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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. ..... :	**211201100SHA-001**
Date of issue..... :	**2022-04-07**
Total number of pages ..... :	**163**
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 61558-1:2017 Include deviations for Australia and New Zealand
Test procedure ..... :	SAA
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC61558_2_16F
Test Report Form(s) Originator .... :	Intertek Testing Services (Singapore) Pte Ltd
Master TRF ..... :	Dated 2019-02-04

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description ..... :	Power Supply
Trade Mark ..... :	GlobTek, Inc.
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	GT*96600-****, GT*91099-*****, GT*96600-*56*** (Refer to page 8 for details)
Ratings ..... :	Class II, IP20, ta: 40°C **For model: GT*96600-****, GT*91099-***** Input: 100-240V~, 50-60Hz or 50/60Hz, 1.5A Output: 5-54Vdc, Max. 8.00A, Max. 65W **For model: GT*96600-*56***** Input: 100-240V~, 50-60Hz or 50/60Hz, 2.0A; Output: 56VDC, Max. 70W (Refer to page 7-8 for details)

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	Intertek Testing Services Shanghai	
Testing location/ address.....:		Building No.86, 1198 Qinzhou Road (North), 200233 Shanghai, China	
Tested by (name, function, signature).....:		Albert Zhou (Engineer)	Albert Zhou
Approved by (name, function, signature)...:		Will Wang (Mandated Reviewer)	Will Wang
☐	**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:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address.....:			
Tested by (name, function, signature).....:			
Witnessed by (name, function, signature) .:			
Approved by (name, function, signature)...:			
Supervised by (name, function, signature) :			

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

Appendix No.1: National differences for Australia/New Zealand (Page 125 to 127, total 3 page)

Appendix No. 2: Photos (Page 128 to 163 total 36 pages)

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, AMD1:2013 used in conjunction with IEC 61558-1:2017”.

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
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
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

Testing location:

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

Summary of compliance with National Differences (List of countries addressed):

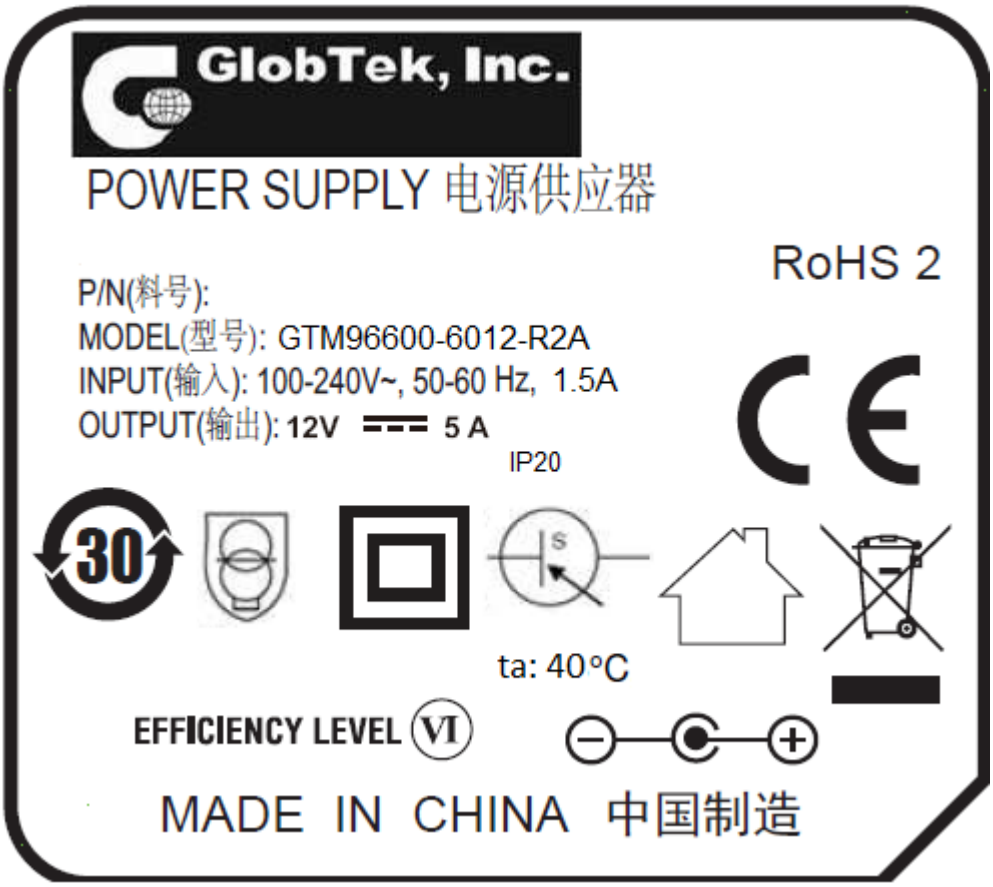
Group differences for Australia and New Zealand are considered.

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:

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



Remark:

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

Other models are with similar label as corresponding above models except different model name and output ratings.

Test item particulars.....:	
Classification of installation and use.....:	Portable
Supply Connection.....:	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 .....:	2018-07-26
Date (s) of performance of tests.....:	2018-07-26 to 2018-10-20

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.
Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty

Through the report, model GTM96600-4005-R2, GTM96600-6512-R2, GTM96600-6554-R2, GTM91099-6015-3.0-T2, GTM91099-6048-12.0-T2 and GTM91099-6048-T2 were tested as typical models for all tests.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

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 ..... :	☒ **Yes** ☐ **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 **3.** Shenzhen ENG Electronics Co., Ltd. Block B2, A4 first floor, A4 third-four Floor of the East, Nuclear Group Industrial District, Baishixia, Fuyun Town, Bao'an, Shenzhen China

General product information and other remarks:

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. Two pieces of outer enclosure are ultrasonic welded. All models have the same circuit diagram.

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.
The GT*91099-***** and GT*96600-**** have same enclosure with smooth surface or groove surface and PCB Layout size, the transformer models TF-series used in GT*96600-**** and models XF-series used in GT*91099-***** have the same primary windings but different with secondary windings and constructions (The TF-series used fly line).

Model Similarity:

GT*91099-*****
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 "60", in step of 1 denote 1W.
The 3rd "*" denotes the standard rated output voltage designation, which can be "09", "15", "24", "48";
The 4th "*"is optional deviation, subtracted from standard output voltage, which can be "-0.01" to "-23.9" with interval of 0.01, or blank to indicate no voltage different.
The 5th "*" =-T2 means desktop class II with C8 AC inlet
=-T2A means desktop class II with C8 AC inlet
=-FW means Open Frame class II
=-P2 means Encapsulated class II
The last "*" denote any six character = 0-9 or A-Z or ()[] or – or blank for marketing purposes.

Model list:

Model	Output Voltage	Max. output current	Max. output power
GT*91099-***-T2/T2A/P2*	5-9V	6A	50W
	9.1-15V	6A	60W
	15.1-24V	4A	60W
	24.1-48V	2.5A	60W

GT*96600-****
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 "65", with interval of 1.
The 3rd "*" denote the standard rated output voltage designation, which can be "05" to "54" or "5.0" to "54.0" in 0.1V increments.
The 4th "*" =-T2 means desktop class II with C8 AC inlet
=-T2A means desktop class II with C18 AC inlet
=-T2L means desktop class II with C8 AC inlet and housing with a DC jack
=-T2AL means desktop class II with C18 AC inlet and housing with a DC jack
=-R2 means hybrid desktop housing class II with C8 AC inlet
=-FW means Open Frame class II
=-P2 means Encapsulated class II
The last "*" denote any six character = 0-9 or A-Z or ()[] or – or blank for marketing purposes.

Model list:

Model	Output Voltage	Max. output current	Max. output power
GT*96600-**-T2/T2A/T3/T3A/T2L/T2AL/R2/P2*	5-6.7Vdc	8.00A	40W
	6.8-11Vdc	6.00A	60W
	11.1-54Vdc	5.42A	65W

GT*96600-*56***
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 "70", with interval of 1.
The 3rd "*" =-T2 means desktop class II with C8 AC inlet
=-T2A means desktop class II with C18 AC inlet
The 4th "*" =-AP or -PP or -SP
-AP (with baby board) stands for Active POE
-PP (no baby board) stands for Passive POE
-SP (no baby board) stands for Simple POE
The last * denote any six character = 0-9 or A-Z or ()[] or – or blank for marketing purposes.

Model list:

Model	Output Voltage	Max. output current	Max. output power
GT*96600-*56-T2/T2A-AP/PP/SP*	56V	1.25A	70W

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

8	**MARKING AND OTHER INFORMATION**		P
8.1	**Transformer marked with (for symbols see Table 1):**		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: 2009+A1:2013)	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
	symbol for Class III		N/A
	m) index IPXX if other than IP00	IP20	P
	n) rated max. ambient temperature ta (if not 25 °C) .....:	See page 5	P
	o) rated minimum ambient temperature t_{amin}, if <10° C and if a temperature sensitive device is used		N/A
	p) p)duty cycle, if any, unless the operating time is		N/A
	q) symbol for overvoltage category, if other than OVC II;		N/A
	r) transformers used with forced air cooling shall be marked with "AF" in m/s		N/A
	s) Information from the manufacturer to the purchaser (data sheet) :		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
	– All markings except those under i) and j) may be illustrated as QR Code according ISO/IEC 18004.		N/A
	t) symbol indicating the maximum altitude of installation, if higher than 2 000 m.		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 non-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		N/A
	Identification of input terminals:		N/A
	Identification of output terminals:		N/A
	Symbol for any point/terminal in connection with frame or core		N/A
8.7	Indication for correct connection		N/A
8.8	Instruction sheet for type X, Y, Z attachments		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
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
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.	3N	N/A
	Power factor	cos φ	N/A
	Class II construction		P
	Class III construction	III	N/A
	Equipment of overvoltage category I	I	N/A
	Equipment of overvoltage category II	II	N/A
	Equipment of overvoltage category III	III	N/A
	Equipment of overvoltage category IV	IV	N/A
	Fuse-link		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Rated max. ambient temperature	t_a :40ºC	P
	Rated minimum ambient temperature	t_{amin}	N/A
	Rated minimum temperature	t_{min}	N/A
	Frame or core terminal		N/A
	Protective earth		N/A
	IP number	IP20	P
	Earth (ground for functional earth)		N/A
	For indoor use only		P
	To indicate that the appliance is intended to be usable up to the maximum altitude 3 000 m.		N/A
	To indicate that the power supply unit shall not be used, if pins of the plug part are damaged.		N/A
	Additional Symbols (IEC 61558-2-16: 2009+A1:2013)		P
	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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	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	Number, letters or other visual means for different positions of regulating devices and switches		N/A
	OFF position indicated by number 0		N/A
	Greater output, input etc. indicated by higher number		N/A
8.13	Marking not on screws or other easily removable parts		P
	Marking clearly discernible (transformer ready for use)		P
	Marking for terminals clearly discernible if necessary after removal of the cover		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	Visible information (symbols) shall be provided, when it is necessary to take special precautions for installation, transportation or use (in the catalogue, data sheet, instruction sheet or packaging):		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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	For transformers generating a protective earth conductor current greater than 10 mA (see also cl. 18.5.2): The installation shall be made according to the wiring rules.		N/A
	For stationary transformers exceeding 1000 VA: The short circuit voltage in % of the rated supply voltage		N/A
	For all transformers the electrical function: An information about the electrical function of the transformer (e.g. inherently short circuit proof safety isolating transformer)		P
	the limiting temperature of the winding under abnormal conditions which shall be respected when the transformer is built into an appliance as information for appliance design;		P
	For transformers with more than one output winding, not for series or parallel connection		N/A
	– an information in the instruction sheet: the transformer is not intended for series/parallel connection		N/A
	For IP00-transformers the test of 27.2 is not performed. The result may be affected by the enclosure in the final application.		N/A
8.15	Marking durable and easily legible		P
8.16	Portable transformers with integrated plugs complying with EN 50075 (IEC plug type C), shall use the symbol IEC 60417-6352:2015-10. The instruction sheet of the plug in transformer shall contain the following information, or equivalent: if the pins of the plug parts are damaged, the plug-in power supply shall be scrapped.	Not direct plug-in type	N/A
9	**PROTECTION AGAINST ELECTRIC SHOCK**		P
9.1	**General**		P
9.2	**Protection against contact with hazardous-live-parts**		P
9.2.1	**Determination of hazardous-live-parts**		P
9.2.1.1	A live part is not a hazardous live part if:		P
	– it is separated from the supply by double or reinforced insulation and		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– the requirements of 9.2.1.2 or 9.2.1.3 are fulfilled		P
9.2.1.2	The touch voltage is ≤35 V(peak) a.c. or ≤ 60 Vd.c.	Max. 56.02Vd.c (GT-96600-7056-T2-AP)	P
9.2.1.3	If the touch voltage is > 35 V (peak)a.c. or > 60 V d.c., the following requirements shall be fulfilled:		P
	The touch current shall not exceed:		P
	– for a.c. 0,7 mA (peak)	0.136mA peak (GTM96600-6554-R2)	P
	– for d.c. 2,0 mA (see Annex J)		N/A
	In addition, when a capacitor is connected to live parts:		—
9.2.1.3.1	discharge: < 45 C (between 60 V and 15 kV)		P
9.2.1.3.2	energy: ≤ 350 mJ (voltage >15 kV)		N/A
9.2.2	Transformers shall have an adequate protection against accessibility to hazardous live parts:		P
	The enclosure of class I and class II transformers gives an adequate protection against accentual 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
	IP00 transformers shall comply with the end product standard after incorporation in the end product.		N/A
	The insulating properties of lacquer, enamel, paper, cotton, oxide film on conductive parts and sealing compound shall not be considered as giving the required protection against accidental contact with hazardous-live-parts with the exception of fully insulated winding wire (FIW).		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Shafts, handles, operating levers, knops 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. 4) with the exception of fully insulated winding wire (FIW).		P
	for Class II transformers: conductive parts separated by basic insulation from hazardous live parts not touchable by test finger		P
	hazardous live parts shall not be touchable with the test pin		P
9.2.3	Accessibility of non-hazardous live parts		P
	Non-hazardous live parts of the output circuit may be accessible if they are isolated from the input circuit by double or reinforced insulation and if the following conditions are fulfilled:		P
	– The no load output voltage is ≤ 35 V peak a.c. or ≤ 60 V ripple free d.c., both poles are accessible	Max. 56.02Vd.c (GT-96600-7056-T2-AP)	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
9.3	Transformers with primary supply plug: 1 s after the interruption of the supply the voltage between the pins do not exceed 35 V (peak) a.c. or 60 V ripple free d.c.		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 ≤ 0,1 µF – no test is conducted.		N/A
	– 10 times switch the supply source on and off, or use a special equipment for to switch off at the most unfavourable electrical angle		P
	If the measured voltage is > 60 V ripple free d.c., the discharge must be ≤ 45 µC.		N/A
10	**CHANGE OF INPUT VOLTAGE SETTING**		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	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 (100 V a. c, to 240 V a.c voltage is allowed (IEC 61558-2-16: 2009+A1:2013):		P
	– if the output voltages does not exceed the rated output voltage and		P
	– if the no-load voltage does not exceed the limits of output voltage deviation		P
11	**OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD**		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 61558-2-16:2009+A1:2013):		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
	For **independent transformers,** this output voltage limitation applies even when output windings, not for interconnection, are connected in series		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
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+A1:2013)		P
12.103	Unless otherwise specified by the manufacturer, SMPS with high frequency output rating shall be tested with 20 cm to 200 cm length of wire connected to the output terminals under the most unfavourable conditions. Two twisted wires or cables rated 60227 IEC 53 may be used. The cross sectional area of the conductors shall be determined according to the rated output of the SMPS, and the current density shall not exceed 5 A/mm2 in normal use. (IEC 61558-2-16:2009+A1:2013)		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
14.1.1	**Temperature-rise test**		P
	No excessive temperature in normal use		P
	The manufacturer may choose the simulated load methods according to 14.1.2.1 or 14.1.2.2 instead of the direct load method that may be applied.		P
	Room temperature: rated ambient temperature ta ± 5 °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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	– bare metal: 65 °C		N/A
	– metal covered by lac or varnish		N/A
	– other material: 80 °C		N/A
	Temperature of external enclosure of stationary transformer 85 °C (not touchable with the IEC test finger)		N/A
	Temperature of external enclosures, handles, etc. of portable transformers:		P
	– continuously held parts of metal: 48 °C		N/A
	– continuously held parts of other material: 48 C		N/A
	– not continuously held parts of metal: 60 °C		N/A
	– not continuously held parts of other material: 80 °C		P
	Temperature of terminals for external conductors 70 °C		N/A
	Temperature of terminals of switches 70 C		N/A
	Temperature of internal and external wiring:		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
14.101	Winding temperature measured by thermocouples at the surface of the winding (IEC 61558-2-16: 2009+A1:2013)		P
	– if the internal frequencies is > 1kHz		P
	– the values of Table 2 for windings temperatures are reduced by 10°C		P
14.2	Application of 14.1 or 14.3 according to the insulation system		P
14.2.1	Class of insulation system (classified materials according to IEC 60 085 and IEC 60 216)	Class B	P
14.2.2	No classified material, or system but the measured temperature does not exceed the value of Class A		N/A
14.2.3	No classified material or system but the measured temperature exceeds the value for Class A, the live parts of the transformers are submitted to the test of 14.3		N/A
14.3	Accelerated ageing test for undeclared class of insulation system		N/A
14.3.1	General		N/A
	Cycling test (10 cycles):		N/A
	– measuring of the no-load input current (mA)		N/A
14.3.2	– heat run (temperature in table 4)		N/A
14.3.3	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
14.3.4	– moisture treatment (48 h, 17.2)		N/A
14.3.5	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

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Clause	Requirement + Test	Result - Remark	Verdict
	– electric strength, no breakdown (18.3 and 18.4); 2 min; test voltage 35% of specified value		N/A
	– Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A
15	**SHORT-CIRCUIT AND OVERLOAD PROTECTION**		P
15.1	**General requirements**		P
15.1.1	Short circuit and overload test method		P
	Tests direct after 14.1 at the same ta and without changing position.	(see appended table)	P
	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
	Wining 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 6 (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

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Clause	Requirement + Test	Result - Remark	Verdict
	– Test according 15.3.1: max. temperature of winding **after first hour, arithmetic mean value** (insulation class): 150 °C (A); 165 °C (E); 175 °C (B); 190 °C (F); 210 °C (H)		N/A
	– Test according 15.3.5: max. temperature of winding (insulation class): 175 °C (A); 190 °C (E); 200 °C (B); 215 °C (F); 235 °C (H)		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
15.1.2	Alternative short circuit and overload test method		N/A
15.2	For inherently short-circuit proof transformers and for transformers with rectifiers test by short circuit of the output winding at rated supply voltage x 1,1: temperature rises values in table 5		N/A
15.3	For non-inherently short-circuit proof transformers and for transformers with rectifiers: temperature rises values in table 5		P
15.3.1	Output terminals short-circuited: protection device operates, test at 0,9 … 1,1 of the rated supply voltage		P
15.3.2	If protected by a fuse accordance with either IEC 60 269-2 or IEC 60 269-3, or a technical equivalent fuse, the transformer is loaded as in table 6.		N/A
15.3.3	If protected by a fuse accordance with either IEC 60 127(all parts) or ISO 8820(all parts), or a technical equivalent fuse, the transformer is loaded with the current as specified for the longest pre arcing time. *If protected by a miniature fuses in accordance to IEC 60127(all parts), 1,5 times of the rated fuse, until steady state condition (in addition)*		N/A
15.3.4	If protected by a circuit-breaker according to IEC 60 898(all parts) the transformer is loaded with a current equal to 1,45 times the value of the circuit-breaker rated current		N/A
15.3.5	If other overload protection than a fuse (IEC 60 127) or a circuit-breaker (IEC 60 269) test with 0,95 times of operating current	Protected by electronic circuit	P

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Clause	Requirement + Test	Result - Remark	Verdict
	If an internal week point is used, the test must be repeated with two new samples. The two additional samples works similar to the first sample. Temperatures in the limit of table 5		N/A
15.4	For non-short-circuit proof transformers: temperature rises values in table 5, tests as indicated in 15.3		N/A
15.5	For fail-safe transformers:		N/A
15.5.1	Three additional new specimens are used		—
	– Upri (V): 1,1 times rated supply voltage ..... :		—
	– Isec (A): 1,5 times rated output current ..... :		—
	– time until steady-state conditions t1 (h) ..... :		—
	– time until failure t2 (h): 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
	– electric strength (Cl. 18, 1 min, test voltage: 35% of specified value); no flashover or break-down for primary-to-secondary only for safety isolating, isolating and separating transformer and for primary-to-body for all kinds of transformer		N/A
	– bare hazardous live parts not accessible by test finger through holes of enclosure		N/A
15.101	Electronic circuits of the SMPS fulfil the requirements of **Annex H of part 1**. After a fault: no electric shock, no fire hazard and no unintentional operation.	(Details see Annex H)	P
16	**MECHANICAL STRENGTH**		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 9.2.2		P
	– no damage for insulating barriers		P
	– handles, levers, etc. have not moved on shafts	No such part	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
16.2	Stationary transformers		P
	3 blows, impact energy 0,5 ±0,05 J		P
16.3	Portable transformers (except of direct plug in transformers)		P
	For portable transformers: 100 falls, 25 mm		P
16.4	Portable transformers provided with integral pins for introduction in socket outlets of the fixed wiring	Not direct plug in type	N/A
16.4.1	General requirements		N/A
	Portable transformers with integral pins for introduction into fixed socket-outlets shall have adequate mechanical strength.		N/A
	Plug in power supply units with integral main plug complying with IEC TR 60083, without plugs complying with EN 50075 (IEC plug type C) shall be tested:		N/A
	a) plug-in transformers: tumbling barrel test: 50 x ≤ 250 g; 25 x > 250 g		N/A
	b) torque test of the plug pins with 0,4 Nm		N/A
	c) pull force according to table 7 for each pin		N/A
16.4.2	Portable transformers provided with integral pins according to EN 50075 (IEC plug type C) for introduction in socket-outlets of the fixed wiring		N/A
	a) The test is carried in a tumbling barrel as described in IEC 60068-2-31.		N/A
	- 1000 x ≤ 100 g; 100 g< 500 x ≤ 200 g; 200 g< 100 x		N/A
	- pull force according to IEC 60884-1:2002, 24.10 for each pin		N/A
	b) torque test of the plug pins with 0,4 Nm		N/A
16.5	Additional requirements for transformers to be used in vehicles and railway applications		N/A
16.5.1	Transformers to be used in vehicles and railway applications		N/A
	An test according IEC 61373 shall be performed with conditions of Table 8 and Table 9 and the frequency values depending on the weight of the specimen are defined in Table 10		N/A
16.5.2	Test requirements for the transportation of transformers		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Shock and vibration testing requirements for transformers subjected to while being transported per IEC 60721-3-2 with conditions according to Table 11 and Figure 8.		N/A
17	**PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE**		P
17.1	Degree of protection (IP code marked on the transformer)	IP20	P
17.1.1	General requirements		P
	Test according to 17.1.2 and for other IP ratings test according to IEC 60 529:		P
	– stable operating temperature before starting the test for < IPX8		N/A
	– the water for the test shall be at a temperature of 15±10℃		N/A
	– transformer mounted and wired as in normal use		N/A
	– fixed transformer mounted as in normal use by the tests according to 17.1.2 A to J		N/A
	– portable transformers placed in the most unfa-vourable 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) no access with hazardous-live-parts or hazardous moving parts with the relevant test probe according to the test described in 17.1.2, items A 1), B 1) and C 1). The test finger may penetrate but the stop face (ø 50 x 20 mm) shall not pass through the openings for the number 2 of the first characteristic numeral		N/A
	b) no entry into the transformer enclosure by the relevant test probe for solid-object-proof transformers according to test described in 17.1.2, items A 2) and B 2). The protection is satisfactory if the full diameter of the probe does not pass through any openings;		N/A
	c) no deposit of talcum powder in dust-proof transformers		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	d) no deposit of talcum powder inside dust-tight transformers		N/A
	e) no trace of water on live parts except SELV parts below 15 V ac or 25 V dc or insulation if hazard for the user or surroundings no reduction of creepage distances		N/A
	f) no accumulation of water in transformers IPX1 so as to impair safety		N/A
	g) no trace of water entered in any part of water-tight transformer		P
17.1.2	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
	- rigid sphere		N/A
	B) Solid-object-proof transformers:		N/A
	- IP3X, wire 2,5 mm; force 3 N		N/A
	- IP4X, wire 1 mm; force 1 N		N/A
	C) Dust-proof transformers, IP5X;		N/A
	1) At every possible point with a probe according to test probe D of B 1).		N/A
	2) dust chamber according to IEC 60 529, fig. 2:		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
	d) fan/blower is switched on		N/A
	e) after 1 min transformer is switched off for cooling time of 3 h		N/A
	D) Dust-tight transformers (IP6X) test according to C)		N/A
	E) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min		N/A
	F) Rain-proof transformers (IPX2) test according to fig. 3 of IEC 60 529 for 10 min in operation, any angle up to 15°		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	G) Spray proofed transformers (IPX3) test according to fig. 4 of IEC 60 529 for 10 min in operation and 10 min switched off , time for complete oscillation (2 x 120°) is 4 sec.		N/A
	H) Splash-proof transformers (IPX4) test according to fig. 4 of IEC 60 529 (see F) for 10 min in operation and 10 min switched off (the tube shall oscillate ≈360)		N/A
	I) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)		N/A
	J) Powerful Jet-proof transformer (IPX6) test according to fig. 6 of IEC 60 529 (nozzle 12 mm)		N/A
	K) Watertight transformers (IPX7)		N/A
	L) Pressure watertight transformers (IPX8)		N/A
17.2	After moisture test (48 h for IP20, 168 h for other transformers):	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 2 M		N/A
	– live parts and body for reinforced insulation 7 M	Input circuit and outer enclosure (rounded with metal foil): >199MΩ	P
	– input circuits and output circuits for basic insulation 2 M		N/A
	– input circuits and output circuits for double or reinforced insulation 5 M	Input circuit and output circuit: >199MΩ	P
	– 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 7 M	>199MΩ	P

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Clause	Requirement + Test	Result - Remark	Verdict
18.3	Electric strength test (1 min): no flashover or breakdown:		P
	Overvoltage category ..... :		P
	1) functional insulation; working voltage (V); test voltage (V) :		N/A
	2) basic insulation; working voltage (V); test voltage (V) ..... :	(see appended table)	P
	3) supplementary insulation; working voltage (V); test voltage (V) ..... :		N/A
	4) double or reinforced insulation:	(see appended table)	P
	5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V) (IEC 61558-2-16:2009+A1:2013)		N/A
18.3.1	A partial discharge test according to IEC 60664-1, (see test description below) shall be performed, if FIW wires or TIW wires are used and if the recurring peak working voltage Ut across the insulation is greater than 750 V. The relevant recurring peak voltage is the maximum measured voltage between the input and the output circuit, if the secondary side is earthed. The measuring shall be done at 1,0 of the maximum rated input voltage.		N/A
18.4	Does not apply (IEC 61558-2-16:2009+A1:2013)		-
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
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 earthing conductor current		P
18.5.1	General		P
18.5.2	Touch current		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Touch current measured after the clause 14 test (hot) for class I and class II transformers (class II transformers with metal foil at the plastic surface). The test circuit according figure 10. Measuring network according Figure J.1 (Annex J). If the frequency is >30kHz, measuring across the 500 Ohm resistor of J.1 (burn effects).	0.136mA peak (GTM96600-6554-R2)	P
	Measurement of the touch current with switch p in both positions and in combination with switches e and n. The measured values are less than the required values of table 15.		P
	– switches n and e in on position	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
18.5.3	Protective earthing conductor current		-
	The transformer is connected as in clause 14 Impedance of the ammeter < 0,5 Ohm, connected between earthing terminal of the transformer and protective earthing conductor		N/A
	The measured values are less than the required values of table 15.		N/A
19	**CONSTRUCTION**		P
19.1	**General construction**		P
19.1.1	General		P
19.1.2	Auto-transformers		N/A
19.1.2.1	For plug connected auto-transformers with rated input voltage > rated output voltage, the potential to earth shall not exceed the rated output voltage.		N/A
19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction is given with the information, that the transformer shall not be used with non-polarised plug and socket outlet system.		N/A
19.1.2.3	A polarity detecting device only energises the output in the case: output potential to earth ≤ rated output voltage, also with reversed input plug.		N/A
	– The contact separation of the device is ≥ 3mm		N/A
	– A current to earth does not exceed 0,75 mA.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– All tests are repeated under fault conditions of H.3.3 of annex H of part 1. The potential to earth does not exceed the max output voltage for more than 5 s.		N/A
19.1.3	Separating transformers		N/A
19.1.3.1	Input and output circuits electrically separated.		N/A
19.1.3.2	The insulation between input and output winding(s) consist of basic insulation		N/A
	Class I SMPS		N/A
	– Insulation between input windings and body consist of basic insulation		N/A
	– Insulation between output windings and body consist of basic insulation		N/A
	Class II SMPS		N/A
	– Insulation between input windings and body consist of double or reinforced insulation		N/A
	– Insulation between output windings and body consist of double or reinforced insulation		N/A
19.1.3.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation		N/A
	For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation.		N/A
19.1.3.4	Parts of output circuits may be connected to protective earthing	No protective earth	N/A
19.1.3.5	No direct contact between output circuits and the body, unless:	No direct connection	N/A
	– Allowed for associated transformers by the equipment standard		N/A
19.1.4	Isolating transformers and safety isolating transformers		P
19.1.4.1	Input and output circuits electrically separated		P
	No possibility of any connection between these circuits		P

