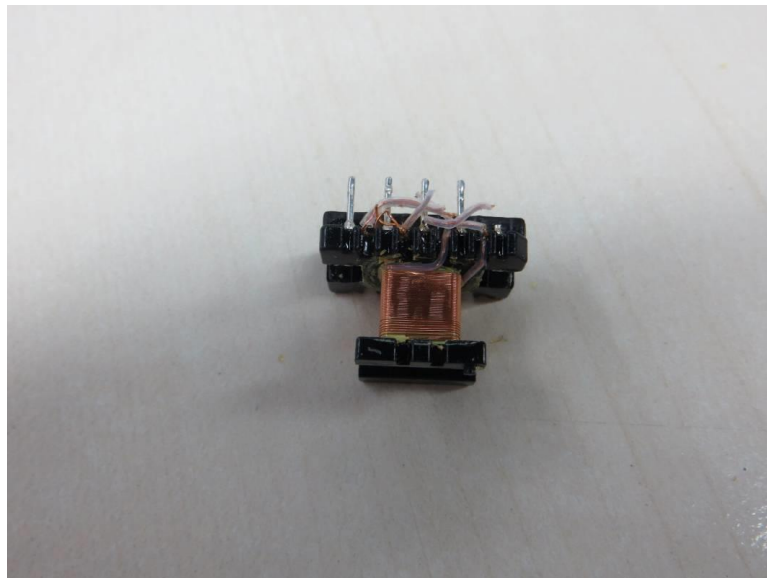
Transformer (EE16)



Transformer (EE16)



Transformer (EE16)



Transformer (EE16)



Clause	Requirement + Test	Result - Remark	Verdict
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Appendix no.3: Equipment combined with two-pole plug (Class II)
The Australian plug was tested according to Annex J of AS/NZS 3112:2017

2.2	PLUG PINS		P
2.2.1	Material for pins		P
	Current carrying parts of plug pins -copper, or copper alloy containing at least 58% copper for parts made from cold rolled sheet or at least 50% copper for other parts; or stainless steel containing at least 13% chromium and not more than 0.09% carbon.	58% copper	P
2.2.2	Assembly of pins		P
2.2.3	The exposed ends and the contact portion of plug pins shall be smooth and free from openings or indentations;		P
2.2.4	Live parts of insulated pin plugs shall not be exposed when the plug is partially or fully engaged with the associated socket.		P
	Plugs with insulated pin do not need to comply with the R20.0 +/-1 mm of Figure 2.1(e).		P
2.8	RATINGS AND DIMENSIONS OF LOW VOLTAGE PLUGS		P
2.8.1	Low voltage flat-pin plugs shall conform to the appropriate dimensions shown in Figure 2.1.		P
	the distance between a live pin of any plug and the edge of the moulding of the plug, shall be not less than 9 mm.	11.03mm min.	P
	No point on the front face of the plug is more than 0.5 mm.	No protrusion	P
2.8.4	Compliance with dimensional requirements of Figure 2.1		P
	Low voltage flat-pin or combination of flat and round pin, plugs having ratings up to 15A of Figure 2.1(a1), Figure 2.1(c), Figure 2.1(d), Figure 2.1(f) or Figure 2.1(g) type shall comply with the dimensional requirements of Figure 2.1(e).		P
	Plugs with insulated pins, complying with this Standard, need not comply with dimension R20+/-1.0 mm of Figure 2.1(e)		P
2.9	INTERNAL CONNECTIONS		N/A
	A loose terminal screw or conductive material cannot bridge any live parts or earthing parts;		N/A
2.10	ARRANGEMENT OF EARTHING CONNECTIONS	No earthing pin	N/A
2.12	MARKING (No marking is applicable for the integral plug portion. See markings for transformer)		N/A

