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. ..... :	BTEK240302001AS
Version Number. ..... :	V0
Date of issue ..... :	2024-06-06
Total number of pages ..... :	126
Name of Testing Laboratory preparing the Report ..... :	Shenzhen BANTEK Testing Co., Ltd.
Applicant's name ..... :	GlobTek, Inc.
Address ..... :	186 Veterans Dr. Northvale, NJ 07647 USA
Test specification:	
Standard ..... :	IEC 61558-2-16:2021 used in conjunction with IEC 61558-1:2017
Test procedure ..... :	Test report
Non-standard test method ..... :	N/A
TRF template used ..... :	IECEE OD-2020-F1:2021, Ed.1.4
Test Report Form No. ..... :	IEC61558_2_16H
Test Report Form(s) Originator .... :	BTEK
Master TRF ..... :	Dated 2022-08-02

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 testing laboratory. The authenticity of this Test Report and its contents can be verified by contacting the testing laboratory, responsible for this Test Report.

Test item description..... :	ICT/ITE POWER SUPPLY
Trade Mark(s) ..... :	GlobTek, Inc.
Manufacturer ..... :	Same as the applicant
Model/Type reference..... :	GT*96605-G2***** (Refer to page 5 for details)
Ratings..... :	Input: 100-240V~, 50-60Hz or 50/60Hz, 1.5A Output: 3.6-20Vdc, Max. 4.6A, Max. 60W (Refer to page 5 for details)

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
Testing Laboratory:	Shenzhen BANTEK Testing Co., Ltd.	
Testing location/ address ..... :	A5&A6, Building B1&B2, No.45 Gangtou Road, Bogang Community, Shajing Street, Bao'an District, Shenzhen, Guangdong, China 518104	
Tested by (name, signature) ..... :	Cary Gu	Cary Gu
Checked by (name, signature) ..... :	Kobe Yang	
Approved by (name, signature)..... :	Double Lee	

SHENZHEN BANTEK TESTING Co., Ltd. * TESTING *

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

Appendix No. 1: Australia and New Zealand National Differences

Appendix No. 1: Photo documentation

Summary of testing:

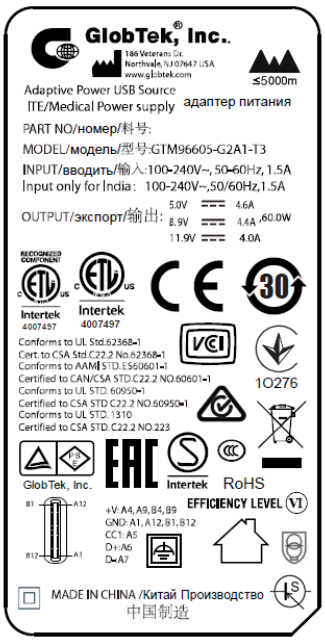
Tests performed (name of test and test clause):	**Testing location:**
The submitted samples were found to comply with the requirements of: - IEC 61558-1:2017 - IEC 61558-2-16:2021 - AS/NZS 61558.1: 2018 +A1: 2020 + A2: 2020 - AS/NZS 61558.2.16: 2022	Shenzhen BANTEK Testing Co., Ltd. A5&A6, Building B1&B2, No.45 Gangtou Road, Bogang Community, Shajing Street, Bao'an District, Shenzhen, Guangdong, China 518104

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

National differences for Australia and New Zealand are considered.

☒ **The product fulfils the requirements of AS/NZS 61558.1: 2018 +A1: 2020 + A2: 2020, AS/NZS 61558.2.16: 2022.**

Copy of marking plate:



Remark: (height of WEEE mark at least 7mm, height of other marks at least 5mm, height of letters and numerals at least 2mm).

According to the EU directives which have been aligned with EU NLF (new legislative framework), both of manufacturer and importer's name and address shall be affixed on the product or, where that is not possible, on its packaging or in a document accompanying the product before the product is placed on the EU market.

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.

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Test item particulars..... :	switch mode power supply units
Classification of installation and use..... :	Class I, Class II and for indoor use only
Supply Connection ..... :	AC 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 ..... :	2024-03-04
Date (s) of performance of tests ..... :	2024-03-05 to 2024-04-01

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.

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

The application for obtaining a 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. Name: GlobTek (Suzhou) Co., Ltd Address: Building 4, No. 76 JinLing East Road, Suzhou Industrial Park, Suzhou, JiangSu, 215021, China 2. Name: GlobTek, Inc. Address: 186 Veterans Dr. Northvale, NJ 07647 USA

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General product information and other remarks:

Product covered by this report is ICT/ITE power supply module.
Power supplies are provided with suitable external enclosure. The top and bottom parts of the enclosure are ultrasonic welded.
All models have the same circuit diagram, PCB layout and transformer.
The power supplies are rated class I or class II or class II units may have an optional functional earth connection.
All the types are designed for continuous operation.
The products are not intended to be used in maximum ambient temperature exceed of 40 °C.
The products are not intended to use in environment which altitude exceed 5000m.

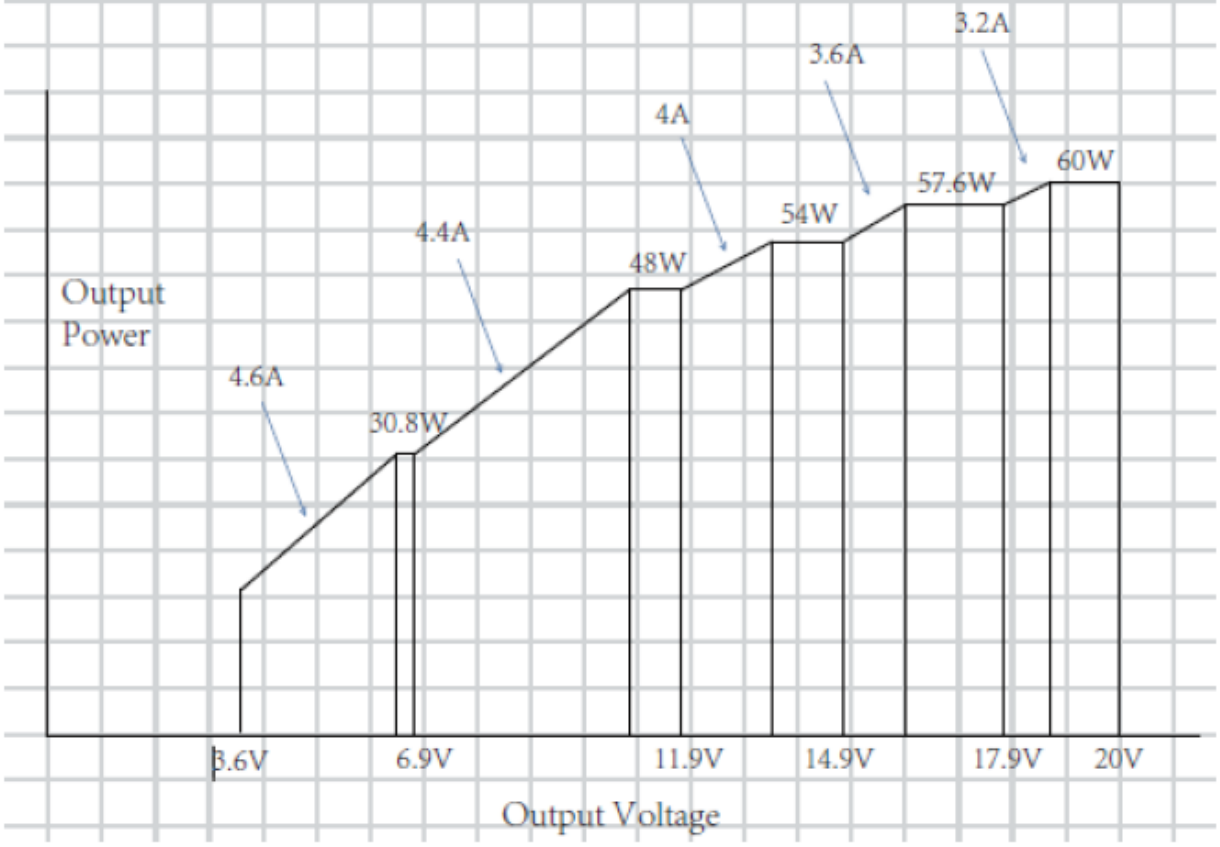
Model Similarity:

GT*96605-G2*****
The 1st "*" part can be 'M' or '-' or 'H' for market identification and not related to safety.
The 2nd "*" can be A1, A2, A3 or any words for market use.
The 3th "*" denotes blank or the rated output wattage designation, which can be "01" to "60", with interval of 0.1W.
The 4th "*" =-T2 means desktop class II with C8 AC inlet.
=-T2A means desktop class II with C18 AC inlet.
=-T3 means desktop class I or class II with functional earth with C14 AC inlet.
=-T3A means desktop class I or class II with functional earth with C6 AC inlet.
=-T3F means desktop class I or class II with functional earth with C14 AC inlet with FLOATING OUTPUT.
=-T3AF means desktop class I or class II with functional earth with C6 AC inlet with FLOATING OUTPUT.
=-R2 means hybrid desktop housing class II with C8 AC inlet.
=-R3A means hybrid desktop housing class I or class II with functional earth with C6 AC inlet.
=-R3AF means hybrid desktop housing class I or class II with functional earth with C6 AC inlet with FLOATING OUTPUT.
The 5th "*" can be blank or -RA. -RA denotes the Product with RIGHT ANGLE daughter board (no output cord); blank denotes the product with output cord.
The last * denote any six character = 0-9 or A-Z or ()[] or – or blank for marketing purposes.
The whole series output will be any one voltage/current combinations (Power Profiles), between 3.6V and 20V.

Model list:

MODEL	Input	Output voltage	Output current	Output wattage
GT*96605-G2**-T2/T2A/T3/T3A/T3F/T3AF/R2/R3A/R3AF**	100-240VAC, 50-60Hz or 50/60Hz, 1.5A	3.6V - 6.9V	4.6A	30.8W
		7.0V - 11.9V	4.4A	48.0W
		12.0V - 14.9V	4.0A	54.0W
		15.0V - 17.9V	3.6A	57.6W
		18.0V - 20.0V	3.2A	60.0W

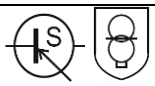
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Model GT*96605-G2**-R3A(6.7VDC, 4.6A) and GT*96605-G2**-R3A(20.0VDC, 3.0A) were chosen to perform all tests.

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

8	**MARKING AND OTHER INFORMATION**		P
8.1	Transformers shall be marked with the following (for symbols see Table 1):		P
	a) rated supply voltage(s) or the rated supply voltage range(s) (V) .....:		P
	b) rated output voltage(s) (V or kV) .....:		P
	c) rated output (VA, kVA, or W) .....:		P
	d) rated output current(s) (A or mA) .....:		P
	e) rated supply frequency(ies) (Hz) .....:		P
	f) rated power factor (if not 1) .....:		N/A
	g) symbol AC for alternating current, or DC for direct current-output		P
	h) relevant graphical symbols shown in Table 101 that indicate the kind of transformer in addition with the symbol for SMPS. (IEC 61558-2-16: 2021)		P
	i) name or trademark of the manufacturer or responsible vendor		P
	j) model or type reference		P
	k) vector group in accordance with IEC 60076-1 for three phase transformer		N/A
	l) symbol for class II construction		P
	symbol for class III construction		N/A
	m) indication of the protection index IP	IP20	P
	n) rated maximum ambient temperature *ta*, if other than 25 °C .....:		P
	o) rated minimum ambient temperature *ta*min, if lower than +10 °C and if a temperature sensitive device is used		N/A
	p) duty cycle, if any, unless the operating time is limited by the construction of the transformer or corresponds to the operating conditions specified in the relevant part of IEC 61558-2.		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
	- short-circuit voltage (% rated supply voltage) for stationary transformers > 1000 VA		N/A

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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		P
8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
8.3	Adjusted voltage easily and clearly discernible		N/A
8.4	For each tapping or winding: rated output voltage and rated output		N/A
	necessary connections clearly indicated		N/A
8.5	For non-short-circuit proof transformers or non-inherently short-circuit proof transformers designed to be protected by fuses shall be marked:		P
	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
	For non-short-circuit proof transformers or non-inherently short-circuit proof transformers designed to be protected with protective devices other than fuses shall be marked:	non-replaceable protective devices	N/A
	Manufacturer's models or type reference of the protective device, and/or the ratings of the protective device		N/A
	Instruction sheet for transformers with replaceable protective device (other than fuses) information with information about the replacement.		N/A
8.6	Terminals for neutral: "N"		N/A
	Terminal for protective earth marked with earthing symbol		P
	Identification of input terminals:		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
8.9	Transformer for indoor use shall be marked with the relevant symbol.		P
8.10	Symbol for Class II construction not confused with manufacturer's name or any other identification		P

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Class II transformer with parts to be mounted – delivered with all parts for class II after mounting.		N/A
	Symbol for class II transformer placed on the part which provides class II.		P
8.11	Correct symbols:		P
	Volts	V	P
	Amperes	A (mA)	P
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	P
	Hertz	Hz	P
	Input	PRI	P
	Output	SEC	P
	Direct current	d.c. (DC) or ⎓	P
	Neutral	N	N/A
	Single-phase a.c.	~	P
	Three-phase a.c.	3 ~	N/A
	Three-phase and neutral a.c.	3N ~	N/A
	Power factor	cos φ	N/A
	Class II construction	⧈	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	▭	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 chassis (or core terminal)	⏚	N/A

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Protective earth (ground)		P
	IP number	IP20	P
	Earth (ground or functional earth)		P
	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.		P
	Additional Symbols (IEC 61558-2-16:2021)		P
	SMPS (Switch mode power supply unit)		P
	SMPS incorporating a Fail-safe separating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof separating transformer		N/A
	SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe safety isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof safety isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof safety isolating transformer (inherently or non-inherently)		P
	SMPS incorporating a Fail-safe auto-transformer		N/A

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	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
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		N/A
	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):		P
	For non-inherently short-circuit proof transformers with non-self-resetting or non-replaceable devices and non-replaceable intentional weak parts: The device cannot be reset or replaced after a short-circuit or an overload		P
	For transformers generating a protective earth conductor current greater than 10 mA and are intended for permanent connection The installation shall be made according to the wiring rules.		N/A
	For stationary transformers exceeding 1000 VA: The short circuit voltage expressed as a percentage of the rated supply voltage		N/A
	The electrical function of the transformer		N/A

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	the limiting temperature of the winding under abnormal conditions which shall be respected when the transformer is built into an appliance as information for appliance design;		N/A
	For transformers not designed for series and/or parallel connection with more than one output winding, not for series or 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.		P
9	**PROTECTION AGAINST ELECTRIC SHOCK**		P
9.1	General		P
	Transformers shall be enclosed and provided with adequate protection against contact with hazardous-live-parts and shall have no risk of an electric shock from stored charge on capacitors.		P
9.2	Protection against contact with hazardous-live-parts		P
9.2.1	Determination of hazardous-live-parts		N/A
9.2.1.1	A live part is not a hazardous-live-part if it is separated from the supply by double or reinforced insulation and the requirements of 9.2.1.2 or 9.2.1.3 are met when the transformer is supplied at rated supply voltage		P
9.2.1.2	The voltage shall not exceed 35 V AC peak or 60 V ripple free DC.		P
9.2.1.3	Where the voltage exceeds 35 V (peak) AC or 60 V ripple free DC, the touch current shall not exceed:		N/A
	- for AC. 0,7 mA (peak)		N/A
	- for DC. 2,0 mA		N/A
	In addition, when a capacitor is connected to live parts:		N/A
9.2.1.3.1	The discharge shall not exceed 45 µC for stored voltages between 60 V and 15 kV, or		P
9.2.1.3.2	The energy of discharge shall not exceed 350 mJ for stored voltages exceeding 15 kV.		N/A
9.2.2	Accessibility to hazardous-live-parts		P

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Transformers shall be constructed to provide adequate protection against accessibility to hazardous-live-parts.		P
	Class I and II transformers shall be so constructed and enclosed that there is adequate protection against accidental contact with hazardous-live-parts.		P
	For class I transformers, accessible parts shall be separated from hazardous-live-parts by at least basic insulation.		N/A
	Class II transformers shall be so constructed and enclosed that there is adequate protection against accessibility to basic insulation and to conductive parts separated from hazardous-live-parts by basic insulation only.		N/A
	Only parts separated from hazardous-liveparts by double or reinforced insulation may be accessible		P
	Hazardous-live-parts shall not be accessible after removal of detachable parts except for		N/A
	- lamps having caps larger B9 and E10		N/A
	- type D fuse holder		N/A
	IP00 transformers shall comply with the end product standard after incorporation in the end product.		N/A
	The insulating properties of lacquer, enamel, paper, cotton, oxide film on conductive parts and sealing compound shall not be considered as giving the required protection against accidental contact with hazardous-live-parts with the exception of fully insulated winding wire (FIW).	Such substance not used	N/A
	Shafts, handles, operating levers, knobs and the like shall not be hazardous-live-parts.	No such Part	N/A
	Compliance is checked by inspection and by the relevant tests of IEC 60529.		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		N/A
	hazardous live parts shall not be touchable with the test pin		P
9.2.3	Accessibility of non-hazardous live parts		P

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Non-hazardous live parts of the output circuit isolated from the input circuit by double or reinforced insulation may be accessible under the following conditions:		P
	- for no-load output voltages not exceeding 35 V peak AC or 60 V ripple-free DC, both poles may be accessible;		P
	- for no-load output voltages exceeding 35 V peak AC or 60 V ripple-free DC and not exceeding 250 V AC, only one of the poles may be accessible.		N/A
9.3	Protection against hazardous electrical discharge		P
	Transformers with primary supply plug: 1 s after the interruption of the supply the voltage between the pins do not exceed 35 V (peak) AC or 60 V ripple free DC		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) AC. or 60 V ripple free DC.		N/A
	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 DC, the discharge must be ≤ 45 µC.		N/A
10	**CHANGE OF INPUT VOLTAGE SETTING**		P
	Transformers with more than one rated supply voltage shall be so constructed that the voltage setting cannot be changed without the aid of a tool.	Cannot be changed	N/A
	Transformers which can be set to different rated supply voltages:		N/A
	- The indication of voltage for which the transformer is set is discernible on the transformer.		N/A
10.101	A wide range (e.g. 100 V AC to 240 V AC) of supply voltage is allowed (IEC 61558-2-16: 2021)		P
	- if the output voltage does not exceed the rated output voltage		P
	- if the no-load output voltage does not exceed the limits of the 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 the output voltage: AC≤ 10%; DC≤ 15%		N/A