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.4.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.4.4)		P
	Class I transformers **not** intended for connection to the mains by a plug:		—
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the input voltage		N/A
	– Insulation between output windings and body, connected to earth consist of basic insulation rated for the output voltage		N/A
	Class I transformers intended for connection to the mains by a plug:		N/A
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the working voltage		N/A
	– Insulation between output windings and body, connected to earth consist of supplementary insulation rated for the working voltage		N/A
	Class II transformers		P
	– Insulation between input windings and body consist of double or reinforced insulation rated to the input voltage		P
	– Insulation between output windings and body consist of double or reinforced insulation, rated to the output voltage		N/A
19.1.4.3	For transformers with intermediate conductive parts not connected to the body (between input/output):		-
19.1.4.3.1	For class I and class II transformers the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A
	– For class II transformers the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (rated to the input voltage and output voltage), for SELV circuits only basic insulation is required.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– For transformers, different from independent, the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A
19.1.4.3.2	Class I transformers with earthed core, and not allowed for class II equipment		N/A
	– Insulation between the input winding and the earthed core: basic insulation rated for the input voltage		N/A
	– Insulation between the output winding and the earthed core: basic insulation rated for the output voltage		N/A
19.1.4.3.3	Insulation between : input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation		N/A
	– 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
19.1.4.4	For class I transformers, with protective screen, **no**t connected to the mains by a plug the following conditions comply:		N/A
	– The insulation between input winding and protective screen consist of basic insulation (rated for the input voltage)		N/A
	– The insulation between output winding and protective screen consist of basic insulation (rated for the 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 protective 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 protective device		N/A
	– The lead out wire is soldered or fixed to the protective screen.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Protective screening is not allowed for transformers with plug connection to the mains		N/A
19.1.4.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled.	No protective earth	N/A
19.1.4.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard)	No direct connection	N/A
19.1.4.7	The distance between input and output terminals for the connection of external wiring is ≥ 25 mm	No terminal	N/A
19.1.4.8	Portable transformers having an rated output ≤ 630 VA shall be class II.		P
19.1.4.9	No connection between output circuit and body except of associated transformers (allowed by equipment standard)	No connection	P
19.1.4.10	Protective screening is not allowed for transformers with plug connection to the mains		N/A
19.2	Fiercely burning material not used	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
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 reinforced insulation, during reassembly after routine servicing not omitted	Enclosure fixed by ultrasonic 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	– For a working voltage above 250 V AC and not exceeding 500 V AC and an overvoltage category III, two Y1 capacitors are required.		N/A
19.9	Insulation material input/output and supplementary insulation of rubber resistant to ageing		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 (IEC 60068-2-14), test Ba: 168 h; 70 C		N/A
	b) impact test (spring-operated impact hammer according to IEC 60 068-2-75; 0,5 ± 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
	– 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 22		N/A
	– one additional layer of serrated tape, and		N/A
	– one additional layer without serration		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– in case of cheekless bobbins the end turns of each layer shall be prevented from being displaced		N/A
19.12.3	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 26.2.4 – Test A, passed for wrapped layers		N/A
	• 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
	• comply with annex K		N/A
	• two layers for supplementary insulation		N/A
	• one layer for basic insulation		N/A
	• 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
	• comply with annex K	Certified triple insulated winding wire	P
	• three layers		P
	• relevant dielectric strength test of 18.3		P
	Where the insulated winding wire is wound:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	• upon metal or ferrite cores		P
	• upon enamelled wire		P
	• under enamelled wire		P
	• 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
	• both windings shall not touch each other and also not the core.		P
	100 % routine test of Annex K3 of part 1 is fulfilled		N/A
	no creepage distances and clearances for insulated winding wires		P
c)	Toroidal cores used with TIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating which fulfils the requirements of basic insulation between a winding and the core		N/A
	2) The primary winding consists of TIW wire with 3 layers (reinforced insulation) and the secondary winding consists of enamelled wire. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire with 3 layers and the secondary winding consists of a TIW wire with 1 layer (requirements for primary and secondary windings can be changed). This construction also is allowed for use with EE-cores or similar.		N/A
d)	Toroidal cores used with FIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating, which fulfil the requirements of basic insulation.		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for supplementary insulation (2 layers) and the secondary winding consists of FIW wire for basic insulation. This construction also is allowed for use with EE-cores or similar.		N/A
	4) Further polyfilar constructions with FIW and TIW wires in combination with enamelled wires for basic insulation only: 4.1) Primary winding consists of enamelled wire, secondary winding consists of FIW wire for reinforced insulation 4.2) Primary winding consists of enamelled wire, secondary winding consists of TIW wire for reinforced insulation		N/A
19.12.3.1	Max. class F for transformers which use FIW-wire		N/A
19.12.3.2	FIW wires comply with IEC 60851-5:2008, IEC 60317-0-7 and IEC 60317-56.		N/A
	• other nominal diameter as mentioned in table 24 can be calculated with the Formula (6) in 26.3.5:		N/A
	FIW wire used for basic or supplementary insulation for transformers according 19.1.3:		–
	• the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	• 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
	• between FIW and enamelled wire, no requirements of creepage distances and clearances		N/A
	• no touch of FIW and enamelled wires		N/A
	FIW wire used for double or reinforced insulation for transformers according 19.1.4:		N/A
	• the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	• for primary and secondary winding FIW-wire for basic insulation is used		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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
	• no touch between the basic insulated PRI and SEC FIW-wires		N/A
	• 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
	• the test voltage of table 14, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 24		N/A
	• 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
	• no touch between the FIW wire and the enamelled wire		N/A
	• 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:		–
	• the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	• PRI or SEC basic insulated FIW wire and to the other winding (enamelled wire) requirements of supplementary insulation		N/A
	• 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
	• upon metal or ferrite cores		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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
	• 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		N/A
	Additional torque ≤ 0,25 Nm		N/A
19.16	Portable transformers for use in irregular or harsh conditions	IP20	P
	Portable transformers having a weight not exceeding 18 kg shall have a protection index IPX4 or higher.		N/A
19.17	Transformers IPX1 - IPX6 totally enclosed, except for drain hole (diameter ≥ 5 mm or 20 mm² with width ≥ 3 mm); drain hole not required for transformer completely filled with insulating materials	IP20	N/A
19.18	Transformers IPX1 with a moulded-on plug, if any		N/A
19.19	Class I transformers with a non-detachable flexible cable or cord with earth conductor and a plug with earth contact	Class II	N/A
19.20	Live parts of SELV and PELV-circuits: separation not less than PRI/SEC of a safety isolating transformer	No PELV-circuit	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	No protective earth	P
	Nominal voltage (V) > 25 V a.c. or 60 V d.c., the required insulation fulfils the high voltage test according to table 8 a		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.20.2	PELV-circuits double or reinforced insulation is necessary		N/A
19.21	FELV-circuits: protection against contact fulfils the min. test voltage required for the primary circuit		N/A
19.22	Class II transformers shall not be provided with means for protective earth		P
	For fixed transformers an earth conductor with double or reinforced insulation to accessible metal parts is allowed		N/A
19.23	Class III transformers shall not be provided with means for protective earth		N/A
20	**COMPONENTS**		P
20.1	Components such as switches, plugs, fuses, lamp holders, flexible cables and cords, comply with relevant IEC standard		P
	Components inside the transformer pass all tests of this standard together with the transformer tests		P
	Testing of components separately to the transformer according the relevant standard:		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
20.2	Appliance couplers for main supply shall comply with:	Appliance inlet used	P
	– IEC 60 320 for IPX0		P
	– 60320-2-3 or IEC 60 309 for other		N/A
20.3	Automatic controls shall comply with IEC 60 730-1	No control	N/A
20.4	Thermal-links comply with IEC 60691	No thermal-link	N/A
20.5	Switches shall comply with annex F	No switche	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

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Clause	Requirement + Test	Result - Remark	Verdict
	– or a flexible supply cable and cord with plug		N/A
	– or an instruction sheet: disconnection by all-poles switches incorporated in fixed wiring		N/A
20.6	Socket-outlets of the output circuit shall be such that there is no unsafe compatibility to plugs complying with input circuit.		P
	Plugs and socket-outlets for SELV systems with both a rated current = 3A and a rated voltage =24 V shall comply with following:		N/A
	SELV plug and socket-outlets shall comply with IEC 60 884-2-4 and IEC 60 906-3		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:		-
	– 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
20.7	Thermal cut-outs, overload releases etc. have adequate breaking capacity		P
	– Thermal cut outs fulfil the relevant requirements of 20.8 and 20.9		N/A
	– Thermal links fulfil the relevant requirements of 20.9		N/A
	– The breaking capacity is in accordance with the relevant fuse standard		P

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Clause	Requirement + Test	Result - Remark	Verdict
20.7.1	For Fuses According IEC 60127 and IEC 60269, the fuse current does not exceed 1,1 times of the rated value		N/A
20.8	Thermal cut outs shall meet the requirements of 20.8.1.1 and 20.8.2, or 20.8.1.2 and 20.8.2.		N/A
20.8.1	Requirements according to IEC 60730-1		N/A
20.8.1.1	Thermal cut-out tested as component shall comply with IEC 60 730-1		N/A
	a) Thermal cut outs type 1 or type 2 (see 6.4 of IEC 60730-1:2013)		N/A
	b) Thermal cut outs fulfil the requirements of micro-interruption (type 1.C or 2.C) or micro-disconnection, (type 1.B or 2.B) (see IEC 60730-1:2013)		N/A
	c) Thermal cut outs with manual rest have a trip free mechanism (type 1.E and 2.E) (see IEC 60730-1:2013)		N/A
	d) The number of cycles of automatic action shall be:		N/A
	– 3000 cycles for self-resetting thermal cut-outs		N/A
	– 300 cycles for non-self-resetting thermal cut-outs resetting by hand		N/A
	– 300 cycles for non-self-resetting thermal cut-outs resetting disconnecting		N/A
	– 30 cycles for non-self-resetting thermal cut-outs which are only resettable by a tool		N/A
	e) Thermal cut outs fulfil the electrical stress according 6.14.2 of IEC 60730-1:2013		N/A
	f) Characteristic of thermal cut-outs:		N/A
	– ratings according IEC 60730-1:2013, cl. 5		N/A
	– classification according to:		-
	1) nature of supply to IEC 60730-1:2013, cl. 6.1		N/A
	2) type of load controlled to IEC 60730-1, cl. 6.2		N/A
	3) degree of protection IPX0 to IEC 60730-1:2013, cl. 6.5.1		N/A
	4) degree of protection IP0X to IEC 60730-1:2013, cl. 6.5.2		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	5) pollution degree to IEC 60730-1:2013, cl. 6.5.3		N/A
	6) comparative tracking index to IEC 60730-1:2013, cl. 6.13		N/A
	7) max. ambient temperature to IEC 60730-1:2013, cl. 6.7		N/A
20.8.1.2	Thermal cut-out tested as a part of the transformer, test with 3 samples:		-
	– at least micro-interruption or micro-disconnection (IEC 60730-1:2013)		N/A
	– 300 h aged at ta (transformer) + 10°C		N/A
	– subjected to a number of cycles for automatic operating according 20.8.1.1		N/A
	During the test no sustaining arcing shall occur, during and after the test no damage at the thermal cut out and the transformer in the sense of this standard		N/A
20.8.2	Thermal cut-outs shall have adequate breaking capacity		-
20.8.2.1	The output of the transformer with a non-self-resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage. After opening of the cut off, the supply voltage is switched of, until the transformer is cooling down.		N/A
	– 3 cycles at 25° C for transformers without t_{amin}		N/A
	– 3 cycles at t_{amin} for transformers with t_{amin}		N/A
	– after the 3 cycles short circuit of the output at 1,1 of rated supply voltage for 48 h.		N/A
	During the tests no sustaining arcing shall occur After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.8.2.2	The output of the transformer with a self-resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage.		N/A
	– 48 h at 25° C for transformers without t_{amin}		N/A
	– 24 h at ta and 24 h at t_{amin} for transformers with t_{amin}		N/A
	During the tests no sustaining arcing shall occur After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.8.3	Test of a PTC resistor:		-

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Clause	Requirement + Test	Result - Remark	Verdict
	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
20.9	Thermal links shall be tested in one of the following two ways.		-
20.9.1	Thermal-links shall comply with IEC 60 691 as a separate component.		N/A
	– electrical conditions to IEC 60691, cl. 6.1		N/A
	– thermal conditions to IEC 60691, cl. 6.2		N/A
	– ratings to IEC 60691, cl. 8 b		N/A
	– suitability of sealing components, impregnating fluids or cleaning solvents IEC 60691, cl. 8 c		N/A
20.9.2	Thermal-links tested as a part of the transformer:		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 MΩ		N/A
	– 3 cycles for replaceable thermal-links		N/A
	– 3 new specimens for not replaceable thermal-links		N/A
20.10	Self-resetting devices not used if mechanical, electrical, etc. hazards		N/A
20.11	Thermal cut-outs which can be reset by soldering operation are not allowed		N/A
20.12	Overload protection devices do not operate during test (20 times switched on and off, at no load); Upri (V): 1,1 times rated supply voltage.	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

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Clause	Requirement + Test	Result - Remark	Verdict
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 supply cord	N/A
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:		N/A
	– not exceed 2 m for cross-sectional area of 0,5 mm^2		N/A
	– exceed 2 m for cross-sectional areas greater than 0,5 mm^2.		N/A
22.5	Power supply cords for transformers IP20 or higher and transformers ”for indoor use only” $\geq$ IP20:		N/A
	– for transformers with a mass $\leq$ 3 kg: IEC 60227-5:2011 – type 60227 IEC 52 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– for transformers with a mass > 3 kg: IEC 60227-5:2011 – type 60227 IEC 53 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53.		N/A
	Power supply cords for transformers for outdoor use: ≥ IPX0: IEC 60245-4:2011 – type 60245 IEC 57		N/A
22.6	Power supply cords for single-phase portable transformers with input current ≤ 16A:		N/A
	– cord set fitted with an appliance coupler in accordance with IEC 60320(all parts)		N/A
22.7	Nominal cross-sectional area (mm²); input current (A) at rated output not less than shown in table 16	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(all parts)		N/A
22.9	Type X, Y or Z attachments: see relevant part of IEC 61558-2.		N/A
22.9.1	For type Z attachment: moulding enclosure and external flexible cable or cord do not affect insulation of cable		N/A
22.9.2	Inlet openings or inlet bushing: without risk of damage to protective covering of external flexible cable or 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
	The sheath of an external flexible cable or cord equivalent to at least that of a cord complying with IEC 60227 (all parts) or 60245 (all parts) is regarded as basic insulation.		N/A
	A lining or a bushing of insulating material in a metallic enclosure is only regarded as supplementary insulation		N/A
	An enclosure of insulating material is regarded as reinforced insulation		N/A
22.9.3	Inlet bushings:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– no damage to external flexible cable or cord		N/A
	– reliably fixed		N/A
	– not removable without tool		N/A
	– not integral with external flexible cable or cord (for type X attachment)		N/A
	– not of natural rubber except for Class I transformer with type X, Y and Z attachments		N/A
22.9.4	For transformers which are moved while operating:		N/A
	– cord guards, if any, of insulating material and fixed		N/A
	Compliance is tested by the oscillating test according to fig. 12:		N/A
	– loaded force during the test according to fig. 12		N/A
	– 10 N for a cross-sectional area > 0,75		N/A
	– 5 N for other cords		N/A
	After the test according to fig. 12:		N/A
	– no short-circuit between the conductors		N/A
	– no breakage of more than 10% of stands 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
	– moulded-on designs, tying the cable into a knot and tying the end with string not allowed		N/A
	– labyrinths, if clearly how, permitted		N/A
	– replacement of cable easily possible		N/A
	– protection against strain and twisting clearly how		N/A
	– suitable for different types of cable unless only one type of cable for transformer		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– the entire flexible cable or cord with covering can be mounted into the cord anchorage		N/A
	– if tightened or loosened no damage		N/A
	– no contact between cable or cord and accessible or electrically connected clamping screws		N/A
	– cord clamped by metal screw not allowed		N/A
	– one part securely fixed to transformer		N/A
	– for Class I transformer: insulating material or insulated from metal parts		N/A
	– for Class II transformers: insulating material or supplementary insulation from metal parts		N/A
	Cord anchorages for type X, Y, Z attachments: cores of power external flexible cable or cord insulated from accessible metal parts by:	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	Type Z	P
	Cord anchorages for type X and Y attachments:		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
	– 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 18		N/A
	– not possible to push cable into transformer		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– 25 pulls of 1 s		P
	– 1 min torque according to table 17		P
	– mass (kg); pull (N); torque (Nm) ..... :	Max. 0.26kg; 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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 other conductive part cannot be reduced to less than 50% of specified value (Cl.26) should conductor break away		N/A
	Transformer with type Y and Z attachments for external conductors: soldered, welded, crimped, etc. connections allowed	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 other conductive parts cannot be reduced to less than 50% of specified value (Cl.26) should conductor break away	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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
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 accessible metal parts separated only by basic or supplementary insulation for Class II transformers		N/A
24	**PROVISION FOR PROTECTIVE EARTHING**		P
24.1	Class I transformers: accessible conductive parts connected to earth terminal	Class II	N/A
	Class II transformers: no provision for protective earth		P
24.2	Protective earth terminal for connection to fixed wiring and for type X attachment transformers: comply with Cl. 23, adequately locked, not possible to loosen without a tool		N/A
24.3	No risk of corrosion from contact between metal of earth terminal and other terminal		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
24.4	Resistance of connection between earth terminal and metal parts 0,1Ω with a min. 25 A or 1,5 times rated input current at 1 min		N/A
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 + 1/3 screw diameter or 8 mm whichever is shorter		N/A
	– correct introduction into screw hole		N/A
25.3	Electrical connections: contact pressure not transmitted through insulating material		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
	Thread-cutting screws and thread-forming screws used for earth continuity allowed if at least 2 screws for each connection are used and it is not necessary to disturb the connection in normal use		N/A
25.5	Screws for current-carrying mechanical connections locked against loosening		N/A
	Rivets for current-carrying connections subject to torsion locked against loosening		N/A
25.6	Test of screwed glands with a torque according table 19. After the test no damage at the transformer and the gland.		N/A
26	**CREEPAGE DISTANCES AND CLEARANCES**		P
26.2	**Creepage distances (cr) and clearances (cr)**		P
26.2.1	General		P
26.2.2	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(all parts)		N/A
	– test A of 26.2.4 is fulfilled		N/A
26.2.3	Uncemented insulating parts pollution degree P2 or P3	Pollution degree 2	P
	– all isolating material are classified acc. to IEC 60085 and IEC 60216(all parts)		P
	– values of pollution degree 1 are not applicable		P
26.2.4	Cemented insulating parts		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	– values of distance through insulation (dti) are fulfilled		N/A
	– creepage distances and clearances are not required		N/A
	– test A of this sub clause is fulfilled		N/A
	Test A		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, with uninsulated wires, without impregnation or potting	(see appended table)	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1		N/A
26.2.5	Enclosed parts, by impregnation or potting		N/A
26.2.5.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	Test B		N/A
	– thermal class		N/A
	– test voltage of 500 V or the working voltage		N/A
	– Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint.	(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 1,25		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007– see Annex R of IEC 61558-1		N/A
26.2.5.2	– The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test C		N/A
	– thermal class		N/A
	– test voltage of 500 V or the working voltage		N/A
	– Test with three specimens, potted or impregnated. (finished components)	(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 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1		N/A
26.3	**Distance through insulation**		P
26.3.1	For supplementary, double or reinforced insulation, the required values of Tables 22 are fulfilled		P
	The insulation fulfil the material classification according IEC 60085 and 60216(all parts) or the test of 14.3	Class B	P
26.3.2	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(all parts)		N/A
	– the test of 14.3 is fulfilled		N/A
	– If both requirements are fulfilled, the required values for solid insulation can be multiplied by 0,4		N/A
	– Minimum thickness of reinforced insulation ≥0,2 mm		N/A
	– Minimum thickness of supplementary insulation ≥0,1 mm		N/A
26.3.3	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 26.3.4 is fulfilled with 150±10 N		N/A
	– The required values for d.t.i. of thin layers in Tables 22 is fulfilled.		N/A
	– If the layers are separated:		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 26.3.4 is fulfilled on each layer with 50±5 N		N/A
	– The required values for d.t.i. of thin layers in Tale 22 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 26.3.4 is fulfilled on 2/3 of the layers with 100±5 N		N/A
	– The required values for d.t.i. of thin layers in Tale 22 is fulfilled.		N/A
	Test according to 14.3 and if the isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts) no distances through insulation are required for insulation in thin sheet form		N/A
	The values for thin layers are used for insulation in thin sheet form as follows:		N/A
	– rated output > 100 VA values for thin layers apply		N/A
	– rated output 25 VA 100 VA 2/3 of the values for thin layers apply		N/A
	– rated output __ 25 VA 1/3 of the values for thin layers apply		N/A
26.3.4	Mandrel test of insulation in thin sheet form (specimen of 70±0,5 mm width are necessary):		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– If the layers are non-separable – at least 3 layers glued together fulfil the test:		N/A
	– pull force of 150±10 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
	– If the layers are separable and 2/3 of at least 3 layers fulfil the test.		N/A
	– pull force of 100±5 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.		N/A
	– If the layers are separable 1 of at least 2 layers fulfil the test:		N/A
	– pull force of 50±5 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
26.3.5	For transformers with FIW wires		N/A
	– thermal cycles		N/A
	– test voltage of 500 V or the working voltage		N/A
	– Test with three specimens	(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		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 immediately at the end of the last cycle with high temperature		N/A
	The partial discharge test shall be done at the end of the cycling test at normal room temperature as performed in 18.3.1.		N/A
	The values of allowed voltage strength for other FIW dimensions than defined in Table 24 are calculated		N/A
26.101	Creepage distances, clearances and distances through insulation, specified values according to (EN 61558-2-16: 2009+A1:2013):		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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	248Vrms, 406Vpeak	P
	– rated supply frequency 50/60 Hz		P
	– rated internal frequency		P
	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
	1. Basic or supplementary insulation:		P
	a) measured values specified values (mm) ..... :	(see appended table)	P
	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
	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
	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: 2009+A1:2013)	Measured frequency: 123.6kHz 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: 2009+A1:2013)		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
26.104	The working voltages of Table 102, 103 and 104 are peak voltages including µsec peaks EN 61558-2-16: 2009+A1:2013)		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: 2009+A1:2013)		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

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Clause	Requirement + Test	Result - Remark	Verdict
	– no voids or gaps are present in between the solid insulation		N/A
	For thick layers d1 ≥ 0,75 the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers d2 ≤ 30 µm the peak value of the field strength is ≤ 10 kV/mm		N/A
	For d1 > d > d2 equation (1) is used for calculation the field strength		N/A
26.107 (A1)	For transformers with FIW wires the following test is required		N/A
	• 10 cycles are required		N/A
	• 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
	• 1 h at 25° C		N/A
	• 2 h at 0° C		N/A
	• 1 h at 25° C – (next cycle start again with 68 h max winding temp + 10)		N/A
	• during the 10 cycles test 2 x working voltage is connected between PRI and SEC		N/A
	• 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
	• 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
	• 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	**General**		P
27.2	**Resistance to heat**		-
27.2.1	All insulating parts are resistant to heat		P
	For parts of rubber, which passed the test of 19.9, no additional test is required.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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
27.2.2	External accessible parts		P
	The Ball-pressure test -: diameter of impression 2 mm; heating cabinet temperature (C) at 70±2 ° C or the temperature T of 14.1 (T + 15±2) - is fulfilled.	(see appended table)	P
27.2.3	Internal parts		P
	For insulating material retaining current carrying parts in position , the ball-pressure test -: diameter of impression 2 mm; heating cabinet temperature (C) at 125±2 ° C or the temperature T of 14.1 (T + 15±2) - is fulfilled	(see appended table)	P
27.3	**Resistance to abnormal heat under fault conditions**		N/A
27.4	Resistance to fire		P
27.4.1	All isolating parts of the transformer shall be resistant to ignition and spread of fire. The test according to IEC 60695-2-10 is required		P
27.4.2	External accessible parts (glow wire tests)		P
	– 650° C for enclosures	Enclosure	P
	– 650 ° C for parts retaining current carrying parts in position and terminals for external conductors Current ≤ 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
27.4.3	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 ≤ 0,2 A		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
H	**ANNEX H, ELECTRONIC CIRCUITS** (IEC 61558-1)		P
H.1	For transformers including electronic circuits, the following requirements apply additionally to Clauses 5, 15, 26. This annex is not required for associated transformers		P
H.2	General notes on tests (addition to clause 5)		P
H.3	SHORT-CIRCUIT AND OVERLOAD PROTECTION (ADDITION TO CLAUSE 15)		P
H.3.1	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 5		P
	– transformer complies with conditions specified in sub-clause 15.1		P
	If a conductor of a pcb becomes open circuited, the transformer is considered to have withstood the particular test, provided that all six conditions as specified are met		N/A
H.3.2	Fault conditions a) to f) of sub-clause H.3.3 are not tested if the following conditions are met:		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.3.3	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 U4, pin 3-4 of U4, Q1	P
	f) low-power circuit: low-power points are connected to the supply source		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.3.4	If for a fuse-link complying with IEC 60 127-3 rated fuse current I1 is used, current I2 is measured as specified:		P
	– if I2 < 2,1 x I1 test of 15.8 is repeated with fuse-link short-circuited		N/A
	– if I2 > 2,75 x I1, no other tests are necessary		P
	If I2 > 2,1 x I1 and I2 < 2,75 x I1 test of 15.8 is repeated as specified		N/A
	For fuses other than those complying with IEC 60 127-3, the test is carried out as specified 15.3.2 to 15.3.5		N/A
H.4	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION		P
H.4.1	For live parts separated by basic insulation smaller cr and cl as in 26 are allowed, if H.3 is fulfilled.		N/A
	In optocouplers no requirements of cr and cl		P
	For coatings annex W applies. Smaller distances as required in IEC 60664-3:2016, clause 4 are applicable,		N/A
	For potted transformers cycling tests acc, 26.2. are applicable		N/A
H.4.2	The ma. surface temperature of optocouplers is 50 K		N/A
K	**ANNEX K, INSULATED WINDING WIRES**		N/A
K.1	Wire construction:		N/A
	• insulated winding wire for basic or supplementary insulation (see 19.12.3)		N/A
	• insulated winding wire for reinforced insulation (see 19.12.3)		N/A
	• splid circular winding wires and stranded winding wires with 0,05 to 5 mm diameter		N/A
	• spirally wrapped insulation – overlapping		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
K.2	Type tests		N/A
K.2.1	General Tests between ambient temperature between 15° C and 35° C and at an humidity between 25% and 75 %		N/A
K.2.2	Electric strength test		N/A
K.2.2.1	Solid circular winding wires and stranded winding wires		N/A
	Test samples prepared according to clause 4.4.1 of IEC 60851-5:2008 (twisted pair)		N/A
	Dielectric strength test: 6 kV for reinforced insulation		N/A
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
K.2.2.2	Square or rectangular wires .		N/A
	Test samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
K.2.3	Flexibility and adherence		N/A
	Claus 5.1 in Test 8 of IEC 60851-3:2009 shall be used		N/A
	Test samples prepared according to clause 5.1.1.4 of IEC 60851-3:2009		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
	Mandrel diameter according table K.1		N/A
	The tension to the wire during winding on mandrel is 118 N/mm² (118 MPa)		N/A
K.2.4	Heat shock		N/A
	Test samples prepared according to 3.2.1 (in Test 9) of IEC 60851-6:2012		N/A
	• high voltage test immediately after this test		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
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
	• high voltage test immediately after this test		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.3	**Testing during manufacturing**		N/A
K.3.1	General Tests as subjected in K.3.2 and K.3.3		N/A
K.3.2	Routine test		N/A
	• Dielectric strength test: 4,2 kV for reinforced insulation		N/A
	• 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
	• Dielectric strength test: 6 kV for reinforced insulation		N/A
	• Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
K.3.3.2	Square or rectangular wire		N/A
	Samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	• Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	• Dielectric strength test: 3 kV for basic or supplementary insulation		N/A

V	**ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS**	N/A

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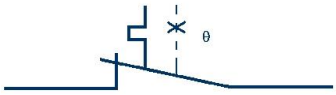
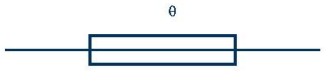
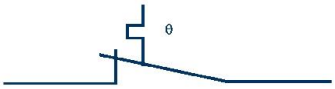
Clause	Requirement + Test	Result - Remark	Verdict
Figure V.1	Restored by manual operation  IEC 489/98		N/A
Figure V.2	Restored by disconnection of the supply  IEC 490/98		N/A
Figure V.3	Thermal link  IEC 491/98		N/A
Figure V.4	Self-resetting thermal cut-out  IEC 492/98		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

11 and 12	**TABLE: OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD; NO-LOAD OUTPUT VOLTAGE**					P
Clause		11		12		
type/rated output/	rated voltage (V)	sec. voltage (V)	delta Usec (%)	Usec V no-load output	delta Usec no-load output %	further information
GTM96600-4005-R2 / 5VDC, 8.0A	100-240VAC	4.823 / 4.898	-3.54 / -2.04	5.090 / 5.089	+5.54 / +3.90	For Clause 11: Required ±10% For Clause 12: Required 20%
GTM96600-6512-R2 / 12VDC, 5.42A	100-240VAC	11.645 / 11.646	-2.96 / -2.96	12.080 / 12.136	+3.74 / +4.21	
GTM96600-6554-R2 / 54VDC, 1.20A	100-240VAC	53.718 / 53.754	-0.52 / -0.46	53.843 / 53.859	+0.23 / +0.20	
GTM91099-6015-3.0-T2 / 12VDC, 5.00A	100-240VAC	11.732 / 11.745	-2.23 / -2.13	12.065 / 12.112	+2.84 / +3.12	
GTM91099-6048-12.0-T2 / 36VDC, 1.67A	100-240VAC	35.852 / 35.878	-0.41 / -0.34	36.132 / 36.343	+0.78 / +1.30	
GTM91099-6048-T2 / 48VDC, 1.25A	100-240VAC	47.934 / 47.957	-0.14 / -0.09	48.069 / 48.059	+0.28 / +0.21	
Note: The values are measured at 100Vac and 240Vac respectively						

14	**TABLE: HEATING**			P
	Test voltage (V) ..... :		110/264	—
	Ambient (ºC) ..... :		40	—
Thermocouple Locations	**Max. temperature measured, (ºC)**		**Max. temperature limit, (ºC)**	
	110	264		
Model: GTM96600-4005-R2				

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Clause	Requirement + Test	Result - Remark	Verdict

T1 winding	103	94	110
T1 core	93	86	Ref
Output wire	53	51	80
U4	83	77	100
MOV1	78	70	85
CY1	80	75	125
CX1	86	72	100
PCB	95	93	130
External enclosure	65	59	80
Internal enclosure	73	67	Ref
Inlet body	59	53	--

14	**TABLE: HEATING**		P
	Test voltage (V).....:	110/264	—
	Ambient (ºC).....:	40	—

Thermocouple Locations	**Max. temperature measured, (ºC)**		**Max. temperature limit, (ºC)**
	110	264	
Model: GTM96600-6512-R2			
T1 winding	106	97	110
T1 core	97	94	Ref
Output wire	58	56	80
Optocoupler	93	85	100
Varistor	80	73	85
Y-capacitor	92	80	125
X-capacitor	93	78	100
PCB	104	91	130
External enclosure	71	63	80
Internal enclosure	85	83	Ref
Inlet body	62	55	--

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

14	**TABLE: HEATING**			P
	Test voltage (V) ..... :		110/264	—
	Ambient (ºC) ..... :		40	—
Thermocouple Locations	**Max. temperature measured, (ºC)**		**Max. temperature limit, (ºC)**	
	110	264		
Model: GTM96600-6554-R2				
T1 winding	102	94	110	
T1 core	98	89	Ref	
Output wire	56	53	80	
Optocoupler	85	77	100	
Varistor	80	67	85	
Y-capacitor	86	77	125	
X-capacitor	88	70	100	
PCB	73	69	130	
External enclosure	67	61	80	
Internal enclosure	82	71	Ref	
Inlet body	66	56	--	
Model: GTM91099-6015-3.0-T2				
T1 winding	104	91	110	
T1 core	97	83	Ref	
Output wire	54	51	80	
Optocoupler	91	79	100	
Varistor	81	70	85	
Y-capacitor	87	76	125	
X-capacitor	92	73	100	
PCB	97	86	130	
External enclosure	69	65	80	
Internal enclosure	79	68	Ref	
Inlet body	68	64	--	
Supplementary information: The appliance can be worked continuely. The value is recorded under continuous conditions.				