Clause	Requirement + Test	Result - Remark	Verdict
2.12.6	Configuration of plugs, viewed as from the pins, shall be earth, neutral and active in a clockwise direction. Where there is no earthing pin, the live pins shall conform to this configuration.		P
2.13	TESTS ON PLUGS		P
2.13.2	Insulation Resistance test	See appended table 2.13.2	P
2.13.3	High voltage test	See appended table 2.13.3	P
2.13.7	Mechanical strength of pin tests		P
2.13.7.1	Tumbling barrel test	See appended table 2.13.7.1	P
2.13.7.2	Pin bending test	See appended table 2.13.7.2	P
	The point of application of the force shall be 14 ± 0.5 mm from the face of the plug.		P
	The direction of the force shall be along a line parallel to the face of the plug.		P
	Active and neutral pins shall be forced towards the centroid of the plug and then back to the starting point. Earth pin shall be forced but in one direction only then back to the starting point.		P
	The distance moved from the point of application shall be 7.5 ± 0.3 mm. Any "spring-back" is ignored.		P
	The travel from the starting point to the end point and back to the starting point is one cycle.		P
	The interval between successive cycles shall be a minimum of 10 s.		P
	The duration of one cycle shall be a maximum of 60 s.		P
	The pins shall be tested for 20 complete cycles.		P
	After to tests the pins shall be inspected with normal or corrected to normal vision.		P
	The pin shall not be broken off.		P
2.13.8	Temperature rise test (modified as follows)		P
	With 1.1 times rated current prescribed by transformer. The temperature rise of the terminals shall not exceed 45 K.	See table 2.13.8	P
2.13.9	Securement of pins		P
2.13.9.1	Movement of pins		P

Clause	Requirement + Test	Result - Remark	Verdict
	Clamped 5 ± 0.5 mm and applying 18 ± 1 N to the pin at 14 ± 0.5 mm		P
	The maximum deflection shall not exceed 2.0 mm.	See table 2.13.9.1	P
2.13.9.2	Fixing of pins		P
	Maintained $50 \pm 2^\circ\text{C}$ for 1 h. 60 ± 0.6 N for 10 min.		P
	The attachment of pins shall be not more than 2.4 mm or if any pin fails to return to within 0.8 mm of its nominal length specified in Figure 2.1 within 5 min of the removal of the test force.	See table 2.13.9.2	P
2.13.13	Tests on the insulation material of insulated pin plugs, if any		P
2.13.13.2	Pressure test at high temperature		P
	Maintained for 2 h at $160 \pm 5^\circ\text{C}$. Force applied through the blade: 2,5 N		P
	Thickness within the area of impression ≥ 50 %. no cracks	See table 2.13.13.2	P
2.13.13.3	Static damp heat test		P
	Two damp heat cycles (12+12h), 95% relative humidity, Lower temperature $25 \pm 3^\circ\text{C}$ and upper temperature 40°C		P
	(a) the insulation resistance test in accordance with Clause 2.13.2(e); (b) high voltage test in accordance with Clause 2.13.3 and; (c) abrasion test in accordance with Clause 2.13.13.6.		P
2.13.13.4	Low temperature test		P
	Maintained at $-15 \pm 2^\circ\text{C}$ for 24h and returned to room temperature		P
	(a) the insulation resistance test in accordance with Clause 2.13.2(e); (b) high voltage test in accordance with Clause 2.13.3 and; (c) abrasion test in accordance with Clause 2.13.13.6.		P
2.13.13.5	Impact test at low temperature		P
	Maintained at $-15 \pm 2^\circ\text{C}$ for at least 24 h. a height of 100 mm. Four impacts. No cracks.		P
2.13.13.6	Abrasion test		P
	Plug pins provided with insulating sleeves: 20000 movements, 4 N (apparatus shown in fig. 23). No damage, the insulating sleeve shall not have punctured or rucked up.		P
Appendix J of AS/NZS 3112: INTEGRAL OR DETACHABLE PLUG PORTIONS OF EQUIPMENT FOR INSERTION INTO SOCKET-OUTLETS			

Clause	Requirement + Test	Result - Remark	Verdict
J1	SCOPE		—
J2	DEFINITIONS		P
J2.1	Detachable plug portion		P
	a). Type A		N/A
	b). Type B		P
	c). Type C		N/A
J2.2	Integral plug portion		N/A
	Integral to the equipment enclosure and not detachable.		N/A
J2.3	Plug portion		P
	Plug portion includes the plug pins, terminals of the plug pins, external dimension of the 'maximum projection' and any connections of a detachable plug portion.		P
J3	REQUIREMENTS FOR THE PLUG PORTION		P
J3.1	General		P
	The following provisions apply to the dimensional and constructional requirements of the plug portion of equipment and any detachable connection:		—
	a). For detachable plug portions, the relevant tests are performed in the most onerous orientation.		P
	b). For type A detachable plug portions, the relevant requirements of AS/NZS 3105 are applicable, in addition to conformance with this appendix.		N/A
	c). For type B detachable plug portions, the conformance is shown by this appendix.		P
	d). For type C detachable plug portions, conformance is shown by assessment to section 2 of this standard and this appendix.		N/A
J3.2	Plug pins of plug portions		P
	The requirements of Clause 2.2 are applicable for plug pins.	See clause 2.2	P
J3.3	Ratings and dimensions for low voltage plug portions		P
	The requirements of Clauses 2.8.1 and 2.8.4 are applicable for ratings and dimensions.	See clause 2.8	P
J3.4	Internal connections for plug portions		N/A
	The requirements of Clause 2.9 are applicable for internal connections unless requirements are contained in the relevant product standard.	See clause 2.9	N/A
J3.5	Arrangement of earthing connections for plug portions		N/A