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	b) inherently short-circuit proof transformers with more than one rated output voltage for the highest output voltage: AC⩽10%; DC⩽15%		N/A
	c) inherently short-circuit proof transformers with more than one rated output voltage for the other output voltages: AC⩽15%; DC⩽20%		N/A
	d) other transformers for the output voltages: AC⩽5%; DC⩽10%		P
11.2	If a transformer is marked with the rated output, the rated output voltage, the rated output current, and the rated power factor, these values shall be substantially in agreement with each other.		N/A
	If no rated output current is assigned to the transformer, the rated output current for the purpose of this specification can be calculated from the rated output and the rated output voltage.		N/A
12	**NO-LOAD OUTPUT VOLTAGE (IEC 61558-2-16:2021)**		P
	Remark: with rectifier measuring on both sides of the rectifier if they are accessible to the user	The rectifier is not accessible to the user	P
12.101	The no load output voltage shall not exceed :		P
	- For SMPS incorporating separating or auto-transformers: 1000V AC. or 1415 V ripple free DC		N/A
	- For SMPS including isolating transformers: 500 V AC. or 708 V ripple-free DC		N/A
	- For SMPS including safety isolating transformers: 50 V AC. or 120 V ripple-free DC		P
	For independent SMPS incorporating separating transformers, isolating transformers or auto-transformers: 50 V AC. or 120 V ripple-free DC		P
	For independent SMPS, this output voltage limitation applies even when output windings, not for interconnection, are connected in series		N/A
	The requirement for series connection does not apply to associated or IP 00 SMPS		N/A
12.202	The difference between no-load output voltage and the output voltage measured in clause 11 does not exceed the values of table 102	(see appended table)	P
12.103	Unless otherwise specified by the manufacturer, SMPS shall be tested with 20 cm to 200 cm length of wire connected to the output terminals under the most unfavourable conditions. Twisted wires or cables rated in accordance with IEC 60227-5:2011 (type 60227 IEC 53) may be used. The cross sectional area of the conductors shall be determined in accordance with the rated output current of the SMPS, and the current density shall not exceed 5 A/mm^2 in normal use.		P

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
13	**SHORT-CIRCUIT VOLTAGE**		N/A
	The short-circuit voltage measured shall not deviate by more than 20 % from the value marked.		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		P
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings		N/A
	Upri (V): 1,1 times rated supply voltage loaded with rated impedance – for independent transformers	90Va.c. and 264Va.c. (as required by applicant)	P
	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		N/A
	Max. temperature windings ……:	(see appended table)	P
	- Class A: 100 °C		N/A
	- Class E: 115 °C		N/A
	- Class B: 120 °C		P
	- Class F: 140 °C		N/A
	- Class H: 165 °C		N/A
	- other classes		N/A
	Temperature of external enclosures of stationary transformers:		N/A
	- bare metal: 65 °C		N/A
	- metal covered by lac or varnish: 70 °C		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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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 and terminals of switches 70 C		N/A
	Temperature of internal and external wiring:		N/A
	- rubber: 65 °C		N/A
	- PVC: 70 °C		P
	Temperature of parts where safety can be affected:		N/A
	- rubber: 75 °C		N/A
	- phenol-formaldehyde: 105 °C		N/A
	- urea-formaldehyde: 85 °C		N/A
	- impregnated paper and fabric: 85 °C		N/A
	- impregnated wood: 85 °C		N/A
	- PVC, polystyrene and similar thermoplastic material: 65 °C		N/A
	- varnished cambric: 75 °C		N/A
	Temperature rise of supports 85 °C		P
	Temperature of printed boards:	T=130°C	P
	- bonded with phenol-formaldehyde: 105 °C		N/A
	- melamine-formaldehyde: 105 °C		N/A
	- phenol-furfural: 105 °C		N/A
	- polyester: 105 °C	130°C rating PCB used (UL approved)	P
	- bonded with epoxy: 140 °C		N/A
	Electric strength between input and output windings (18.3, 1 min); test voltage (V) ……:	3000V 1min	P
14.101	Winding temperature measured by thermocouples at the surface of the winding (IEC 61558-2-16: 2021)		P
	- if the internal frequencies is > 500Hz		P
	- the values of Table 2 for windings temperatures are reduced by 10°C		P
14.102	SMPS shall be tested at 0,9 times and 1,1 times the rated supply voltage	100Vx0.9=90V 240Vx1.1=264V	P
14.2	Application of 14.1 or 14.3 according to the insulation system		P

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
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 Cycling test (10 cycles):		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 less than 30%		N/A
	- insulation resistance acc. cl.18.1 and 18.2		N/A
	- electric strength, no breakdown (18.3 and 18.4); 2 min; test voltage 35% of specified value		N/A
	- Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A
15	**SHORT-CIRCUIT AND OVERLOAD PROTECTION**		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	P
	Transformer with rectifier tests of 15.2 and 15.3 at the input and the output terminals of the rectifier.		N/A
	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

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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)	Protected, no high temperature	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)		P
	- 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)		P
	- Test according 15.3.5: max. temperature of winding (insulation class): 175 °C (A); 190 °C (E); 200 °C (B); 215 °C (F); 235 °C (H)		P
	Max. temperature of external enclosures (accessible by test finger) 105 °C		P
	Max. temperature of insulation of wiring (rubber and PVC) 85 °C		N/A
	Temperature rise of supports 105 °C		P
15.1.2	Alternative short circuit and overload test method		N/A
	The manufacturer may choose to apply any of the following methods described in 14.1.2.1 and 14.1.2.2. These test procedures are according to IEC 60076-11:2004, 23.2.1 and 23.2.2		N/A
15.2	Inherently short-circuit proof transformers		N/A
	Inherently short-circuit proof transformers are tested by short-circuiting the output windings until steady-state conditions are reached		N/A
15.3	Non-inherently short-circuit proof transformers		P
	Non-inherently short-circuit proof transformers are tested as follows		P
15.3.1	Output terminals short-circuited: protection device operates, test at 0,9 … 1,1 of the rated supply voltage	1) short-circuit after 14.2 at hot condition, electronic circuit protected immediately 2) short-circuit at cold condition, electronic circuit protected immediately	P

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Clause	Requirement + Test	Result - Remark	Verdict
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 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	(see appended table)	P
	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		N/A
	- Upri (V): 1,1 times rated supply voltage ……...:		N/A
	- Isec (A): 1,5 times rated output current ……..:		N/A
	- time until steady-state conditions t1 (h) ……:		N/A
	- 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 breakdown for primary-to-secondary only for safety isolating, isolating and separating transformer and for primary-to-body for all kinds of transformer		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- bare hazardous live parts not accessible by test finger through holes of enclosure		N/A
15.101	Electronic circuits shall be so designed and applied that a fault condition within the SMPS will not cause electric shock, or fire hazard, and unintentional operation of the appliance will not impair safety.	(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		N/A
	- handles, levers, etc. have not moved on shafts		N/A
16.2	Stationary transformers		N/A
	3 blows, impact energy 0,5 ±0,05 J		N/A
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		P
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 times, x ≤ 250 g; 25 times, 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		P
	a) The test is carried in a tumbling barrel as described in IEC 60068-2-31.		P
	- 1000 times: x ≤ 100 g; 500 times: 100 g< x ≤ 200 g; 200 times: g< 100 x		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- pull force according to IEC 60884-1:2002, 24.10 for each pin		P
	b) torque test of the plug pins with 0,4 Nm		P
16.5	Additional requirements for transformers to be used in vehicles and railway applications		N/A
16.5.1	Transformers to be used in vehicles and railway applications		N/A
	An test according IEC 61373 shall be performed with conditions of Table 8 and Table 9 and the frequency values depending on the weight of the specimen are defined in Table 10	N/A	
16.5.2	Test requirements for the transportation of transformers		N/A
	Shock and vibration testing requirements for transformers subjected to while being transported per IEC 60721-3-2 with conditions according to Table 11 and Figure 8.		N/A
17	**PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE**		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		P
	- fixed transformer mounted as in normal use by the tests according to 17.1.2 A to J		N/A
	- portable transformers placed in the most 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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;		P
	c) no deposit of talcum powder in dust-proof transformers		N/A
	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 inside the enclosures of drip-proof, spray-proof, splash-proof and jet-proof transformers, which may impair safety		N/A
	g) no trace of water entered in any part of water-tight transformer		N/A
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 with C)		N/A
	E) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	F) Rain-proof transformers (IPX2) test according to fig. 3 of IEC 60 529 for 10 min in operation, any angle up to 15°		N/A
	G) Spray proofed transformers (IPX3) test according to fig. 4 of IEC 60 529 for 10 min in operation and 10 min switched off , time for complete oscillation (2 x 120°) is 4 sec.		N/A
	H) Splash-proof transformers (IPX4) test according to fig. 4 of IEC 60 529 (see F) for 10 min in operation and 10 min switched off (the tube shall oscillate ≈360)		N/A
	I) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)		N/A
	J) Powerful Jet-proof transformer (IPX6) test according to fig. 6 of IEC 60 529 (nozzle 12 mm)		N/A
	K) Watertight transformers (IPX7)		N/A
	L) Pressure watertight transformers (IPX8)		N/A
17.2	After moisture test (48 h for IP20, 168 h for other transformers):	40°C, 93%R.H. 120hours	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 MΩ		N/A
	- live parts and body for reinforced insulation ⩾ 7 MΩ	＞100MΩ	P
	- input circuits and output circuits for basic insulation ⩾ 2 MΩ		N/A
	- input circuits and output circuits for double or reinforced insulation ⩾ 5 MΩ	＞100MΩ	P
	- each input circuit and all other input circuits connected together ⩾ 2 MΩ		N/A
	- each output circuit and all other output circuits connected together ⩾ 2 MΩ		N/A
	- hazardous live parts and metal parts with basic insulation (Class II transformers) ⩾ 2 MΩ		N/A
	- conductive parts of class II transformers which are separated from hazardous-live parts by basic insulation only, and the body ⩾ 5 MΩ		N/A
	- metal foil in contact with inner and outer surfaces of insulating enclosures ⩾ 7 MΩ		P

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
18.3	Electric strength test (1 min): no flashover or break-down:		P
	Overvoltage category ……..:	II	P
	1) functional insulation; working voltage (V); test voltage (V) ……..:		N/A
	2) basic insulation; working voltage (V); test voltage (V) ……..:	Working voltage: 240V Test voltage: 1500V	P
	3) supplementary insulation; working voltage (V); test voltage (V) ……..:		N/A
	4) double or reinforced insulation……..:	Working voltage: 240V Test voltage: 3000V	P
	5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V)		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
18.3.1.101	For transformers incorporated in an SMPS in accordance with Annex BB, a partial discharge type test in accordance with Annex AA shall be performed		N/A
18.4	Does not apply (IEC 61558-2-16:2021)		P
18.101	SMPS shall fulfil the impulse dielectric test in accordance with Annex R of IEC 61558-1:2017		P
	After the test of 18.3, the SMPS shall be connected to the impulse test equipment. The impulse dielectric test shall be carried out in accordance with Annex R of IEC 61558-1:2017 between the input and output terminals of the SMPS. The interval between the impulses shall be at least 1 s if the impulses are produced inside the SMPS.	4923V at sea level	P
	During the test, there shall be no breakdown of the insulation between turns of a winding, between input and output circuits, between adjacent input or output circuits, or between the windings and any conductive core		P
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).		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.	Max. 0.262mA	P
	switches n and e in on position		P
	switch n: off and switch e: on		P
	switch n: on and switch e: off		P
18.5.3	Protective earthing conductor current		N/A
	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	Plug connected auto-transformers where the rated input voltage is higher than the rated output voltage, shall not have any potential to protective earthing at the output socket higher than the rated output voltage.		N/A
19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction shall be given for not using such a transformer with a nonpolarized 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
	- All tests are repeated under fault conditions of H.3.3. The potential to earth does not exceed 1,1 times the max output voltage for more than 5 s.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- for class I transformers, the insulation between the input / output winding and the body shall consist of at least basic insulation (rated for the working voltage)		N/A
	- for class II transformers, the insulation between the input / output winding and the body shall consist of double or reinforced insulation (rated for the working voltage).		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 transformer		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 transformer		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 transformer the insulation between input and output windings via the intermediate conductive parts consist of basic insulation		N/A
	For class II transformer 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 relevant equipment standard		N/A
19.1.4	Isolating transformers and safety isolating transformers		P

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.4.1	Input and output circuits electrically separated		P
	No possibility of any connection between these circuits		P
19.1.4.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.4.4)		P
	Class I transformers not intended for connection to the mains by a plug:		N/A
	- Insulation between input windings and body connected to earth consist of basic insulation (rated for the input voltage)		N/A
	- Insulatio between output windings and body, connected to earth consist of basic insulation rated (rated for the output voltage)		N/A
	Class I transformers intended for connection to the mains by a plug:		P
	- 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 for the input voltage)		P
	- Insulation between output windings and body consist of double or reinforced insulation (rated for the output voltage)		N/A
19.1.4.3	For transformers with intermediate conductive parts not connected to the body (between input/output):		N/A
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 for the working voltage)		P
	- 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 for the input voltage and output voltage), for SELV circuits only basic insulation is required.		P

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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 for 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 and 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, not 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
	For transformers for connection to the mains by the means of a plug of any type (incorporating or not), the alternative with basic insulation plus protective screening is not allowed.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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.	The protective earth connecting to the CY1 secondary pin, meeting the supplementary insulation between the output circuit and protective earth	P
19.1.4.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard) or when 19.8 is fulfilled.		P
19.1.4.7	The distance between input and output terminals for the connection of external wiring is ≥ 25 mm		P
19.1.4.8	Portable transformers having an rated output ≤ 630 VA shall be class II.		P
19.1.4.9	No connection between output circuit and body except of associated transformers (allowed by equipment standard)		P
19.1.4.10	Protective screening is not allowed for transformers with plug connection to the mains		N/A
19.2	Flammability of materials		P
	Materials known to be highly flammable, such as celluloid, shall not be used in the construction of transformers.	Such substance not used	P
	Cotton, silk, paper and similar fibrous material shall not be used as insulation, unless impregnated.		P
	Wax and similar impregnators shall not be used, unless suitably restrained from migration		P
	Wood, even if impregnated, shall not be used as supplementary or reinforced insulation		P
19.3	Short-circuit characteristics of portable transformers		P
	Portable transformer: short-circuit proof or fail-safe	Short-circuit proof	P
19.4	Class II transformer contact prevention of accessible conductive parts		P
	There shall be provisions to prevent contact between accessible conductive parts and conduits or metal sheaths of supply wiring for class II transformers.	No conduit or metal sheath of supply wiring	N/A
19.5	Class II transformer insulation reassembling after service		P
	Parts of class II transformers serving as supplementary insulation or reinforced insulation which might be omitted during reassembly after servicing, shall either:		P
	- be fixed in such a way that they cannot be removed without being seriously damaged; or		P
	- be so designed that they cannot be replaced in an incorrect position and that, if they are omitted, the **transformer** is rendered inoperable or is manifestly incomplete		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Sleeving may, however, be used as **supplementary insulation** on internal wiring, if it is retained in position by positive means.		N/A
19.6	Loosening of wires, screws or similar parts		P
	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 less than 50% specified values (Cl. 26)	No this parts	N/A
19.7	Resistor or capacitor connection with accessible conductive parts		N/A
	Conductive parts connected to accessible metal parts by resistors or capacitors shall be separated from hazardous live parts by double or reinforced insulation		N/A
19.8	Bridging of separated conductive parts by resistors or capacitors		P
	Resistors or capacitors connected between hazardous live parts and the body (accessible metal parts) consist of:		P
	- components according to IEC 60 065, 14.2 or capacitor Y2 according to IEC 60 384-14	Approved Y2 capacitor used	P
	- at least two separate components		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	Insulating material separating input and output windings		N/A
	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	Accidental contact protection against hazardous-live-parts provided by isolating coating		N/A
	Protection against accidental contact by insulating coating:		N/A
	a) ageing test (IEC 60068-2-14), test Na: 168 h; 70± 2℃		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. 18.3		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.11	Insulating material of handles, operating levers, knobs and similar parts		N/A
	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	Winding 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		N/A
	- of parts of windings or of internal wiring in case of rupture or loosening		N/A
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
	- in case of cheekless bobbins the end turns of each layer shall be prevented from being displaced		N/A
19.12.3	Insulated winding wires, in an insulation system providing basic, supplementary or reinforced insulation, shall meet the following requirements.	Approved TIW used	P
	• 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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	• the finished component pass routine test for 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	Approved triple insulated winding wire	P
	• three layers		P
	• relevant dielectric strength test of 18.3		P
	Where the insulated winding wire is wound:		P
	• upon metal or ferrite cores		N/A
	• 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 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

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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 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
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
	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:		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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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
	• 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
19.13	Fixing of handles, operating levers and similar parts		N/A
	Handles, operating levers and similar parts shall be fixed in a reliable manner so that they will not become loose as a result of heating, vibration, etc. which may occur in normal use.	No such part	N/A
19.14	Fixing of covers providing protection against electric shock		P
	Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool	Ultrasonic pressing	N/A
19.15	Strain on fixed socket-outlets caused by pin-transformers connection		P
	Transformer with pins for fixed socket-outlets: no strain on socket-outlet		P
	Additional torque ≤ 0,25 Nm		P
19.16	Portable transformers for use in irregular or harsh conditions		N/A
	Portable transformers for use in irregular or harsh conditions		N/A
	Portable transformers having a weight not exceeding 18 kg shall have a protection index IPX4 or higher.		N/A
19.17	Drain hole of transformers protected against ingress of water		N/A
	Transformers having a protection index from IPX1 up to and including IPX6 shall have an effective drain hole at least 5 mm in diameter or 20 mm^2 in area, with a width of at least 3 mm.		N/A
	The drain hole is not required if the transformer, including its windings and core and all uninsulated live parts, are completely embedded in a potting material.		N/A
19.18	Plug connected transformers protected against ingress of water		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Transformers classified for a protection index higher than IPX1 and having a cord provided with a plug; it shall be a moulded-on plug.		N/A
19.19	Flexible cable or flexible cord connection for class I portable transformers		N/A
	Class I transformers with a non-detachable flexible cable or cord with earth conductor and a plug with earth contact		N/A
19.20	SELV- and PELV-circuit separation of live parts		P
	Live parts of SELV- and PELV-circuits shall be electrically separated from each other and from other circuits	Only one SELV-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		P
	Nominal voltage (V) > 25 V a.c. or 60 V d.c., the required insulation fulfils the high voltage test according to table 14		N/A
19.20.2	PELV-circuits double or reinforced insulation is necessary		N/A
19.21	Protection against contact for FELV-circuit		N/A
	FELV-circuits: protection against contact fulfils the min. test voltage required for the primary circuit		N/A
19.22	Protective earthing regarding class II transformers		N/A
	Class II transformers shall not be provided with means for protective earth		N/A
	A class II transformer intended for looping-in may have an internal terminal for maintaining the electrical continuity of a protective earthing conductor not terminating in the transformer, provided that the terminal is insulated from the accessible conductive parts by class II insulation.		N/A
19.23	Protective earthing regarding class III transformers		N/A
	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, capacitor and 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