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

14	TABLE: HEATING			P
	Test voltage (V) ..... :		110/264	—
	Ambient (ºC) ..... :		40	—
Thermocouple Locations	**Max. temperature measured, (ºC)**		**Max. temperature limit, (ºC)**	
	110	264		
Model: GTM91099-6048-12.0-T2				
T1 winding	86	82	110	
T1 core	90	86	Ref	
Output wire	57	56	80	
Optocoupler	83	78	100	
Varistor	78	72	85	
Y-capacitor	75	72	125	
X-capacitor	92	76	100	
PCB	70	67	130	
External enclosure	69	66	80	
Internal enclosure	74	68	Ref	
Inlet body	62	56	--	
Model: GTM91099-6048-T2				
T1 winding	90	92	110	
T1 core	92	93	Ref	
Output wire	59	59	80	
Optocoupler	84	83	100	
Varistor	69	63	85	
Y-capacitor	76	76	125	
X-capacitor	80	71	100	
PCB	72	72	130	
External enclosure	61	61	80	
Internal enclosure	69	67	Ref	
Inlet body	66	62	--	
Supplementary information: The appliance can be worked continuely. The value is recorded under continuous conditions.				

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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	

15	TABLE: Short circuit and overload protection			P
	Test voltage (V) :	90V / 264V		—
	Ambient (ºC) :	25		—
Thermocouple Locations	**Max. temperature measured, (ºC)**		**Max. temperature limit, (ºC)**	
--	90V	264V	--	
Model: GTM96600-4005-R2				
Support	42	38	105	
Transformer winding	93	82	175 (Class B)	
Output wire	39	39	85	
Enclosure outside	52	45	105	
Model: GTM96600-6512-R2				
Support	53	47	105	
Transformer winding	112	105	175 (Class B)	
Output wire	52	50	85	
Enclosure outside	74	62	105	
Model: GTM96600-6554-R2				
Support	44	42	105	
Transformer winding	108	103	175 (Class B)	
Output wire	46	44	85	
Enclosure outside	65	62	105	
Supplementary information: The appliance can be worked continuely. The value is recorded under continuous conditions.				

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

15	TABLE: Short circuit and overload protection			P
	Test voltage (V) :	90V / 264V		—
	Ambient (ºC) :	25		—
Thermocouple Locations	**Max. temperature measured, (ºC)**		**Max. temperature limit, (ºC)**	
--	90V	264V	--	
Model: GTM91099-6015-3.0-T2				
Support	55	48	105	
Transformer winding	109	90	175 (Class B)	
Output wire	45	42	85	
Enclosure outside	59	52	105	
Model: GTM91099-6048-12.0-T2				
Support	47	42	105	
Transformer winding	93	75	175 (Class B)	
Output wire	44	40	85	
Enclosure outside	62	58	105	
Model: GTM91099-6048-T2				
Support	50	47	105	
Transformer winding	98	92	175 (Class B)	
Output wire	42	38	85	
Enclosure outside	61	60	105	
Supplementary information: The appliance can be worked continuely. 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:			

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Clause	Requirement + Test	Result - Remark	Verdict

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)		3716	No
Live parts of different polarity (Basic)		1858	No
Body and live parts (Reinforced)		3716	No
Output circuit and core (Reinforced)		3716	No
Core and accessible part (Reinforced)		3716	No
Supplementary information:			

20	TABLE: List of critical components	P

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	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 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

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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
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	KUNSHAN CITY HUA SHENG CIRCUIT BOARD CO LTD	HS-S	Min. 1,6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E229877
Alt. use	HUIZHOU SHUNJIA ELECTRONICS CO LTD	SJ-B	Min. 1,6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E320884
Alt. use	SHANGHAI H-FAST ELECTRONICS CO LTD	411001, 211001	Min. 1,6 mm thickness, min. V-0, 130°C	IEC 61558-2-16 UL 796	Tested with appliance UL E337862
Fuse (FS1, FS2 or F1, F2) (FS2 or F2 is optional) (FS1, FS2 for GT*91099 series, F1, F2 for GT*96600 series)	Conquer Electronics Co., Ltd.	MST series	T3.15A, 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	T3.15A, 250V	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40018781 UL E220181
Alt. use	Bel Fuse Ltd.	RST-Serie(s)	T3.15A, 250V	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40011144 UL E20624

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Clause	Requirement + Test	Result - Remark	Verdict

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
Alt. use	Cooper Bussmann LLC	SS-5	T3.15A, 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	T3.15A, 250V	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40012592 UL E221465
Alt. use	Das & Sons International Ltd.	385T series	T3.15A, 250V	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40008524 UL E205718
Alt. use	Dongguan Better Electronics Technology Co., Ltd.	932	T3.15A, 250V	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40033369 UL E300003
Alt. use	Hollyland Company Limited	5ET	T3.15A, 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)	T3.15A, 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	T3.15A, 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)	T3.15A, 250V	IEC 60127-1 IEC 60127-3 UL 248-1 UL 248-14	VDE 40017009 UL E213695
Y capacitor (CY1, CY2) (Optional)	TDK-EPC Corporation, Capacitors Group Circuit Devices Business Group	CD	Y1, AC250V, max 2200pF, 25/085/21/B	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 138526 UL E37861

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Clause	Requirement + Test	Result - Remark	Verdict

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
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
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, 40/085/21/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 LT D	WD	Y1, AC250V, max 2200pF, 55/125/21/C	IEC/EN 60384-14	VDE 40016157
X capacitor (CX1) (Optional)	Cheng Tung Industrial Co., Ltd.	CTX	Min. 300VAC, Max. 0.47µF,110 °C, X1 or X2	IEC 60950-1 UL 60384-14 UL 1414	Tested with appliance UL E193049

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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
Alt. use	Tenta Electric Industrial Co. Ltd.	MEX	Min. 250VAC, Max. 0.47µF, 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. 0.47µF, 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. 0.47µF, 40/100/21/C, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40015608 UL E183780
Alt. use	Yuon Yu Electronics Co. Ltd.	MPX	Min. 250VAC, Max. 0.47µF, 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. 0.47µF, 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. 0.47µF, 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. 0.47µF, 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. 0.47µF, 40/110/56/B, X1 or X2	IEC/EN 60384-14 UL 60384-14 UL 1414	VDE 40018690 UL E252286
Alt. use	Foshan Shunde Chuang Ge Electronic Industrial Co., Ltd.	MKP-X2	Min. 250VAC, Max. 0.47µF, 40/105/21/B, X2	IEC/EN 60384-14	VDE 40008922
Alt. use	Okaya Electric Industries Co. LTD	RE-Series	Min. 250VAC, Max. 0.47µF, 55/100/56/C, X2	IEC/EN 60384-14	VDE 40028657

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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
Alt. use	VISHAY Capacitors Belgium NV	F 1772	Min. 250VAC, Max. 0.47µF, 40/100/56/C, X2	IEC/EN 60384-14	VDE 40005095
Alt. use	Winday Electronic Industrial Co., Ltd.	MPX series	Min. 250VAC, Max. 0.47µF, 40/100/21/C, X2	IEC/EN 60384-14	VDE 40018071
Photo coupler (U1 or U4) (U1 for GT*91099 series, U4 for GT*96600 series)	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

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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
Alt. use	Toshiba Corporation Semiconductor & Storage Products Company	TLP817F	Dti > 0.4mm, Ext cr > 8.0mm, Isolation 3000Vac min., 110°C min., Thermal cycling test	IEC/EN 60747-5-2	VDE 40021173
Varistor MOV1 or MOV (Optional) (MOV/MOV1 for GT*91099 series, MOV1 for GT*96600 series)	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
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), 85°C, The coating is V-0	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	VDE 40030401
Alt. use	Walsin Technology Co., Ltd.	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 40010090
Alt. use	Lien Shun Electronics Co., Ltd.	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 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	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

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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
Appliance inlet CN1 Class II units (C8 type)	Zhejiang 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	TECX-UNIONS Technology Corporation	SO-222	2.5A, 250Vac	IEC/EN 60320-1	VDE 40043268
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 CN1 Class II units (C18 type)	Rong Feng Industrial Co., Ltd.	SS-120A	10A, 250Vac	IEC/EN 60320-1	VDE 40028101
Output cord	Interchangeable	Interchangeable	Min. 24AWG, min. 300Vac, min. 80°C	IEC/EN 61558-2-16 UL 758	Tested with appliance UL approved
Heat-shrinkable tubing (Optional)	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR, RSFR-H, RSFR-HPF	600V, 125 °C	IEC/EN 61558-2-16 UL 224	Tested with appliance UL E203950
Alt. use	QIFURUI ELECTRONICS CO	QFR-h	600V, 125°C	IEC/EN 61558-2-16 UL 224	Tested within appliance UL E225897
Alt. use	DONGGUAN SALIPT CO LTD	SALIPT S-901-300 SALIPT S-901-600	Min. 300V, 125°C	IEC/EN 61558-2-16 UL 224	Tested within appliance UL E209436
Alt. use	GUANGZHOU KAIHENG ENTERPRISE GROUP	K-2 (+) K-2 (CB)	Min. 300V, 125°C	IEC/EN 61558-2-16 UL 224	Tested within appliance UL E214175
Alt. use	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-HFT	Min. 300V, 125°C	IEC/EN 61558-2-16 UL 224	Tested within appliance UL E180908

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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
Transformer (T1)	GlobTek / ENG / BOAM / HAOPUWEI	See attachment for details	Class B, with critical component listed below	IEC 61558-2-16	Tested with appliance
- Magnet wire	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWN/U (UL E201757)	MW28-C, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWS/U (UL E201757)	MW75-C, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	JUNG SHING WIRE CO LTD	UEW-4 (UL E174837)	MW75C, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	JUNG SHING WIRE CO LTD	UEY-2 (UL E174837)	MW28-C, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	JIANGSU HONGLIU MAGNET WIRE TECHNOLOGY CO LTD	2UEW/130 (UL E335065)	MW75-C, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	CHANGZHOU DAYANG WIRE & CABLE CO LTD	2UEW/130 (UL E158909)	MW75-C, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	WUXI JUFENG COMPOUND LINE CO LTD	2UEWB (UL E206882)	MW75#, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	JIANGSU DARTONG M & E CO LTD	UEW (UL E237377)	MW 75-C, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	SHANDONG SAINT ELECTRIC CO LTD	UEW/130 (UL E194410)	MW75#, 130ºC	IEC 61558-2-16	Tested with appliance
Alt. use	ZHEJIANG LANGLI ELECTRIC EQUIPMENTS CO LTD	UEW (UL E222214)	MW 79#, 130ºC	IEC 61558-2-16	Tested with appliance

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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
-Triple-insulated wire (Secondary)	Great Leoflon Industrial Co., Ltd.	TRW (B) Serie(s)	Class B, reinforced insulation	IEC 60950-1 IEC 61558-2-16 UL 2353 UL 60601-1	VDE 136581 UL E211989
- Alt. use	COSMOLINK CO. Ltd.	TIW-M Serie(s)	Class B, reinforced insulation	IEC 60950-1 UL 2353 UL 60601-1	VDE 138053 UL E213764
- Alt. use	Furukawa Electric Co., Ltd. Electronics & Automotive Systems Company Global Business Development Division	TEX-E	Class B, reinforced insulation	IEC 60950-1 IEC 61558-2-16 UL 2353 UL 60601-1	VDE 006735 UL E206440
- Alt. use	TOTOKU ELECTRIC CO LTD	TIW-2	Reinforced insulation, rated 130° C (Class B)	IEC 60950-1 IEC 61558-2-16 UL 2353 UL 60601-1	VDE 40005152 UL E249037
- Alt. use	E&B TECHNOLOGY CO LTD	E&B-XXXB E&B-XXXB-1	Reinforced insulation, Class B	IEC 60950-1 IEC 61558-2-16 UL 2353 UL 60601-1	VDE 40023473 UL E315265
- Alt. use	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-TIW	Reinforced insulation, Class B	IEC 60950-1 IEC 61558-2-16 UL 2353 UL 60601-1	Tested with appliance UL E249037
- Alt. use	SHENZHEN JIUDING NEW MATERIAL CO LTD	DTIW-B	Reinforced insulation, Class B	IEC 60950-1 IEC 61558-2-16 UL 2353 UL 60601-1	VDE 40037495 UL E357999
-Bobbin	CHANG CHUN PLASTICS CO LTD	T375J T375HF	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

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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
- Alt. use	SUMITOMO BAKELITE CO LTD	PM-9820	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
- Alt. use	HITACHI CHEMICAL CO LTD	CP-J-8800	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 E42956
-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	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	IEC 61558-2-16	Tested with appliance UL E156256
-Alt. use	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	WF	600V, 200ºC	IEC 61558-2-16	Tested with appliance UL E203950
-Alt. use	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-TT-T / CB-TT-S	Min. 300V, 200ºC	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

Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
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 EXCY0098	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	TEIJIN CHEMICALS LTD	LN-1250P 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
Alt. use	CHI MEI CORPORATION	PA-765A	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 E56070
Alt. use	CHI MEI CORPORATION	PC-540	PC/ABS, Min. V-0, Min. thickness: 2.0mm, 70°C	IEC 61558-2-16 UL 94 UL 746 A/B/C/D	Tested with appliance UL E56070

Supplementary information:

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

For all transformers under all manufacturers.

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

Product Model	Voltage range	Transformer model	Pri. Turns	Sec. Turns	Aux. Turns	Construction type
GT*96600 series	5V-8.9V	TF058	36T	3T	9T	2
	9V-15V	TF059	36T	4T	5T	
	15.1V-20V	TF063	36T	5T	5T	
	20.1V-28V	TF060	36T	7T	5T	
	28.1V-40V	TF064	36T	10T	5T	
	40.1V-54V	TF061	36T	13T	5T	
GT*96600-*56*** series	56V	TF072	36T	15T	5T	--
GT*91099 series	5V-9V	XF00794	45T	3T	8T	1
	9.1V-15V	XF00694	36T	5T	4T	
	15.1V-24V	XF00695	36T	6T	5T	
	24.1V-48V	XF00731	36T	13T	5T	
Note: Transformer used in model GT*96600 series and GT*91099 series have the same primary windings but different with the turns of secondary windings. The model name difference only distinguishes different article No.						

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

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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)**
GT*96600 series						
L to N before fuse	346	240	2.4	2.92	2.44	2.92
Two poles of fuse	346	240	2.4	2.51	2.44	2.51
Primary to Secondary trace (PCB under Y capacitor) (basic)	406	248	2.48	4.75	2.52	4.75
Primary to Secondary trace (PCB under Y capacitor) (supplementary)	406	248	2.48	4.01	2.52	4.01
Live parts to accessible parts(RI)	406	248	4.82	7.84	5.18	7.84
Primary circuits to secondary circuits(RI)	406	248	4.82	6.61	5.18	6.61
Primary winding to secondary winding(RI)	406	248	4.82	6.78	5.18	6.78
Secondary winding to core(RI)	406	248	4.82	7.26	5.18	7.26
Core to secondary parts(RI)	406	248	4.82	7.01	5.18	7.01
GT*91099 series						
L to N before fuse	346	240	2.4	6.4	2.44	6.4
Two poles of fuse	346	240	2.4	3.3	2.44	3.3
Primary to Secondary trace (PCB under Y capacitor) (basic)	406	248	2.48	3.35	2.52	3.35
Primary to Secondary trace (PCB under Y capacitor) (supplementary)	406	248	2.48	3.46	2.52	3.46
Live parts to accessible parts(RI)	406	248	4.82	6.64	5.18	6.64
Primary circuits to secondary circuits(RI)	406	248	4.82	7.20	5.18	7.20
Primary winding to secondary winding(RI)	406	248	4.82	6.78	5.18	6.78
Secondary winding to core(RI)	406	248	4.82	6.96	5.18	6.96
Core to secondary parts(RI)	406	248	4.82	7.58	5.18	7.58
Supplementary information:						

IEC 61558-2-16			
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)**
GT*96600-*56* series**						
L to N before fuse	346	240	2.4	4.8	2.44	4.8
Two poles of fuse	346	240	2.4	3.1	2.44	3.1
Live parts to accessible parts(RI)	406	248	4.82	6.4	5.18	6.4
Primary circuits to secondary circuits(RI)	406	248	4.82	6.9	5.18	6.9
Primary winding to secondary winding(RI)	406	248	4.82	6.8	5.18	6.8
Secondary winding to core(RI)	406	248	4.82	7.2	5.18	7.2
Core to secondary parts(RI)	406	248	4.82	7.0	5.18	7.0

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	248	3716	Triple insulation winding and basic insulation	Triple insulation winding + 2-layer insulating tape
Enclosure thickness	248	3716	1.0	2.0
Supplementary information:				

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	

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		

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

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**				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	

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

27.2	**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 (EXCY0098)		125	1.48
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
Enclosure and Plug Holder (LN-1250P)		125	0.95
PCB (T2)		125	0.62
PCB (T2A)		125	0.65
PCB (T2B)		125	0.64

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Clause	Requirement + Test	Result - Remark	Verdict

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 (YLH-1)	125	0.67
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
PCB (XK-3)	125	0.68
PCB (HS-S)	125	0.67
PCB (DFD-1)	125	0.71
PCB (XSJ-B)	125	0.72
Bobbin (T375J)	125	1.03
Bobbin (T375HF)	125	1.05
Bobbin (4130)	125	1.08
Bobbin (PM-9820)	125	0.98
Bobbin (CP-J-8800)	125	1.06

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Clause	Requirement + Test	Result - Remark	Verdict

27.4	TABLE: Resistance to heat and fire - Glow wire tests							P
Object/ Part No./ Material	**Manufacturer / trademark**	**Glow wire test (GWT); (°C)**						**Verdict**
		550	**650**		**750**		**850**	
			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
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 (EXCY0098)	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 (LN-1250P)	TEIJIN CHEMICALS LTD	--	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 (YLH-1)	SUZHOU CITY YILIHUA	--	--	--	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)	KUOTIANGENT LTD	--	--	--	NI	NI	--	P
PCB (C-2A)	KUOTIANGENT 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 (HS-S)	KUNSHAN CITY HUA SHENG	--	--	--	NI	NI	--	P
PCB (DFD-1)	JIANGSU DIFEIDA	--	--	--	NI	NI	--	P
PCB (SJ-B)	HUIZHOU SHUNJIA	--	--	--	NI	NI	--	P
Bobbin (T375J)	CHANG CHUN PLASTICS CO.,LTD	--	NI	NI	--	--	--	P

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Clause	Requirement + Test	Result - Remark	Verdict

Bobbin (T375HF)	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 (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

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	cos φ	N/A
	Class II construction	⧈	N/A
	Class III construction	III	N/A
	Equipment of overvoltage category I	I	N/A
	Equipment of overvoltage category II	II	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Equipment of overvoltage category III		N/A
	Equipment of overvoltage category IV		N/A
	Fuse-link		N/A
	Rated max. ambient temperature	t_a	N/A
	Rated minimum ambient temperature	t_{amin}	N/A
	Rated minimum temperature	t_{min}	N/A
	Frame or core terminal		N/A
	Protective earth		N/A
	IP number	IPXX	N/A
	Earth (ground for functional earth)		N/A
	For indoor use only		N/A
	To indicate that the appliance is intended to be usable up to the maximum altitude 3 000 m.		N/A
	To indicate that the power supply unit shall not be used, if pins of the plug part are damaged.		N/A
	Additional Symbols (IEC 61558-2-16:09)		N/A
	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

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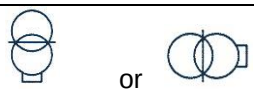
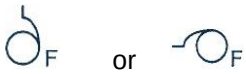
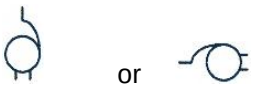
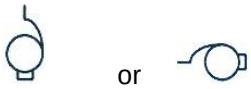
Clause	Requirement + Test	Result - Remark	Verdict
	SMPS incorporating a **Short-circuit-proof isolating transformer** (inherently or non-inherently)		N/A
	SMPS incorporating a **Fail-safe safety isolating transformer**		N/A
	SMPS incorporating a **Non-short-circuit-proof safety isolating transformer**		N/A
	SMPS incorporating a **Short-circuit-proof safety isolating transformer** (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe **auto-transformer**		N/A
	SMPS incorporating a **Non-short-circuit proof auto-transformer**		N/A
	SMPS incorporating a **Short-circuit proof auto-transformer** (inherently or non-inherently)		N/A
	SMPS (Switch mode power supply unit)		N/A
BB.9	**PROTECTION AGAINST ELECTRIC SHOCK**		N/A
BB.10	**CHANGE OF INPUT VOLTAGE SETTING**		N/A
BB.11	**OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD**		N/A
BB.12	**NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)**		N/A
BB.13	**SHORT-CIRCUIT VOLTAGE**		N/A
BB.14	**HEATING**		N/A
BB.14.2	Application of 14.1 or 14.3 according to the insulation system		N/A
BB.14.2.1	Class of isolating system (classified materials according to IEC 60 085 and IEC 60 216)		N/A
BB.14.2.2	No classified material, or system but the measured temperature does not exceed the value of Class A		N/A
BB.14.2.3	No classified material or system but the measured temperature exceeds the value for Class A, the live parts of the transformers are submitted to the test of 14.3		N/A
BB.14.3	Accelerated ageing test for undeclared class of isolating system		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V) (IEC 61558-2-16:2009)		N/A
18.102 (A1)	Partial discharge tests according IEC 60664-1 , if the working voltage is > 750 V peak		N/A
	Partial discharge is ≤ 10 pC at time P2 See Fig. 19.101		N/A
BB.19	**CONSTRUCTION**		N/A
BB.19.1	**General construction**		N/A
BB.19.1.1	General		N/A
BB.19.1.2	Auto-transformers		N/A

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

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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.		N/A
BB.19.1.3.4	Parts of output circuits may be connected to protective earth		N/A
BB.19.1.3.5	No direct contact between output circuits and the body, unless:		N/A
	– Allowed for associated transformers by the equipment standard		N/A
BB.19.1.4	Isolating transformers and safety isolating transformers		N/A
BB.19.1.4.1	Input and output circuits electrically separated		N/A
	No possibility of any connection between these circuits		N/A
BB.19.1.4.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.4.4)		N/A
	Class I transformers **not** intended for connection to the mains by a plug:		—
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the input voltage		N/A
	– Insulation between output windings and body, connected to earth consist of basic insulation rated for the output voltage		N/A
	Class I transformers intended for connection to the mains by a plug:		N/A
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the working voltage		N/A
	– Insulation between output windings and body, connected to earth consist of supplementary insulation rated for the working voltage		N/A
	Class II transformers		N/A
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
BB.19.1.4.3	For transformers with intermediate conductive parts not connected to the body (between input/output):		N/A
BB.19.1.4.3.1	For class I and class II transformers the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A
	– For class II transformers the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (rated to the input voltage, for SELV circuits only basic insulation to the body)		N/A
	– For transformers, different from independent, the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A
BB.19.1.4.3.2	Class I transformers with earthed core, and not allowed for class II equipment		N/A
	– Insulation from the input to the earthed core: basic insulation rated for the input voltage		N/A
	– Insulation from the output voltage to the earthed core: basic insulation rated for the output voltage		N/A
BB.19.1.4.3.3	Insulation between : input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation		N/A
	– If the insulation from input or output to the intermediate metal part is less than basic insulation, the part is considered to be connected to input or output.		N/A
BB.19.1.4.4	For class I transformers, with protective screen, **no**t connected to the mains by a plug the following conditions comply:		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

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

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Clause	Requirement + Test	Result - Remark	Verdict
	– distance through insulation according to table 13		N/A
	– one additional layer of serrated tape, and		N/A
	– one additional layer without serration		N/A
	– in case of cheek less bobbins the end turns of each layer shall be prevented from being displaced		N/A
BB.19.12.3	Insulated windings wires providing basic, supplementary or reinforced insulation, meet the following requirements:		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
	• test 26.2.4 – Test A, passed for wrapped layers		N/A
	• 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
	• comply with annex K		N/A
	• two layers for supplementary insulation		N/A
	• one layer for basic insulation		N/A
	• 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
	• comply with annex K		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	• three layers		N/A
	• relevant dielectric strength test of 18.3		N/A
	Where the insulated winding wire is wound:		N/A
	• upon metal or ferrite cores		N/A
	• upon enamelled wire		N/A
	• under enamelled wire		N/A
	• 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
	• both windings shall not touch each other and also not the core.		N/A
	100 % routine test of Annex K3 of part 1 is fulfilled		N/A
	no creepage distances and clearances for insulated winding wires		N/A
c)	Toroidal cores used with TIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	4) a coating which fulfils the requirements of basic insulation between a winding and the core		N/A
	5) The primary winding consists of TIW wire with 3 layers (reinforced insulation) and the secondary winding consists of enamelled wire. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	6) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire with 3 layers and the secondary winding consists of a TIW wire with 1 layer (requirements for primary and secondary windings can be changed). This construction also is allowed for use with EE-cores or similar.		N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
	1) a coating, which fulfils the requirements of basic insulation		N/A
	2) The primary winding consists of FIW wire for basic insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfils the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for supplementary insulation (2 layers) and the secondary winding consists of FIW wire for basic insulation. This construction also is allowed for use with EE-cores or similar.		N/A
	4) Further polyfilar constructions with FIW and TIW wires in combination with enamelled wires for basic insulation only: 4.1) Primary winding consists of enamelled wire, secondary winding consists of FIW wire for reinforced insulation 4.2) Primary winding consists of enamelled wire, secondary winding consists of TIW wire for reinforced insulation		N/A
BB.19.12.3.1	Max. class F for transformers which use FIW-wire		N/A
BB.19.12.3.2	FIW wires comply with IEC 60851-5:2008, IEC 60317-0-7 and IEC 60317-56.		N/A
	• other nominal diameter as mentioned in table 24 can be calculated with the Formula (6) in 26.3.5:		N/A
	FIW wire used for basic or supplementary insulation for transformers according 19.1.3:		N/A
	• the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	• 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
	• between FIW and enamelled wire, no requirements of creepage distances and clearances		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	• no touch of FIW and enamelled wires		N/A
	FIW wire used for double or reinforced insulation for transformers according 19.1.4:		N/A
	• the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	• for primary and secondary winding FIW-wire for basic insulation is used		N/A
	• 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
	• no touch between the basic insulated PRI and SEC FIW-wires		N/A
	• 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
	• the test voltage of table 14, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 24		N/A
	• 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
	• no touch between the FIW wire and the enamelled wire		N/A
	• 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:		N/A
	• the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	• PRI or SEC basic insulated FIW wire and to the other winding (enamelled wire) requirements of supplementary insulation		N/A
	• 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
	• upon metal or ferrite cores		N/A
	• 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
	• both windings shall not touch each other and also not the core.		N/A
BB.20	**COMPONENTS**		N/A
BB.21	**INTERNAL WIRING**		N/A
BB.22	**SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS**		N/A
BB.23	**TERMINALS FOR EXTERNAL CONDUCTORS**		N/A
BB.24	**PROVISION FOR PROTECTIVE EARTHING**		N/A
BB.25	**SCREWS AND CONNECTIONS**		N/A
BB.26	**CREEPAGE DISTANCES AND CLEARANCES**		N/A
BB.26.1	See 26.101		N/A
BB.26.2	Creepage distances (cr) and clearances (cr)		N/A
BB.26.2.1	Windings covered with adhesive tape		N/A
	– the values of pollution degree 1 are fulfilled		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		N/A
	– test A of 26.2.3 is fulfilled		N/A
BB.26.2.2	Uncemented insulating parts pollution degree P2 or P3		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		N/A
	– values of pollution degree 1 are not applicable		N/A
BB.26.2.3	Cemented insulating parts		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1		N/A
BB.26.2.4	Enclosed parts, by impregnation or potting		N/A
BB.26.2.4.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	Test B		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.	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,25		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1		N/A
BB.26.2.4.2	– The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)		N/A
	– all isolating materials are classified acc. to IEC 60085 and IEC 60216		N/A
	Test C		N/A
	– thermal class		N/A
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 ≥0,2 mm		N/A
	– Minimum thickness of supplementary insulation ≥0,1 mm		N/A
BB.26.3.2	Insulation in thin sheet form		N/A
	– If the layers are non-separable (glued together):		N/A
	– The requirement of 3 layers is fulfilled		N/A
	– The mandrel test according 26.3.3 is fulfilled with 150 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index ”e” is fulfilled.		N/A
	– If the layers are separated:		N/A
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.3 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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 µsec peaks EN 61558-2-16:09)		N/A
	The working voltage according to Table 13 of part 1 are r.m.s. voltages		N/A
BB.26.105	Creepage distances		N/A
	Two determinations of creepage distances are necessary (see Figure 102)		N/A
	– determination based on measured peak working voltage according Tables 105 to 110		N/A
	Peak working voltage		N/A
	Pollution degree		N/A
	Basic or supplementary insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	If the values based on table 105 to 110 are lower than the relevant values in Tables 13, C.1 or D.1, the higher values shall be applicable		N/A
BB.26.106	Distance through insulation (EN 61558-2-16:09)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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 d1 ≥ 0,75 the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers d2 ≤ 30 µm the peak value of the field strength is ≤ 10 kV/mm		N/A
	For d1 > d > d2 equation (1) is used for calculation the field strength		N/A
BB.26.107 (A1)	For transformers with FIW wires the following test is required		N/A
	• 10 cycles are required		N/A
	• 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
	• 1 h at 25° C		N/A
	• 2 h at 0° C		N/A
	• 1 h at 25° C – (next cycle start again with 68 h max winding temp + 10)		N/A
	• during the 10 cycles test 2 x working voltage is connected between PRI and SEC		N/A
	• 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
	• 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
	• 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