Clause	Requirement + Test	Result - Remark	Verdict
	The requirements of Clause 2.10 are applicable for the arrangement of earthing connections.	See clause 2.10	N/A
J3.6	Configuration of plug portions		P
	The requirements of Clause 2.12.6 are applicable to the configuration of the plug portion.	See clause 2.12.6	P
J4	TESTS		P
J4.1	General		—
	Plug portions of equipment shall be subjected to the following tests and unless stated otherwise, shall comply with the requirements specified in Section 2 for each test.		P
	Conformance for detachable plug portions shall be established by assessment with the plug portion fully assembled with the equipment.		P
J4.2	High voltage test		P
	The requirements of Clause 2.13.3 are applicable unless requirements are contained in the relevant product standard.	See appended table 2.13.3	P
J4.3	Mechanical strength of pin tests		P
J4.3.1	Tumbling barrel test		P
	The requirements of clause 2.13.7.1 are modified as follow:		—
	a). 500 times if the mass does not exceed 250 g.	Measured: Max. 65g	P
	b). 250 times if the mass exceeds 250 g.	Measured: Min. g	N/A
	Following each test the samples shall comply with item clause 2.13.7.1.	See appended table 2.13.7.1	P
J4.3.2	Pin bending test		P
	The pins of the plug portion not subjected to any previous tests shall be tested for conformance with the pin bending test of Clause 2.13.7.2.	See appended table 2.13.7.2	P
J4.4	Temperature rise test		P
	The relevant requirements of Clause 2.13.8 are applicable for the temperature rise test, except that the test current shall be that specified in the relevant product Standard.	See appended table 2.13.8	P
	The temperature rise of the pins shall not exceed 45 K irrespective of the temperature rise of parts specified in end product standards.		P
J4.5	Securement of pins of the plug portion		P
	The requirements of Clause 2.13.9 are applicable for the securement of pins.	See appended table 2.13.9	P

Clause	Requirement + Test	Result - Remark	Verdict
J4.6	Tests on the insulation material of insulated pin-plug portions		P
	The requirements of Clause 2.13.13 are applicable for insulating material of insulated plug pins.	See appended table 2.13.13.2 ~ 2.13.13.6	P
J4.7	Equipment with a plug portion intended to be supported by the contacts of a socket-outlet		P
	Equipment with a plug portion intended to be supported by the contacts of socket-outlets shall not impose undue strain on those socket-outlets.		P
	The additional torque shall not exceed 0.25Nm.	Normal position: 0.131Nm max.; Reverse position: 0.130Nm max.	P
	The flexible cord is allowed to hang freely in excess of 500mm resting on the horizontal surface during the test.		P
J4.8	Additional requirements for detachable plug portions		P
J4.8.1	Access to live parts		P
	It is not possible to contact live parts with the small test finger of Fig.13 of IEC 61032.		P
	It shall not be possible to incorrectly assemble the plug portion to the equipment allowing access to live parts.		P
	Conformance is checked by inspection and applying small test finger of Fig.13 of IEC 61032.		P
J4.8.2	Construction of detachable contacts where the input current of the equipment exceeds 0.2A		P
	Contact shall be made with both sides of each flat pin.		P
	It shall be permissible to use spring-assisted single-sided contacts.		P
	Contacts shall not rely exclusively on the resilience of the contact material and shall have an opposite face of material other than thermoplastic or resilient insulating material.		P
	The alignment and contact making properties of contacts shall be independent of terminal screws.		P
	The effectiveness of the contacts shall be independent of pressure from any thermoplastic or resilient moulding.		P
	Conformance with the effectiveness of the contacts is checked by inspection and appendix J4.8.3.		P
J4.8.3	Plug portion detachment requirements		P
	Conformance is verified by inspection and the following test:		P