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Clause	Requirement + Test	Result - Remark	Verdict
	Testing of components separately to the transformer according the relevant standard:		P
	- Ratings of the component in line with the transformer ratings, including inrush current. Component test according the component standard, based on the component marking (rating).		P
	- Components without markings tested under transformer conditions including inrush current.		P
	- If no IEC standard exists, the component is tested under transformer conditions.		P
20.2	Appliance couplers for main supply shall comply with:		P
	- IEC 60 320 for IPX0		P
	- IEC 60320-2-3 or IEC 60309 for other		N/A
20.3	Automatic controls shall comply with IEC 60730-1	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 switch	N/A
	Disconnection from the supply:	AC inlet	P
	- by a switch, disconnecting all poles of the supply (full disconnection under the relevant overvoltage category)		N/A
	- or a flexible supply cable and cord with plug		N/A
	- or an instruction sheet: disconnection by all-poles switches incorporated in fixed wiring		N/A
20.6	Socket-outlets of the output circuit shall be such that there is no unsafe compatibility to plugs complying with input circuit.		N/A
	SELV plug and socket-outlets shall comply with IEC 60 884-2-4 and IEC 60 906-3		N/A
	Plugs and socket-outlets for SELV systems with both a rated current ≤3A and a rated voltage ≤ 24 VAC or 60VDC with a power not exceeding 72W are allowed to comply only with following:		N/A
	- It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	- Socket outlets do not accommodate plugs of other standardised voltage systems		N/A
	- Socket outlets do not have a protective earth contact		N/A
	PELV plug and socket-outlets shall comply with following:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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, thermal links, overload relays, fuses and other overload protective devices shall 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
	For fuses according IEC 60127 and IEC 60269, the fuse current does not exceed 1,1 times of the rated value		P
20.8	Thermal cut outs shall meet the requirements of 20.8.1.1 and 20.8.2, or 20.8.1.2 and 20.8.2.		N/A
20.8.1	Requirements according to IEC 60730-1		N/A
20.8.1.1	Thermal cut-out tested as component shall comply with IEC 60 730-1		N/A
	a) Thermal cut outs type 1 or type 2 (see 6.4 of IEC 60730-1:2013)		N/A
	b) Thermal cut outs fulfil the requirements of micro-interruption (type 1.C or 2.C) or micro-disconnection, (type 1.B or 2.B) (see IEC 60730-1:2013)		N/A
	c) Thermal cut outs with manual 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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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:		N/A
	1) nature of supply to IEC 60730-1:2013, cl. 6.1		N/A
	2) type of load controlled to IEC 60730-1:2013, cl. 6.2		N/A
	3) degree of protection IPX0 to IEC 60730-1:2013, cl. 6.5.1		N/A
	4) degree of protection IP0X to IEC 60730-1:2013, cl. 6.5.2		N/A
	5) pollution degree to IEC 60730-1:2013, cl. 6.5.3		N/A
	6) comparative tracking index to IEC 60730-1:2013, cl. 6.13		N/A
	7) max. ambient temperature to IEC 60730-1:2013, cl. 6.7		N/A
20.8.1.2	Thermal cut-out tested as a part of the transformer, test with 3 samples:		N/A
	- 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		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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:		N/A
	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.		N/A
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 8 b) of IEC 60691:2015		N/A
	- suitability of sealing components, impregnating fluids or cleaning solvents 8 c) of IEC 60691:2015		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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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 intended to be reset by soldering operation shall not be used for overload protection.		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, 20 times, intervals 10s.	P
21	**INTERNAL WIRING**		P
21.1	Internal wiring and electrical connections protected or enclosed		P
	Wire-ways smooth and free from sharp edges		P
21.2	Openings in sheet metal: edges rounded (radius ⩾ 1,5 mm) or bushings of insulating material		N/A
21.3	Uninsulated conductors: distances adequately maintained		N/A
21.4	When external wires are connected to terminal, internal wiring shall not loosen up		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**		P
22.1	All cables, flexible cords etc. shall have appropriate current and voltage ratings		P
22.2	Input and output wiring inlet and outlet openings for external wiring: separate entries without damage to protective covering of cable or cord		P
	Input and output wiring inlet and outlet openings for flexible cables or cords: insulating material or bushing of insulating material		N/A
	Bushings for external wiring: reliably fixed, not of rubber unless part of cord guard		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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” ≥ IP20:		N/A
	- for transformers with a mass ≤ 3 kg: IEC 60227-5:2011 – type 60227 IEC 52 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53;		N/A
	- for transformers with a mass > 3 kg: IEC 60227-5:2011 – type 60227 IEC 53 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53.		N/A
	Power supply cords for transformers for outdoor use: ≥ 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 (mm^2); input current (A) at rated output not less than shown in table 16		N/A
22.8	Class I transformer with power supply flexible cable: green/yellow core connected to earth terminal		N/A
	Plug for single-phase transformer with input current at rated output ⩽16 A shall comply with IEC TR 60083, IEC 60 906-1 or IEC 60 309(all parts)		N/A
22.9	Type X, Y or Z attachments: see relevant part of IEC 61558-2.	Type X	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	- 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

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Clause	Requirement + Test	Result - Remark	Verdict
	- labyrinths, if clearly how, permitted		N/A
	- replacement of cable easily possible		N/A
	- protection against strain and twisting clearly how		N/A
	- suitable for different types of cable unless only one type of cable for transformer		N/A
	- the entire flexible cable or cord with covering can be mounted into the cord anchorage		N/A
	- if tightened or loosened no damage		N/A
	- no contact between cable or cord and accessible or electrically connected clamping screws		N/A
	- cord clamped by metal screw not allowed		N/A
	- one part securely fixed to transformer		N/A
	- for Class I transformer: insulating material or insulated from metal parts		N/A
	- for Class II transformers: insulating material or supplementary insulation from metal parts		N/A
	Cord anchorages for type X, Y, Z attachments: cores of power external flexible cable or cord insulated from accessible metal parts by:		N/A
	- basic insulation (Class I transformers), separate insulating barrier/cord anchorage		N/A
	- supplementary insulation (Class II transformers), special lining/cable or cord sheath of cable sheath of cable		N/A
	Cord anchorages for type X and Y attachments:		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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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		N/A
	- 25 pulls of 1 s		N/A
	- 1 min torque according to table 17		N/A
	- mass (kg); pull (N); torque (Nm) ……..:		N/A
	- during test: cable not damaged		N/A
	- after test: longitudinal displacement ⩽ 2 mm for cable or cord and ⩽ 1 mm for conductors in terminals		N/A
	- creepage distances and clearances values specified in Cl. 26		N/A
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**		N/A
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 or equally effective devices.	No terminal for external conductors	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		N/A
	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		N/A
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
23.6	Terminal blocks not accessible without the aid of a tool	Not accessible after installation	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
	Class II transformers: no provision for protective earth		N/A
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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	- current-carrying conductors becoming touch before the earth conductor		N/A
25	**SCREWS AND CONNECTIONS**		N/A
25.1	Screwed connections withstand mechanical stresses		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
	For a screw in engagement with the threads of insulating material: No damage after torque test: diameter (mm); torque (Nm); ten times		N/A
	For nuts and other screws: 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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, CLEARANCES AND DISTANCES THROUGH INSULATION**		**P**
26.2	Creepage distances and clearances		**P**
26.2.1	General		P
	The creepage distance and clearance values are shown in Table 20 and Table 21.	Clearance use IEC 60664-1:2007 Table A.2	P
26.2.2	Windings covered with adhesive tape		N/A
	- all insulating materials are classified according to IEC 60085 and IEC 60216 (all parts);		N/A
	- the impulse voltage dielectric test of 6.1.2.2.1 of IEC 60664-1:2007 is fulfilled; and		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
	Two of the three specimens are subjected to:		N/A
	- the relevant humidity treatment according to 17.2 (48 h)		N/A
	- the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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 (e.g. 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
	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

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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 1,35		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	Approved insulation material used	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 $\geq$0,2 mm		N/A
	- Minimum thickness of supplementary insulation $\geq$0,1 mm		N/A
26.3.3	Insulation in thin sheet form		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 26.3.4 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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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 and ≤ 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
	- 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 1,35 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

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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
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 and distances through insulation given in Table 21, Table 22 and Table 23 of IEC 61558-1:2017 are generally applicable (IEC 61558-2-16: 2021)	(see appended table)	P
26.102	In compliance with IEC 60664-4:2005, the requirements of 26.103 to 26.106 for creepage distances, clearances and solid insulation are required above 30 kHz and up to the frequency of 3 MHz. For frequencies above 3 MHz, the tests in accordance with 7.4 and 7.5 of IEC 60664-4:2005, high-frequency testing (high-frequency high-voltage test and high-frequency partial discharge test) shall be carried out.	Measured frequency: 48.8kHz Max.	P
26.103	Clearance (IEC 61558-2-16:2021)	Clearance use IEC 60664-1:2007 Table A.2	P
	a) Clearance for frequency ≥ 30 kHz according figure 101 two determinations are necessary:		P
	• determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.		P
	• determination based on the measured peak working voltage in accordance with Table 106.		P
	b) Clearance for frequency ≤ 30 kHz according figure 101 two determinations are necessary:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	• determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.		P
	• determination based on the measured peak working voltage in accordance with Table 105.		P
26.104	The working voltages of Table 105 and Table 106 for determination of clearances are peak working voltages. (IEC 61558-2-16: 2021)		P
	All peak working voltages including µs-peaks shall be used to determine clearances in accordance with Table 105 and Table 106.		P
26.105	Creepage distances (IEC 61558-2-16: 2021)		P
	Two determinations of creepage distances are necessary (see Figure 102)		P
	• determination based on the measured RMS working voltage in accordance with Table 21 of IEC 61558-1:2017;		P
	• determination based on the measured peak working voltage in accordance with Table 107 to Table 112 and the fundamental frequency shall be considered		P
	A high-frequency RMS ripple voltage content not more than 10% can be neglected.		P
	The values in Table 107 to Table 112 do not take into account the effects of tracking phenomena for frequencies above 30 kHz.		P
	The most severe value of the required creepage distances in accordance with Table 107 to Table 112 for frequencies above 30 kHz and the relevant values in Table 21 of IEC 61558-1:2017 shall take precedence.		P
	If the value of the creepage distance is lower than the value of the clearance, the value of the clearance shall be applicable for the creepage distance.		N/A
	The peak working voltage also includes any DC voltage and any repetitive peak impulse generated by the SMPS (see 26.105). A determination based on RMS values is also required (see 26.104 and Table 112).		P
26.106	Distance through insulation (IEC 61558-2-16:2021)		N/A
	Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:		N/A
	- the max. frequency is < 10 MHz		N/A
	- the field strength approximately comply with Figure 103		N/A
	- no voids or gaps are present in between the solid insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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 formula (2) is used for calculation the field strength		N/A
27	**RESISTANCE TO HEAT, FIRE AND TRACKING**		**P**
27.1	General		P
27.2	Resistance to heat		N/A
27.2.1	All insulating parts are resistant to heat		N/A
	For parts of rubber, which passed the test of 19.9, no additional test is required.		N/A
	The tests are not required for cables and small connectors with a rated current ≤ 3 A, a rated voltage ≤ 24 V AC or 60 V DC and a power ≤ 72 W		N/A
27.2.2	External accessible parts		N/A
	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)	N/A
27.2.3	Internal parts		N/A
	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)	N/A
27.3	Resistance to abnormal heat under fault conditions		P
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		P
	- 650 °C for parts retaining current carrying parts in position and terminals for external conductors Current ≤ 0,2 A		N/A
	- 750° C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current > 0,2 A		N/A
	- 850° C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current > 0,2 A	Enclosure	P

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Clause	Requirement + Test	Result - Remark	Verdict
27.4.3	Internal parts	(see appended table)	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
	- 750 °C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current > 0,2 A	PCB, Bobbin	P
	- 850 °C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current > 0,2 A	PCB, Bobbin	P
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**		N/A
	Ferrous parts protected against rusting		N/A
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
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

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
F.3	Manually operated mechanical switches tested as part of the transformer shall comply with the conditions specified under F.3		N/A
ANNEX H	**ELECTRONIC CIRCUITS**		**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:		N/A
	- electronic circuit is a low-power circuit as specified		N/A
	- safety of the appliance as specified does not rely on correct functioning of the electronic circuit		N/A
H.3.3	Fault conditions tested as specified when relevant:		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		P
	d) short-circuit of any two terminals of an electronic component as specified		P
	e) any failure of an integrated circuit as specified		P
	f) low-power circuit: low-power points are connected to the supply source		N/A
	Cl. 15 is repeated with a simulated fault as indicated in a) to e), if the transformer incorporates an electronic circuit to ensure compliance with Cl. 15		P

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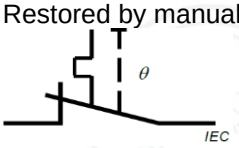
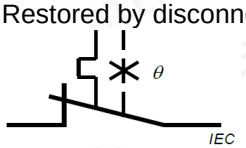
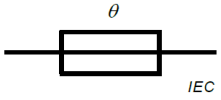
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Clause	Requirement + Test	Result - Remark	Verdict
	Fault condition e) is applied for encapsulated and similar components		N/A
	PTC's and NTC's are not short-circuited if they are used as specified		N/A
H.3.4	If for a fuse-link complying with IEC 60 127-3 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 re-peated 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 (ADDITION TO CLAUSE 26)		N/A
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		N/A
	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 according to 26.2. are applicable		N/A
H.4.2	The ma. surface temperature of optocouplers is 50 K		N/A
ANNEX K	**INSULATED WINDING WIRES**		P
K.1	Wire construction:		P
	• insulated winding wire for basic or supplementary insulation (see 19.12.3)		N/A
	• insulated winding wire for reinforced insulation (see 19.12.3)	Approved TIW used	P
	• splid circular winding wires and stranded winding wires with 0,05 to 5,0 mm diameter		N/A
	• spirally wrapped insulation – overlapping		N/A
K.2	Type tests		N/A
K.2.1	General Tests between ambient temperature between 15°C and 35°C and at a humidity between 25% and 75 %		N/A
K.2.2	Electric strength test		N/A

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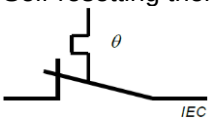
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Clause	Requirement + Test	Result - Remark	Verdict
K.2.2.1	Solid circular winding wires and stranded winding wires		N/A
	Test samples prepared according to clause 4.4.1 of IEC 60851-5:2008 (twisted pair)		N/A
	Dielectric strength test: 6 kV for reinforced 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
	• 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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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

ANNEX V	**ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS**		N/A
Figure V.1	Restored by manual operation 		N/A
Figure V.2	Restored by disconnection of the supply 		N/A
Figure V.3	Thermal link 		N/A

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Figure V.4	Self-resetting thermal cut-out 		N/A

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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
For mode GT*96605-G2**-R3A						
6.7VDC	100V/50Hz	6.77	+1.04%	6.85	+1.18%	For Clause 11: Required ±5% For Clause 12: Required ±10%
6.7VDC	100V/60Hz	6.78	+1.19%	6.82	+0.59%	
6.7VDC	240V/50Hz	6.85	+2.24%	6.90	+0.73%	
6.7VDC	240V/60Hz	6.82	+1.79%	6.92	+1.47%	
5VDC	100V/50Hz	4.97	-0.60%	5.18	+4.23%	
5VDC	100V/60Hz	4.97	-0.60%	5.18	+4.23%	
5VDC	240V/50Hz	4.98	-0.40%	5.17	+3.82%	
5VDC	240V/60Hz	4.98	-0.40%	5.17	+3.82%	
9VDC	100V/50Hz	9.0	0.00%	9.19	+2.11%	
9VDC	100V/60Hz	9.0	0.00%	9.19	+2.11%	
9VDC	240V/50Hz	8.99	-0.11%	9.18	+2.11%	
9VDC	240V/60Hz	8.99	-0.11%	9.18	+2.11%	
12VDC	100V/50Hz	12.06	+0.50%	12.23	+1.41%	
12VDC	100V/60Hz	12.06	+0.50%	12.23	+1.41%	
12VDC	240V/50Hz	12.06	+0.50%	12.22	+1.33%	
12VDC	240V/60Hz	12.06	+0.50%	12.22	+1.33%	
15VDC	100V/50Hz	15.04	+0.27%	15.20	+1.06%	
15VDC	100V/60Hz	15.04	+0.27%	15.20	+1.06%	
15VDC	240V/50Hz	15.05	+0.33%	15.20	+1.00%	
15VDC	240V/60Hz	15.05	+0.33%	15.20	+1.00%	
20VDC	100V/50Hz	20.07	+0.35%	20.19	+0.60%	
20VDC	100V/60Hz	20.07	+0.35%	20.19	+0.60%	
20VDC	240V/50Hz	20.07	+0.35%	20.18	+0.55%	
20VDC	240V/60Hz	20.07	+0.35%	20.18	+0.55%	
Supplementary information: The values are measured at 100Vac and 240Vac respectively						

14	TABLE: Heating Test		P
	Test voltage (V) .....:	90V/60Hz, 264V/50Hz	—
	Ambient (ºC) .....:	See below	—
Thermocouple Locations	**Max. temperature measured, (ºC)**	**Max. temperature limit, (ºC)**	
For model GT*96605-G2**-R3A(Output: 20VDC, 3A), Label up			

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Clause	Requirement + Test	Result - Remark	Verdict