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Clause	Requirement + Test	Result - Remark	Verdict

BB.27	**RESISTANCE TO HEAT, FIRE AND TRACKING**		N/A
IEC 61558-2-16 Annex BB			
Clause	Requirement + Test	Result - Remark	Verdict
BB.E	**ANNEX E , GLOW WIRE TEST**		N/A
	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		N/A
BB.E.1	Clause 6, ”Severities” of IEC 6095-2-11, apply with the temperature stated in 27.3 of IEC 61558-1		N/A
BB.E2	Clause 8, ”Conditioning”, of IEC 60695-2-11 apply, preconditioning is required		N/A
BB.E3	Clause 10, ”Test Procedure”, of IEC 60695-2-11apply, The tip of the glow wire is applied to the flat side of the surface.		N/A
BB.F	**ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER**		N/A
BB.H	**ANNEX H, ELECTRONIC CIRCUITS** (IEC 61558-1)		N/A
BB.K	**ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION**		N/A
BB.K.1	Wire construction:		N/A
	• insulated winding wire for basic or supplementary insulation (see 19.12.3)		N/A
	• insulated winding wire for reinforced insulation (see 19.12.3)		N/A
	• splid circular winding wires and stranded winding wires with 0,05 to 5 mm diameter		N/A
	• 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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/mm² (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
	• high voltage test immediately after this test		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.2.5	Retention of dielectric strength after bending (test as specified under test 13 of 4.6.1 c) of IEC 60 851-5)		N/A
	• high voltage test immediately after this test		N/A
	• Dielectric strength test: 5,5 kV for reinforced insulation		
	• Dielectric strength test: 2,75 kV for basic or supplementary insulation		

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Clause	Requirement + Test	Result - Remark	Verdict
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
	• Dielectric strength test: 4,2 kV for reinforced insulation		N/A
	• 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
	• Dielectric strength test: 6 kV for reinforced insulation		N/A
	• Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
BB K.3.3.2	Square rectangular wire		N/A
	Samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	• Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	• 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**				N/A
	Test for transformers, use FIW-wire				
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	

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

BB 18.2	**TABLE: insulation resistance measurements**	N/A
Insulation resistance R between:	**R (MΩ)**	**Required R (MΩ)**
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 18.3	**TABLE: Dielectric Strength**	N/A
Test voltage applied between:	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
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

IEC 61558-2-16 - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	VOID (AS/NZS 61558.1:2008/A3:2020)		N/A
19.16	Replace the text with the following variation:		N/A
	VOID (AS/NZS 61558.1:2008)		N/A
	Insert the following variation		P
19.201	Transformers having integral pins for insertion into socket outlets shall comply with the appropriate requirements of AS/NZS 3112.	Not direct plug-in type	N/A
	Compliance is checked as specified in Appendix J of AS/NZS 3112 (AS/NZS 61558.1:2008/A3:2020)		N/A
20	**COMPONENTS**		P
	Replace the first paragraph with the following variation:		P
	Components shall comply with the safety requirements specified in the relevant IEC or Australian/New Zealand Standards as far as they reasonably apply. (AS/NZS 61558.1:2008)		P
	Replace the third paragraph with the following variation:		P
	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

IEC 61558-2-16 - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	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
	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: 56V Voltage abnormal operation: 56.02V Deviation: 0.04%	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 No.2: Photos of product

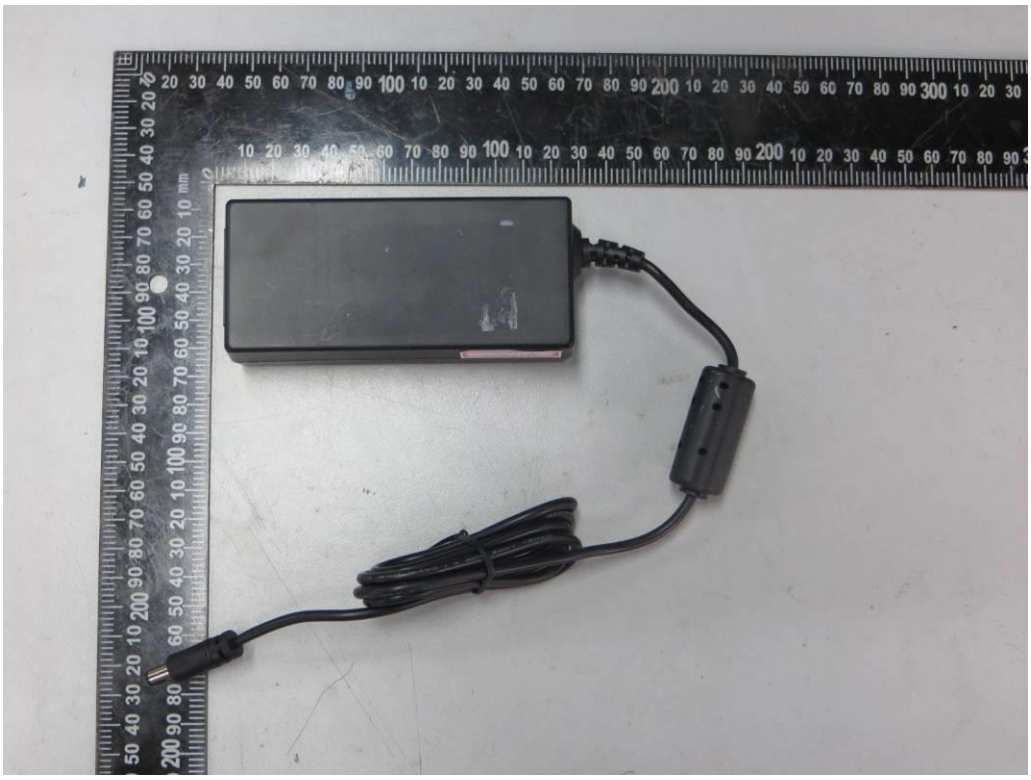
External view

External view

Appendix No.2: Photos of product

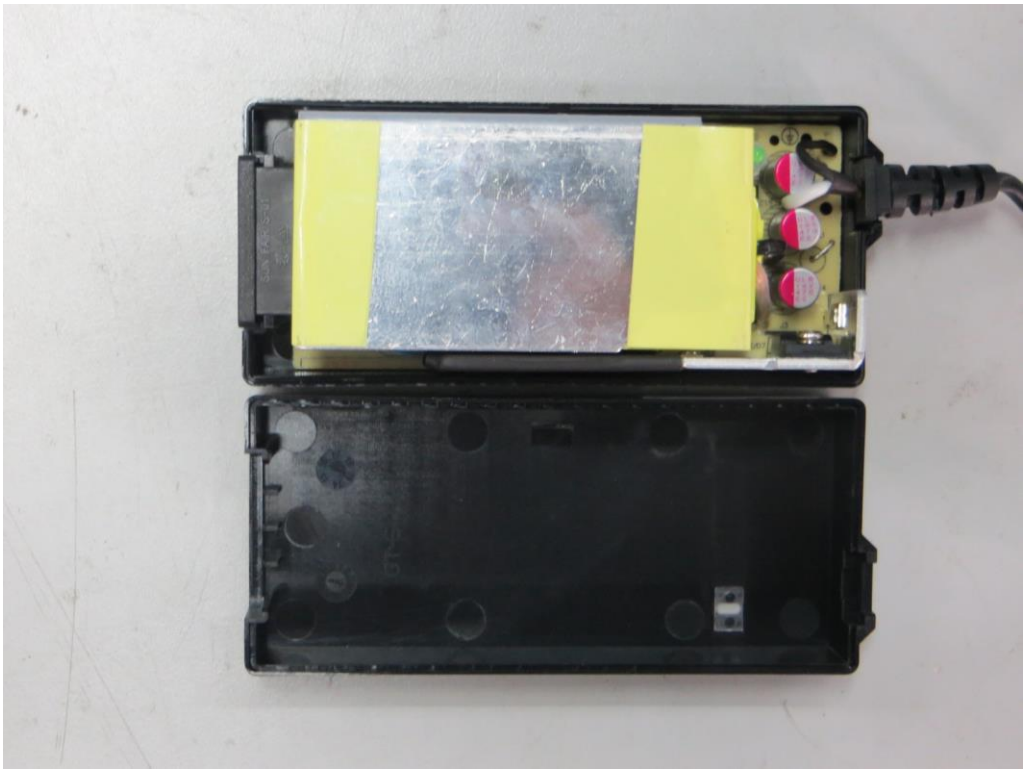
External view

External view

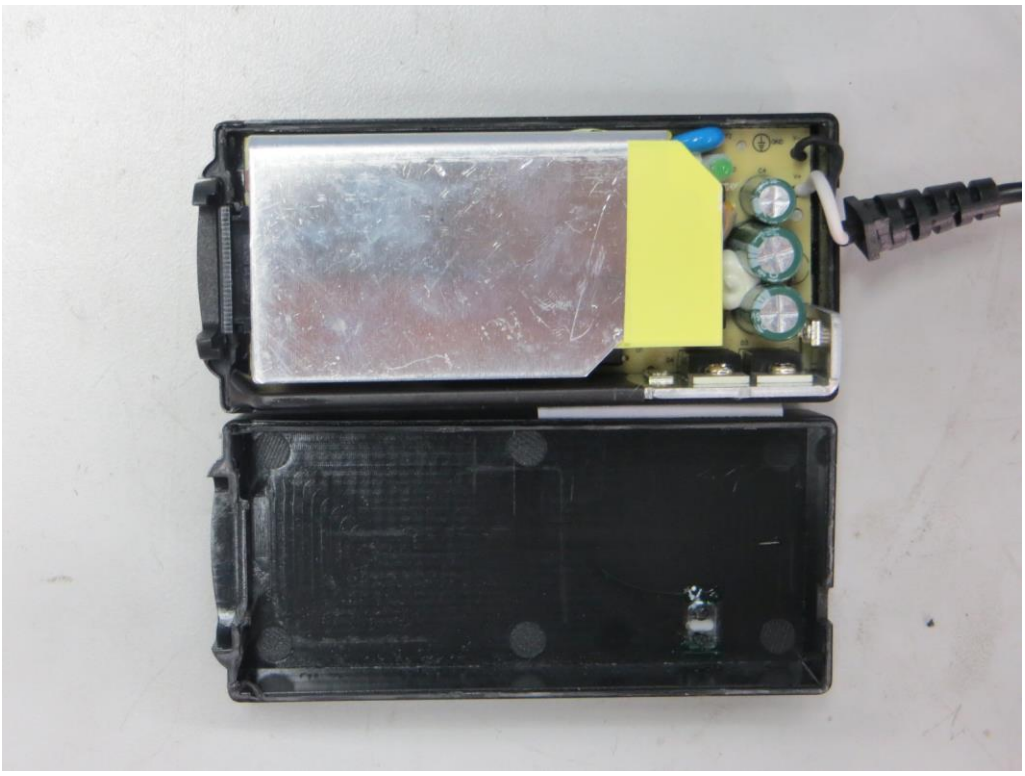


Appendix No.2: Photos of product

Internal view

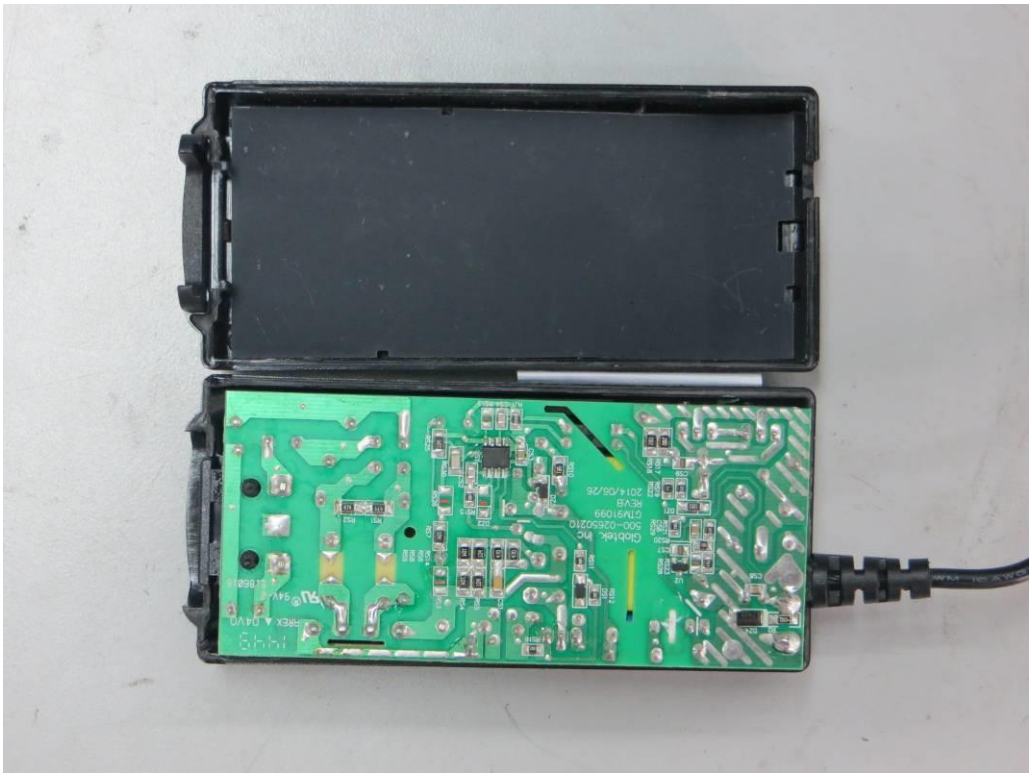


Internal view



Appendix No.1: Photos of product

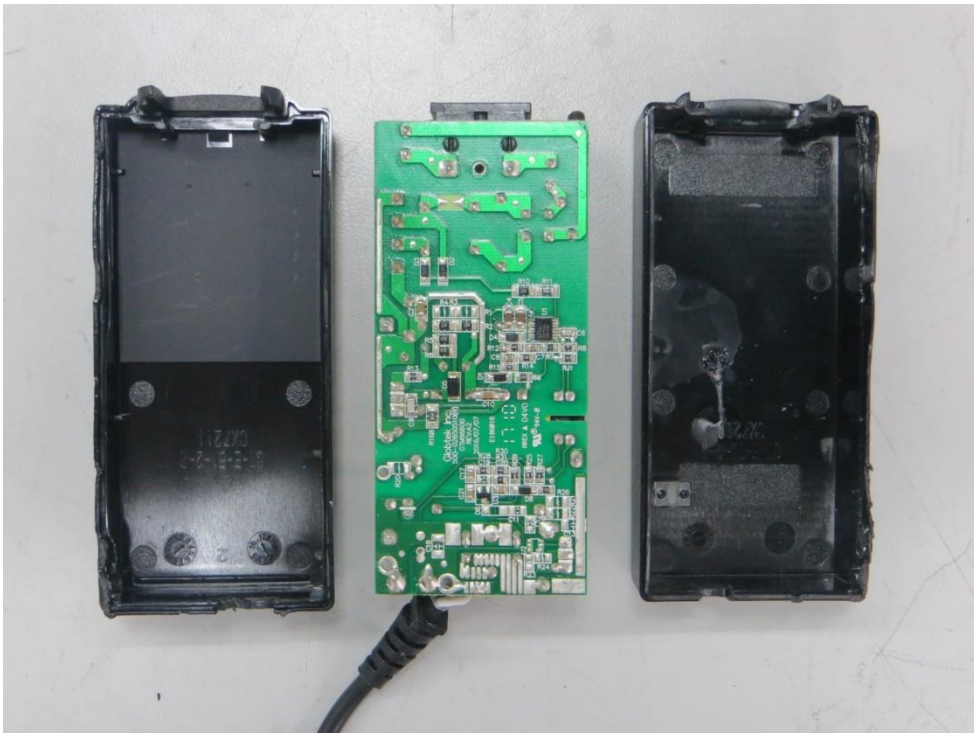
Internal view



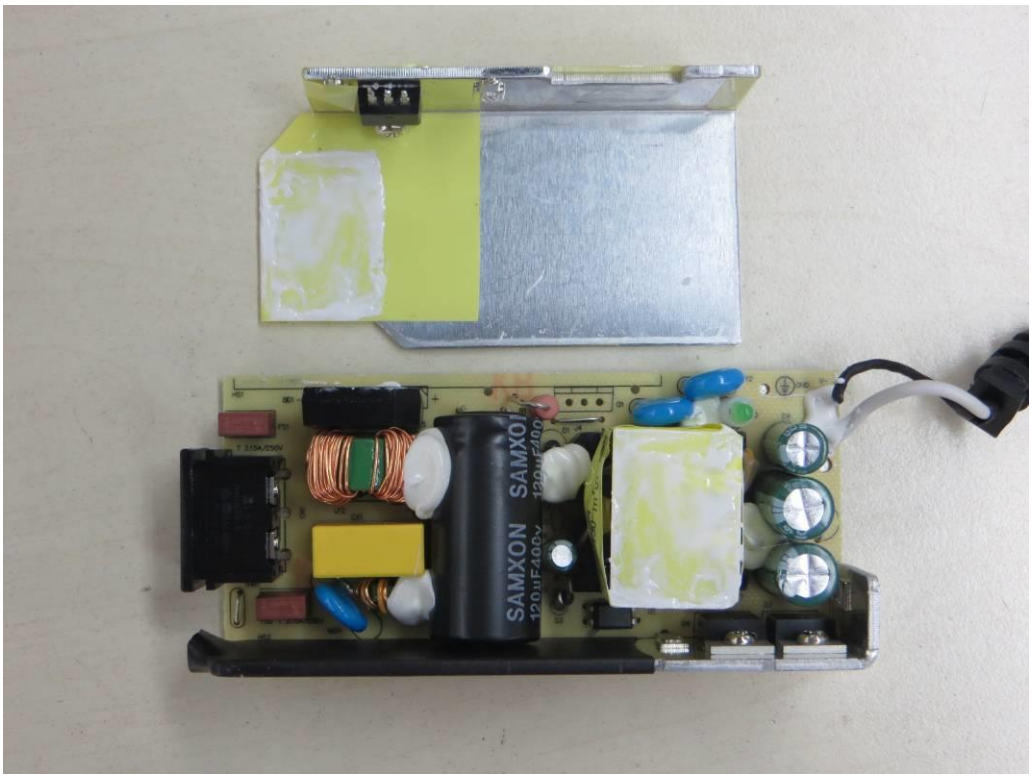
Internal view

Appendix No.1: Photos of product

Internal view

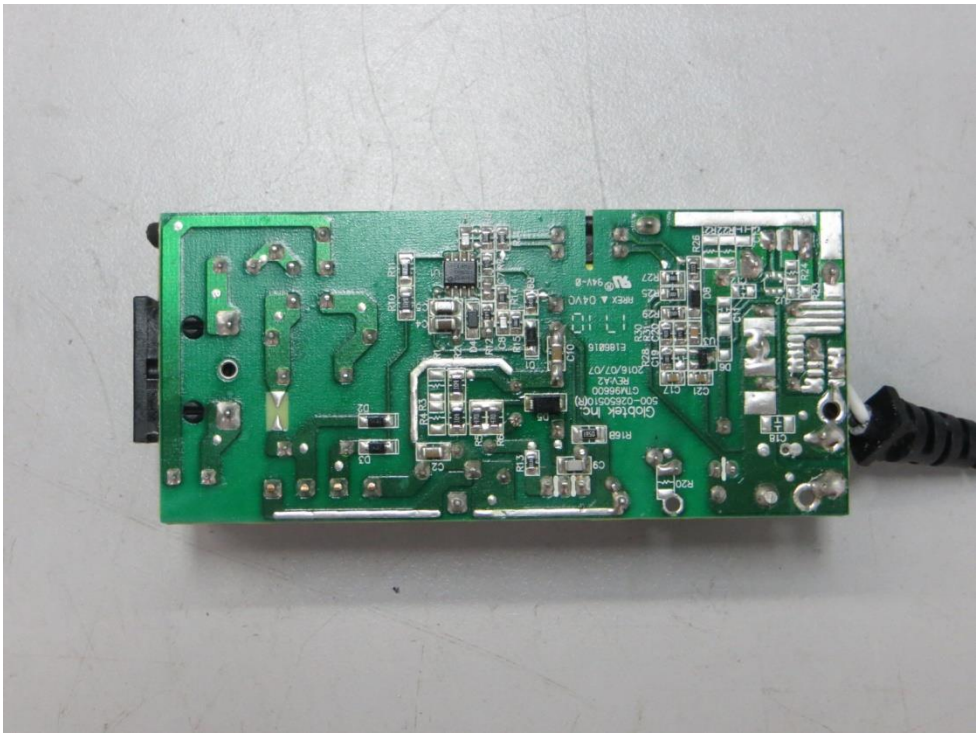


PCB



Appendix No.1: Photos of product

PCB



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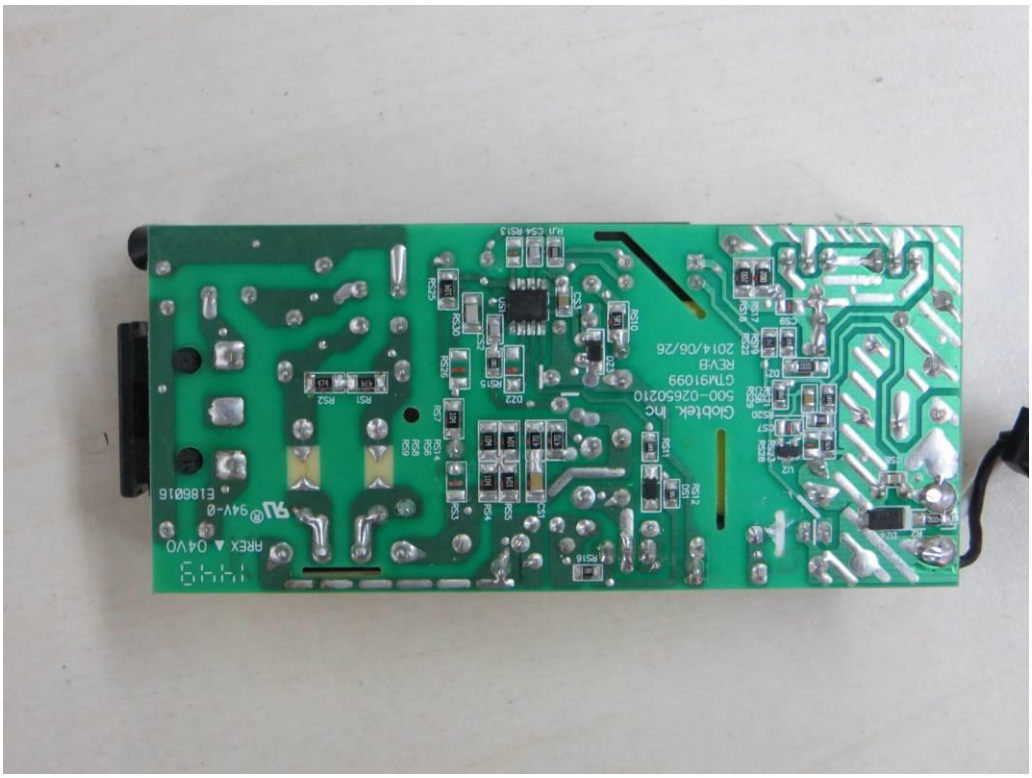
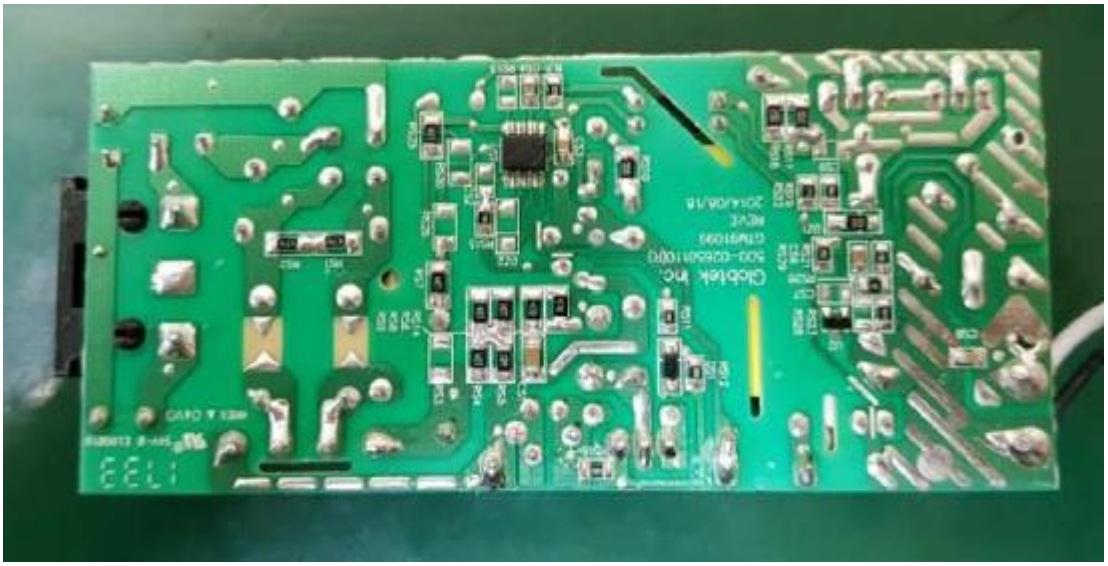
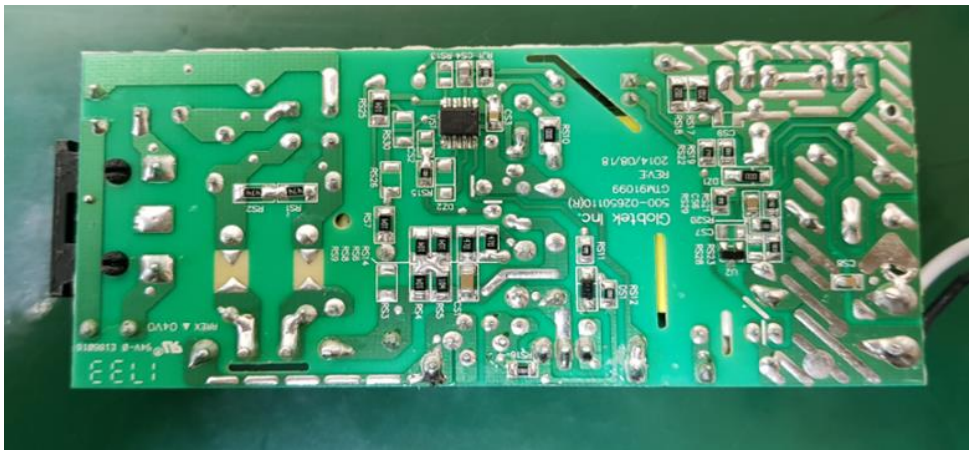