Clause	Requirement + Test	Result - Remark	Verdict
	The plug portion shall be connected and disconnected 50 times (100 strokes).		P
	Test with a force.....:	60N	P
	During the test period, the plug portion shall not separate from the equipment.		P
	Temperature rise test for plugs shall be conducted immediately without disturbing the samples.....:	7K	P
J4.8.4	Resistance of insulating material to heat and fire		P
J4.8.4.1	Resistance to heat		P
	For Type B detachable plug portions parts of non-metallic material, parts of insulating material supporting live parts including connections, and parts of thermoplastic material providing supplementary insulation or reinforced insulation, shall be sufficiently resistant to heat if their deterioration could cause the appliance to fail to comply with this Standard		P
	This requirement does not apply to the insulation or sheath of flexible cords or internal wiring		N/A
	Conformance is checked by subjecting the relevant part to the ball pressure test of IEC 60695-10-2		P
	The test is carried out at a temperature of $40\pm 2^{\circ}\text{C}$ plus the maximum temperature rise determined during the temperature test of Paragraph J4.4, but it shall be at least--		P
	a. $75\pm 2^{\circ}\text{C}$, for external parts;		P
	2. $125\pm 2^{\circ}\text{C}$, for parts supporting live parts		P
J4.8.4.2	Resistance to fire		P
	Plug portions shall comply with the requirements for resistance to fire in accordance with AS/NZS 3100. The glow-wire test temperature 'T' shall be 750°C		P

Clause	Requirement + Test	Result - Remark	Verdict
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2.13.2	TABLE 2.2: Test No. 1 - Insulation Resistance test	P
Electric strength:		
Between:	Insulation Resistance at 500V d.c. (required $\geq 5 \text{ M}\Omega$)	—
(a) Between all poles of the plug, taken in pairs.	199 M Ω	P
(b) Between live poles and any external metal, all live poles being connected together.	199 M Ω	P
(c) Between live poles and earthing terminal metal of exposed metal, all live poles being connected together.	N/A	N/A
(d) Between live poles and accessible insulating part, all live poles being connected together.	199 M Ω	P
(e) For insulated pin plugs, between live poles and a metal foil applied around the insulation on each live pin for a distance of approximately 4 mm from plug face, all live poles being connected.	199 M Ω	P

2.13.3	TABLE 2.2: Test No. 2 - High voltage test	P
Electric strength:		
Between:	Test voltage (V a.c.)	—
(a) Between all poles of the plug, taken in pairs.	1000	P
(b) Between live poles and any external metal, all live poles being connected together.	3000	P
(c) Between live poles and earthing terminal metal of exposed metal, all live poles being connected together.	N/A	N/A
(d) Between live poles and accessible insulating part, all live poles being connected together.	3000	P
(e) For insulated pin plugs, between live poles and a metal foil applied around the insulation on each live pin for a distance of approximately 4 mm from plug face, all live poles being connected.	1250V	P

Clause	Requirement + Test	Result - Remark	Verdict
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2.13.7.1	TABLE 2.2: Test No. 7a – Tumbling barrel test			P
Requirement		Test result		
		Sample 1	Sample 2	Sample 3
After 1000 times of falls, the sample shall show no damage within the meaning of this standard:		—	—	—
(a) Live parts shall not have become exposed to the standard test finger.		P	P	P
(b) For earthing pin, the resistance of the plug/socket-outlet circuit shall be such that compliance with Clause 3.14.7 is maintained.		N/A	N/A	N/A
(c) Any other function affecting safety shall not be impaired.		P	P	P
(d) No live part shall have become detached or loosened, to the extent that a hazardous situation is created.		P	P	P
(e) The pins shall be inspected with normal, or corrected to normal, vision. Insulation may be removed if necessary. Pins shall not be broken or show cracking.		P	P	P

2.13.7.2	TABLE 2.2: Test No. 7b – Pin bending test			P
Requirement		Test result		
		Sample 1	Sample 2	Sample 3
Bend the pins with 20 cycles according to standard, after the tests:		—	—	—
The pins shall be inspected with normal or corrected to normal vision.		P	P	P
The pin shall not be broken off.		P	P	P