AC inlet	66.3	66.1	70
MOV1 body	89.0	75.2	105
LF1 winding	97.1	80.0	130
CX1 body	96.8	84.2	100
LF2 winding	116.5	90.4	130
PCB near BD1	106.4	88.0	130
C1 body	100.1	100.9	105
C12 body	102.0	100.8	105
PCB near T1	115.0	105.3	130
T1 primary winding	103.5	101.1	110
T1 bobbin	101.3	97.7	--
T1 secondary winding	100.1	99.7	110
CY1 body	108.9	96.6	125
U4 body	97.5	100.0	110
C15 body	92.1	88.6	105
PCB near Q5	97.4	94.4	130
CY3 body	111.0	101.2	125
PCB near U1	113.1	100.8	130
Heat sink	112.0	98.1	--
Output cord	73.4	76.7	80
Enclosure inside near T1 top	92.2	81.5	120
Enclosure inside near T1 bottom	81.4	76.9	120
Enclosure inside near T1 side	89.2	82.8	120
Enclosure outside near T1 top	77.6	71.3	80
Enclosure outside near T1 bottom	75.4	72.0	80
Enclosure outside near T1 side	74.5	71.3	80
Support	40.8	40.9	85
Ambient	40.0	40.0	--
For model GT*96605-G2**-R3A(Output: 20VDC, 3A), Label down			
AC inlet	63.4	63.5	70
MOV1 body	88.4	73.5	105
LF1 winding	95.7	79.1	130
CX1 body	95.7	83.5	100
LF2 winding	111.6	87.6	130

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Clause	Requirement + Test	Result - Remark	Verdict

PCB near BD1	104.5	86.7	130
C1 body	95.7	100.4	105
C12 body	97.5	99.4	105
PCB near T1	112.6	103.4	130
T1 primary winding	102.1	96.7	110
T1 bobbin	100.3	93.4	--
T1 secondary winding	99.9	92.6	110
CY1 body	105.6	93.4	125
U4 body	95.4	95.6	110
C15 body	91.9	85.4	105
PCB near Q5	93.4	93.1	130
CY3 body	105.7	98.4	125
PCB near U1	106.4	99.4	130
Heat sink	109.5	97.6	--
Output cord	71.2	73.4	80
Enclosure inside near T1 top	91.0	80.6	120
Enclosure inside near T1 bottom	79.6	75.6	120
Enclosure inside near T1 side	84.6	80.7	120
Enclosure outside near T1 top	73.4	68.7	80
Enclosure outside near T1 bottom	72.5	69.4	80
Enclosure outside near T1 side	70.7	69.5	80
Support	40.5	40.6	85
Ambient	40.0	40.0	--
For model GT*96605-G2**-R3A(Output: 6.7VDC, 4.6A), Label up			
AC inlet	57.3	63.1	70
MOV1 body	91.0	67.8	105
LF1 winding	87.3	75.1	130
CX1 body	89.5	80.1	100
LF2 winding	100.1	79.2	130
PCB near BD1	99.8	81.5	130
C1 body	87.5	88.1	105
C12 body	88.3	85.7	105
PCB near T1	98.4	95.3	130

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Clause	Requirement + Test	Result - Remark	Verdict

T1 primary winding	94.5	91.1	110
T1 bobbin	91.4	87.7	--
T1 secondary winding	94.7	89.7	110
CY1 body	98.7	86.6	125
U4 body	95.8	89.1	110
C15 body	90.2	81.6	105
PCB near Q5	91.6	90.1	130
CY3 body	95.3	87.1	125
PCB near U1	94.6	89.1	130
Heat sink	102.4	79.2	--
Output cord	65.5	65.0	80
Enclosure inside near T1 top	78.9	74.1	120
Enclosure inside near T1 bottom	74.8	73.2	120
Enclosure inside near T1 side	76.4	72.1	120
Enclosure outside near T1 top	67.1	65.1	80
Enclosure outside near T1 bottom	67.0	62.0	80
Enclosure outside near T1 side	64.7	62.8	80
Support	40.7	41.0	85
Ambient	40.0	40.0	--
For model GT*96605-G2**-R3A(Output: 6.7VDC, 4.6A), Label down			
AC inlet	54.6	62.1	70
MOV1 body	90.3	66.5	105
LF1 winding	86.5	74.3	130
CX1 body	85.6	80.0	100
LF2 winding	95.9	79.0	130
PCB near BD1	98.6	82.0	130
C1 body	83.4	84.6	105
C12 body	86.4	83.8	105
PCB near T1	96.5	94.6	130
T1 primary winding	93.7	91.0	110
T1 bobbin	92.0	85.6	--
T1 secondary winding	93.4	88.4	110
CY1 body	96.4	85.6	125
U4 body	93.6	86.4	110

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Clause	Requirement + Test	Result - Remark	Verdict

C15 body	90.0	82.0	105
PCB near Q5	91.0	89.1	130
CY3 body	93.7	86.4	125
PCB near U1	93.7	88.6	130
Heat sink	101.3	78.3	--
Output cord	65.0	65.0	80
Enclosure inside near T1 top	78.5	73.7	120
Enclosure inside near T1 bottom	75.6	72.4	120
Enclosure inside near T1 side	73.4	72.2	120
Enclosure outside near T1 top	66.9	64.9	80
Enclosure outside near T1 bottom	65.4	62.3	80
Enclosure outside near T1 side	64.6	62.0	80
Support	40.5	41.6	85
Ambient	40.0	40.0	--

Supplementary information:
1. Thermocouple method used.
2. UL approved 130°C PCB used.

14	**TABLE: Heating test, resistance method**		N/A
	Test voltage (V) ..... :		—
	Ambient, t_1 (°C) ..... :		—
	Ambient, t_2 (°C) ..... :		—

Temperature rise of winding	**R_1 (Ω)**	**R_2 (Ω)**	**ΔT (K)**	**Max. dT (K)**	**Insulation class**

Supplementary information:

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

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15	**TABLE: Short circuit and overload protection**		P
	Test voltage (V) :	264V/50Hz	—
	Ambient (oC) :	See below	—

Thermocouple Locations	max. temperature measured, (°C)	max. temperature limit, (°C)
For model For model GT*96605-G2**-R3A(Output: 20VDC, 3A) OL		
T1 primary winding	108.6	165
T1 bobbin	105.4	165
T1 secondary winding	108.9	165
Output cord	78.5	85
Enclosure outside near T1 top	78.5	105
Enclosure outside near T1 bottom	76.7	105
Enclosure outside near T1 side	74.9	105
Support	41.3	105
Ambient	40.0	--
For model GT*96605-G2**-R3A(Output: 6.7VDC, 4.6A) OL		
T1 primary winding	101.2	165
T1 bobbin	92.5	165
T1 secondary winding	100.9	165
Output cord	67.5	85
Enclosure outside near T1 top	68.5	105
Enclosure outside near T1 bottom	67.5	105
Enclosure outside near T1 side	67.6	105
Support	41.4	105
Ambient	40.0	--

Supplementary information:

1. All the conditions were considered for clause 15, and also max. temperature with rated 1.1 times voltage during test output overload for recorded as above.

Limited temperature for winding is 165 °C (Class B) under 25 °C ambient.

OL=Overload.

18.2	**TABLE: insulation resistance measurements**	P
Insulation resistance R between:	**R (MΩ)**	**Required R (MΩ)**
Between input circuit and output circuit	> 100	5
Between L/N before fuse	> 100	5
Between terminals of fuse	> 100	2
Between primary winding and secondary winding of transformer	> 100	5
Between iron core and secondary winding of transformer	> 100	5
Insulation sheet	> 100	5

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live parts and accessible enclosure	> 100	5
For Class I models		
Between live parts and earth	> 100	2
Supplementary information:		

18.3	**TABLE: Dielectric Strength**	P

Test voltage applied between:	**Test potential applied (V)**	**Breakdown / flashover (Yes/No)**
Between input circuit and output circuit	3000Va.c.	No
Between L/N before fuse	1500Va.c.	No
Between terminals of fuse	1500Va.c.	No
Between primary winding and secondary winding of transformer	3000Va.c.	No
Between iron core and secondary winding of transformer	3000Va.c.	No
Insulation sheet	3000Va.c.	No
live parts and accessible enclosure	3000Va.c.	No
For Class I models		
Between live parts and earth	1500Va.c.	No
Supplementary information:		

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20	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Plastic enclosure	SABIC Innovative Plastics B V	HF500R(f2)	V-0, min. thickness 2.0 mm,125 ºC	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E45329 + tested with appliance
(Alternate)	SABIC Innovative Plastics B V	CX7211(GG)	V-0, min. thickness 2.0 mm,85 ºC	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E45329 + tested with appliance
(Alternate)	SABIC Innovative Plastics B V	945(GG)	V-0, min. thickness 2.0 mm,120 ºC	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E45329 + tested with appliance
(Alternate)	SABIC JAPAN L L C	945(GG)	Min. V-0, min. thickness 2.0 mm,120 ºC	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E207780 + tested with appliance
(Alternate)	SABIC Innovative Plastics US L L C	945(GG)	Min. V-0, min. thickness 2.0 mm,120 ºC	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E121562 + tested with appliance
(Alternate)	TEIJIN LIMITED RESIN AND PLASTIC	LN-1250G(*)	V-0, min.2.0 mm thickness, 105°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E50075 + tested with appliance
(Alternate)	Covestro Deutschland AG [PC Resins]	6485 + (z)(f1)	V-0, min. thickness: 2.0mm, 115 ºC	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E41613 + tested with appliance
Appliance inlet(C14)	Rich Bay Co., Ltd.	R-301SN	250 Vac, 10A	IEC 60320-1	VDE 40030228
(Alternate)	LECI Electronics Co., Ltd	DB-14	250 Vac, 10A	IEC 60320-1	VDE 40032137
(Alternate)	TECX	TU-301-S TU-301-SP series	250 Vac, 10A	EN IEC 60320-1	ENEC-04684
(Alternate)	Sun Fair Electric Wire & Cable (HK) Co. Ltd.	S-03	250 Vac, 10A	IEC 60320-1	VDE 40034447
(Alternate)	Rong Feng Industrial Co., Ltd	SS-120	250 Vac, 10A	IEC 60320-1	VDE 40028101
(Alternate)	Zhe Jiang Bei Er jia Electronic Co., Ltd.	ST-A01 Series	250 Vac, 10A	IEC 60320-1	VDE 40013388
Appliance inlet(C8)	LECI Electronics Co., Ltd	DB-8	250 Vac, 2.5A	IEC 60320-1	VDE 40032028

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(Alternate)	Sun Fair Electric Wire & Cable (HK) Co. Ltd.	S-01	250 Vac, 2.5A	IEC 60320-1	VDE 40034449
Alt.	Rich Bay Co., Ltd.	R-201SN90	250 Vac, 2.5A	IEC 60320-1	VDE 40030384
Alt.	Rong Feng Industrial Co., Ltd.	RF-180	250 Vac, 2.5A	IEC 60320-1	VDE 40030168
Alt.	Zhe Jiang Bei Er jia Electronic Co., Ltd.	ST-A03 Series	250 Vac, 2.5A	IEC 60320-1	VDE 40014833
Alt.	Kunshan DLK Electronics Technology Co., Ltd	CDJ-8	250 Vac, 2.5A	IEC 60320-1	VDE 40025531
Alt.	TECX	SO-222	250 Vac, 2.5A	EN IEC 60320-1	ENEC-04808
Appliance inlet(C6)	LECI Electronics Co., Ltd	DB-6	250 Vac, 2.5A	IEC 60320-1	VDE 40032465
(Alternate)	TECX	TU-333	250 Vac, 2.5A	EN IEC 60320-1	ENEC-04682
(Alternate)	Zhe Jiang BeiErjia Electronic Co., Ltd.	ST-A04 Series	250 Vac, 2.5A	IEC 60320-1	VDE 40016045
(Alternate)	Rong Feng Industrial Co., Ltd.	RF-190	250 Vac, 2.5A	IEC 60320-1	VDE 40030379
(Alternate)	Rich Bay Co., Ltd	R-30790	250 Vac, 2.5A	IEC 60320-1	VDE 40030381
(Alternate)	Sun Fair Electric Wire & Cable (HK) Co. Ltd.	S-02	250 Vac, 2.5A	IEC 60320-1	VDE 40034448
PCB	SHENZHEN TONGCHUANGX IN ELECTRONICS CO LTD	TCX	Min. 1.0 mm thickness, min. V-0, 130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E250336 + tested with appliance
(Alternate)	SHUANG MING INDUSTRY CO LTD	T015V0, T005V0	Min. 1.0 mm thickness, V-0, 130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E78017 + tested with appliance
(Alternate)	Shanghai H-FAST Electronics Co Ltd	211001	Min. 1.0 mm thickness, min. V-0, 130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E337862 + tested with appliance

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(Alternate)	Guangde Boya Xinxing Electronic Technology Co Ltd	BY-1	V-0, 130°C, Min. 1.0 mm thickness	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E475783 + tested with appliance
(Alternate)	Golden Board Circuit (Zhuhai) LTD	JYH-2	Min. 1.0 mm thickness, V-0, 130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E489124 + tested with appliance
(Alternate)	Zhejiang Wanzheng Electronics Science & Technology Co.,Ltd.	JWZ-2	Min. 1.0 mm thickness, min. V-0, 130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E302598 + tested with appliance
(Alternate)	Jiangxi ZHONG XIN HUA Electronics Industry Co Ltd	ZXH-2	V-0, 130°C, Min. 1.0 mm thickness	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E331298 + tested with appliance
(Alternate)	Shenzhen Jia Li Chuang Technology Development Co LTD	JLC-1	V-0, 130°C, Min. 1.0mm thickness	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E479892 + tested with appliance
(Alternate)	Interchangeable	Interchangeable	V-0, 130°C, Min. 1.0mm thickness	AS/NZS 61558.1, AS/NZS 61558.2.16	UL + tested with appliance
Fuse (F1,F2) (F2 optional)	Conquer Electronics Co., Ltd.	MST	T3.15A, 250V	IEC 60127-1 IEC 60127-3	VDE 40017118
(Alternate)	Suzhou Walter Electronic Co. Ltd	2010	T3.15A, 250V	IEC 60127-1 IEC 60127-3	VDE 40018781
(Alternate)	Suzhou Walter Electronic Co. Ltd	ICP	T3.15A, 250V	IEC 60127-1 IEC 60127-3	VDE 40012824
(Alternate)	Zhongshan Lanbao Electrical Appliances	RTI-10 Serie(s)	T3.15A, 250V	IEC 60127-1 IEC 60127-3	VDE 40017009
(Alternate)	Bel Fuse Ltd.	RST	T3.15A, 250V	IEC 60127-1 IEC 60127-3	VDE 40011144
(Alternate)	Conquer Electronics Co., Ltd.	MET	T3.15A, 250V	IEC 60127-1 IEC 60127-3	VDE 40017157
X capacitor (CX1) (optional)	Cheng Tung Industrial Co., Ltd.	CTX	Max 0.47μF, Min.250V,100℃ X2	IEC 60384-14	ENEC-02671
(Alternate)	Tenta Electric Industrial Co. Ltd.	MEX	Max 0.47μF, Min.250V,100℃ X2	IEC 60384-14	VDE 119119

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Clause	Requirement + Test	Result - Remark	Verdict

(Alternate)	Ultra Tech Xiphi Enterprise Co. Ltd.	HQX	Max 0.47μF, Min.250V,100℃ X2	IEC/EN 60384-14	ENEC-04401
(Alternate)	Sinhua Electronics (Huzhou) Co., Ltd	MPX	Max 0.47μF, Min.250V,110℃ X1	IEC 6038414	VDE 40014686
(Alternate)	Dain Electronics Co., Ltd.	MEX, MPX, NPX	Max 0.47μF, Min.250V,100℃ X2	IEC 60384-14	VDE 40018798
(Alternate)	Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd.	MPX	Max 0.47μF, Min.250V,110°C X2	IEC 60384-14	VDE 40034679
Y capacitor (CY1 CY2) (optional)	TDK Corporation	CD	Min. 250Vac; max. 3300pF; Y1, 125℃	IEC 60384-14	VDE 40017931
(Alternate)	Success Electronics Co., Ltd	SE	Min. 250Vac; max. 3300pF; Y1, 125℃	IEC 60384-14	VDE 40020002
(Alternate)	Success Electronics Co., Ltd.	SE	Min. 250Vac; max. 3300pF; Y2, 125℃	IEC 60384-14	VDE 40037218
(Alternate)	Success Electronics Co., Ltd.	SB	Min. 250Vac; max. 2200pF; Y1, 125℃	IEC 60384-14	VDE 40037221
(Alternate)	Success Electronics Co., Ltd.	SB	Min. 250Vac; max. 2200pF; Y1, 125℃	IEC 60384-14	VDE 40020001
(Alternate)	Walsin Technology Corp.	AH	Min. 250Vac; max. 3300pF; Y1, 125℃	IEC 60384-14	VDE 40001804
(Alternate)	Haohua Electronic Co.	CT 7	Min. 250Vac; max. 3300pF; Y1, 125℃	IEC 60384-14	VDE 40003902
(Alternate)	Murata Mfg Co Ltd	KX Series	Min. 250Vac; max. 3300pF; Y1, 125℃	IEC 60384-14	VDE 40002831
(Alternate)	Shantou High New Technology Dev. Zone Songtian Enterprise Co., Ltd.	CD-Series	Y1, AC250V, max. 3300pF, 125℃	IEC 60384-14	VDE 40025754
Y capacitor (CY3) (optional)	Huizhou Jingqin Electronic Components Co., Ltd.	SMD Series	Y1, AC250V, max. 47000pF, 125℃	IEC 60384-14	ENEC-04145

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

Photo Coupler (U4)	Everlight Electronics Co., Ltd.	EL817	Dti≥0.4mm EXT.cr. and cl.≥7.6mm,110℃	IEC 60747-5-2	VDE 132249
(Alternate)	COSMO Electronics Corporation	K1010 / KP1010	Dti≥0.4mm EXT.cr. and cl.≥6.5mm,thermal cycling test,115℃	IEC 60747-5-2	VDE 101347
(Alternate)	Lite-On Technology Corporation	LTV-817	Dti≥0.4mm EXT.cr. and cl.≥7.0mm,thermal cycling test,115℃	IEC 60747-5-2	VDE 40015248
(Alternate)	Bright Led Electronics Corp.	BPC-817 (A/B/C/D/L) BPC-817 M BPC-817 S	Dti≥0.4mm, EXT.cr. and cl.≥ 7.6mm, 10℃	IEC/EN 60747-5-2	VDE 40007240
Varistor MOV1 (Optional)	Thinking Electronic Industrial Co., Ltd.	TVR10471KT VR14471K	470V	IEC 61051-1, IEC 61051-2, IEC 61051-2-2	VDE005944
(Alternate)	Success Electronics Co., Ltd.	SVR10D471K SVR14D471K	470V	IEC 61051-1, IEC 61051-2, IEC 61051-2-2	VDE 123677
(Alternate)	Thinking Electronic Industrial Co., Ltd.	TVR10621	620V	IEC 61051-1, IEC 61051-2, IEC 61051-2-2	VDE 005944
(Alternate)	Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd.	10D621K	620V	IEC 61051-1, IEC 61051-2, IEC 61051-2-2	VDE 40023049
(Alternate)	Xiamen Set Electronics Co., Ltd.	TFV8S471K TFV10S471K	470V	IEC 61051-1, IEC 61051-2, IEC 61051-2-2	TUV RH J50554061
(Alternate)	Guangdong Huiwan Electronics Technology Co.,LTD.	V-621K-10 DEH	620V	IEC 61051-1, IEC 61051-2, IEC 61051-2-2	VDE 40043880
(Alternate)	Guangdong Huiwan Electronics Technology Co.,LTD.	V-621K-14 DEH	620V	IEC 61051-1, IEC 61051-2, IEC 61051-2-2	VDE 40043880
Transformer (T1)	GlobTek Haopuwei	TF093	Class B	AS/NZS 61558.1, AS/NZS 61558.2.16	Test with appliance