Appendix No.1: Photos of product

PCB

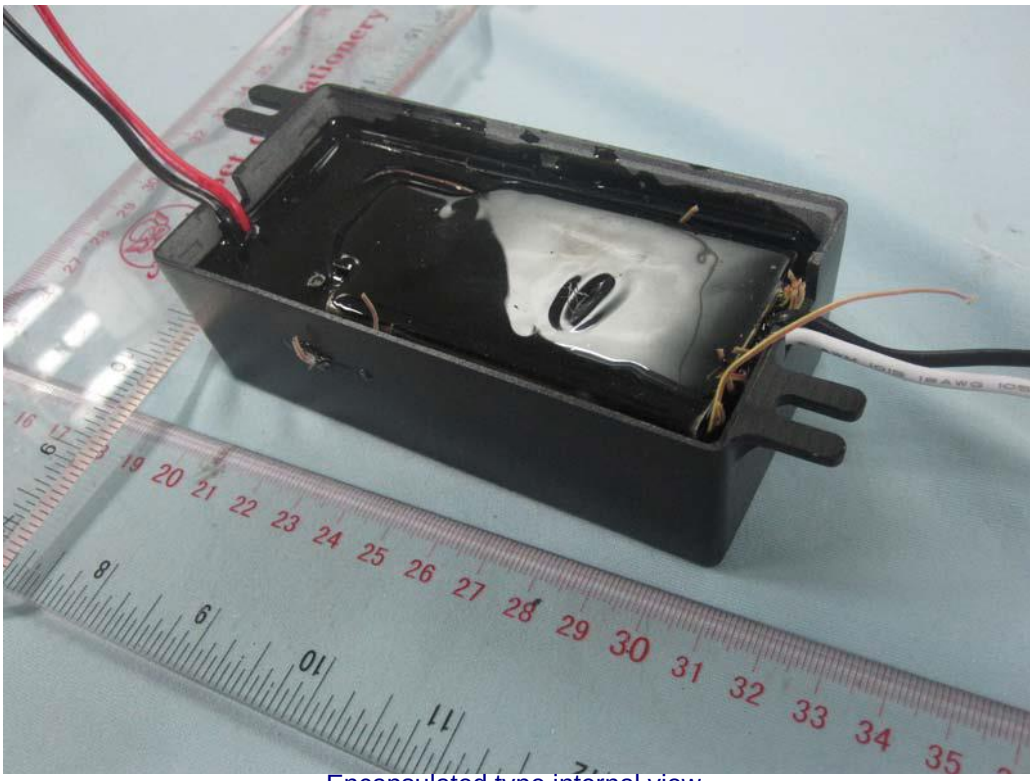


PCB

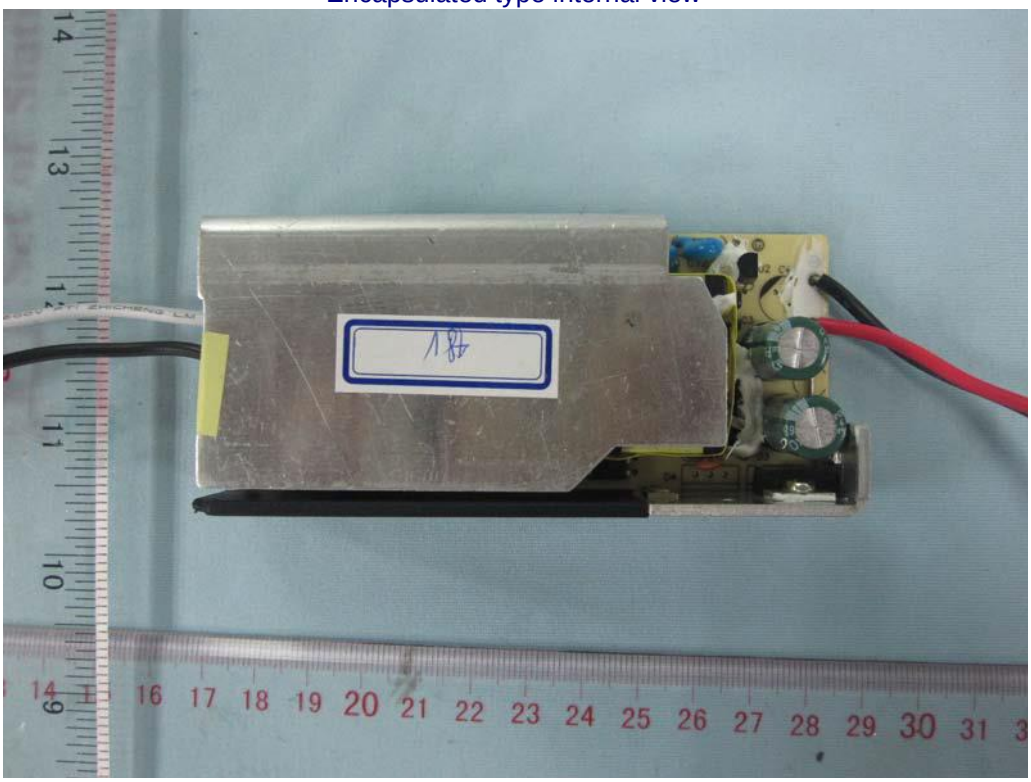


Appendix No.1: Photos of product

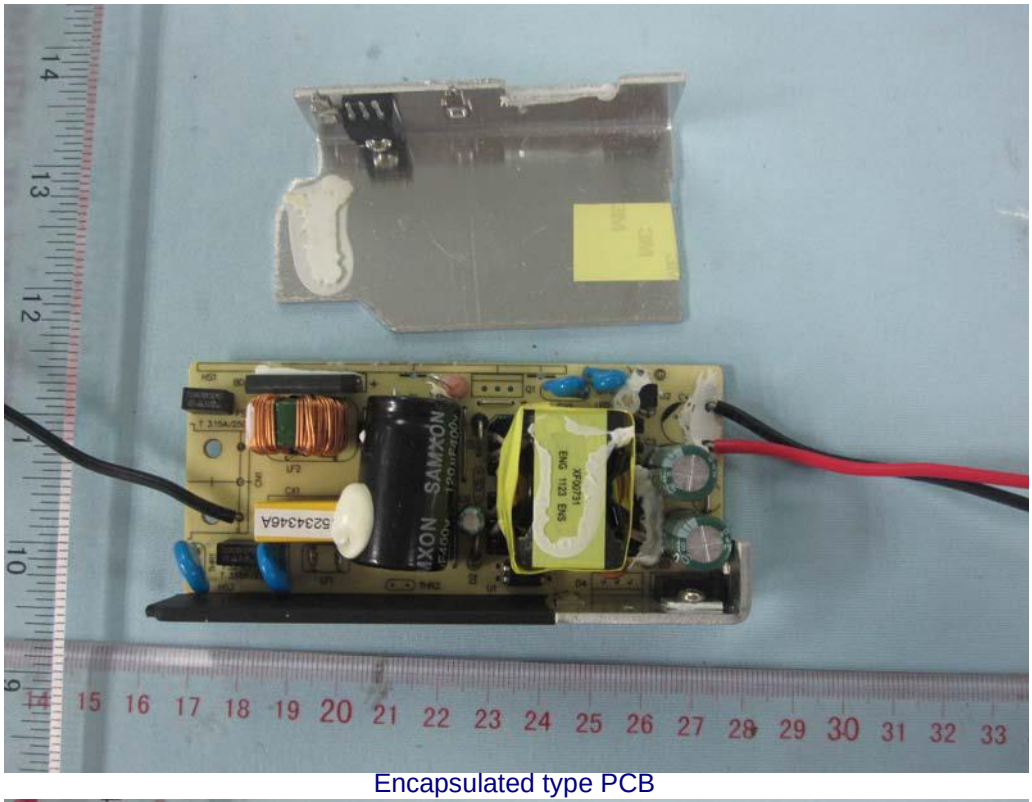
Encapsulated type



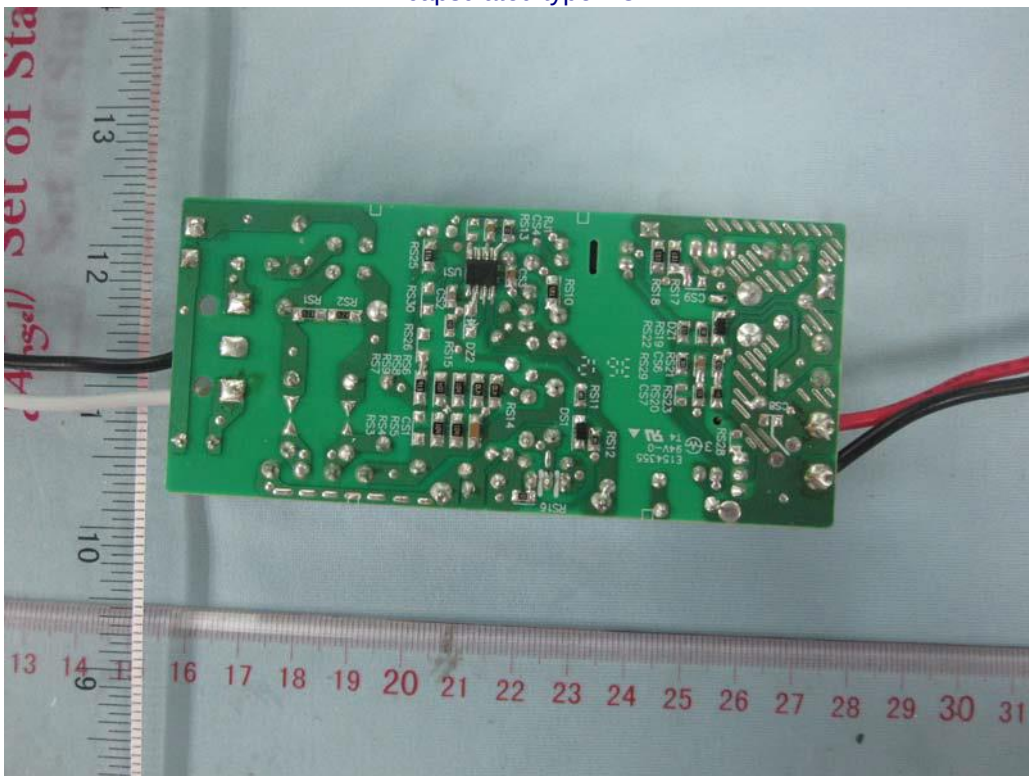
Encapsulated type internal view



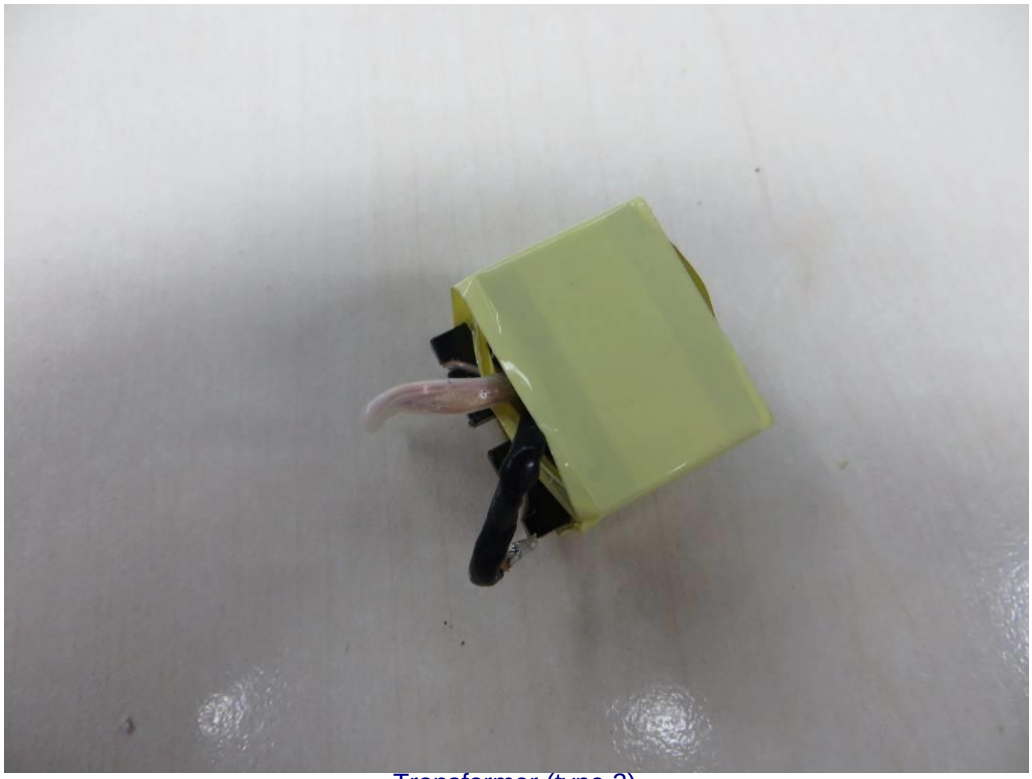
Encapsulated type PCB



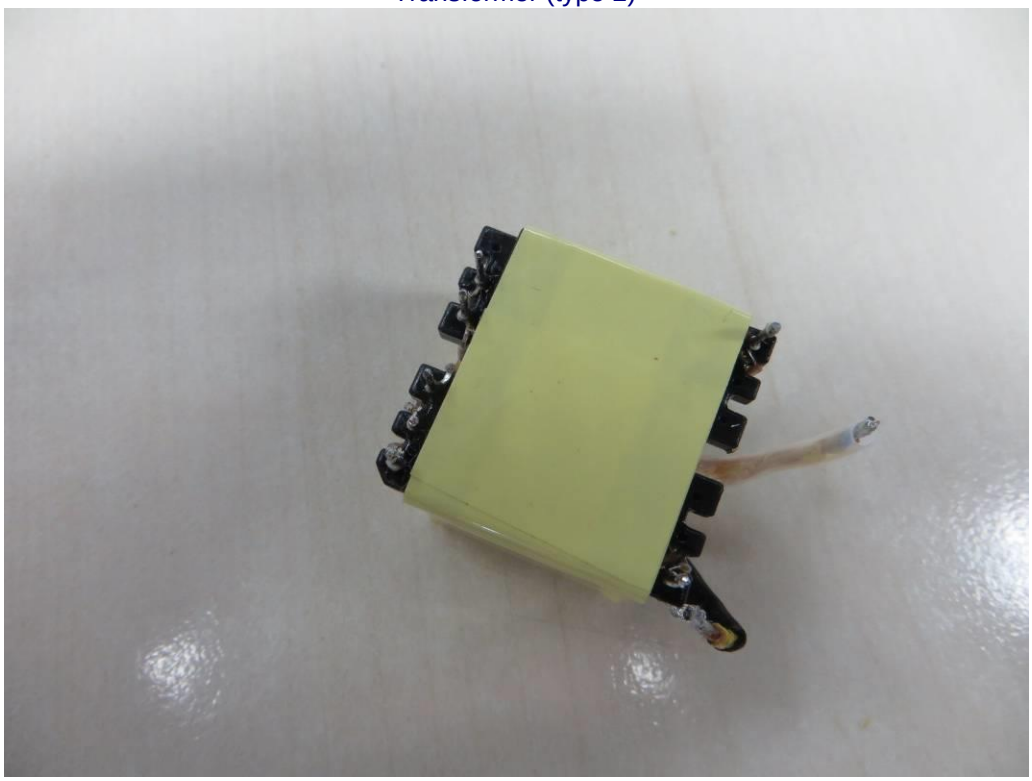
Encapsulated type PCB



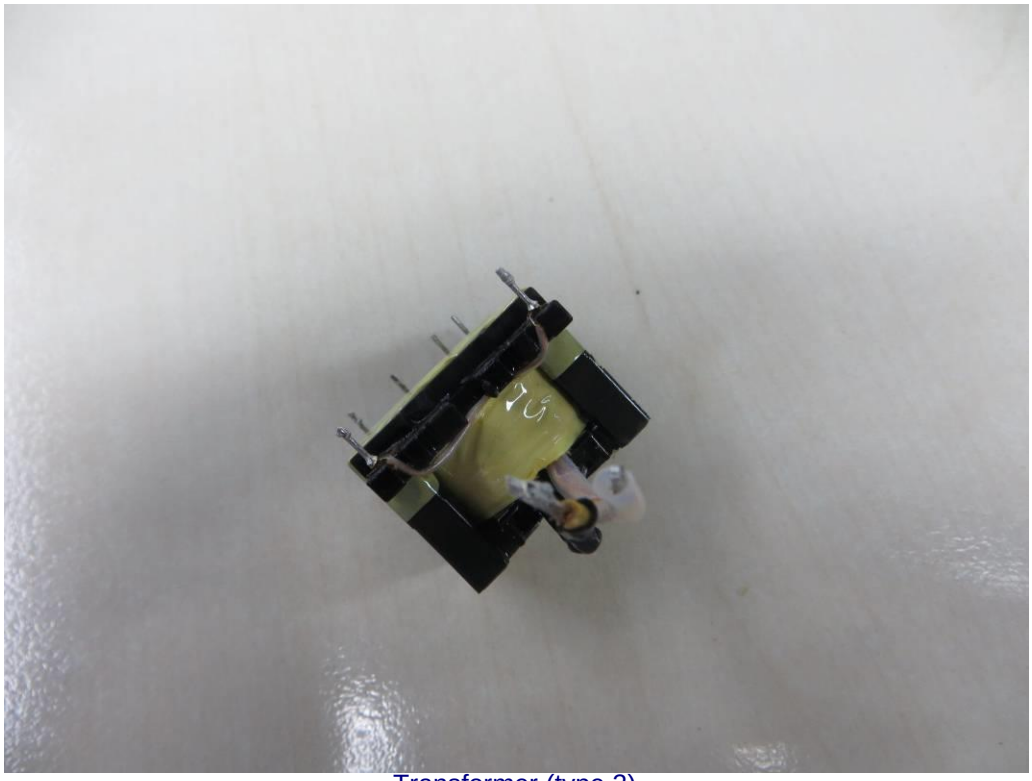
Transformer (type 2)



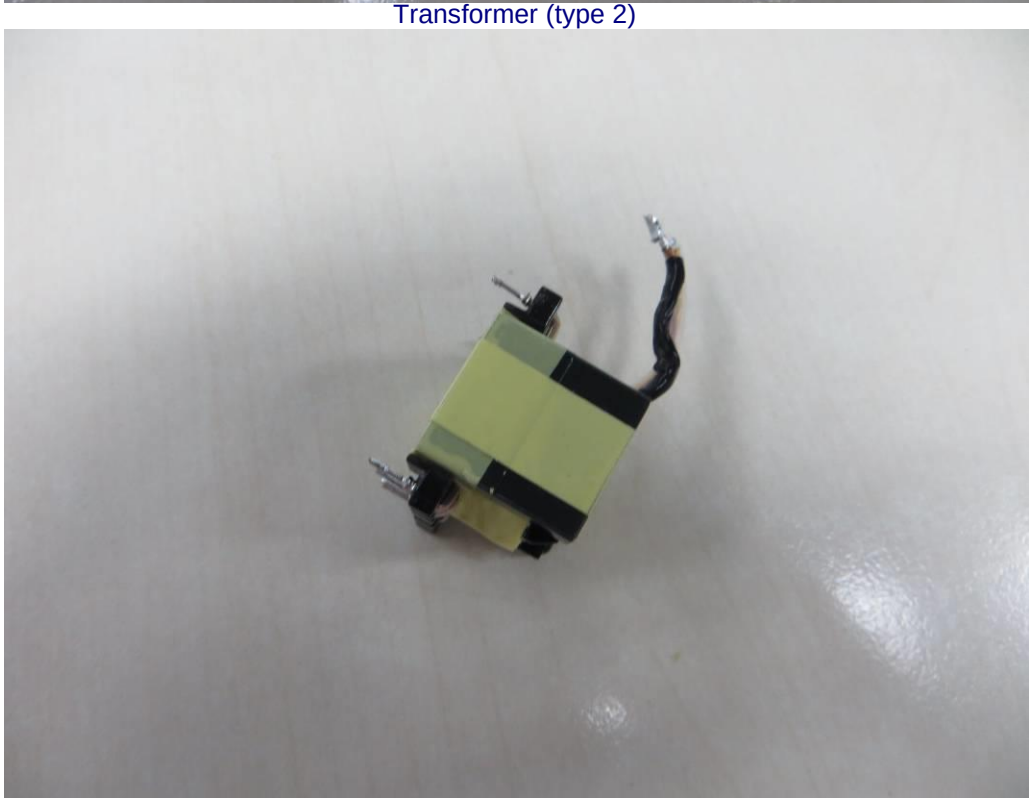
Transformer (type 2)



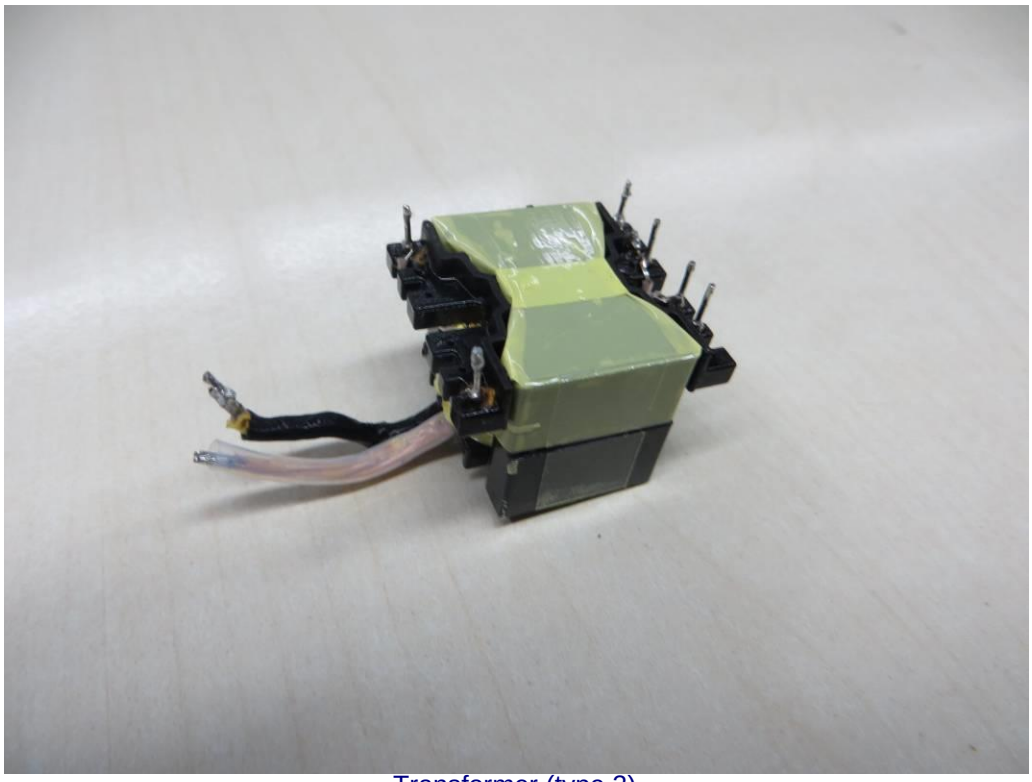
Transformer (type 2)



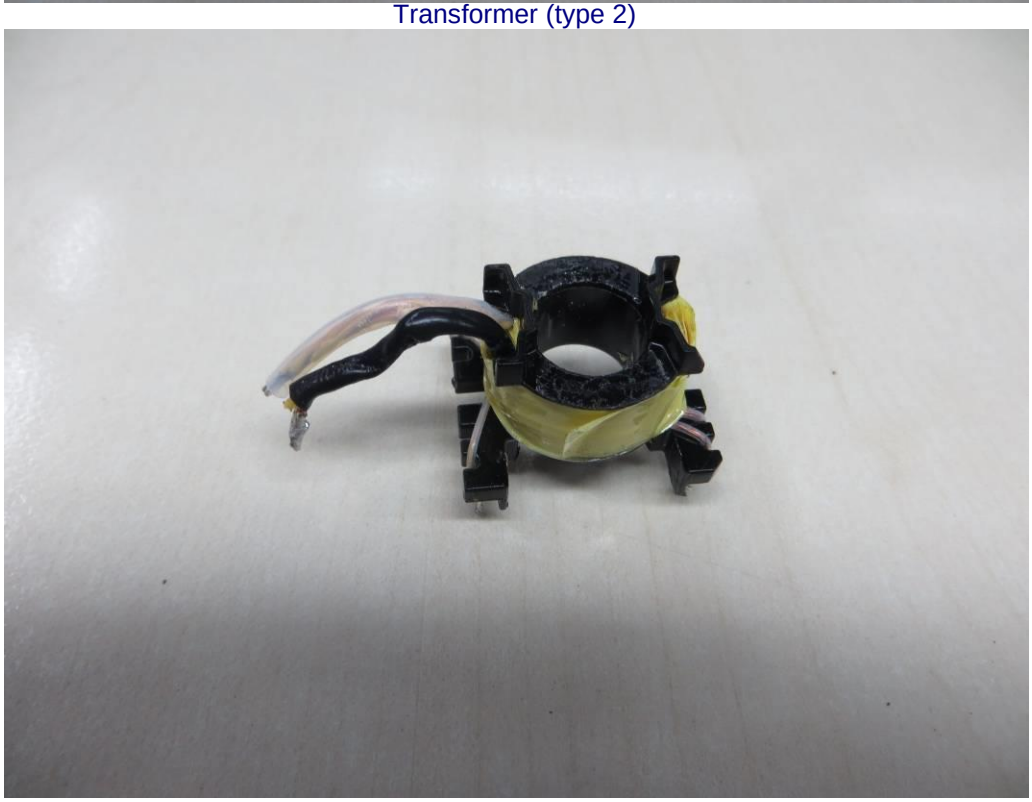
Transformer (type 2)



Transformer (type 2)

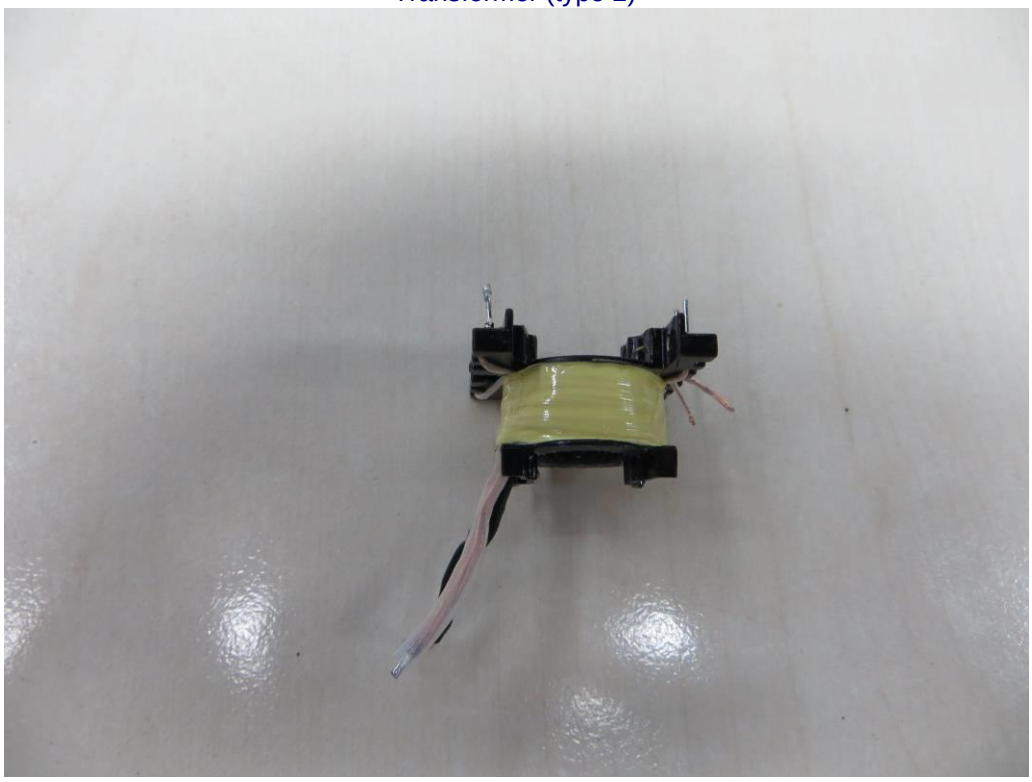


Transformer (type 2)

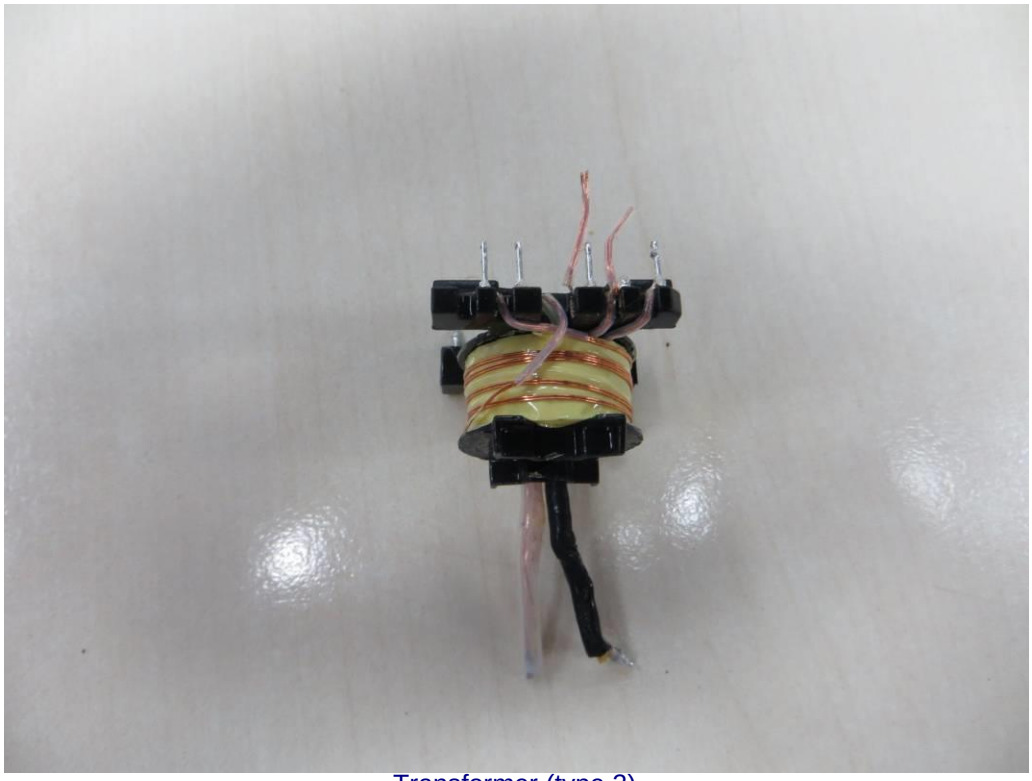


Transformer (type 2)