2.13.8	TABLE 2.2: Test No. 8 – Temperature rise test	P
Test current (1.1×I _n): 0.66A (For model GTM96180-1807-2.0)		
Tested part		Test result
Temperature rise on termination 1 (K):		7K
Temperature rise on termination 2 (K):		6K

Clause	Requirement + Test	Result - Remark	Verdict
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2.13.9.1	TABLE 2.2: Test No. 9a – Movement of pins	P
Test condition: Preconditioned at 40°C for 1 h; Applied a force of 18 N gradually in 10 s and maintained for 10 s.		
Requirement		Test result
The maximum deflection shall not exceed 2.0 mm.		0.62mm
The plug can be inserted in the standard gauge shown in Appendix A, Appendix B and Appendix F without the application of undue force.		P
For other types of plugs, the plug can be inserted into an appropriate socket-outlet without the application of undue force.		N/A

2.13.9.2	TABLE 2.2: Test No. 9b – Fixing of pins	P
Test condition: Heated to 50°C for 1 h; Applied a force of 60 N gradually in 10 s and maintained for 10 min.		
Requirement		Test result
		Pin 1 Pin 2 Earth Pin
Any pin shall not be displaced relative to the adjacent material of the body by more than 2.4 mm at any time during these tests		0.56mm 0.58mm N/A
Any pin shall return to within 0.8 mm of its nominal length specified in Figure 2.1 (a1) within 5 min of the removal of the test force		0.26mm 0.31mm N/A

2.13.13.2	TABLE 2.2: Test No. 13a – Pressure test at high temperature	P
Test condition: heating at 160°C for 2h, applied a force of 2.5N through the blade to the specimen		
Requirement		Test result
		Before test After test verdict
The thickness within the area of impression shall be not less than 50% of the thickness measured before the test.		P P P
No cracks on the insulation material.		No cracks No cracks P
The dimension of the insulating material shall not have changed below the minimum size shown in fig2.4		P P P

Clause	Requirement + Test	Result - Remark	Verdict
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2.13.13.3	TABLE 2.2: Test No. 13b – Static damp heat test	P
Test condition: two damp heat cycles (12+12h), 95% relative humidity, Lower temperature 25±3°C and upper temperature 40°C		
Requirement		Test result
after this treatment and after recovery to room temperature, this specimen shall be subjected to:		—
(a) the insulation resistance test		P
(b) high voltage test		P
(c) abrasion test		P

2.13.13.4	TABLE 2.2: Test No. 13c – Low temperature test	P
Test condition: maintained at –15±2°C for 24h and returned to room temperature		
Requirement		Test result
after this treatment and after recovery to room temperature, this specimen shall be subjected to:		—
(a)the insulation resistance test		P
(b)high voltage test		P
(c)abrasion test		P

2.13.13.5	TABLE 2.2: Test No. 13d – Impact test at low temperature	P
Test condition: Test temperature (°C): -15 Duration: 24 hours		
Requirement		Test result
After the test the specimen shall show no damage within the meaning of this standard		P

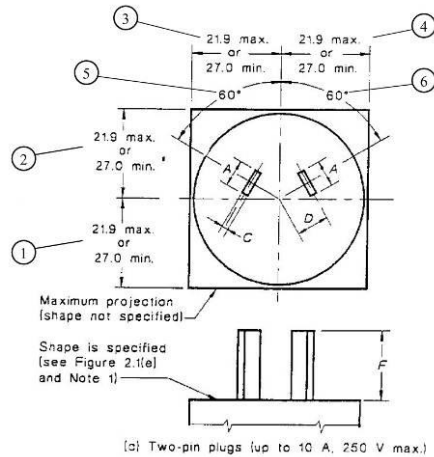
Clause	Requirement + Test	Result - Remark	Verdict
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2.13.13.6	TABLE 2.2: Test No. 13e – Abrasion test	P
Test condition: 20000 movements,30 movements per min.		
Requirement		Test result
After the test:		—
The pins shall show no damage which may affect safety or impair the further use of the plug		P
The insulating sleeve shall not have punctured or rucked up.		P