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Clause	Requirement + Test	Result - Remark	Verdict

Magnet wire	IANGSU HONGLIU MAGNET WIRE TECHNOLOGY CO LTD	2UEW/130	130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E335065 + tested with appliance
(Alternate)	Interchangeable	Interchangeable	130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL + tested with appliance
-Triple-insulated wire (Secondary)	Great Leoflon Industrial Co., Ltd.	TRW (B)	130°C	IEC 61558-1, IEC 61558-2-16	VDE 136581
(Alternate)	TOTOKU INC.	TIW-2 ，TIW-2 LZ	130°C	IEC 61558-1, IEC 61558-2-16	VDE 40044910
-Bobbin	CHANG CHUN PLASTICS CO LTD	T375J(G5)(G6), T375HF	V-0, 150°C, thickness 0.45 mm min.	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E59481 + tested with appliance
(Alternate)	SUMITOMO BAKELITE CO LTD	PM-9820, PM-9823, PM-9630	V-0, 150°C, thickness 0.45 mm min.	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E41429 + tested with appliance
(Alternate)	CHANG CHUN PLASTICS CO LTD	4130	V-0, 140°C, thickness 0.38 mm min.	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E59481 + tested with appliance
(Alternate)	Resonac Techno Service Corporation	CP-J-8800	V-0, 150°C, thickness 0,45 mm min.	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E514814 + tested with appliance
-Insulating tape	3M COMPANY ELECTRICAL MARKETS DIV (EMD)	1350F-1(b) 1350T-1 (b), 44 (a)	130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E17385 + tested with appliance
(Alternate)	BONDTEC PACIFIC CO LTD	370s(b)	130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E175868 + tested with appliance
(Alternate)	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PZ*(b) CT*(c)(g) CT(b)(g)	130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E165111 + tested with appliance
(Alternate)	JINGJIANG JINGYI ADHESIVE PRODUCT CO LTD	JY25-A(b)	130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E246950 + tested with appliance

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Clause	Requirement + Test	Result - Remark	Verdict

(Alternate)	CHANG SHU LIANG YI TAPE INDUSTRY CO LTD	LY-XX*	Min.130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E246820 + tested with appliance
-PTFE tubing	GREAT HOLDING INDUSTRIAL CO LTD	TFT, TFS	Min. 300V, 200°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E156256 + tested with appliance
(Alternate)	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	WF	600V, 200°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E203950 + tested with appliance
(Alternate)	CHANGYUAN ELECTRONICS GROUP CO LTD	CB-TT-T, CB TT-S	Min. 300V, 200°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E180908 + tested with appliance
Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	Min. 130°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E228349 + tested with appliance
MYLAR (Optional)	Sichuan Longhua Film Co Ltd	PP-(i)(j)	V-0, 105°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E254551 + tested with appliance
(Alternate)	FORMEX, DIV OF ILLINOIS TOOL WORKS INC, FORMERLY	FORMEX GK -(a)(b) Panels	V-0, 115°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E121855 + tested with appliance
(Alternate)	SABIC JAPAN L L C	FR60 (GG1), FR63 (GG1), FR65 (GG1), FR7 (GG1), FR700	VTM-0, 80°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E207780 + tested with appliance
(Alternate)	CHENGDU KANGLONGXIN PLASTICS CO LTD	KLX PP BK-10 series	VTM-0, 110°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E315185 + tested with appliance
(Alternate)	SK MICROWORKS CO LTD	SH71S	VTM-2, 105°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E74359 + tested with appliance
(Alternate)	TORAY INDUSTRIES INC FILM DIV	Lumirror MX10	VTM-2, 120°C	AS/NZS 61558.1, AS/NZS 61558.2.16	UL E86511 + tested with appliance

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Clause	Requirement + Test	Result - Remark	Verdict

Inductor LF1	GlobTek/ HEJIA	GTM91099-LF1	Min. 200uH	AS/NZS 61558.1, AS/NZS 61558.2.16	Test with appliance
Inductor LF2	GlobTek /HAOPUWEI	NF00031	Min.10mH	AS/NZS 61558.1, AS/NZS 61558.2.16	Test with appliance

Supplementary information:

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

25	TABLE: Threaded Part Torque Test	N/A

Threaded part identification	Diameter of thread (mm)	Column number (I, II, or III)	Applied torque (Nm)

Supplementary information:

26	TABLE: Clearance And Creepage Distance Measurements	P

clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
Line and Neutral before fuse F1	420	250	1.5	6.4	3.0	6.4
Two terminals of fuse F1	420	250	1.5	3.2	3.0	3.2
Primary trace and secondary trace under CY1	420	250	1.5	4.7	3.0	4.7
Primary trace and secondary trace under CY2	420	250	1.5	4.8	3.0	4.8
Line and other parts	420	250	1.5	4.6	3.0	5.3
Primary trace and secondary trace under T1	560	250	3.0	9.5	6.0	9.5
EC5 to core of transformer	560	250	3.0	8.7	6.0	8.7
Trace between Primary EC2 and secondary EC5	420	250	3.0	6.5	6.0	6.5
Primary trace and secondary trace under U7	420	250	3.0	8.0	6.0	8.0
Live parts and enclosure	560	250	3.0	11.7	6.0	11.7
Secondary to core of transformer	560	250	3.0	＞10	6.0	＞10

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Clause	Requirement + Test	Result - Remark	Verdict

Primary trace and secondary trace	560	250	3.0	＞10	6.0	＞10
For Class I models						
Live parts and earth	420	250	1.5	4.8	3.0	4.8
Supplementary information:						

26	**TABLE: Distance Through Insulation Measurements**				**P**
Distance through insulation di at/of:	**U r.m.s. (V)**	**Test voltage (V)**	**Required di (mm)**	**di (mm)**	
Input to output through transformer	250	N/A	Triple insulation winding	Triple insulation winding	
Enclosure	250	3000Va.c.	0.84	2.0	
Insulation tape used on transformer	250	3000Va.c.	0.25	4 layers	
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	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

26.2 TEST B	**TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION**		N/A
	Test with three specially prepared specimens with potted – P1 values are required		

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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	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

26.2 TEST C	**TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION**		N/A
	Test with three specially prepared specimens with potting (only dti is required)		

cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

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

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

27.2	**TABLE: Ball Pressure Test of Thermoplastics**			P
Allowed impression diameter (mm) .....:		2.0		—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	
Bobbin	1)	125	0.7	
PCB	1)	125	0.8	
Supplementary information: 1) See Table 20 Critical components information.				

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IEC 61558-2-16			
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	1)	--	NI	NI	--	--	--	P
Bobbin	1)	--	NI	NI	NI	NI	P	P
PCB	1)	--	--	--	NI	NI	P	P
Inlet	1)	--	--	--	NI	NI	P	P
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.

NI: No Ignition

1) See Table 20 Critical components information.

Annex H	TABLE: short-circuit and overload protection					P
	Power source for EUT: Manufacturer, model/type, output rating .....:		--			—
	Ambient temperature (°C) .....:		25.0			—
Comonent No.	Fault	Supply voltage (V)	Input current (A)	Test time	Observation	
Output	SC	264	0.013	10min	Unit shutdown immediately, recoverable, no damage, no hazards. output voltage: 0V;	
U2 pin 1-4	SC	264	0.013	10min	Unit shutdown immediately, recoverable, no damage, no hazards. output voltage: 0V;	
C14	SC	264	0.013	10min	Unit shutdown immediately, recoverable, no damage, no hazards. output voltage: 0V;	
C2	SC	264	0	1s	F1 open immediately, no danger. Repeat 9 times total 10 times, the same as results. output voltage: 0V;	
C1	SC	264	0	1s	F1 open immediately, no danger. Repeat 9 times total 10 times, the same as results. output voltage: 0V;	
BD1	SC	264	0	1s	F1 open immediately, no danger. Repeat 9 times total 10 times, the same as results. output voltage: 0V;	

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

U4 pin 1-2	SC	264	0.013	10min	Unit shutdown immediately, recoverable, no damage, no hazards. output voltage: 0V;
U4 pin 3-4	SC	264	0.013	10min	Unit shutdown immediately, recoverable, no damage, no hazards. output voltage: 0V;
U4 pin 1	OC	264	0.013	10min	Unit shutdown immediately, recoverable, no damage, no hazards. output voltage: 0V;
U4 pin 3	OC	264	0.013	10min	Unit shutdown immediately, recoverable, no damage, no hazards. output voltage: 0V;
Supplementary information: SC=Short circuit.					

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

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Class II construction		N/A
	Class III construction		N/A
	Equipment of overvoltage category I		N/A
	Equipment of overvoltage category II		N/A
	Equipment of overvoltage category III		N/A
	Equipment of overvoltage category IV		N/A
	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 (Switch mode power supply unit)		N/A
	SMPS incorporating a Fail-safe separating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof separating transformer		N/A

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe safety isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof safety isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof safety isolating transformer (inherently or non-inherently)		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
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

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
BB.14.3	Accelerated ageing test for undeclared class of isolating system		N/A
	Cycling test (10 cycles):		N/A
	– measuring of the no-load input current (mA)		N/A
BB.14.3.2	– heat run (temperature in table 4)		N/A
BB.14.3.3	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
BB.14.3.4	– moisture treatment (48 h, 17.2)		N/A
BB.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 less than 30%		N/A
	– insulation resistance acc. Cl.18.1 and 18.2		N/A
	– electric strength, no breakdown (18.3 and 18.4); 2 min; test voltage 35% of specified value		N/A
	– Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A
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 MΩ		N/A
	– live parts and body for reinforced insulation ⩾ 7 MΩ		N/A
	– input circuits and output circuits for basic insulation ⩾ 2 MΩ		N/A
	– input circuits and output circuits for double or reinforced insulation ⩾ 5 MΩ		N/A
	– each input circuit and all other input circuits connected together ⩾ 2 MΩ		N/A
	– each output circuit and all other output circuits connected together ⩾ 2 MΩ		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) ⩾2 MΩ		N/A

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	– body and metal parts with basic insulation (Class II transformers) ⩾5 MΩ		N/A
	– metal foil in contact with inner and outer surfaces of enclosures ⩾ 2 MΩ		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
	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)		N/A
BB.19	CONSTRUCTION		N/A
BB.19.1	General construction		N/A
BB.19.1.1	General		N/A
BB.19.1.2	Auto-transformers		N/A
BB.19.1.2.1	Plug connected auto-transformers where the rated input voltage is higher than the rated output voltage, shall not have any potential to protective earthing at the output socket higher than the rated output voltage.		N/A
BB.19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction shall be given for not using such a transformer with a nonpolarized 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– for class I transformers, the insulation between the input / output winding and the body shall consist of at least basic insulation (rated for the working voltage)		N/A
	– for class II transformers, the insulation between the input / output winding and the body shall consist of double or reinforced insulation (rated for the working voltage).		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 transformer		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 transformer		N/A
	– Insulation between input windings and body consist of double or reinforced insulation		N/A
	– Insulation between output windings and body consist of double or reinforced insulation		N/A
BB.19.1.3.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation		N/A
	For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation.		N/A
BB.19.1.3.4	Parts of output circuits may be connected to protective earth		N/A
BB.19.1.3.5	No direct contact between output circuits and the body, unless:		N/A
	– Allowed for associated transformers by the equipment standard		N/A

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

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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
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
	– 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
	For transformers for connection to the mains by the means of a plug of any type (incorporating or not), the alternative with basic insulation plus protective screening is not allowed.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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	Winding construction		N/A
BB.19.12.1	Undue displacement in all types of transformers not allowed:		N/A
			N/A
			N/A
			N/A
			N/A
			N/A
	– of input or output windings or turns thereof		N/A
	– of internal wiring or wires for external connection		N/A
	– of parts of windings or of internal wiring in case of rupture or loosening		N/A
BB.19.12.2	Serrated tape:		N/A
	– distance through insulation according to table 22		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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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
	• 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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
	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.		
e)	Toroidal cores used with TIW in combination with FIW wire, for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		
	1) a coating, which fulfils the requirements of basic insulation.		

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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 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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
	• 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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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
	• 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	General		N/A
	The creepage distance and clearance values are shown in Table 20 and Table 21.		N/A
BB.26.2.2	Windings covered with adhesive tape		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– all insulating materials are classified according to IEC 60085 and IEC 60216 (all parts);		N/A
	– the impulse voltage dielectric test of 6.1.2.2.1 of IEC 60664-1:2007 is fulfilled; and		N/A
	– test A of 26.2.4 is fulfilled		N/A
BB.26.2.3	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.26.2.4	Cemented insulating parts		N/A
	– all isolating materials are classified acc. To IEC 60085 and IEC 60216		N/A
	– values of distance through insulation (dti) are fulfilled		N/A
	– creepage distances and clearances are not required		N/A
	– test A of this sub clause is fulfilled		N/A
	Test A		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, with uninsulated wires, without impregnation or potting	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– 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
BB.26.2.5	Enclosed parts, by impregnation or potting		N/A
BB.26.2.5.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		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
	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
BB.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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1		N/A
BB.26.3	Distance through insulation		N/A
BB.26.3.1	For supplementary, double or reinforced insulation, the required values of Tables 22 are fulfilled		N/A
	The insulation fulfil the material classification according IEC 60085 and 60216(all parts) or the test of 14.3		N/A
BB.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		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.26.3.3	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 26.3.4 is fulfilled with 150 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

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.4 is fulfilled on 2/3 of the layers with 100±5 N		N/A
	– The required values for d.t.i. of thin layers in Tale 22 is fulfilled.		N/A
	Test according to 14.3 and if the isolating materials are classified acc. To IEC 60085 and IEC 60216 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 and ≤ 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
BB.26.3.4	Mandrel test of insulation in thin sheet form (specimen of 70±0,5 mm width are necessary):		N/A
	– If the layers are non-separable – at least 3 layers glued together fulfil the test:		N/A
	– pull force of 150 N		N/A
	– high voltage test of 5,0 Kv or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
	– If the layers are separable and 2/3 of at least 3 layers fulfil the test.		N/A
	– pull force of 100 N		N/A
	– high voltage test of 5,0 Kv or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.		N/A
	– If the layers are separable 1 of at least 2 layers fulfil the test:		N/A
	– pull force of 50 N		N/A
	– high voltage test of 5,0 Kv or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A

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IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
BB.26.101	Creepage distances and distances through insulation given in Table 21, Table 22 and Table 23 of IEC 61558-1:2017 are generally applicable (IEC 61558-2-16: 2021)	(see appended table)	N/A
BB.26.102	In compliance with IEC 60664-4:2005, the requirements of 26.103 to 26.106 for creepage distances, clearances and solid insulation are required above 30 kHz and up to the frequency of 3 MHz. For frequencies above 3 MHz, the tests in accordance with 7.4 and 7.5 of IEC 60664-4:2005, high-frequency testing (high-frequency high-voltage test and high-frequency partial discharge test) shall be carried out.		N/A
BB.26.103	Clearance (IEC 61558-2-16:2021)		N/A
	a.) Clearance for frequency ≥ 30 kHz according figure 101 two determinations are necessary:		N/A
	determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.		N/A
	determination based on the measured peak working voltage in accordance with Table 106.		N/A
	b.) Clearance for frequency ≤ 30 kHz according figure 101 two determinations are necessary:		N/A
	– determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.		N/A
	– determination based on the measured peak working voltage in accordance with Table 105.		N/A
BB.26.104	The working voltages of Table 105 and Table 106 for determination of clearances are peak working voltages. (IEC 61558-2-16: 2021)		N/A
	All peak working voltages including µs-peaks shall be used to determine clearances in accordance with Table 105 and Table 106.		N/A
BB.26.105	Creepage distances (IEC 61558-2-16: 2021)		N/A
	Two determinations of creepage distances are necessary (see Figure 102)		N/A
	– determination based on the measured RMS working voltage in accordance with Table 21 of IEC 61558-1:2017;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	determination based on the measured peak working voltage in accordance with Table 107 to Table 112 and the fundamental frequency shall be considered		N/A
	A high-frequency RMS ripple voltage content not more than 10% can be neglected.		N/A
	The values in Table 107 to Table 112 do not take into account the effects of tracking phenomena for frequencies above 30 kHz.		N/A
	The most severe value of the required creepage distances in accordance with Table 107 to Table 112 for frequencies above 30 kHz and the relevant values in Table 21 of IEC 61558-1:2017 shall take precedence.		N/A
	If the value of the creepage distance is lower than the value of the clearance, the value of the clearance shall be applicable for the creepage distance.		N/A
	The peak working voltage also includes any DC voltage and any repetitive peak impulse generated by the SMPS (see 26.105). A determination based on RMS values is also required (see 26.104 and Table 112).		N/A
BB.26.106	Distance through insulation (IEC 61558-2-16:2021)		N/A
	Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:		N/A
	– the max. frequency is < 10 MHz		N/A
	– the field strength approximately comply with Figure 103		N/A
	– no voids or gaps are present in between the solid insulation		N/A
	For thick layers 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 formula (2) is used for calculation the field strength		N/A
BB.27	RESISTANCE TO HEAT, FIRE AND TRACKING		

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

IEC 61558-2-16 Annex BB			
Clause	Requirement + Test	Result – Remark	Verdict
BB.E	ANNEX E , GLOW WIRE TEST		N/A
BB.E.1	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		N/A
BB.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		N/A
BB.E.3	Clause 7, “Conditioning”, of IEC 60695-2-11:2014 apply, preconditioning is required		N/A
BB.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.		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
	Dielectric strength test: 6 Kv for reinforced insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

IEC 61558-2-16 Annex BB			
Clause	Requirement + Test	Result – Remark	Verdict
	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 3.2.1 (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
	• 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		
BB.K.3	Testing during manufacturing		N/A

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

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

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				N/A
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.					
2.					
3.					
4.					