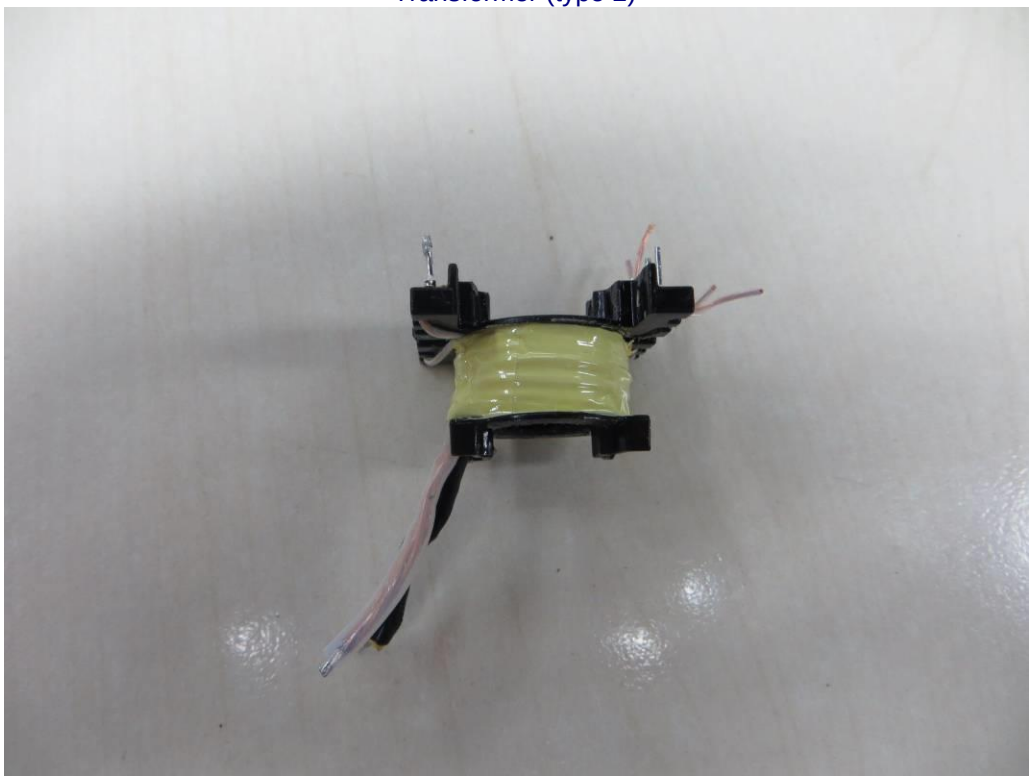
Transformer (type 2)



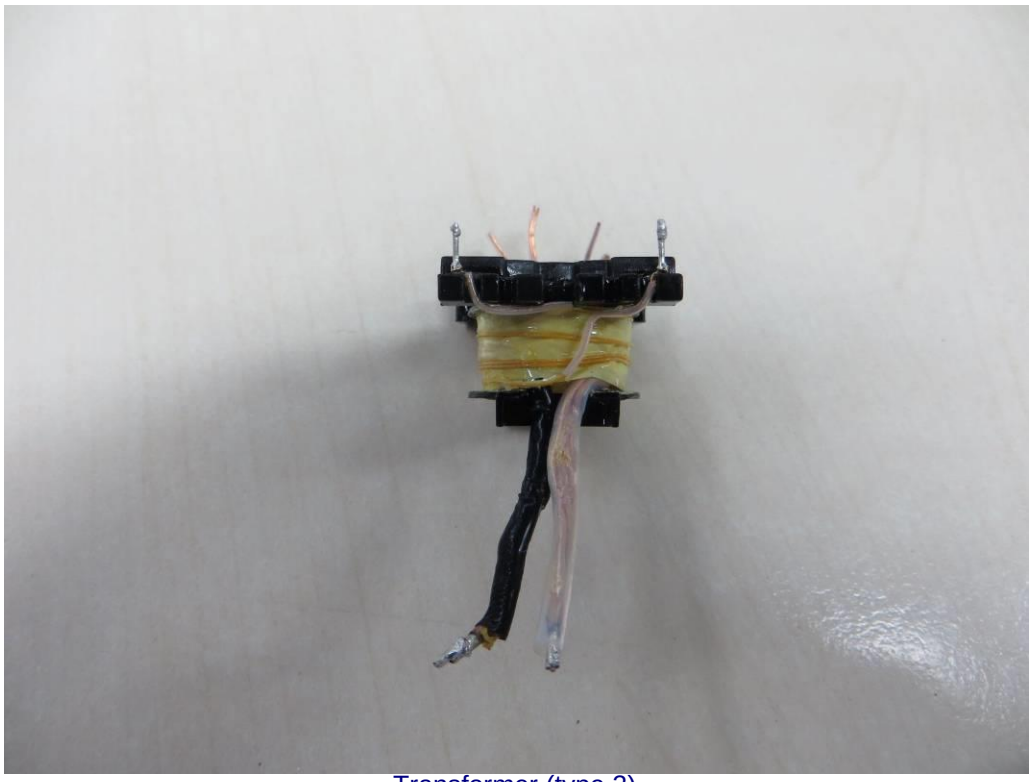
Transformer (type 2)



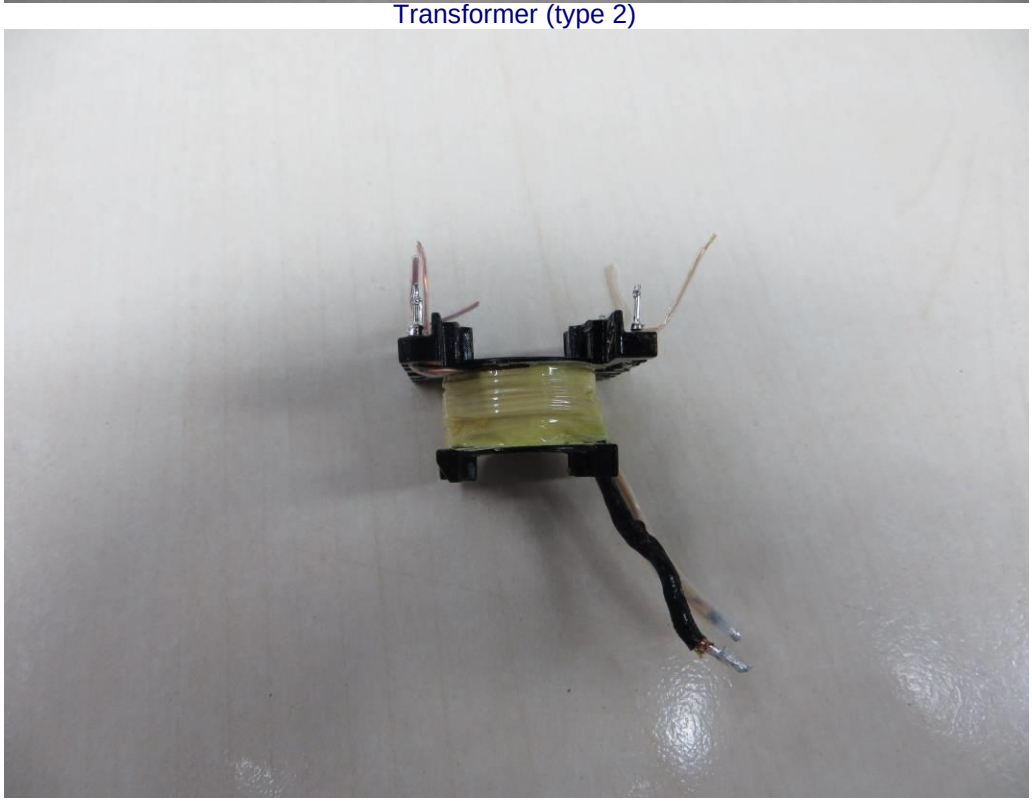
Transformer (type 2)



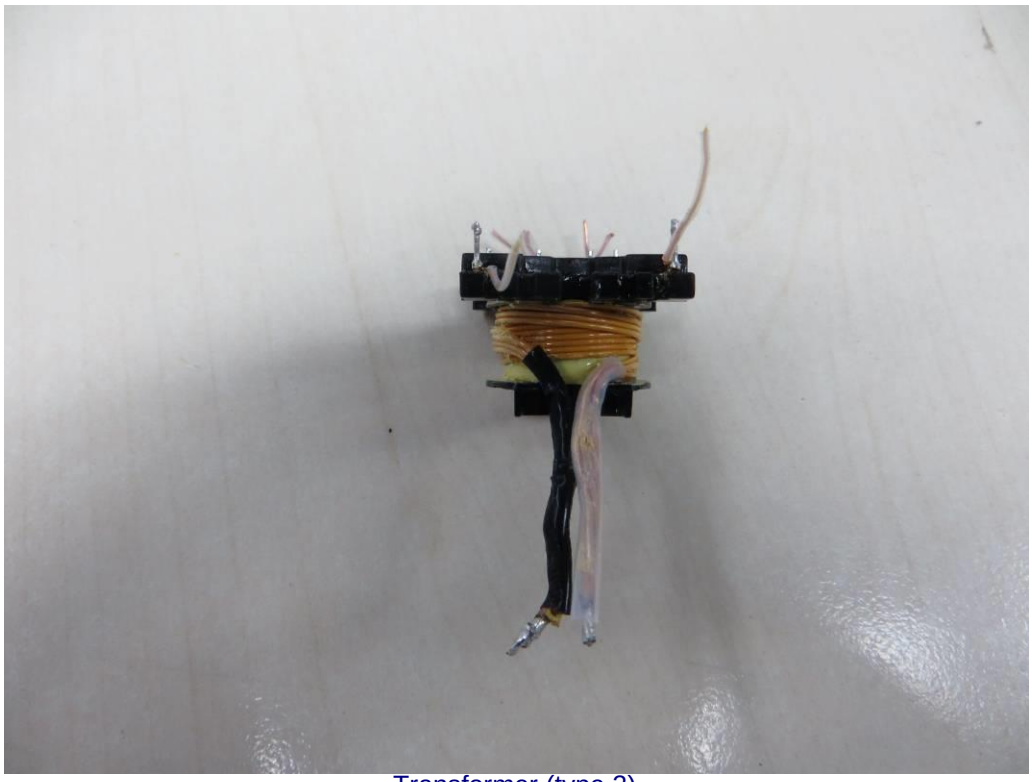
Transformer (type 2)



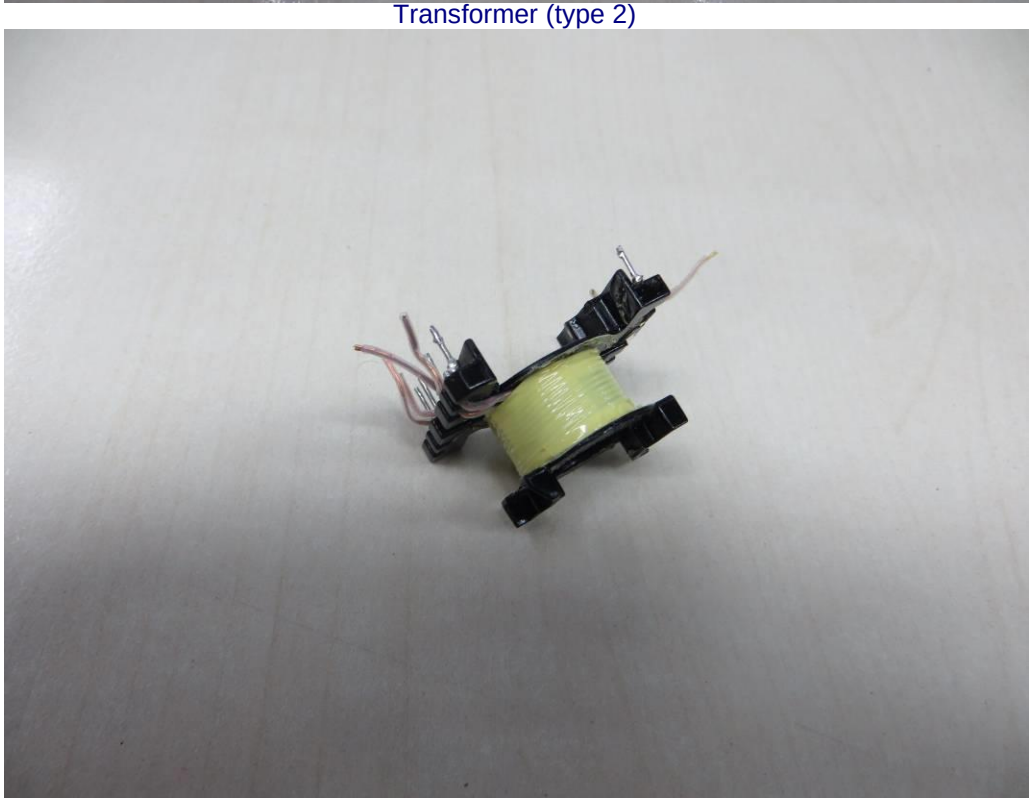
Transformer (type 2)



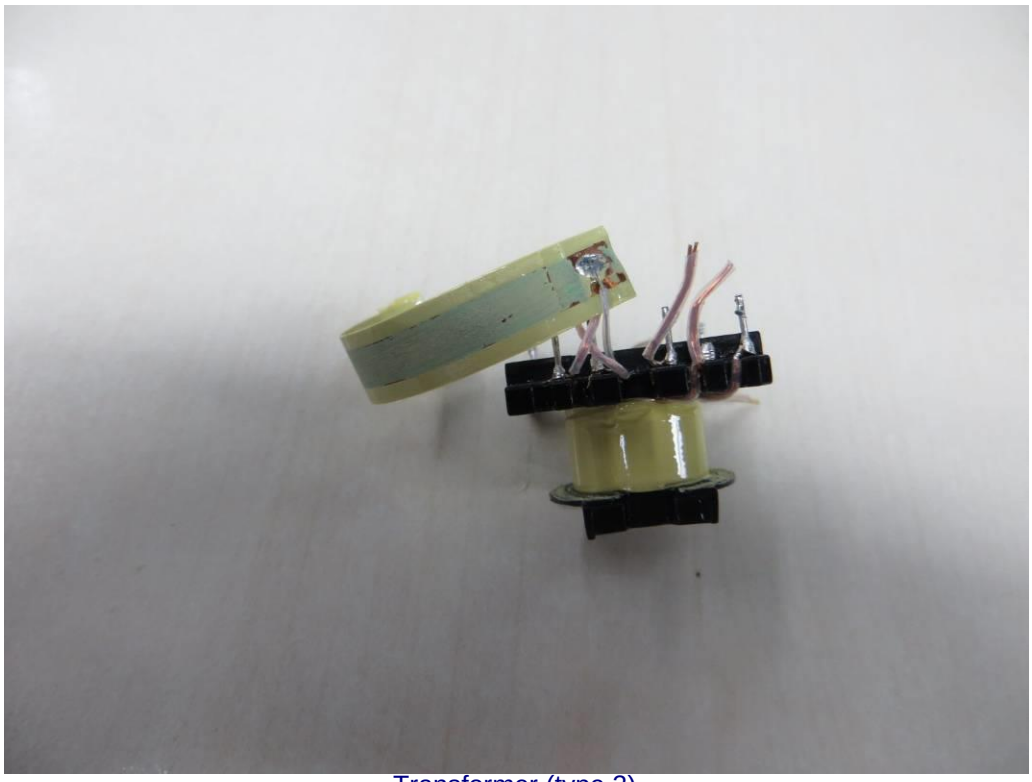
Transformer (type 2)



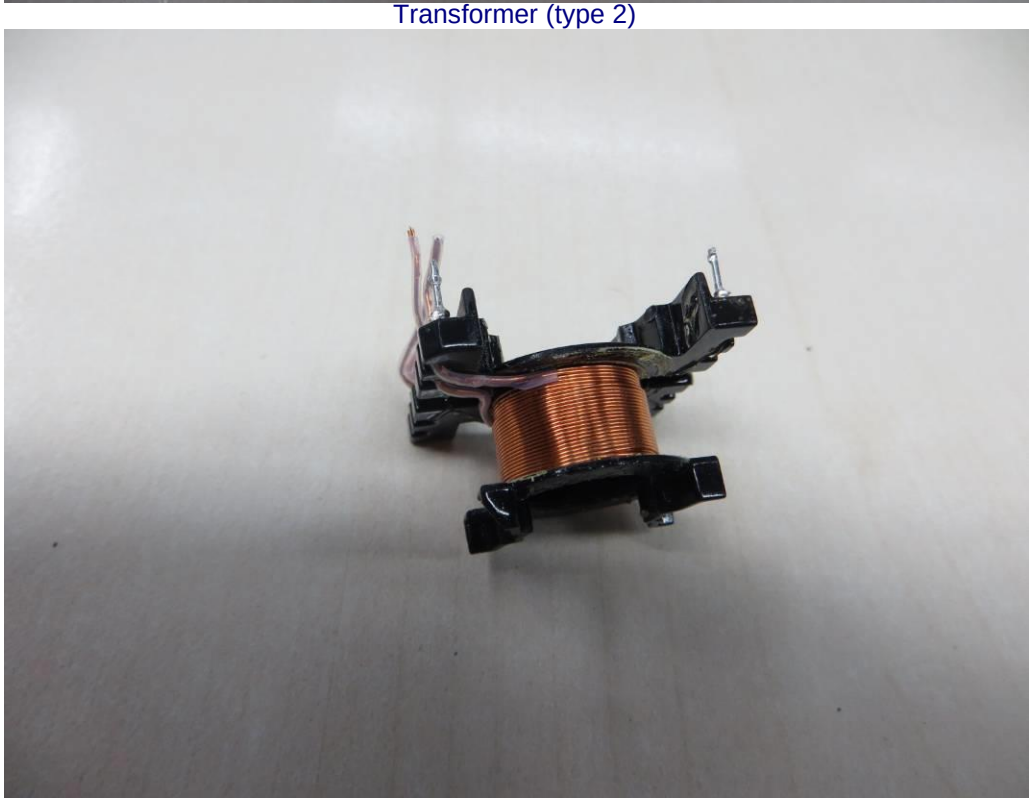
Transformer (type 2)



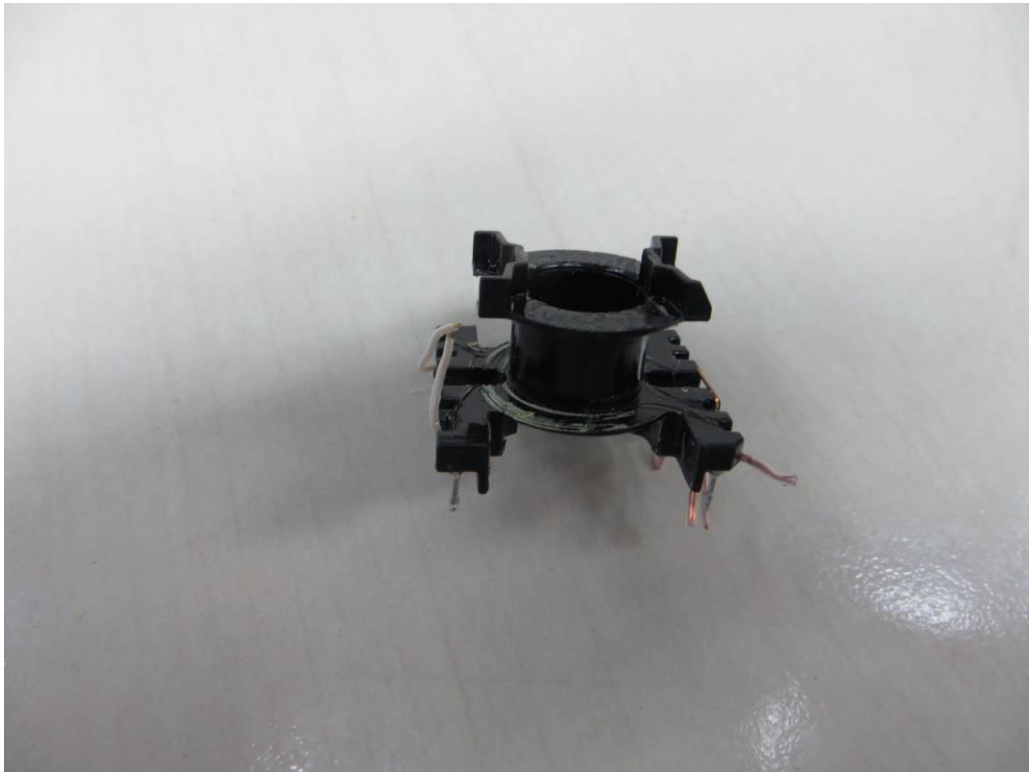
Transformer (type 2)



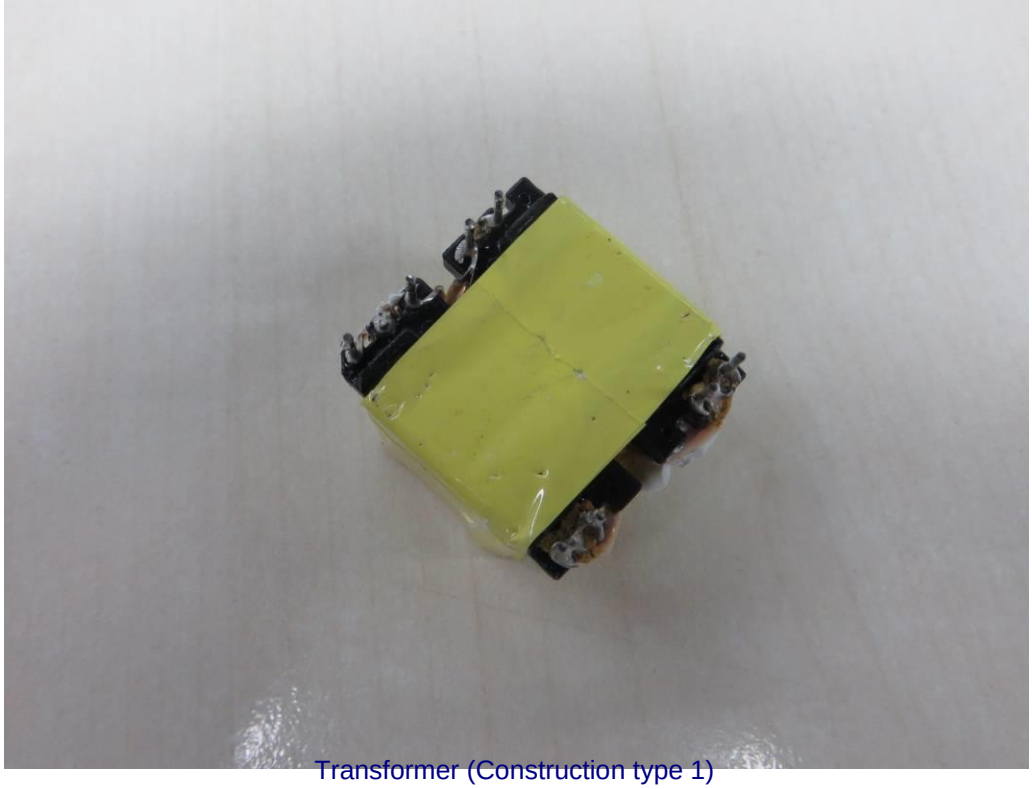
Transformer (type 2)



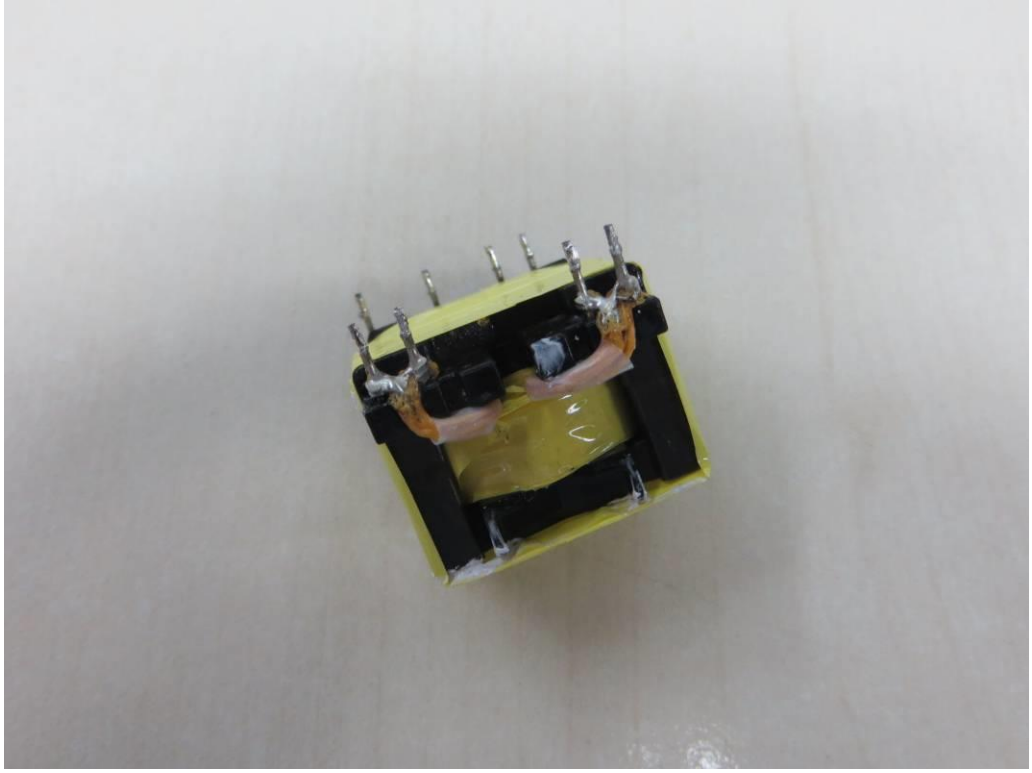
Transformer (type 2)



Transformer (Construction type 1)



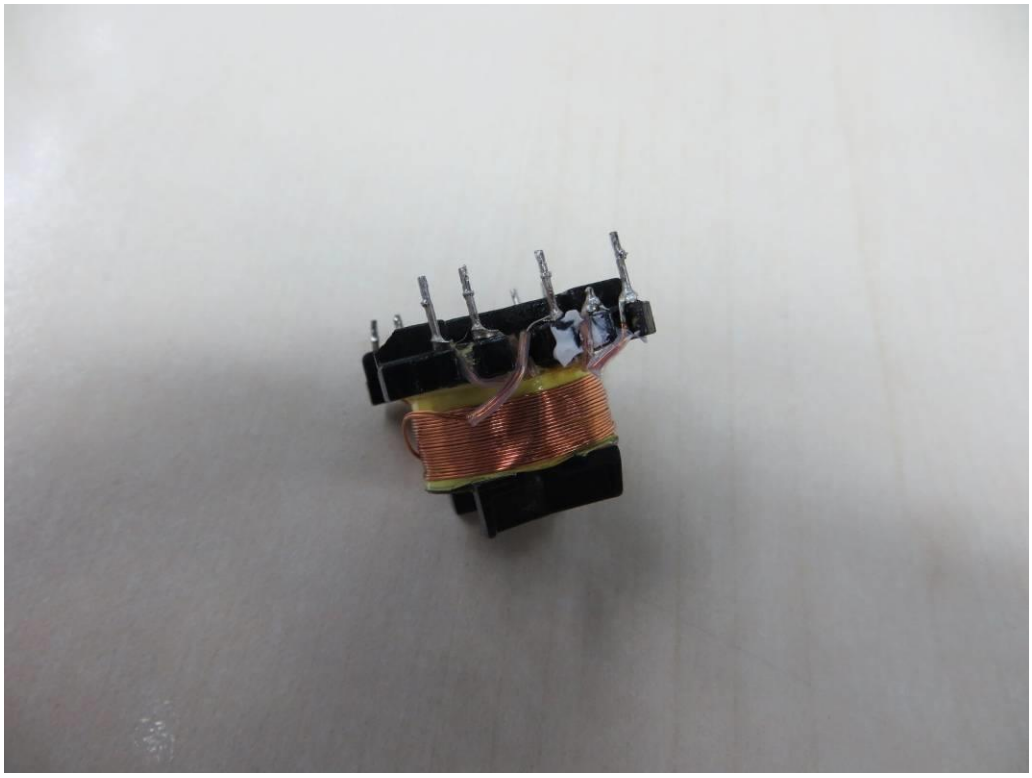
Transformer (Construction type 1)



Appendix No.1: Photos of product

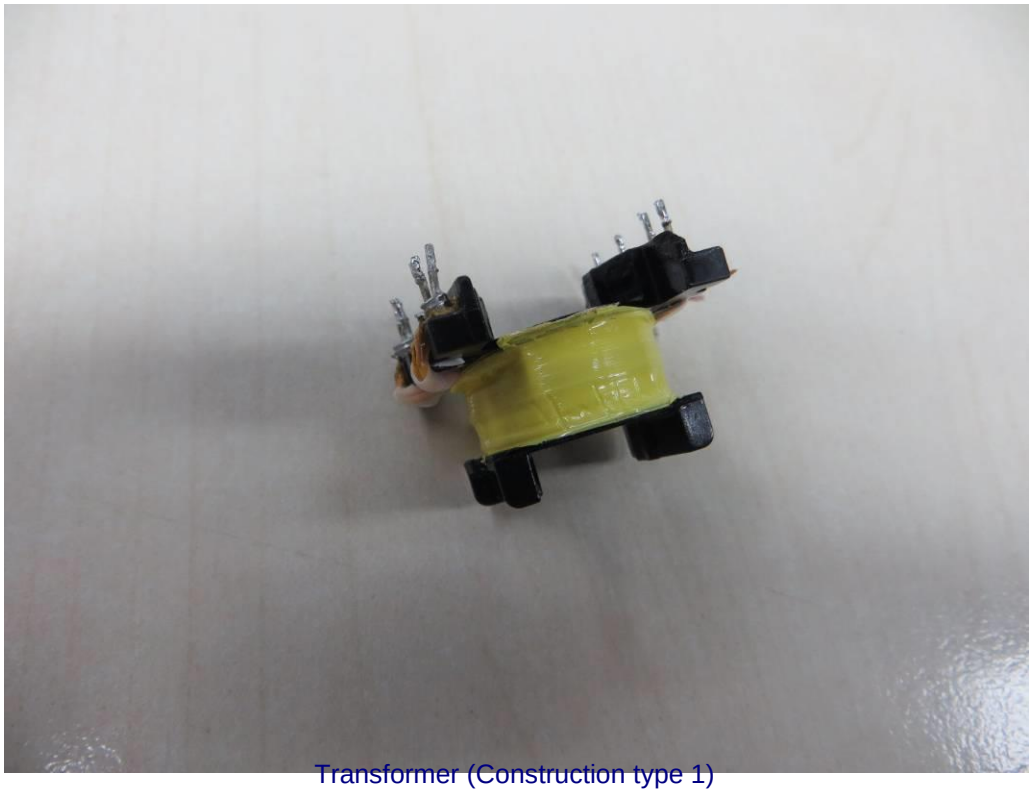
Transformer (Construction type 1)

Transformer (Construction type 1)