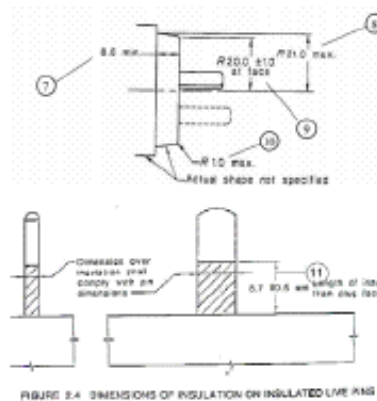
CHECKING OF DIMENSIONS

Dimensions checked by gauge and measurement

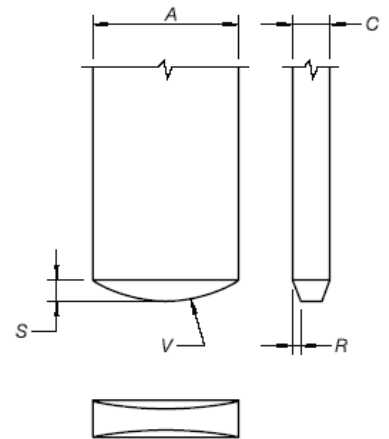
Standard sheet Figure 2.1 (c)



Standard sheet Figure 2.1 (e)



Standard sheet Figure 2.1 (h)



For model GT*96180 series

Position	Required (mm)	By Measurement (mm) (Q-SAA / Q-AU)	By the gauge shown in Figure A1
A	6.35±0.15	6.33 / 6.36	-
B	6.35±0.15	-	-
C	1.63 ^{+0.15} _{-0.05}	1.63 / 1.66	-
D	7.92	-	OK
E	10.31	-	OK
F	17.06±0.4	17.13 / 16.93	-
G	19.94±0.8	-	-
R	0.35±0.05	0.31 / 0.34	-
S	0.90±0.10	0.83 / 0.88	-
T	≥0.60	-	-
V	6	-	OK
1	21.9 max. or 27.0 min.	20.80 / 64.19	-
2	21.9 max. or 27.0 min.	20.80 / 20.95	-
3	21.9 max. or 27.0 min.	62.88 / 20.95	-
4	21.9 max. or 27.0 min.	20.80 / 20.95	-
5	60°	-	OK
6	60°	-	OK
7	8.6 min.	10.48 / 10.80	-
8	21.0 max.	20.77 / 20.95	-
9	20.0±1.0	20.45 / 20.75	-
10	1.0 max	0.31 / 0.31	-
11	8.7±0.5	8.79 / 8.97	-

Overall view for Q-SAA integral plug



Overall view for Q-AU integral plug



APPENDIX NO.4: MECHANICAL DURABILITY TEST FOR NON-STANDARD INTERCHANGEABLE PLUG ADAPTERS ACCORDING IEC 61984: 2008

IEC 61984: 2008										
Clause	Requirement + Test	Result - Remark	Verdict							
6.14.1	MECHANICAL ENDURANCE (COC AND CBC)		P							
	A connector, either COC or CBC, shall meet the mechanical operations without load as specified in the DS or in the manufacturer's specification (preferred numbers of operating cycles are given in Table 4a).	100 cycles	P							
7.3.9	MECHANICAL OPERATION		P							
	The object of this test is to assess the mechanical operational endurance of a connector either CBC or COC in the normal operational mode without electrical load.		P							
	The test shall be carried out according to test 9a of IEC 60512, under the following conditions, unless otherwise specified.		P							
	Test conditions:		P							
	The specimens shall be engaged and disengaged by means of a device simulating normal operating conditions.		P							
	The preparation and mounting of the specimen shall be as in normal use.		P							
	The type and cross sectional area of the cable/wire bundle to be used shall be specified by the manufacturer or by the DS.		P							
	The number of operating cycles shall be specified by the manufacturer or by the DS.		P							
	Preferred values are indicated in Table 4a.	100 cycles	P							
	The speed of insertion and withdrawal shall be approximately 0,01 m/s with a rest in the unmated position of approximately 30 s.		P							
Table 4	Mechanical and electrical durability		P							
	Table 4a – Operating cycles – Preferred values		P							
	<table><tr><th>Operating cycles - Preferred values</th></tr><tr><td>10</td></tr><tr><td>50</td></tr><tr><td>100</td></tr><tr><td>500</td></tr><tr><td>1 000</td></tr><tr><td>5 000</td></tr></table>	Operating cycles - Preferred values	10	50	100	500	1 000	5 000	100 cycles	P
Operating cycles - Preferred values										
10										
50										
100										
500										
1 000										
5 000										