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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		N/A

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	
5.					
6.					
7.					
8.					
9.					
10.					

BB.26.2 TEST B	**TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION**		N/A
	Test with three specially prepared specimens with potted – P1 values are required		

cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

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)		

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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	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

BB.26.3.5	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION		N/A
	Test for transformers, use FIW-wire		

cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

BB 18.2	TABLE: insulation resistance measurements	N/A
Insulation resistance R between:	R (MΩ)	Required R (MΩ)
Supplementary information:		

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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**					
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**			
Distance through insulation di at/of:	U r.m.s. (V)	Test voltage (V)	Required di (mm)	di (mm)
Supplementary information:				

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Clause	Requirement + Test	Result - Remark	Verdict

Appendix No. 1: Australia and New Zealand National Differences

ATTACHMENT to IEC61558_2_16H			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT **IEC 61558-2-16:2021** **(AUSTRALIA/NEW ZEALAND) NATIONAL DIFFERENCES** (Safety of transformers, reactors, power supply units and combinations thereof - Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units for general applications)			
Differences according to.....:	AS/NZS 61558.2.16:2022 AS/NZS 61558.1:2018 +A1:2020 + A2:2020		
TRF template used: ..... :	IECEE OD-2020-F3:2022, Ed. 1.2		
Attachment Form No. .....:	AU_NZ_ND_IEC61558_2_16H		
Attachment Originator .....:	NZ Electrotechnical Committee/Standards New Zealand		
Master Attachment .....:	Date 2023-09-15		
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	National Differences		--
5	**GENERAL CONDITIONS FOR THE TESTS**		P
5.2	*Add* the following variation:		N/A
	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 61558.1:2018/A2:2020)		N/A
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 61558.1:2018)		P
16	**MECHANICAL STRENGTH**		N/A
16.4	*Replace* the text with the following variation:		N/A
	VOID (AS/NZS 61558.1:2018/A2:2020)		N/A
19	**CONSTRUCTION**		P
19.15	Replace the test specification with the following variation:		N/A
	VOID (AS/NZS 61558.1:2018/A2:2020)		N/A

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AS 61558-2-16			
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ATTACHMENT to IEC61558_2_16H			
Clause	Requirement + Test	Result - Remark	Verdict
	Insert the following variation:		N/A
AZ.19.201	Transformers having integral pins for insertion into socket outlets shall comply with the appropriate requirements of AS/NZS 3112.		N/A
	Compliance is checked as specified in Appendix J of AS/NZS 3112 (AS/NZS 61558.1:2018)		N/A
20	**COMPONENTS**		P
	Replace the first paragraph with the following variation:		N/A
	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 61558.1:2018)		P
	Replace the third paragraph with the following variation:		N/A
	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 61558.1:2018)		P
20.6	Insert the following variation:		N/A
	Plugs and socket-outlets for SELV systems may also comply with the requirements of Appendix E in AS/NZS 3112 (AS/NZS 61558.1:2018/A2:2020)		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 61558.1:2018)		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 61558.1:2018)		N/A
22.8	Replace the second paragraph in the requirement, with the following variation:		-
	Power supply cords of portable transformers shall be fitted with an appropriately rated plug complying with AS/NZS 3112 or AS/NZS 3123 or IEC 60309-1 (AS/NZS 61558.1:2018)		N/A

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

ATTACHMENT to IEC61558_2_16H			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX H	**ELECTRONIC CIRCUITS**		P
H.3.1	Add the following to the test specification after the existing fourth paragraph:		P
	During and after the tests the no-load output voltage of an accessible safety extra-low voltage outlet or connector or Universal Serial Bus (USB) outlet shall not have increased by more than 3 V or 10% of its no-load output voltage in normal use, whichever is higher. (AS/NZS 61558.1:2018)	See table Annex H	P
	Special national conditions (if any)		P
	Australia		N/A
8	**MARKING AND OTHER INFORMATION**		P
8.1	After Item a) insert the following variation:		P
	The marking of rated supply voltage or rated supply voltage range of single-phase transformers shall cover 240 V and for poly-phase transformers, 415 V (AS/NZS 61558.1:2018/A2:2020)	100-240V	P
	New Zealand		N/A
8	**MARKING AND OTHER INFORMATION**		P
8.1	After Item a) insert the following variation:		P
	The marking of rated supply voltage of single-phase transformers shall be 230 V and for poly-phase transformers shall be 400 V. (AS/NZS 61558.1:2018/A2:2020)	100-240V	P
	The marking of rated supply voltage range of single-phase transformers shall cover 230 V and for poly-phase transformers, 400 V (AS/NZS 61558.1:2018/A2:2020)		N/A

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Appendix No. 1:

Photo documentation

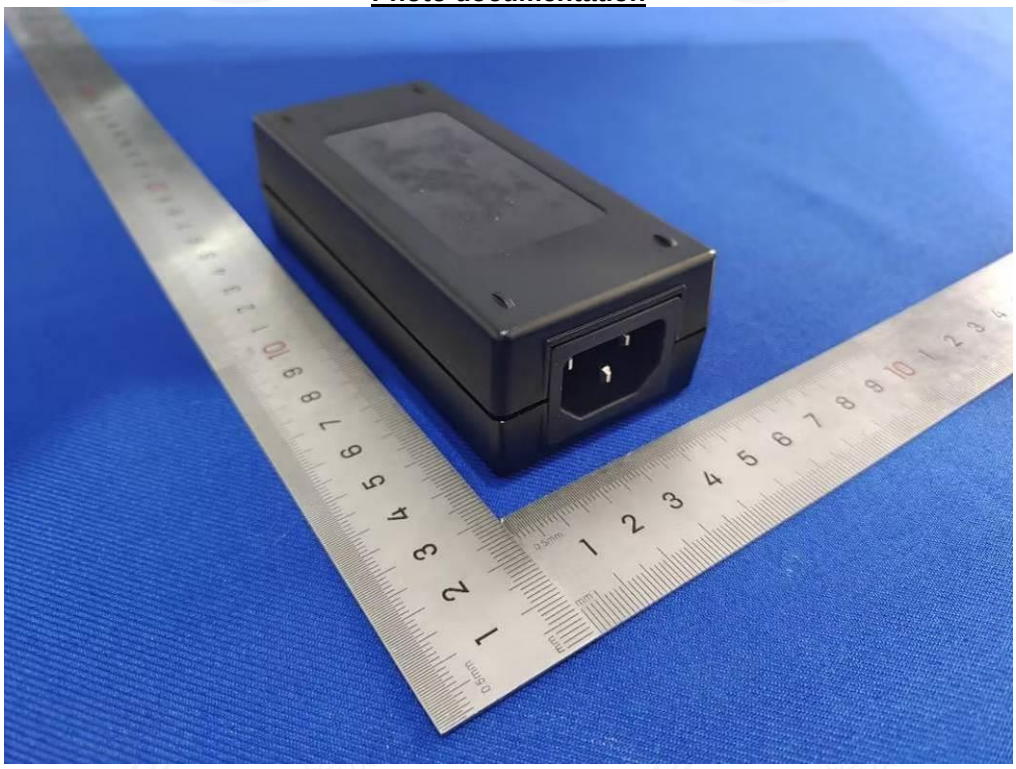


Figure 1 External view (for model GT*96605-G2**-T3-RA)

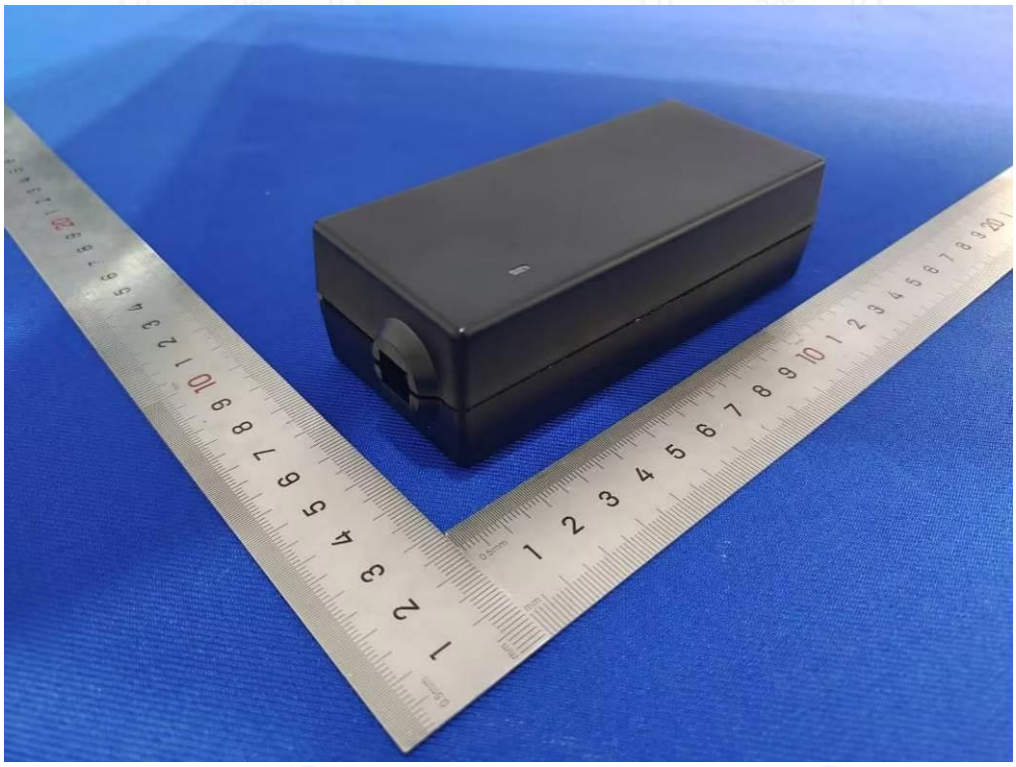


Figure 2 External view (for model GT*96605-G2**-T3-RA)

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Photo documentation

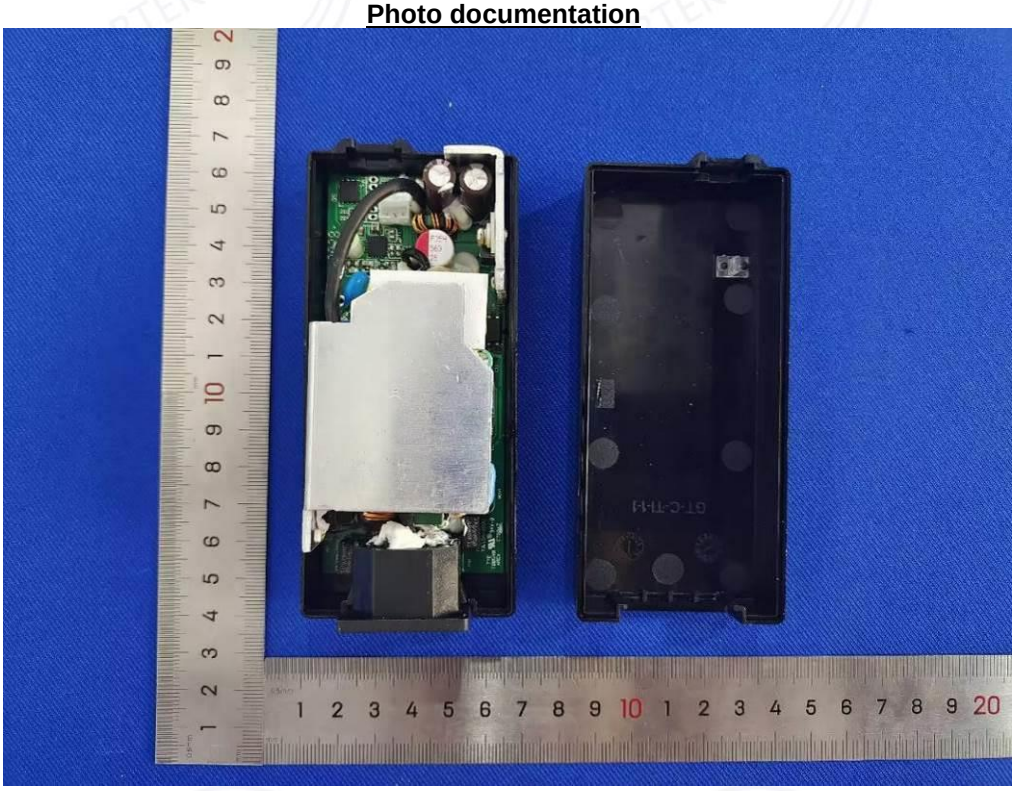


Figure 3 Internal view (for model GT*96605-G2**-T3-RA)



Figure 4 Internal view (for model GT*96605-G2**-T3-RA)

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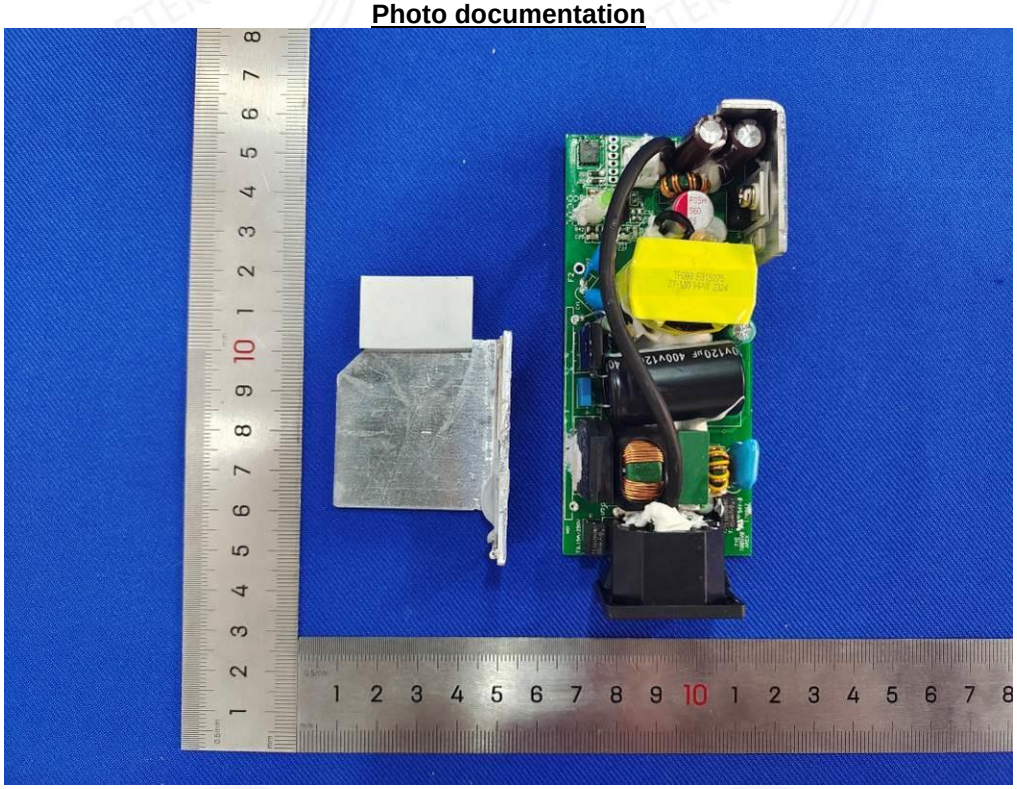


Figure 5 PCB view (for model GT*96605-G2**-T3-RA)

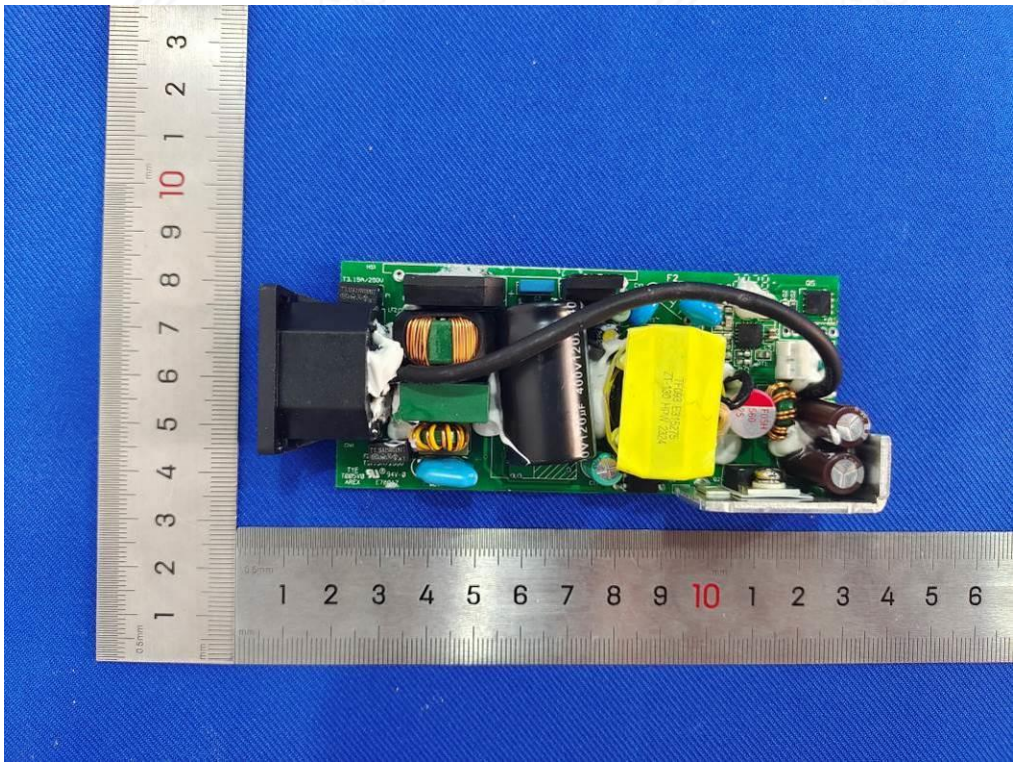


Figure 6 PCB view (for model GT*96605-G2**-T3-RA)