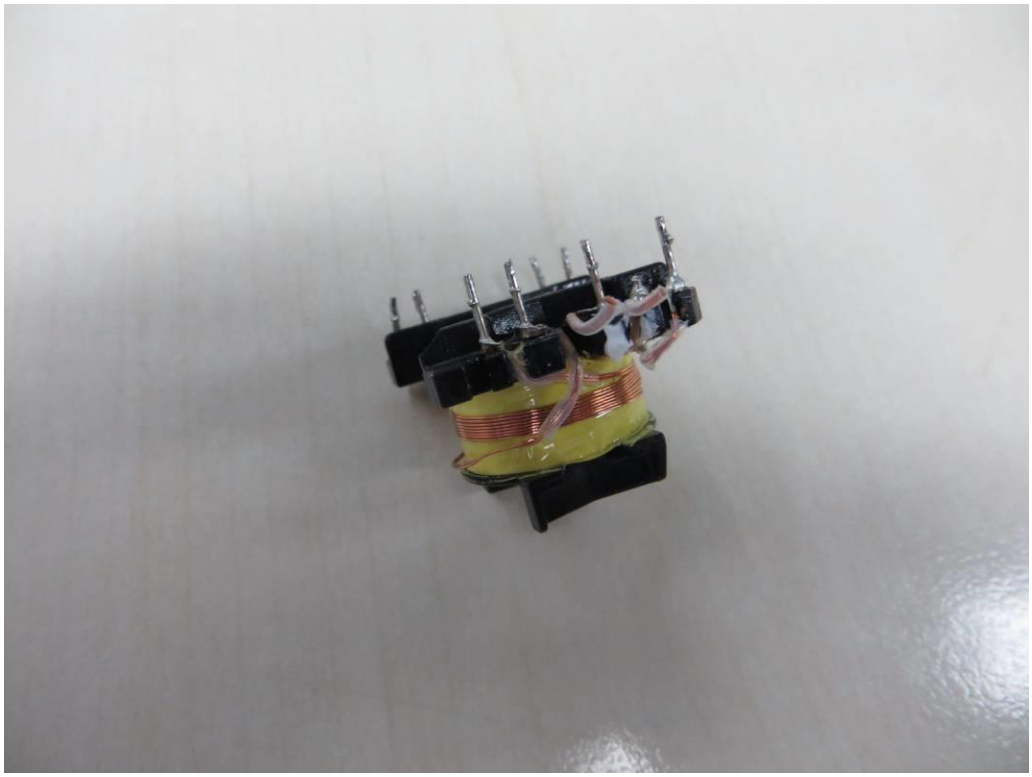


Appendix No.1: Photos of product

Transformer (Construction type 1)



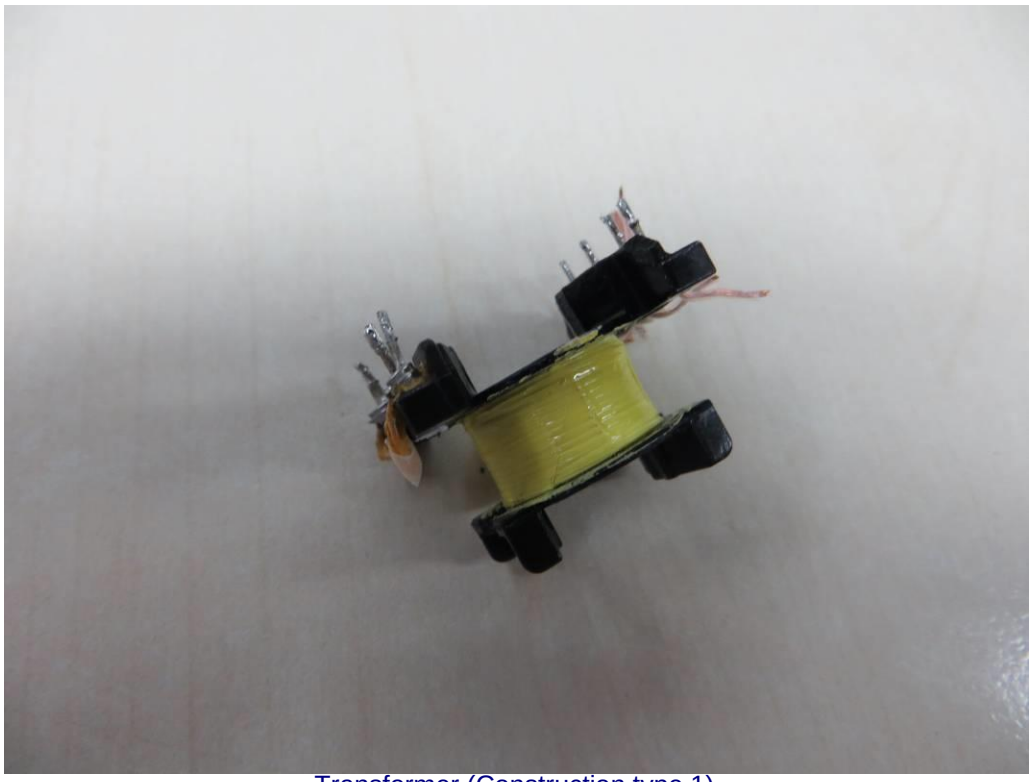
Transformer (Construction type 1)



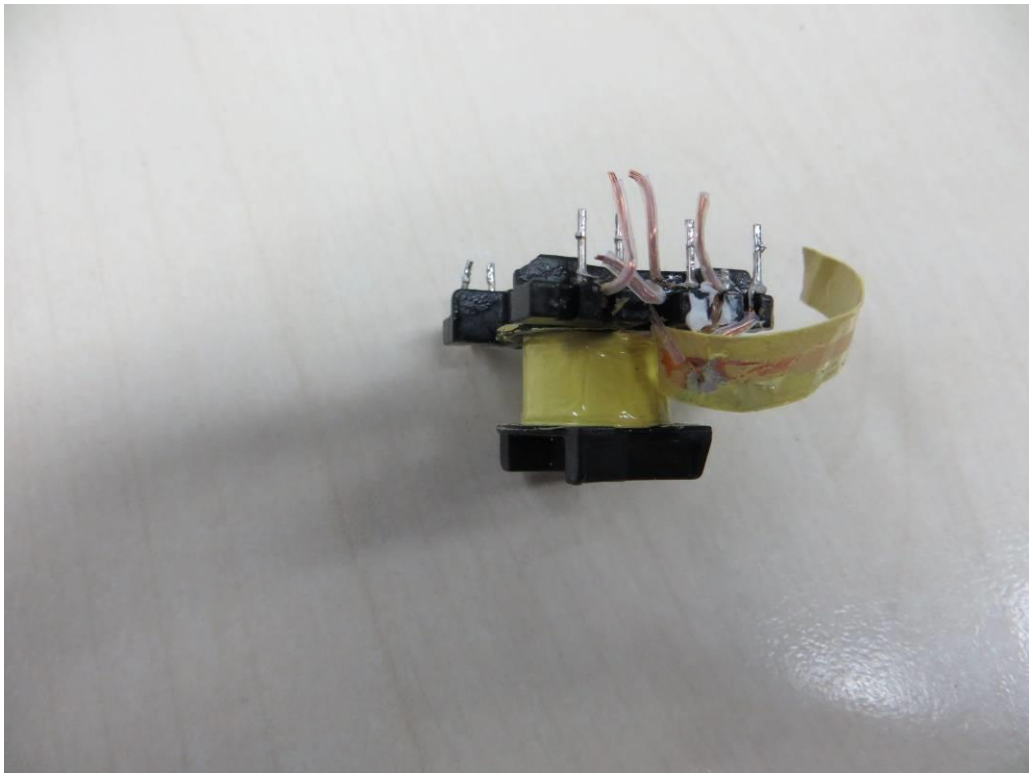
Transformer (Construction type 1)

Transformer (Construction type 1)

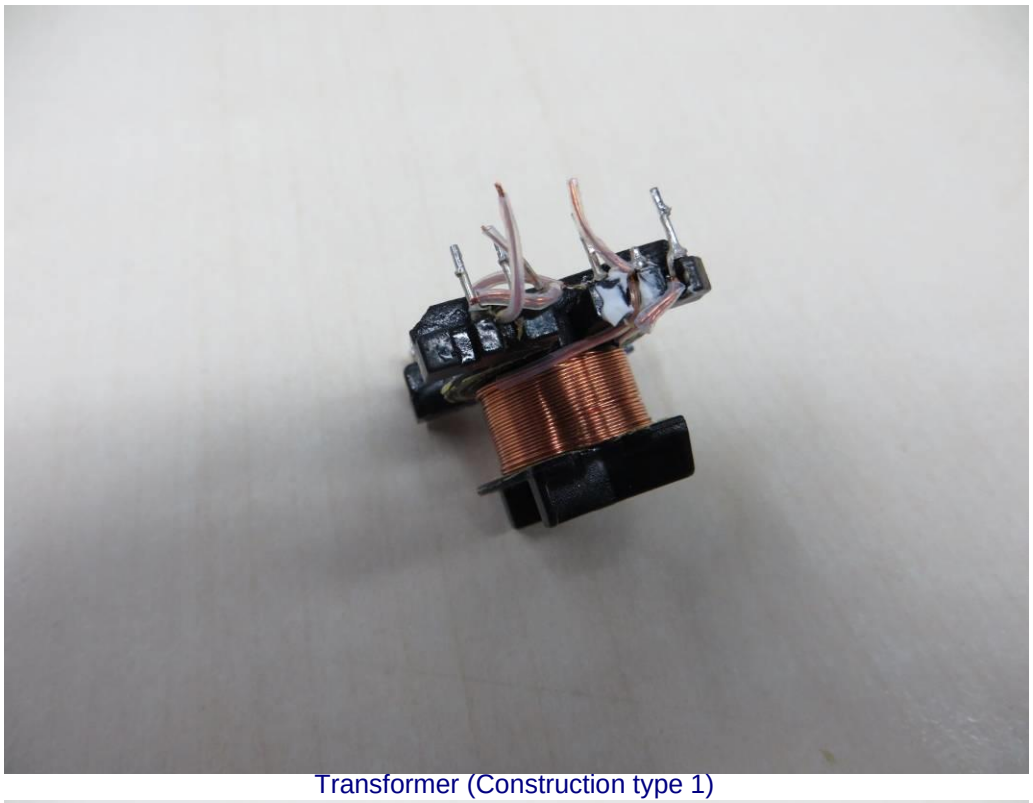
Transformer (Construction type 1)



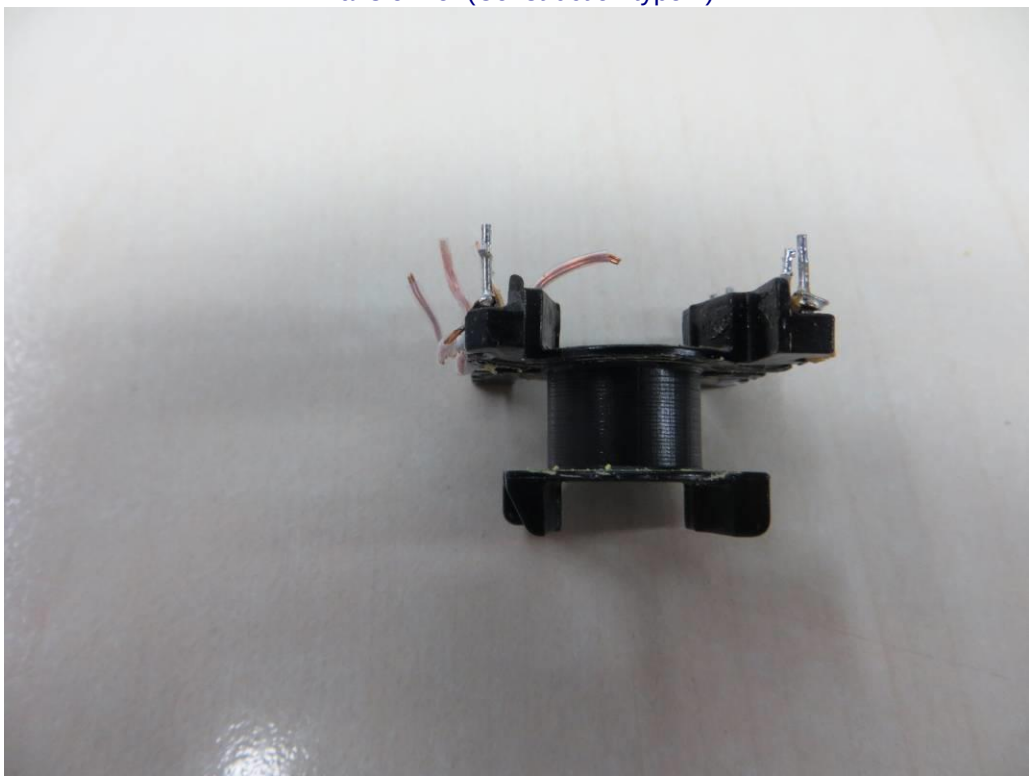
Transformer (Construction type 1)



Transformer (Construction type 1)



Transformer (Construction type 1)



Appendix No.1: Photos of product

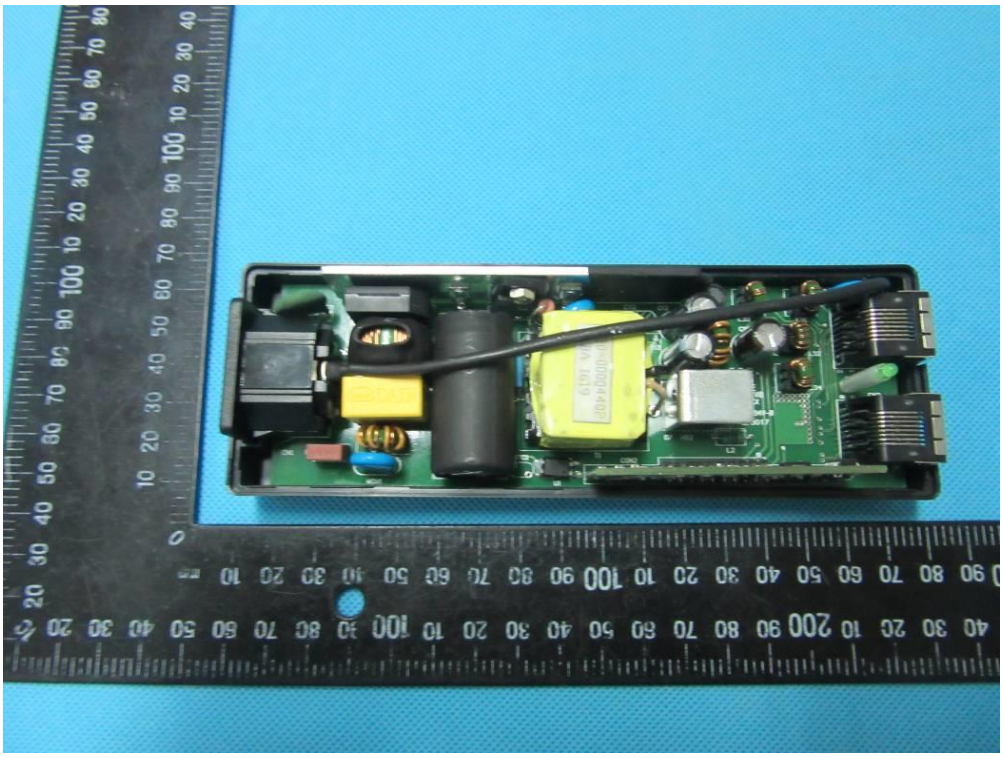
External view for GT*96600-*56*** series

External view for GT*96600-*56*** series

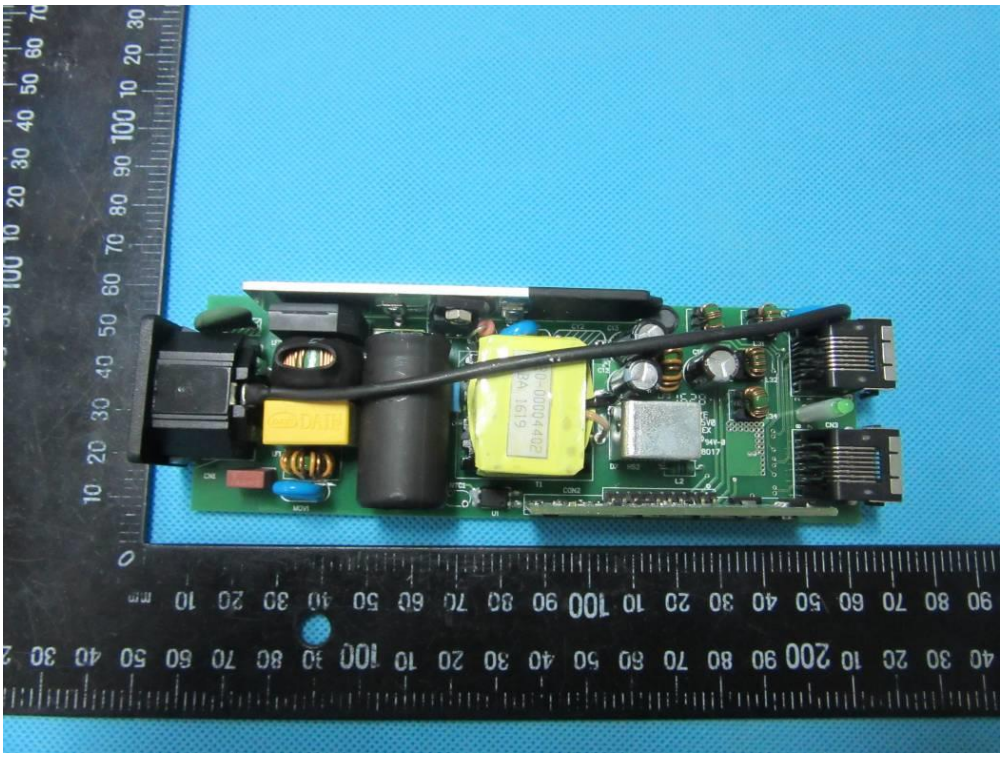
External view for GT*96600-*56*** series (Enclosure with lug)

Internal view for GT*96600-*56*** series

Internal view for GT*96600-*56*** series

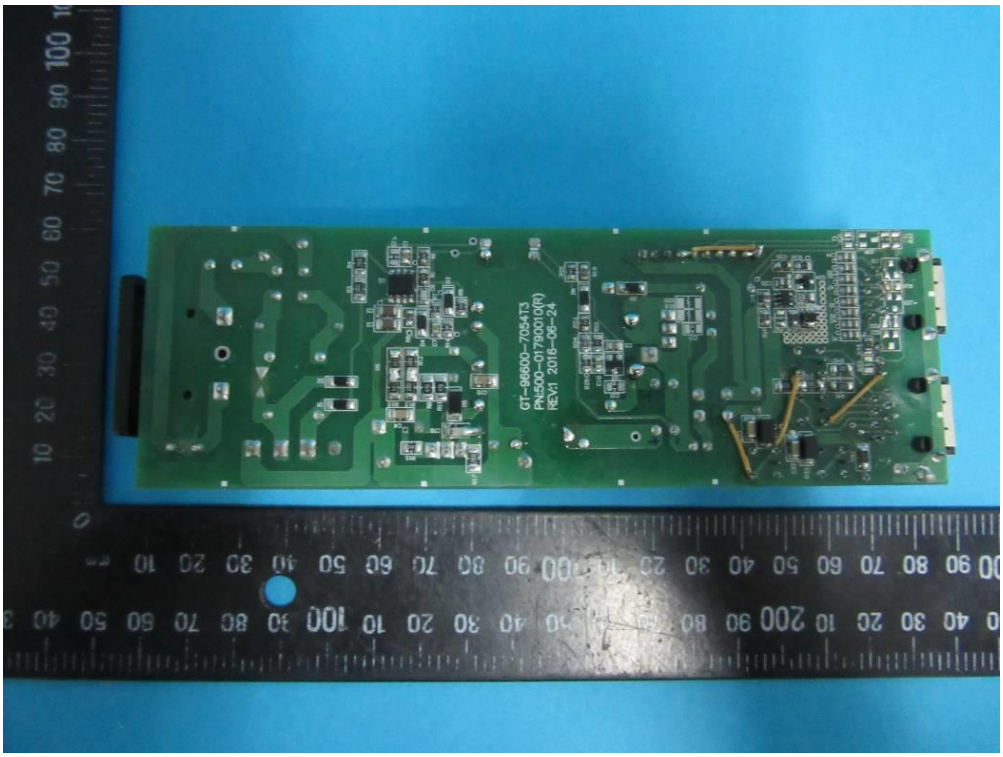


PCB view for GT*96600-*56*** series

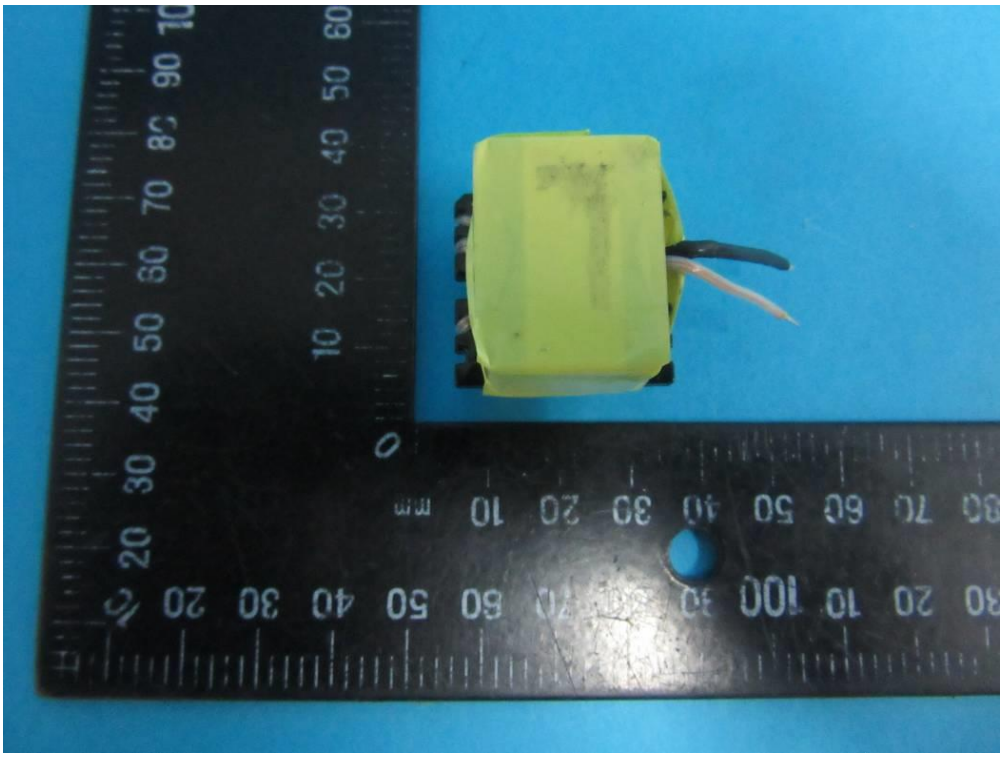


Appendix No.1: Photos of product

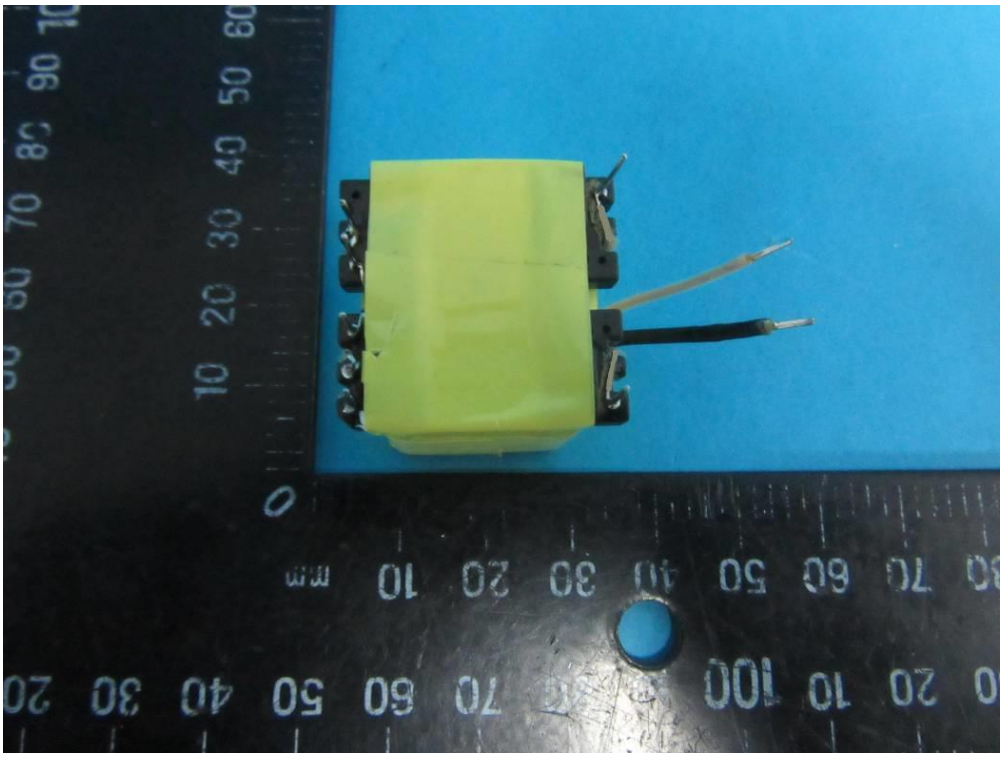
PCB view for GT*96600-*56*** series



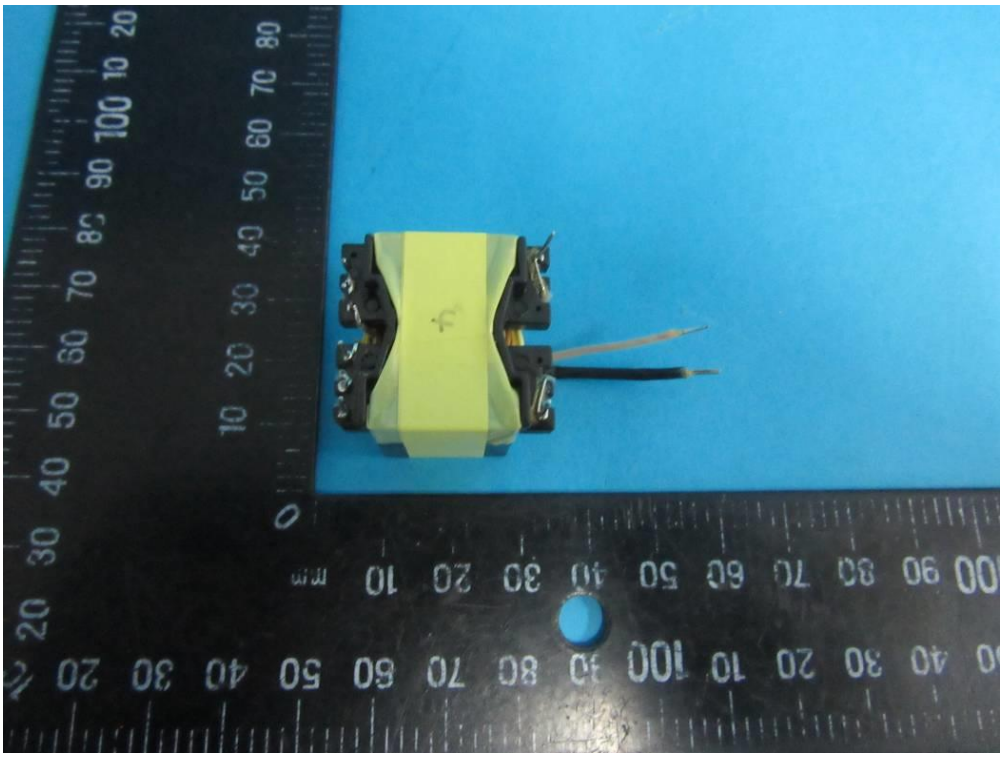
Transformer for GT*96600-*56*** series



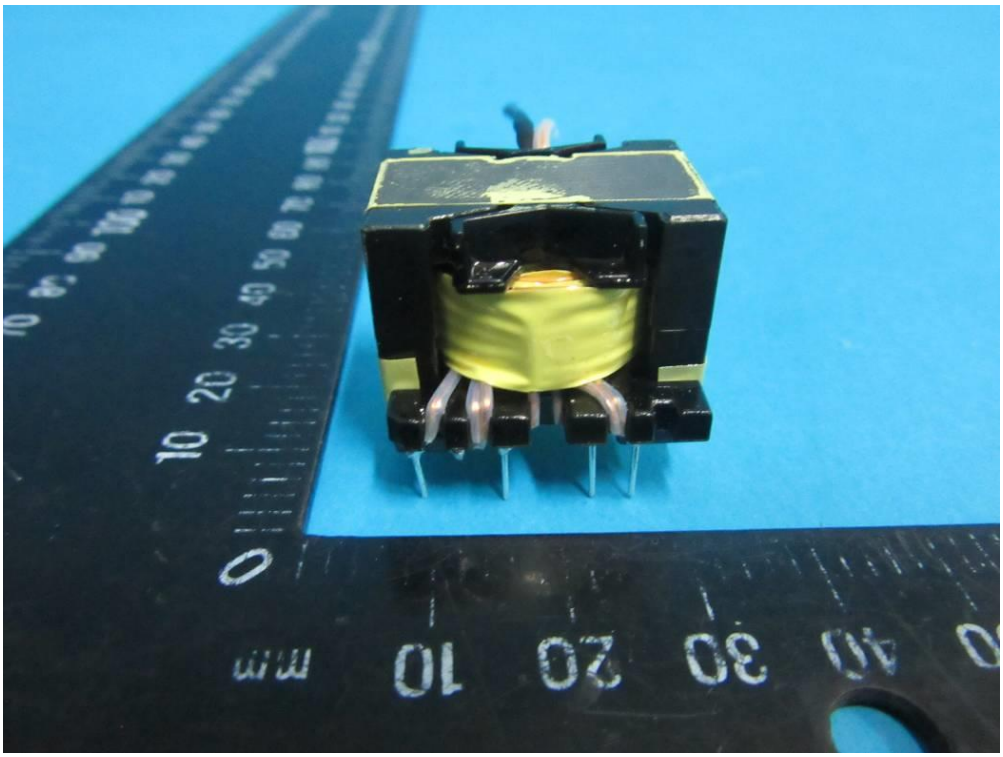
Transformer for GT*96600-*56*** series



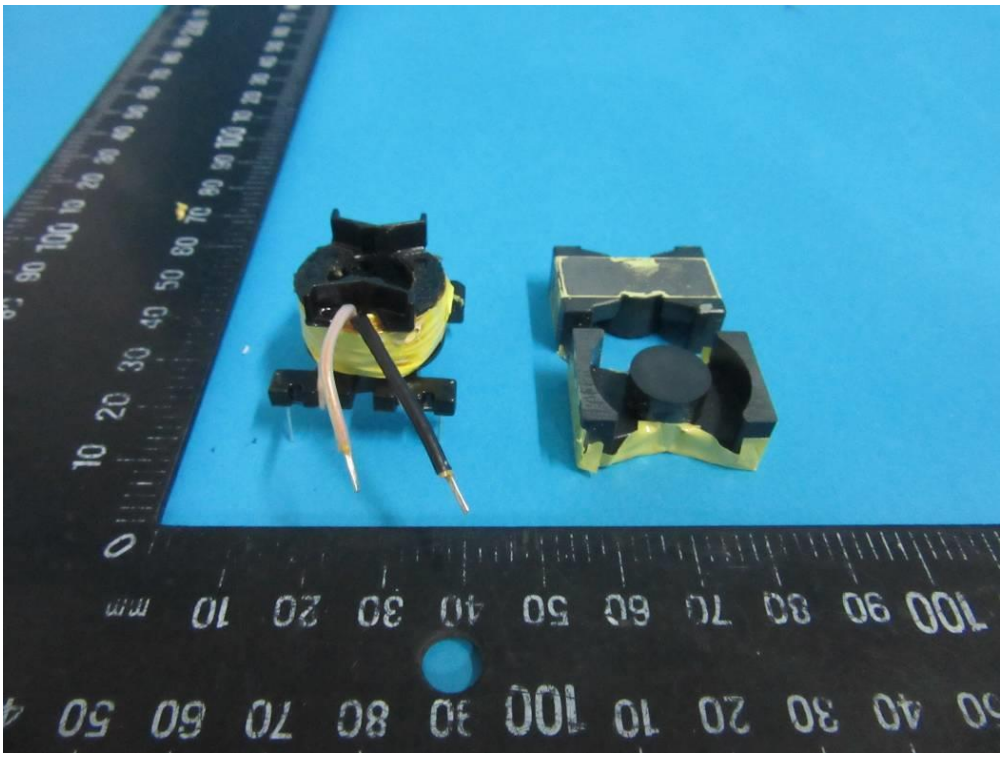
Transformer for GT*96600-*56*** series



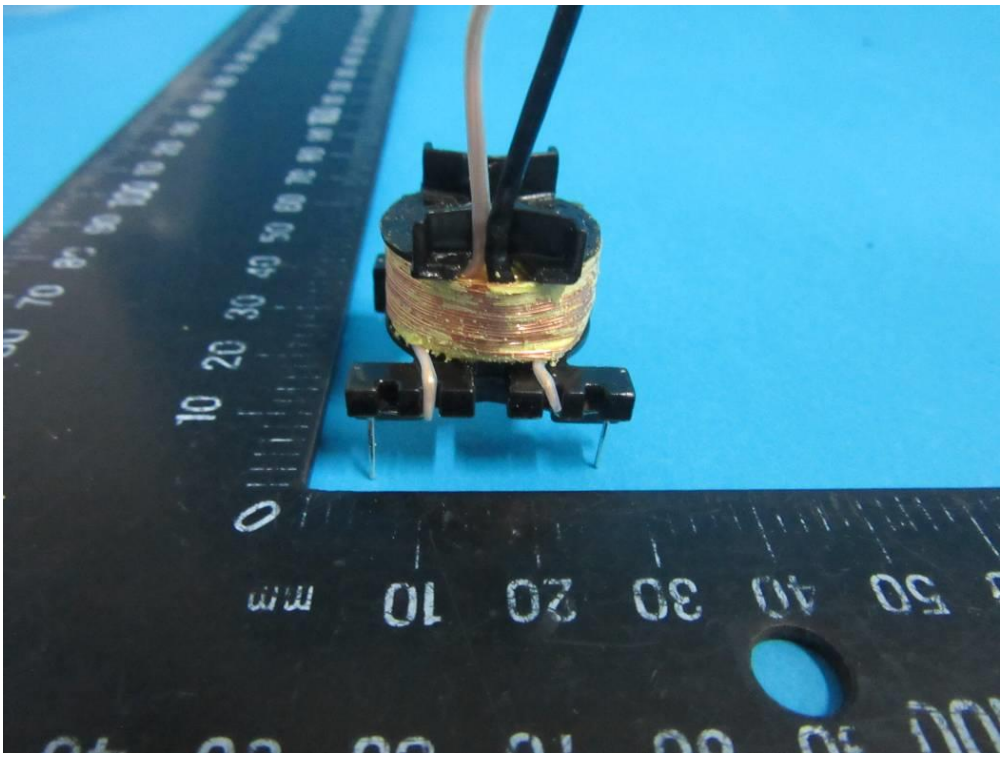
Transformer for GT*96600-*56*** series



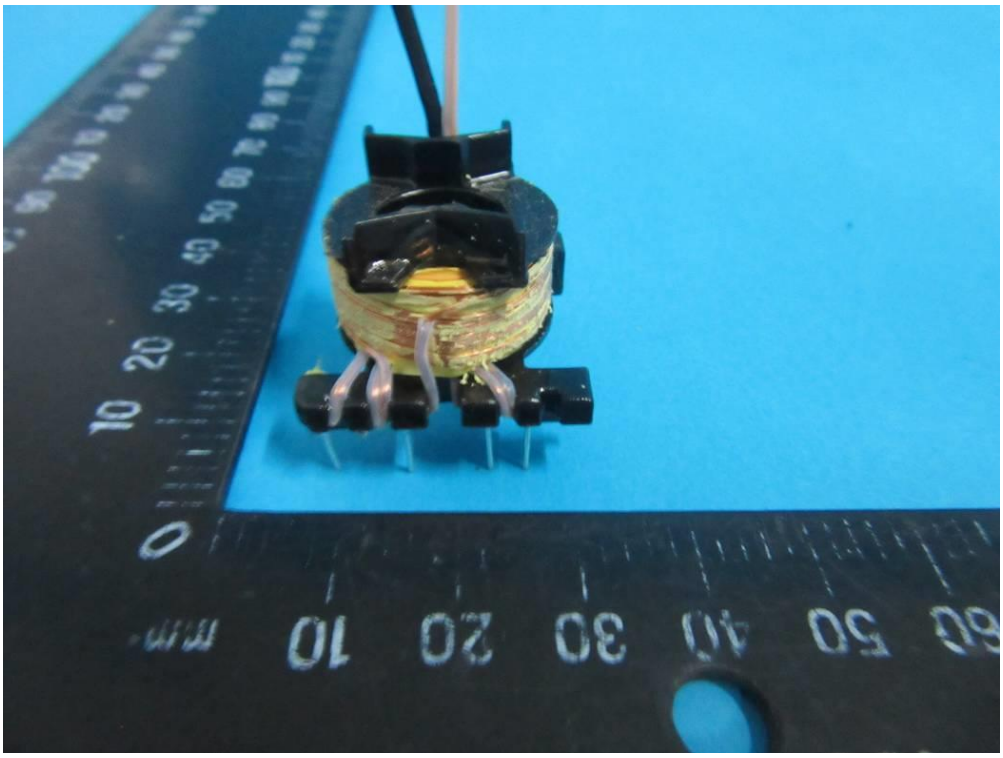
Transformer for GT*96600-*56*** series



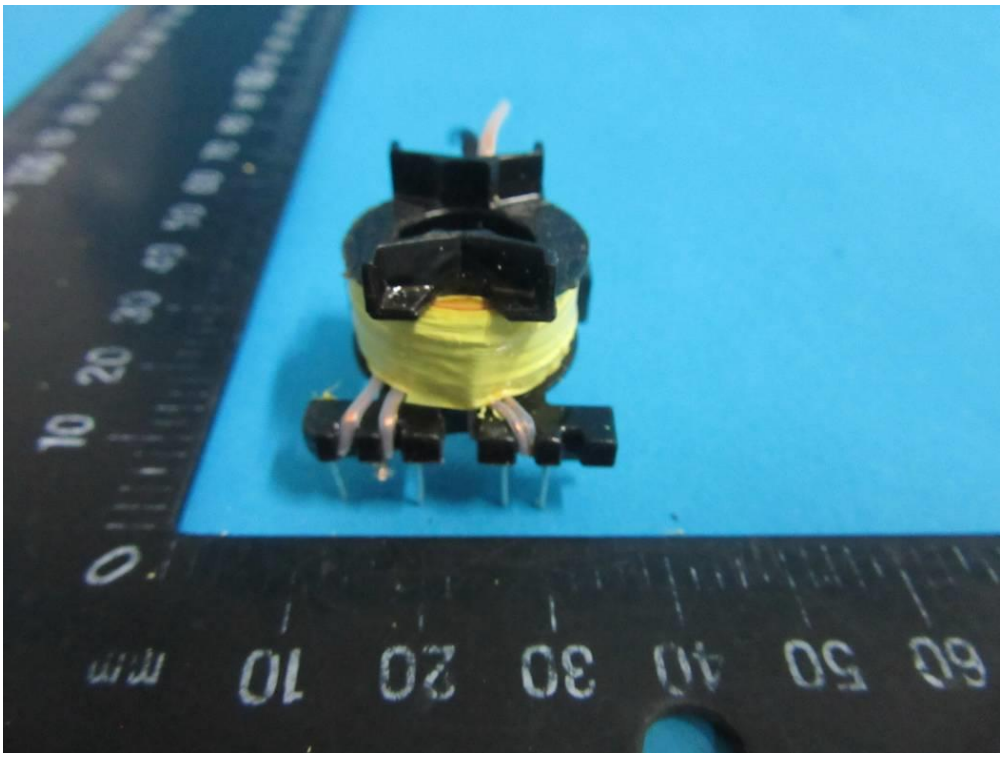
Transformer for GT*96600-*56*** series



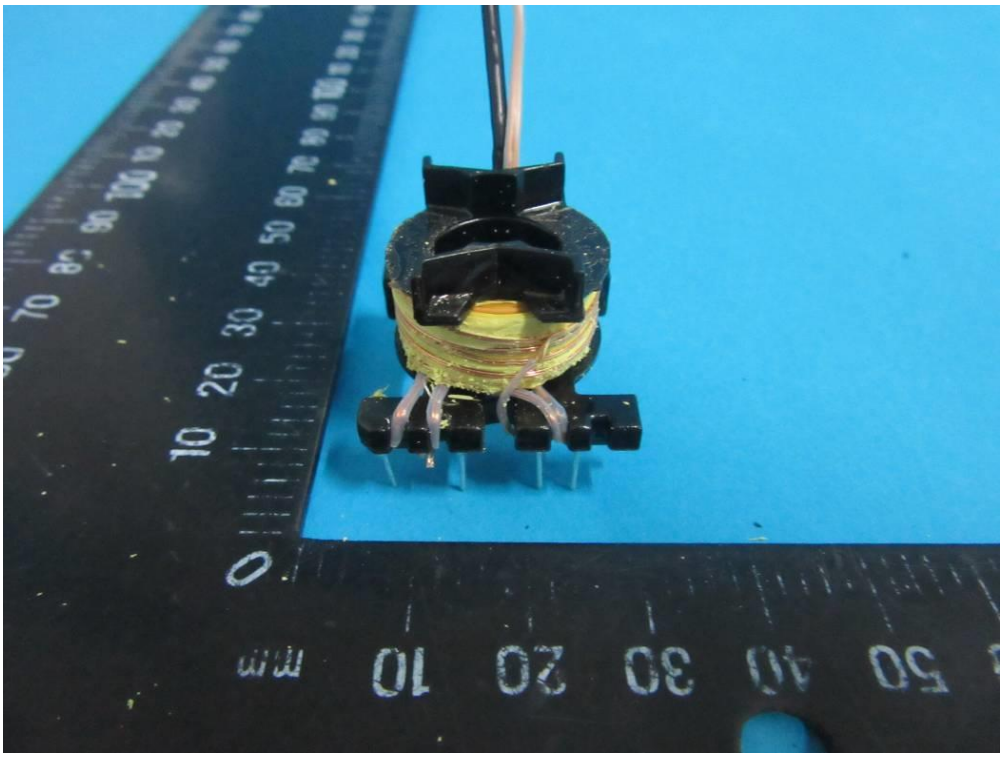
Transformer for GT*96600-*56*** series



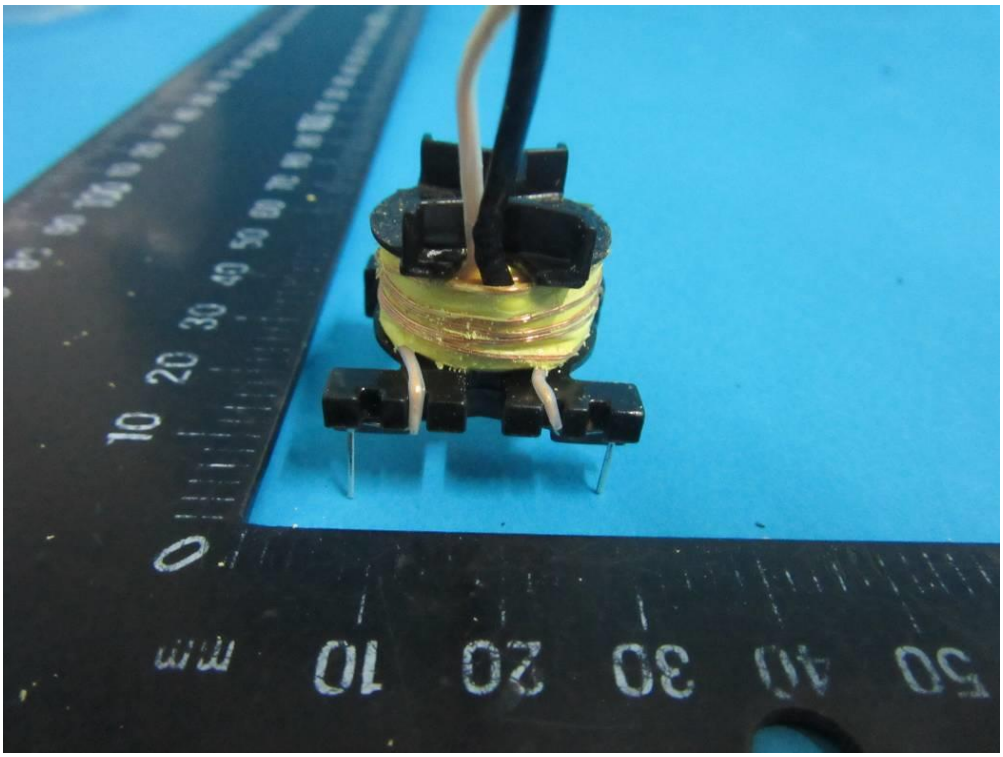
Transformer for GT*96600-*56*** series



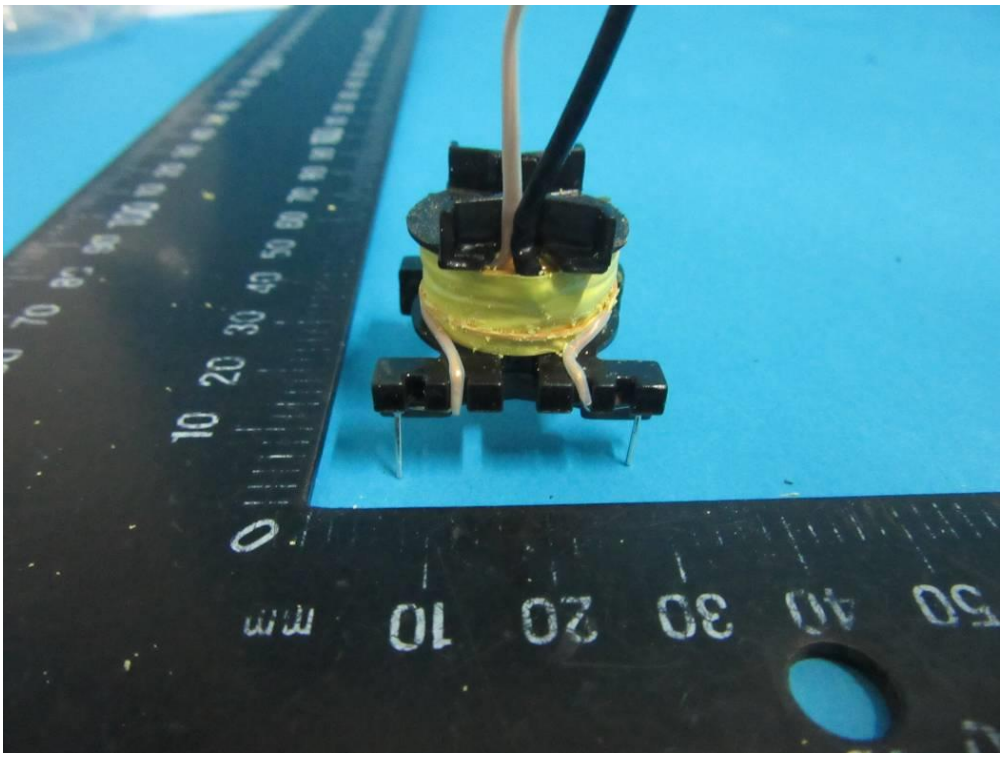
Transformer for GT*96600-*56*** series



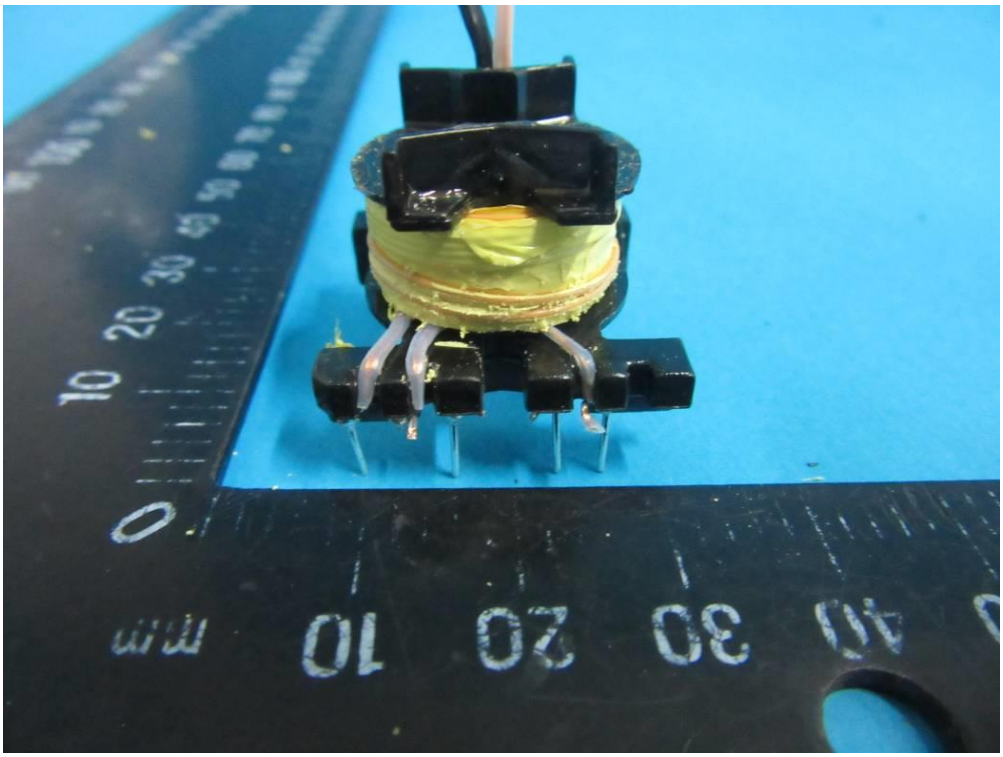
Transformer for GT*96600-*56*** series



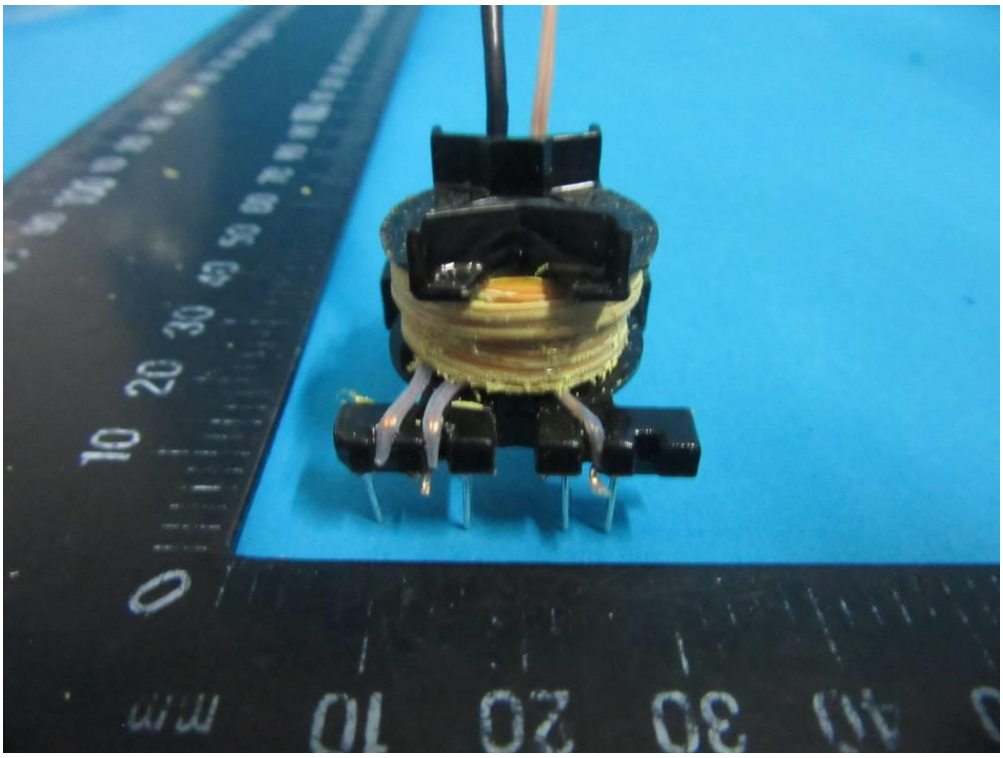
Transformer for GT*96600-*56*** series



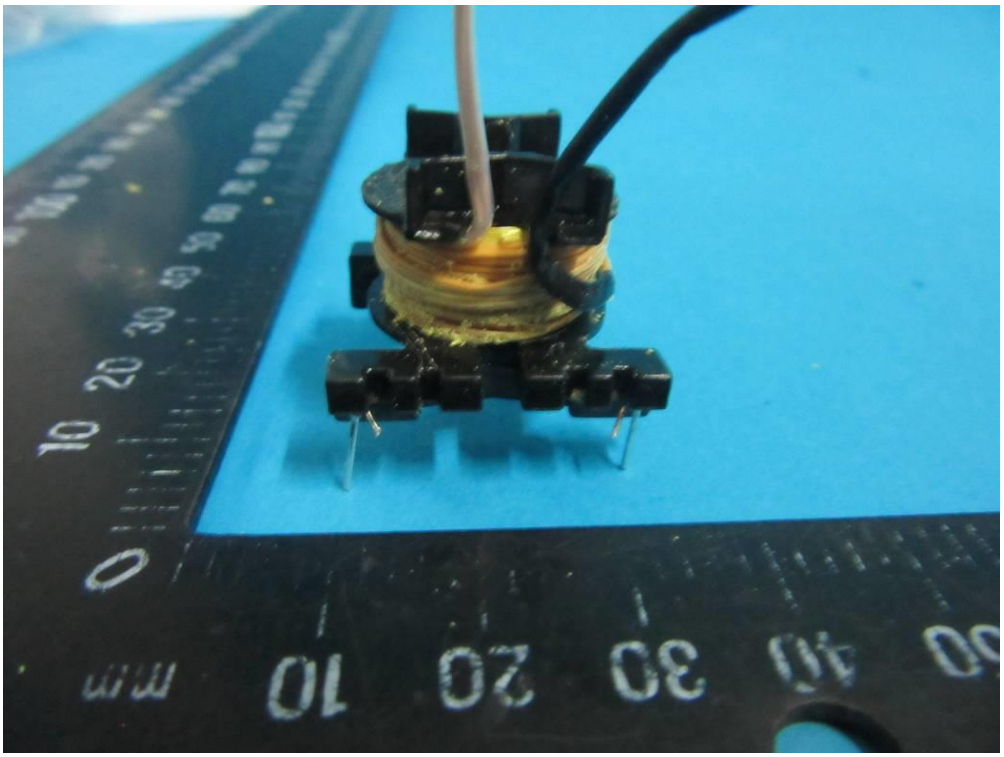
Transformer for GT*96600-*56*** series



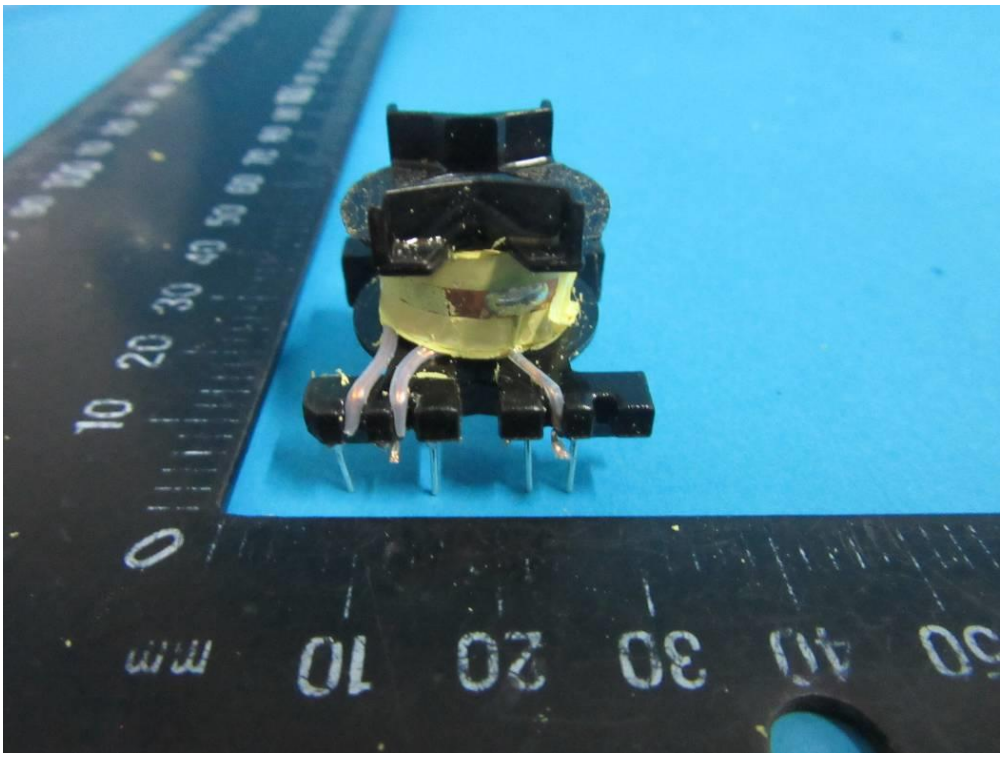
Transformer for GT*96600-*56*** series



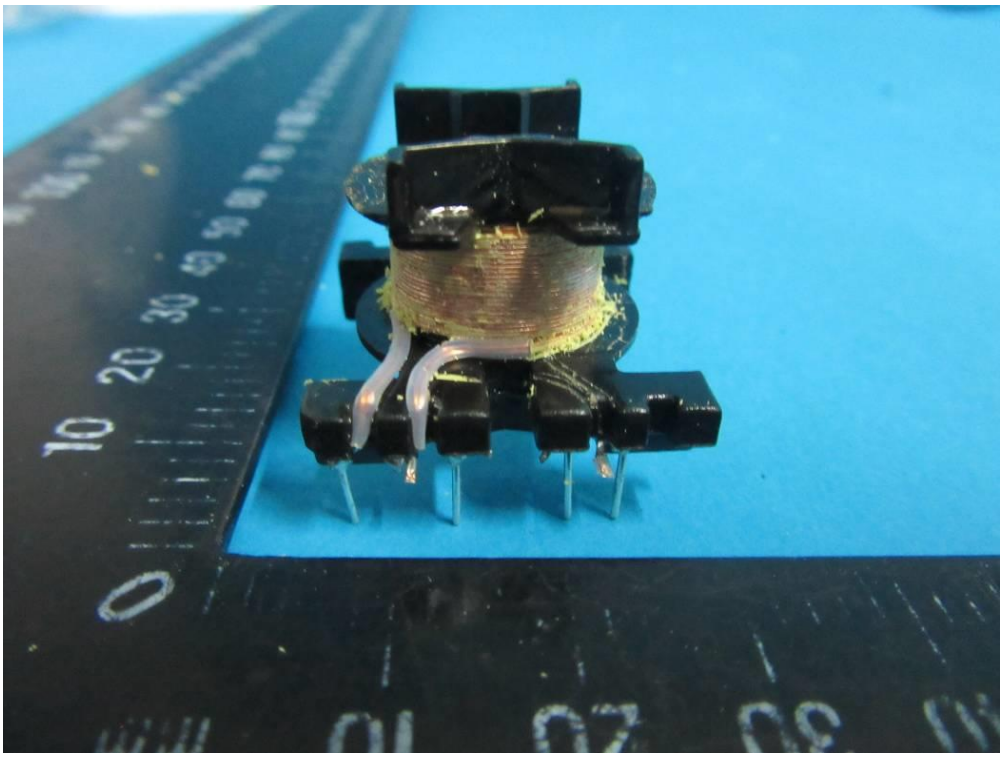
Transformer for GT*96600-*56*** series



Transformer for GT*96600-*56*** series



Transformer for GT*96600-*56*** series



Transformer for GT*96600-*56*** series