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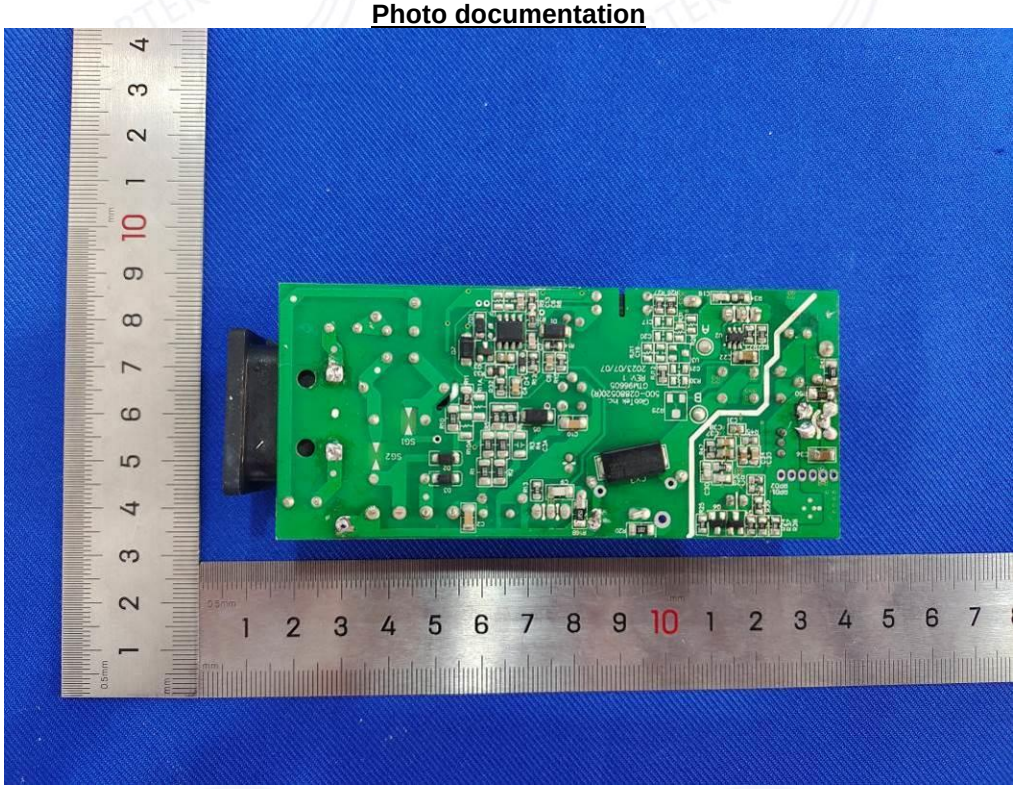


Figure 7 PCB view (for model GT*96605-G2**-T3-RA)



Figure 8 External view (for model GT*96605-G2**-T3)

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Figure 9 Internal view (for model GT*96605-G2**-T3)

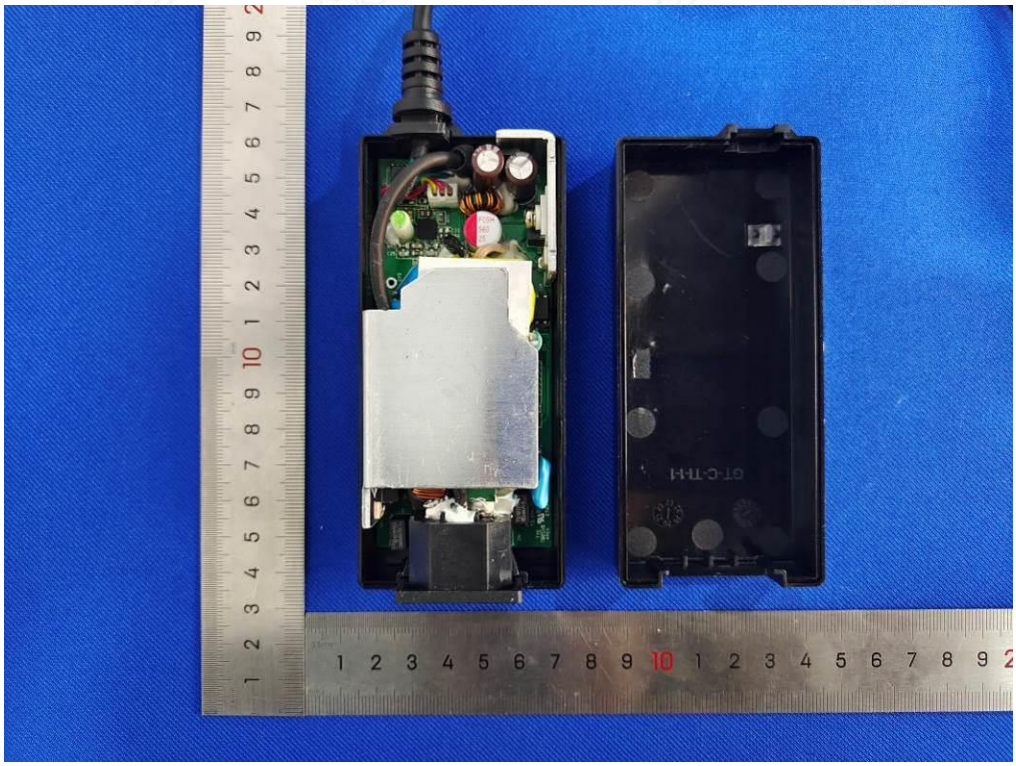


Figure 10 Internal view (for model GT*96605-G2**-T3)

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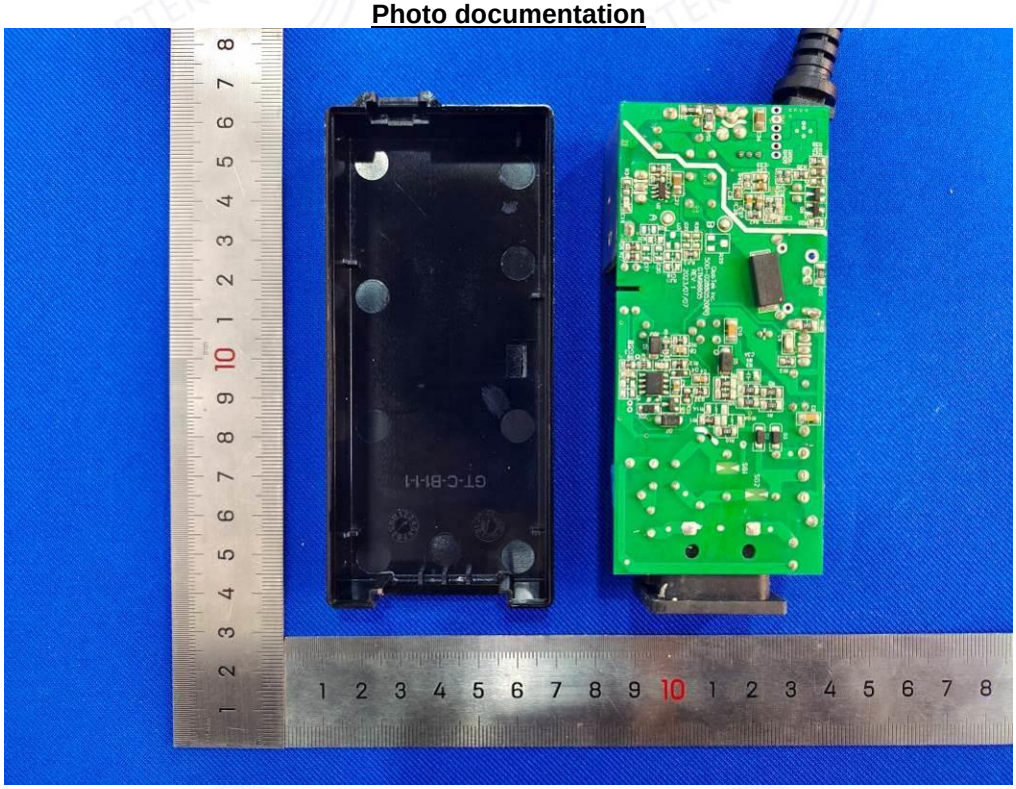


Figure 11 Internal view (for model GT*96605-G2**-T3)

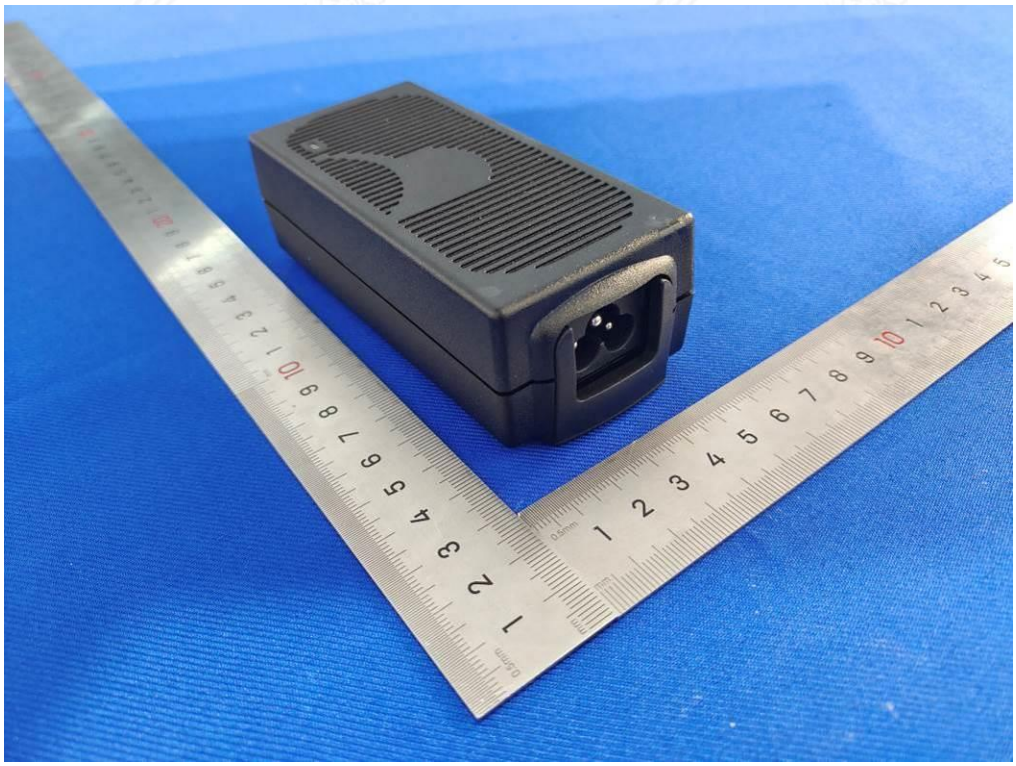


Figure 12 External view (for model GT*96605-G2**-R3A-RA)

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Figure 13 External view (for model GT*96605-G2**-R3A-RA)



Figure 14 Internal view (for model GT*96605-G2**-R3A-RA)

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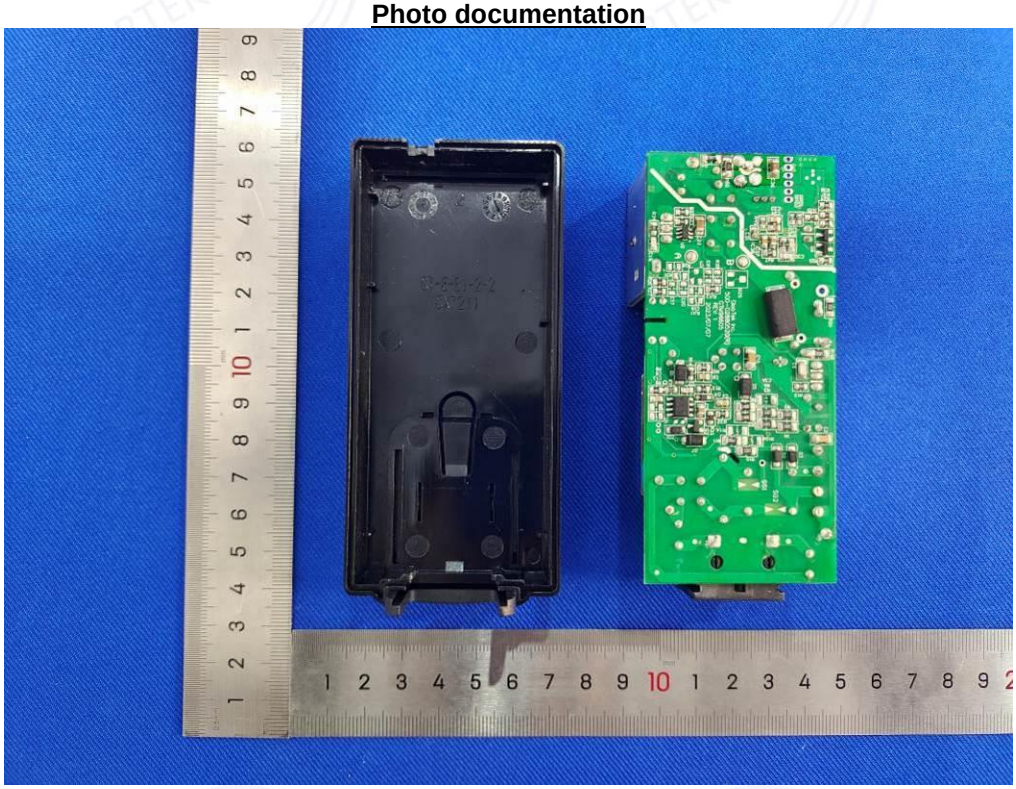


Figure 15 Internal view (for model GT*96605-G2**-R3A-RA)



Figure 16 External view (for model GT*96605-G2**-R3A)

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Figure 17 External view (for model GT*96605-G2**-R3A)



Figure 18 Internal view (for model GT*96605-G2**-R3A)

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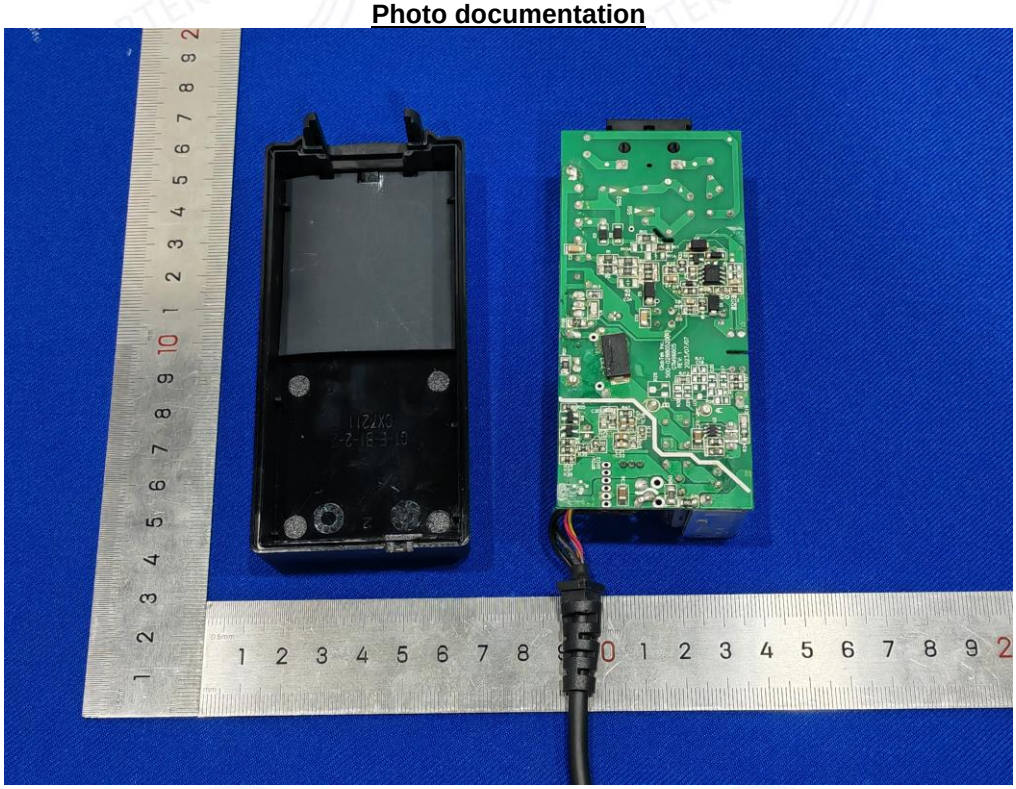


Figure 19 Internal view (for model GT*96605-G2**-R3A)

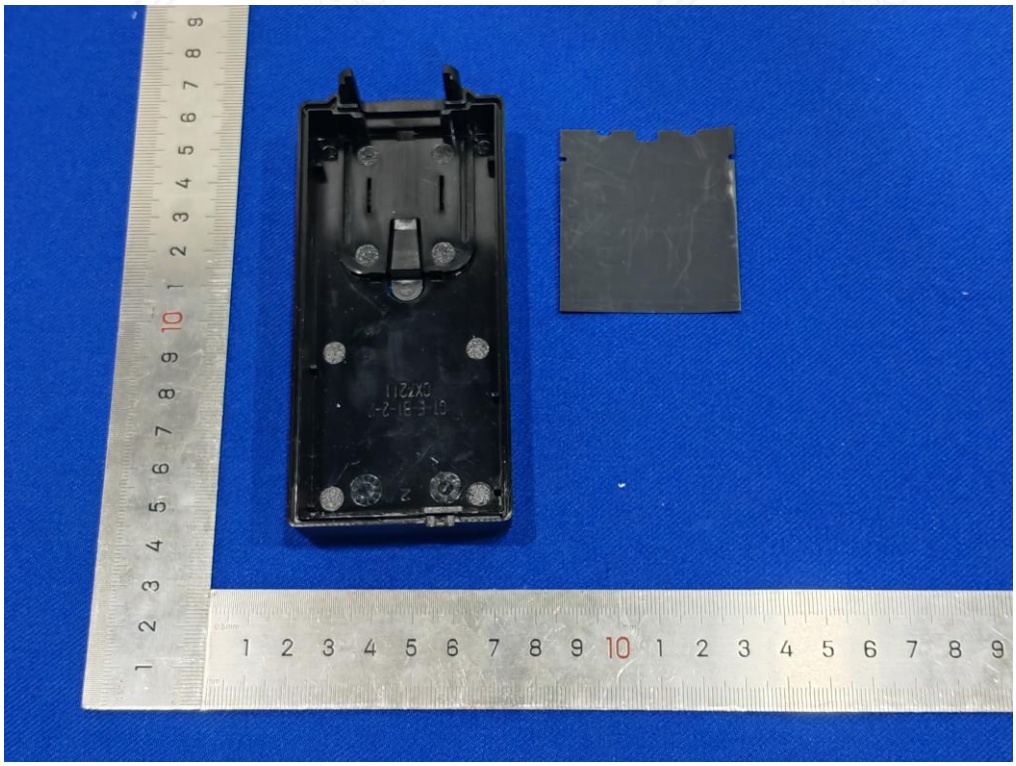


Figure 20 Internal view (for model GT*96605-G2**-R3A)

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Figure 21 Internal view

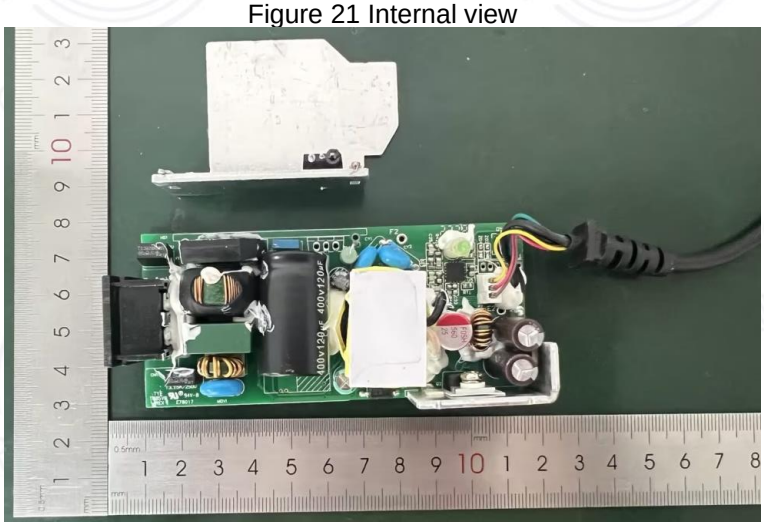


Figure 22 Internal view



Figure 23 Internal view

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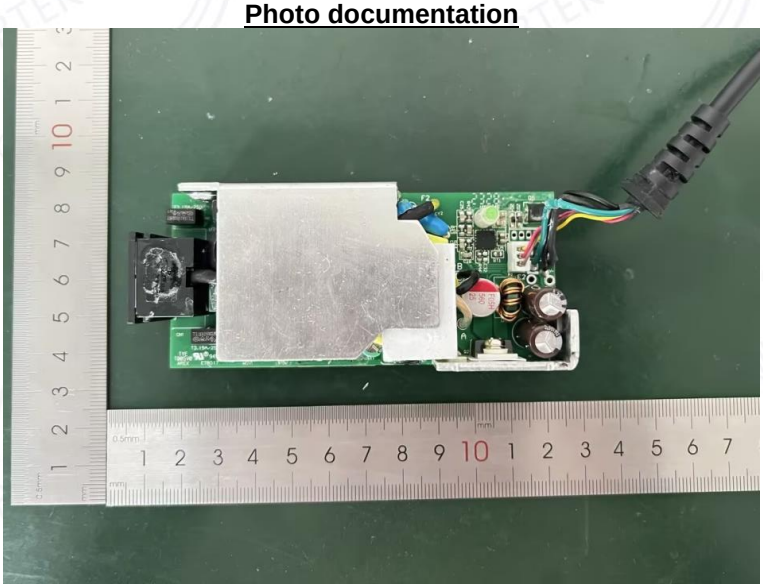


Figure 24 Internal view

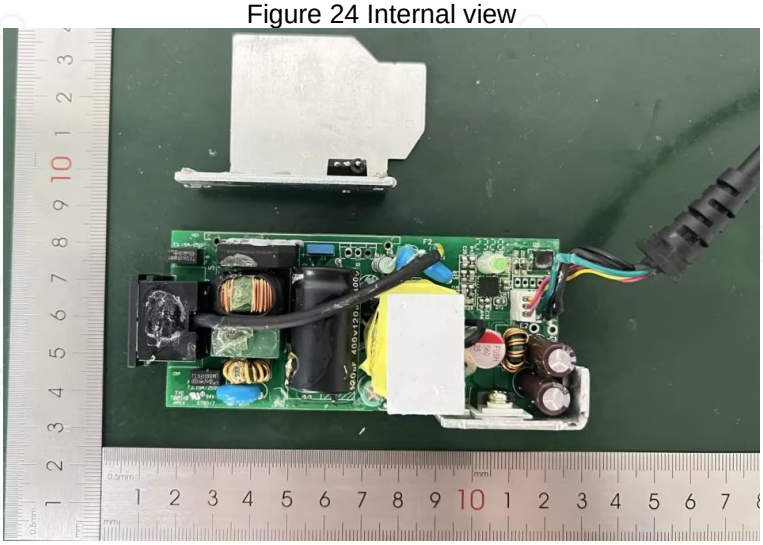


Figure 25 Internal view

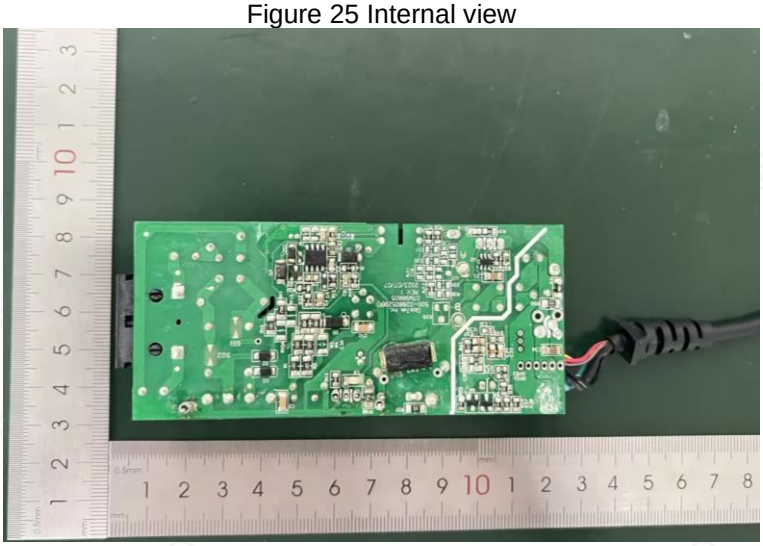


Figure 26 Internal view

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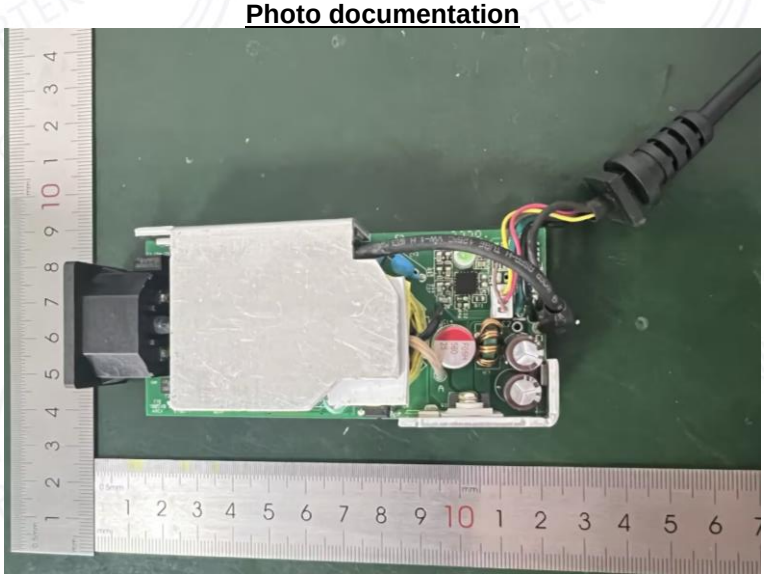


Figure 27 Internal view

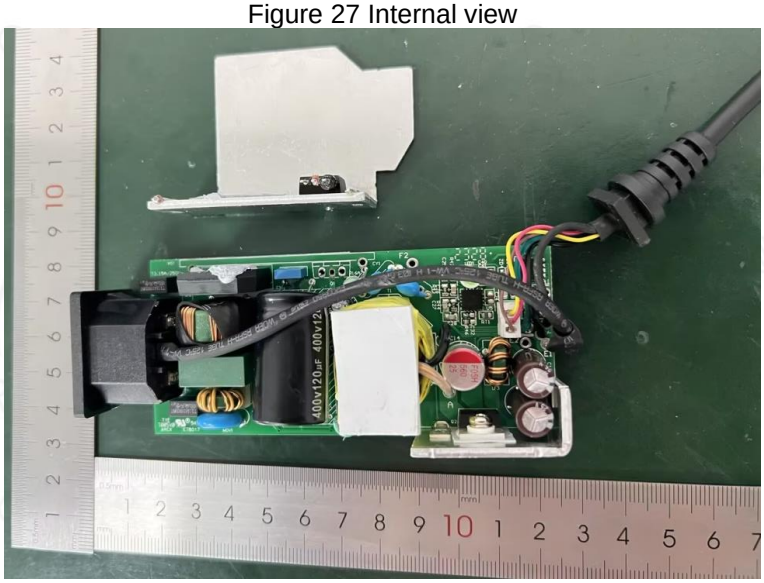


Figure 28 Internal view

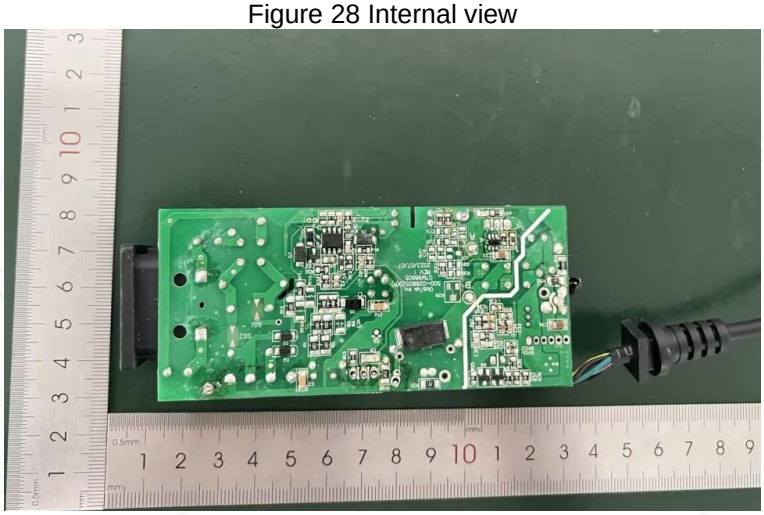


Figure 29 Internal view

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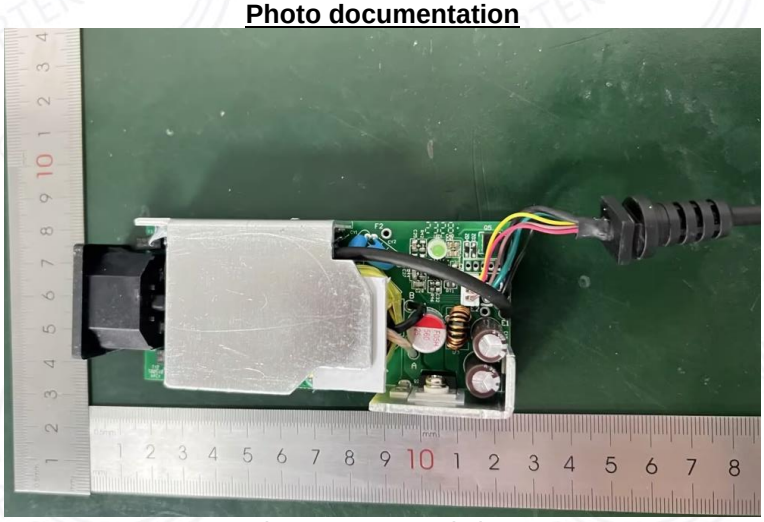


Figure 30 Internal view

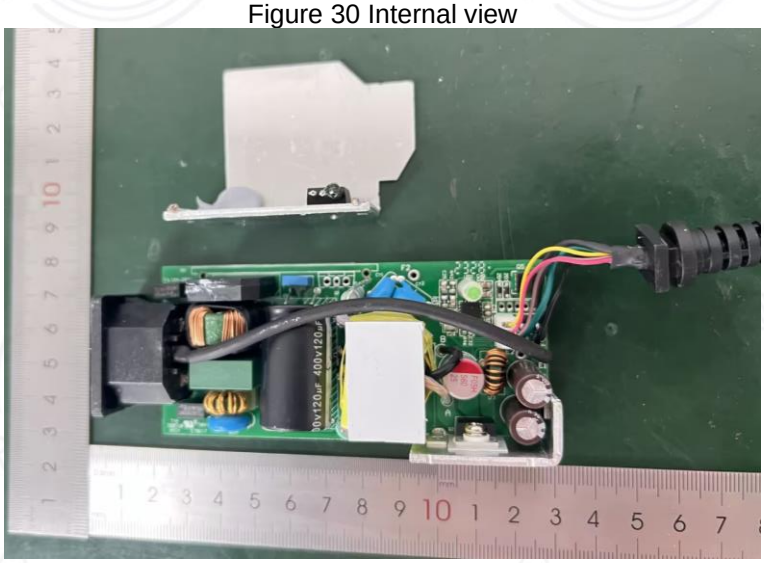


Figure 31 Internal view

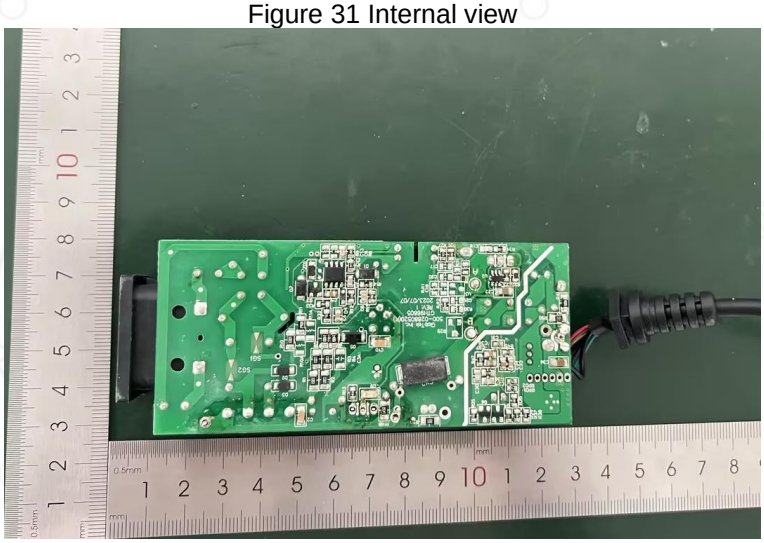


Figure 32 Internal view

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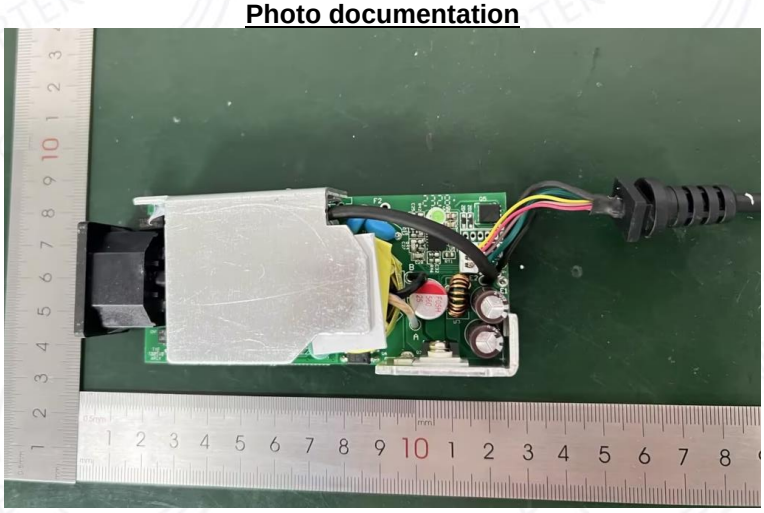


Figure 33 Internal view

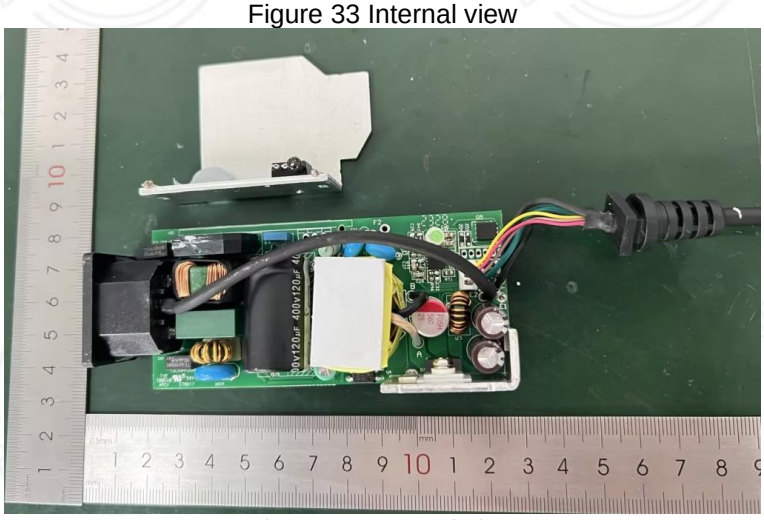


Figure 34 Internal view

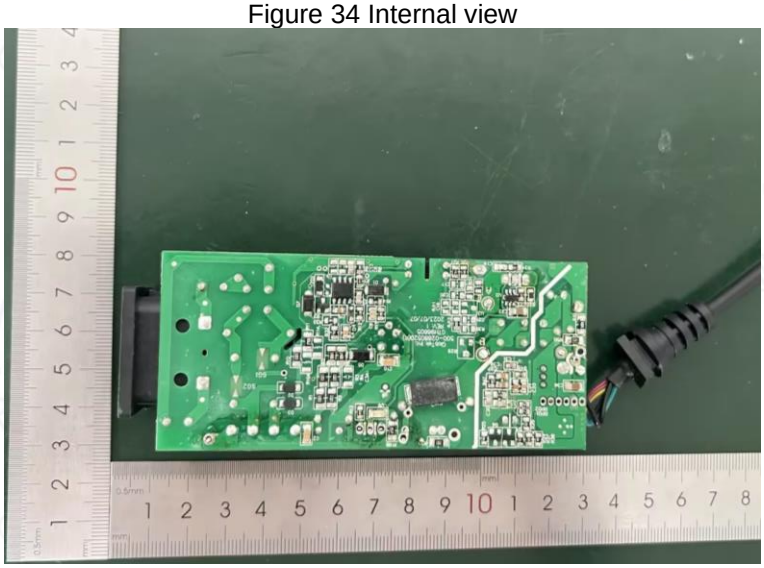


Figure 35 Internal view

---End of test report---

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